# FCC/ISED - TEST REPORT

| | | | | |
|---|---|---|---|---|
| Report Number | : | **64.790.22.04877.02-R1** | Date of Issue: | 2023-08-28 |
| Model | : | **EU-SK110, US-SK110** | | |
| Product Type | : | Smart Kit | | |
| Applicant | : | GD Midea Air-Conditioning Equipment Co., Ltd. | | |
| Address | : | Lingang Road, Beijiao, Shunde 528311 Foshan, Guangdong, China | | |
| Manufacturer | : | GD Midea Air-Conditioning Equipment Co., Ltd. | | |
| Address | : | Lingang Road, Beijiao, Shunde 528311 Foshan, Guangdong, China | | |
| Test Result | : | ■ **Positive** ☐ **Negative** | | |
| Total pages including Appendices | : | **39** | | |

*Any use for advertising purposes must be granted in writing. This technical report may only be quoted in full. This report is the result of a single examination of the object in question and is not generally applicable evaluation of the quality of other products in regular production. For further details, please see testing and certification regulation chapter A-3.4.*



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# 2 Details about the Test Laboratory

**Details about the Test Laboratory**
Test Site 1

| | |
|---|---|
| Company name: | TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch<br>Building 12&13, Zhiheng Wisdomland Business Park,<br>Guankou Erlu, Nantou, Nanshan District,<br>Shenzhen, 518052 China |
| FCC Designation Number: | CN5009 |
| FCC Registration No.: | 514049 |
| IC Registration Number: | 10320A |
| Telephone: | 86 755 8828 6998 |
| Fax: | 86 755 8828 5299 |

# 3 Description of the Equipment under Test

| | |
|---|---|
| Product: | Smart Kit |
| PMN: | Smart Kit |
| Model no.: | EU-SK110, US-SK110 |
| HVIN: | EU-SK110, US-SK110 |
| FVIN: | N/A |
| FCC ID: | 2ADQOMDNA23 |
| IC: | 12575A-MDNA23 |
| Rating: | 5VDC |
| RF Transmission Frequency: | 2402MHz-2480MHz |
| No. of Operated Channel: | 40 |
| Modulation: | GFSK |
| Antenna Type: | PCB onboard antenna |
| Antenna Gain: | 2.7dBi max |
| Description of the EUT: | The product is a smart kit with WIFI and BLE functions, which can only be used for the control function of home appliances of Midea Group. It cannot be connected to a computer for any other functions. |

NOTE 1: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

NOTE 2:
EU-SK110, US-SK110 are identical except model name.
Unless otherwise specified, the model EU-SK109 was chosen as representative sample to perform fully testing, the additional conducted output power and spurious radiated emissions tests were applied on model EU-SK110 to verify the difference, other models are deemed to fulfil relevant requirements without further testing.


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# 4 Summary of Test Standards

| Test Standards | |
|---|---|
| FCC Part 15 Subpart C<br>10-1-2021 Edition | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators |
| RSS-Gen<br>Issue 5, April 2018<br>Amendment 1, March 2019 +<br>Amendment 2, February 2021 | General Requirements and Information for the Certification of Radio Apparatus |
| RSS-247 Issue 2<br>February 2017 | Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices |

All the test methods were according to KDB558074 D01 v05r02 DTS Measurement Guidance and ANSI C63.10 (2013).


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# 5 Summary of Test Results

| Technical Requirements | | | |
|---|---|---|---|
| **FCC Part 15 Subpart C 10-1-2021 Edition / RSS-247 Issue 2, February 2017/ RSS-Gen Issue 5, April 2018 Amendment 1, March 2019 + Amendment 2, February 2021** | | | |
| Test Condition | | Test Result | Test Site |
| §15.207<br>RSS-GEN 8.8 | Conducted emission AC power port | Pass | Site 1 |
| §15.247 (b) (3) &<br>RSS-247 5.4(d) | Conducted output power | Pass | Site 1 |
| RSS-247 5.4(d) | Equivalent Isotropic Radiated Power | Pass | Site 1 |
| §15.247(e)<br>RSS-247 5.2(b) | Power spectral density | Pass | Site 1 |
| §15.247(a)(2)<br>RSS-247 5.2(a) &<br>RSS-GEN 6.7 | 6dB bandwidth | Pass | Site 1 |
| §15.247(a)(1)<br>RSS-247 5.1(b) | 20dB Occupied bandwidth | N/A | -- |
| RSS-GEN 6.7 | 99% Occupied Bandwidth | Pass | Site 1 |
| §15.247(a)(1)<br>RSS-247 5.1(b) | Carrier frequency separation | N/A | -- |
| §15.247(a)(1)(iii)<br>RSS-247 5.1(d) | Number of hopping frequencies | N/A | -- |
| §15.247(a)(1)(iii)<br>RSS-247 5.1(d) | Dwell Time | N/A | -- |
| §15.247(d)<br>RSS-247 5.5 | Spurious RF conducted emissions | Pass | Site 1 |
| §15.247(d)<br>RSS-247 5.5 | Band edge | Pass | Site 1 |
| §15.247(d) &<br>§15.209 & §15.205<br>RSS-247 5.5 & RSS-Gen 6.13 | Spurious radiated emissions for transmitter | Pass | Site 1 |
| §15.203<br>RSS-Gen 6.8 | Antenna requirement | Pass<br>See note 1 | -- |

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses a PCB onboard antenna, which gain is 2.7dBi. In accordance to §15.203 and RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.


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# 6 General Remarks

**Remarks**

This report is used to apply C2PC on new models EU-SK110 and US-SK110, which is based on the previous report 64.790.22.04877.01-R1 for following technical changes:
- Remove the plastic enclosure and USB interface, and change to SMT interface type.
- Add a metal shielding.
- The module size and interface are different, in order to better match the performance of antenna, different components are used:
L17=NC, L3=2.7pF, C16=NC, R28=R27=100ohm, R24=R23=NC
So in this application the test data of conducted output power and radiated spurious emissions in this report is new test data to verify the compliance of these changes, other test data were refer from 64.790.22.04877.01-R1 of original application and these test data are still effective and representative of the compliance of this change of the product.

This submittal(s) (test report) is intended for FCC ID: 2ADQOMDNA23, complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15 Subpart C 10-1-2021 Edition.
This submittal(s) (test report) is intended for IC: 12575A-MDNA23, complies with RSS-247 Issue 2, February 2017 and RSS-Gen Issue 5, Amendment 2, February 2021.

This report is only for the BLE function.

**SUMMARY:**

All tests according to the regulations cited on page 6 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

| | | |
|---|---|---|
| Sample Received Date: | 2022-11-30 | 2023-06-02 |
| Testing Start Date: | 2022-12-12 | 2023-06-08 |
| Testing End Date: | 2023-01-10 | 2023-08-28 |

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch –

| Reviewed by: | Prepared by: | Tested by: |
|---|---|---|
| Jessie He | Myron Yu | Carry Cai |
| Project Manager | Project Engineer | Test Engineer |



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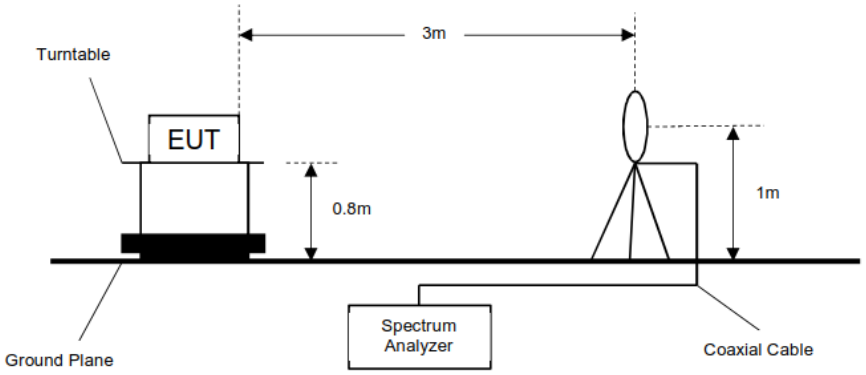
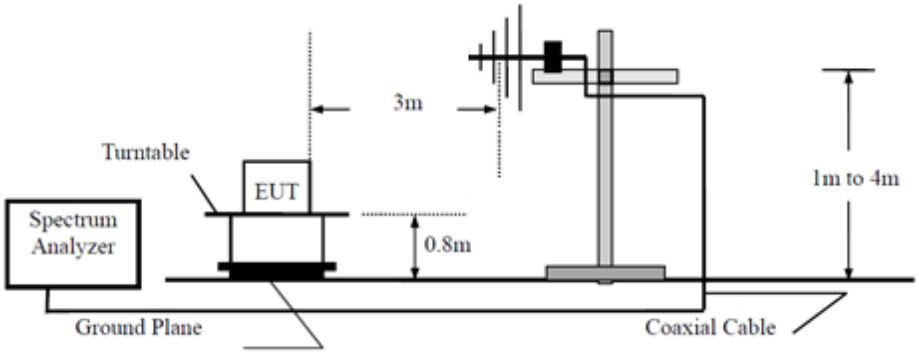
# 7 Test Setups

## 7.1 Radiated test setups

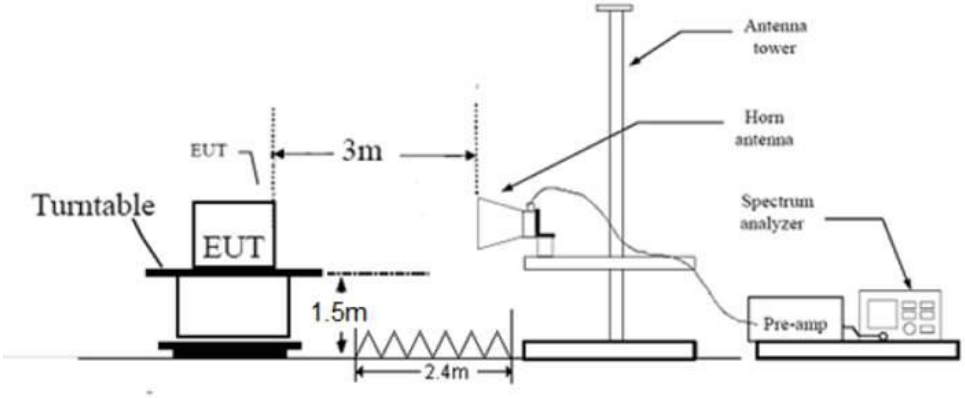
9kHz - 30MHz




Below 1GHz




Above 1GHz



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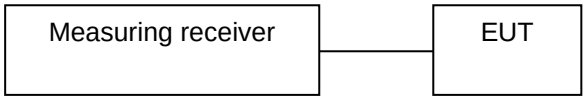
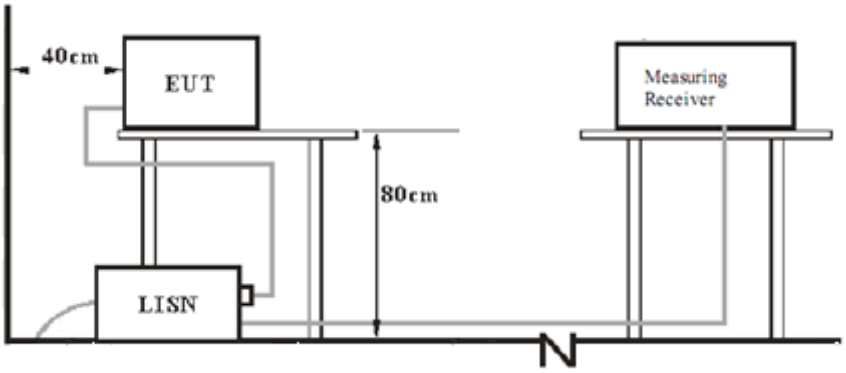
## 7.2 Conducted RF test setups




## 7.3 AC Power Line Conducted Emission test setups



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# 8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO. | S/N |
|---|---|---|---|
| MOBILE PHONE | APPLE | IPHONE 6 | --- |
| APP | MIDEA | MSMARTHOME | --- |
| MAINBOARD | MIDEA | / | --- |
| LAPTOP | LENOVO | X240 | L34015282 |
| SOFTWARE | REALTEK | RTLBTAPP | VERSION 5.2.2.85 |

The system was configured to channel 0, 19, and 39 for the test.

