# FCC Part 15 Subpart B&C§15.247
# RSS-247 ISSUE No.:2

# Test Report

| | |
|---|---|
| **Equipment Under Test** | **Wireless Headphones** |
| **Model Name** | **ATH-SR50BT** |
| **Variant Model Name** | **ATH-SR50BT BK, ATH-SR50BT BW,**<br>**ATH-SR50BT BK(EX), ATH-SR50BT BW(EX),**<br>**ATH-SR50BT BK(DF), ATH-SR50BT BW(DF)** |
| **Applicant** | **Audio-Technica Corporation** |
| **Manufacturer** | **Audio-Technica Corporation** |
| **Date of Test(s)** | **2018. 10. 24 ~ 2018. 10. 29** |
| **Date of Issue** | **2018. 11. 26** |

In the configuration tested, the EUT complied with the standards specified above.

| Issue to | Issue by |
|---|---|
| **Audio-Technica Corporation**<br>2-46-1 Nishi-Naruse, Machida , Tokyo, 194-8666, Japan<br><br>Tel.: +81-42-739-9162<br>Fax: +81-42-739-9160 | **MOVON CORPORATION**<br>498-2, Geumeo-ri, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 449-812<br><br>Tel.: +82-31-338-8837<br>Fax: +82-31-338-8847 |

# Revision history

| Revision | Date of issue | Description | Revised by |
|---|---|---|---|
| -- | Nov 26, 2018 | Initial | -- |

# Table of contents

# 1. Applicant Information & Laboratory Information

## 1.1.1 Details of applicant & Manufacturer

| | | |
|---|---|---|
| Applicant | : | Audio-Technica Corporation |
| Address | : | 2-46-1 Nishi-Naruse, Machida , Tokyo, 194-8666, Japan |
| Contact Person | : | Kamimura Fumio |
| Telephone | : | +81-42-739-9168 |
| Fax | : | +81-42-739-9160 |

## 1.1.2 Laboratory Information

| | | |
|---|---|---|
| Applicant | : | MOVON Corporation |
| Telephone | : | + 82-31-338-8837 |
| Fax | : | + 82-31-338-8847 |
| Test Site Number | | *FCC(KR0151)* |
| Address | : | 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, South Korea |
| Test Site Number | | *IC(6432B-3)* |
| Address | : | 194-1 Geumeo-ri, Pogok-eup<br>Cheoin-gu, Yongin-si, Gyeonggi-do 449-812 Korea |
| Test Site Number | | *IC(21313-1)* |
| Address | : | 494, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 170-30<br>Yongin IP 17030 Korea |

### 1.3. Summary of test results

The EUT has been tested according to the following specifications;

| Section in FCC part 15 | Section in RSS-GEN, RSS-247 | Description | Result |
|---|---|---|---|
| §15.205<br>§15.209<br>§15.247(d) | 5.5 | Transmitter radiated spurious emissions,<br>Conducted spurious emission | C |
| §15.109(a) | RSS-Gen 6 | Receiver radiated spurious emission | C |
| §15.247(a)(2) | A8.2(a) | 6 dB Bandwidth and 99 % bandwidth | C |
| §15.247(b)(e) | A8.4(4) | Maximum Conducted Output Power | C |
| §15.247(e) | A8.2(b) | Transmitter Power Spectral Density | C |
| §1.1307(b)(1) | RSS-Gen 5.5<br>RSS-102 | RF exposure evaluation | C |
| §15.207(a) | 7.2.2 | Conducted power line test | C |

*The sample was tested according to the following specification:*
***FCC Parts 15.247; ANSI C63.4:2014, ANSI C63.10:2013***
***FCC Public Notice KDB 558074 D01v05***
***RSS-247 ISSUE No.: 2***
***RSS-GEN ISSUE 4***
*TEST SITE REGISTRATION NUMBER:**FCC(KR0151),IC(6432B-3),IC(21313-1)***

**※ Abbreviation**

C Complied
N/A Not applicable
F Fail

**Approval Signatories**

| Test and Report Completed by : | Report Approval by : |
|---|---|
| 손 홍민 | 진 태섭 |
| Kin Son<br>Test Engineer<br>MOVON CORPORATION | Issac Jin<br>Technical Manager<br>MOVON CORPORATION |

## 2. EUT Description

| | |
|---|---|
| **Kind of product** | Wireless Headphones |
| **Model** | ATH-SR50BT |
| **Variant Model Name** | ATH-SR50BT BK, ATH-SR50BT BW,<br>ATH-SR50BT BK(EX), ATH-SR50BT BW(EX),<br>ATH-SR50BT BK(DF), ATH-SR50BT BW(DF) |
| **FCC ID** | JFZSR50BT |
| **IC Number** | 1752B-SR50BT |
| **Serial Number** | N/A |
| **Power supply** | DC 3.7V |
| **Frequency range** | 2 402 ㎒ ~ 2 480 ㎒ |
| **Modulation technique** | GFSK |
| **Number of channels** | 40 |
| **Antenna gain** | 3.609 ㏈i (Max.) |
| **Test Site Registration Number** | FCC(KR0151), IC(6432B-3), IC(21313-1) |

### 2.1. Declarations by the manufacturer
None

### 2.2. Details of modification
None

## 3. Measurement equipment.

| Equipment | Manufacturer | Model | Serial number | Calibration Interval | Calibration due. |
|---|---|---|---|---|---|
| Test Receiver | R&S | ESVS30 | 829673/015 | 1 year | 2018-12-07 |
| Signal Generator | R&S | SMB100A | 178128 | 1 year | 2018-12-08 |
| Spectrum Analyzer | R&S | FSV-40 | 100832 | 1 year | 2019-05-28 |
| Power Meter | Agilent | E4416A | GB41290645 | 1 year | 2019-05-29 |
| Power Sensor | Agilent | 9327A | US40441490 | 1 year | 2019-05-29 |
| Horn Antenna | R&S | HF906 | 100236 | 2 year | 2019-04-25 |
| Horn Antenna | AH Systems | SAS-572 | 269 | 2 year | 2019-08-01 |
| Horn Antenna | AH Systems | SAS-573 | 164 | 2 year | 2020-04-26 |
| Bi-Log Ant. | S/B | VULB 9161SE | 4159 | 2 year | 2020-06-11 |
| Power Amplifier | MITEQ | AFS43-01002600 | 2048519 | 1 year | 2018-11-03 |
| Controller | INNCO | CO2000 | co200/064/6961003/L | N/A | N/A |
| Antenna Master | INNCO | MA4000 | MA4000/038/6961003/L | N/A | N/A |
| Loop Antenna | ETS LINDGREN | 6502 | 00118166 | 2 year | 2018-10-31 |
| TWO LINE-V-NETWORK | R&S | ESH3-Z5 | 100296 | 1 year | 2019-03-07 |
| Low Noise Amplifier | TESTEK | TK-PA18H | 170013-L | 1 year | 2019-05-28 |
| Power Amplifie | SONOMA INSTRUMENT | 310N | 185428 | 1 year | 2018-12-07 |
| WIDEBAND RADIO COMMUNICATION TESTER | R&S | CMW500 | 154160 | 1 year | 2019-05-29 |
| EMI TEST RECEVER | R&S | ESR3 | 101873 | 1 year | 2019-05-28 |
| PULSE LIMITER | R&S | ESH3-Z2 | 100288 | 1 year | 2019-05-28 |
| Power Divider | HP | 11636B | 12481 | 1 year | 2019-05-31 |
| RF Cable | SUHNER | SUCOFLEX100 | 84047746 | N/A | N/A |
| RF Cable | SUHNER | SUCOFLEX102 | 801270/2 | N/A | N/A |
| RF Cable | SUHNER | SUCOFLEX102 | 801270/2 | N/A | N/A |

