



FCC/IC - TEST REPORT

Report Number : **68.910.19.0058.01** Date of Issue: September 19, 2019

Model : **BLELED**

Product Type : Module for Lighting kit

Applicant : Winplus Co., Ltd.

Address : Suites 6-11, 7th Floor, Corporation Park, 11 On Lai Street, Shatin,
Hong Kong

Manufacture : Winplus Co., Ltd.

Address : Suites 6-11, 7th Floor, Corporation Park, 11 On Lai Street, Shatin,
Hong Kong

Test Result : **Positive** **Negative**

Total pages including Appendices : 27

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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
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration Number: 514049

FCC Designation Number: CN5009

ISED#: 10320A

CAB identifier: CN0077

Telephone: 86 755 8828 6998

Fax: 86 755 8828 5299

3 Description of the Equipment Under Test

Description of the Equipment Under Test

| | |
|----------------------------|--|
| Product/PMN: | Module for Lighting kit |
| Model no./HVIN: | BLELED |
| HMN: | Exterior Trim LED |
| FCC ID: | WUI-BLELED |
| IC: | 7297A-BLELED |
| Options and accessories: | NIL |
| Ratings: | 1.8-3.6VDC |
| RF Transmission Frequency: | 2402MHz-2480MHz |
| No. of Operated Channel: | 40 |
| Modulation: | GFSK |
| Antenna Type: | Integrated Antenna |
| Antenna Gain: | 1.5dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a Module for Lighting kit supports 2.4GHz Bluetooth functions. |

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | RATINGS | MODEL NO. |
|-------------------|--------------|--------------------|-----------|
| Exterior Trim LED | WINPLUS | Input: 12VDC, 0.1A | LM57485 |

4 Summary of Test Standards

| Test Standards | |
|--|---|
| FCC Part 15 Subpart C 10-1-2018 Edition | PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators |
| RSS-Gen Issue 5, Amendment 1, March 2019 | General Requirements and Information for the Certification of Radio Apparatus |
| RSS-210 Issue 9 August 2016 | RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment |

All the test methods were according to ANSI C63.10-2013.



5 Summary of Test Results

| Technical Requirements | | | | | |
|---|------------|-----------|-------------------------------------|--------------------------|-------------------------------------|
| FCC Part 15 Subpart C 15.249, RSS-Gen, RSS-210 | | | | | |
| Test Condition | Pages | Test Site | Test Result | | |
| | | | Pass | Fail | N/A |
| 15.207 & RSS-Gen A8.8 Conducted emission AC power port | See note 1 | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.205(a), §15.209(a), §15.249(a), §15.249(c) & RSS-210 B.10, RSS-GEN 6.13/8.9/8.10 Field strength of emissions and Restricted bands | 9 | Site 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.249(d), RSS-210 B.10 Out of band emissions | 14 | Site 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| FCC §15.215(c) 20dB bandwidth & RSS-Gen 6.7 99% Occupied Bandwidth | 19 | Site 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| §15.203, RSS-GEN 6.8 Antenna requirement | See note 2 | | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Remark 1: N/A- Not Applicable;

Note 1: The EUT is not intended to operate from the AC power lines;

Note 2: The EUT used an integral PCB antenna, which gain is 1.5dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

Note 3: The radio module do not has shielded cover, so it was tested with a host for this modular approve application, the host information as below :

Company name: Winplus Co., Ltd.

Product/PMN: Exterior Trim LED

Model no./HVIN: LM57485

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: WUI-BLELED and IC: 7297A-BLELED complies with Section 15.207, 15.205, 15.209, 15.249 of the FCC Part 15, Subpart C Rules; RSS-Gen Issue 5 and RSS-210 issue 9.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment Under Test

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

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

Sample Received Date: September 03, 2019

Testing Start Date: September 03, 2019

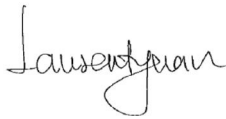
Testing End Date: September 04, 2019

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

Reviewed by:

Prepared by:

Tested by:



Laurent Yuan
EMC Project Manager



Henry Chen
EMC Project Engineer

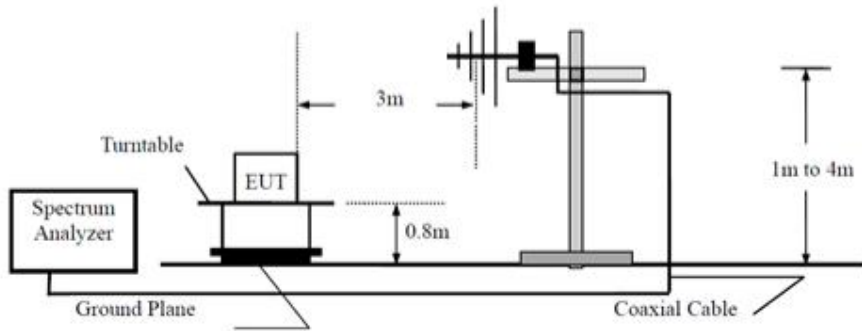


Louise Liu
EMC Test Engineer

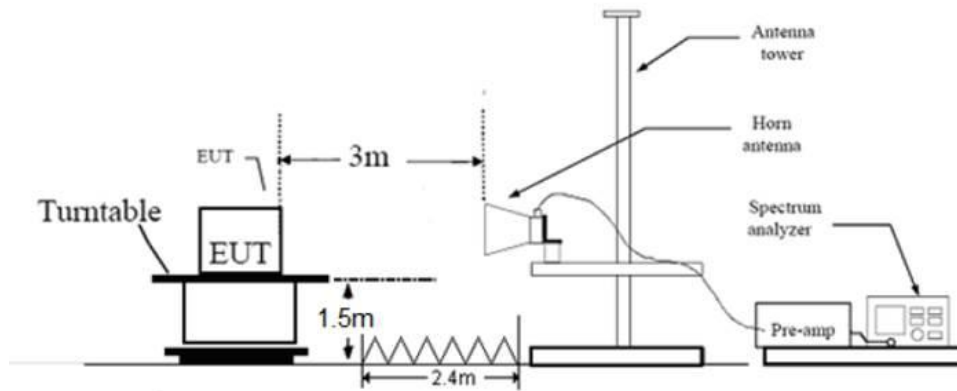
7 Test setups

7.1 Radiated test setups

Below 1GHz



Above 1GHz



8 Technical Requirement

8.1 Field strength of emissions and Restricted bands

Test Method

- 1: The EUT was placed 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 \geq 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 \geq 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: Modify the unit for continuous operation: use the settings shown above, then correct the reading by subtracting the peak to average duty cycle correction factor $20\log(\text{duty cycle})$, derived from the appropriate duty cycle calculation.

Field strength of emissions and Restricted bands

Limits

According to §15.249 (a) & RSS-210 A2.9(a) , the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental (millivolts/meter) | Field strength of harmonics (microvolts/meter) |
|-----------------------|--|--|
| 902–928 MHz | 50 | 500 |
| 2400–2483.5 MHz | 50 | 500 |
| 5725–5875 MHz | 50 | 500 |
| 24.0–24.25 GHz | 250 | 2500 |

According to §15.249 (c)& RSS-210 B.10, Field strength limits are specified at a distance of 3 meters.

According to §15.249 (d)& RSS-210 B.10, Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209& RSS-Gen, whichever is the lesser attenuation.

According to §15.205 and RSS-GEN 8.10 Unwanted emissions falling into restricted bands in §15.205 (a) and RSS-GEN 8.10 Table 7 shall comply with the limits specified in §15.209 and RSS-Gen.

| 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 |

Field strength of emissions and Restricted bands

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.

EUT: Module for Lighting kit
 M/N: BLELED
 Operating Condition: Tx; 2402MHz

For QP Value

| Radiated Emission | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------|----------------------|--------------------|--------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dBµV/m | Correction Factor dB | QP Emission dBµV/m | Limit dBµV/m | Margin dBm | Emission Type |
| QP | 701.664375 | H | 4.85 | 27.4 | 32.25 | 46.00 | 13.75 | Spurious |
| QP | 39.551250 | V | 15.88 | 16.1 | 31.98 | 40.00 | 8.02 | Spurious |

For Peak Value

| Radiated Emission | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------|----------------------|--------------------|--------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dBµV/m | Correction Factor dB | PK Emission dBµV/m | Limit dBµV/m | Margin dBm | Emission Type |
| PK | 2402.000000 | H | 79.20 | -5.9 | 73.30 | 114.00 | 40.70 | Fundamental |
| PK | 2402.000000 | V | 72.72 | -5.9 | 66.82 | 114.00 | 47.18 | Fundamental |
| PK | 2486.687500 | H | 54.31 | -5.2 | 49.11 | 74.00 | 24.89 | Spurious |
| PK | 2486.625000 | V | 46.01 | -5.2 | 40.81 | 74.00 | 33.19 | Spurious |
| PK | 4804.000000 | H | 45.59 | 2.7 | 48.29 | 74.00 | 25.71 | Harmonic |
| PK | 4804.000000 | V | 46.93 | 2.7 | 49.63 | 74.00 | 33.26 | Harmonic |

For AV Value

| Radiated Emission | | | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------|----------------------|--------------------|-------------------|--------------------|--------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dBµV/m | Correction Factor dB | PK Emission dBµV/m | Average Factor dB | AV Emission dBµV/m | Limit dBµV/m | Margin dBm | Emission Type |
| AV | 2402.000000 | H | 79.20 | -5.9 | 73.30 | -16.83 | 56.47 | 94.00 | 37.53 | Fundamental |
| AV | 2402.000000 | V | 72.72 | -5.9 | 66.82 | -16.83 | 49.99 | 94.00 | 44.01 | Fundamental |
| AV | / | H | / | / | / | / | / | 54.00 | / | Spurious |
| AV | / | V | / | / | / | / | / | 54.00 | / | Spurious |

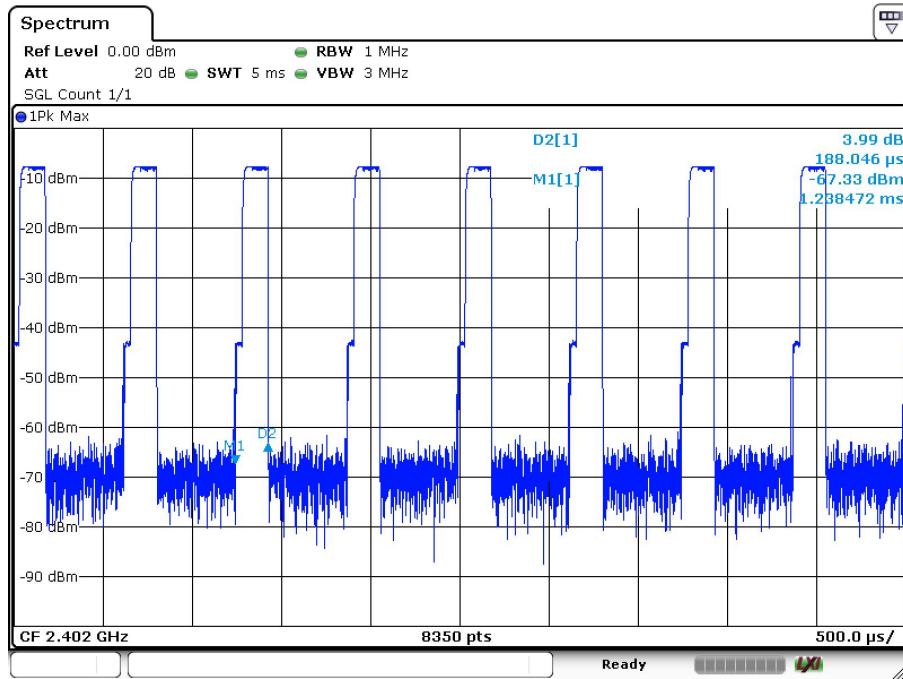
peak to average duty cycle correction factor =20log(duty cycle), duty cycle=14.4%