Test Software Information:

| Test Software Version | RTLBTAPP (Version 5.2.2.85) | |
|---|---|---|
| Modulation | Setting TX Power | Packet Type |
| GFSK | Tx Gain Index 6 | / |



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# 9 Technical Requirement

## 9.1 Conducted Emission

**Test Method**

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

**Limit**

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

| Frequency MHz | QP Limit dBµV | AV Limit dBµV |
|---|---|---|
| 0.150-0.500 | 66-56* | 56-46* |
| 0.500-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreasing linearly with logarithm of the frequency



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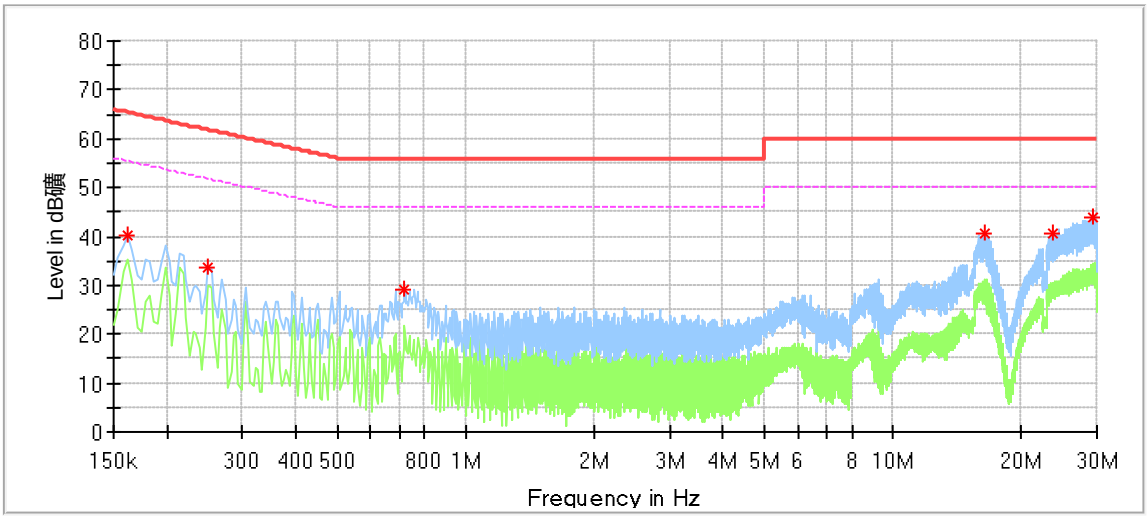
## Conducted Emission

| | | |
|---|---|---|
| Product Type | : | Smart Kit |
| M/N | : | US-SK109 |
| Operating Condition | : | Bluetooth transmission |
| Test Specification | : | Power Line, Live |
| Comment | : | AC 120V/60Hz (Midea-mainboard) |




## Critical_Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|
| 0.162000 | 40.06 | --- | 65.36 | 25.30 | L1 | 9.58 |
| 0.250000 | 33.54 | --- | 61.76 | 28.22 | L1 | 9.60 |
| 0.718000 | 28.94 | --- | 56.00 | 27.06 | L1 | 9.64 |
| 16.470000 | 40.79 | --- | 60.00 | 19.21 | L1 | 9.98 |
| 23.690000 | 40.44 | --- | 60.00 | 19.56 | L1 | 10.08 |
| 29.518000 | 43.85 | --- | 60.00 | 16.15 | L1 | 10.02 |

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)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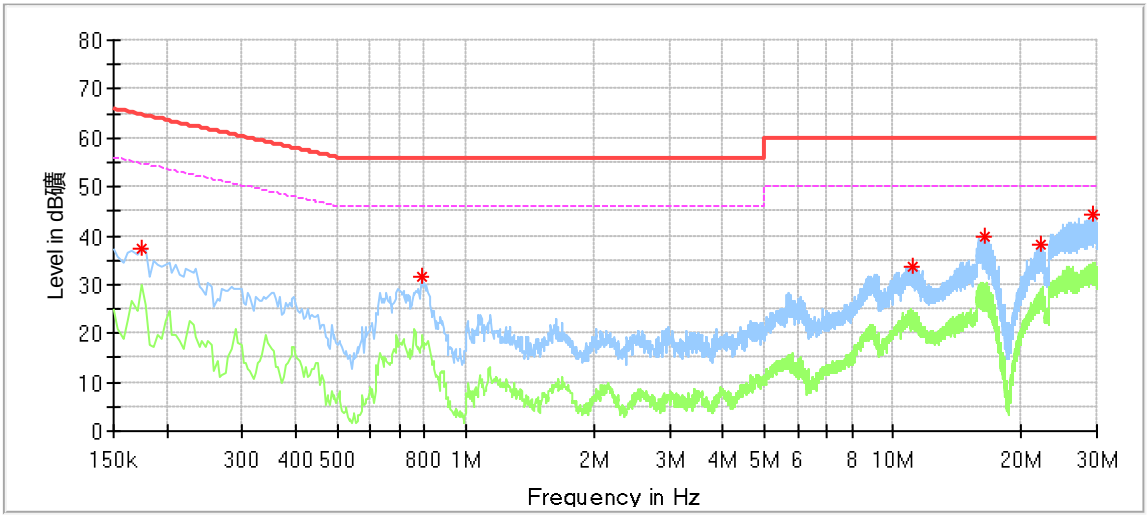
## Conducted Emission

Product Type : Smart Kit
M/N : US-SK109
Operating Condition : Bluetooth transmission
Test Specification : Power Line, Neutral
Comment : AC 120V/60Hz (Midea-mainboard)




## Critical_Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|
| 0.174000 | 37.36 | --- | 64.77 | 27.41 | N | 9.58 |
| 0.790000 | 31.42 | --- | 56.00 | 24.58 | N | 9.64 |
| 11.090000 | 33.82 | --- | 60.00 | 26.18 | N | 9.93 |
| 16.370000 | 39.84 | --- | 60.00 | 20.16 | N | 9.99 |
| 22.234000 | 38.24 | --- | 60.00 | 21.76 | N | 10.11 |
| 29.394000 | 44.27 | --- | 60.00 | 15.73 | N | 10.06 |

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)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## 9.2 Conducted output power

**Test Method**

1. The EUT was placed on 0.8m height table, the RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following test receiver settings:
   Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
   RBW > the 20dB bandwidth of the emission being measured, VBW≥RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

**Limits**

According to §15.247 (b) (3) & RSS-247 5.4(d), conducted output power limit as below:

| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|---|---|---|
| 2400-2483.5 | ≤1 | ≤30 |

According to & RSS-247 5.4(d), EIRP limit as below:

| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|---|---|---|
| 2400-2483.5 | ≤4 | ≤36.2 |

Test result as below table

| Test Mode | Frequency (MHz) | Conducted Output Power (dBm) | Antenna Gain (dBi) | EIRP (dBm) | Result |
|---|---|---|---|---|---|
| BLE 1M | 2402 | 5.15 | 2.7 | 7.85 | Pass |
| | 2440 | 5.60 | 2.7 | 8.30 | Pass |
| | 2480 | 5.85 | 2.7 | 8.55 | Pass |


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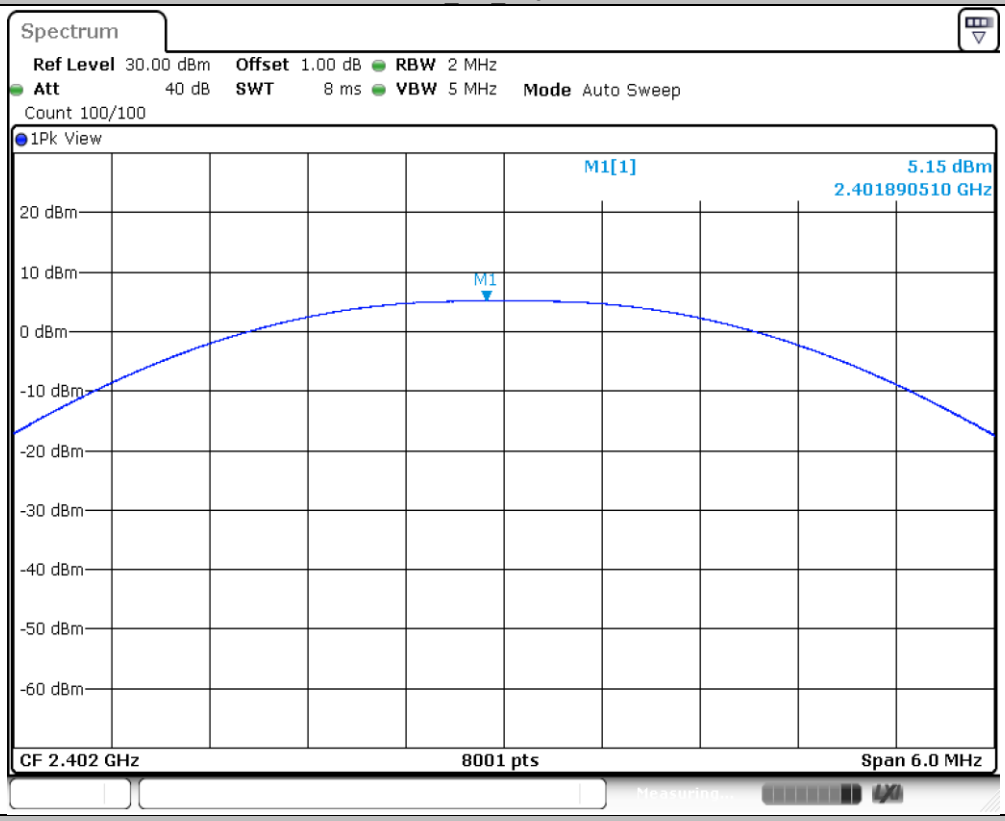
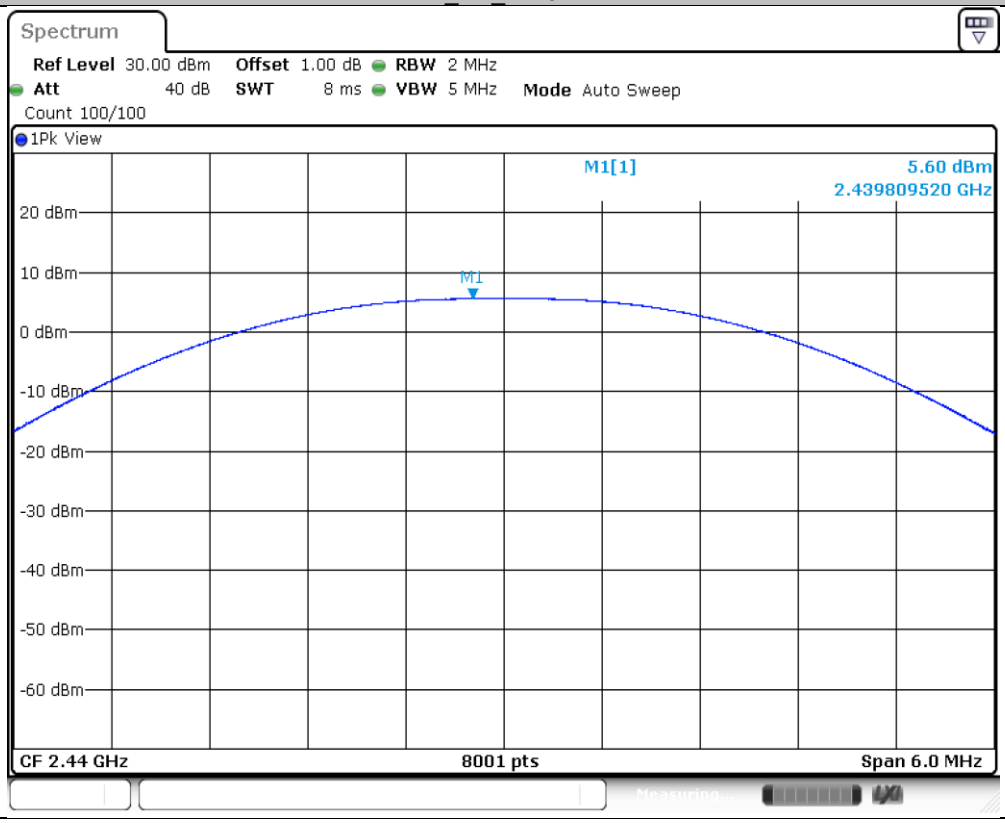
## Test Graphs

BLE_1M_2402MHz




BLE_1M_2440MHz



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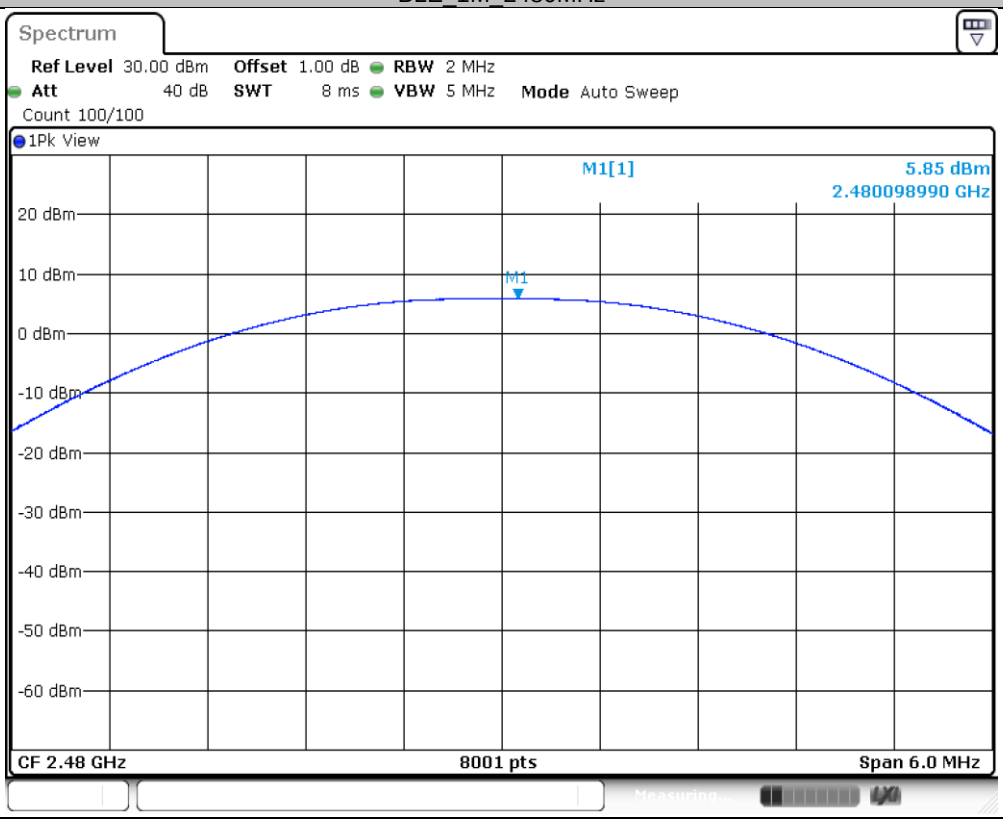
BLE_1M_2480MHz



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## 9.3 6dB bandwidth

### Test Method

1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   RBW=100KHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Use the automatic bandwidth measurement capability of an instrument, use the X dB bandwidth mode with X set to 6 dB.
5. Allow the trace to stabilize, record the 6 dB Bandwidth value.

