



## KES Co., Ltd.

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www.kes.co.kr

Report No.:

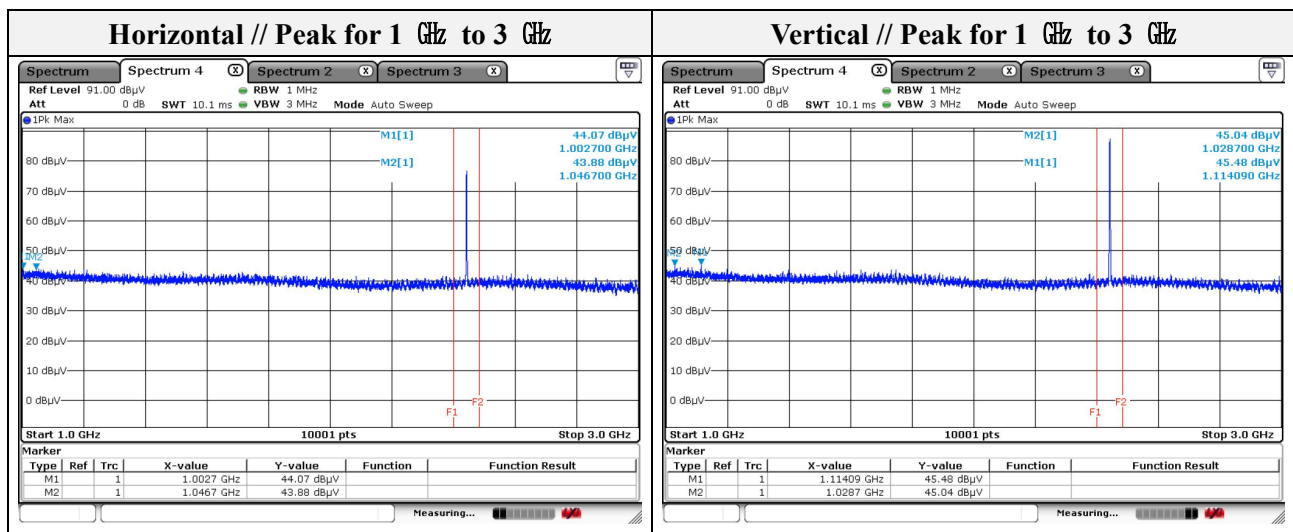
KES-RF1-22T0044

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Mode: EDR  
Transfer rate: 3 Mbps(Worst case)  
Distance of measurement: 3 meter  
Channel: 40

### - Spurious

| Frequency (MHz) | Level (dBμV) | Detect mode | Ant. Pol. (H/V) | CF (dB) | DCF (dB) | Field strength (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|--------------|-------------|-----------------|---------|----------|-------------------------|----------------|-------------|
| 1 002.70        | 44.07        | Peak        | H               | -11.15  | -        | 32.92                   | 74.00          | 41.08       |
| 1 028.70        | 45.04        | Peak        | V               | -11.01  | -        | 34.03                   | 74.00          | 39.97       |
| 1 046.70        | 43.88        | Peak        | H               | -10.91  | -        | 32.97                   | 74.00          | 41.03       |
| 1 114.09        | 45.48        | Peak        | V               | -10.55  | -        | 34.93                   | 74.00          | 39.07       |
| 4 884.60        | 41.37        | Peak        | V               | 5.44    | -        | 46.81                   | 74.00          | 27.19       |