**※ Remark;**
**Support equipment**

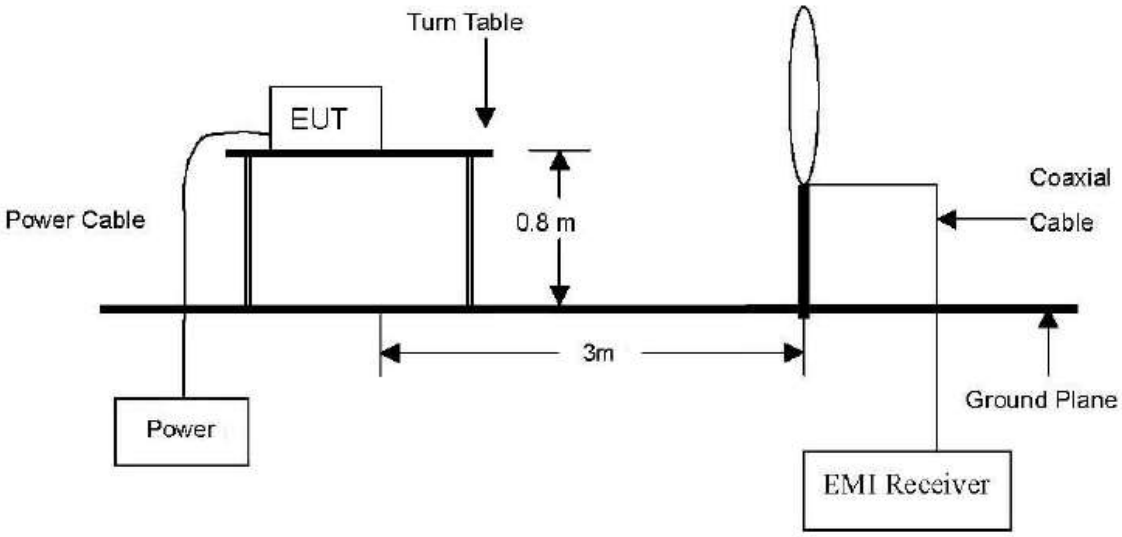
| Description | Manufacturer | Model | Serial number |
|---|---|---|---|
| Notebook computer | DELL | Lattitude D510 | - |

# 4. Transmitter radiated spurious emissions and conducted spurious emissions

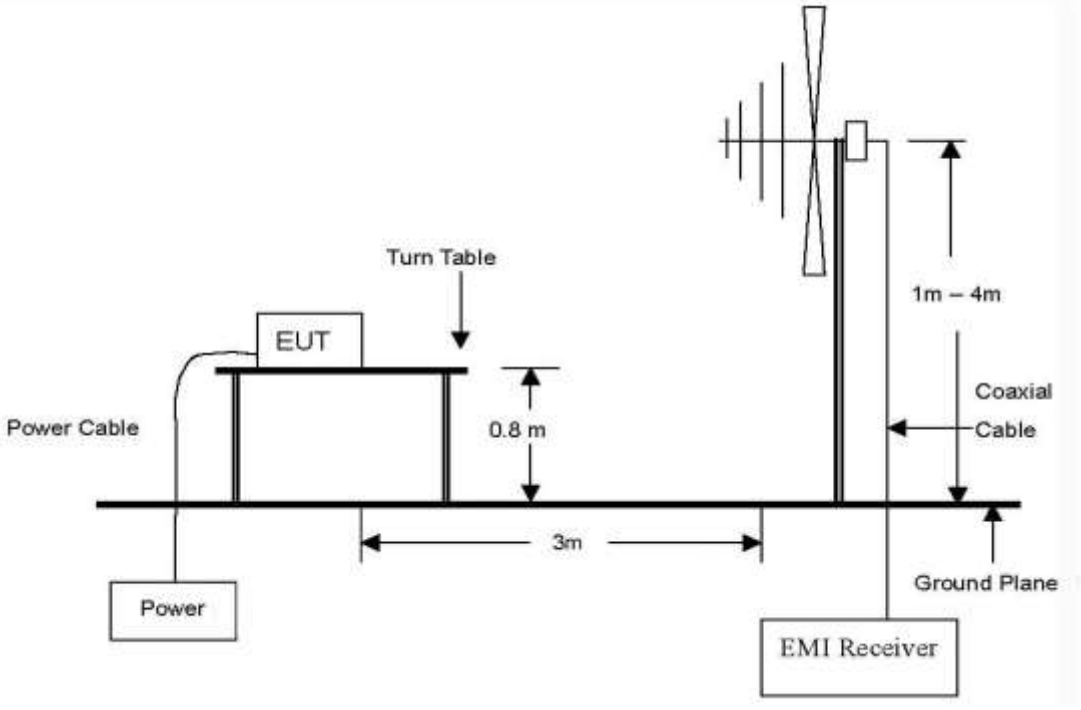
## 4.1. Test setup

### 4.1.1. Transmitter radiated spurious emissions

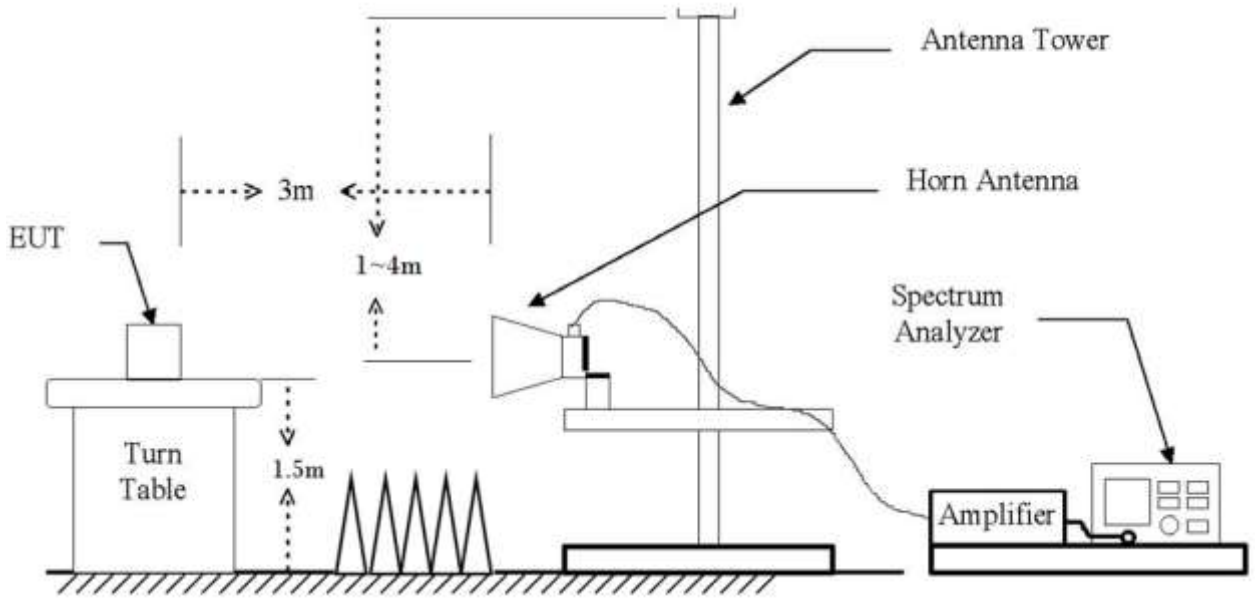
The diagram below shows the test setup that is utilized to make the measurements for emission from 9kHz to 30MHz Emissions.