### Limit

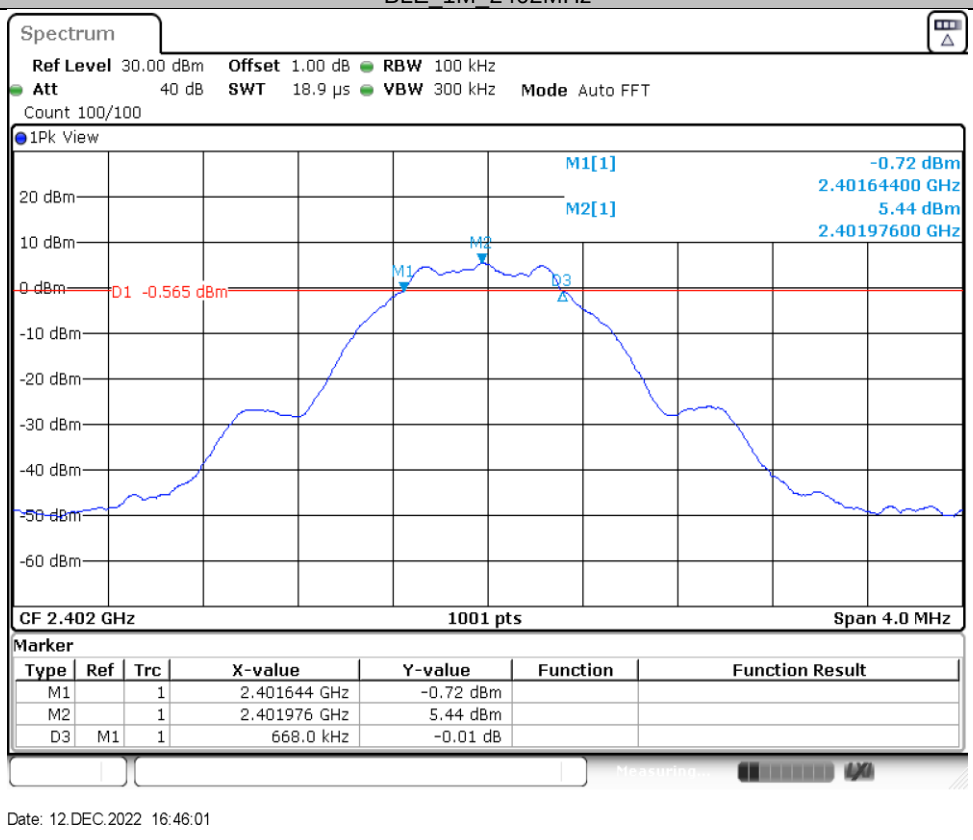
| Limit [kHz] |
|---|
| ≥500 |

### Test result

| Test Mode | Channel (MHz) | Result (MHz) | Limit (kHz) | Verdict |
|---|---|---|---|---|
| BLE 1M | 2402 | 0.668 | ≥500 | PASS |
| | 2440 | 0.660 | ≥500 | PASS |
| | 2480 | 0.668 | ≥500 | PASS |

### Test Graphs

BLE_1M_2402MHz



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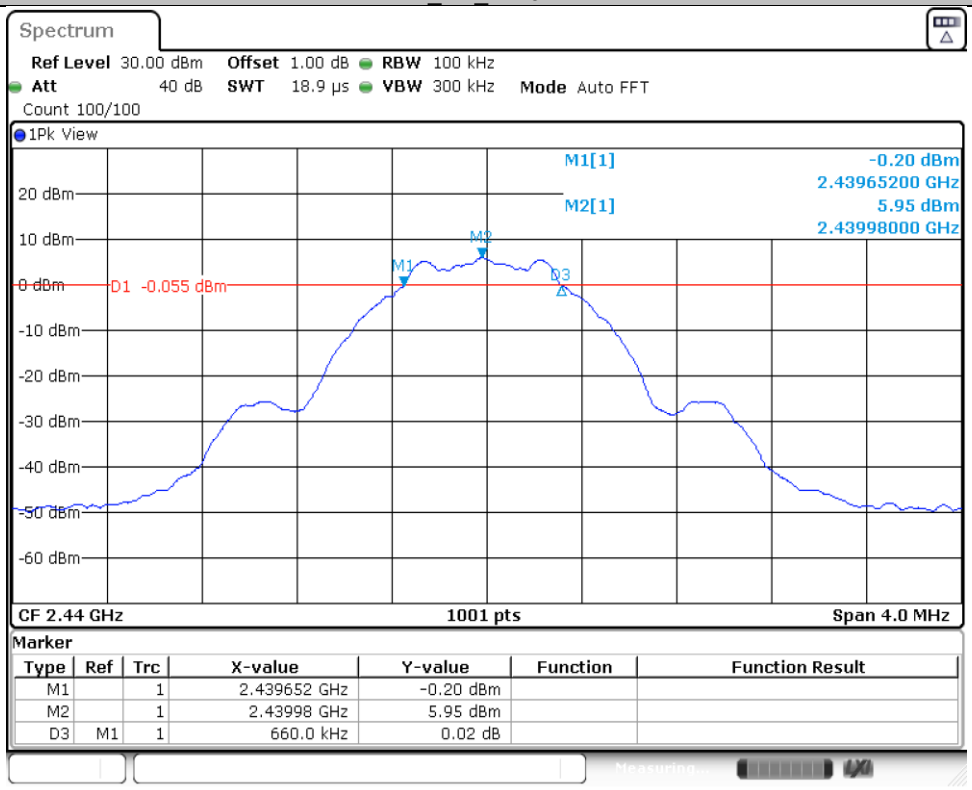
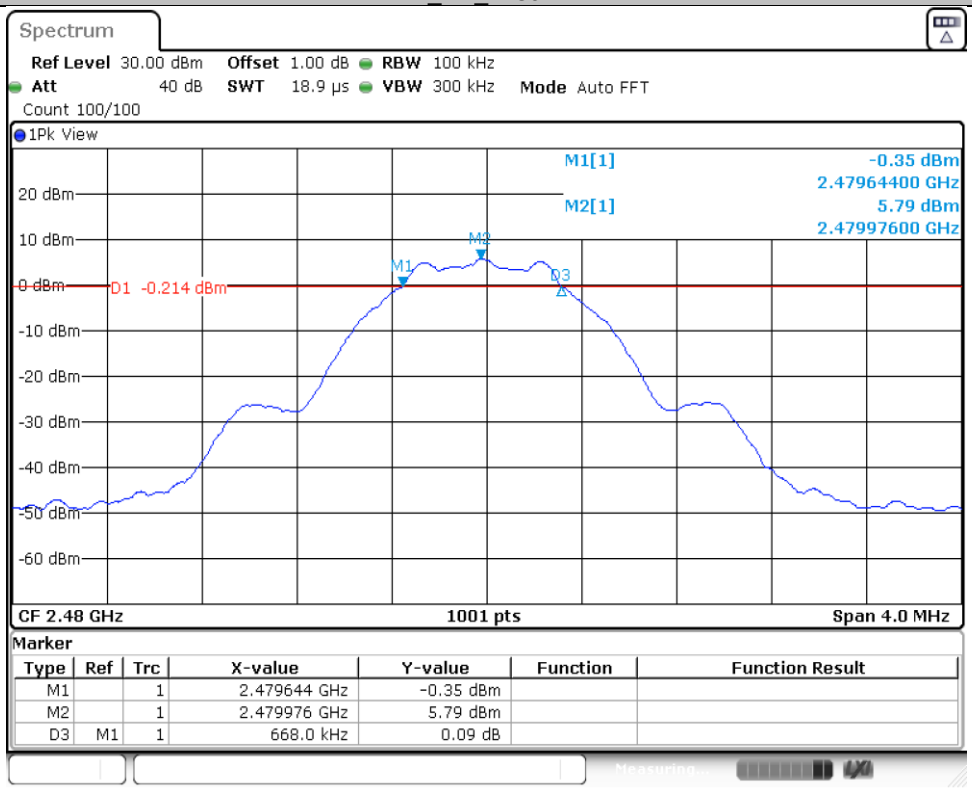
BLE_1M_2440MHz




Date: 12.DEC.2022 16:47:47

BLE_1M_2480MHz

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## 9.4 99% bandwidth

**Test Method**

1. Connect EUT test port to spectrum analyzer.
2. Use the following spectrum analyzer settings:
   RBW=1% to 5% of the actual occupied, VBW≥3RBW, Sweep = auto,
   Detector function = peak, Trace = max hold
3. Use the automatic bandwidth measurement capability of an instrument, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
4. Allow the trace to stabilize, record the X dB Bandwidth value.

**Limit**

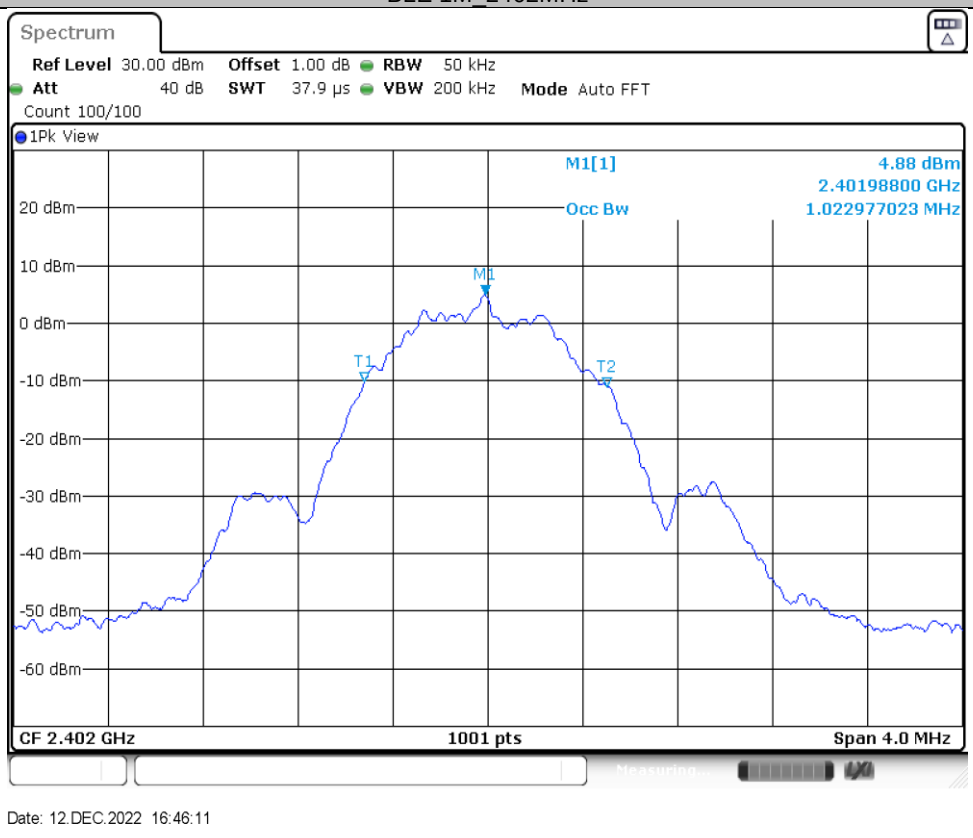
| Limit [kHz] |
|---|
| -- |

**Test result**

| Test Mode | Channel (MHz) | Result (MHz) | Limit | Verdict |
|---|---|---|---|---|
| BLE 1M | 2402 | 1.023 | --- | PASS |
| | 2440 | 1.027 | --- | PASS |
| | 2480 | 1.023 | --- | PASS |