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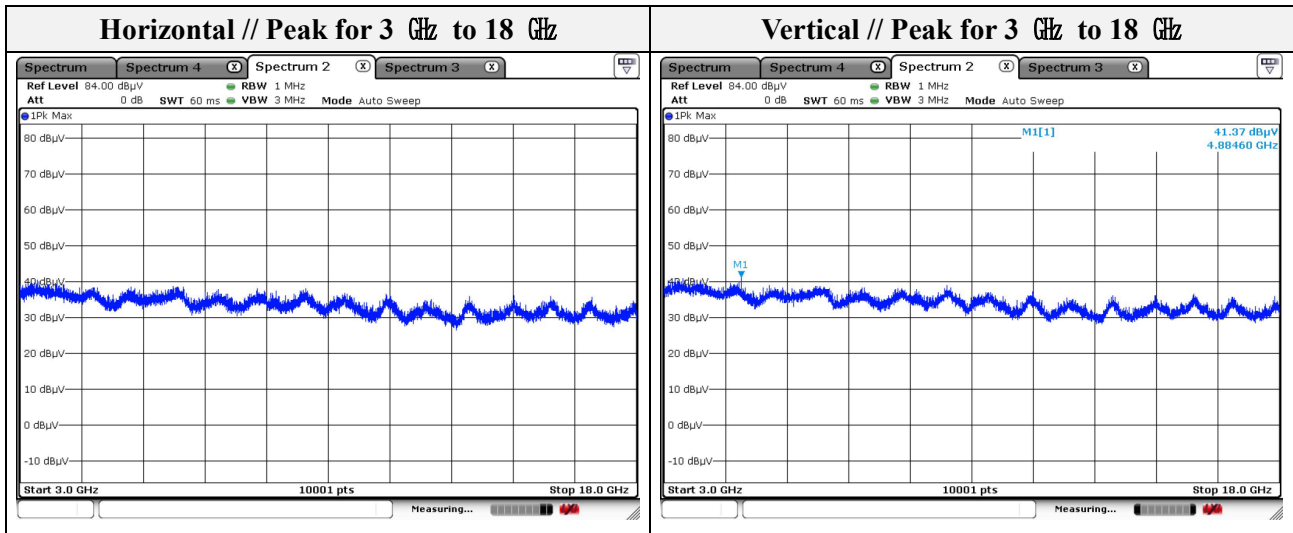
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Note.

1. Average test would be performed if the peak result were greater than the average limit.

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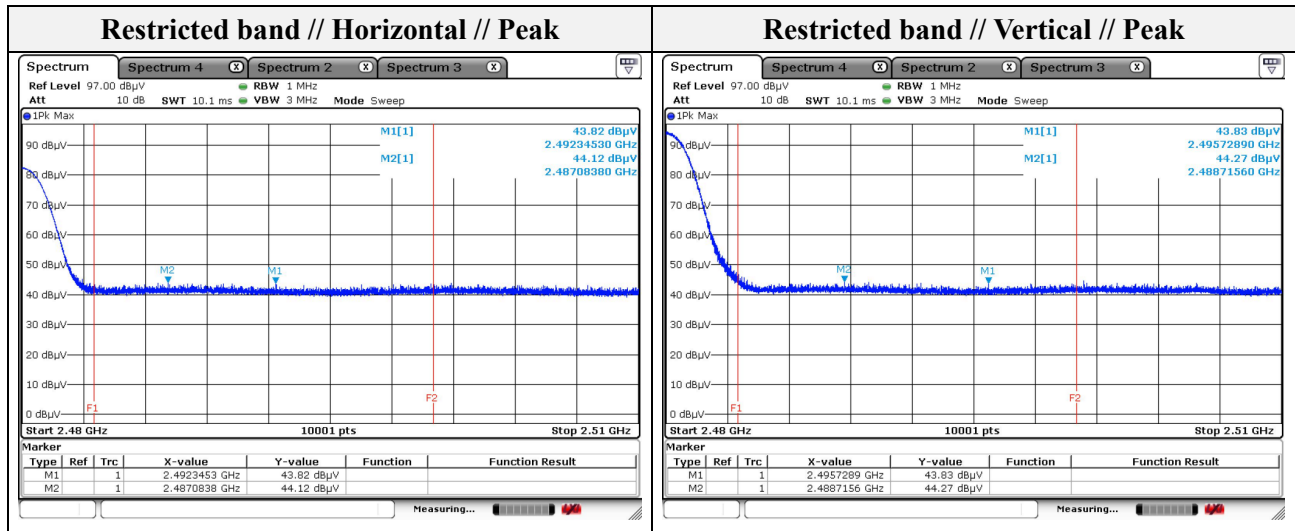
Mode: EDR  
Transfer rate: 3 Mbps(Worst case)  
Distance of measurement: 3 meter  
Channel: 78

