



KES Co., Ltd.

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KES-RF-23T0113
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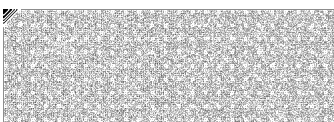
Mode: BLE_1 Mbps
Channel: 20
Distance of measurement: 3 meter

- Spurious

| Frequency (MHz) | Level (dBμV) | Detect mode | Ant. Pol. (H/V) | CF (dB) | DCF (dB) | Field strength (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|--------------|-------------|-----------------|---------|----------|-------------------------|----------------|-------------|
| 1 001.30 | 47.50 | Peak | H | -9.59 | - | 37.91 | 74.00 | 36.09 |
| 1 396.26 | 50.51 | Peak | V | -6.88 | - | 43.63 | 74.00 | 30.37 |
| 1 595.24 | 52.94 | Peak | V | -5.28 | - | 47.66 | 74.00 | 26.34 |
| 1 792.62 | 47.81 | Peak | V | -3.39 | - | 44.42 | 74.00 | 29.58 |
| 4 883.10 | 48.19 | Peak | H | 7.09 | - | 55.28 | 74.00 | 18.72 |
| 4 883.10 | 44.95 | Peak | V | 7.09 | - | 52.04 | 74.00 | 21.96 |
| 4 884.60 | 34.51 | Average | H | 7.10 | 1.76 | 43.37 | 54.00 | 10.63 |

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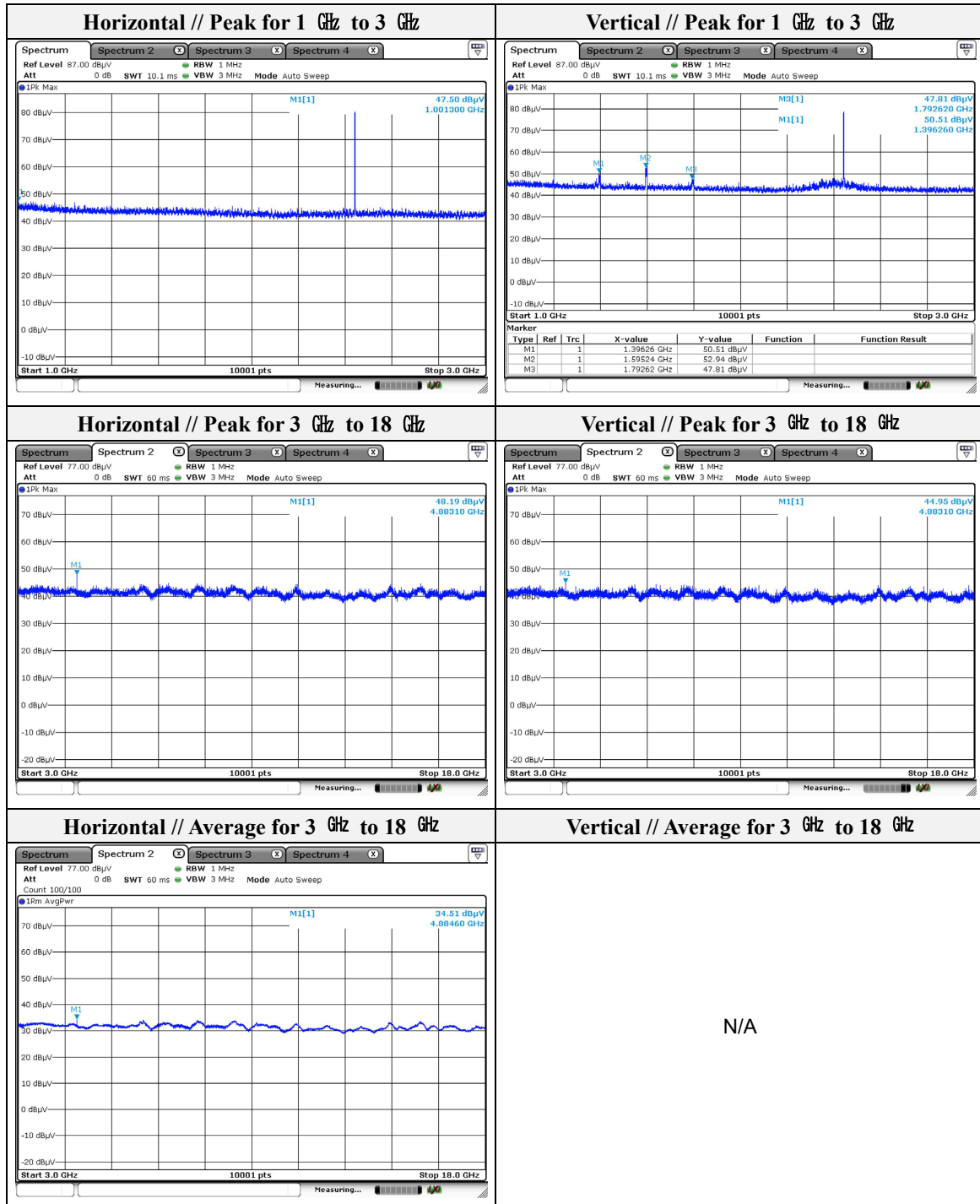