**Test Graphs**

BLE 1M_2402MHz



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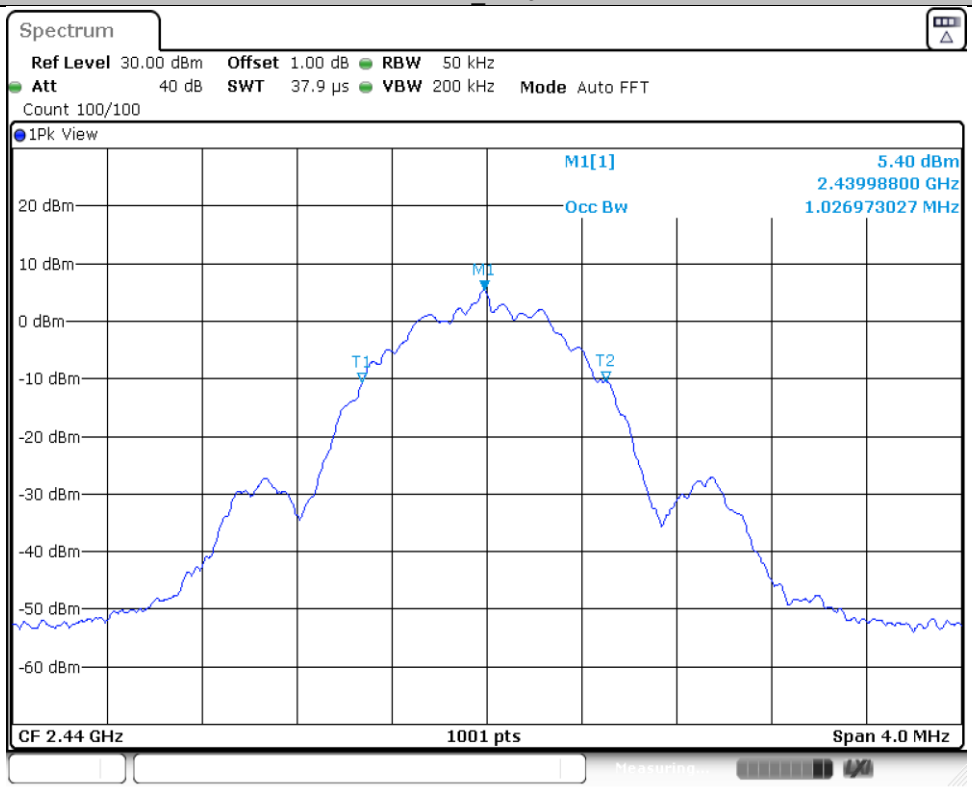
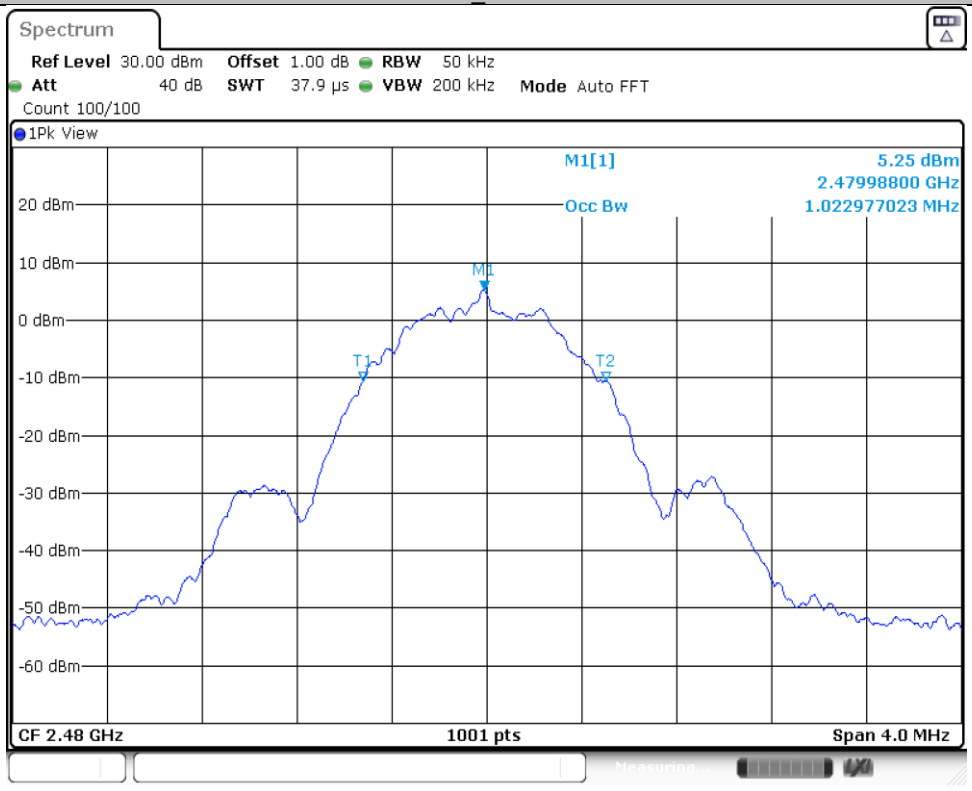
BLE 1M_2440MHz




Date: 12.DEC.2022 16:47:57

BLE 1M_2480MHz




Date: 12.DEC.2022 16:49:52



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## 9.5 Power spectral density

**Test Method**

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
4. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
5. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
6. Repeat above procedures until other frequencies measured were completed.

**Limit**

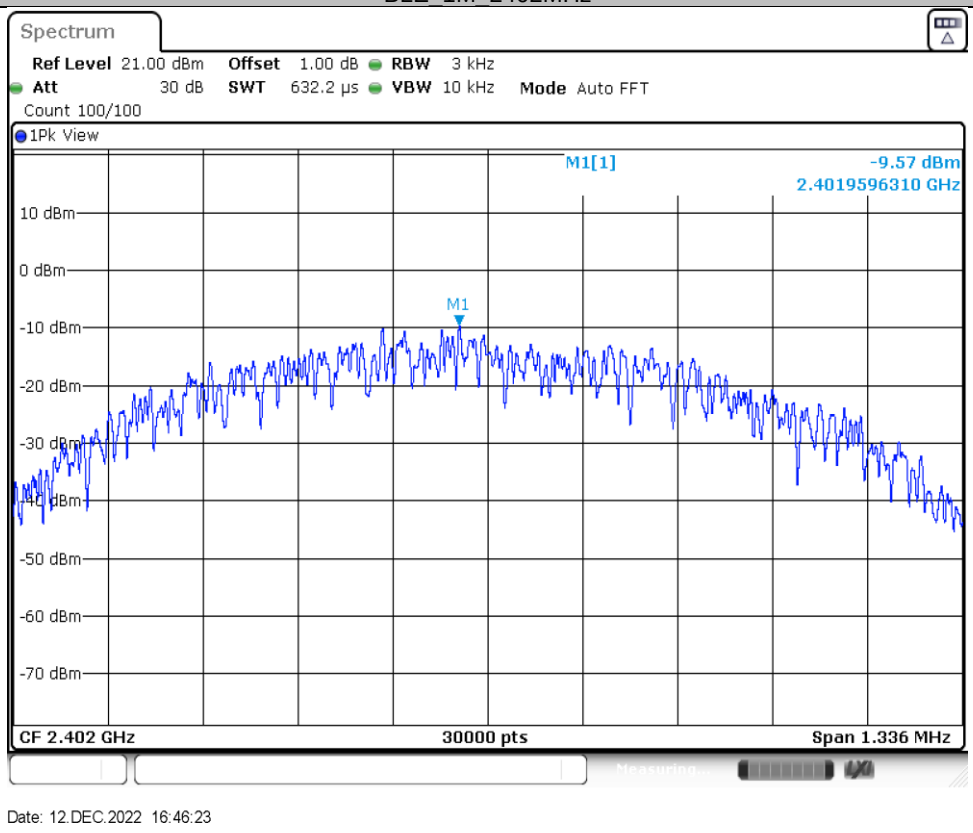
| Limit [dBm/3kHz] |
|---|
| ≤8 |

**Test result**

| Test Mode | Channel (MHz) | Result (dBm/3KHz) | Limit(dBm/3kHz) | Verdict |
|---|---|---|---|---|
| BLE 1M | 2402 | -9.57 | 8 | PASS |
| | 2440 | -10.40 | 8 | PASS |
| | 2480 | -10.12 | 8 | PASS |

**Test Graphs**

BLE_1M_2402MHz



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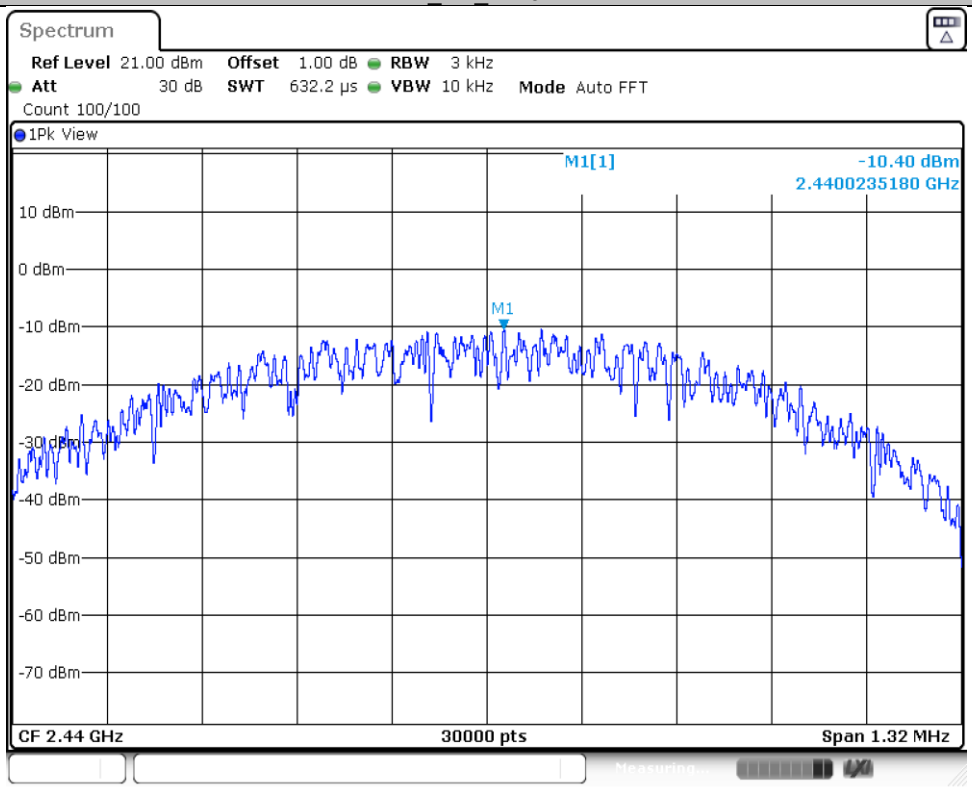
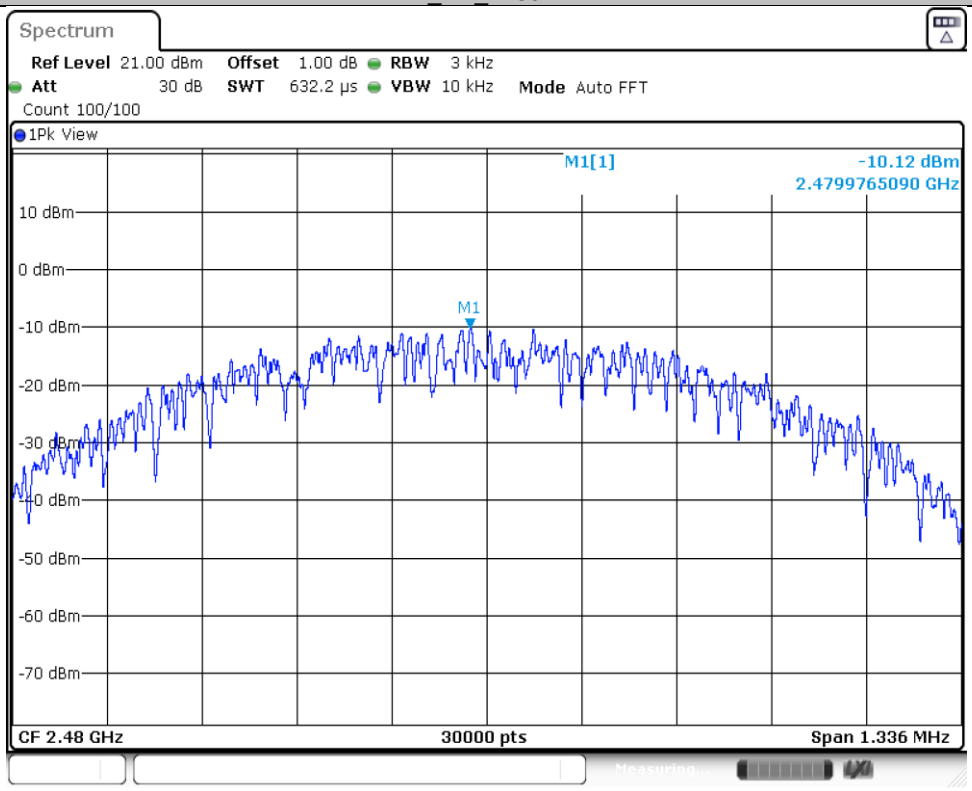
BLE_1M_2440MHz




Date: 12.DEC.2022 16:48:10

BLE_1M_2480MHz




Date: 12.DEC.2022 16:50:04



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## 9.6 Spurious RF conducted emissions

**Test Method**

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   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 $10^{th}$ harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
5. The level displayed must comply with the limit specified in this Section. Submit these plots.
6. Repeat above procedures until all frequencies measured were complete.

