# FCC/IC - TEST REPORT

| | | | | |
|---|---|---|---|---|
| Report Number | : | **68.940.18.0036.01** | Date of Issue: | October 31, 2018 |
| Model | : | **SLP-M412BX8GWW** | | |
| Product Type | : | Smart Lighting Module | | |
| Applicant | : | TCL Technoly Electronics (Huizhou) Co., Ltd. | | |
| Address | : | Section 37, Zhongkai High-tech Development Zone, 516006 Huizhou City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA | | |
| Manufacturer | : | Samsung Electronics Co., Ltd. | | |
| Address | : | #129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, REPUBLIC OF KOREA | | |
| Production Facility | : | TCL Technoly Electronics (Huizhou) Co., Ltd. | | |
| Address | : | Section 37, Zhongkai High-tech Development Zone, 516006 Huizhou City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA | | |
| Test Result | : | ■ **Positive** ☐ **Negative** | | |
| Total pages including Appendices | : | 32 | | |

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# 1 Table of Contents





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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>Nantou Checkpoint Road 2, Nanshan District,<br>Shenzhen City, 518052,<br>P. R. China |
| FCC Registration Number: | 514049 |
| IC Registration Number: | 10320A-1 |
| Telephone: | 86 755 8828 6998 |
| Fax: | 86 755 8828 5299 |

# 3 Description of the Equipment under Test

| | |
|---|---|
| Product/PMN: | Smart Lighting Module |
| Model no./HVIN: | SLP-M412BX8GWW |
| IC: | 9976A-IOTSBD4 |
| FCC ID: | ZVA-IOT-S-BD4 |
| Rated Input: | 100-277VAC, 50/60Hz, 100mA |
| RF Transmission Frequency: | 2402MHz-2480MHz |
| No. of Operated Channel: | 40 |
| Modulation: | GFSK |
| Antenna Type: | Integrated Antenna |
| Antenna Gain: | 2dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a Smart Lighting Module supports 2.4GHz Bluetooth functions. |


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# 4 Summary of Test Standards

| Test Standards | |
|---|---|
| FCC Part 15 Subpart C 10-1-2017 Edition | PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators |
| RSS-Gen Issue 5 April 2018 | RSS-Gen — General Requirements for Compliance of Radio Apparatus |
| RSS-247 Issue 2 February 2017 | Digital Transmission Systems (DTS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices |

All the test methods were according to KDB558074 D01 DTS Meas Guidance v04 and ANSI C63.10 (2013).


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# 5 Summary of Test Results

| Technical Requirements | | | | | |
|---|---|---|---|---|---|
| **FCC Part 15 Subpart C/RSS-247 Issue 2/RSS-Gen Issue 5** | | | | | |
| Test Condition | | | Pages | Test Result | Test Site |
| §15.207 | RSS-GEN 8.8 | Conducted emission AC power port | 10 | Pass | Site 1 |
| §15.247(b)(1) | RSS-247 Clause 5.4(b) | Conducted AV output power for FHSS | -- | N/A | -- |
| §15.247(b)(3) | RSS-247 Clause 5.4(d) | Conducted AV output power for DTS | 13 | Pass | Site 1 |
| §15.247(e) | RSS-247 Clause 5.2(b) | Power spectral density | 19 | Pass | Site 1 |
| §15.247(a)(2) | RSS-247 Clause 5.2(a) | 6dB bandwidth | 15 | Pass | Site 1 |
| §15.247(a)(1) | RSS-247 Clause 5.1(a) | 20dB Occupied bandwidth | -- | N/A | -- |
| -- | RSS-GEN 6.7 | 99% Occupied Bandwidth | 17 | Pass | Site 1 |
| §15.247(a)(1) | RSS-247 Clause 5.1(b) | Carrier frequency separation | -- | N/A | -- |
| §15.247(a)(1)(iii) | RSS-247 Clause 5.1(d) | Number of hopping frequencies | -- | N/A | -- |
| §15.247(a)(1)(iii) | RSS-247 Clause 5.1(d) | Dwell Time | -- | N/A | -- |
| §15.247(d) | RSS-247 Clause 5.5 | Spurious RF conducted emissions | 21 | Pass | Site 1 |
| §15.247(d) | RSS-247 Clause 5.5 | Band edge | 25 | Pass | Site 1 |
| §15.247(d) & §15.209 & §15.205 | RSS-247 Clause 5.5 & RSS-GEN 6.13 RSS-GEN 8.9 RSS-GEN 8.10 | Spurious radiated emissions for transmitter | 27 | Pass | Site 1 |
| §15.203 | RSS-GEN 6.8 | Antenna requirement | See note 1 | Pass | -- |

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses an Integrated Metal Antenna 0.5dBi max. According to §15.203, it is considered sufficiently to comply with the provisions of this section.


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# 6 General Remarks

**Remarks**
This submittal(s) (test report) is intended for FCC ID:ZVA-IOT-S-BD4 and IC:9976A-IOTSBD4 complies with Section 15.207, 15.205, 15.209, 15.247 of the FCC Part 15, Subpart C Rules; RSS-Gen Issue 5 and RSS-247 issue 2.