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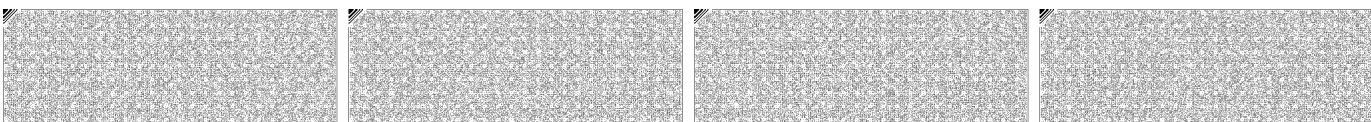


Note.

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

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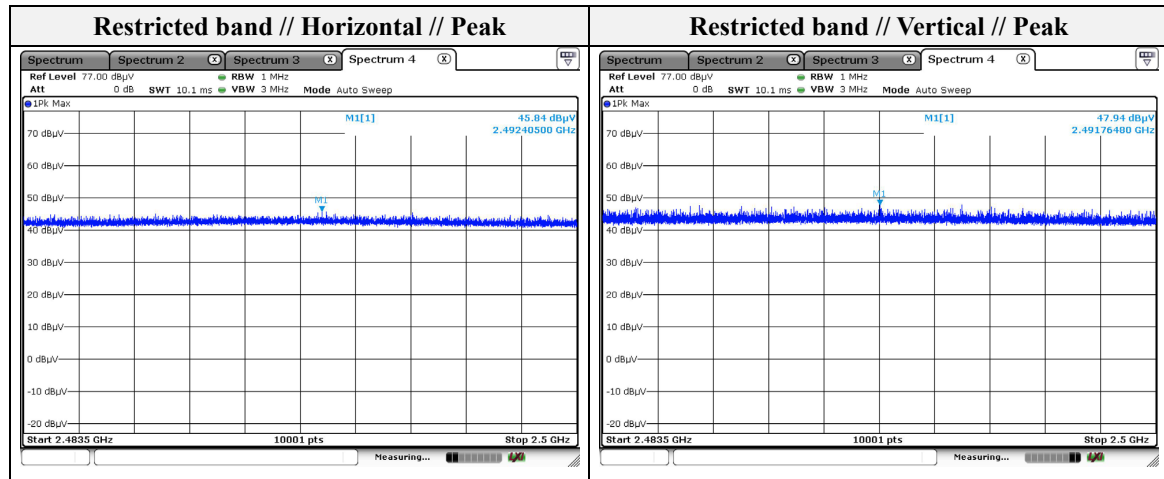
Mode: BLE_1 Mbps
Channel: 39
Distance of measurement: 3 meter

- Spurious

| Frequency (MHz) | Level (dBμV) | Detect mode | Ant. Pol. (H/V) | CF (dB) | DCF (dB) | Field strength (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|--------------|-------------|-----------------|---------|----------|-------------------------|----------------|-------------|
| 1199.68 | 49.14 | Peak | H | -8.21 | - | 40.93 | 74.00 | 33.07 |
| 1393.26 | 48.17 | Peak | H | -6.90 | - | 41.27 | 74.00 | 32.73 |
| 1396.86 | 52.24 | Peak | V | -6.87 | - | 45.37 | 74.00 | 28.63 |
| 1597.84 | 52.47 | Peak | V | -5.25 | - | 47.22 | 74.00 | 26.78 |
| 1797.22 | 48.31 | Peak | V | -3.35 | - | 44.96 | 74.00 | 29.04 |
| 4961.10 | 49.53 | Peak | H | 7.65 | - | 57.18 | 74.00 | 16.82 |
| 4961.10 | 46.26 | Peak | V | 7.65 | - | 53.91 | 74.00 | 20.09 |
| 4961.10 | 37.83 | Average | H | 7.65 | 1.76 | 47.24 | 54.00 | 6.76 |

