

# 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.: KR19-SRF0103-B<br>Page (1) of (25) |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------------------------|

**1. Client**

- Name : VESTA.DS, Inc.
- Address : 401 south. Dupont Ave. Ontario. CA 91761
- Date of Receipt : 2019-03-26

**2. Use of Report** : -

**3. Name of Product and Model** : V REMOTE / DR960G

**4. Manufacturer and Country of Origin** : DAESUNG CELTIC ENERSYS / Korea

**5. FCC ID** : 2ARQP-DR960G

**6. Date of Test** : 2019-05-27 to 2019-06-05

**7. Test Standards** : FCC Part 15 Subpart C, 15.209, 15.231

**8. Test Results** : Refer to the test result in the test report

|             |                                                                                                                               |                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Affirmation | Tested by<br><br>Name : Kwonse Kim<br><br> | Technical Manager<br><br>Name : Jaehyong Lee<br><br> |
|-------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|

2019-08-26

**KCTL Inc.**

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.

**KCTL Inc.**

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Report No.:  
KR19-SRF0103-B

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**Report revision history**

| Date       | Revision       | Page No  |
|------------|----------------|----------|
| 2019-07-23 | Initial report | -        |
| 2019-08-22 | Updated        | 4, 6, 18 |
| 2019-08-26 | Updated        | 4        |
|            |                |          |
|            |                |          |
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|            |                |          |

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**1. General information**

Client : VESTA.DS,Inc.  
 Address : 401 south. Dupont Ave. Ontario. CA 91761  
 Manufacturer : DAESUNG CELTIC ENERSYS  
 Address : 55-72, SANGGOK-RO,SAMSUNG-MYUN,EUMSUNG-GUN,CHUNGBUK,  
 KOREA,27658  
 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-3327, G-198, C-3706, T-1849  
 Industry Canada Registration No. : 8035A  
 KOLAS No.: KT231

**2. Device information**

Equipment under test : V REMOTE  
 Model : DR960G  
 Frequency range : WIFI(802.11b/g/n HT20)\_2 412 MHz ~ 2 462 MHz  
 433.125 MHz ~ 434.125 MHz  
 Modulation technique : WIFI(802.11a/b/g/n HT20)\_DSSS, OFDM  
 433 MHz\_FSK  
 Number of channels : WIFI(802.11b/g/n HT20)\_11ch  
 433 MHz\_21ch  
 Power source : AC 120 V  
 Antenna specification : Chip Antenna (WIFI 2.4 GHz)  
 Helical Antenna (433 MHz)  
 Antenna gain : 1.5 dBi (WIFI 2.4 GHz), -2.35 dBi (433 MHz)  
 Software version : 1.0.16  
 Hardware version : DR960G\_v1.1  
 Test device serial No. : N/A  
 Operation temperature : 23 °C

**2.1. Accessory information**

| Equipment     | Manufacturer      | Model    | Serial No.    | Power source        |
|---------------|-------------------|----------|---------------|---------------------|
| AC/DC adapter | BRIDGEPOWER Corp. | BI01012C | N/A           | 100-240 V, 50-60 Hz |
| LAN Cable     | -                 | -        | -             | -                   |
| Access Point  | D-Link Corp.      | DIR-850L | R3WD3H6000587 | 12V, 1.5A           |

## 2.2. Frequency/channel operations

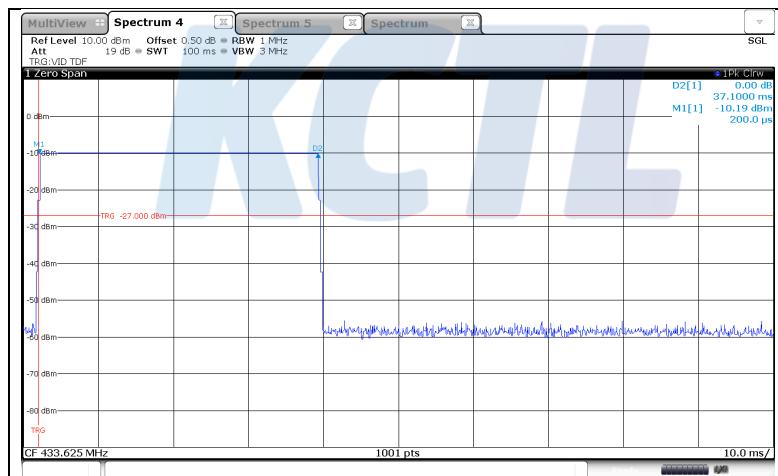
This device contains the following capabilities:

WIFI(802.11b/g/n HT20), 433 MHz

| Ch. | Frequency (MHz) |
|-----|-----------------|
| 0   | 433.125         |
| .   | .               |
| 10  | 433.625         |
| .   | .               |
| 20  | 434.125         |

Table 2.2.1. 433 MHz mode

## 2.3. Duty Cycle Correction Factor



Note<sub>1)</sub> : Period : 100 ms, On time : 37.10 ms

Note<sub>2)</sub> : DCCF =  $20\log(1/x) = 20\log(1/0.37) = 8.61$  dB,  $x = 37.1/100 = 0.37$

## 3. Antenna requirement

According to §15.203

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 transmitter has a unique coupling(Reverse type SMA).
- The E.U.T Complies with the requirement of §15.203.

#### 4. Summary of tests

| FCC Part section(s)                     | Parameter                                           | Test results |
|-----------------------------------------|-----------------------------------------------------|--------------|
| 15.231(c)                               | 20 dB Bandwidth                                     | Pass         |
| 15.231(a)                               | Transmission Time                                   | Pass         |
| 15.205(a),(b)<br>15.209(a)<br>15.231(b) | Field Strength of Fundamental and Spurious Emission | Pass         |
| 15.207(a)                               | Conducted Emissions                                 | Pass         |

**Notes:**

1. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although 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.
2. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation
3. The test procedure(s) in this report were performed in accordance as following.
  - ANSI C63.10-2013

#### 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( $\pm$ ) |         |
|------------------------------|-------------------------------|---------|
| Conducted RF power           | 1.76 dB                       |         |
| Conducted spurious emissions | 4.03 dB                       |         |
| 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 |

**6. Measurement results explanation example**

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.