Remark:

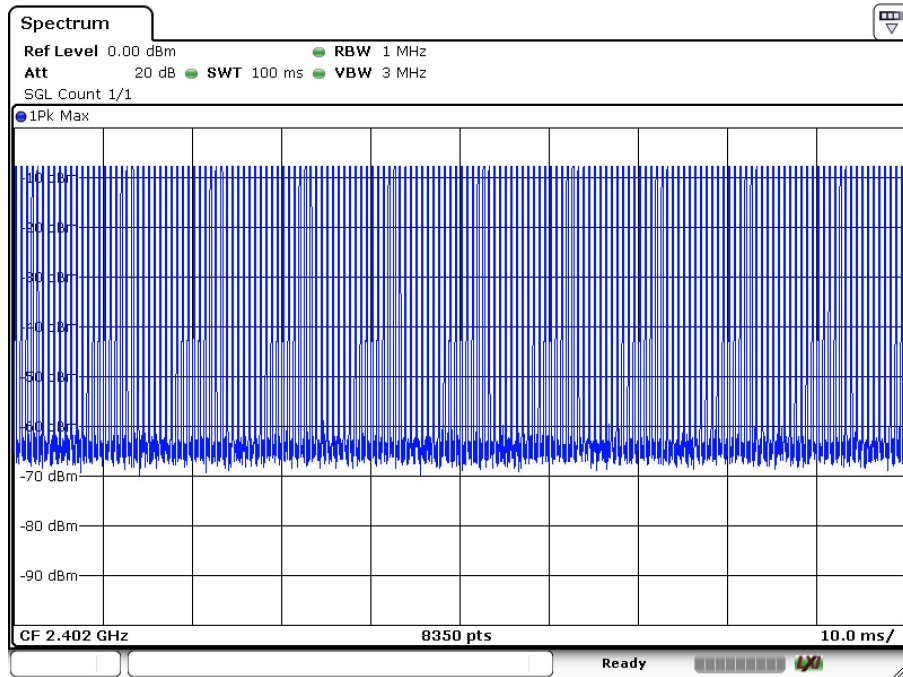
- 1: Data of measurement within this frequency range shown "/" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
 - 2: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
 - 3: AV Emission Level= PK Emission +20log(duty cycle)
 - 4: PK Emission = Reading Level + Correction Factor
- Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
 Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
 (The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Restricted bands

Duty Cycle $= (0.18 \times 80) / 100 = 14.4\%$
 Duty Cycle Factor $= 20 \log(\text{Duty Cycle}) = -16.83$



Date: 19.SEP.2019 19:00:39



Date: 19.SEP.2019 19:02:19

Field strength of emissions and Restricted bands

EUT: Module for Lighting kit
M/N: BLELED
Operating Condition: Tx; 2440MHz

For QP Value

| Radiated Emission | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------------|----------------------|--------------------------|--------------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dB μ V/m | Correction Factor dB | QP Emission dB μ V/m | Limit dB μ V/m | Margin dBm | Emission Type |
| QP | / | H | / | / | / | / | / | Spurious |
| QP | / | V | / | / | / | / | / | Spurious |

For Peak Value

| Radiated Emission | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------------|----------------------|--------------------------|--------------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dB μ V/m | Correction Factor dB | PK Emission dB μ V/m | Limit dB μ V/m | Margin dBm | Emission Type |
| PK | 2440.000000 | H | 79.93 | -5.6 | 74.33 | 114.00 | 39.67 | Fundamental |
| PK | 2440.000000 | V | 75.44 | -5.6 | 69.84 | 114.00 | 44.16 | Fundamental |
| PK | 2496.187500 | H | 46.08 | -5.1 | 40.98 | 74.00 | 33.02 | Spurious |
| PK | 2495.687500 | V | 48.08 | -5.1 | 42.95 | 74.00 | 31.05 | Spurious |
| PK | 4880.000000 | H | 48.94 | 2.9 | 51.84 | 74.00 | 22.16 | Harmonic |
| PK | 4880.000000 | V | 46.60 | 2.9 | 49.50 | 74.00 | 24.50 | Harmonic |

For AV Value

| Radiated Emission | | | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------------|----------------------|--------------------------|-------------------|--------------------------|--------------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dB μ V/m | Correction Factor dB | PK Emission dB μ V/m | Average Factor dB | AV Emission dB μ V/m | Limit dB μ V/m | Margin dBm | Emission Type |
| AV | 2440.000000 | H | 79.93 | -5.6 | 74.33 | -10.81 | 63.52 | 94.00 | 30.84 | Fundamental |
| AV | 2440.000000 | V | 75.44 | -5.6 | 69.84 | -10.81 | 59.03 | 94.00 | 34.97 | Fundamental |
| AV | / | H | / | / | / | / | / | 54.00 | / | Spurious |
| AV | / | V | / | / | / | / | / | 54.00 | / | Spurious |

