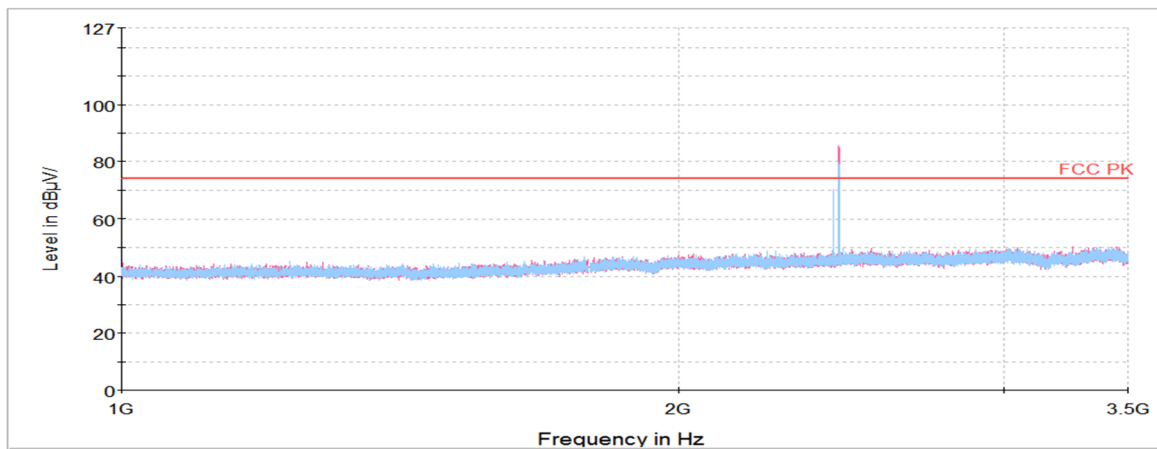
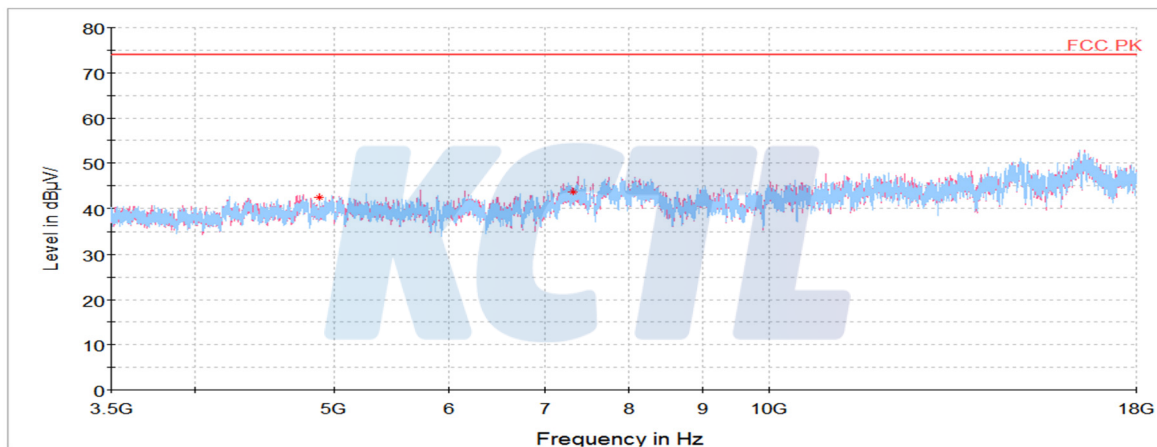
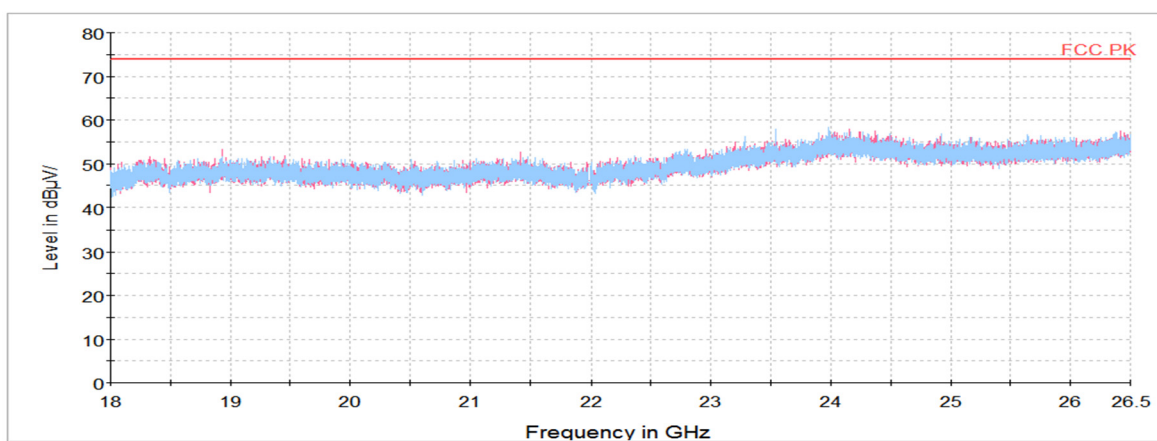


**Horizontal/Vertical for 1 GHz ~ 3.5 GHz****Horizontal/Vertical for 3.5 GHz ~ 18 GHz****Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