- 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) |
|-----------------|--------------|-------------|-----------------|---------|----------|-------------------------|----------------|-------------|
| 2491.76 | 47.94 | Peak | V | -0.56 | - | 47.38 | 74.00 | 26.62 |
| 2492.41 | 45.84 | Peak | H | -0.56 | - | 45.28 | 74.00 | 28.72 |



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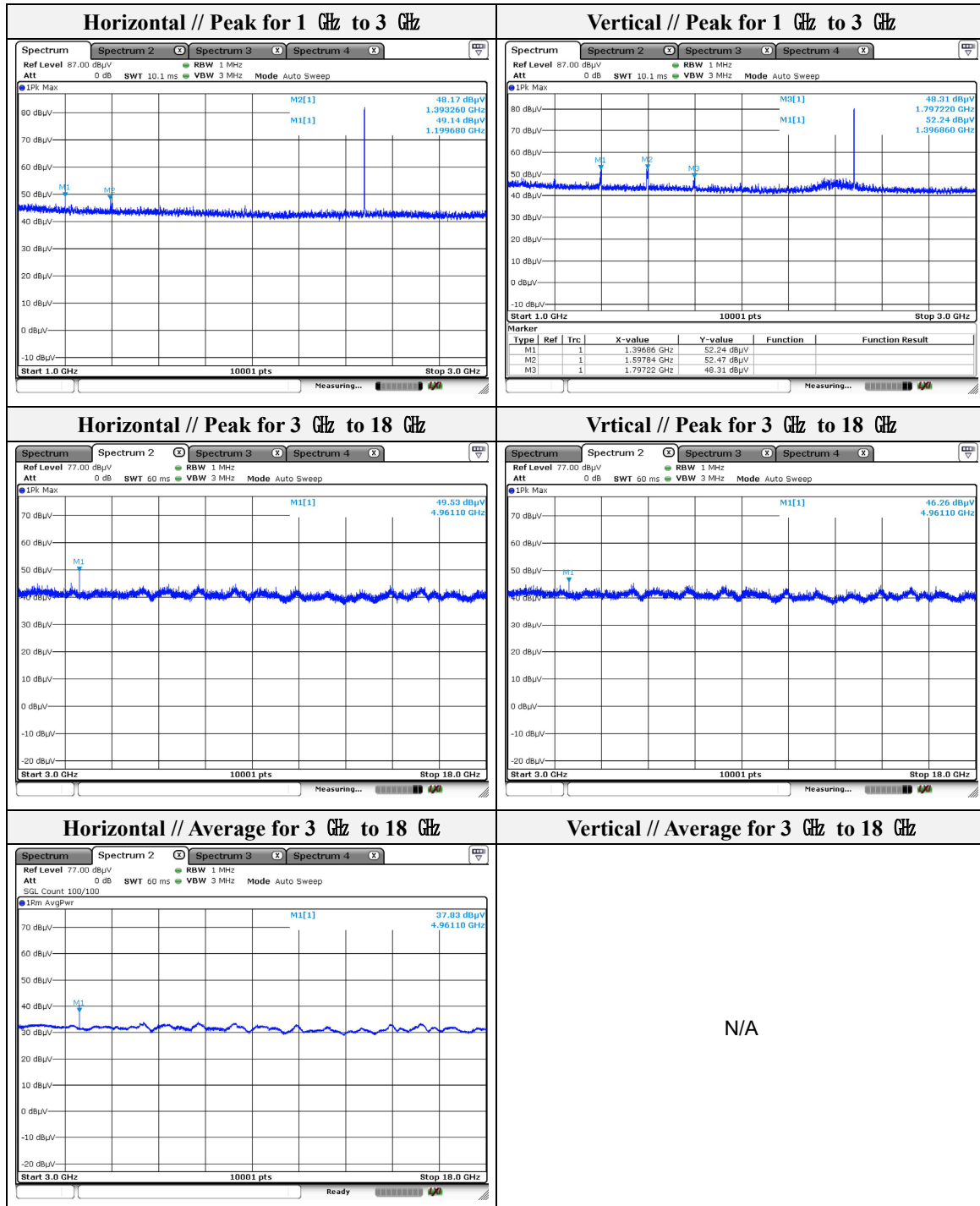
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Note.