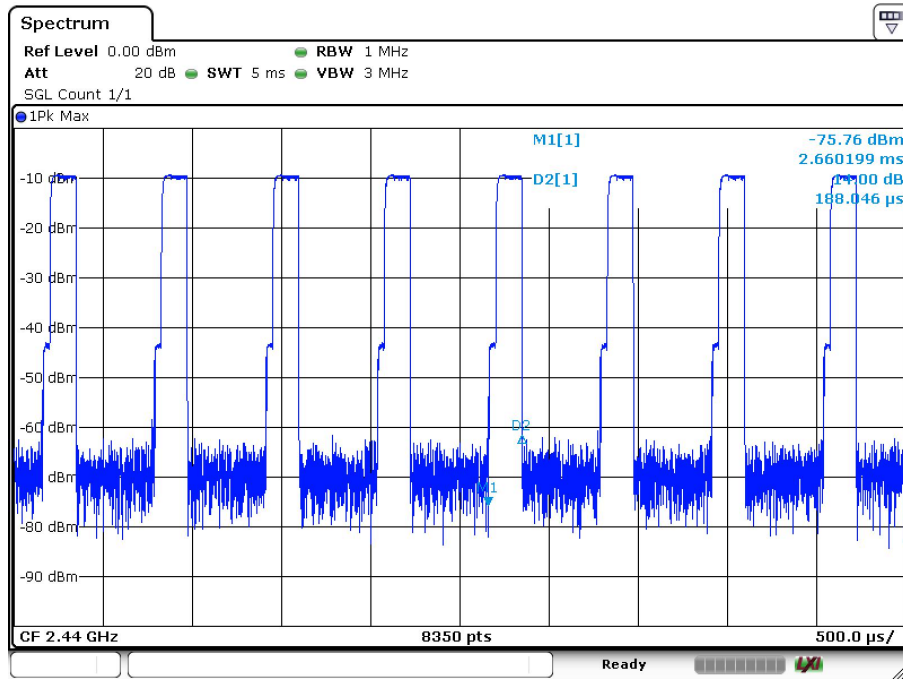
peak to average duty cycle correction factor =20log(duty cycle), duty cycle=14.4%

Remark:

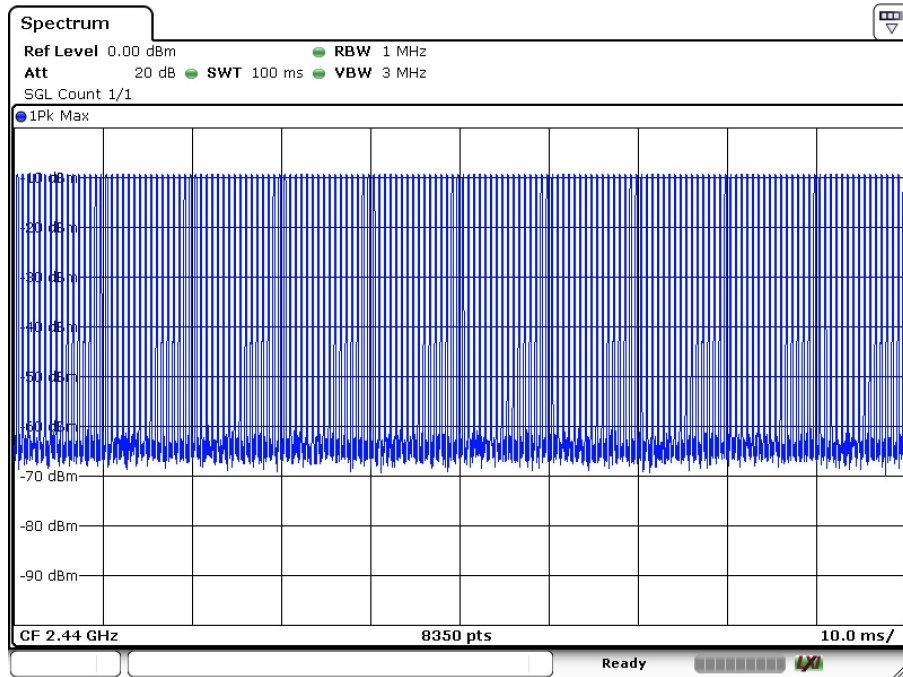
- 1: Data of measurement within this frequency range shown "/" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
 - 2: "(*)" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
 - 3: AV Emission Level= PK Emission +20log(dutycycle)
 - 4: PK Emission = Reading Level + Correction Factor
- Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Restricted bands

Duty Cycle $= (0.18 \times 160) / 100 = 28.8\%$
 Duty Cycle Factor $= 20 \log(\text{Duty Cycle}) = -10.81$



Date: 19.SEP.2019 19:05:21



Date: 19.SEP.2019 19:03:39

Field strength of emissions and Restricted bands

EUT: Module for Lighting kit
M/N: BLELED
Operating Condition: Tx; 2480MHz

For QP Value

| Radiated Emission | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------------|----------------------|--------------------------|--------------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dB μ V/m | Correction Factor dB | QP Emission dB μ V/m | Limit dB μ V/m | Margin dBm | Emission Type |
| QP | / | H | / | / | / | / | / | Spurious |
| QP | / | V | / | / | / | / | / | Spurious |

For Peak Value

| Radiated Emission | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------------|----------------------|--------------------------|--------------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dB μ V/m | Correction Factor dB | PK Emission dB μ V/m | Limit dB μ V/m | Margin dBm | Emission Type |
| PK | 2480.000000 | H | 80.10 | -5.2 | 74.90 | 114.00 | 39.10 | Fundamental |
| PK | 2480.000000 | V | 75.10 | -5.2 | 69.90 | 114.00 | 44.10 | Fundamental |
| PK | 2494.312500 | H | 55.65 | -5.1 | 50.55 | 74.00 | 23.45 | Spurious |
| PK | 2494.312500 | V | 46.47 | -5.1 | 41.37 | 74.00 | 32.63 | Spurious |
| PK | 4960.000000 | H | 37.68 | 3.3 | 40.98 | 74.00 | 33.02 | Harmonic |
| PK | 4960.000000 | V | 36.50 | 3.3 | 39.80 | 74.00 | 34.20 | Harmonic |