**KCTL Inc.**

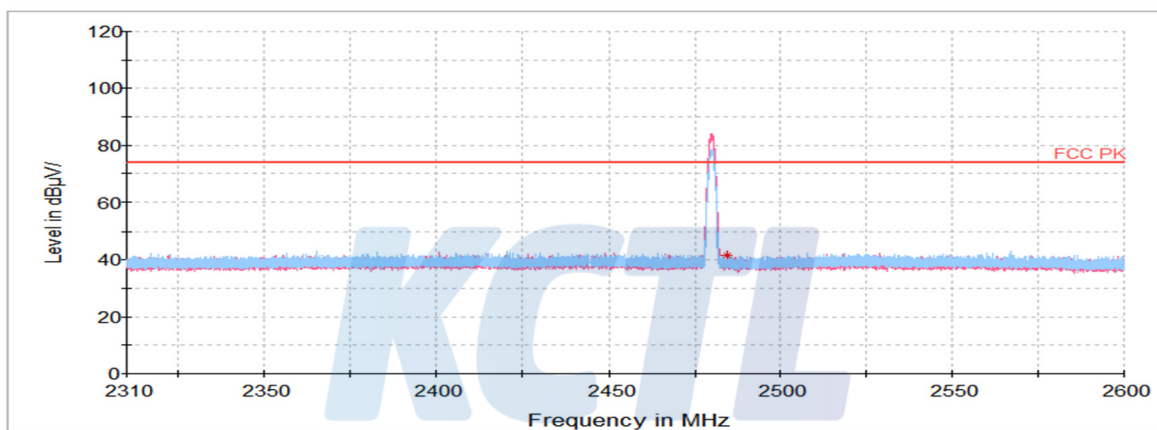
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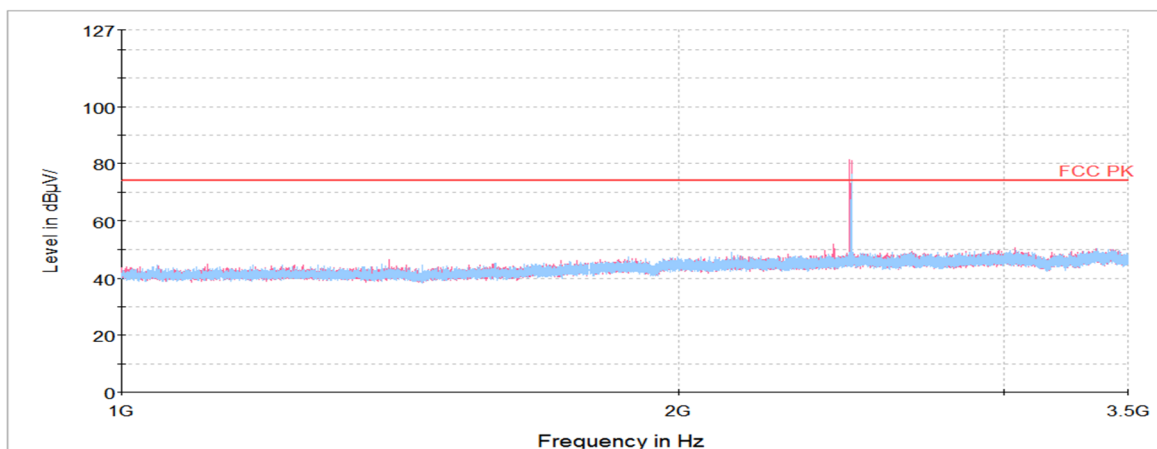
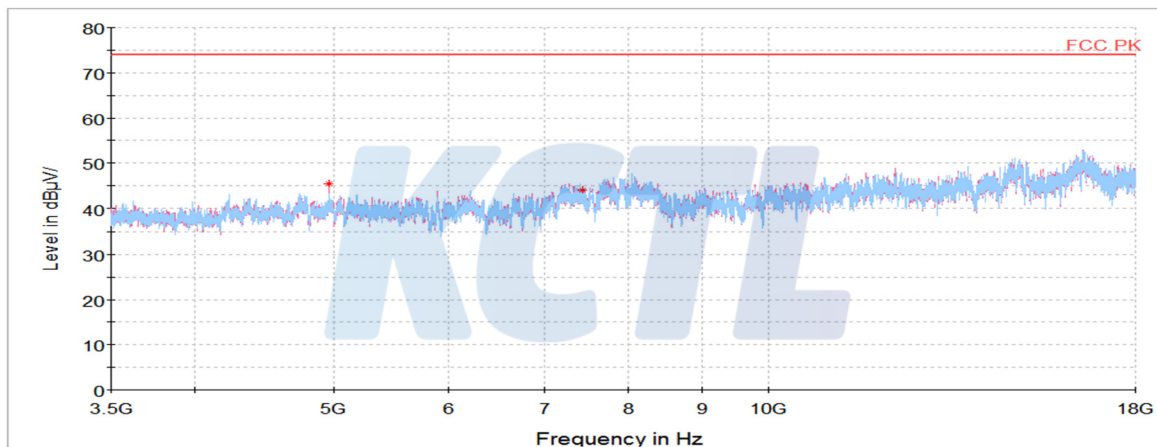
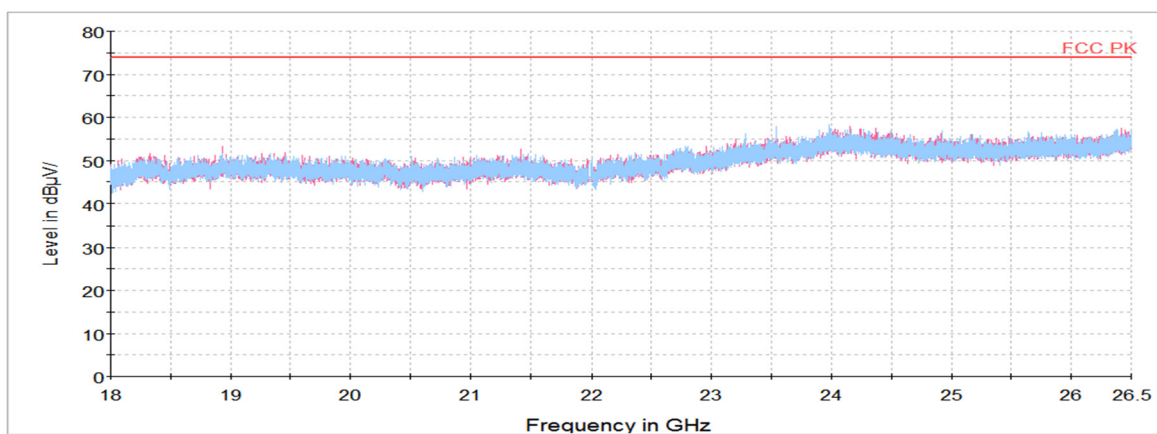
Report No.:  
KR20-SRF0034-A

Page (32) of (45)

**KCTL****High Channel**

| Frequency                                                      | Pol.  | Reading        | Antenna Factor | Amp. + Cable | DCCF | Result           | Limit            | Margin |
|----------------------------------------------------------------|-------|----------------|----------------|--------------|------|------------------|------------------|--------|
| (MHz)                                                          | (V/H) | (dB( $\mu$ V)) | (dB)           | (dB)         | (dB) | (dB( $\mu$ V/m)) | (dB( $\mu$ V/m)) | (dB)   |
| Peak data                                                      |       |                |                |              |      |                  |                  |        |
| 2 484.44 <sup>1)</sup>                                         | H     | 38.78          | 32.07          | -29.22       | -    | 41.63            | 74.00            | 32.37  |
| 4 959.52 <sup>1)</sup>                                         | V     | 66.19          | 33.98          | -54.67       | -    | 45.50            | 74.00            | 28.50  |
| 7 440.38 <sup>1)</sup>                                         | H     | 60.73          | 35.40          | -52.20       | -    | 43.93            | 74.00            | 30.07  |
| Average Data                                                   |       |                |                |              |      |                  |                  |        |
| No spurious emissions were detected within 20 dB of the limit. |       |                |                |              |      |                  |                  |        |

**Horizontal/Vertical for Band-edge**

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz****Horizontal/Vertical for 3.5 GHz ~ 18 GHz****Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