**SUMMARY:**

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

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

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

Sample Received Date: October 09, 2018

Testing Start Date: October 09, 2018

Testing End Date: October 26, 2018

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

| Reviewed by: | Prepared by: | Tested by: |
|---|---|---|
| Laurent Yuan | Henry Chen | Louise Liu |
| EMC Project Manager | EMC Project Engineer | EMC Test Engineer |


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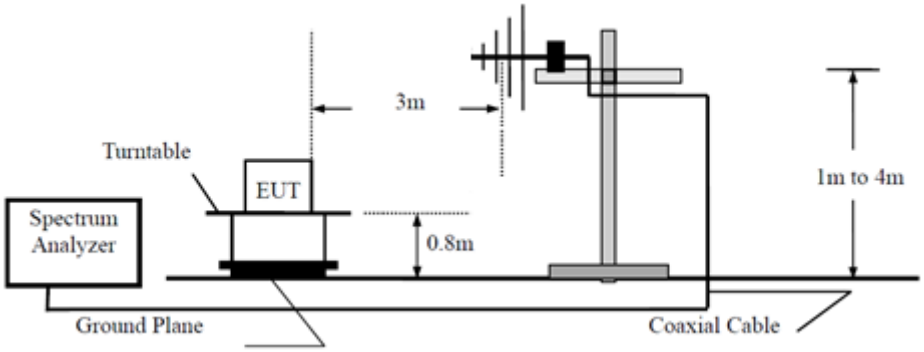
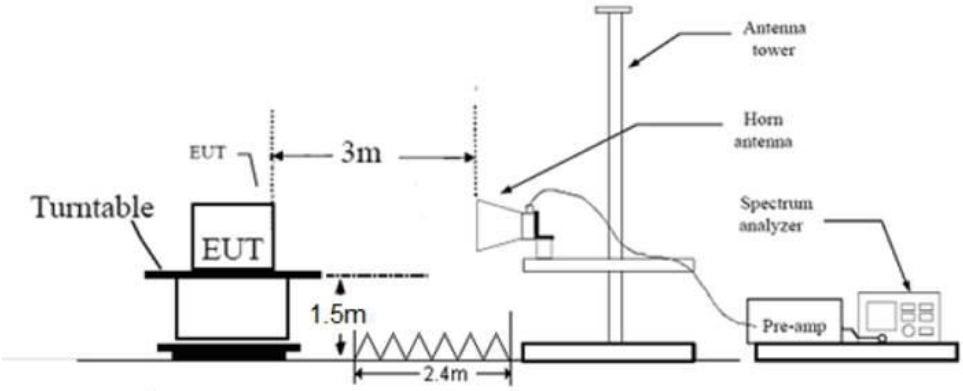
# 7 Test Setups

## 7.1 Radiated test setups

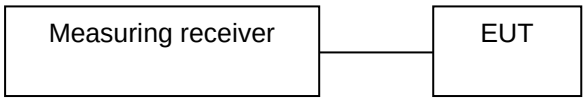
Below 1GHz



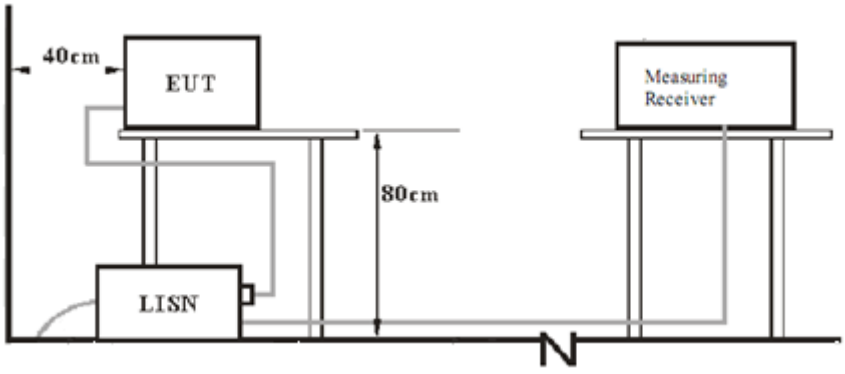

Above 1GHz




## 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 |
|---|---|---|---|
| --- | --- | --- | --- |
| --- | --- | --- | --- |
| --- | --- | --- | --- |

Test software information:

| Test Software Version | Bluetooth Signaling 1 V3.7.30 from CMW 270 | |
|---|---|---|
| Modulation | Setting TX Power | Packet Type |
| GFSK | / | / |

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


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# 9 Technical Requirement

## 9.1 Conducted Emission

**Test Method**

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

**Limit**

| 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 line


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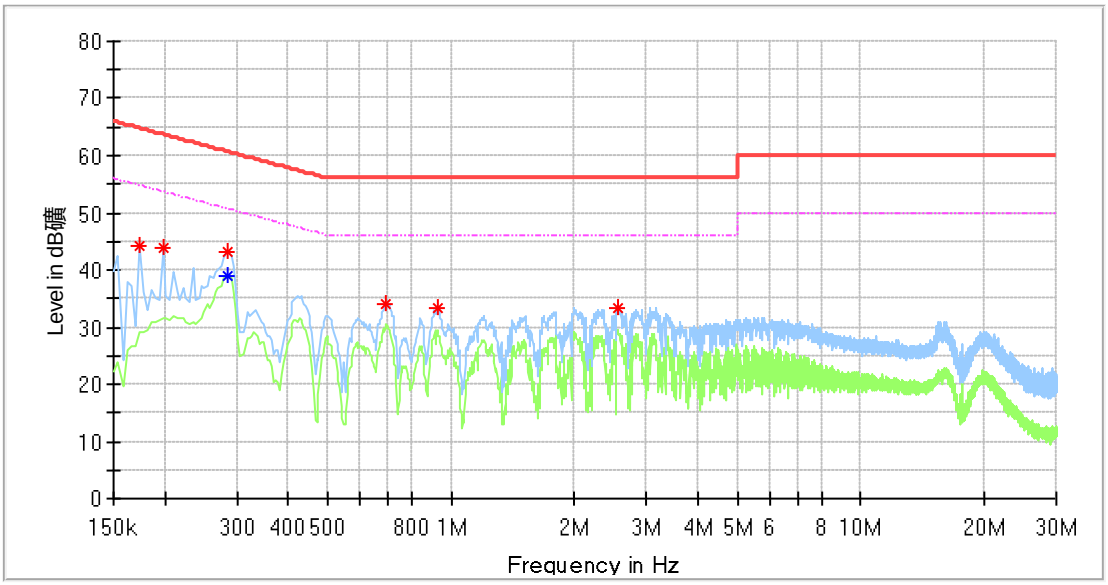
## Conducted Emission

| | | |
|---|---|---|
| Product Type | : | Smart Lighting Module |
| M/N | : | SLP-M412BX8GWW |
| Operating Condition | : | Normal working with transmitting |
| Test Specification | : | Power Line, Live |
| Comment | : | AC 120V/60Hz |