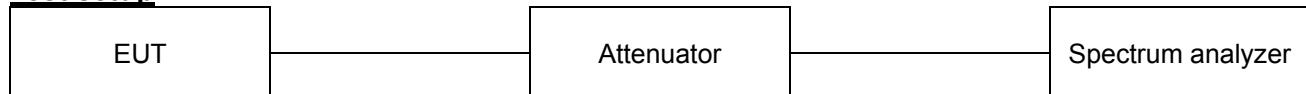
With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

| Frequency (MHz) | Factor(dB) | Frequency (MHz) | Factor(dB) |
|-----------------|------------|-----------------|------------|
| 30              | 10.08      | 800             | 10.45      |
| 100             | 10.19      | 900             | 10.55      |
| 200             | 10.12      | 1 000           | 10.52      |
| 300             | 10.26      | 2 000           | 10.87      |
| 400             | 10.30      | 3 000           | 11.07      |
| 500             | 10.40      | 4 000           | 11.30      |
| 600             | 10.45      | 5 000           | 11.46      |
| 700             | 10.46      | 6 000           | 11.70      |

**Note.**

Offset(dB) = RF cable loss(dB) + Attenuator(dB)



**7. Test results****7.1. 20 dB Bandwidth****Test setup****Limit**

According to §15.231(c), the bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5 % of the Center Frequency. Bandwidth is determined at the point 20 dB down from the modulated carrier.

**Test procedure**

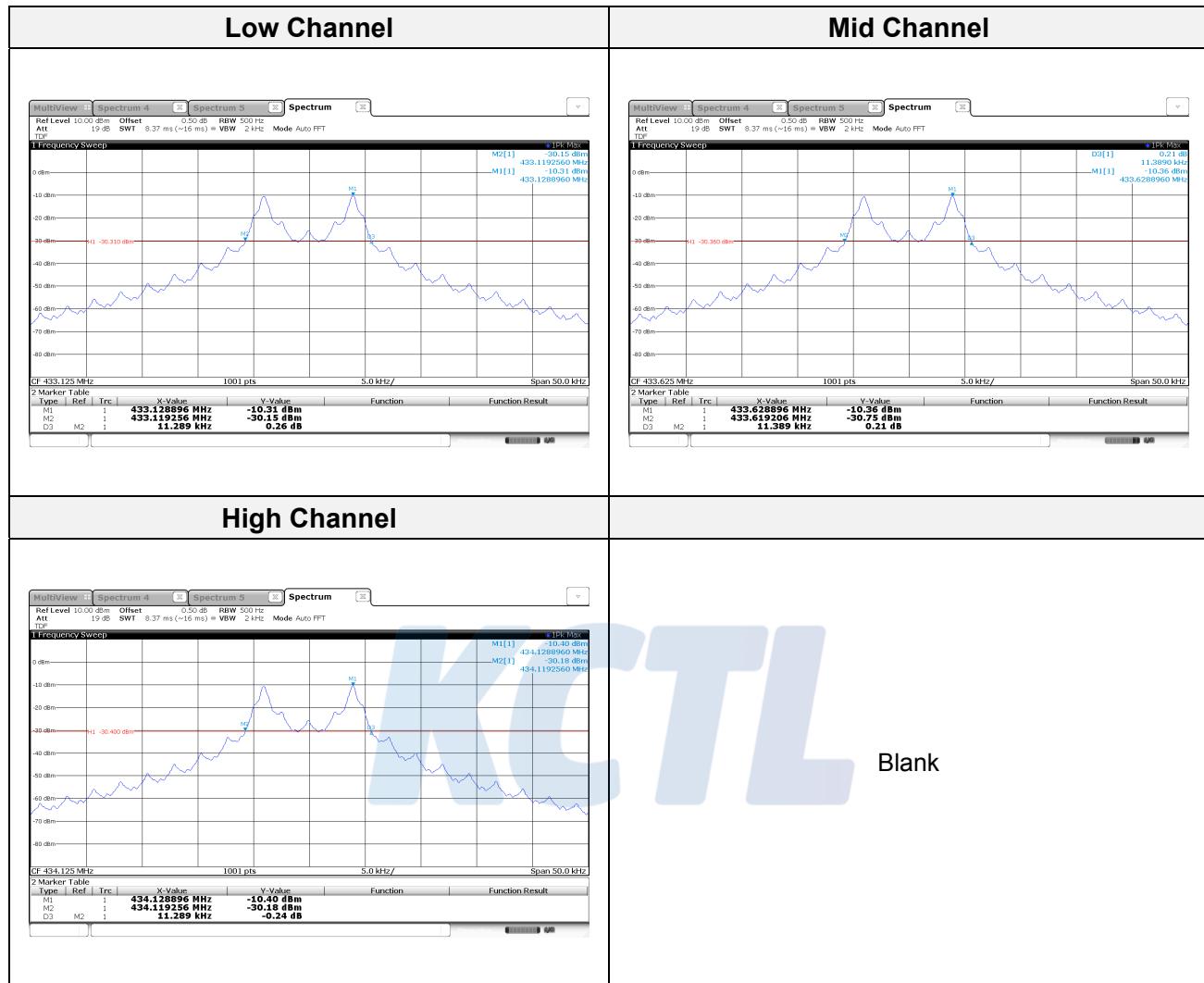
ANSI C63.10, Section 6.9.2

**Test settings**

1. Set RBW = 1% to 5% of the OBW
2. Set the VBW > RBW. X 3
3. Detector = Peak.
4. Trace mode = Max hold.

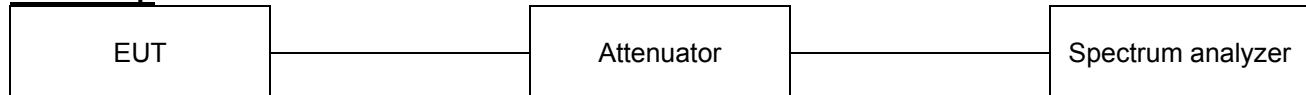
**Test results**

| Frequency [MHz] | 20 dB Bandwidth [MHz] | Limit [MHz] |
|-----------------|-----------------------|-------------|
| 433.125         | 0.011                 | 1.083       |
| 433.625         | 0.011                 | 1.084       |
| 434.125         | 0.011                 | 1.085       |