**KCTL Inc.**

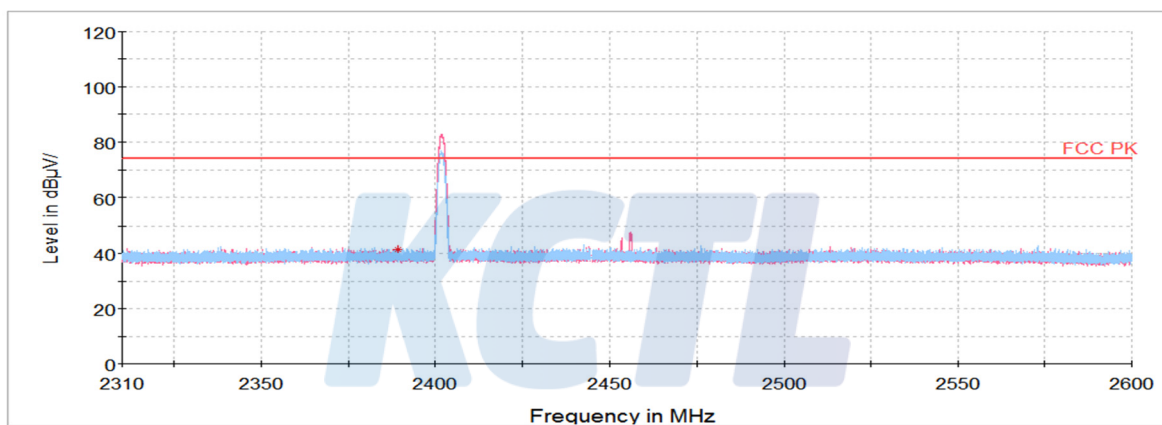
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Suwon-si, Gyeonggi-do, 16677, Korea  
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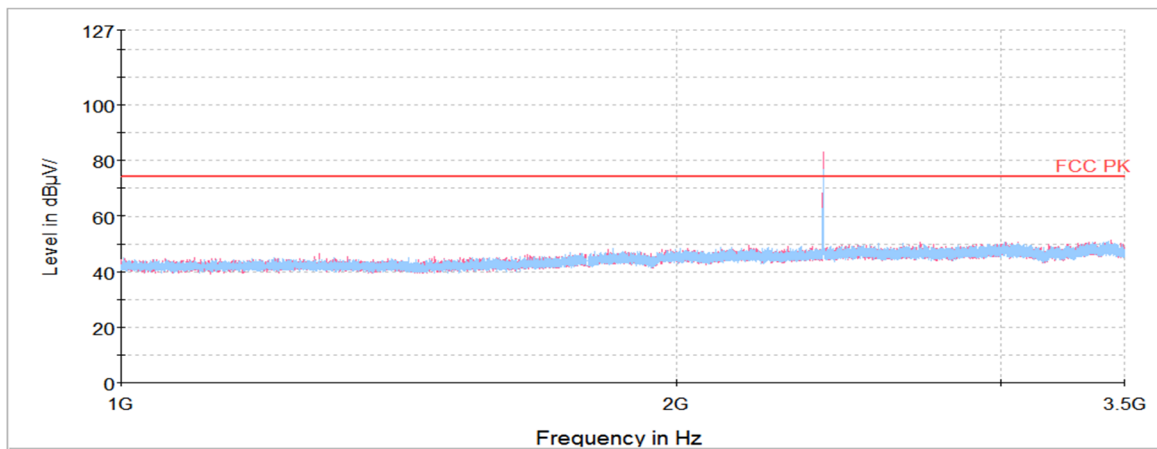
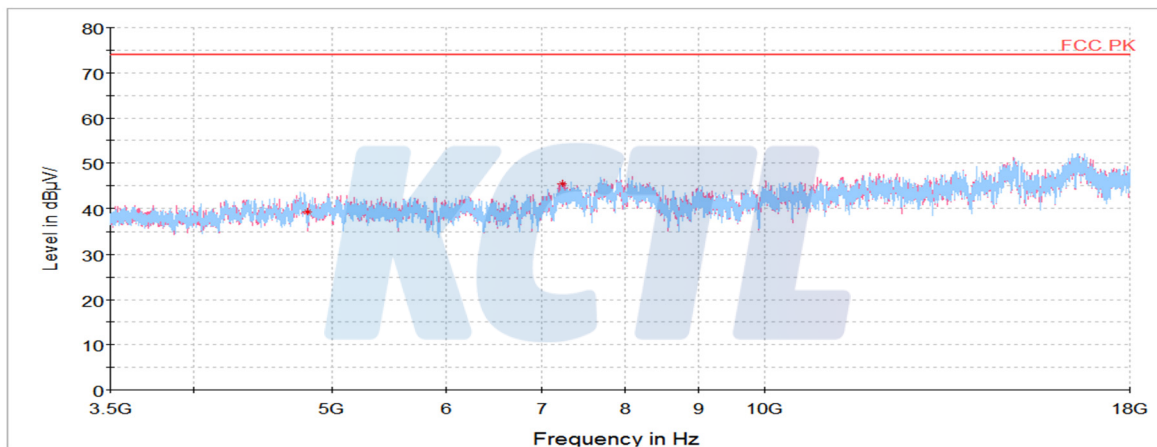
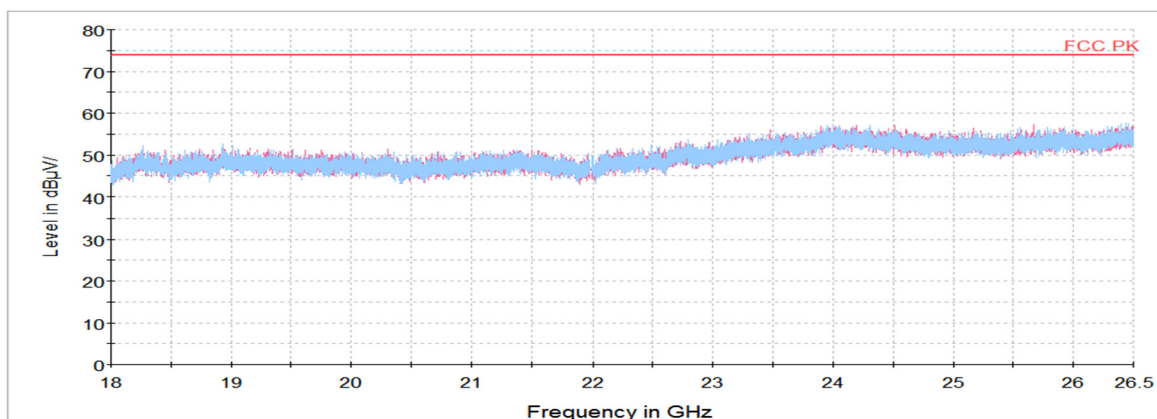
Report No.:  
KR20-SRF0034-A

Page (34) of (45)

**KCTL****8DPSK****Low Channel**

| Frequency                                                      | Pol.  | Reading        | Antenna Factor | Amp. + Cable | DCCF | Result           | Limit            | Margin |
|----------------------------------------------------------------|-------|----------------|----------------|--------------|------|------------------|------------------|--------|
| (MHz)                                                          | (V/H) | (dB( $\mu$ V)) | (dB)           | (dB)         | (dB) | (dB( $\mu$ V/m)) | (dB( $\mu$ V/m)) | (dB)   |
| <b>Peak data</b>                                               |       |                |                |              |      |                  |                  |        |
| 2 389.19 <sup>1)</sup>                                         | H     | 38.66          | 31.88          | -29.04       | -    | 41.50            | 74.00            | 32.50  |
| 4 804.09 <sup>1)</sup>                                         | H     | 58.28          | 33.92          | -53.02       | -    | 39.18            | 74.00            | 34.82  |
| 7 238.73                                                       | H     | 62.96          | 35.40          | -52.96       | -    | 45.40            | 74.00            | 28.60  |
| <b>Average Data</b>                                            |       |                |                |              |      |                  |                  |        |
| No spurious emissions were detected within 20 dB of the limit. |       |                |                |              |      |                  |                  |        |