### - Spurious

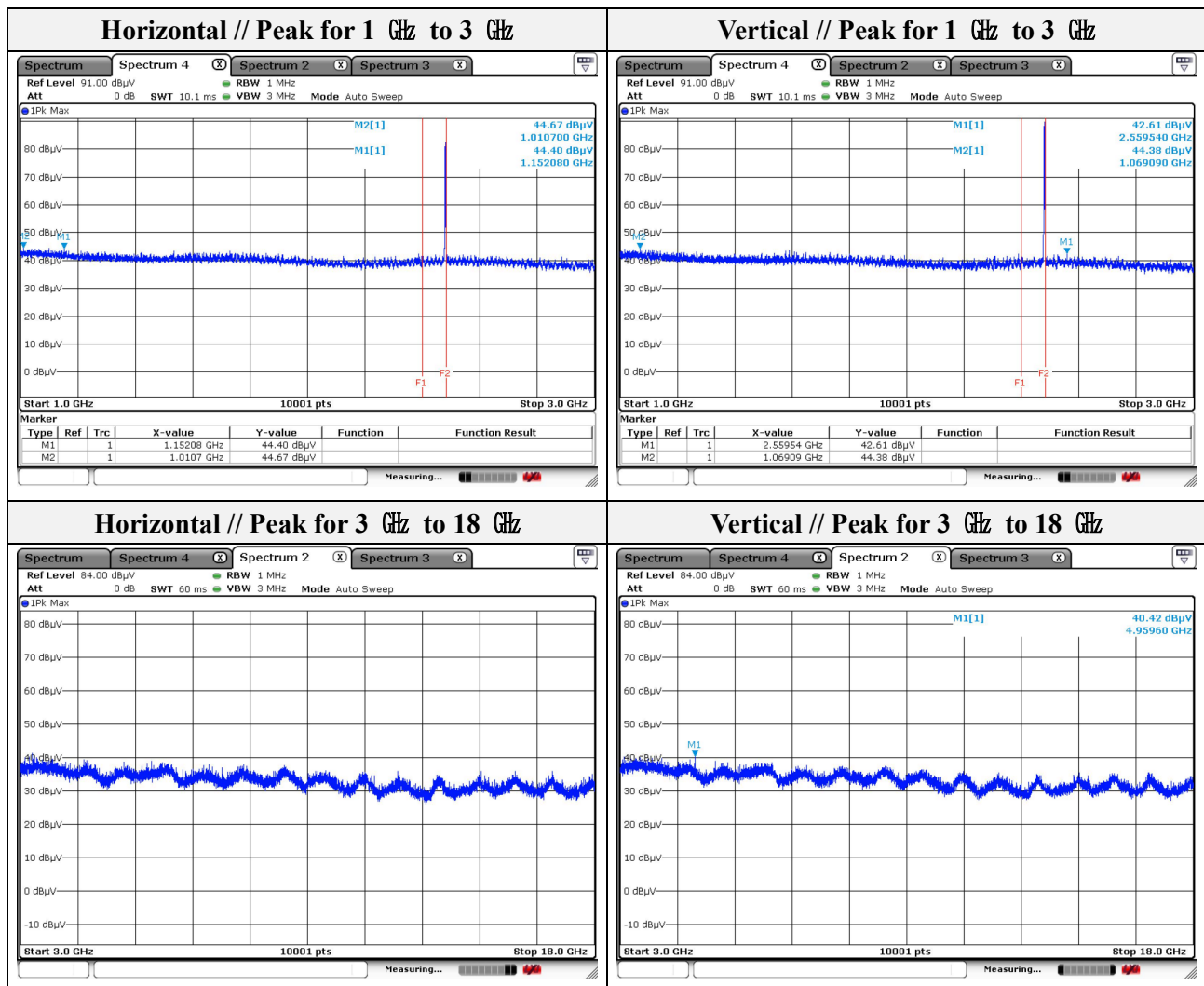
| Frequency (MHz) | Level (dBμV) | Detect mode | Ant. Pol. (H/V) | CF (dB) | DCF (dB) | Field strength (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|--------------|-------------|-----------------|---------|----------|-------------------------|----------------|-------------|
| 1 010.70        | 44.67        | Peak        | H               | -11.10  | -        | 33.57                   | 74.00          | 40.43       |
| 1 069.09        | 44.38        | Peak        | V               | -10.79  | -        | 33.59                   | 74.00          | 40.41       |
| 1 152.08        | 44.40        | Peak        | H               | -10.35  | -        | 34.05                   | 74.00          | 39.95       |
| 2 559.54        | 42.61        | Peak        | V               | -2.17   | -        | 40.44                   | 74.00          | 33.56       |
| 4 959.60        | 40.42        | Peak        | V               | 5.99    | -        | 46.41                   | 74.00          | 27.59       |