**Limit**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that 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 § 15.247(b)(3) and RSS 247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB.

| Frequency Range MHz | Limit (dBc) |
|---|---|
| 30-25000 | -20 |


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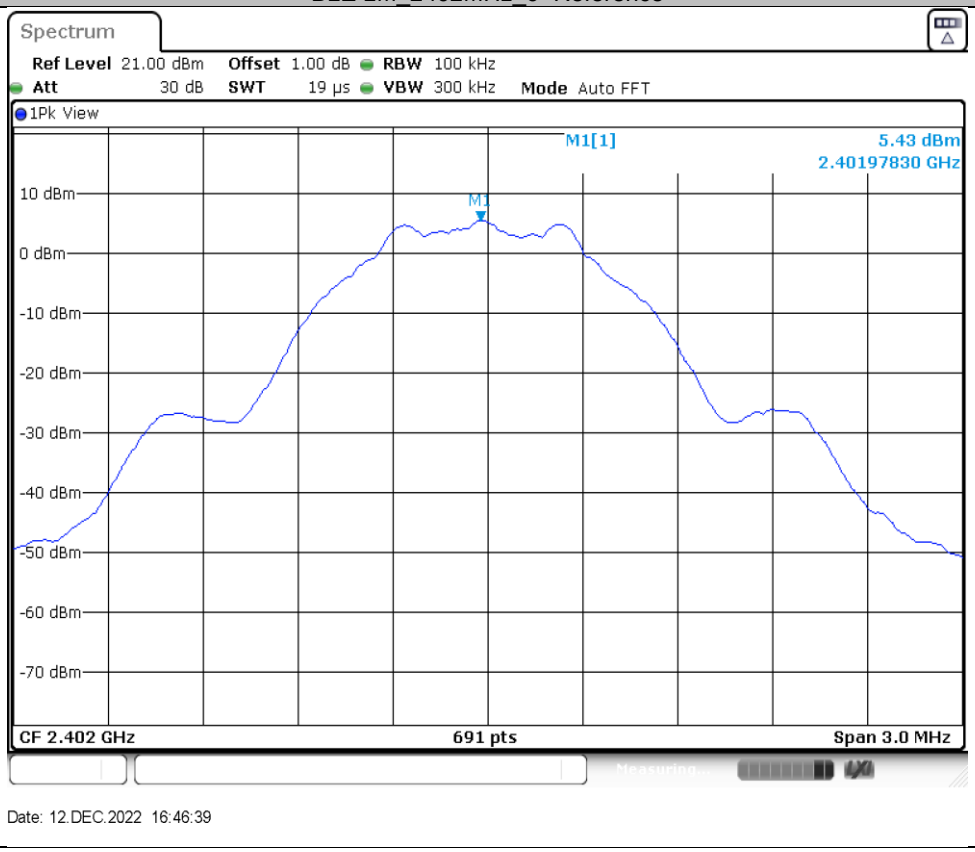
**Test Result**
Remark: The emissions exceed limit is fundamental signal.

| Test Mode | Channel (MHz) | Freq Range (MHz) | Ref Level (dBm) | Result (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|---|
| BLE 1M | 2402 | Reference | 5.43 | 5.43 | --- | PASS |
| | | 30~1000 | --- | -58.17 | <=-14.57 | PASS |
| | | 1000~26500 | --- | -49.12 | <=-14.57 | PASS |
| | 2440 | Reference | 5.97 | 5.97 | --- | PASS |
| | | 30~1000 | --- | -58.26 | <=-14.03 | PASS |
| | | 1000~26500 | --- | -52.24 | <=-14.03 | PASS |
| | 2480 | Reference | 5.75 | 5.75 | --- | PASS |
| | | 30~1000 | --- | -58.23 | <=-14.25 | PASS |
| | | 1000~26500 | --- | -51.93 | <=-14.25 | PASS |

## Test Graphs

BLE 1M_2402MHz_0~Reference





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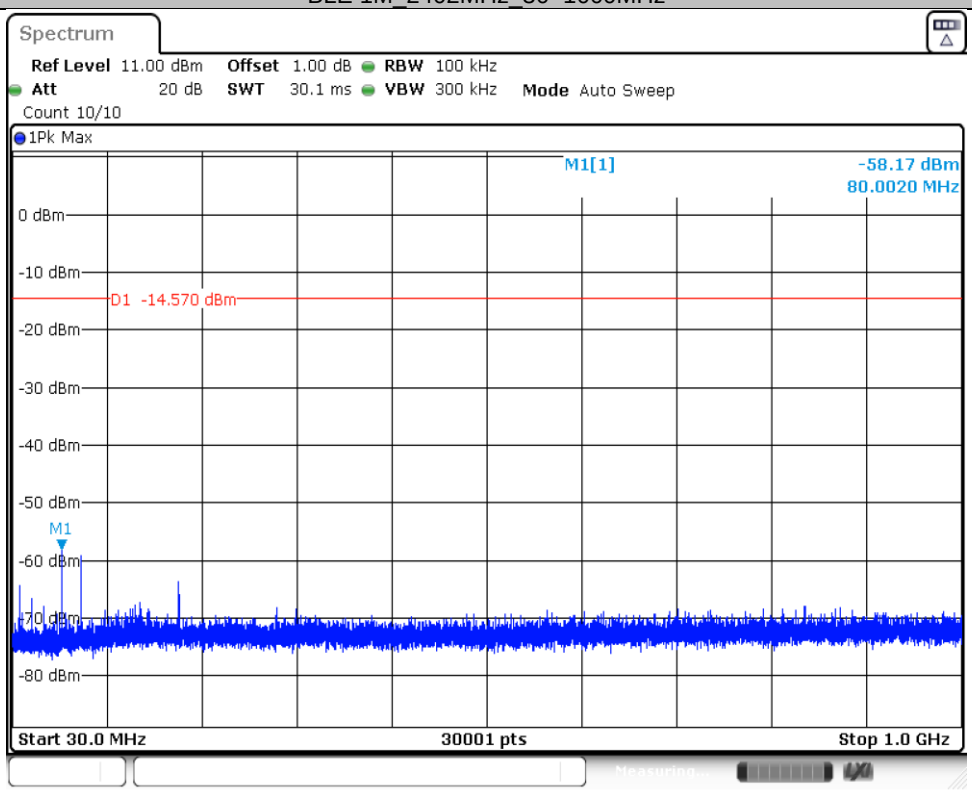
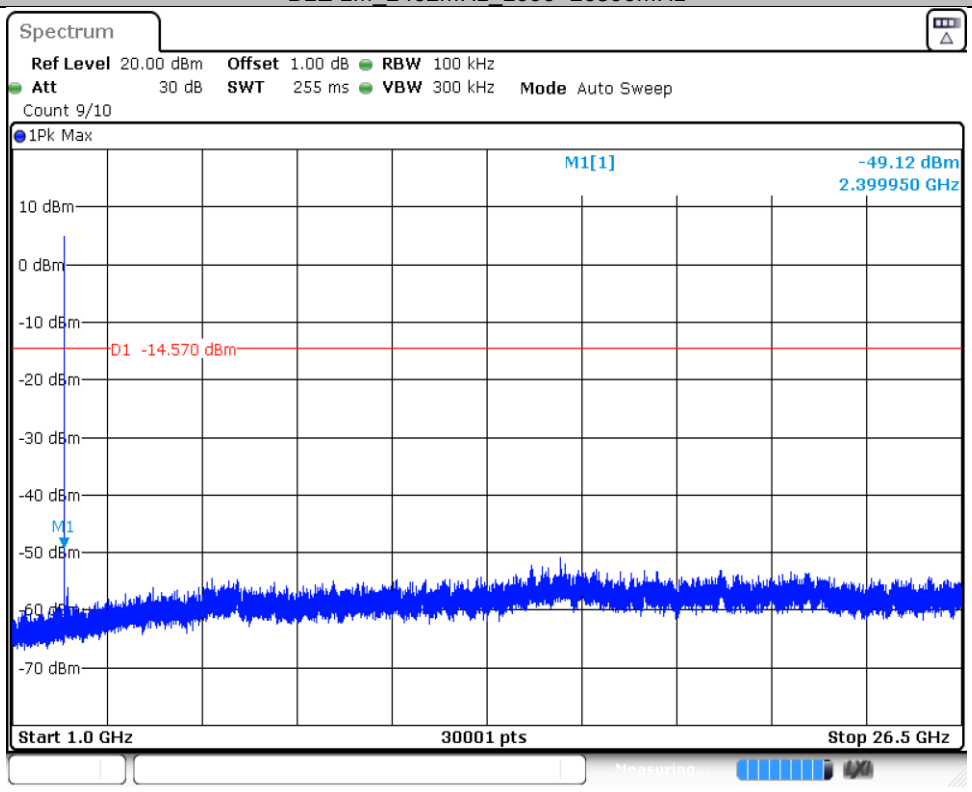
BLE 1M_2402MHz_30~1000MHz




Date: 12.DEC.2022 16:46:45

BLE 1M_2402MHz_1000~26500MHz




Date: 12.DEC.2022 16:46:53



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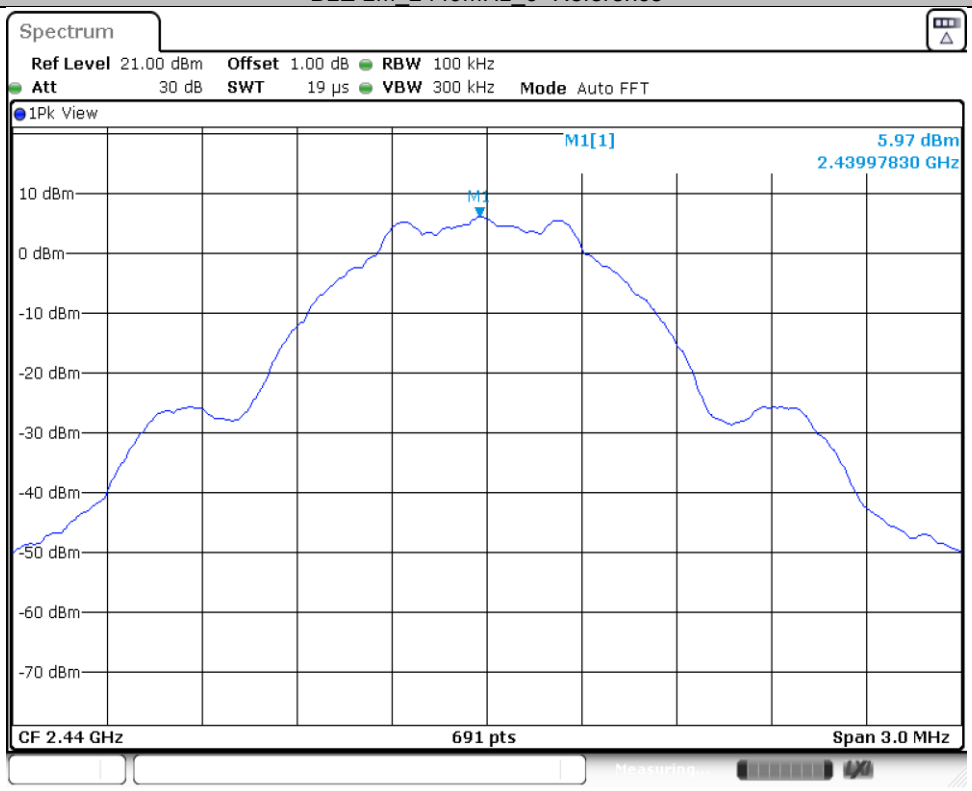
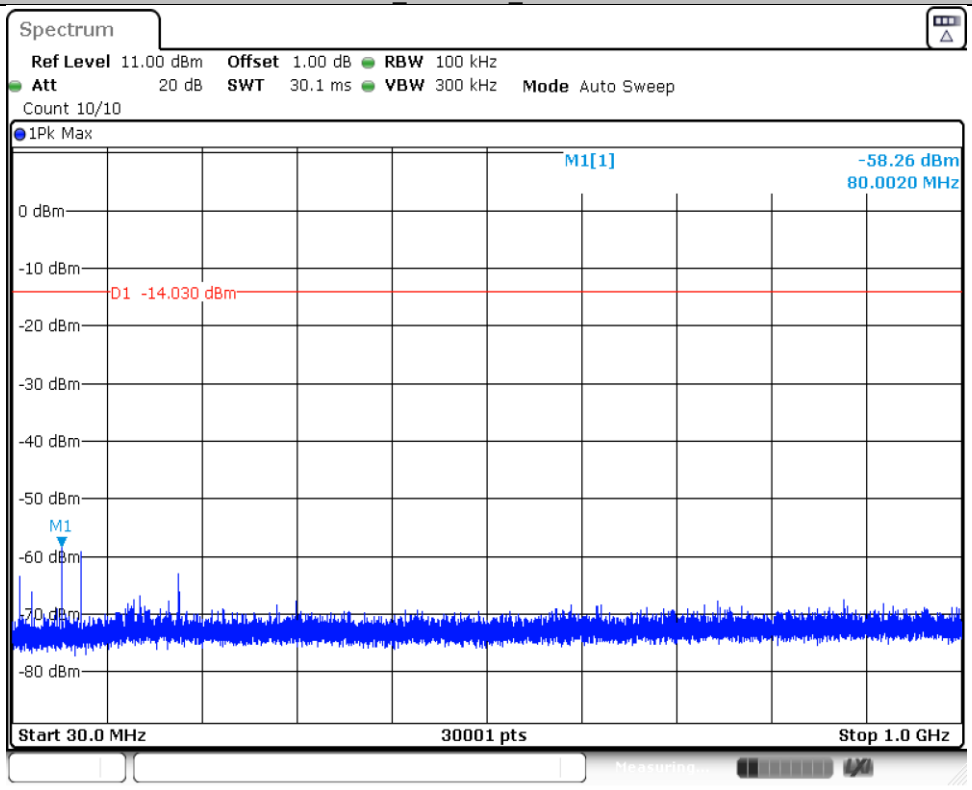
BLE 1M_2440MHz_0~Reference