For AV Value

| Radiated Emission | | | | | | | | | | |
|-------------------|-------------------------|------------------|----------------------------|----------------------|--------------------------|-------------------|--------------------------|--------------------|------------|---------------|
| Value | Emissions Frequency MHz | E-Field Polarity | Reading Level dB μ V/m | Correction Factor dB | PK Emission dB μ V/m | Average Factor dB | AV Emission dB μ V/m | Limit dB μ V/m | Margin dBm | Emission Type |
| AV | 2480.000000 | H | 80.10 | -5.2 | 74.90 | -16.36 | 58.54 | 94.00 | 35.46 | Fundamental |
| AV | 2480.000000 | V | 75.10 | -5.2 | 69.90 | -16.36 | 53.54 | 94.00 | 40.46 | Fundamental |
| AV | / | H | / | / | / | / | / | 54.00 | / | Spurious |
| AV | / | V | / | / | / | / | / | 54.00 | / | Spurious |

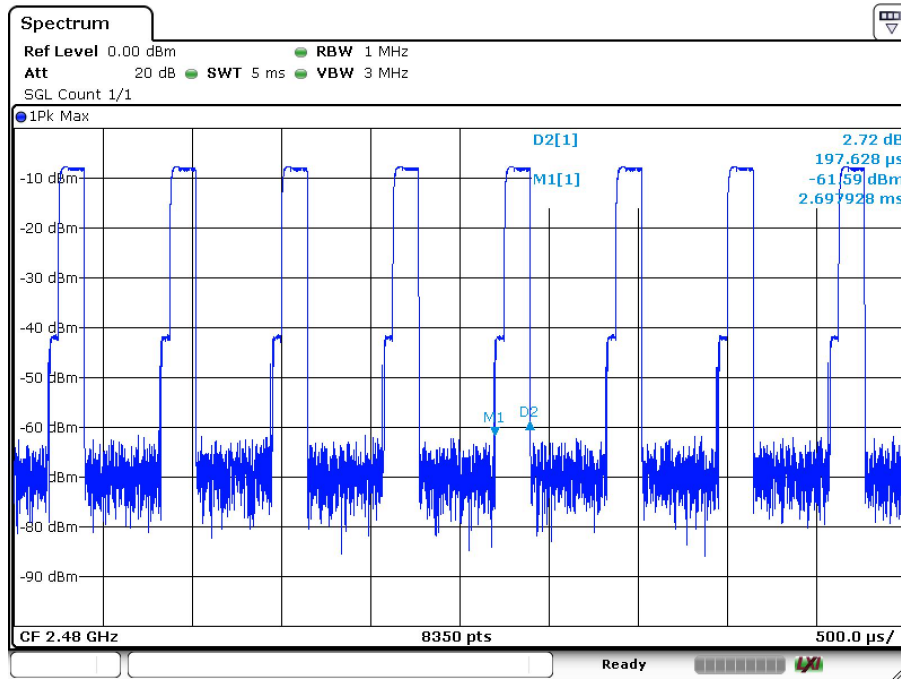
peak to average duty cycle correction factor =20log(duty cycle), duty cycle=14.4%

Remark:

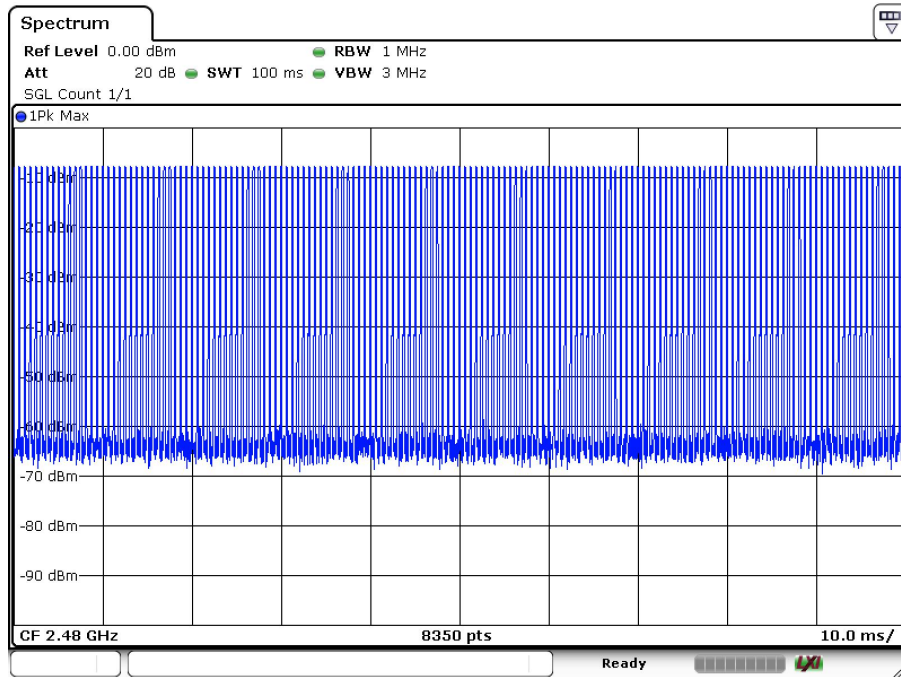
- 1: Data of measurement within this frequency range shown "/" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
 - 2: "(*)" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
 - 3: AV Emission Level= PK Emission +20log(dutycycle)
 - 4: PK Emission = Reading Level + Correction Factor
- Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