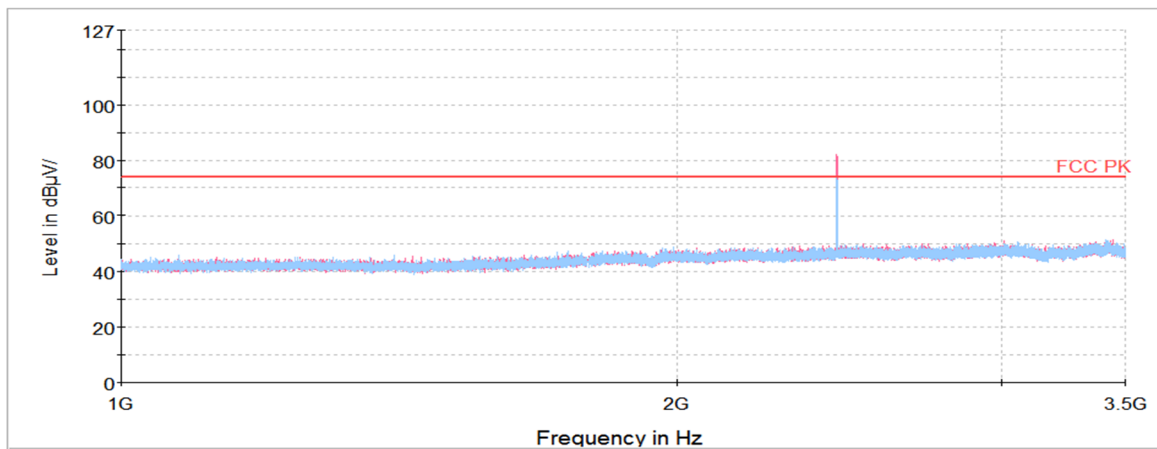
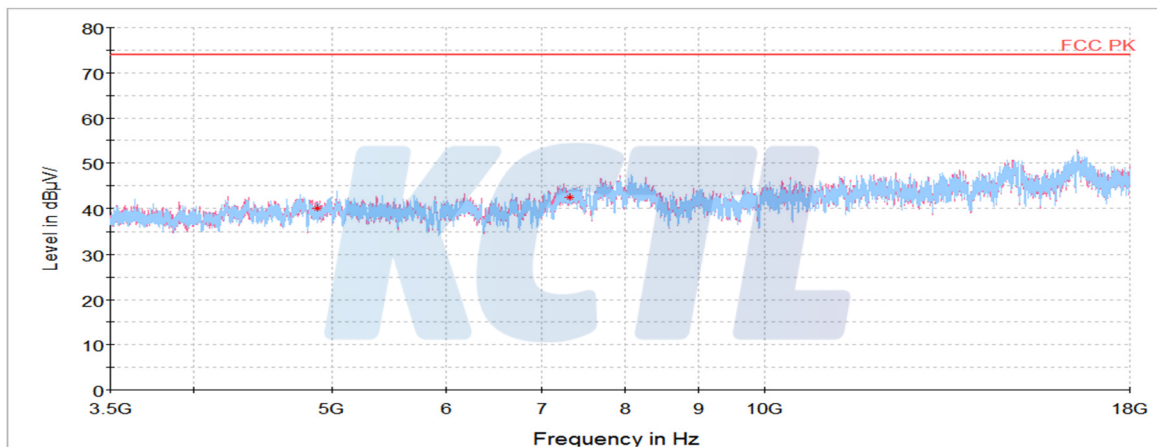
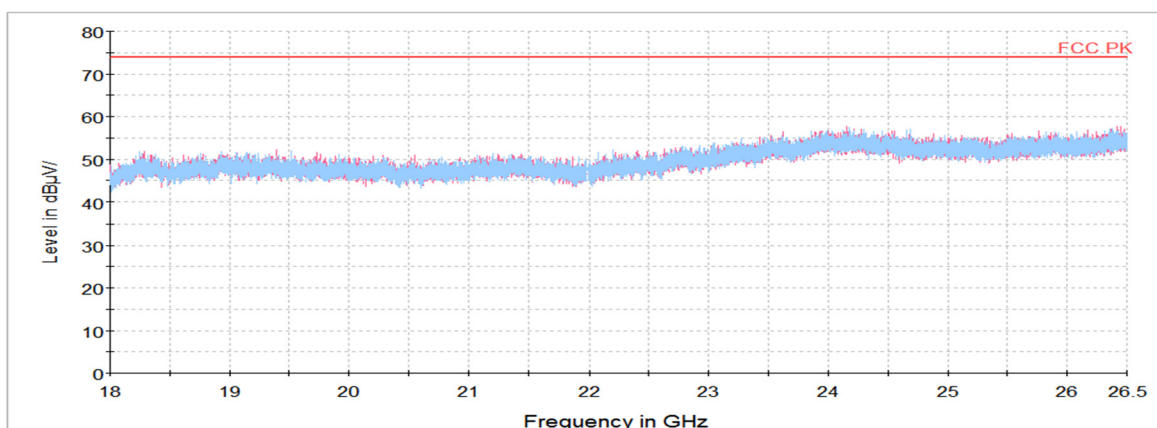
**Horizontal/Vertical for Band-edge**

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz****Horizontal/Vertical for 3.5 GHz ~ 18 GHz****Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

### Middle Channel

| Frequency                                                      | Pol.  | Reading         | Antenna Factor | Amp. + Cable | DCCF | Result            | Limit             | Margin |
|----------------------------------------------------------------|-------|-----------------|----------------|--------------|------|-------------------|-------------------|--------|
| (MHz)                                                          | (V/H) | (dB( $\mu V$ )) | (dB)           | (dB)         | (dB) | (dB( $\mu V/m$ )) | (dB( $\mu V/m$ )) | (dB)   |
| <b>Peak data</b>                                               |       |                 |                |              |      |                   |                   |        |
| 4 881.58 <sup>1)</sup>                                         | V     | 61.21           | 33.95          | -55.21       | -    | 39.95             | 74.00             | 34.05  |
| 7 323.47 <sup>1)</sup>                                         | H     | 59.74           | 35.40          | -52.64       | -    | 42.50             | 74.00             | 31.50  |
| <b>Average Data</b>                                            |       |                 |                |              |      |                   |                   |        |
| No spurious emissions were detected within 20 dB of the limit. |       |                 |                |              |      |                   |                   |        |



**Horizontal/Vertical for 1 GHz ~ 3.5 GHz****Horizontal/Vertical for 3.5 GHz ~ 18 GHz****Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