Date: 12.DEC.2022 16:48:15

BLE 1M_2440MHz_30~1000MHz




Date: 12.DEC.2022 16:48:21



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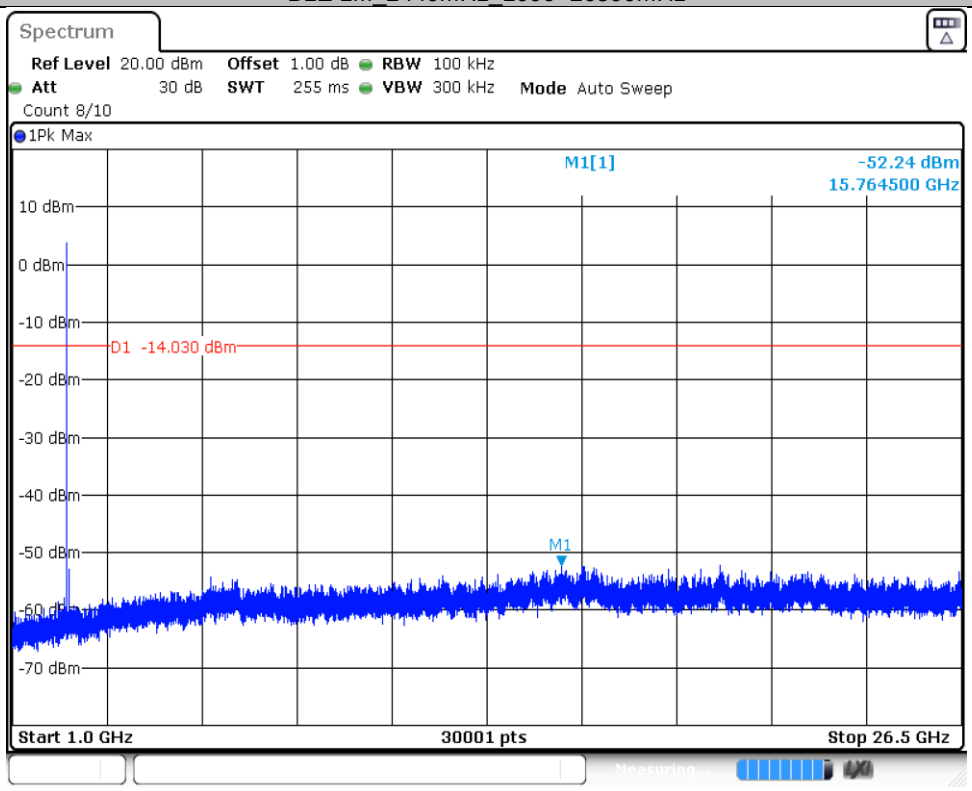
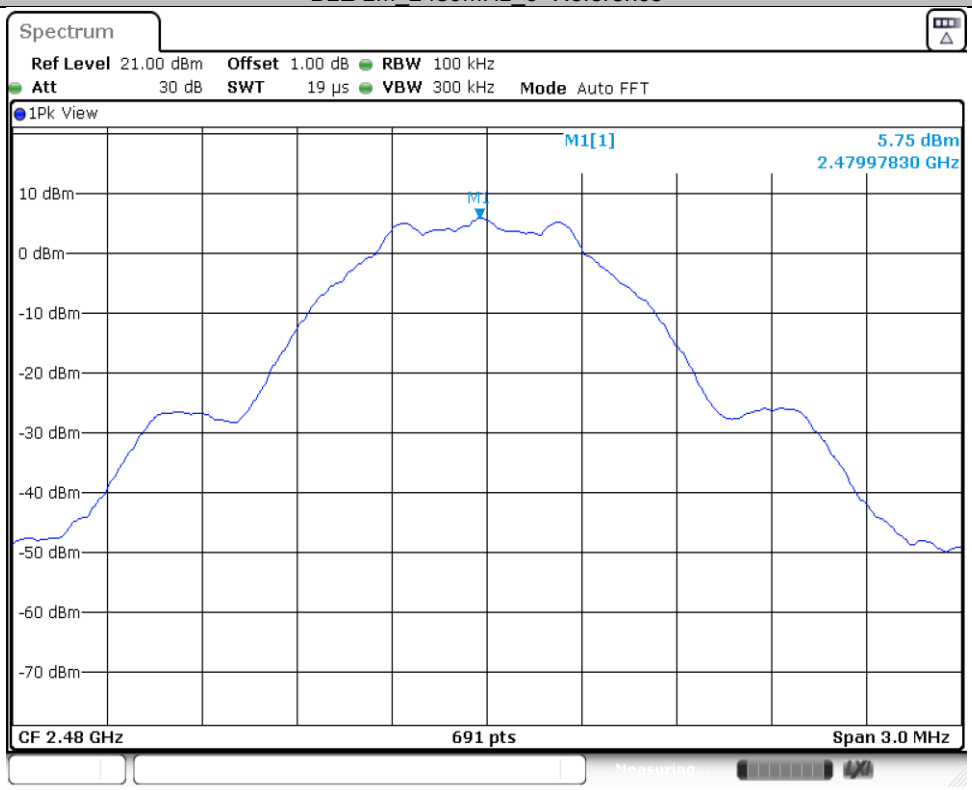
BLE 1M_2440MHz_1000~26500MHz




Date: 12.DEC.2022 16:48:29

BLE 1M_2480MHz_0~Reference




Date: 12.DEC.2022 16:50:18



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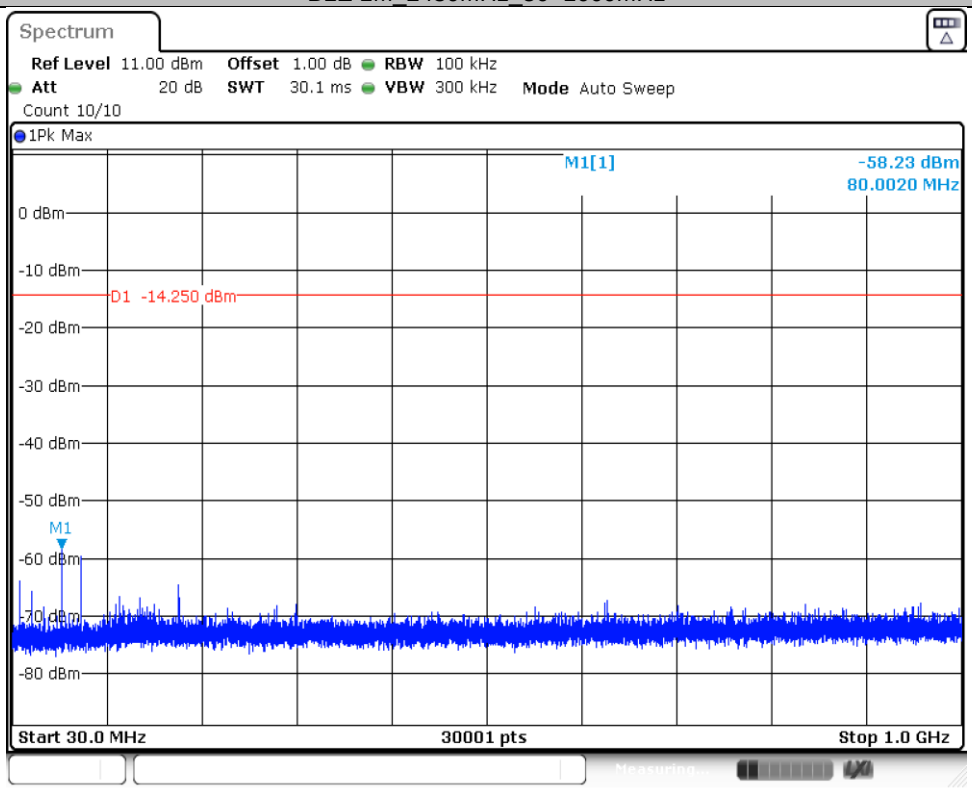
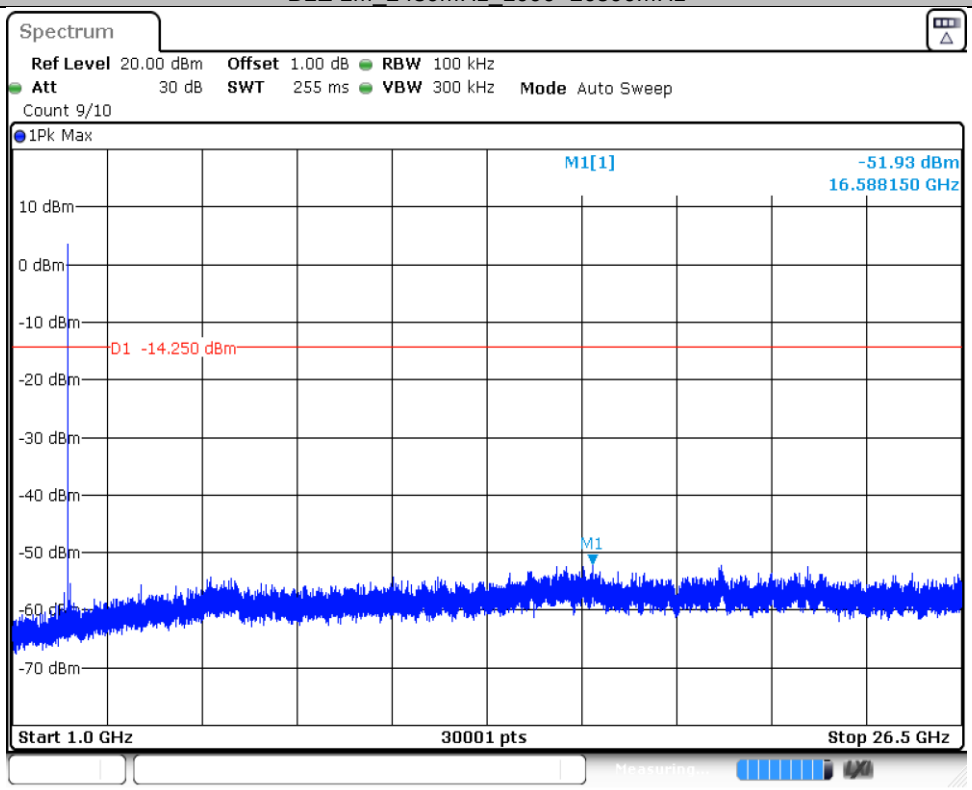
BLE 1M_2480MHz_30~1000MHz




Date: 12.DEC.2022 16:50:24

BLE 1M_2480MHz_1000~26500MHz




Date: 12.DEC.2022 16:50:32



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## 9.7 Band edge

**Test Method**

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize, use the peak and delta measurement to record the result.
5. The level displayed must comply with the limit specified in this Section.
6. Repeat above procedures until all frequencies measured were complete and submit all the plots.

**Limit:**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that 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 § 15.247(b)(3) and RSS-247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB.

| Frequency Range MHz | Limit (dBc) |
|---|---|
| 30-25000 | -20 |



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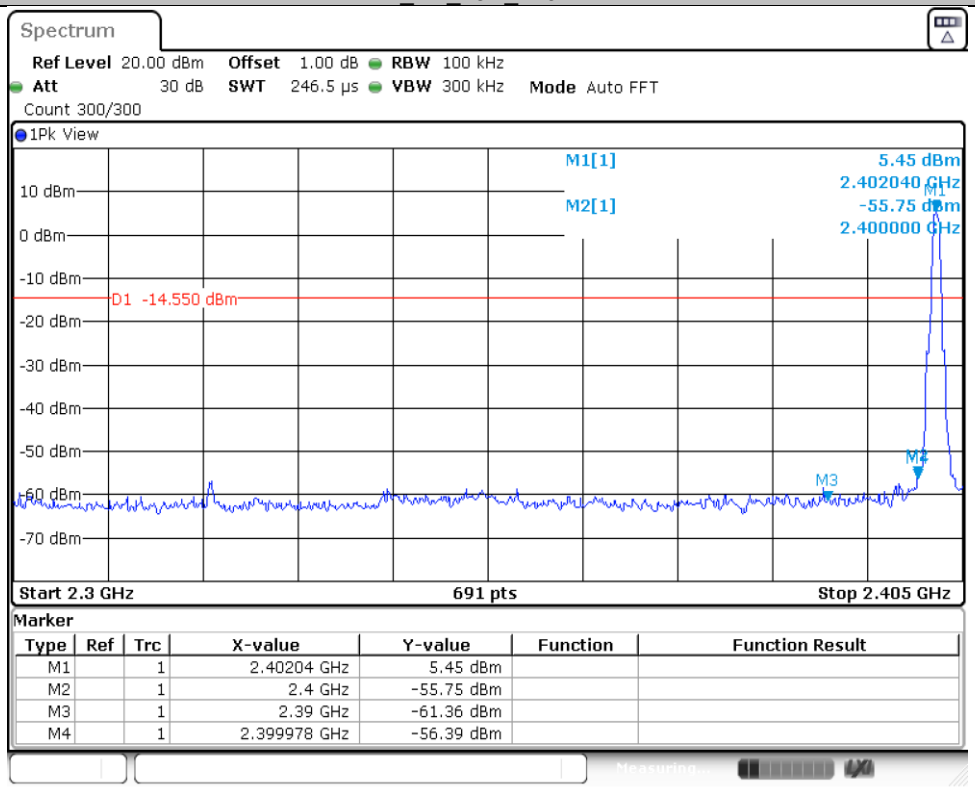
## Test result

| Test Mode | Channel (MHz) | Ref Level (dBm) | Result (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|
| BLE 1M | 2402 | 2.63 | -55.75 | <=-14.55 | PASS |
| | 2480 | 2.25 | -55.92 | <=-14.29 | PASS |