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

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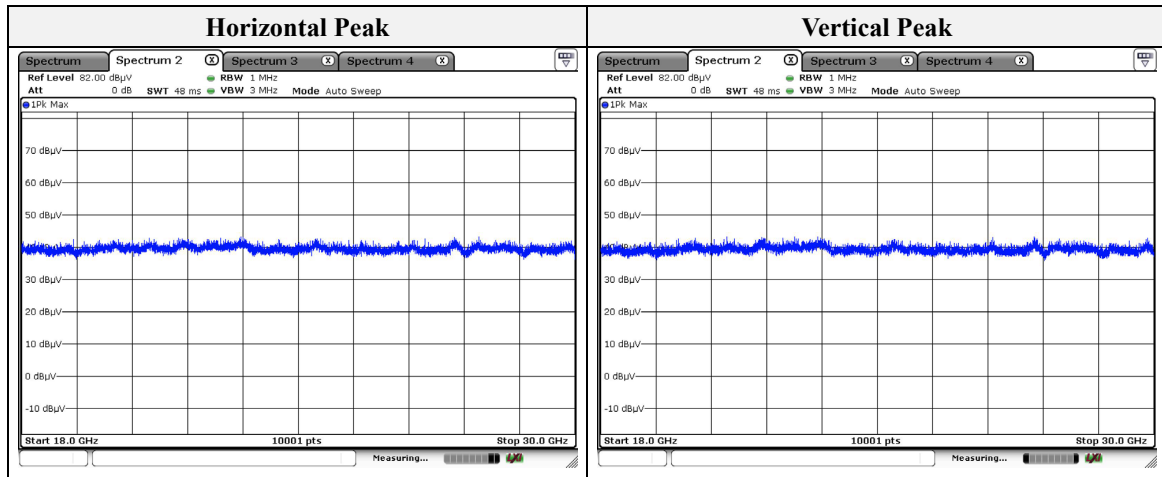
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Test results (18 GHz to 30 GHz)

Mode: BLE_1 Mbps
Channel: 00 (Worst case)
Distance of easurement : 3 meter



Note.

No spurious emission were detected above 18 GHz.

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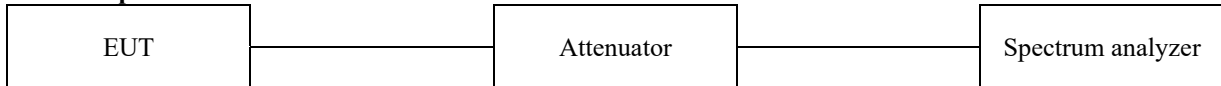


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3.5 Conducted spurious emissions & band edge

Test setup



Test procedure

Band edge

ANSI C63.10 – Section 11.11

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100 kHz
4. VBW = 300 kHz
5. Detector = Peak
6. Trace mode = max hold
7. Sweep time = auto
8. The trace was allowed to stabilize

Out of band emissions

ANSI C63.10 – Section 11.11

1. Start frequency was set to 30 MHz and stop frequency was set to 25 GHz for 2.4 GHz frequencies and 40 GHz for 5 GHz frequencies
2. RBW = 100 kHz
3. VBW = 300 kHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. 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))