Field strength of emissions and Restricted bands

Duty Cycle $= (0.19 \times 80) / 100 = 15.2\%$
 Duty Cycle Factor $= 20 \log(\text{Duty Cycle}) = -16.36$



Date: 19.SEP.2019 19:09:14



Date: 19.SEP.2019 19:09:43

8.2 Out of Band Emissions

Test Method

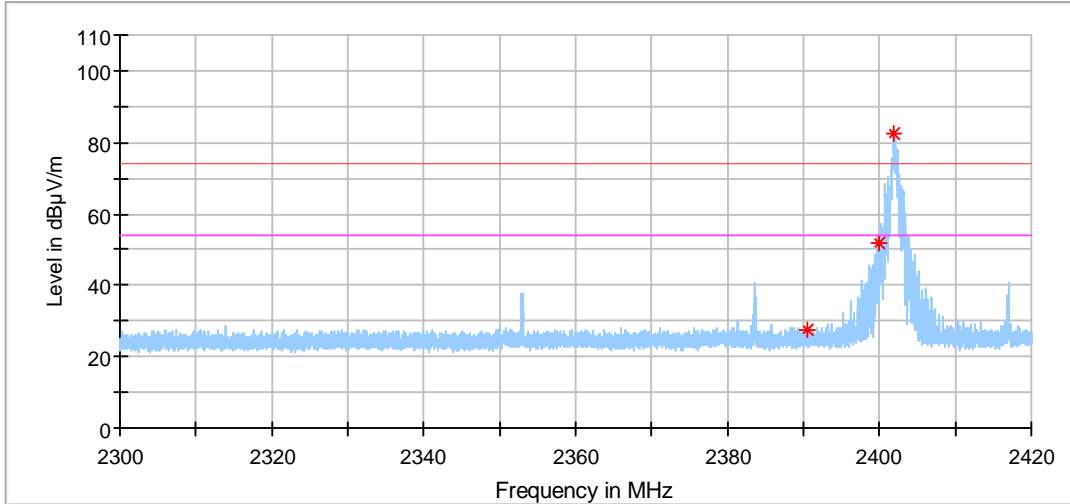
- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

Limits

According to §15.249(d) & RSS-210 B.10 Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209 and RSS-Gen, whichever is the lesser attenuation.

Out of Band Emissions

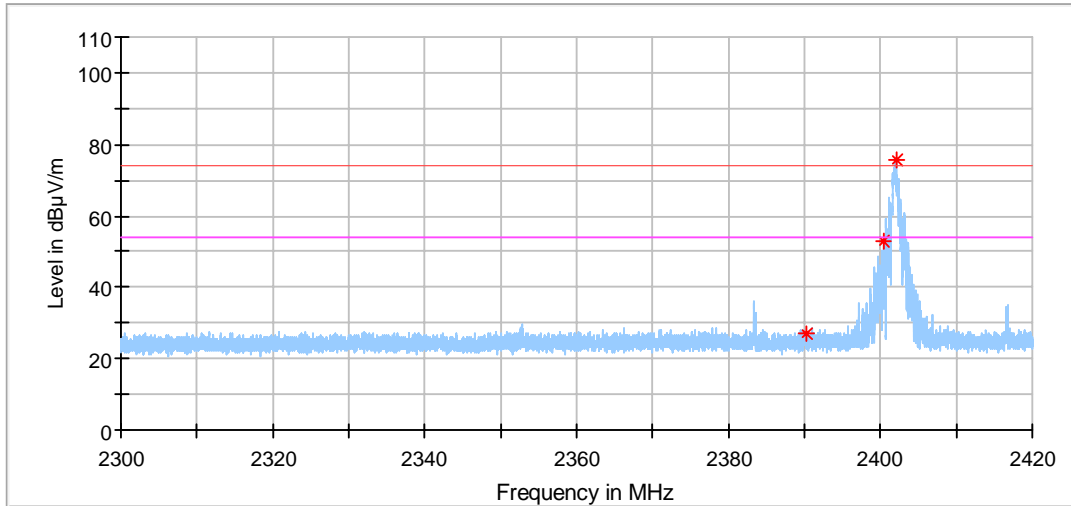
EUT: Module for Lighting kit
 M/N: BLELED
 Operating Condition: Tx; 2402MHz
 Polarization: Horizontal



| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 2390.596250 | 27.50 | 74.00 | 46.50 | --- | --- | 154.0 | H | 353.0 | -6.0 |
| 2399.967500 | 52.05 | 74.00 | 21.95 | --- | --- | 154.0 | H | 152.0 | -6.0 |
| 2402.022500 | 82.49 | 74.00 | -8.49 | --- | --- | 154.0 | H | 137.0 | -5.9 |

Out of Band Emissions

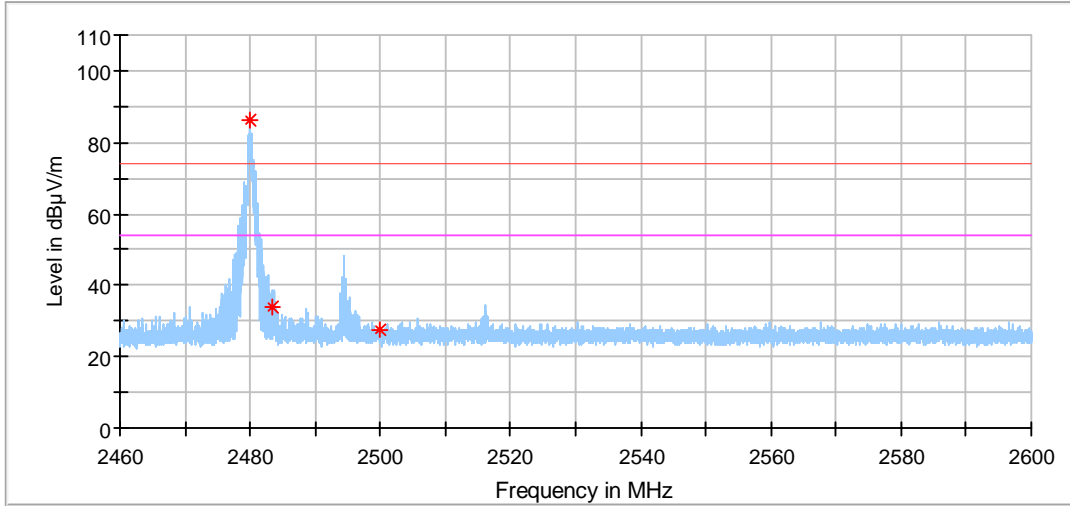
EUT: Module for Lighting kit
 M/N: BLELED
 Operating Condition: Tx; 2402MHz
 Polarization: Vertical



| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 2390.228750 | 26.80 | 74.00 | 47.20 | --- | --- | 154.0 | V | 305.0 | -6.0 |
| 2400.323750 | 52.89 | 74.00 | 21.11 | --- | --- | 154.0 | V | 330.0 | -6.0 |
| 2402.030000 | 75.57 | 74.00 | -1.57 | --- | --- | 154.0 | V | 135.0 | -5.9 |

Out of Band Emissions

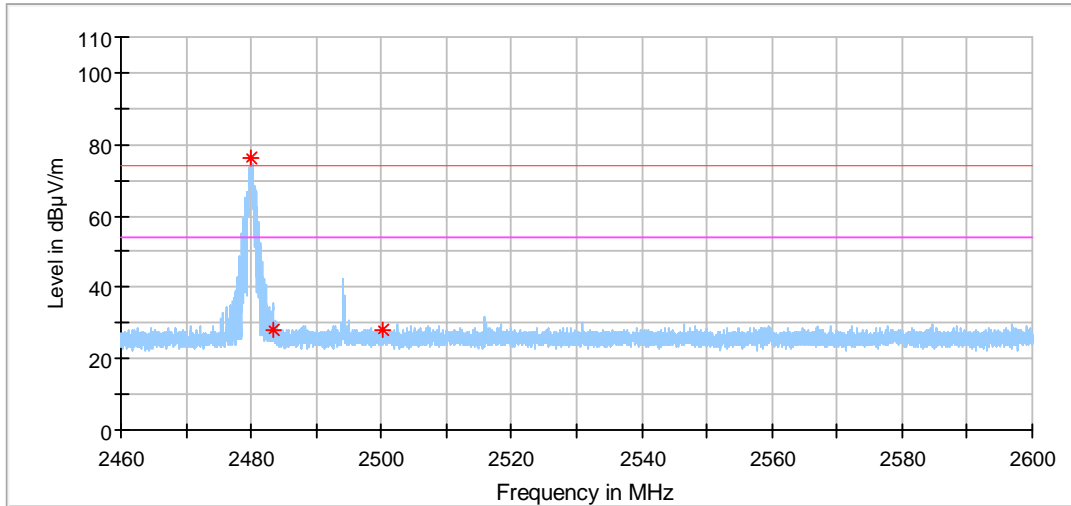
EUT: Module for Lighting kit
 M/N: BLELED
 Operating Condition: Tx; 2480MHz
 Polarization: Horizontal



| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 2480.020000 | 85.99 | 74.00 | -11.99 | --- | --- | 154.0 | H | 232.0 | -5.2 |
| 2483.533125 | 34.09 | 74.00 | 39.91 | --- | --- | 154.0 | H | 236.0 | -5.2 |
| 2500.026875 | 27.32 | 74.00 | 46.68 | --- | --- | 154.0 | H | 106.0 | -5.1 |

Out of Band Emissions

EUT: Module for Lighting kit
 M/N: BLELED
 Operating Condition: Tx; 2480MHz
 Polarization: Vertical



| Frequency (MHz) | MaxPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 2479.888750 | 76.41 | 74.00 | -2.41 | --- | --- | 154.0 | V | 153.0 | -5.2 |
| 2483.563750 | 28.21 | 74.00 | 45.79 | --- | --- | 154.0 | V | 319.0 | -5.2 |
| 2500.241250 | 27.78 | 74.00 | 46.22 | --- | --- | 154.0 | V | 121.0 | -5.1 |

8.3 20dB Bandwidth & 99% Occupied Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to spectrum analyser. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB/99% from the reference level. Record the frequency difference as the emission bandwidth.

Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

According to RSS-Gen 6.7 when an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

20dB Bandwidth & 99% Occupied Bandwidth

| Frequency | 20dB Bandwidth | 99% Bandwidth | Limit |
|-----------|----------------|---------------|-------|
| MHz | MHz | MHz | MHz |
| 2402 | 1.063 | 1.041 | -- |