The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to 40 ㎓ emissions.



## 4.2. Limit

According to §15.247(d), in any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement , provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.109(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

| Frequency (㎒) | Distance (Meters) | Radiated at 3M (㏈㎶/m) | Radiated (㎶/m) |
|---|---|---|---|
| 0.009–0.490 | 300 | See the remark | 2400/F(㎑) |
| 0.490–1.705 | 30 | | 24000/F(㎑) |
| 1.705–30.0 | 30 | | 30 |
| 30 - 88 | 3 | 40.0 | 100 |
| 88 – 216 | 3 | 43.52 | 150 |
| 216 – 960 | 3 | 46.02 | 200 |
| Above 960 | 3 | 53.97 | 500 |

*Remark

1. Emission level in ㏈uV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(㏈)
   Limit line=Specific limits(㏈uV) + distance extrapolation factor.

## 4.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.10:2013
In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

### 4.3.1. Test procedures for radiated spurious emissions

1. The EUT is placed on a turntable, which is 0.8 m (Below 1 ㎓.)**/** 1.5 m (Above 1 ㎓) above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

**※ Remark;**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 10 ㎑ for Peak detection (PK) at frequency below 30 ㎒
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑ for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 ㎓.
3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 ㎒ for Peak detection and frequency above 1 ㎓.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒z and the video bandwidth is 10 ㎐ for Average detection (AV) at frequency above 1 ㎓.

### 4.3.2. Test procedures for conducted spurious emissions

All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

Per the guidance of KDB 558074, section 5.4.1.1, the reference level for out of band emissions is established from the plots of this section since the band edge emissions are measured with a RBW of 100 ㎑. This reference level is then used as the limit in subsequent plots for out of band spurious emissions shown in section 4.4.4. The limit for out of band spuriousemission at the band edge is 30 ㏈ below the fundamental emission level measured in a 100 ㎑ bandwidth.

## 4.4. Test result

Ambient temperature: 20℃
Relative humidity: 45% R.H.

### 4.4.1. Spurious radiated emission

The frequency spectrum from 9㎑ to 30㎒ was investigated. Emission levels are not reported muchlower than the limits by over 20 ㏈. All reading values are peak values.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

**A. Low channel (2 402 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | CL (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**B. Middle channel (2 440 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | CL (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**C. High channel (2 480 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | CL (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**※ Remark**
1. Actual = Reading + Ant. factor + CL (Cable loss)
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBuV) + Distance extrapolation factor
4. 15.31 Measurement standards.
The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

### 4.4.2. Spurious radiated emission

The frequency spectrum from 30 ㎒ to 1 000 ㎒ was investigated. Emission levels are not reported muchlower than the limits by over 20 ㏈. All reading values are peak values.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

**A. Low channel (2 402 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | C.L (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**B. Middle channel (2 441 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | C.L (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**C. High channel (2 480 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | C.L (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**※ Remark**

1. Actual = Reading + Ant. factor + CL (Cable loss)
2. 15.31 Measurement standards.
   The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

### 4.4.3. Spurious radiated emission

The frequency spectrum above 1 000 ㎒was investigated. Emission levels are not reported much lower thanthe limits by over 20 ㏈.
To get a maximum emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

**A. Low channel (2 402 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | C.L (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**B. Middle channel (2 441 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | C.L (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**C. High channel (2 480 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | C.L (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**※ Remark**

1. Measuring frequencies from 1 ㎓ to the 10th harmonic of highest fundamental Frequency.
2. Radiated emissions measured in frequency above 1 000 ㎒ were made with an instrument usingpeak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit.
4. Actual = Reading + Ant. factor- Amp + CL (Cable loss)
5. 15.31 Measurement standards.

**THE AMPLITUDE OF SPURIOUS EMISSIONS FROM INTENTIONAL RADIATORS AND EMISSIONS FROM UNINTENTIONAL RADIATORS WHICH ARE ATTENUATED MORE THAN 20 DB BELOW THE PERMISSIBLE VALUE NEED NOT BE REPORTED UNLESS SPECIFICALLY REQUIRED ELSEWHERE IN THIS PART.**

### 4.4.4 Band Edge

**A. 2 310 - 2 390 ㎒ measurement (2 402MHz)**

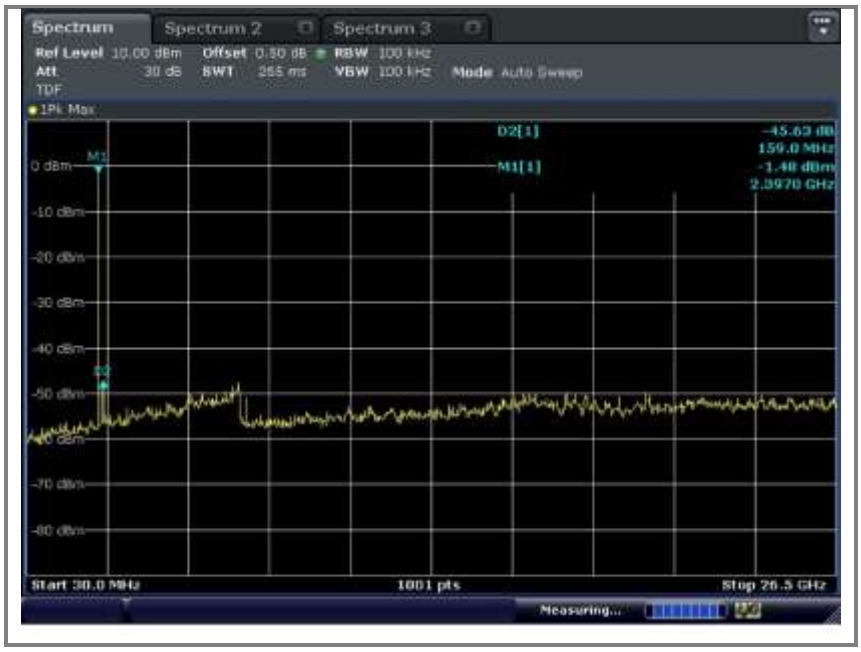
| Radiated emissions | | | Ant. | Correction factors | | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (dB㎶) | Detector mode | Pol. | Ant. factor (dB/m) | Amp+CL (dB) | Duty factor (dB) | Actual (dB㎶/m) | Limit (dB㎶/m) | Margin (dB) |
| 2327.30 | 58.39 | Peak | V | 28.09 | 44.63 | | 41.85 | 74.00 | 32.15 |
| 2337.45 | 47.28 | Average | V | 28.09 | 44.63 | 1.61 | 32.35 | 54.00 | 21.65 |
| 2342.73 | 60.15 | Peak | H | 28.09 | 44.63 | | 43.61 | 74.00 | 30.39 |
| 2337.29 | 47.29 | Average | H | 28.09 | 44.63 | 1.61 | 32.36 | 54.00 | 21.64 |