## Test Graphs

BLE_1M_Low_2402MHz



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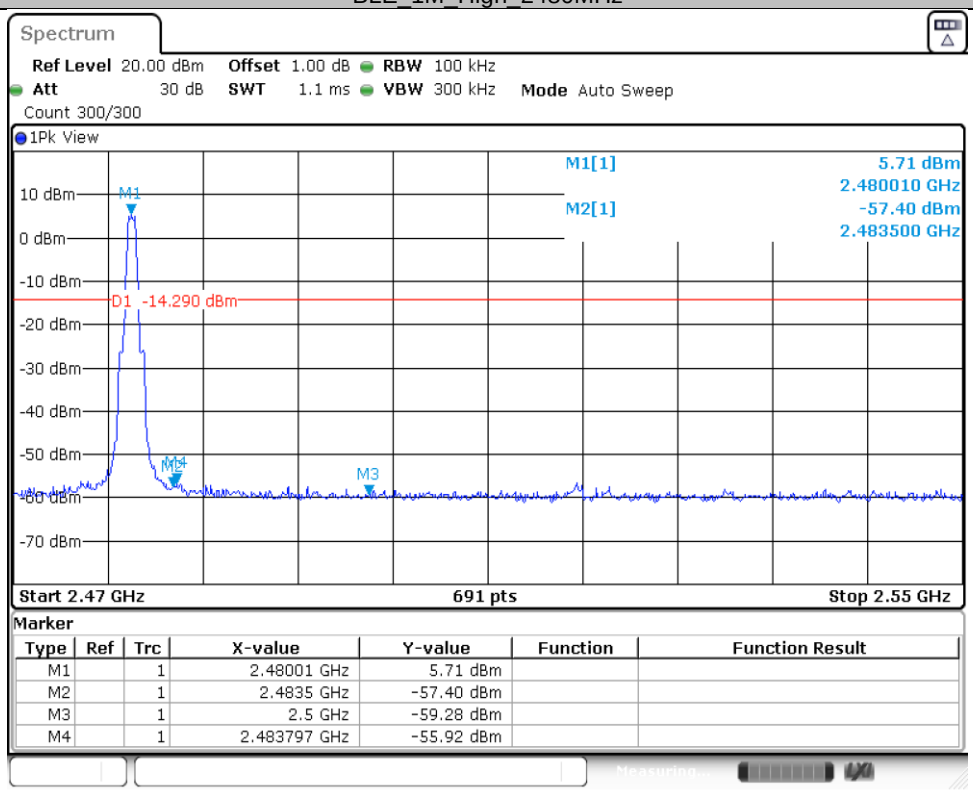
BLE_1M_High_2480MHz



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## 9.8 Spurious radiated emissions for transmitter

**Test Method**

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna is varied from one meter to four 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.
4: 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:
For Below 1GHz
Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz to 120KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1MHz.
b) VBW \ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction


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factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

**Limit**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that 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 § 15.247(b)(3) and RSS 247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in § 15.209(a) and RSS-Gen is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§ 15.205(a) and RSS-Gen scetion8.9, must also comply with the radiated emission limits specified in § 15.209(a) and RSS-Gen section 8.10.

| Frequency MHz | Field Strength uV/m | Field Strength dBµV/m | Detector |
|---|---|---|---|
| 30-88 | 100 | 40 | QP |
| 88-216 | 150 | 43.5 | QP |
| 216-960 | 200 | 46 | QP |
| 960-1000 | 500 | 54 | QP |
| Above 1000 | 500 | 54 | AV |
| Above 1000 | 5000 | 74 | PK |


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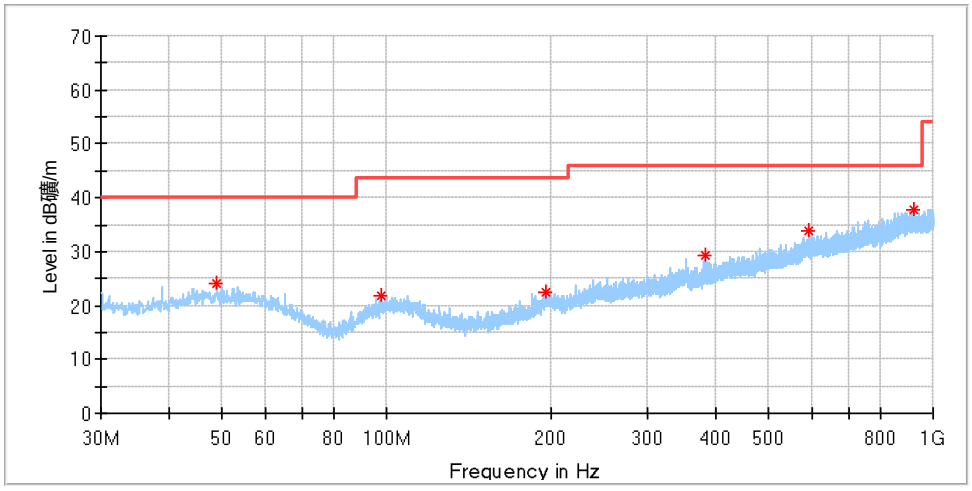
## Spurious radiated emissions for transmitter

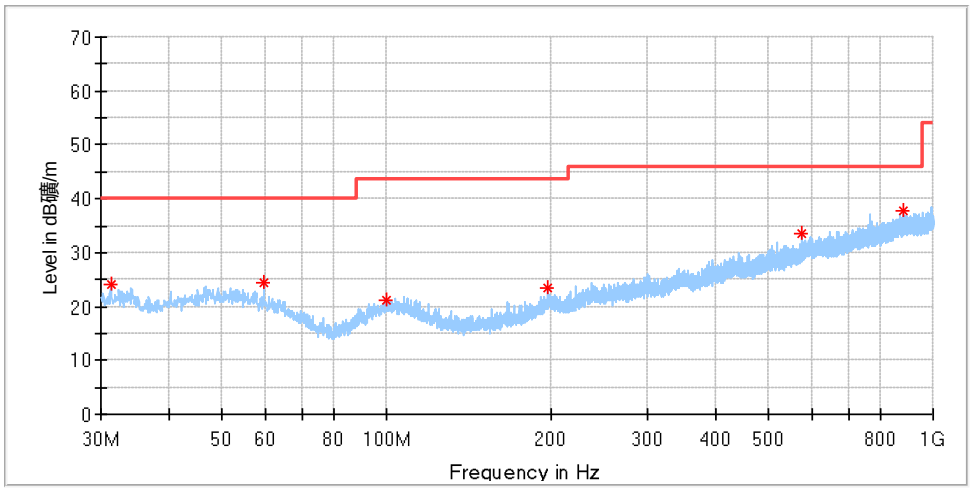
According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

**Transmitting spurious emission test result as below:**

For test model: EU-SK110
Below 1G:




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|
| 48.854375 | 24.08 | 40.00 | 15.92 | 200.0 | H | 236.0 | 20.62 |
| 97.596875 | 21.92 | 43.50 | 21.58 | 200.0 | H | 236.0 | 18.65 |
| 195.688125 | 22.33 | 43.50 | 21.17 | 200.0 | H | 82.0 | 19.02 |
| 383.989375 | 29.23 | 46.00 | 16.77 | 200.0 | H | 279.0 | 23.43 |
| 592.175625 | 33.81 | 46.00 | 12.19 | 200.0 | H | 0.0 | 27.99 |
| 922.885000 | 37.66 | 46.00 | 8.34 | 200.0 | H | 262.0 | 32.14 |




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|
| 31.273125 | 24.01 | 40.00 | 15.99 | 100.0 | V | 0.0 | 17.76 |
| 59.645625 | 24.33 | 40.00 | 15.67 | 100.0 | V | 329.0 | 19.79 |
| 100.021875 | 21.15 | 43.50 | 22.35 | 100.0 | V | 312.0 | 18.79 |
| 197.506875 | 23.31 | 43.50 | 20.19 | 100.0 | V | 106.0 | 19.25 |
| 576.595000 | 33.54 | 46.00 | 12.46 | 100.0 | V | 358.0 | 27.18 |
| 884.024375 | 37.63 | 46.00 | 8.37 | 100.0 | V | 9.0 | 31.78 |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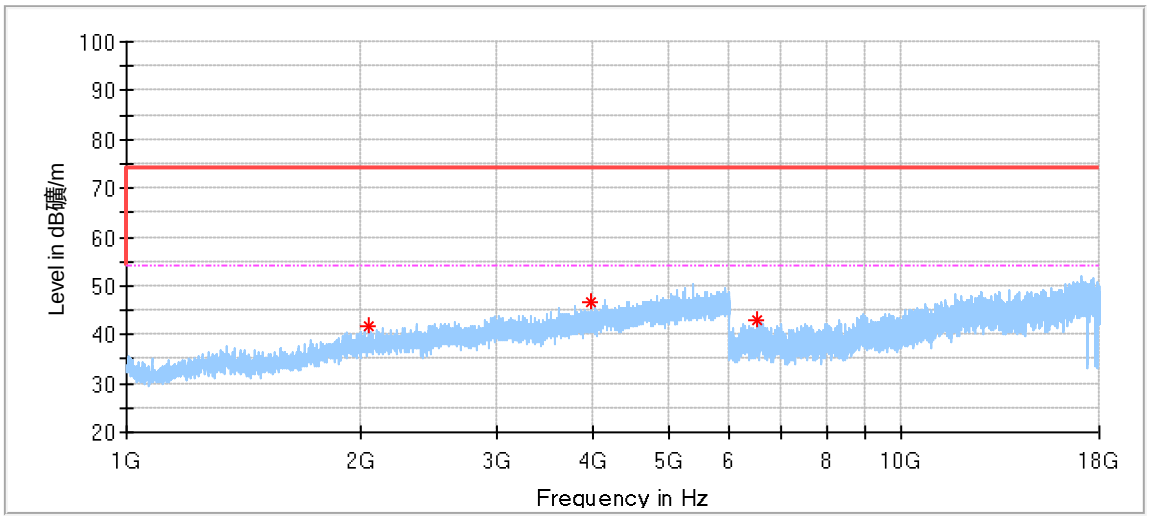
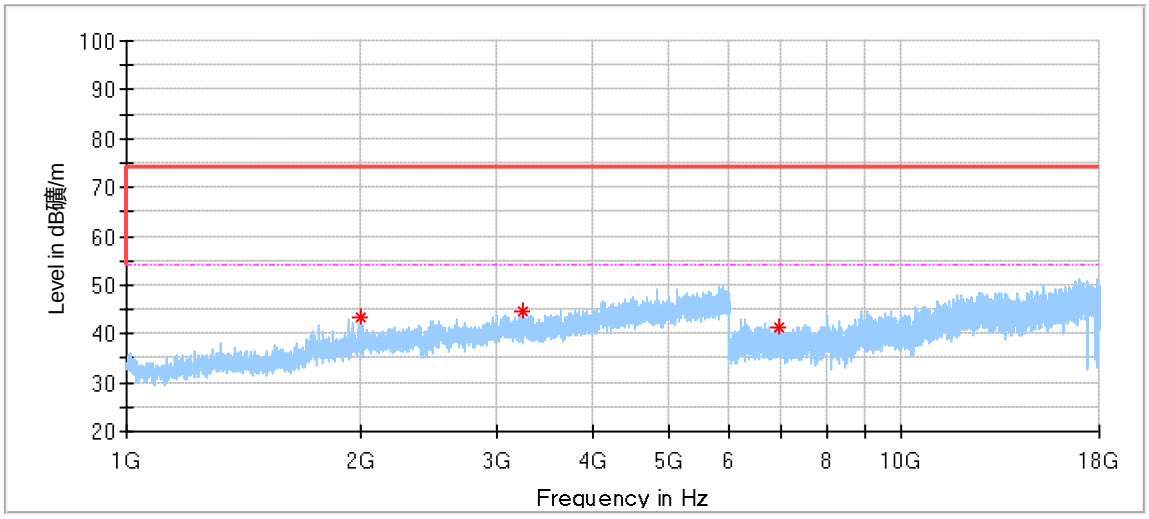
## Low channel 2402MHz




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|
| 2057.000000 | 41.62 | 74.00 | 32.38 | 150.0 | H | 232.0 | -3.87 |
| 3970.500000 | 46.46 | 74.00 | 27.54 | 150.0 | H | 250.0 | 1.27 |
| 6497.500000 | 43.07 | 74.00 | 30.93 | 150.0 | H | 226.0 | 9.06 |