**Test plot**

## 7.2. Transmission Time

### Test setup



### Limit

According to §15.231(a)(1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

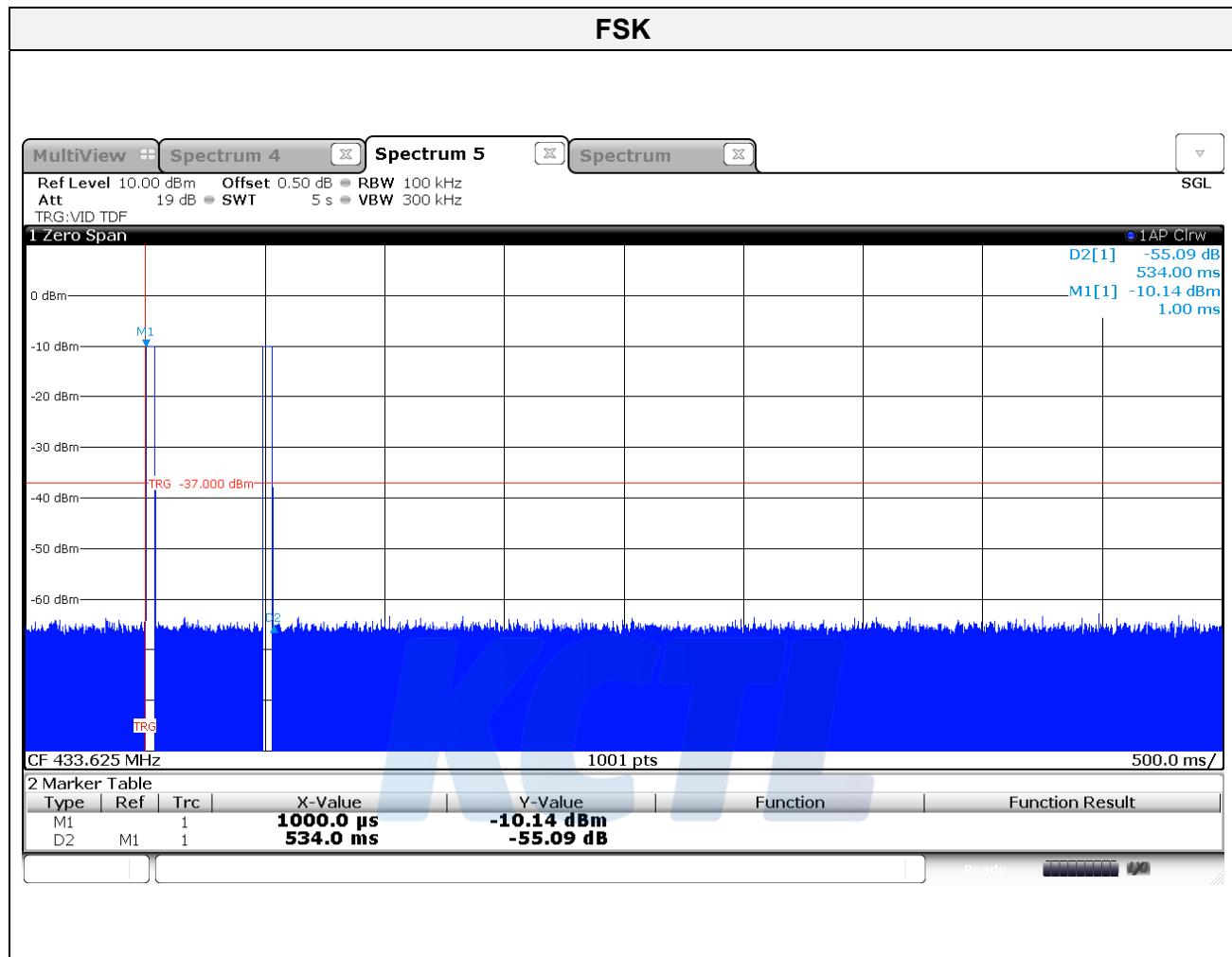
### Test procedure

ANSI C63.10-2013.

1. The transmitter output is connected to the spectrum analyzer.
2. RBW : 100 kHz
3. VBW : 300 kHz
4. Span : Zero span
5. The bandwidth of fundamental frequency was measured and recorded.

### Test results

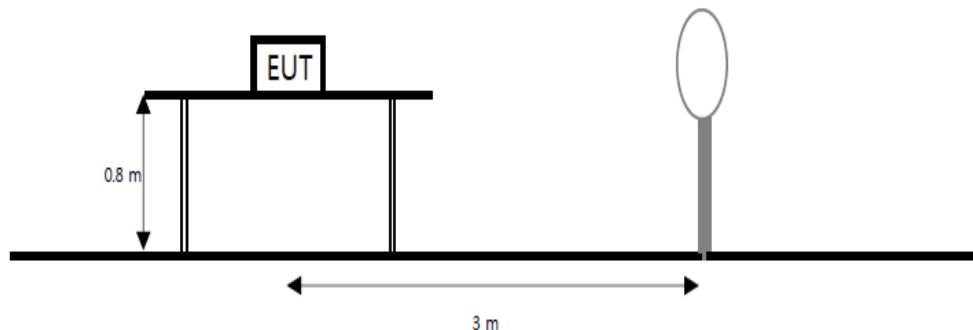
| Frequency [MHz] | Transmission time [s] | Limit [s] |
|-----------------|-----------------------|-----------|
| 433.625         | 0.534                 | 5.000     |

**Test plot**

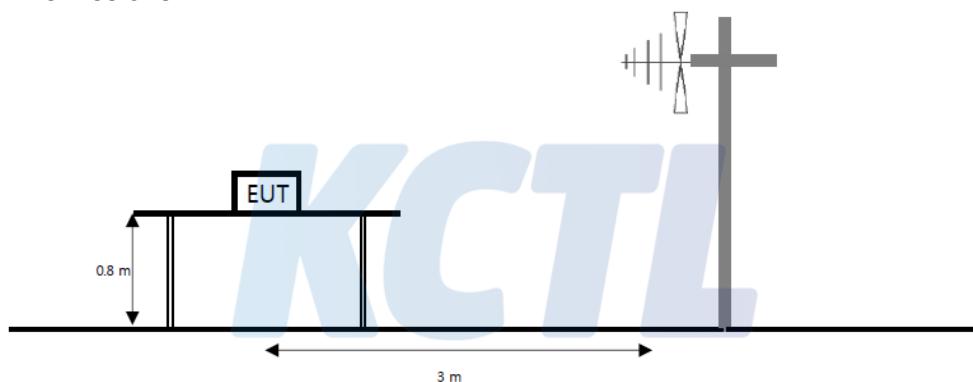
### 7.3. Field strength of Fundamental and Spurious emission

#### Test setup

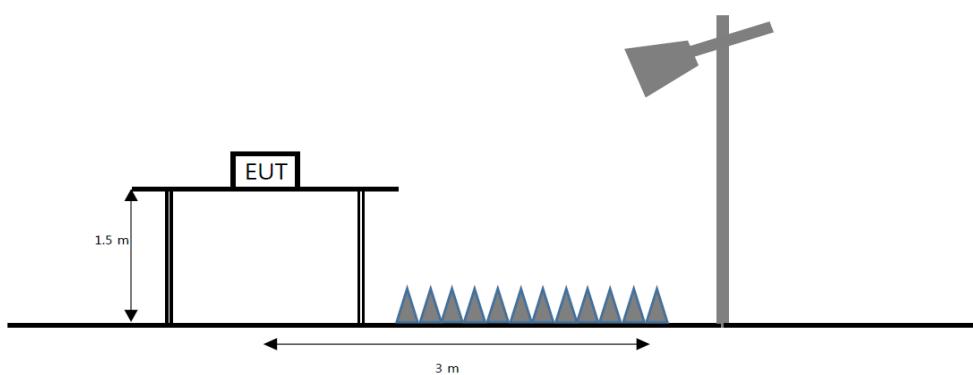
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions



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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



### Limit

According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: 83

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009 - 0.490   | 2 400/F(kHz)                      | 300                           |
| 0.490 - 1.705   | 24 000/F(kHz)                     | 30                            |
| 1.705 - 30.0    | 30                                | 30                            |
| 30 - 88         | 100 **                            | 3                             |
| 88 - 216        | 150**                             | 3                             |
| 216 - 960       | 200**                             | 3                             |
| Above 960       | 500                               | 3                             |

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

According to §15.231(b), in addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|-----------------------------|--------------------------------------------------|---------------------------------------------------------|
| 40.66 - 40.70               | 2,250                                            | 225                                                     |
| 70 - 130                    | 1,250                                            | 125                                                     |
| 130 - 174                   | 1,250 to 3,750 **                                | 125 to 375 **                                           |
| 174 - 260                   | 3,750                                            | 375                                                     |
| 260 - 470                   | 3,750 to 12,500 **                               | 375 to 1,250 **                                         |
| Above 470                   | 12,500                                           | 1,250                                                   |

\*\* linear interpolations

### Test procedure

ANSI C63.10-2013

**Test settings**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
- c. The spectrum from 9 kHz to 6 GHz was investigated with the transmitter on. For 9 kHz to 30 MHz, the transmitter was set to the worst-case channel. For 30 MHz to 6 GHz, the transmitter was set to Low and High channels, as described in 15.31(m).
- d. The antenna is a broadband antenna, and its height is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.
- i. Normally, output is measured with average result. but in this case, average result is calculated by measuring peak result and applying DCCF.

**Notes:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120  $\text{kHz}$  for peak detection(PK) and Quasi-peak detection (QP) at frequency below 1  $\text{GHz}$ .
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1  $\text{MHz}$  for peak detection and frequency above 1  $\text{GHz}$ .
3. The radiated restricted band edge and spurious radiated emissions average measurements use a duty cycle correction factor (DCCF).
4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1  $\text{MHz}$  for Peak detection and frequency above 1  $\text{GHz}$ . The resolution bandwidth of test receiver/spectrum analyzer is 1  $\text{MHz}$  and the video bandwidth is 1  $\text{kHz}$  ( $1/T$ ) for Average detection (AV) at frequency above 1  $\text{GHz}$ . (where  $T$  = pulse width)
5.  $f < 30 \text{ MHz}$ , extrapolation factor of 40 dB/decade of distance.  $F_d = 40\log(D_m/D_s)$   
 $f \geq 30 \text{ MHz}$ , extrapolation factor of 20 dB/decade of distance.  $F_d = 20\log(D_m/D_s)$

Where:

$F_d$ = Distance factor in dB

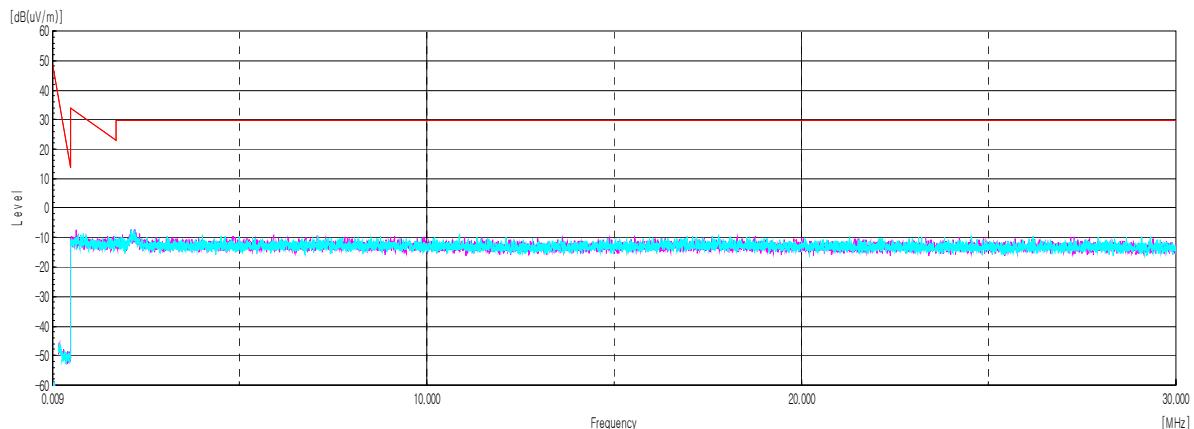
$D_m$ = Measurement distance in meters

$D_s$ = Specification distance in meters

6. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or  $F_d$ (dB)
7. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
8. Average test would be performed if the peak result were greater than the average limit.
9. <sup>1)</sup> means restricted band.
10. According to part 15.31(f)(2), an extrapolation factor of 40 dB/decade is applied because measured distance of radiated emission is 3 m.

**Test results (Below 30 MHz) – Worst case: Middle frequency**

| Frequency                                                      | Pol.  | Reading        | Cable Loss | Amp Gain | Ant. Factor | DCCF | Result           | Limit            | Margin |
|----------------------------------------------------------------|-------|----------------|------------|----------|-------------|------|------------------|------------------|--------|
| (MHz)                                                          | (V/H) | (dB( $\mu$ V)) | (dB)       | (dB)     | (dB)        | (dB) | (dB( $\mu$ V/m)) | (dB( $\mu$ V/m)) | (dB)   |
| No spurious emissions were detected within 20 dB of the limit. |       |                |            |          |             |      |                  |                  |        |