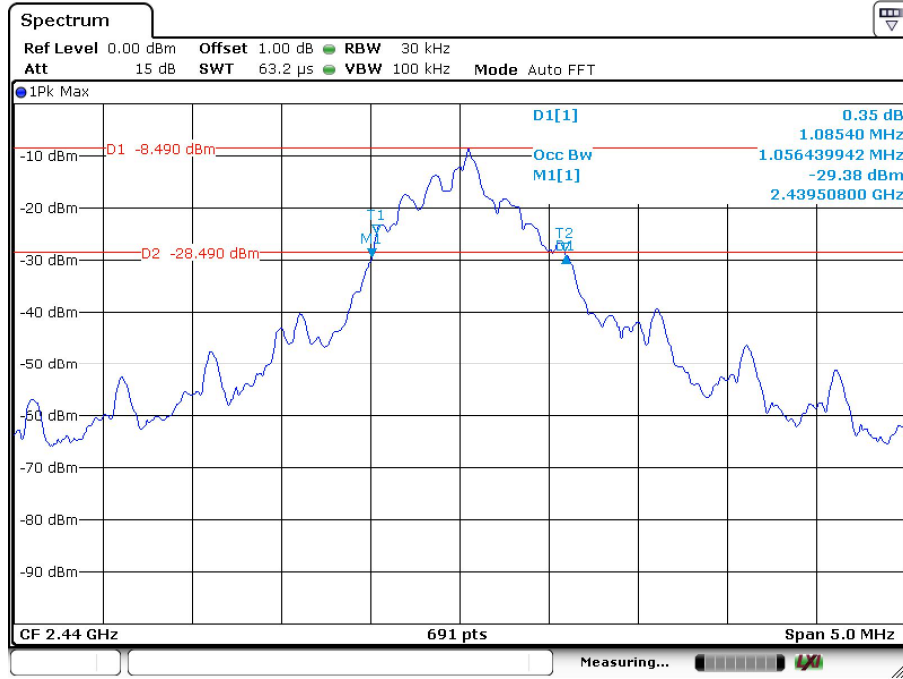


Date: 4.SEP.2019 11:49:02

2402MHz

20dB Bandwidth & 99% Occupied Bandwidth

| Frequency | 20dB Bandwidth | 99% Bandwidth | Limit |
|-----------|----------------|---------------|-------|
| MHz | MHz | MHz | MHz |
| 2440 | 1.085 | 1.056 | -- |

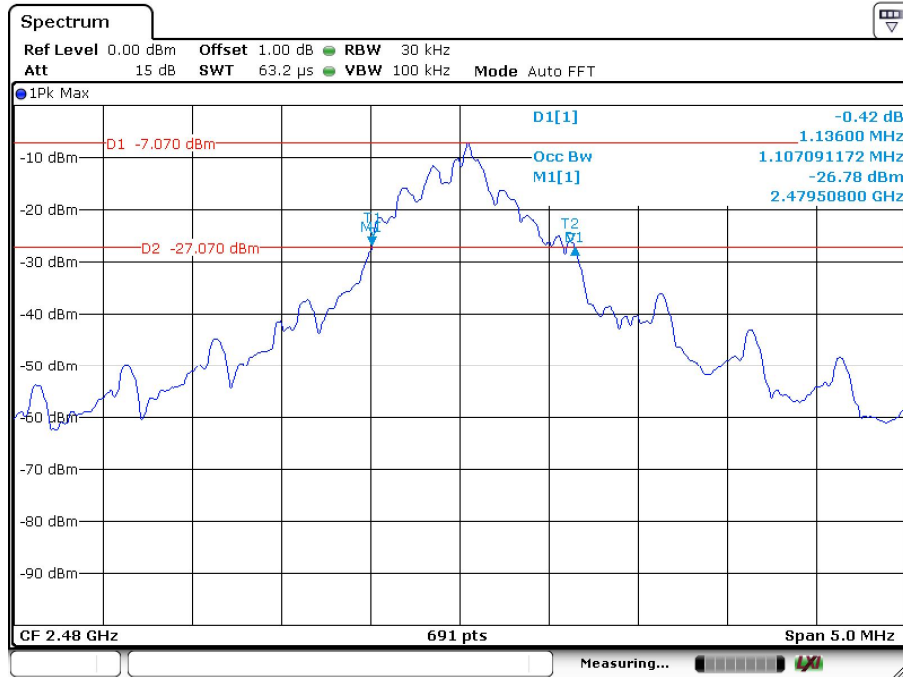


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2440MHz

20dB Bandwidth & 99% Occupied Bandwidth

| Frequency | 20dB Bandwidth | 99% Bandwidth | Limit |
|-----------|----------------|---------------|-------|
| MHz | MHz | MHz | MHz |
| 2480 | 1.136 | 1.107 | -- |



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2480MHz

9 Test equipment lists

List of Test Instruments

Radiated Emission Test

| DESCRIPTION | MANUFACTURER | MODEL NO. | EQUIPMENT ID | SERIAL NO. | CAL. DUE DATE |
|--------------------------|-----------------|-----------|--------------------|----------------|---------------|
| EMI Test Receiver | Rohde & Schwarz | ESR 26 | 68-4-74-14-002 | 101269 | 2020-6-28 |
| Horn Antenna | Rohde & Schwarz | HF907 | 68-4-80-14-005 | 102294 | 2020-6-22 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 68-4-80-14-006 | 100398 | 2020-7-7 |
| Pre-amplifier | Rohde & Schwarz | SCU 18 | 68-4-29-14-001 | 102230 | 2020-6-28 |
| Signal Generator | Rohde & Schwarz | SMY01 | 68-4-48-16-001 | 839369/005 | 2020-6-28 |
| Attenuator | Agilent | 8491A | 68-4-81-16-001 | MY39264334 | 2020-6-28 |
| 3m Semi-anechoic chamber | TDK | 9X6X6 | 68-4-90-14-001 | ---- | 2020-7-7 |
| Test software | Rohde & Schwarz | EMC32 | 68-4-90-14-001-A10 | Version9.15.00 | N/A |



10 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 Radiated Emission in 3m chamber 30MHz-1000MHz | Horizontal: 4.91dB; Vertical: 4.89dB; |
| Uncertainty for Radiated Spurious Emission 25MHz-3000MHz | Horizontal: 4.80dB; Vertical: 4.87dB; |
| Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz | Horizontal: 4.59dB; Vertical: 4.58dB; |
| Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz | Horizontal: 5.05dB; Vertical: 5.04dB; |