**B. 2 483.5 – 2 500 ㎒ measurement (2 480MHz)**

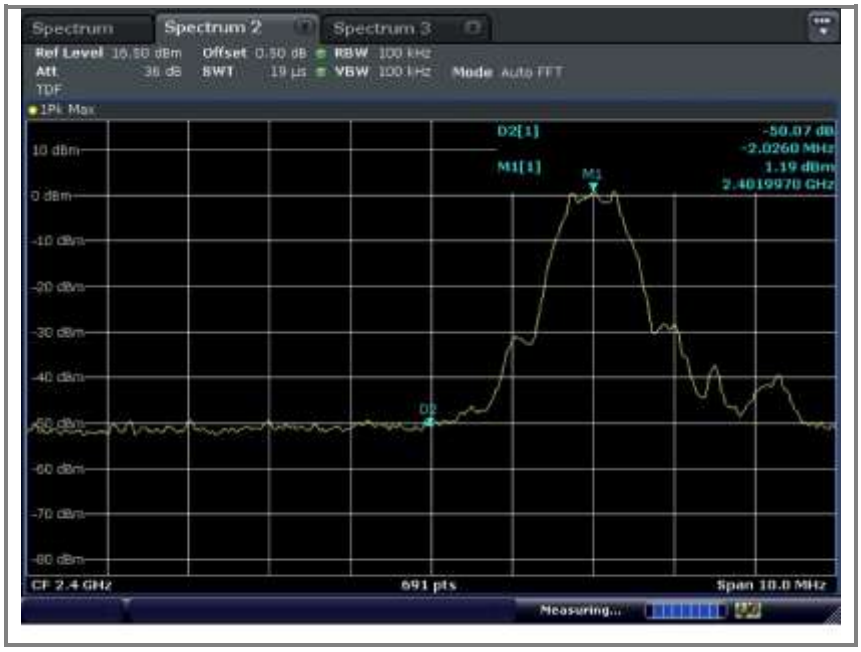
| Radiated emissions | | | Ant. | Correction factors | | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (dB㎶) | Detector mode | Pol. | Ant. factor (dB/m) | Amp+CL (dB) | Duty factor (dB) | Actual (dB㎶/m) | Limit (dB㎶/m) | Margin (dB) |
| 2489.92 | 58.51 | Peak | V | 28.09 | 44.63 | | 41.97 | 74.00 | 32.03 |
| 2499.98 | 45.48 | Average | V | 28.09 | 44.63 | 1.61 | 30.55 | 54.00 | 23.45 |
| 2490.93 | 57.67 | Peak | H | 28.09 | 44.63 | | 41.13 | 74.00 | 32.87 |
| 2499.32 | 45.47 | Average | H | 28.09 | 44.63 | 1.61 | 30.54 | 54.00 | 23.46 |