## Critical_Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|
| 0.174000 | 44.26 | --- | 64.77 | 20.50 | L1 | 10.2 |
| 0.198000 | 43.80 | --- | 63.69 | 19.89 | L1 | 10.2 |
| 0.286000 | --- | 39.02 | 50.64 | 11.62 | L1 | 10.2 |
| 0.286000 | 43.17 | --- | 60.64 | 17.47 | L1 | 10.2 |
| 0.694000 | 34.08 | --- | 56.00 | 21.92 | L1 | 10.3 |
| 0.930000 | 33.16 | --- | 56.00 | 22.84 | L1 | 10.3 |
| 2.558000 | 33.50 | --- | 56.00 | 22.50 | L1 | 10.3 |

## Final_Result

| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|
| --- | --- | --- | --- | --- | | --- |

Remark: “*” Correct factor=cable loss + LISN factor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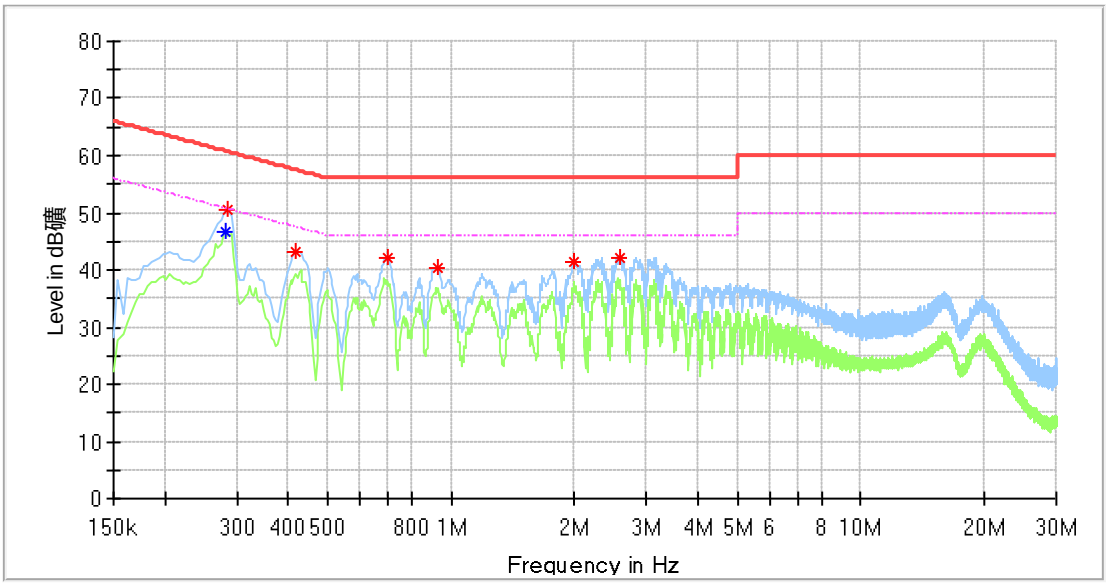
## Conducted Emission

| | | |
|---|---|---|
| Product Type | : | Smart Lighting Module |
| M/N | : | SLP-M412BX8GWW |
| Operating Condition | : | Normal working with transmitting |
| Test Specification | : | Power Line, Neutral |
| Comment | : | AC 120V/60Hz |




## Critical_Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|
| 0.282000 | --- | 46.84 | 50.76 | 3.92 | N | 10.2 |
| 0.286000 | 50.56 | --- | 60.64 | 10.08 | N | 10.2 |
| 0.418000 | 43.29 | --- | 57.49 | 14.20 | N | 10.3 |
| 0.702000 | 42.01 | --- | 56.00 | 13.99 | N | 10.3 |
| 0.930000 | 40.24 | --- | 56.00 | 15.76 | N | 10.3 |
| 1.998000 | 41.34 | --- | 56.00 | 14.66 | N | 10.3 |
| 2.578000 | 42.00 | --- | 56.00 | 14.00 | N | 10.3 |

## Final_Result

| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line | Corr. (dB) |
|---|---|---|---|---|---|---|
| --- | --- | --- | --- | --- | | --- |

Remark： “*” Correct factor=cable loss + LISN factor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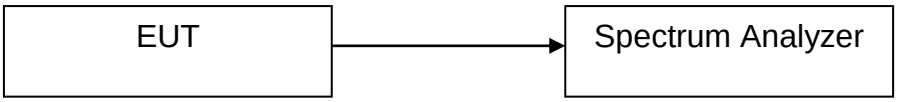
## 9.2 Conducted AV output power

### Test Method

1. Setting the highest output power level of the EUT:
2. Connect to gated spectrum analyzer.

### Test Setup




### Limits

According to §15.247 (b) (3), conducted AV output power limit as below:

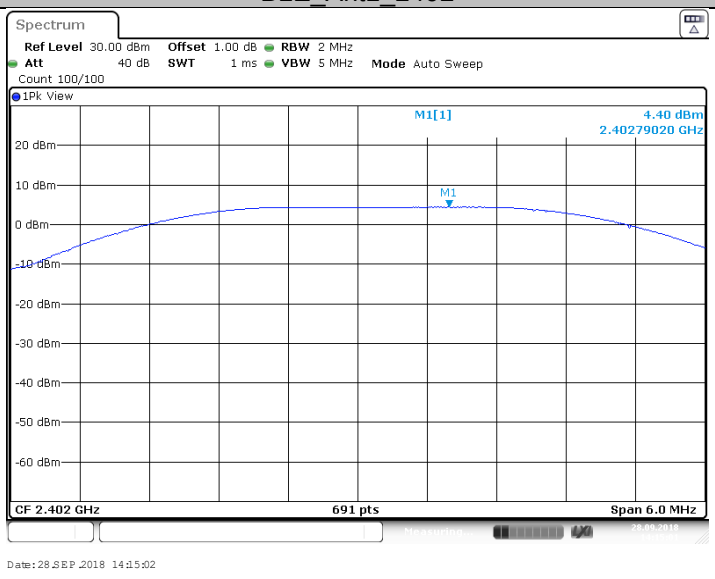
| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|---|---|---|
| 2400-2483.5 | ≤1 | ≤30 |