**Horizontal/Vertical**

**Test results (Below 1 000 MHz) - Field strength of fundamental**

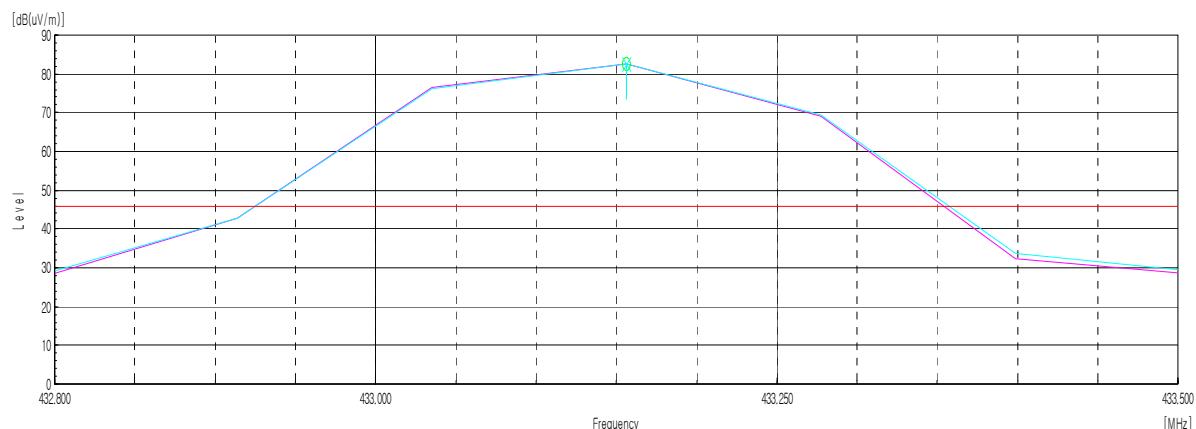
| Frequency<br>(MHz)  | Reading<br>(dB( $\mu$ V)) | Pol.<br>(V/H) | Ant. Factor<br>(dB) | Amp + Cable<br>(dB) | DCCF<br>(dB) | Result<br>(dB( $\mu$ V/m)) | Limit<br>(dB( $\mu$ V/m)) | Margin<br>(dB) |
|---------------------|---------------------------|---------------|---------------------|---------------------|--------------|----------------------------|---------------------------|----------------|
| <b>Peak data</b>    |                           |               |                     |                     |              |                            |                           |                |
| 433.125             | 87.10                     | H             | 22.66               | -27.33              | -            | 82.43                      | 100.80                    | 18.37          |
| 433.625             | 87.50                     | H             | 22.67               | -27.33              | -            | 82.84                      | 100.82                    | 17.98          |
| 434.125             | 87.10                     | H             | 22.68               | -27.33              | -            | 82.45                      | 100.83                    | 18.38          |
| <b>Average Data</b> |                           |               |                     |                     |              |                            |                           |                |
| 433.125             | 87.10                     | H             | 22.66               | -27.33              | -8.61        | 73.82                      | 80.80                     | 6.98           |
| 433.625             | 87.50                     | H             | 22.67               | -27.33              | -8.61        | 74.23                      | 80.82                     | 6.59           |
| 434.125             | 87.10                     | H             | 22.68               | -27.33              | -8.61        | 73.84                      | 80.83                     | 6.99           |

Note.

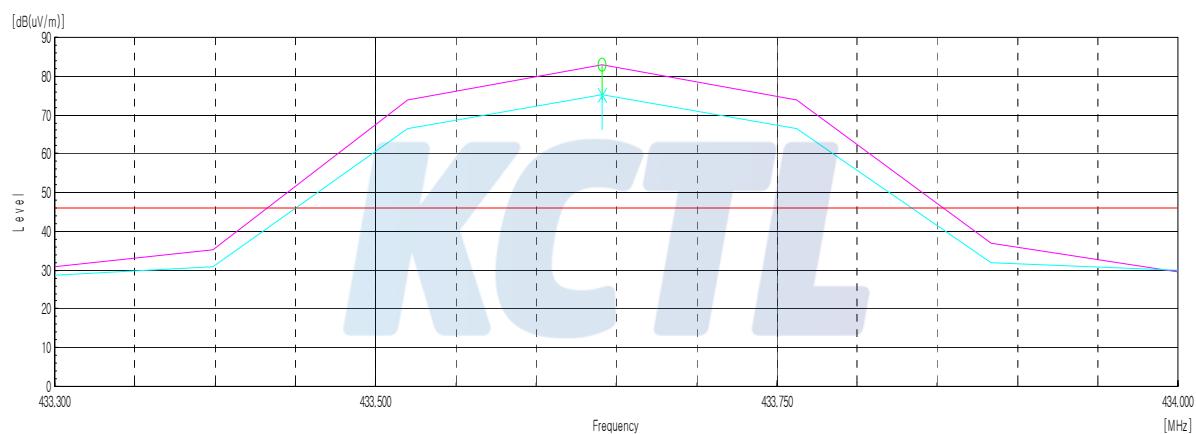
1. Average result : Peak reading + Duty cycle correction factor