## A. Low channel(2 402 ㎒)

### Unwanted Emission data

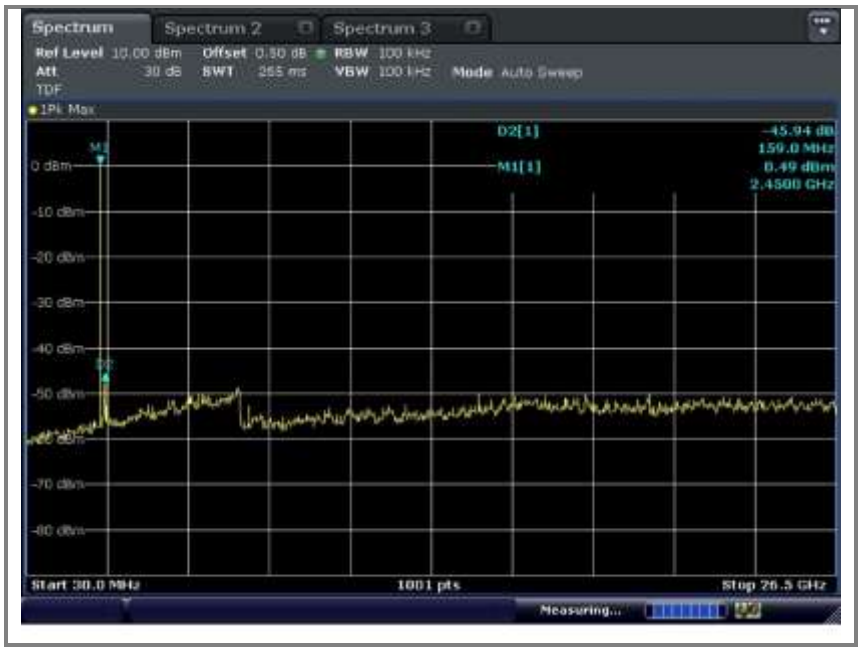



### Band-edge data



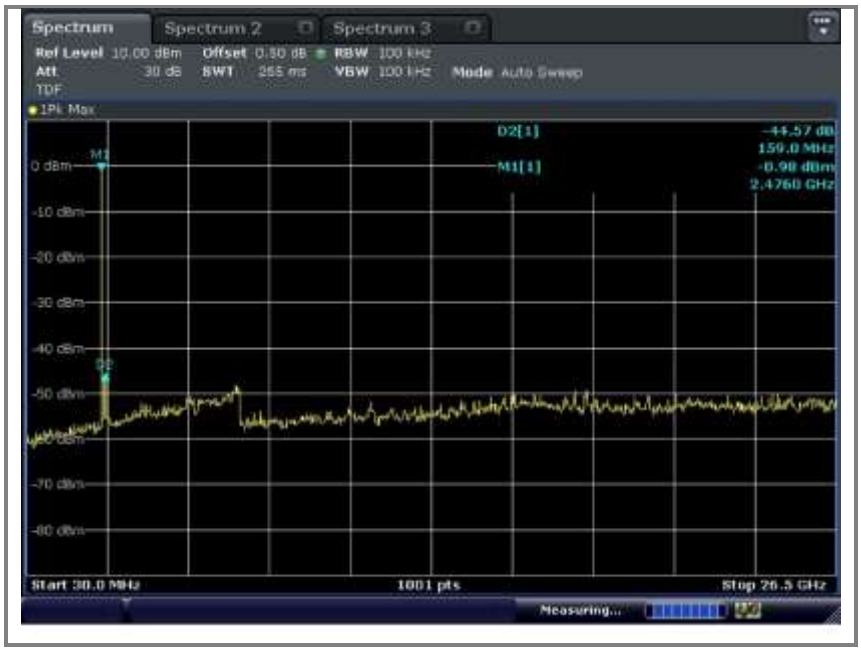
**B. Middle channel(2 440 ㎒)**

**Unwanted Emission data**

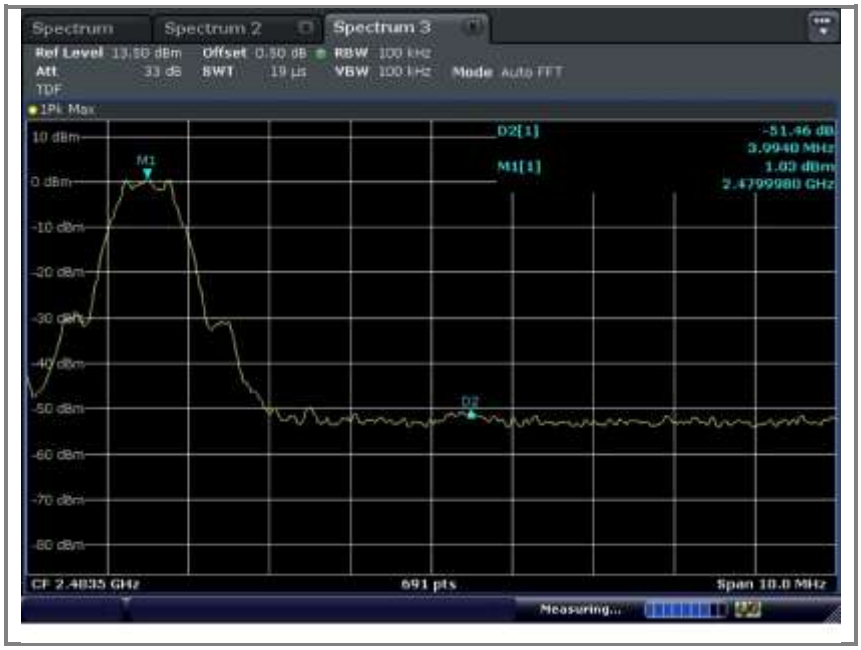


## C. High channel(2 480 ㎒)

### Unwanted Emission data




### Band-edge data



## *5. Receiver radiated spurious emissions*

### 5.1. Test setup
Same as clause 5.1.

### 5.1.1.Receiver radiated spurious emissions
Same as clause 5.1.1

### 5.2.Limit
According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission fromunintentional radiator at a distance of 3 m shall not exceed the following values:

| Frequency (㎒) | Distance (Meters) | Radiated (dB㎶/m) | Radiated (㎶/m) |
|---|---|---|---|
| 0.009–0.490 | 300 | See the remark | 2400/F(㎑) |
| 0.490–1.705 | 30 | | 24000/F(㎑) |
| 1.705–30.0 | 30 | | 30 |
| 30 - 88 | 3 | 40.0 | 100 |
| 88 – 216 | 3 | 43.5 | 150 |
| 216 – 960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

### 5.3.Test procedures
Same as clause 5.3.
Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003
In case of the air temperature of the test site is out of the range is 10 to 40°C before the testing proceeds the warm-up time of EUT maintain adequately

### 5.3.1.Test procedures for radiated spurious emissions
Same as Clause 5.3.1.

## 5.4.Test results

Ambient temperature: 20 ℃
Relative humidity: 45% R.H.

### 5.4.1.Spurious radiated emission.

The frequency spectrum from 30 ㎒ to 26㎓ was investigated. Emission levels are not reported muchlower than the limits by over 30 ㏈. All reading values are peak values.

**A. Low channel (2 402 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | CL (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**B. Middle channel (2 440 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | CL (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

**C. High channel (2 480 ㎒)**

| Radiated emissions | | | Ant. | Correction factors | | Total | Limit | |
|---|---|---|---|---|---|---|---|---|
| Frequency (㎒) | Reading (㏈㎶) | Detector mode | Pol. | Ant. factor (㏈/m) | CL (㏈) | Actual (㏈㎶/m) | Limit (㏈㎶/m) | Margin (㏈) |
| No other emissions were detected at a level greater than 20dB below limit. | | | | | | | | |

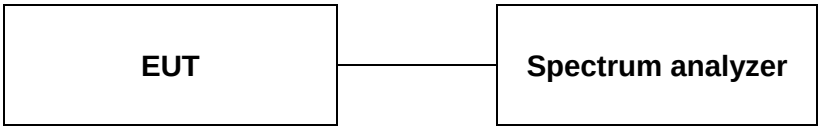
**※ Remark**

1. Actual = Reading + Ant. factor + CL (Cable loss)
2. 15.31 Measurement standards.

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

## 6. 6 dB bandwidth& 99% bandwidth measurement

### 6.1. Test setup




### 6.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902~928 ㎒, 2 400~2 483.5 ㎒, and 5 725~5 825 ㎒ bands. The minimum of 6 dB Bandwidth shall be at least 500 ㎑

### 6.3. Test procedure

1. The 6dB band width was measured with a spectrum analyzer connected to RF antenna connector(conducted measurement) while EUT was operating in transmit mode at the appropriate centerfrequency. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer.Display Line and Marker Delta functions, the 6dB band width of the emission was determined.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW = 100㎑,VBW≥ 3 x RBW, Span= 2times the DTS bandwidth
   Detector= peak, Trace = max hold, Sweep=auto couple

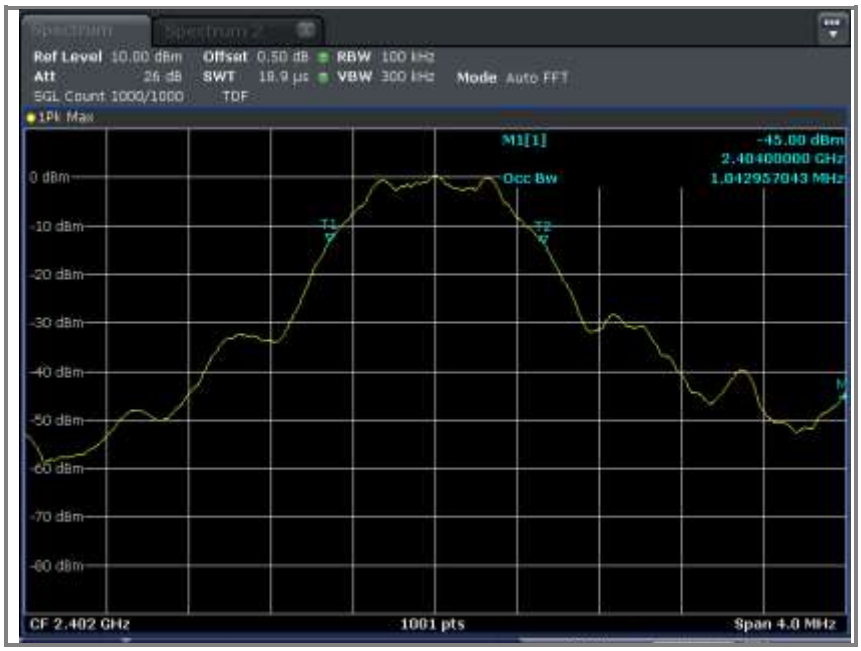
### 6.4. Test results

Ambient temperature: 22℃
Relative humidity: 45% R.H.