Test result as below table

| Frequency<br>MHz | Conducted AV Output Power<br>dBm | Result |
|---|---|---|
| Top channel 2402MHz | 4.40 | Pass |
| Middle channel 2440MHz | 4.95 | Pass |
| Bottom channel 2480MHz | 5.00 | Pass |

### Test Graphs

BLE_Ant1_2402



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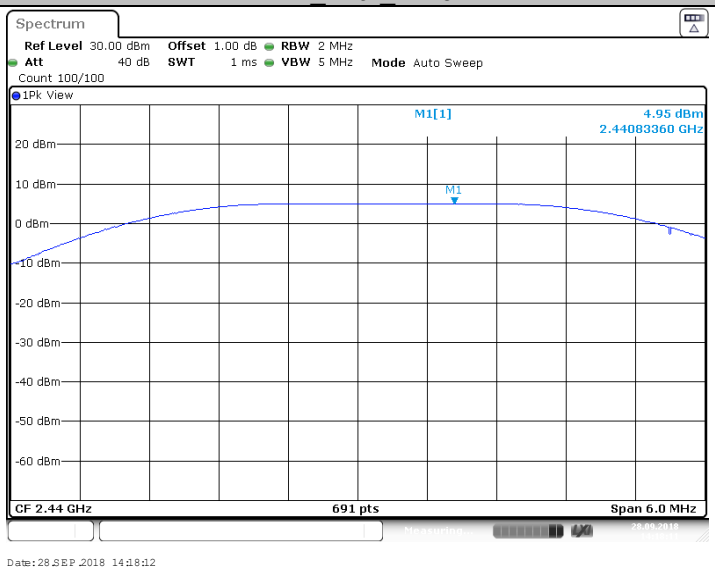
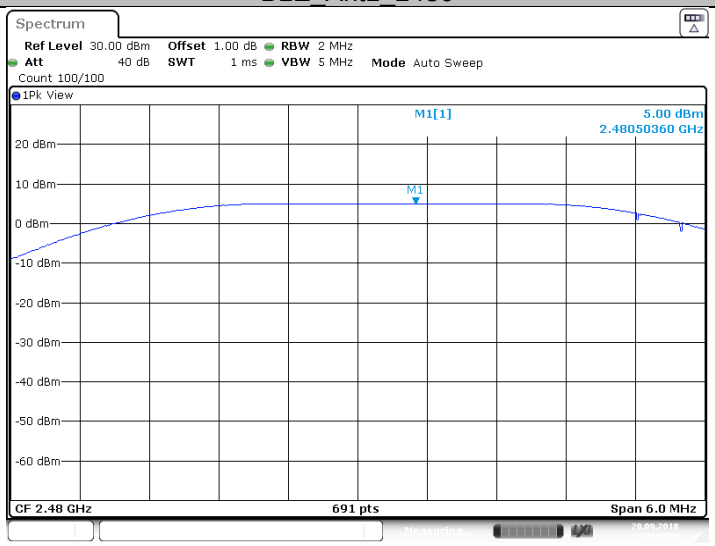
| BLE_Ant1_2440 |
|---|
|  |
| BLE_Ant1_2480 |
|  |



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## 9.3 6dB bandwidth

**Test Method**

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, 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.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

**Limit**

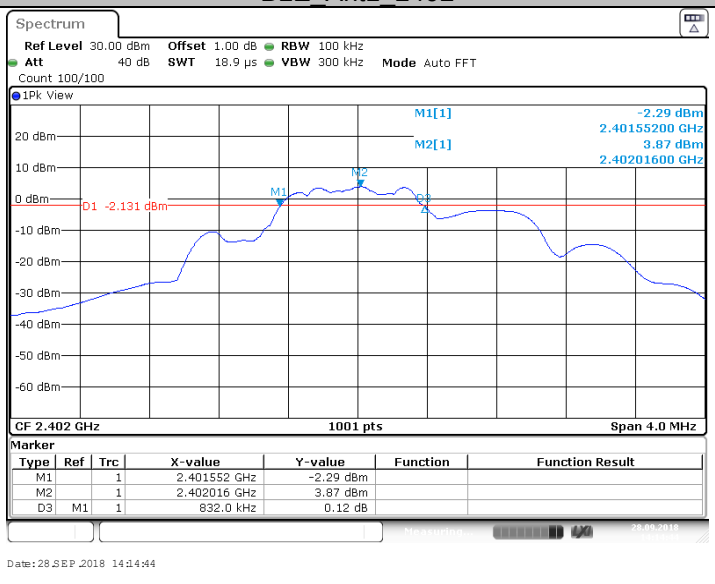
| Limit [kHz] |
|---|
| ≥500 |

**Test result**

| Test Mode | Channel (MHz) | Result (MHz) | Limit (KHz) | Verdict |
|---|---|---|---|---|
| BLE | 2402 | 0.832 | ≥500 | PASS |
| BLE | 2440 | 0.916 | ≥500 | PASS |
| BLE | 2480 | 1.024 | ≥500 | PASS |