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|
| 2003.000000 | 43.33 | 74.00 | 30.67 | 150.0 | V | 351.0 | -4.21 |
| 3246.500000 | 44.77 | 74.00 | 29.23 | 150.0 | V | 17.0 | -0.61 |
| 6967.000000 | 41.50 | 74.00 | 32.50 | 150.0 | V | 119.0 | 9.53 |



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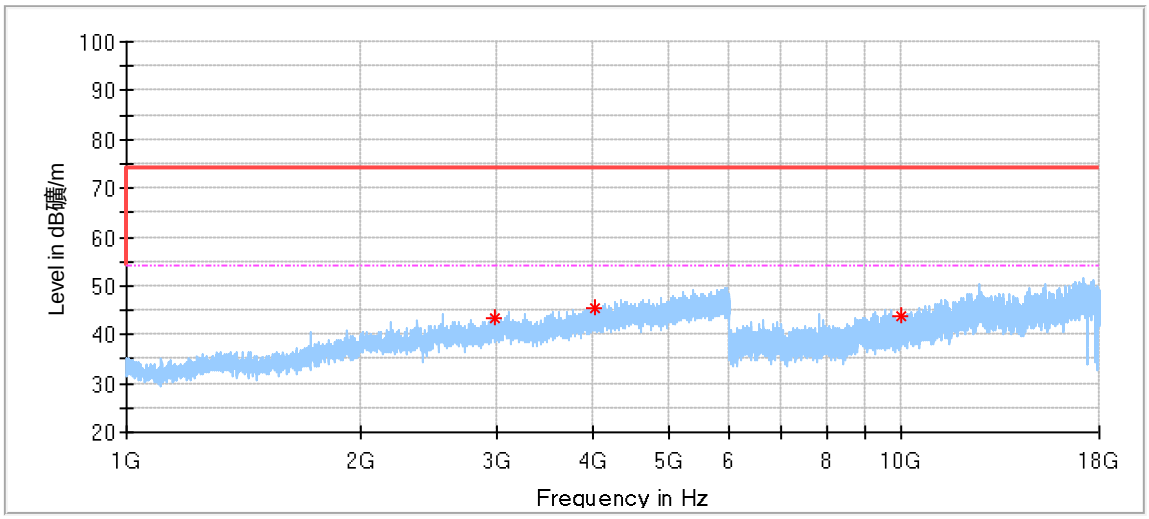
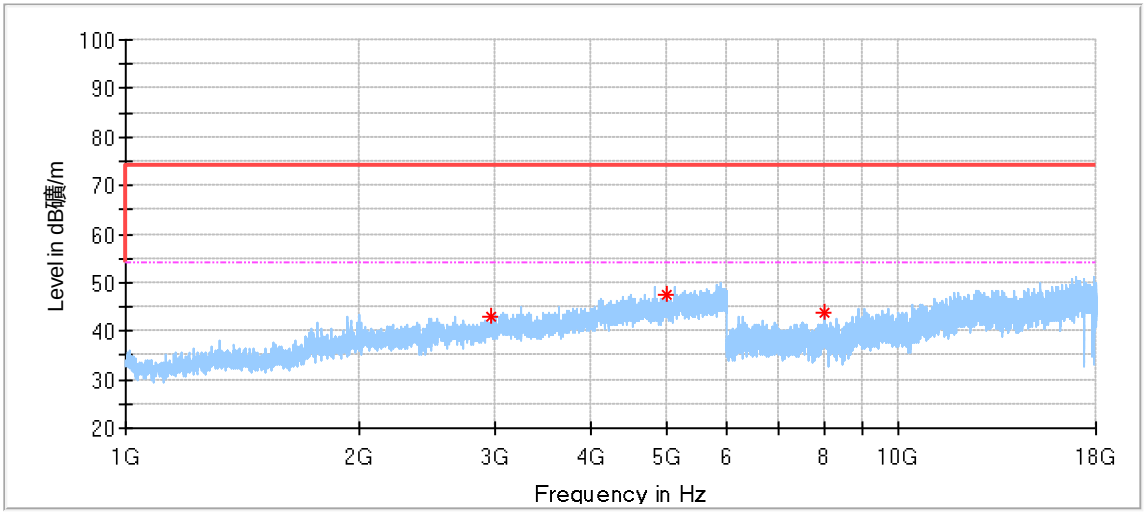
## Middle channel 2440MHz




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|
| 2985.500000 | 43.51 | 74.00 | 30.49 | 150.0 | H | 105.0 | -0.91 | --- |
| 4014.000000 | 45.60 | 74.00 | 28.40 | 150.0 | H | 328.0 | 1.44 | --- |
| 9970.500000 | 43.74 | 74.00 | 30.26 | 150.0 | H | 354.0 | 13.14 | --- |




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|
| 2970.500000 | 43.10 | 74.00 | 30.90 | 150.0 | V | 114.0 | -0.98 | --- |
| 5012.000000 | 47.30 | 74.00 | 26.70 | 150.0 | V | 239.0 | 4.57 | --- |
| 8017.000000 | 43.61 | 74.00 | 30.39 | 150.0 | V | 147.0 | 11.07 | --- |



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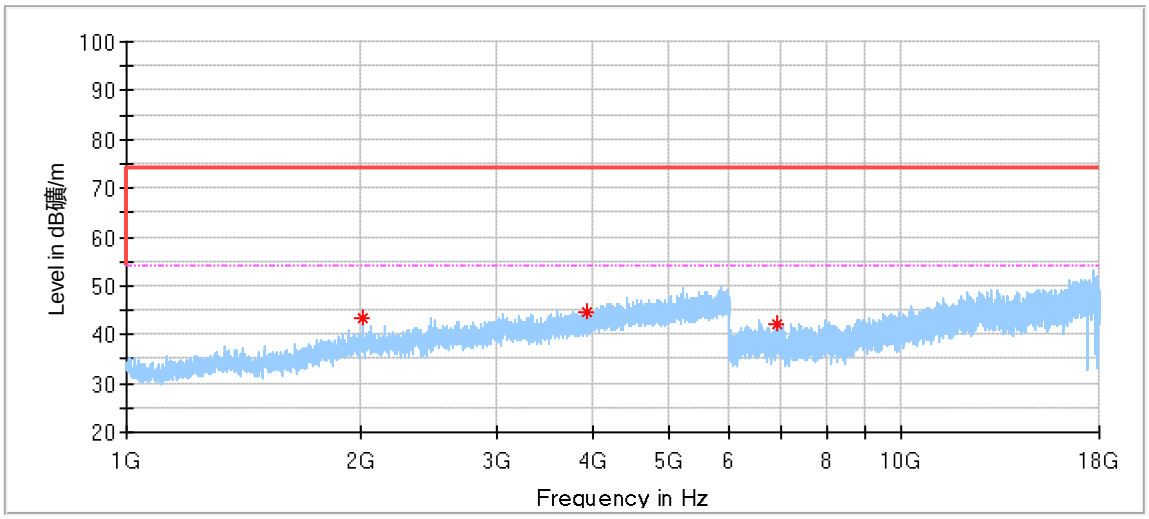
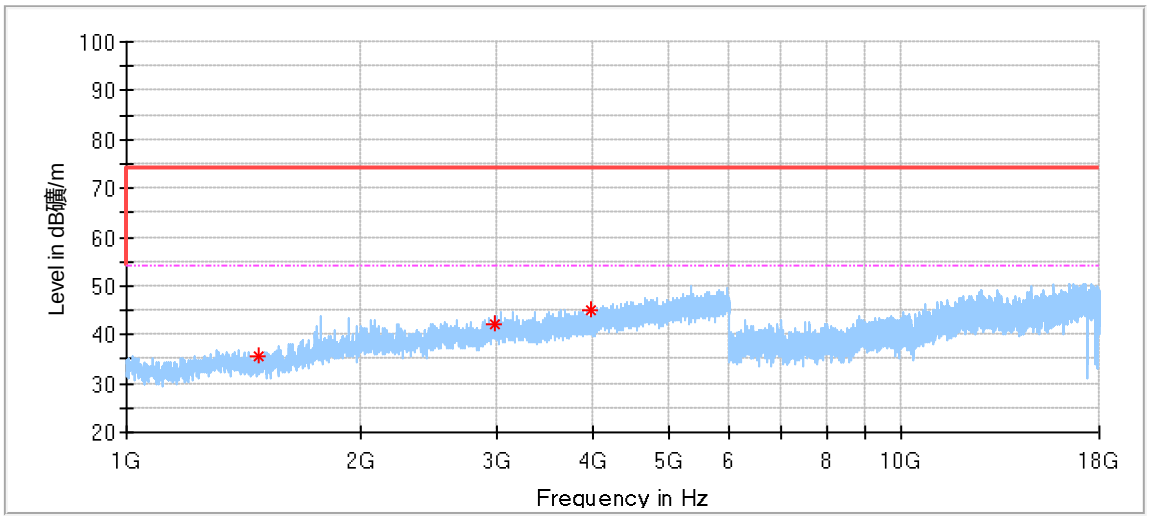
## High channel 2480MHz




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|---|---|---|---|---|---|---|---|
| 2016.000000 | 43.50 | 74.00 | 30.50 | 150.0 | H | 141.0 | -4.13 |
| 3922.000000 | 44.67 | 74.00 | 29.33 | 150.0 | H | 310.0 | 1.06 |
| 6921.500000 | 42.24 | 74.00 | 31.76 | 150.0 | H | 119.0 | 9.76 |




| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|
| 1481.500000 | 35.66 | 74.00 | 38.34 | 150.0 | V | 147.0 | -8.97 | --- |
| 2982.000000 | 42.34 | 74.00 | 31.66 | 150.0 | V | 319.0 | -0.93 | --- |
| 3968.000000 | 45.17 | 74.00 | 28.83 | 150.0 | V | 245.0 | 1.25 | --- |

Remark:

(1) Data of measurement within frequency ranges 9kHz-30MHz and 18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report,

(2) Level= Reading Level + Correction Factor

(3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)



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# 10 Test Equipment List

Conducted Emission Test

| Description | Manufacturer | Model no. | Equipment ID | Serial no. | Cal interval (year) | Cal. due date |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 68-4-74-19-002 | 102590 | 1 | 2024-5-19 |
| LISN | Rohde & Schwarz | ENV216 | 68-4-87-19-001 | 102472 | 1 | 2024-5-20 |
| Attenuator | Shanghai Huaxiang | TS2-26-3 | 68-4-81-16-003 | 080928189 | 1 | 2024-5-19 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-19-005-A01 | Version 10.35.02 | N/A | N/A |
| Shielding Room | TDK | CSR #2 | 68-4-90-19-005 | ---- | 3 | 2025-10-15 |

Radiated Emission Test, SAC-3 #2

| Description | Manufacturer | Model no. | Equipment ID | Serial no. | Cal interval (year) | Cal. due date |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR 26 | 68-4-74-14-002 | 101269 | 1 | 2024-5-20 |
| Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9162 | 68-4-80-19-003 | 284 | 1 | 2024-3-5 |
| Horn Antenna | Rohde & Schwarz | HF907 | 68-4-80-14-005 | 102294 | 1 | 2024-5-28 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 68-4-80-14-006 | 100398 | 1 | 2023-8-17 |
| Pre-amplifier | Rohde & Schwarz | SCU 18F | 68-4-29-19-001 | 100745 | 1 | 2024-5-19 |
| Pre-amplifier | Rohde & Schwarz | SCU 18F | 68-4-29-19-002 | 100746 | 1 | 2024-5-19 |
| Sideband Horn Antenna | Q-PAR | QWH-SL-18-40-K-SG | 68-4-80-14-008 | 12827 | 1 | 2023-7-12 |
| Pre-amplifier | Rohde & Schwarz | SCU 40A | 68-4-29-14-002 | 100432 | 1 | 2023-7-27 |
| Attenuator | Mini-circuits | UNAT-6+ | 68-4-81-21-002 | 15542 | 1 | 2024-5-19 |
| 3m Semi-anechoic chamber | TDK | SAC-3 #2 | 68-4-90-19-006 | ---- | 2 | 2024-5-28 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-19-006-A01 | Version 10.35.02 | N/A | N/A |

RF Conducted Test

| Description | Manufacturer | Model no. | Equipment ID | Serial no. | Cal interval (year) | Cal. due date |
|---|---|---|---|---|---|---|
| Signal Analyzer | Rohde & Schwarz | FSV40 | 68-4-74-14-004 | 101030 | 1 | 2024-5-19 |



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## 11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| System Measurement Uncertainty | |
|---|---|
| Test Items | Extended Uncertainty |
| Uncertainty for Conducted Emission in new shielding room (68-4-90-19-005) 150kHz-30MHz (for test using AMN ENV216) | 3.33dB |
| Uncertainty for Radiated Emission in 3m chamber (68-4-90-14-001) 9kHz-30MHz | 4.70dB |
| Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 30MHz-1000MHz | Horizontal: 4.59dB;<br>Vertical: 4.75dB; |
| Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz | Horizontal: 5.08dB;<br>Vertical: 5.09dB; |
| Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) above 18000MHz | Horizontal: 3.14dB;<br>Vertical: 3.12dB |
| Uncertainty for Conducted RF test with TS 8997 | RF Power Conducted: 1.31dB<br>Frequency test involved:<br>$0.6\times10^{-8}$ or 1% |

Measurement Uncertainty Decision Rule:
Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.

---THE END OF REPORT---


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