| Frequency(㎒) | 6 dB bandwidth(㎒) | 99% bandwidth(㎒) |
|---|---|---|
| 2 402 | 0.70 | 1.04 |
| 2 440 | 0.70 | 1.04 |
| 2 480 | 0.70 | 1.04 |

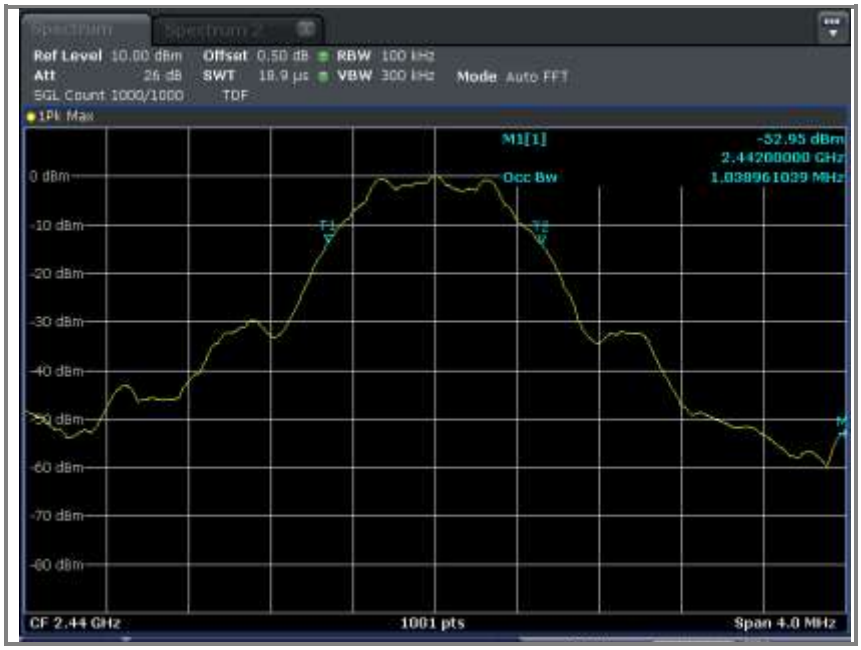
**A. Low channel(2 402 ㎒) - 6 ㏈ bandwidth**


**A. Low channel(2 402 ㎒)–99 % bandwidth**



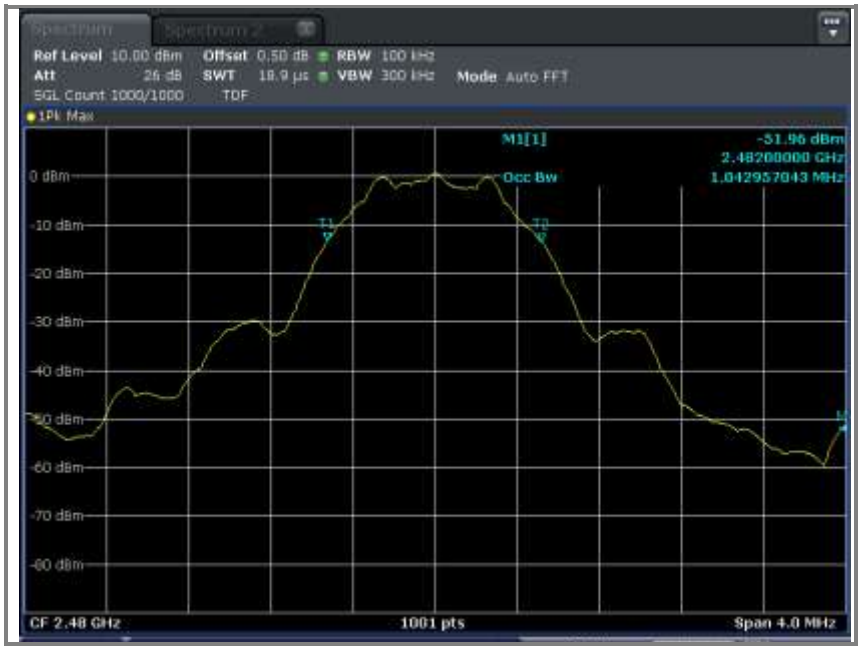
**B. Middle channel(2 440 ㎒)- 6 ㏈ bandwidth**


**B. Middle channel(2 440 ㎒)–99 % bandwidth**



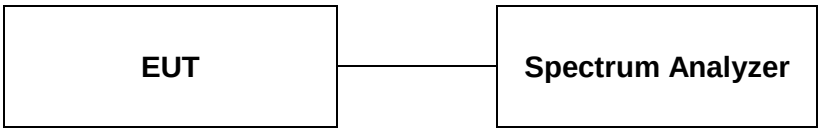
**C. High channel(2 480 ㎒) -6 ㏈ bandwidth**


**C. High channel(2 480 ㎒)–99 % bandwidth**



## 7. Maximum Output Power Measurement

### 7.1. Test setup.




### 7.2. Limit

The maximum peak output power of the intentional radiator shall not exceed the following:
1. §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by aminimum of 25 ㎑or the 6 ㏈ bandwidth of the hopping channel, whichever is greater, provided thesystems operate with an output power no greater than 125 ㎽
2. §15.247(b)(1), For frequency hopping systems operating in the 2400–2483.5 ㎒ employing atleast 75non-overlapping hopping channels, and all frequency hopping systems in the 5725–5 805 ㎒ band: 1Watt.

### 7.3 Test procedure

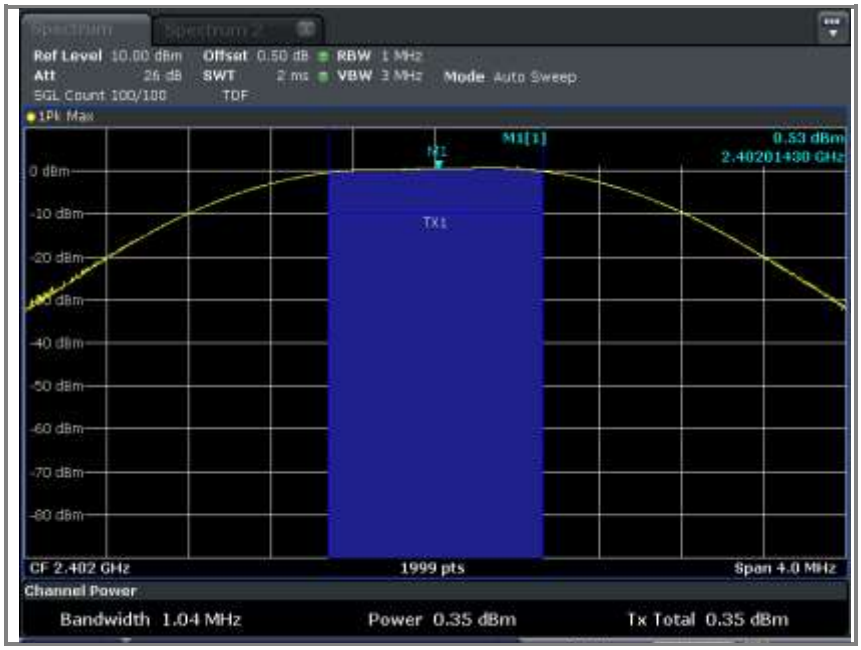
Maximum Peak Conducted Output Power is measured using the following procedure (RBW ≥ DTS bandwidth).
1. Set the RBW ≥ DTS bandwidth.
2. Set VBW ≥ 3 x RBW. / Set span ≥ 3 x RBW.
4. Sweep time = auto couple
5. Detector = peak
6. Trace mode = max hold
7. Allow trace to fully stabilize
8. Use peak marker function to determine the peak amplitude level.