**Test Graphs**

BLE_Ant1_2402



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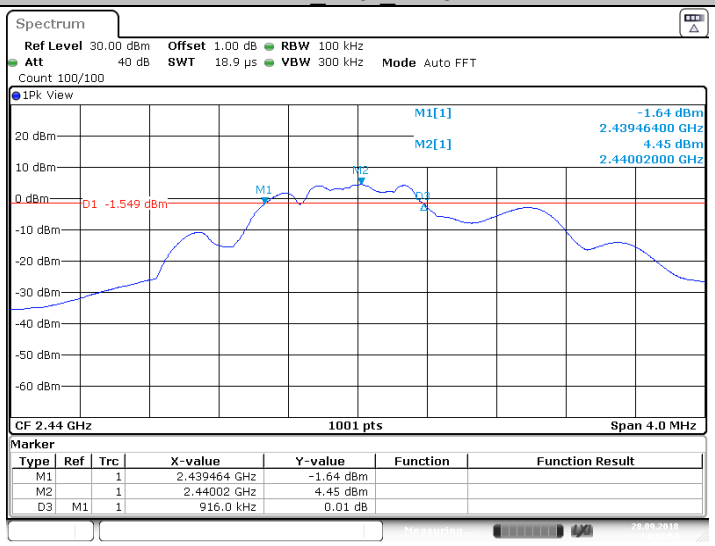
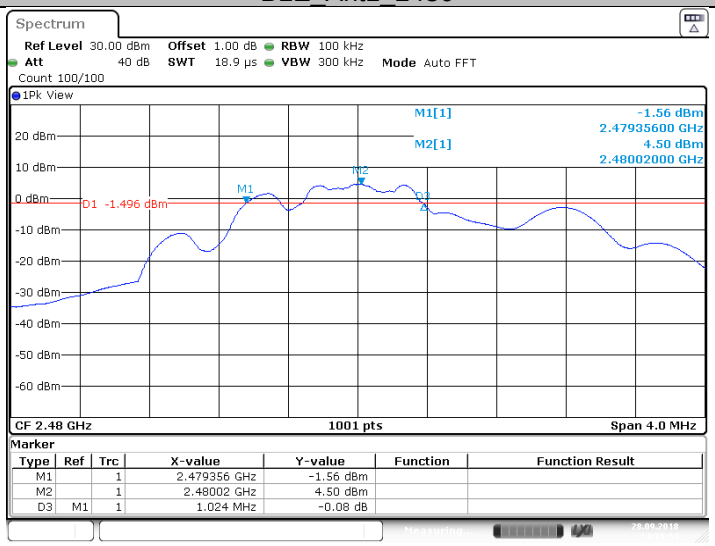
## BLE_Ant1_2440




## BLE_Ant1_2480



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## 9.4 99% bandwidth

**Test Method**

4. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
5. Use the automatic bandwidth measurement capability of an instrument, may be employed using the OBW bandwidth mode.
6. Allow the trace to stabilize, record the OBW Bandwidth value.

**Limit**

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

**Test result**

| Test Mode | Channel (MHz | Result (MHz) | Limit | Verdict |
|---|---|---|---|---|
| BLE | 2402 | 1.83 | --- | PASS |
| BLE | 2440 | 1.998 | --- | PASS |
| BLE | 2480 | 2.222 | --- | PASS |

**Test Graphs**

BLE_Ant1_2402




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BLE_Ant1_2440


BLE_Ant1_2480




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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. Set analyzer center frequency to DTS channel center frequency. RBW=100kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto,
   Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

**Limit**

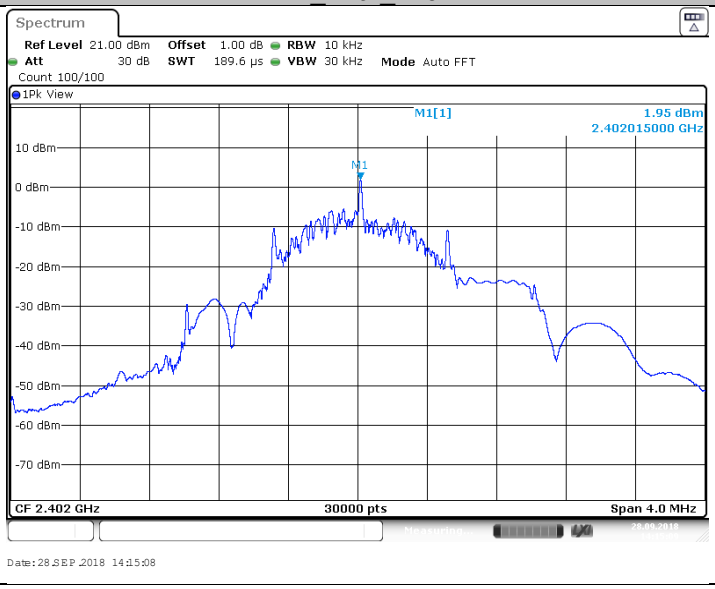
| Limit [dBm] |
|---|
| ≤8 |

**Test result**

| Test Mode | Channel (MHz) | Result (dBm) | Limit | Verdict |
|---|---|---|---|---|
| BLE | 2402 | 1.95 | 8 | PASS |
| BLE | 2440 | 2.55 | 8 | PASS |
| BLE | 2480 | 2.21 | 8 | PASS |

**Test Graphs**

BLE_Ant1_2402



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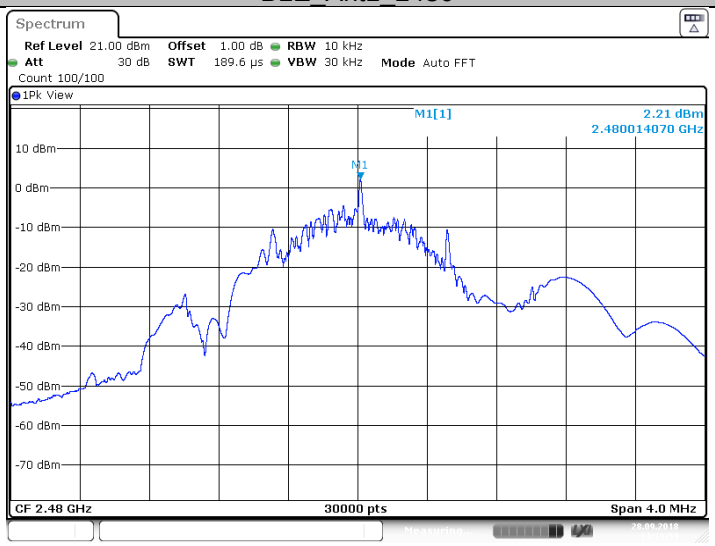
BLE_Ant1_2440