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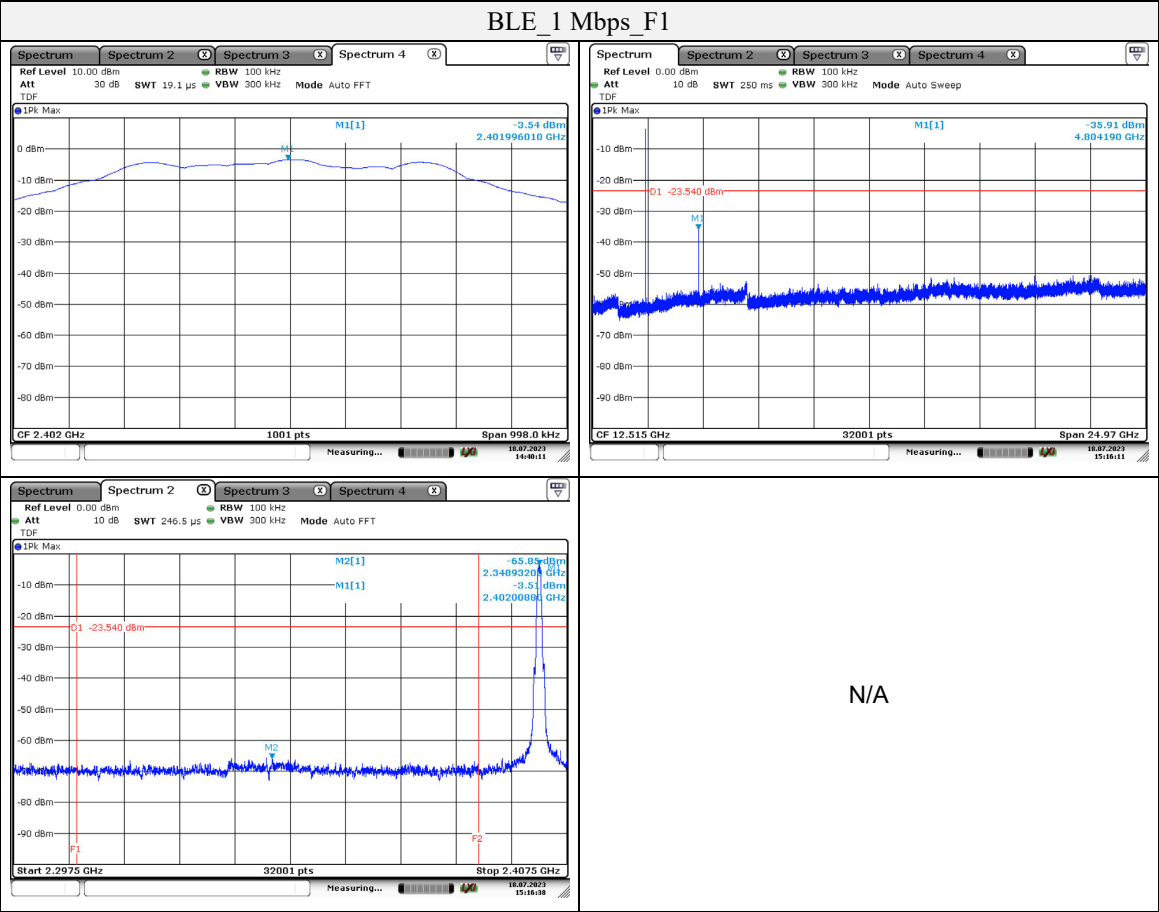




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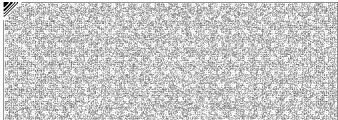
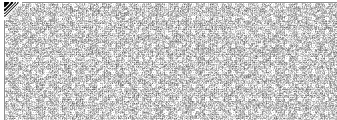
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Test results