### 7.4 Test results

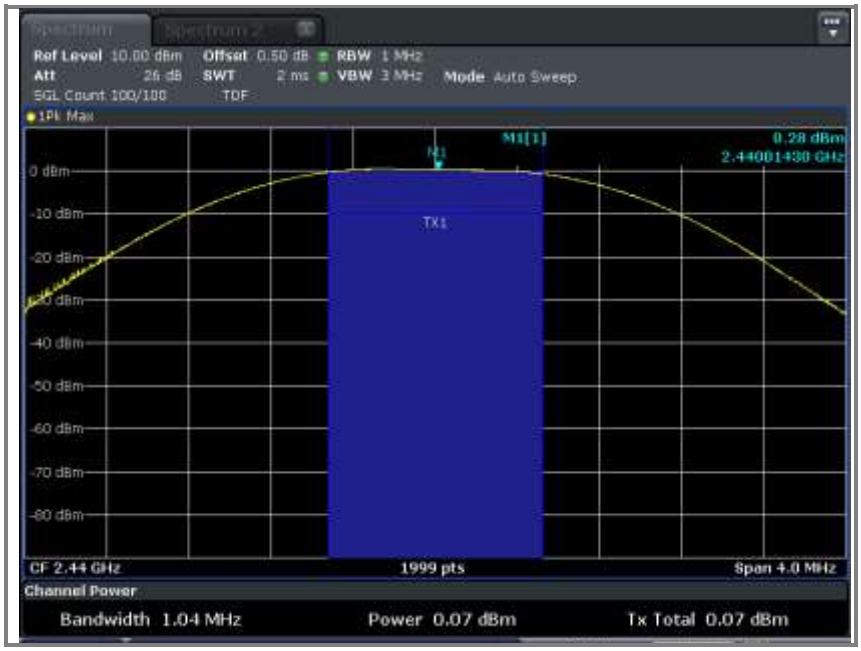
Ambient temperature: 22℃
Relative humidity: 45% R.H.

| Frequency(㎒) | Conducted power (㏈m) | Limit (㏈m) |
|---|---|---|
| 2 402 | 0.35 | 30 |
| 2 440 | 0.07 | |
| 2 480 | 0.49 | |

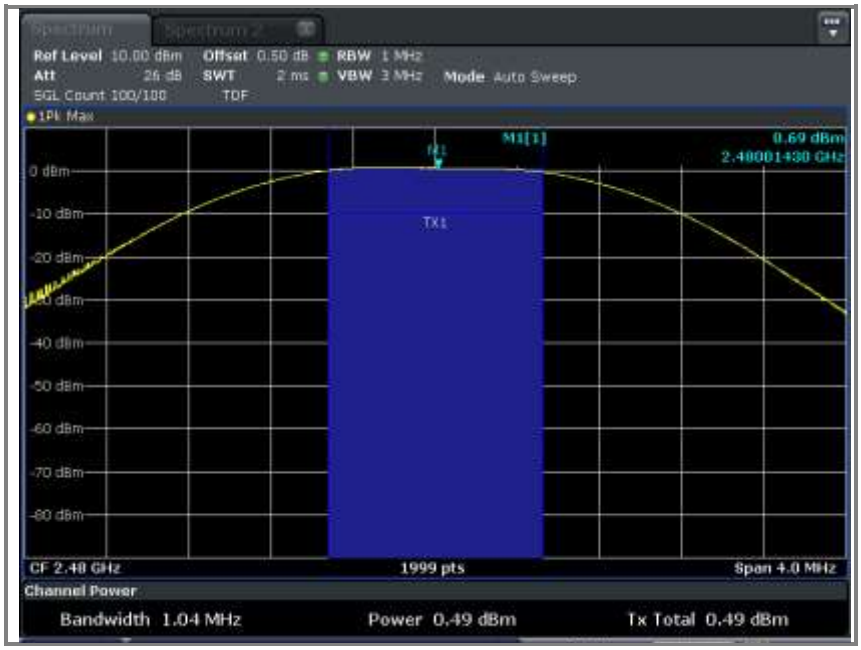
**A. Low channel(2 402 ㎒)**




**B. Middle channel(2 440 ㎒)**

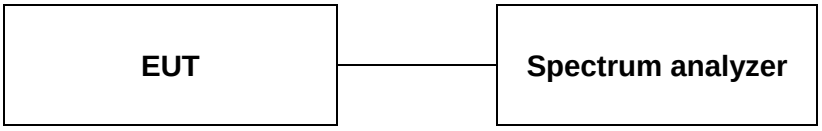


**C. High channel(2 480 ㎒)**



## 8. Power Spectral Density Measurement

### 8.1. Test setup




### 8.2. Limit

< 8dBm @ 3kHz BW

### 8.3. Test procedure (PKPSD)

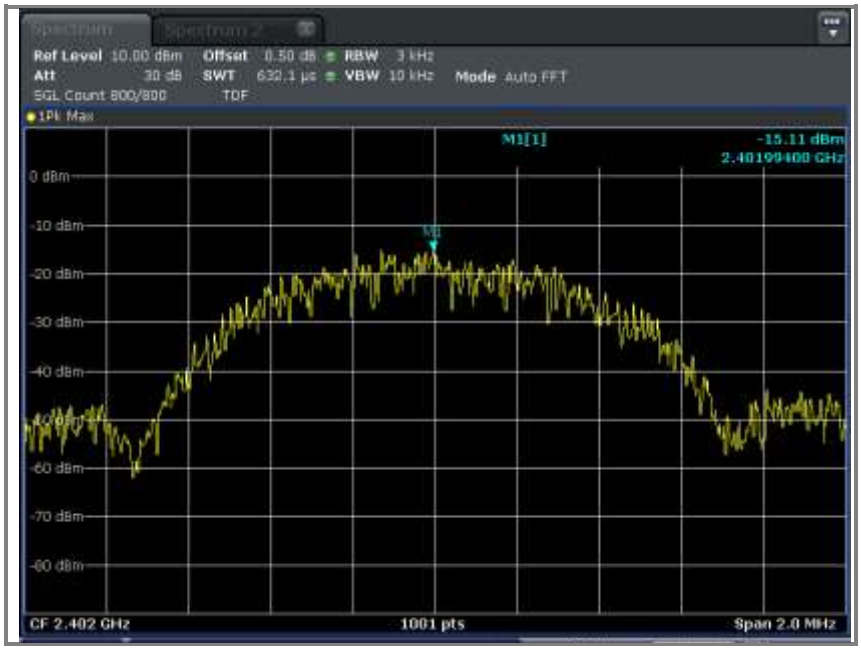
1. The RF power output was measured with a Spectrum analyzer connected to the RF Antenna connector(conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency,A spectrum analyzer was used to record the shape of the transmit signal.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using;
   Span = 1.5 times the DTS bandwidth
   RBW = 3㎑ ≤ RBW ≤100㎑
   VBW ≥ 3 x RBW,Sweep = Auto couple
   Detectorfunction = peak, Trace = max hold