BLE_Ant1_2480



## 9.6 Spurious RF conducted emissions

**Test Method**

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

**Limit**

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

**Test Result**

| Test Mode | Channel (MHz) | Freq Range (MHz) | Result (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|
| BLE | 2402 | 30~1000 | -69.45 | -16.12 | PASS |
| BLE | 2402 | 1000~26500 | -39.77 | -16.12 | PASS |
| BLE | 2440 | 30~1000 | -68.33 | -15.5 | PASS |
| BLE | 2440 | 1000~26500 | -39.18 | -15.5 | PASS |
| BLE | 2480 | 30~1000 | -68.48 | -15.59 | PASS |
| BLE | 2480 | 1000~26500 | -37.72 | -15.59 | PASS |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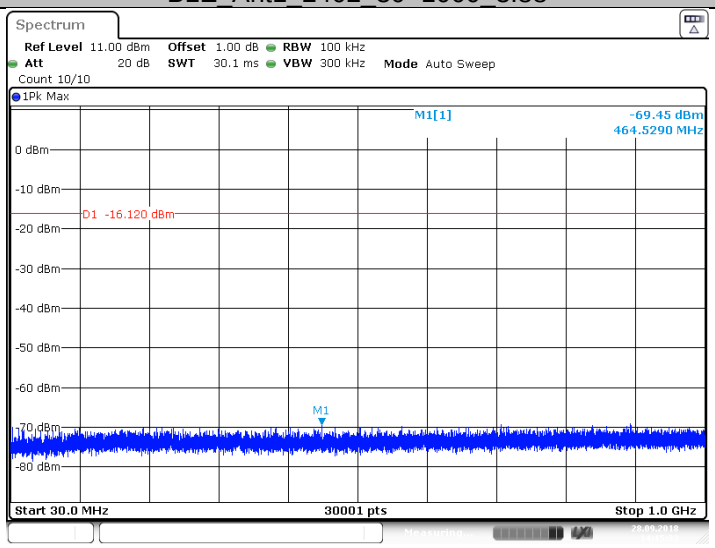
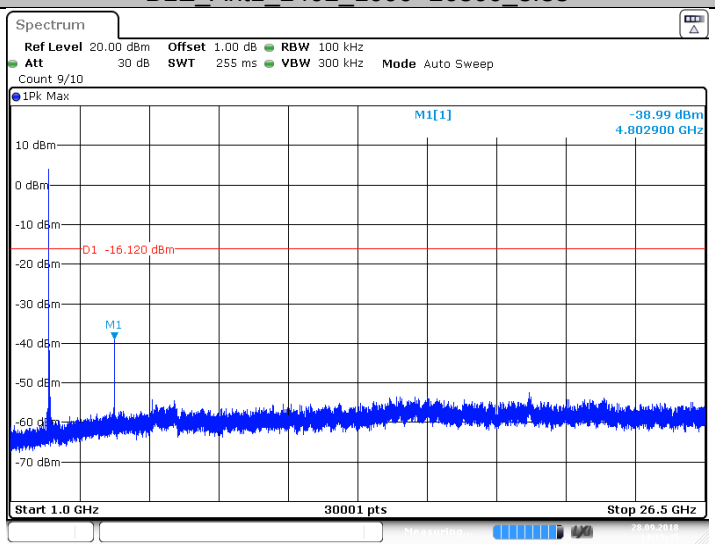
## Test Graphs

BLE_Ant1_2402_30~1000_3.88




BLE_Ant1_2402_1000~26500_3.88



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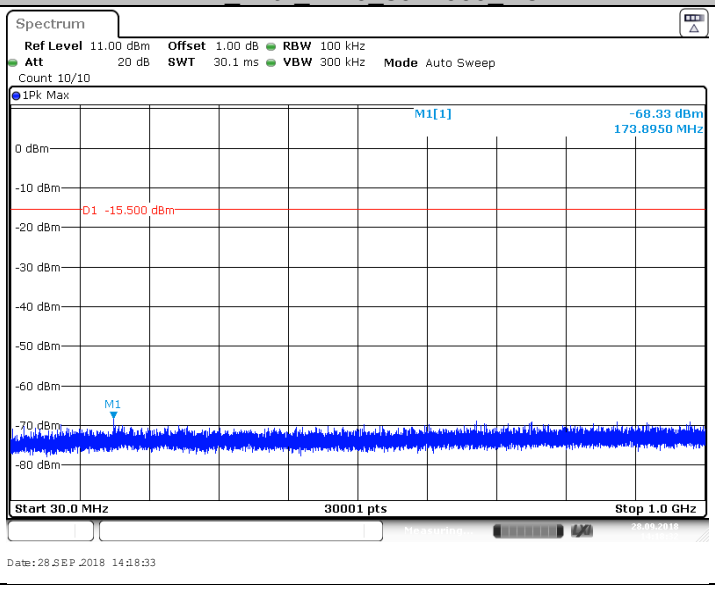
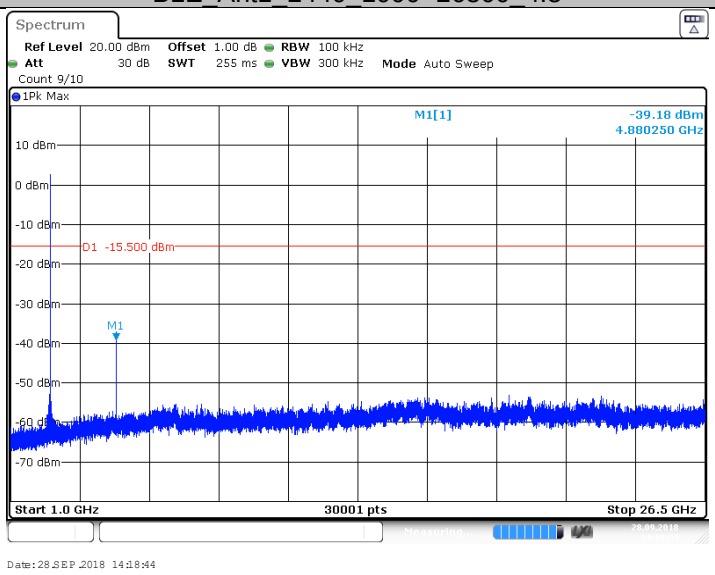
## BLE_Ant1_2440_30~1000_4.5