### - Band edge

| Frequency (MHz) | Level (dBμV) | Detect mode | Ant. Pol. (H/V) | CF (dB) | DCF (dB) | Field strength (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|--------------|-------------|-----------------|---------|----------|-------------------------|----------------|-------------|
| 2 487.08        | 44.12        | Peak        | H               | -2.39   | -        | 41.73                   | 74.00          | 32.27       |
| 2 488.72        | 44.27        | Peak        | V               | -2.38   | -        | 41.89                   | 74.00          | 32.11       |
| 2 492.35        | 43.82        | Peak        | H               | -2.36   | -        | 41.46                   | 74.00          | 32.54       |
| 2 495.73        | 43.83        | Peak        | V               | -2.35   | -        | 41.48                   | 74.00          | 32.52       |



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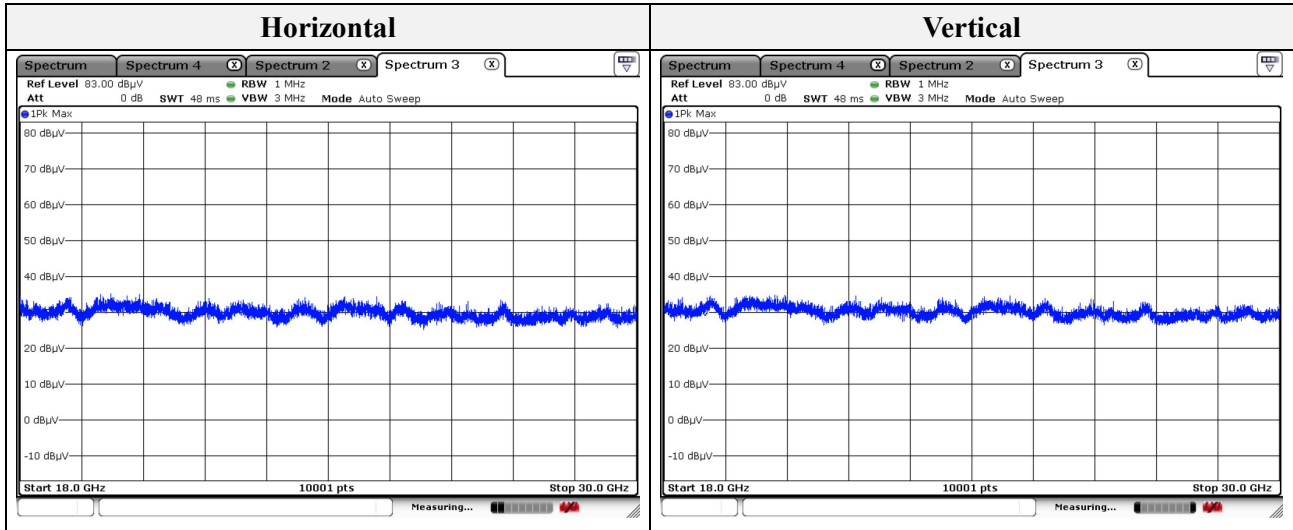


Note.

1. Average test would be performed if the peak result were greater than the average limit.

**Test results (18 GHz to 30 GHz) – Worst case**

|                          |                |
|--------------------------|----------------|
| Mode:                    | BDR            |
| Transfer rate:           | 1 Mbps         |
| Distance of measurement: | 3 meter        |
| Channel:                 | 78(Worst case) |



Note.

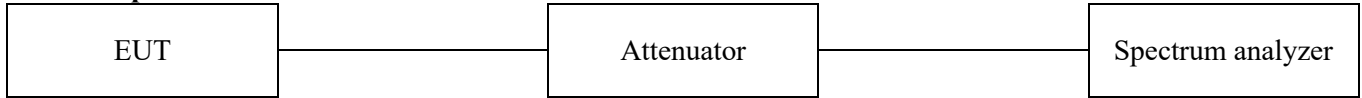
1. No spurious emission were detected above 18 GHz.

### 3.7. Conducted band edge and out of band emissions

#### Test procedure

KDB 558074 v05r02 & ANSI 63.10-2013

#### Test setup



#### Test setting

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 10th harmonic.
2. RBW = 100 kHz
3. VBW  $\geq$  300 kHz
4. Detector = Peak
5. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