**KCTL Inc.**

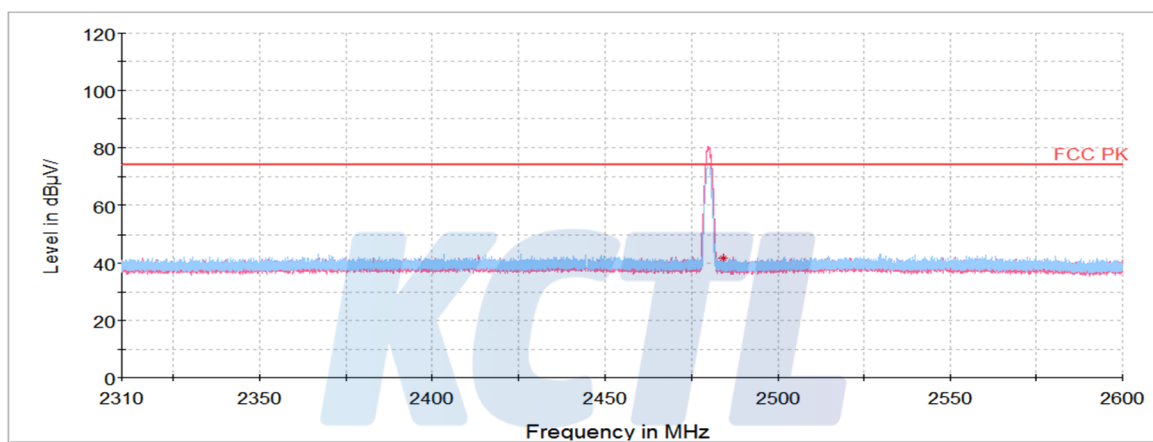
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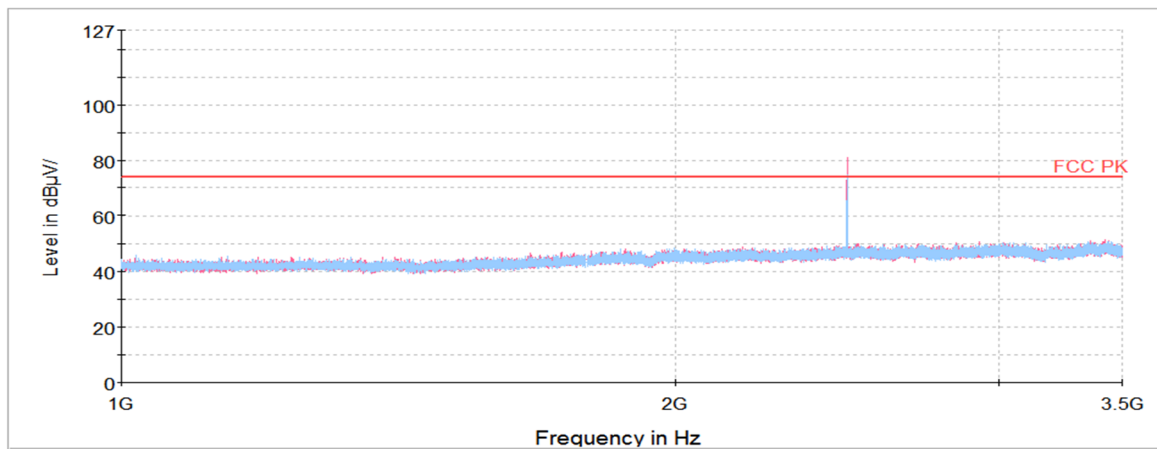
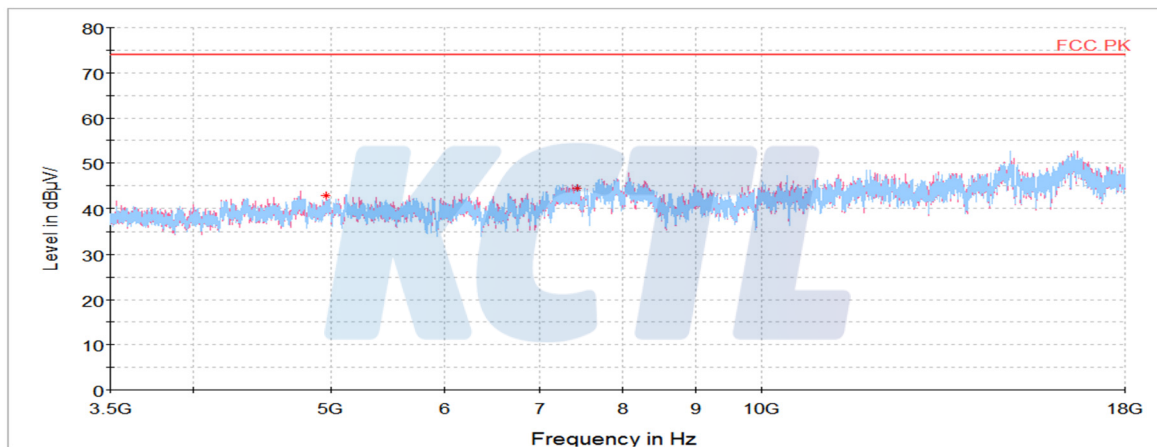
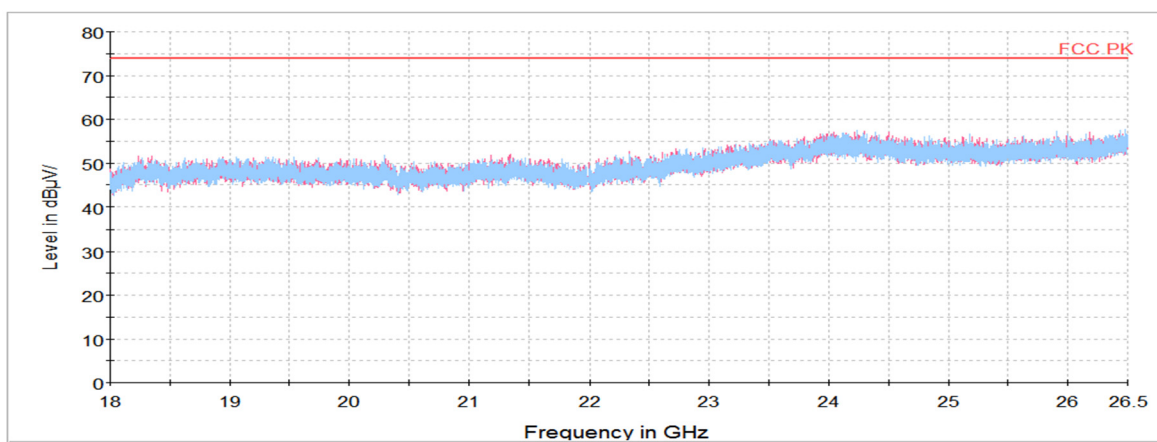
Report No.:  
KR20-SRF0034-A

Page (38) of (45)