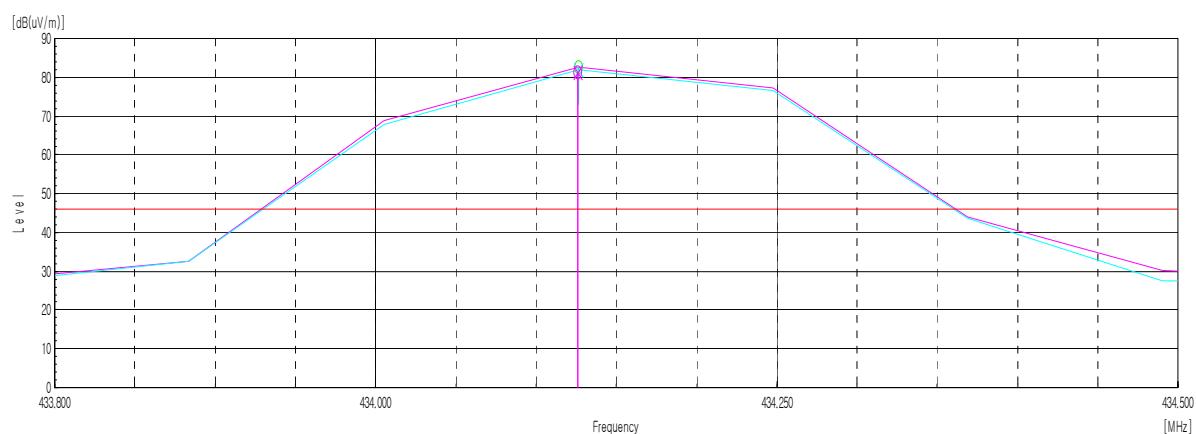
### Horizontal/Vertical for Low channel



### Horizontal/Vertical for Middle channel

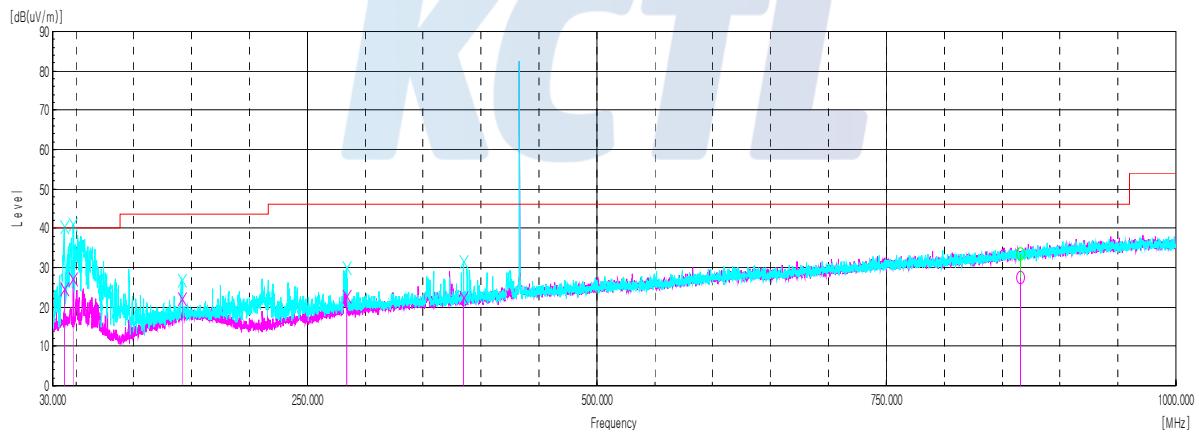


### Horizontal/Vertical for High channel



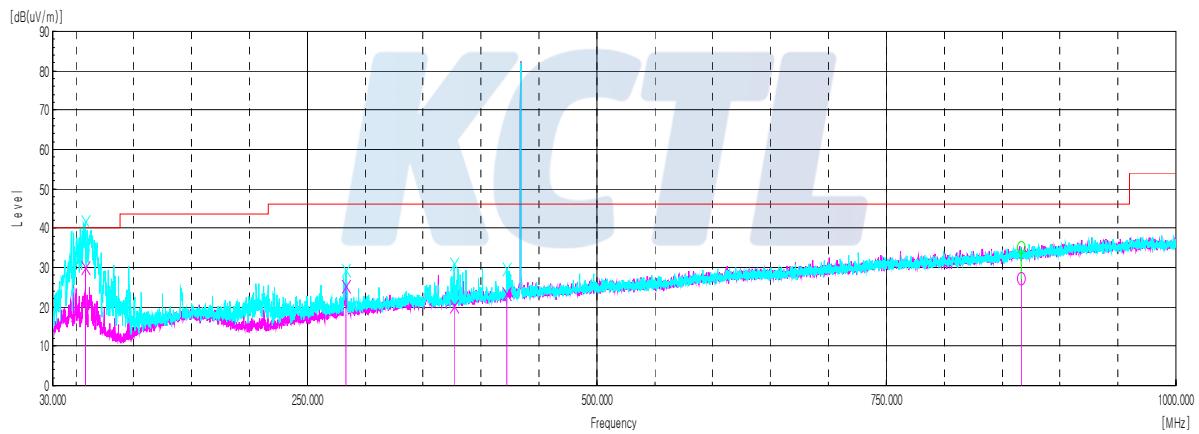
**Test results (Below 1 000 MHz) – Spurious emission****Low Channel**

| Frequency<br>(MHz)                                             | Reading<br>(dB( $\mu$ V)) | Pol.<br>(V/H) | Ant. Factor<br>(dB) | Amp + Cable<br>(dB) | DCCF<br>(dB) | Result<br>(dB( $\mu$ V/m)) | Limit<br>(dB( $\mu$ V/m)) | Margin<br>(dB) |
|----------------------------------------------------------------|---------------------------|---------------|---------------------|---------------------|--------------|----------------------------|---------------------------|----------------|
| <b>Peak data</b>                                               |                           |               |                     |                     |              |                            |                           |                |
| 866.63                                                         | 31.00                     | H             | 28.90               | -24.76              | -            | 35.10                      | 80.75                     | 45.65          |
| <b>Average data</b>                                            |                           |               |                     |                     |              |                            |                           |                |
| No spurious emissions were detected within 20 dB of the limit. |                           |               |                     |                     |              |                            |                           |                |
| <b>Quasi peak Data</b>                                         |                           |               |                     |                     |              |                            |                           |                |
| 39.94                                                          | 37.10                     | V             | 18.39               | -30.82              | -            | 24.67                      | 40.00                     | 15.33          |
| 47.95                                                          | 39.30                     | V             | 18.40               | -30.63              | -            | 27.07                      | 40.00                     | 12.93          |
| 142.04                                                         | 32.80                     | V             | 18.92               | -29.52              | -            | 22.20                      | 43.50                     | 21.30          |
| 283.78                                                         | 32.20                     | V             | 18.98               | -28.32              | -            | 22.80                      | 46.00                     | 23.20          |
| 385.02                                                         | 28.70                     | V             | 21.35               | -27.63              | -            | 22.40                      | 46.00                     | 23.60          |