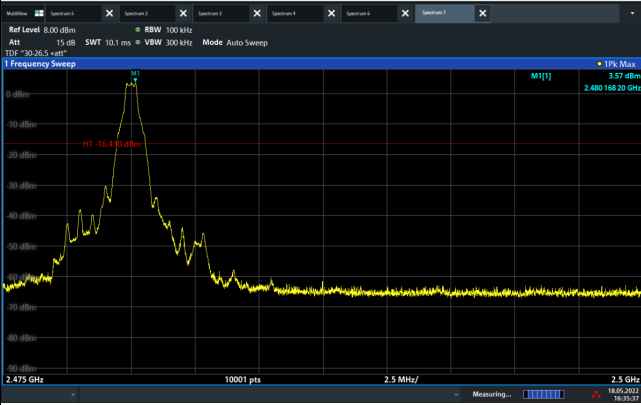
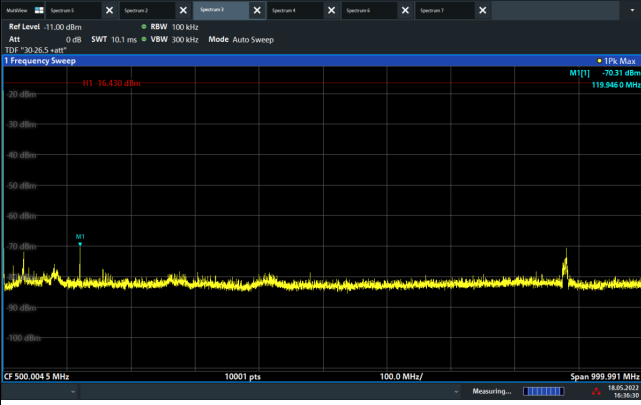
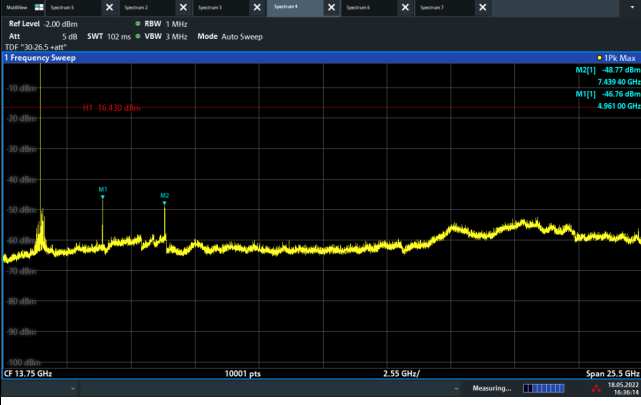
#### Limit

According to 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, 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 limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see section 15.205(c))

## Test results



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| BDR(1Mbps)                                                                          |       |
|-------------------------------------------------------------------------------------|-------|
| 2480 MHz                                                                            | -     |
|    | BLANK |
|   | BLANK |
|  | BLANK |