**KCTL****High Channel**

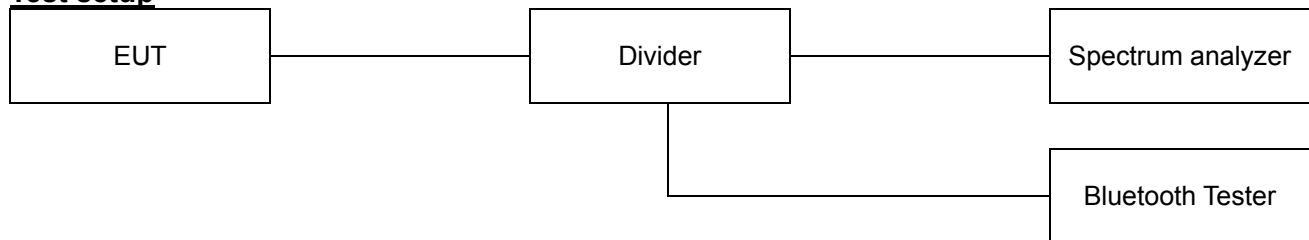
| Frequency                                                      | Pol.  | Reading        | Antenna Factor | Amp. + Cable | DCCF | Result           | Limit            | Margin |
|----------------------------------------------------------------|-------|----------------|----------------|--------------|------|------------------|------------------|--------|
| (MHz)                                                          | (V/H) | (dB( $\mu$ V)) | (dB)           | (dB)         | (dB) | (dB( $\mu$ V/m)) | (dB( $\mu$ V/m)) | (dB)   |
| Peak data                                                      |       |                |                |              |      |                  |                  |        |
| 2 484.22 <sup>1)</sup>                                         | V     | 38.88          | 32.07          | -29.22       | -    | 41.73            | 74.00            | 32.27  |
| 4 959.97 <sup>1)</sup>                                         | V     | 63.45          | 33.98          | -54.66       | -    | 42.77            | 74.00            | 31.23  |
| 7 439.92 <sup>1)</sup>                                         | H     | 61.30          | 35.40          | -52.20       | -    | 44.50            | 74.00            | 29.50  |
| Average Data                                                   |       |                |                |              |      |                  |                  |        |
| No spurious emissions were detected within 20 dB of the limit. |       |                |                |              |      |                  |                  |        |

**Horizontal/Vertical for Band-edge**

**Horizontal/Vertical for 1 GHz ~ 3.5 GHz****Horizontal/Vertical for 3.5 GHz ~ 18 GHz****Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

## 7.7. Conducted Spurious Emission

### Test setup



### Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operation, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation specified in §15.209(a) is not required. In addition, radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limit : 20 dBc

### Test procedure

ANSI C63.10 - Section 11.11.3  
558074 D01 v04 – Section 11.3

### Test settings

Set the spectrum analyzer as follows:

- 1) Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10<sup>th</sup> harmonic.  
Typically, several plots are required to cover this entire span.
- 2) RBW = 100 kHz
- 3) VBW ≥ RBW
- 4) Sweep = auto
- 5) Detector function = peak
- 6) Trace = max hold
- 7) Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 8) Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

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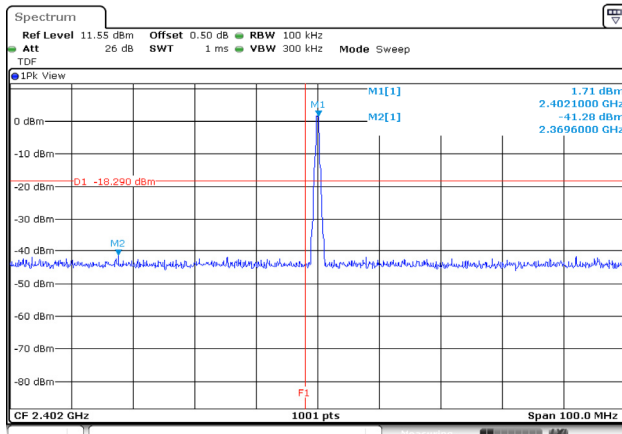
Page (41) of (45)



## Test results

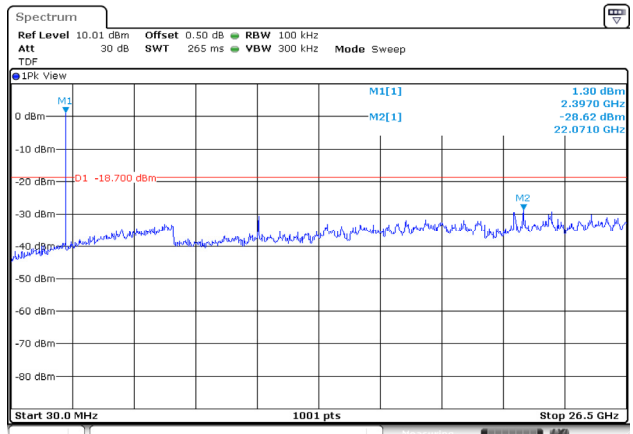
### GFSK

#### Conducted band-edge



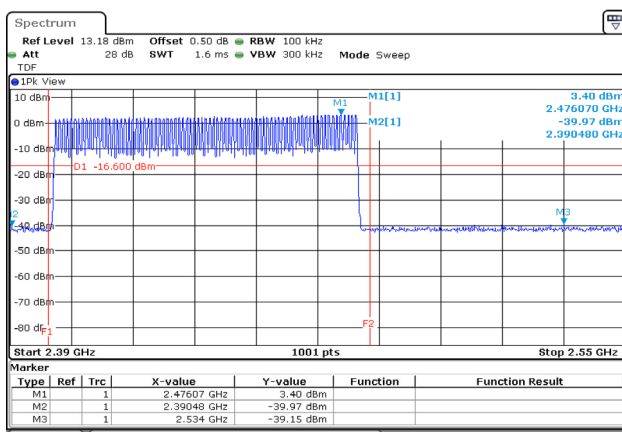
Lowest

#### Conducted spurious



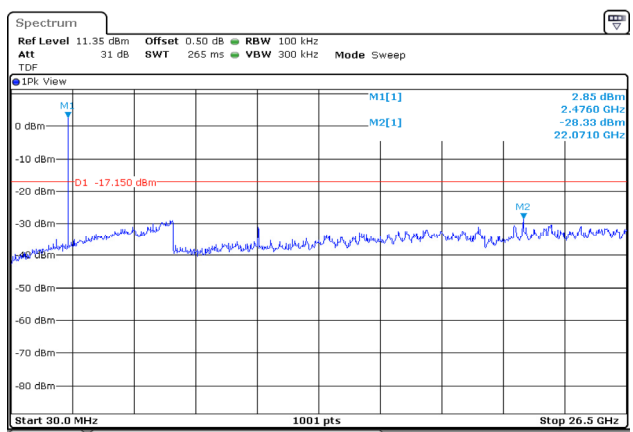
Lowest

Highest



With Hopping Band-edge

Middle



Highest

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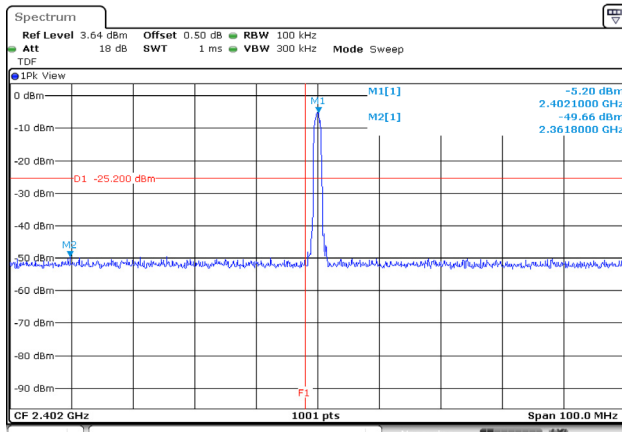
Page (42) of (45)