## BLE_Ant1_2440_1000~26500_4.5



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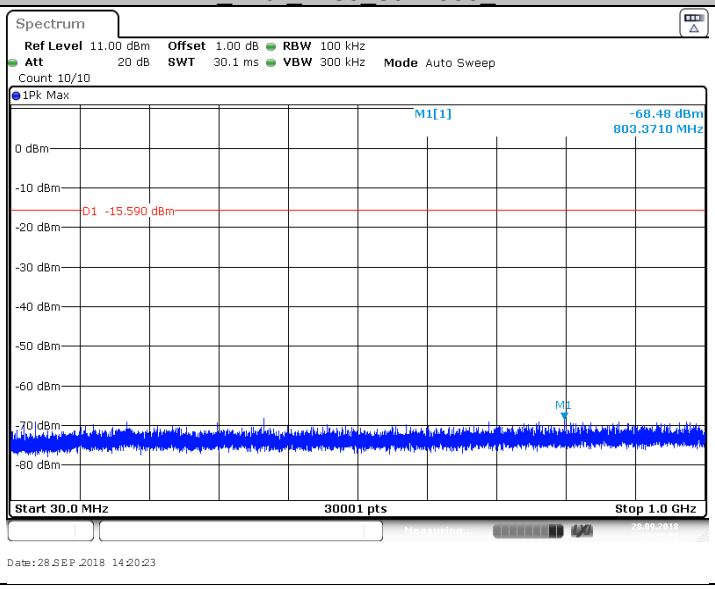
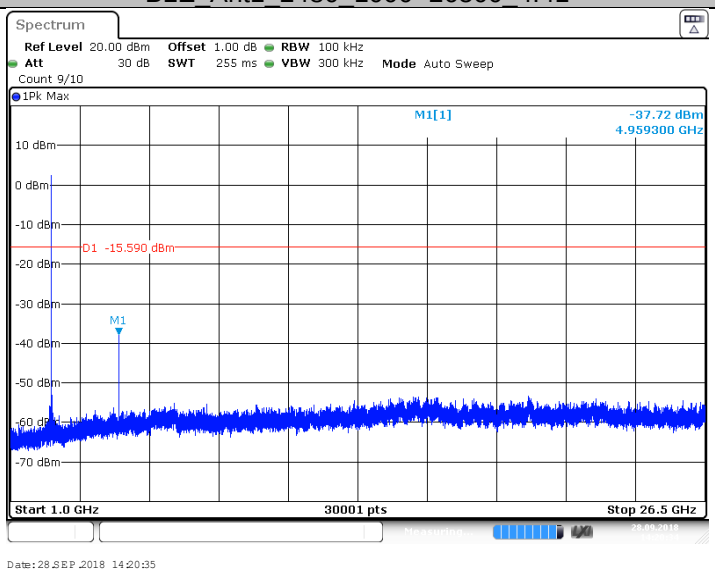
## BLE_Ant1_2480_30~1000_4.41




## BLE_Ant1_2480_1000~26500_4.41



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## 9.7 Band edge

**Test Method**

1 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≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

**Limit**

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

**Test result**

| Test Mode | Ch Name | Channel (MHz) | Result (dBm) | Limit | Verdict |
|---|---|---|---|---|---|
| BLE | Low | 2402 | -37.87 | -16.08 | PASS |
| BLE | High | 2480 | -43.11 | -15.61 | PASS |


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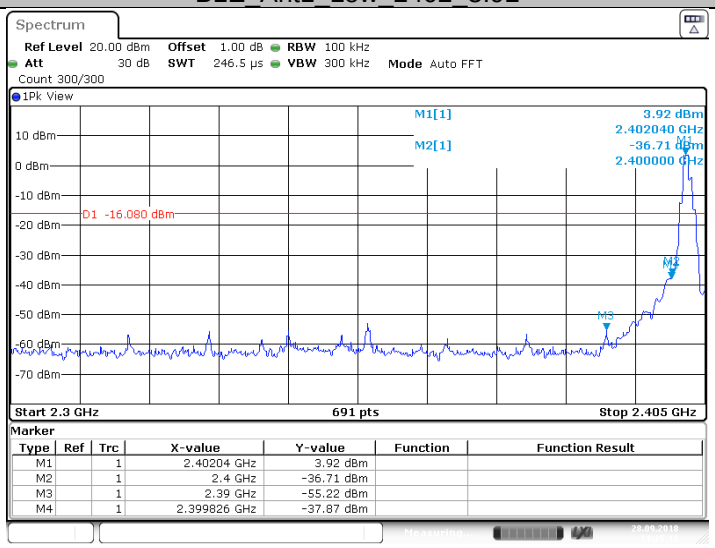
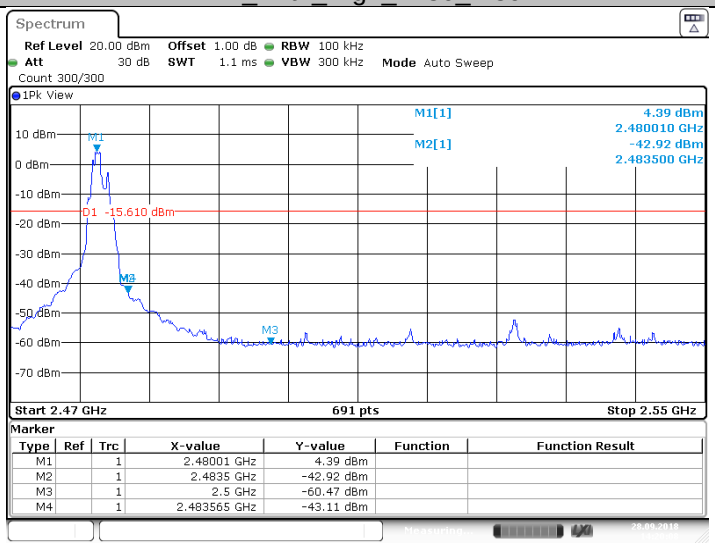
## Test Graphs

BLE_Ant1_Low_2402_3.92




BLE_Ant1_High_2480_4.39



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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 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 and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

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, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

**Note:**

1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).