**Horizontal/Vertical**

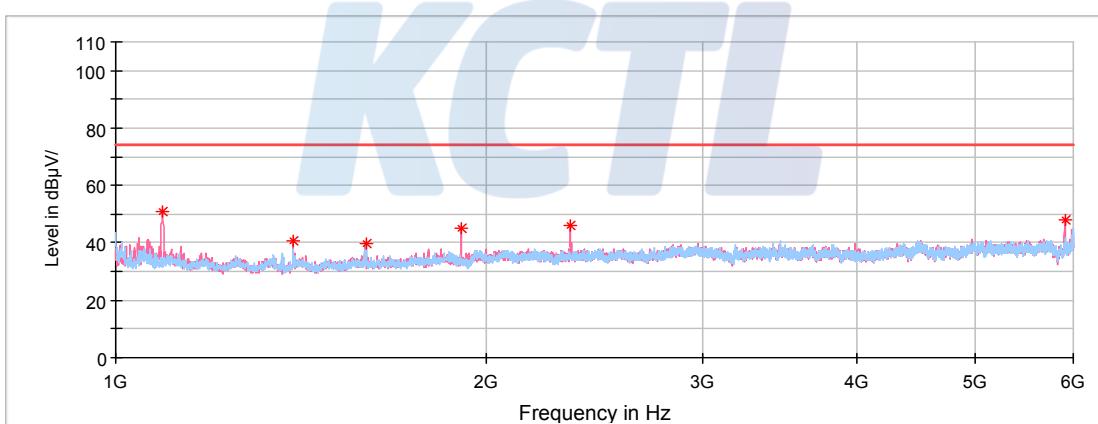
**High Channel**

| Frequency                                                      | Reading        | Pol.  | Ant. Factor | Amp + Cable | DCCF | Result           | Limit            | Margin |
|----------------------------------------------------------------|----------------|-------|-------------|-------------|------|------------------|------------------|--------|
| (MHz)                                                          | (dB( $\mu$ V)) | (V/H) | (dB)        | (dB)        | (dB) | (dB( $\mu$ V/m)) | (dB( $\mu$ V/m)) | (dB)   |
| <b>Peak data</b>                                               |                |       |             |             |      |                  |                  |        |
| 866.63                                                         | 23.00          | H     | 28.90       | -24.76      | -    | 27.14            | 80.75            | 53.61  |
| <b>Average data</b>                                            |                |       |             |             |      |                  |                  |        |
| No spurious emissions were detected within 20 dB of the limit. |                |       |             |             |      |                  |                  |        |
| <b>Quasi peak Data</b>                                         |                |       |             |             |      |                  |                  |        |
| 58.49                                                          | 42.40          | V     | 18.02       | -30.4       | -    | 30.02            | 40.00            | 9.98   |
| 283.53                                                         | 34.70          | V     | 18.97       | -28.32      | -    | 25.30            | 46.00            | 20.70  |
| 377.02                                                         | 26.80          | V     | 21.14       | -27.68      | -    | 20.30            | 46.00            | 25.70  |
| 422.24                                                         | 28.50          | V     | 22.29       | -27.4       | -    | 23.40            | 80.43            | 57.03  |

**Horizontal/Vertical**

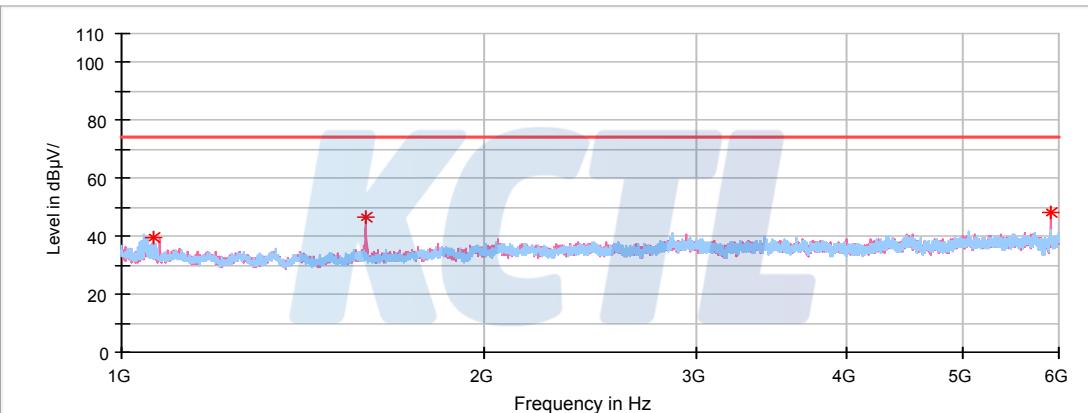
**Test results (Above 1 000 MHz)****Low Channel**

| Frequency<br>(MHz)                                             | Reading<br>(dB( $\mu$ N)) | Pol. | Ant. Factor<br>(dB) | Amp + Cable<br>(dB) | DCCF<br>(dB) | Result<br>(dB( $\mu$ N/m)) | Limit<br>(dB( $\mu$ N/m)) | Margin<br>(dB) |
|----------------------------------------------------------------|---------------------------|------|---------------------|---------------------|--------------|----------------------------|---------------------------|----------------|
| <b>Peak data</b>                                               |                           |      |                     |                     |              |                            |                           |                |
| 1 092.97                                                       | 71.60                     | V    | 28.08               | -60.18              | -            | 39.50                      | 74.00                     | 34.50          |
| 1 597.66                                                       | 75.11                     | V    | 28.72               | -58.59              | -            | 45.24                      | 74.00                     | 28.76          |
| 1 994.50                                                       | 67.84                     | V    | 31.66               | -58.38              | -            | 41.12                      | 74.00                     | 32.88          |
| 2 390.81                                                       | 66.57                     | V    | 32.01               | -57.82              | -            | 40.76                      | 74.00                     | 33.24          |
| 5 905.56                                                       | 66.68                     | V    | 34.99               | -54.75              | -            | 46.92                      | 74.00                     | 27.08          |
| <b>Average data</b>                                            |                           |      |                     |                     |              |                            |                           |                |
| No spurious emissions were detected within 20 dB of the limit. |                           |      |                     |                     |              |                            |                           |                |

**Horizontal/Vertical for 1 GHz ~ 6 GHz**

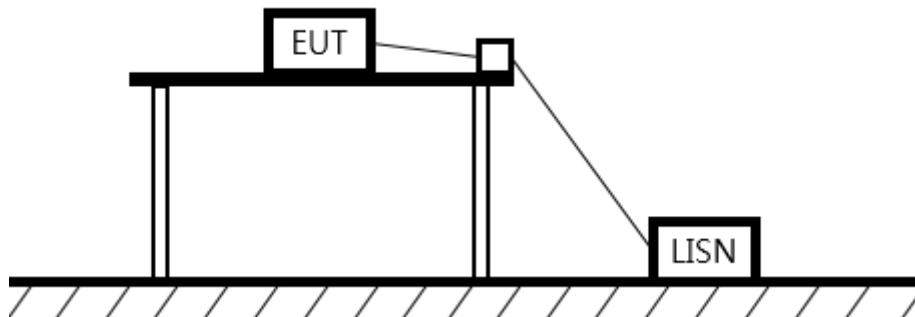
**High Channel**

| Frequency                                                      | Reading        | Pol.  | Ant. Factor | Amp + Cable | DCCF | Result           | Limit            | Margin |
|----------------------------------------------------------------|----------------|-------|-------------|-------------|------|------------------|------------------|--------|
| (MHz)                                                          | (dB( $\mu$ V)) | (V/H) | (dB)        | (dB)        | (dB) | (dB( $\mu$ V/m)) | (dB( $\mu$ V/m)) | (dB)   |
| <b>Peak data</b>                                               |                |       |             |             |      |                  |                  |        |
| 1 061.63                                                       | 71.46          | H     | 28.09       | -60.08      | -    | 39.47            | 74.00            | 34.53  |
| 1 593.41                                                       | 76.37          | V     | 28.69       | -58.57      | -    | 46.49            | 74.00            | 27.51  |
| 5 905.56                                                       | 67.77          | V     | 34.99       | -54.75      | -    | 48.01            | 74.00            | 25.99  |
| <b>Average data</b>                                            |                |       |             |             |      |                  |                  |        |
| No spurious emissions were detected within 20 dB of the limit. |                |       |             |             |      |                  |                  |        |