## Test results

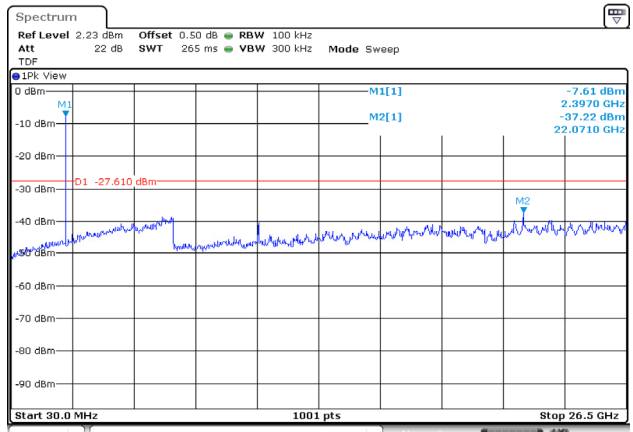
### 8DPSK

#### Conducted band-edge

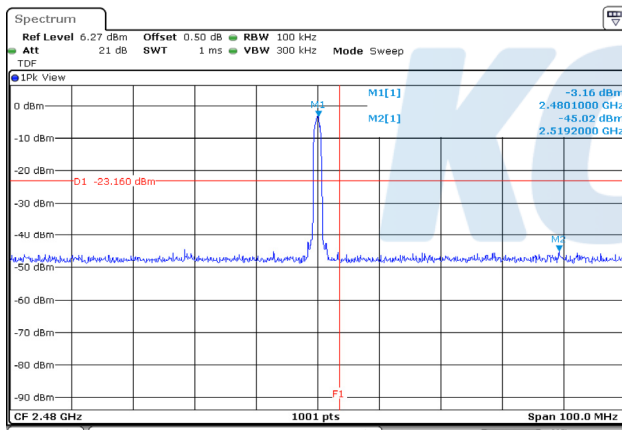


Lowest

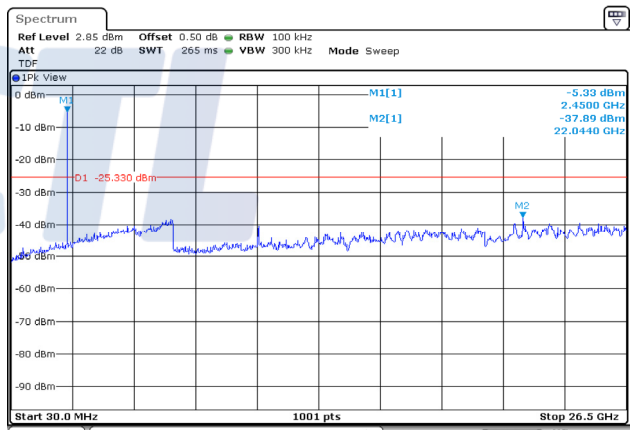
#### Conducted spurious



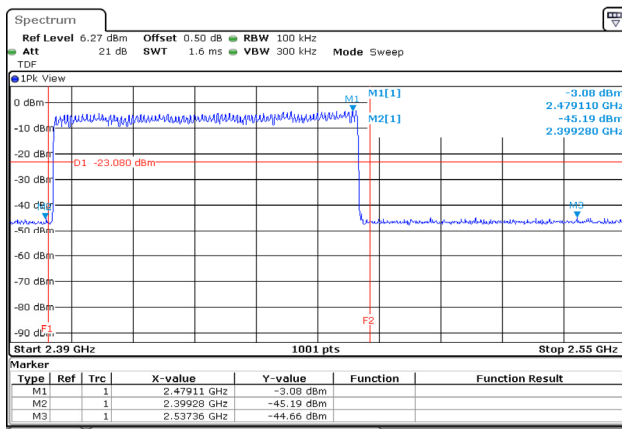
Lowest



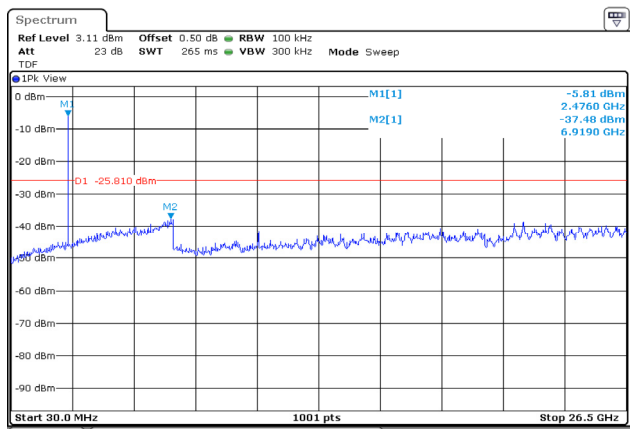
Highest



Middle



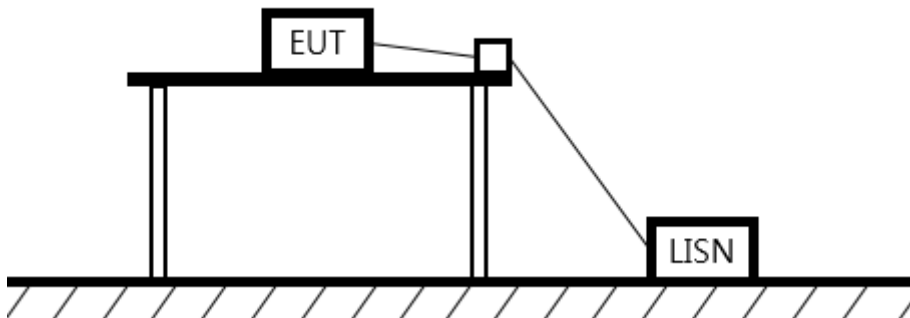
With Hopping Band-edge



Highest

## 7.8. 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 50 $\mu$ H/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 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.

# KCTL Inc.

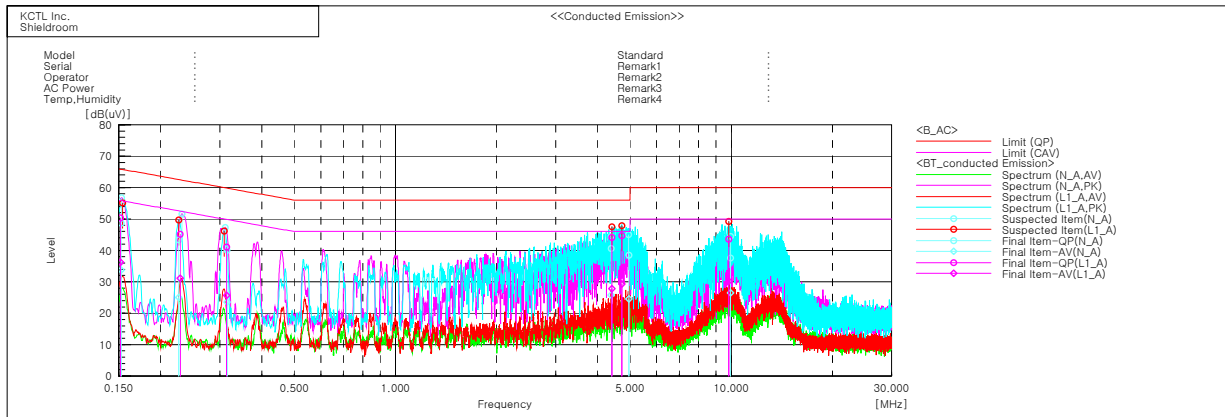
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Report No.:  
KR20-SRF0034-A