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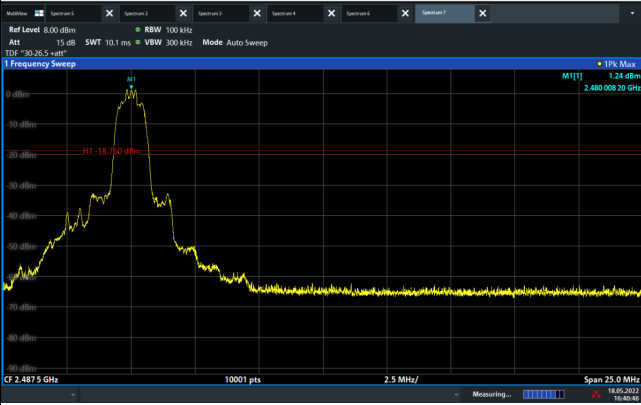
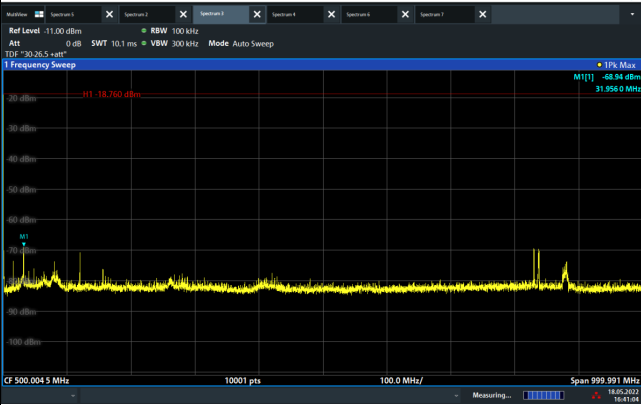
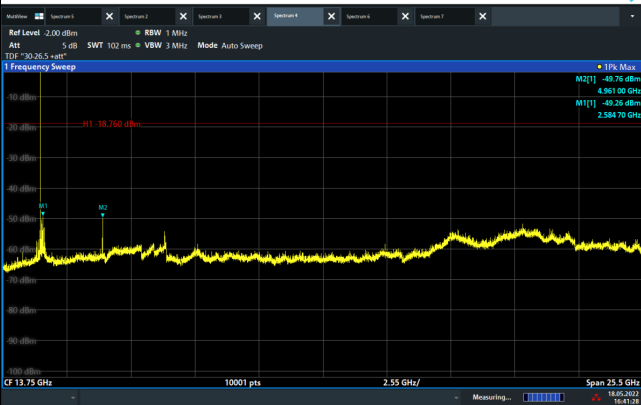
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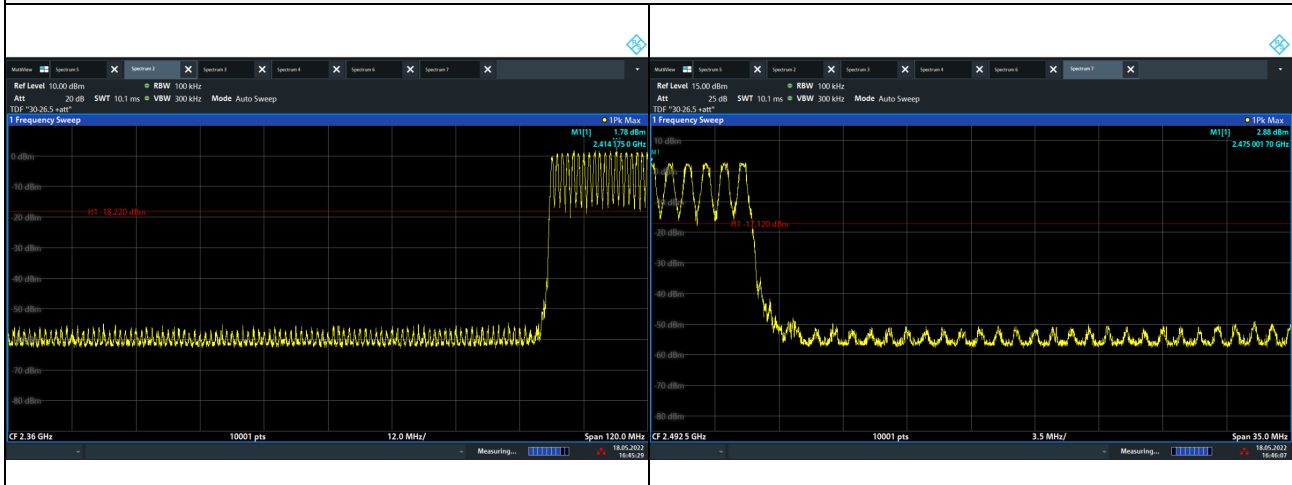
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| EDR(3Mbps)                                                                          |       |
|-------------------------------------------------------------------------------------|-------|
| 2480 MHz                                                                            | -     |
|    | BLANK |
|   | BLANK |
|  | BLANK |

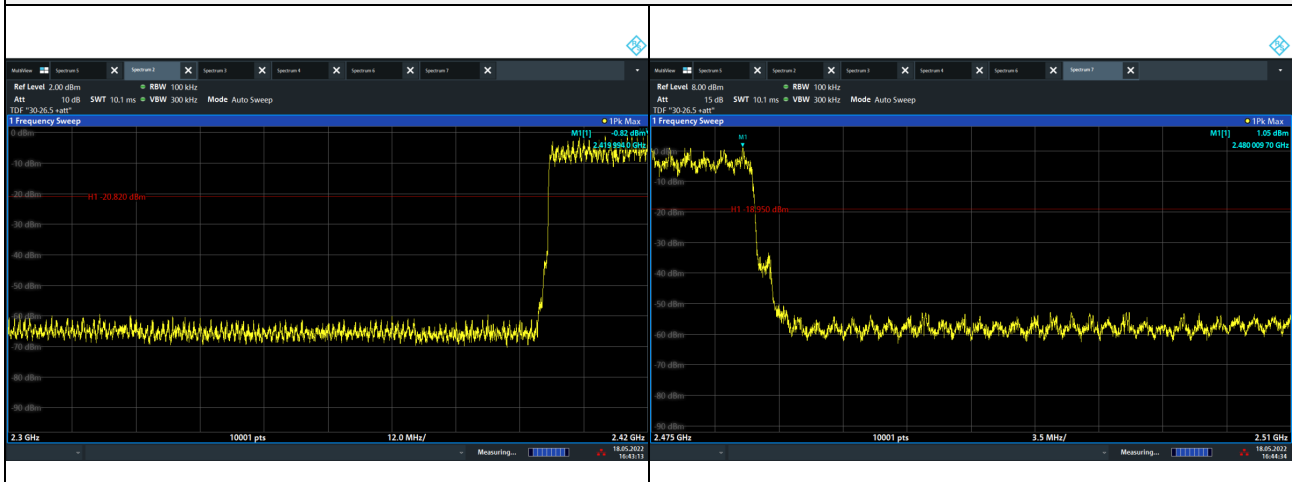
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### Hopping mode\_BDR(1Mbps)