**Horizontal/Vertical for 1 GHz ~ 6 GHz**

## 7.4. AC Conducted emission

### Test setup



### Limit

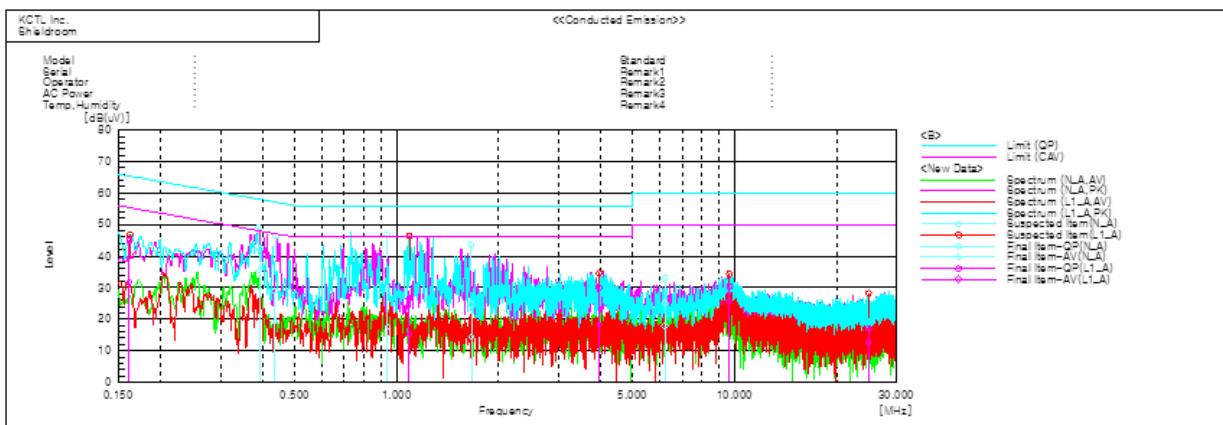
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the 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 50Ω/50μH 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.

## Test results



## Final Result

| -- N_A Phase -- |           |               |                |      |              |               |             |             |              |               |
|-----------------|-----------|---------------|----------------|------|--------------|---------------|-------------|-------------|--------------|---------------|
| No.             | Frequency | Reading<br>OP | Reading<br>CAV | c.f. | Result<br>OP | Result<br>CAV | Limit<br>OP | Limit<br>AV | Margin<br>OP | Margin<br>CAV |
| 1               | 0.39299   | 32.4          | 25.7           | 9.9  | 42.3         | 35.6          | 58.0        | 48.0        | 15.7         | 12.4          |
| 2               | 0.43463   | 19.1          | 9.4            | 9.9  | 29.0         | 19.3          | 57.2        | 47.2        | 28.2         | 27.9          |
| 3               | 0.39363   | 19.5          | 7.9            | 9.8  | 29.3         | 17.7          | 56.0        | 46.0        | 26.7         | 28.0          |
| 4               | 1.66329   | 15.0          | 4.7            | 9.8  | 24.8         | 14.5          | 56.0        | 46.0        | 31.2         | 31.5          |
| 5               | 6.22175   | 15.3          | 7.9            | 10.0 | 25.3         | 17.9          | 60.0        | 50.0        | 34.7         | 32.0          |

--- L1\_A Phase ---

| No. | Frequency<br>[MHz] | Reading<br>[dB (uV)] | Reading<br>[CAV] | c.f. | Result<br>[dB (uV)] | Result<br>[dB (uV)] | Limit<br>[dB (uV)] | Limit<br>[dB (uV)] | Margin<br>[dB] | Margin<br>[dB] |
|-----|--------------------|----------------------|------------------|------|---------------------|---------------------|--------------------|--------------------|----------------|----------------|
| 1   | 0.1615             | 35.1                 | 21.8             | 10.0 | 45.1                | 31.8                | 65.4               | 55.4               | 20.3           | 29.3           |
| 2   | 1.08812            | 16.7                 | 5.6              | 9.8  | 26.5                | 15.4                | 56.0               | 46.0               | 29.5           | 30.6           |
| 3   | 3.96666            | 20.2                 | 8.4              | 9.9  | 30.1                | 18.3                | 56.0               | 46.0               | 25.9           | 27.7           |
| 4   | 9.6382             | 20.1                 | 15.5             | 10.3 | 30.4                | 25.8                | 60.0               | 50.0               | 29.6           | 24.2           |
| 5   | 24.88876           | 6.1                  | 1.6              | 11.0 | 17.1                | 12.6                | 60.0               | 50.0               | 42.9           | 37.4           |

## 8. Measurement equipment

| Equipment Name           | Manufacturer      | Model No.                  | Serial No. | Next Cal. Date |
|--------------------------|-------------------|----------------------------|------------|----------------|
| Spectrum Analyzer        | R&S               | FSW50                      | 101013     | 20.05.13       |
| Spectrum Analyzer        | R&S               | FSV30                      | 100914     | 19.09.10       |
| ATTENUATOR               | API Inmet         | 40AH2W-10                  | 14         | 20.05.15       |
| Vector Signal Generator  | R&S               | SMBV100A                   | 257566     | 20.01.04       |
| Signal Generator         | R&S               | SMR40                      | 100007     | 20.05.13       |
| EMI TEST RECEIVER        | R&S               | ESCI7                      | 100732     | 19.08.23       |
| EMI TEST RECEIVER        | R&S               | ESCI3                      | 100001     | 19.08.23       |
| TWO-LINE V - NETWORK     | R&S               | ENV216                     | 101584     | 20.04.05       |
| Bi-Log Antenna           | SCHWARZBECK       | VULB 9168                  | 583        | 20.05.21       |
| COAXIAL FIXED ATTENUATOR | Agilent           | 8491B-003                  | 2708A18758 | 20.05.04       |
| Horn antenna             | ETS.lindgren      | 3117                       | 161225     | 20.05.22       |
| Amplifier                | SONOMA INSTRUMENT | 310N                       | 284608     | 19.08.23       |
| Amplifier                | L-3 Narda-MITEQ   | AMF-7D-01001800<br>-22-10P | 2031196    | 20.02.21       |
| Loop Antenna             | R&S               | HFH2-Z2                    | 100355     | 20.08.24       |
| Antenna Mast             | Innco Systems     | MA4640-XP-ET               | -          | -              |
| Antenna Mast             | Innco Systems     | MA4000-EP                  | 303        | -              |
| Turn Table               | Innco Systems     | DT2000                     | 79         | -              |
| Turn Table               | Innco Systems     | DT2000                     | 79         | -              |
| Cable Assembly           | RadiAll           | 2301761768000PJ            | 1724.659   | -              |
| Cable Assembly           | gigalane          | RG-400                     | -          | -              |

**End of test report**