Page (44) of (45)

# KCTL

## Test results



### Final Result

| --- N_A Phase --- |                 |                     |                      |           |                    |                     |                   |                   |                |                 |
|-------------------|-----------------|---------------------|----------------------|-----------|--------------------|---------------------|-------------------|-------------------|----------------|-----------------|
| No.               | Frequency [MHz] | Reading QP [dB(μV)] | Reading CAV [dB(μV)] | c.f. [dB] | Result QP [dB(μV)] | Result CAV [dB(μV)] | Limit QP [dB(μV)] | Limit AV [dB(μV)] | Margin QP [dB] | Margin CAV [dB] |
| 1                 | 0.15245         | 38.6                | 23.6                 | 10.1      | 48.7               | 33.7                | 65.9              | 55.9              | 17.2           | 22.2            |
| 2                 | 0.22661         | 33.3                | 15.0                 | 10.0      | 43.3               | 25.0                | 62.6              | 52.6              | 19.3           | 27.6            |
| 3                 | 0.31495         | 30.1                | 13.6                 | 10.0      | 40.1               | 23.6                | 59.8              | 49.8              | 19.7           | 26.2            |
| 4                 | 4.38808         | 30.2                | 15.4                 | 10.4      | 40.6               | 25.8                | 56.0              | 46.0              | 15.4           | 20.2            |
| 5                 | 4.95336         | 28.1                | 14.1                 | 10.4      | 38.5               | 24.5                | 56.0              | 46.0              | 17.5           | 21.5            |
| 6                 | 9.9573          | 27.0                | 15.9                 | 10.6      | 37.6               | 26.5                | 60.0              | 50.0              | 22.4           | 23.5            |

| --- L1_A Phase --- |                 |                     |                      |           |                    |                     |                   |                   |                |                 |
|--------------------|-----------------|---------------------|----------------------|-----------|--------------------|---------------------|-------------------|-------------------|----------------|-----------------|
| No.                | Frequency [MHz] | Reading QP [dB(μV)] | Reading CAV [dB(μV)] | c.f. [dB] | Result QP [dB(μV)] | Result CAV [dB(μV)] | Limit QP [dB(μV)] | Limit AV [dB(μV)] | Margin QP [dB] | Margin CAV [dB] |
| 1                  | 0.152           | 40.3                | 26.1                 | 10.1      | 50.4               | 36.2                | 65.9              | 55.9              | 15.5           | 19.7            |
| 2                  | 0.22843         | 35.1                | 21.1                 | 10.0      | 45.1               | 31.1                | 62.5              | 52.5              | 17.4           | 21.4            |
| 3                  | 0.31421         | 31.1                | 15.7                 | 10.0      | 41.1               | 25.7                | 59.9              | 49.9              | 18.8           | 24.2            |
| 4                  | 4.41029         | 33.7                | 17.4                 | 10.4      | 44.1               | 27.8                | 56.0              | 46.0              | 11.9           | 18.2            |
| 5                  | 4.71851         | 34.3                | 18.9                 | 10.4      | 44.7               | 29.3                | 56.0              | 46.0              | 11.3           | 16.7            |
| 6                  | 9.83042         | 32.9                | 19.5                 | 10.7      | 43.6               | 30.2                | 60.0              | 50.0              | 16.4           | 19.8            |

## 8. Measurement equipment

| Equipment Name              | Manufacturer                 | Model No.                                     | Serial No.  | Next Cal. Date |
|-----------------------------|------------------------------|-----------------------------------------------|-------------|----------------|
| Spectrum Analyzer           | R & S                        | FSV30                                         | 100807      | 20.07.30       |
| Spectrum Analyzer           | R & S                        | FSV40                                         | 100988      | 21.01.03       |
| DC Power Supply             | AGILENT                      | E3632A                                        | MY40001543  | 20.05.13       |
| Wideband Power Sensor       | R & S                        | NRP-Z81                                       | 102398      | 21.01.21       |
| Bluetooth Tester            | TESCOM                       | TC-3000C                                      | 3000C000270 | 20.07.31       |
| Power Divider               | Aeroflex/<br>Weinschel, Inc. | 1580-1                                        | SC571       | 20.08.01       |
| Attenuator                  | API Inmet                    | 40AH2W-10                                     | 15          | 20.05.15       |
| Attenuator                  | R & S                        | DNF<br>Dämpfungsglied<br>10 dB in<br>N-50 Ohm | 31211       | 20.05.13       |
| EMI TEST RECEIVER           | R & S                        | ESCI                                          | 100732      | 20.08.22       |
| Bi-Log Antenna              | SCHWARZBECK                  | VULB 9168                                     | 583         | 20.05.04       |
| Amplifier                   | SONOMA<br>INSTRUMENT         | 310N                                          | 284608      | 20.08.22       |
| COAXIAL FIXED<br>ATTENUATOR | Agilent                      | 8491B-003                                     | 2708A18758  | 20.05.04       |
| Horn antenna                | ETS.lindgren                 | 3116                                          | 00086635    | 20.05.09       |
| Horn antenna                | ETS.lindgren                 | 3117                                          | 161225      | 20.05.22       |
| AMPLIFIER                   | L-3 Narda-MITEQ              | AMF-7D-01001800-<br>22-10P                    | 2031196     | 20.02.21       |
| AMPLIFIER                   | L-3 Narda-MITEQ              | JS44-18004000-33<br>-8P                       | 2000997     | 20.08.01       |
| Broadband<br>PreAmplifier   | SCHWARZBECK                  | BBV9718                                       | 216         | 20.07.30       |
| LOOP Antenna                | R & S                        | HFH2-Z2                                       | 100355      | 20.08.24       |
| Antenna Mast                | Innco Systems                | MA4640-XP-ET                                  | -           | -              |
| Turn Table                  | Innco Systems                | DT2000                                        | 79          | -              |
| Antenna Mast                | Innco Systems                | MA4000-EP                                     | 303         | -              |
| Turn Table                  | Innco Systems                | DT2000                                        | 79          | -              |
| Highpass Filter             | WT                           | WT-A1698-HS                                   | WT160411001 | 20.05.14       |
| TWO-LINE V -<br>NETWORK     | R&S                          | ENV216                                        | 101584      | 20.04.05       |
| EMI TEST RECEIVER           | R & S                        | ESCI                                          | 101408      | 20.02.22       |
| Signal Generator            | R & S                        | SMB100A                                       | 176206      | 21.01.21       |
| Cable Assembly              | RadiAll                      | 2301761768000PJ                               | 1724.659    | -              |
| Cable Assembly              | gigalane                     | RG-400                                        | -           | -              |
| Cable Assembly              | HUER+SUHNER                  | SUCOFLEX 104                                  | MY4342/4    | -              |

**End of test report**