### Hopping mode\_EDR(3Mbps)



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### 3.8. AC conducted emissions

#### 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       |



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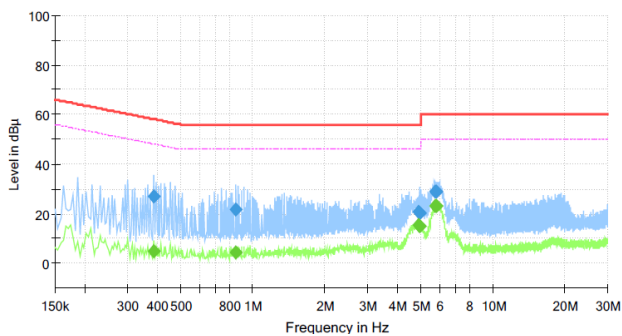
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### Test results

|                          |                |
|--------------------------|----------------|
| Mode:                    | BDR            |
| Transfer rate:           | 1 Mbps         |
| Distance of measurement: | 3 meter        |
| Channel:                 | 78(Worst case) |

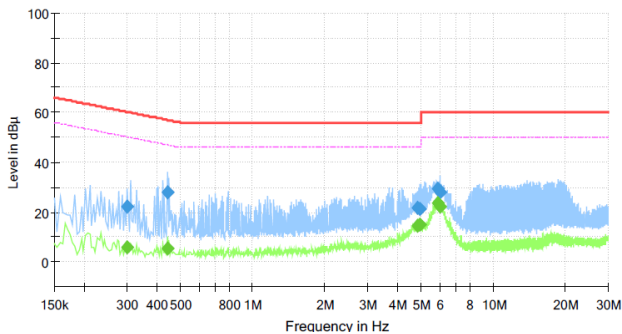
#### Hot Line



#### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.386000        | 26.95            | ---            | 58.15        | 31.20       | 1000.0          | 9.000           | L1   | 19.8       |
| 0.386000        | ---              | 5.06           | 48.15        | 43.09       | 1000.0          | 9.000           | L1   | 19.8       |
| 0.850000        | ---              | 4.39           | 48.00        | 41.61       | 1000.0          | 9.000           | L1   | 20.2       |
| 0.850000        | 21.69            | ---            | 58.00        | 34.31       | 1000.0          | 9.000           | L1   | 20.2       |
| 4.906000        | ---              | 15.27          | 48.00        | 30.73       | 1000.0          | 9.000           | L1   | 19.9       |
| 4.906000        | 20.84            | ---            | 58.00        | 35.16       | 1000.0          | 9.000           | L1   | 19.9       |
| 4.962000        | ---              | 14.94          | 48.00        | 31.06       | 1000.0          | 9.000           | L1   | 19.9       |
| 4.962000        | 20.23            | ---            | 58.00        | 35.77       | 1000.0          | 9.000           | L1   | 19.9       |
| 5.778000        | ---              | 23.23          | 50.00        | 26.77       | 1000.0          | 9.000           | L1   | 19.8       |
| 5.778000        | 28.96            | ---            | 60.00        | 31.04       | 1000.0          | 9.000           | L1   | 19.8       |
| 5.794000        | ---              | 23.32          | 50.00        | 26.68       | 1000.0          | 9.000           | L1   | 19.8       |
| 5.794000        | 29.01            | ---            | 60.00        | 30.99       | 1000.0          | 9.000           | L1   | 19.8       |