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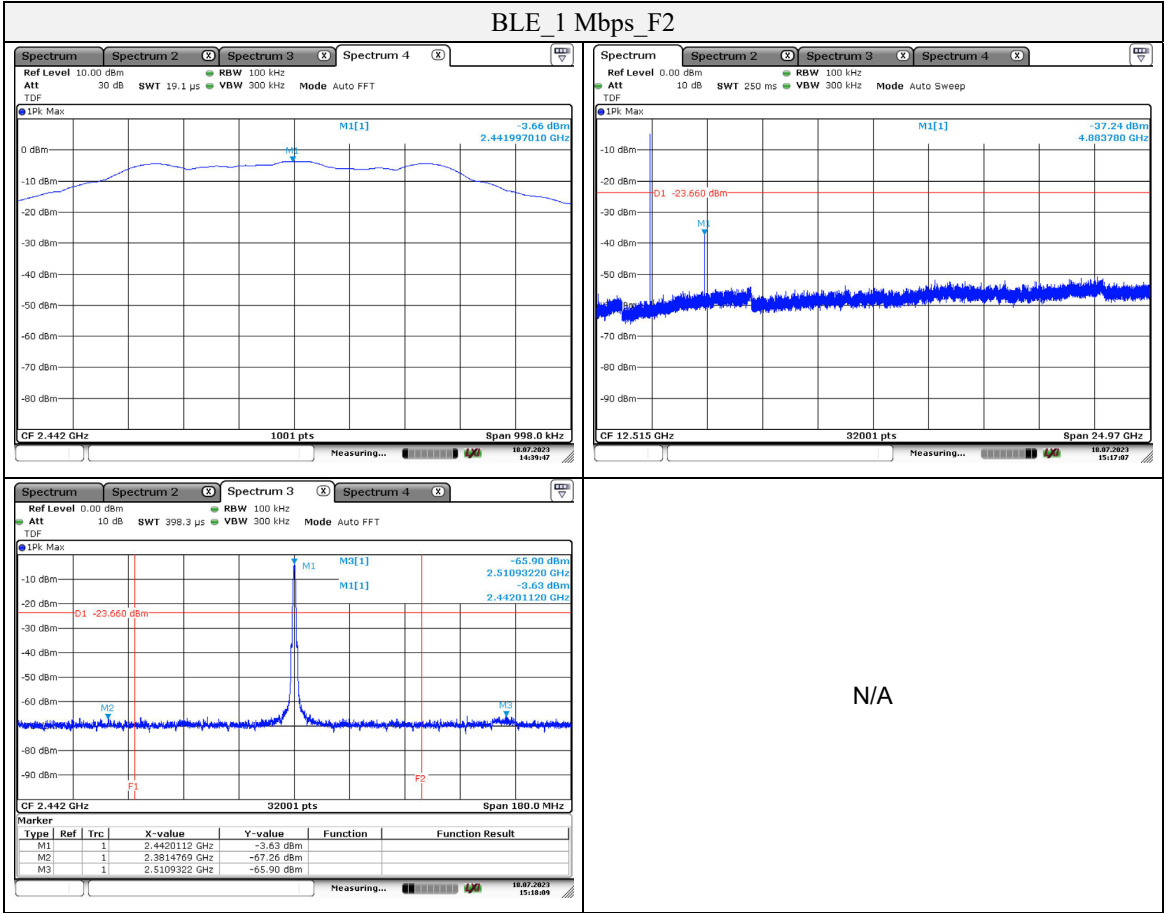
KES-QP16-F01(00-23-01-01)





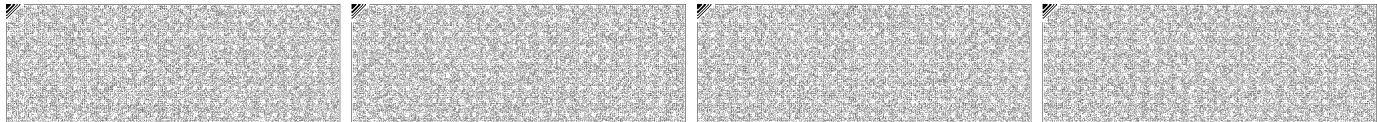
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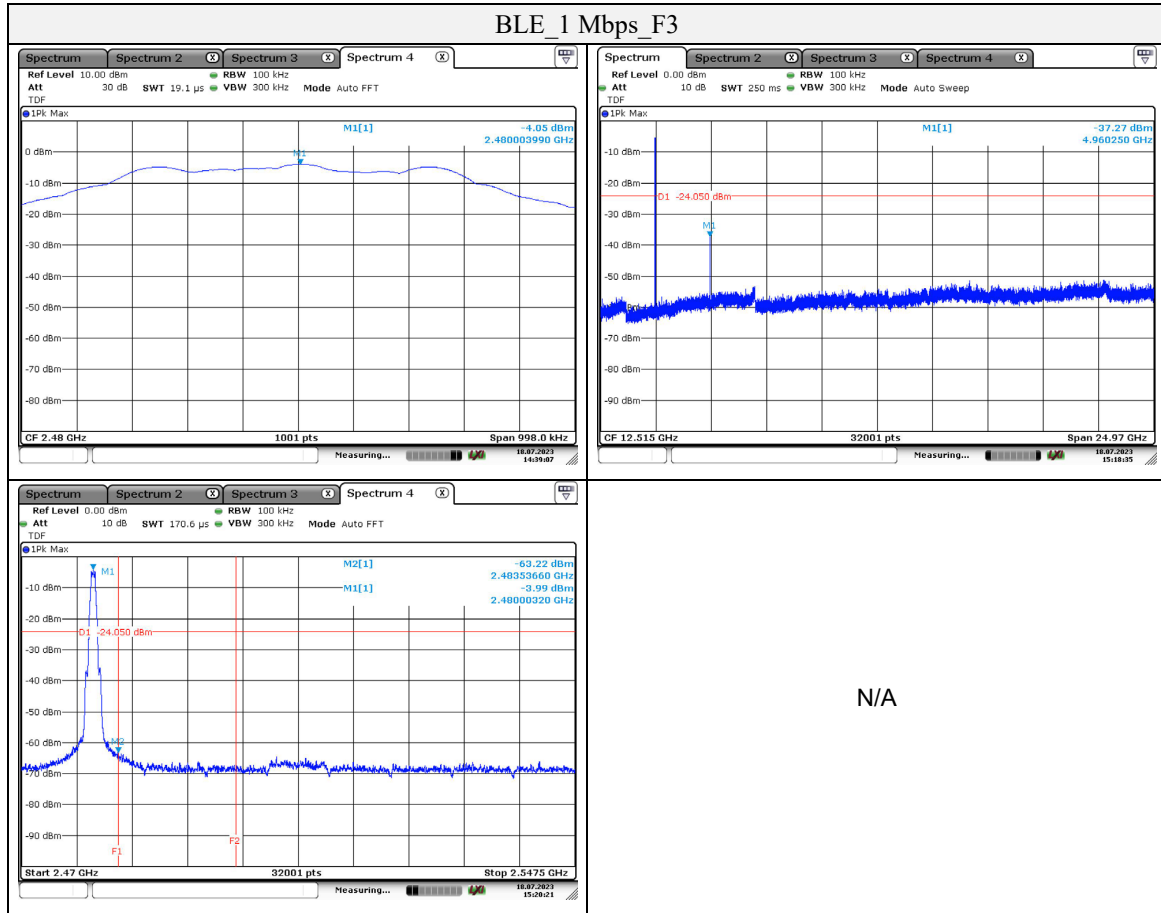
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3.6. AC conducted emissions