4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.


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## Limit

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

| 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:**

2402MHz (30MHz – 1GHz)

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Corr. | Result |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | dB | | dB | |
| 119.994444* | 36.38 | Horizontal | 43.50 | 7.12 | QP | -29.5 | Pass |
| 119.994444* | 33.31 | Vertical | 43.50 | 10.19 | QP | -29.5 | Pass |

2402MHz (Above 1GHz)

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Corr. | Result |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | dB | | dB/m | |
| 1888.312500 | 36.64 | Horizontal | 74.00 | 37.36 | PK | -9.4 | Pass |
| 2248.125000* | 33.86 | Vertical | 74.00 | 40.14 | PK | -6.7 | Pass |

2440MHz (30MHz – 1GHz)

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Corr. | Result |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | dB | | dB | |
| -- | -- | Horizontal | -- | -- | QP | -- | Pass |
| -- | -- | Vertical | -- | -- | QP | -- | Pass |

2440MHz (Above 1GHz)

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Corr. | Result |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | dB | | dB/m | |
| 1889.000000 | 33.26 | Horizontal | 74.00 | 40.74 | PK | -9.4 | Pass |
| 2248.000000* | 31.36 | Vertical | 74.00 | 42.64 | PK | -6.7 | Pass |

2480MHz (30MHz – 1GHz)

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Corr. | Result |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | dB | | dB | |
| -- | -- | Horizontal | -- | -- | QP | -- | Pass |
| -- | -- | Vertical | -- | -- | QP | -- | Pass |

2480MHz (Above 1GHz)

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Corr. | Result |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | dB | | dB/m | |
| 1886.750000 | 35.81 | Horizontal | 74.00 | 38.19 | PK | -9.4 | Pass |
| 2391.062500 | 33.90 | Vertical | 74.00 | 40.10 | PK | -5.7 | Pass |


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Remark:

(1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.
(3) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain.
(4) Below 1GHz: Corrector factor = Antenna Factor + Cable Loss.


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# 10 Test Equipment List

## Radiated Emission Test

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR 26 | 101269 | 2019-7-6 |
| Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 707 | 2019-6-28 |
| Horn Antenna | Rohde & Schwarz | HF907 | 102294 | 2019-6-28 |
| Pre-amplifier | Rohde & Schwarz | SCU 18 | 102230 | 2019-7-6 |
| Signal Generator | Rohde & Schwarz | SMY01 | 839369/005 | 2019-7-6 |
| Attenuator | Agilent | 8491A | MY39264334 | 2019-7-6 |
| 3m Semi-anechoic chamber | TDK | 9X6X6 | ---- | 2020-7-7 |
| Test software | Rohde & Schwarz | EMC32 | Version 9.15.00 | N/A |

## Conducted Emission Test

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101782 | 2019-7-6 |
| LISN | Rohde & Schwarz | ENV4200 | 100249 | 2019-7-6 |
| LISN | Rohde & Schwarz | ENV432 | 101318 | 2019-7-6 |
| LISN | Rohde & Schwarz | ENV216 | 100326 | 2019-7-6 |
| ISN | Rohde & Schwarz | ENY81 | 100177 | 2019-7-6 |
| ISN | Rohde & Schwarz | ENY81-CA6 | 101664 | 2019-7-6 |
| High Voltage Probe | Rohde & Schwarz | TK9420(VT9420) | 9420-584 | 2019-6-30 |
| RF Current Probe | Rohde & Schwarz | EZ-17 | 100816 | 2019-6-30 |
| Attenuator | Shanghai Huaxiang | TS2-26-3 | 080928189 | 2019-7-6 |
| Test software | Rohde & Schwarz | EMC32 | Version9.15.00 | N/A |

## TS8997 Test System

| DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|
| Signal Generator | Rohde & Schwarz | SMB100A | 108272 | 2019-7-6 |
| Vector Signal Generator | Rohde & Schwarz | SMBV100A | 262825 | 2019-7-6 |
| Communication Synthetical Test Instrument | Rohde & Schwarz | CMW 270 | 101251 | 2019-5-31 |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101030 | 2019-7-6 |
| Vector Signal Generator | Rohde & Schwarz | SMU 200A | 105324 | 2019-7-6 |
| RF Switch Module | Rohde & Schwarz | OSP120/OSP-B157 | 101226/100851 | 2019-7-6 |
| Power Splitter | Weinschel | 1580 | SC319 | 2019-7-5 |
| 10dB Attenuator | Weinschel | 56-10 | 58764 | 2019-7-6 |
| 10dB Attenuator | R&S | DNF | DNF-001 | 2019-7-6 |
| 10dB Attenuator | R&S | DNF | DNF-002 | 2019-7-6 |
| 10dB Attenuator | R&S | DNF | DNF-003 | 2019-7-6 |
| 10dB Attenuator | R&S | DNF | DNF-004 | 2019-7-6 |
| Test software | Rohde & Schwarz | EMC32 | Version 10.38.00 | N/A |
| Test software | Tonscend | System for BT/WIFI | Version 2.6 | N/A |


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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 | |
|---|---|
| **Items** | **Extended Uncertainty** |
| Uncertainty for Radiated Spurious Emission 25MHz-3000MHz | Horizontal: 4.80dB;<br>Vertical: 4.87dB; |
| Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz | Horizontal: 4.59dB;<br>Vertical: 4.58dB; |
| Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz | Horizontal: 5.05dB;<br>Vertical: 5.04dB; |
| Uncertainty for Conducted RF test with TS 8997 | Power level test involved: 1.16dB<br>Frequency test involved:<br>$0.6\times10^{-7}$ |
| Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200) | 3.21dB |


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