#### Neutral Line



#### Final Result

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.302000        | 22.20            | ---            | 60.19        | 37.99       | 1000.0          | 9.000           | N    | 19.6       |
| 0.302000        | ---              | 5.66           | 50.19        | 44.53       | 1000.0          | 9.000           | N    | 19.6       |
| 0.442000        | ---              | 5.46           | 47.02        | 41.56       | 1000.0          | 9.000           | N    | 19.8       |
| 0.442000        | 27.85            | ---            | 57.02        | 29.17       | 1000.0          | 9.000           | N    | 19.8       |
| 4.822000        | ---              | 14.33          | 48.00        | 31.67       | 1000.0          | 9.000           | N    | 19.9       |
| 4.822000        | 21.80            | ---            | 58.00        | 34.20       | 1000.0          | 9.000           | N    | 19.9       |
| 4.950000        | ---              | 15.16          | 48.00        | 30.84       | 1000.0          | 9.000           | N    | 19.9       |
| 4.950000        | 21.31            | ---            | 58.00        | 34.69       | 1000.0          | 9.000           | N    | 19.9       |
| 5.886000        | ---              | 23.50          | 50.00        | 26.50       | 1000.0          | 9.000           | N    | 19.8       |
| 5.886000        | 29.27            | ---            | 60.00        | 30.73       | 1000.0          | 9.000           | N    | 19.8       |
| 6.038000        | ---              | 22.31          | 50.00        | 27.69       | 1000.0          | 9.000           | N    | 19.8       |
| 6.038000        | 27.90            | ---            | 60.00        | 32.10       | 1000.0          | 9.000           | N    | 19.8       |

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**Appendix A. Measurement equipment**

| Equipment                    | Manufacturer         | Model         | Serial No.      | Calibration interval | Calibration due. |
|------------------------------|----------------------|---------------|-----------------|----------------------|------------------|
| Spectrum analyzer            | R&S                  | FSV3044       | 101272          | 1 year               | 2023.03.14       |
| SIGNAL GENERATOR             | KEYSIGHT             | N5182B        | MY59100115      | 1 year               | 2023.04.27       |
| SIGNAL GENERATOR             | Anritsu              | 68369B        | 002118          | 1 year               | 2023.05.13       |
| Power Meter                  | Anritsu              | ML2495A       | 2010001         | 1 year               | 2023.04.27       |
| Pulse Power Sensor           | Anritsu              | MA2411B       | 1911111         | 1 year               | 2023.04.27       |
| Attenuator                   | Mini-Circuits        | BW-S10-2W263+ | 3               | 1 year               | 2023.01.17       |
| Loop Antenna                 | Schwarzbeck          | FMZB1513      | 225             | 2 years              | 2023.01.18       |
| BILOG ANTENNA                | Schwarzbeck          | VULB 9168     | 9168-461        | 2 years              | 2022.12.22       |
| Horn Antenna                 | A.H                  | SAS-571       | 414             | 1 year               | 2023.01.18       |
| Horn Antenna                 | SCHWARZBECK          | BBHA9170      | BBHA<br>9170550 | 1 year               | 2023.01.18       |
| Amplifier                    | SONOMA<br>INSTRUMENT | 310N          | 401123          | 1 year               | 2022.06.07       |
| PREAMPLIFIER                 | HP                   | 8449B         | 3008A00538      | 1 year               | 2022.06.21       |
| BROADBAND<br>AMPLIFIER       | SCHWARZBECK          | BBV9721       | PS9721-003      | 1 year               | 2023.01.17       |
| Attenuator                   | HUBER+SHHNER         | 6806.17.A     | NONE            | 1 year               | 2023.04.01       |
| AC POWER SOURCE/<br>ANALYZER | HP                   | 6813A         | 3729A00754      | 1 year               | 2023.01.14       |
| DC Power supply              | Agilent              | 6632B         | MY43004090      | 1 year               | 2022.06.21       |
| EMI Test Receiver            | R&S                  | ESU26         | 100552          | 1 year               | 2023.03.31       |
| LISN                         | ENV216               | R & S         | 101787          | 1 year               | 2022.12.27       |
| EMI TEST RECEIVER            | ESR3                 | R & S         | 101783          | 1 year               | 2022.12.28       |
| PULSE LIMITER                | ESH3-Z2              | R & S         | 101915          | 1 year               | 2022.12.27       |

**Peripheral devices**

| Device            | Manufacturer         | Model No. | Serial No.    |
|-------------------|----------------------|-----------|---------------|
| Notebook computer | LG Electronics Inc., | LGS53     | 306QCZP560949 |
| Test Jig Board    | N/A                  | N/A       | N/A           |

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