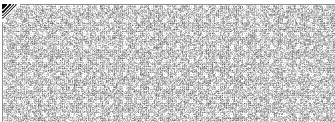
Limit

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 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 (dBμV/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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Test results

Mode: BLE_1 Mbps
Channel: 00 (Worst case)

Hot Line

Level in dBm

Frequency in Hz

Final Result

| Frequency (MHz) | QuasiPeak (dBm V) | CAverage (dBm V) | Limit (dBm V) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-------------------|------------------|---------------|-------------|-----------------|-----------------|------|------------|
| 0.562000 | --- | 30.75 | 46.00 | 15.25 | 1000.0 | 9.000 | L1 | 19.5 |
| 0.562000 | 38.31 | --- | 56.00 | 17.69 | 1000.0 | 9.000 | L1 | 19.5 |
| 0.994000 | --- | 19.52 | 46.00 | 26.48 | 1000.0 | 9.000 | L1 | 19.6 |
| 0.994000 | 25.61 | --- | 56.00 | 30.39 | 1000.0 | 9.000 | L1 | 19.6 |
| 1.530000 | --- | 11.49 | 46.00 | 34.51 | 1000.0 | 9.000 | L1 | 19.6 |
| 1.530000 | 18.68 | --- | 56.00 | 37.32 | 1000.0 | 9.000 | L1 | 19.6 |
| 9.582000 | --- | 26.04 | 50.00 | 23.96 | 1000.0 | 9.000 | L1 | 20.3 |
| 9.582000 | 35.20 | --- | 60.00 | 24.80 | 1000.0 | 9.000 | L1 | 20.3 |
| 10.154000 | --- | 27.65 | 50.00 | 22.35 | 1000.0 | 9.000 | L1 | 20.3 |
| 10.154000 | 36.44 | --- | 60.00 | 23.56 | 1000.0 | 9.000 | L1 | 20.3 |