### 8.4. Test results

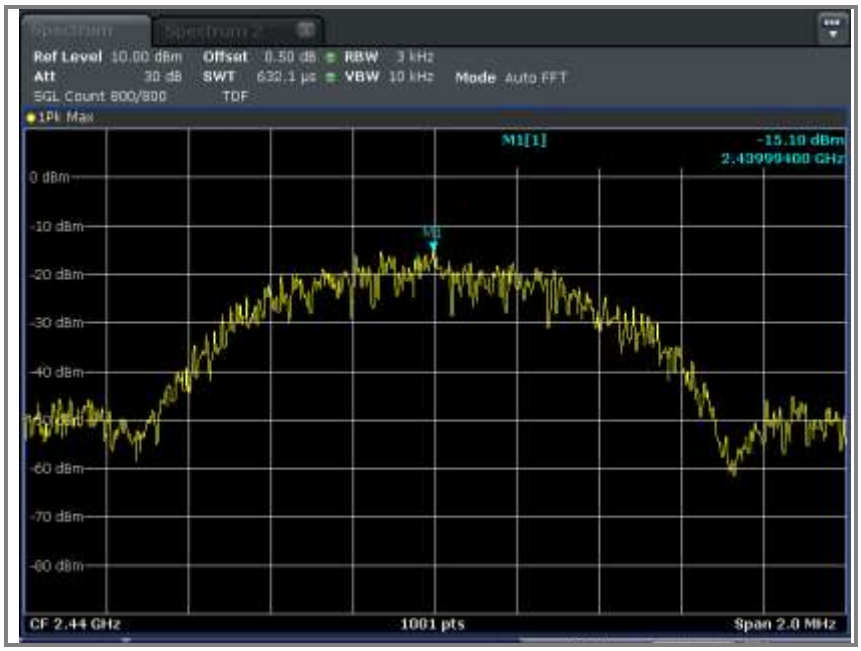
Ambient temperature: 22℃
Relative humidity: 45% R.H.

| Frequency(㎒) | Peak output power(dBm) | Limit (dBm) |
|---|---|---|
| 2 402 | -15.11 | 8 |
| 2 440 | -15.10 | |
| 2 480 | -15.01 | |

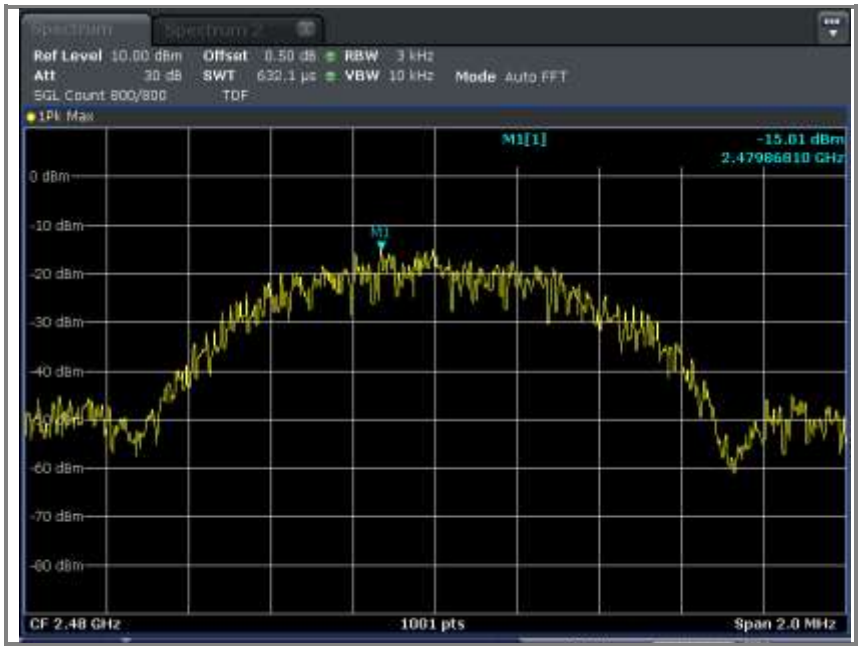
**A. Low channel(2 402 ㎒)**




**B. Middle channel(2 440 ㎒)**



**C. High channel(2 480 ㎒)**



# 9. Antenna requirement

## 9.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designedto ensure that no antenna other than that furnished by the responsible party shall be used with the device.And according to FCC 47 CFR Section §15.247 (b) if transmitting antennas of directional gain greater than 6dBi are used.

## 9.2. Antenna Connected Construction

Antenna used in this product is PCB antenna,
Antenna gain is 3.609 dBi.

## 10. RF exposure evaluation

### 10.1 RF Exposure Compliance Requirement

### 10.1.1 Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v06
4.3.1. Standalone SAR test exclusion considerations
Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

### 10.1.2 Limits

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

The SAR exclusion table from RSS-102 issue 5 is reproduced below:

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|---|---|---|---|---|---|
| | At separation distance of ≤5 mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| ≤300 | 71 mW | 101 mW | 132 mW | 162 mW | 193 mW |
| 450 | 52 mW | 70 mW | 88 mW | 106 mW | 123 mW |
| 835 | 17 mW | 30 mW | 42 mW | 55 mW | 67 mW |
| 1900 | 7 mW | 10 mW | 18 mW | 34 mW | 60 mW |
| 2450 | 4 mW | 7 mW | 15 mW | 30 mW | 52 mW |
| 3500 | 2 mW | 6 mW | 16 mW | 32 mW | 55 mW |
| 5800 | 1 mW | 6 mW | 15 mW | 27 mW | 41 mW |

| Frequency (MHz) | Exemption Limits (mW) | | | | |
|---|---|---|---|---|---|
| | At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of 50 mm |
| ≤300 | 223 mW | 254 mW | 284 mW | 315 mW | 345 mW |
| 450 | 141 mW | 159 mW | 177 mW | 195 mW | 213 mW |
| 835 | 80 mW | 92 mW | 105 mW | 117 mW | 130 mW |
| 1900 | 99 mW | 153 mW | 225 mW | 316 mW | 431 mW |
| 2450 | 83 mW | 123 mW | 173 mW | 235 mW | 309 mW |
| 3500 | 86 mW | 124 mW | 170 mW | 225 mW | 290 mW |
| 5800 | 56 mW | 71 mW | 85 mW | 97 mW | 106 mW |

### 10.1.3 EUT RF Exposure

**Operation mode: BLE**

The Max Conducted Average Output Power is 0.65dBm in Highest channel(2.480 GHz)

Target power & Tolerance
Target power:0.00 dBm Tolerance: ±1.00 dBm

1.00dBm logarithmic terms convert to numeric result is nearly 1.26 mW
According to the formula. calculate the Peak Output Power test result:

General RF Exposure = (1.26 mW / 5 mm ) x √2.480 GHz = 0.397

So the SAR report is not required.

※ **Remark**
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)]