Neutral Line

Level in dBm

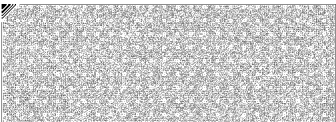
Frequency in Hz

Final Result

| Frequency (MHz) | QuasiPeak (dBm V) | CAverage (dBm V) | Limit (dBm V) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|-------------------|------------------|---------------|-------------|-----------------|-----------------|------|------------|
| 0.554000 | --- | 33.63 | 46.00 | 12.37 | 1000.0 | 9.000 | N | 19.5 |
| 0.554000 | 48.72 | --- | 56.00 | 7.28 | 1000.0 | 9.000 | N | 19.5 |
| 0.558000 | --- | 34.22 | 46.00 | 11.78 | 1000.0 | 9.000 | N | 19.5 |
| 0.558000 | 49.25 | --- | 56.00 | 6.75 | 1000.0 | 9.000 | N | 19.5 |
| 3.974000 | --- | 27.02 | 46.00 | 18.98 | 1000.0 | 9.000 | N | 19.8 |
| 3.974000 | 45.58 | --- | 56.00 | 10.42 | 1000.0 | 9.000 | N | 19.8 |
| 4.062000 | --- | 26.74 | 46.00 | 19.26 | 1000.0 | 9.000 | N | 19.9 |
| 4.062000 | 45.19 | --- | 56.00 | 10.81 | 1000.0 | 9.000 | N | 19.9 |
| 5.926000 | --- | 27.07 | 50.00 | 22.93 | 1000.0 | 9.000 | N | 20.1 |
| 5.926000 | 39.45 | --- | 60.00 | 20.55 | 1000.0 | 9.000 | N | 20.1 |
| 7.590000 | --- | 29.33 | 50.00 | 20.67 | 1000.0 | 9.000 | N | 20.2 |
| 7.590000 | 39.14 | --- | 60.00 | 20.86 | 1000.0 | 9.000 | N | 20.2 |

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3.7. Antenna requirement

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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

The EUT has an internal chip antenna and meets the requirements of this section.

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Appendix A. Measurement equipment

| Equipment | Manufacturer | Model | Serial No. | Calibration interval | Calibration due. |
|--------------------------|-------------------|-------------|-----------------|----------------------|------------------|
| EMI Test Receiver | R&S | ESU26 | 100552 | 1 year | 2024.03.21 |
| Spectrum Analyzer | R&S | FSV40 | 101002 | 1 year | 2024.06.14 |
| EMI Test Receiver | R&S | ESR3 | 101783 | 1 year | 2023.11.11 |
| ATTENUATOR | KEYSIGHT | 8493C | 82506 | 1 year | 2024.01.17 |
| Power Meter | Anritsu | ML2495A | 1438001 | 1 year | 2024.01.13 |
| Pulse Power Sensor | Anritsu | MA2411B | 1339205 | 1 year | 2024.01.13 |
| SIGNAL GENERATOR | KEYSIGHT | N5182B | MY59100115 | 1 year | 2024.05.26 |
| SIGNAL GENERATOR | Anritsu | 68369B | 002118 | 1 year | 2024.05.12 |
| BAND REJECT FILTER | MICRO-TRONICS | BRM50702 | G272 | 1 year | 2024.01.12 |
| Attenuator | KEYSIGHT | - | - | 1 year | 2024.03.21 |
| Loop Antenna | Schwarzbeck | FMZB1513 | 1513-257 | 2 years | 2025.03.22 |
| Horn Antenna | A.H | SAS-571 | 414 | 1 year | 2024.01.16 |
| Horn Antenna | SCHWARZBECK | BBHA9170 | BBHA 9170550 | 1 year | 2024.01.16 |
| TRILOG-BROADBAND ANTENNA | VULB9163 | Schwarzbeck | 714 | 2 years | 2024.04.19 |
| Amplifier | SONOMA INSTRUMENT | 310N | 186549 | 1 year | 2024.03.21 |
| PREAMPLIFIER | HP | 8449B | 3008A00538 | 1 year | 2024.05.31 |
| BROADBAND AMPLIFIER | SCHWARZBECK | BBV9721 | PS9721-003 | 1 year | 2024.01.16 |
| DC POWER SUPPLY | AGILENT | 6632B | US36351824 | 1 year | 2024.01.13 |
| LISN | R&S | ENV216 | 101787 | 1 year | 23.11.10 |
| PULSE LIMITER | R&S | ESH3-Z2 | 101915 | 1 year | 23.11.10 |

Peripheral devices

| Device | Manufacturer | Model No. | Serial No. |
|-------------------|----------------------|-----------|---------------|
| Notebook computer | LG Electronics Inc., | LG15N54 | 504NZJV027828 |
| Jig board | - | - | - |

The end of test report.

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