



# FCC RADIO TEST REPORT

**FCC ID** : S9GR550  
**Equipment** : Wireless Access Point  
**Brand Name** : Ruckus  
**Model Name** : R550  
**Applicant** : Ruckus Wireless Inc.  
350 W. Java Dr., Sunnyvale CA 94089 USA  
**Manufacturer** : Ruckus Wireless Inc.  
350 W. Java Dr., Sunnyvale CA 94089 USA  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Mar. 20, 2020 and testing was started from Mar. 26, 2020 and completed on Mar. 26, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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## History of this test report

| Report No. | Version | Description                               | Issued Date   |
|------------|---------|-------------------------------------------|---------------|
| FR021504B  | 01      | Initial issue of report                   | Apr. 01, 2020 |
| FR021504B  | 02      | Revise Antenna information in section 1.1 | Apr. 16, 2020 |
|            |         |                                           |               |
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|            |         |                                           |               |
|            |         |                                           |               |
|            |         |                                           |               |

## Summary of Test Result

| Report Clause | Ref Std. Clause    | Test Items                                 | Result (PASS/FAIL) | Remark |
|---------------|--------------------|--------------------------------------------|--------------------|--------|
| 3.1           | 15.247(a)(2)       | 6dB Bandwidth                              | Pass               | -      |
| 3.1           | 2.1049             | 99% Occupied Bandwidth                     | Reporting only     | -      |
| 3.2           | 15.247(b)(3)       | Output Power                               | Pass               | -      |
| 3.3           | 15.247(e)          | Power Spectral Density                     | Pass               | -      |
| 3.4           | 15.247(d)          | Conducted Band Edges and Spurious Emission | Pass               | -      |
| 3.5           | 15.203 & 15.247(b) | Antenna Requirement                        | Pass               | -      |

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Wii Chang**

**Report Producer: Yimin Ho**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax and Zigbee

| Product Specification subjective to this standard |                                                                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Antenna Type                                      | WLAN:<br><Ant. 1> Internal Antenna<br><Ant. 2> Internal Antenna<br>Bluetooth: Metal Antenna<br>Zigbee: Metal Antenna |

## 1.2 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.3 Testing Location

|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| Test Site          | SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory                                                   |
| Test Site Location | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| Test Site No.      | Sporton Site No.                                                                                                      |
|                    | TH05-HY                                                                                                               |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

## 1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
  - ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ANSI C63.10-2013

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 2 Test Configuration of Equipment Under Test

### 2.1 Carrier Frequency Channel

| Frequency Band  | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) |
|-----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 11      | 2405           | 19      | 2445           |
|                 | 12      | 2410           | 20      | 2450           |
|                 | 13      | 2415           | 21      | 2455           |
|                 | 14      | 2420           | 22      | 2460           |
|                 | 15      | 2425           | 23      | 2465           |
|                 | 16      | 2430           | 24      | 2470           |
|                 | 17      | 2435           | 25      | 2475           |
|                 | 18      | 2440           | 26      | 2480           |

## 2.2 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases |                                 |
|-----------------------------|---------------------------------|
| Test Item                   | Data Rate / Modulation          |
|                             | 250 kbps / OQPSK                |
| Conducted Test Cases        | Mode 1: Zigbee Tx CH11_2405 MHz |
|                             | Mode 2: Zigbee Tx CH18_2440 MHz |
|                             | Mode 3: Zigbee Tx CH25_2475 MHz |

## 2.3 EUT Operation Test Setup

The RF test items, utility "PuTTY Release 0.67" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

## 2.4 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

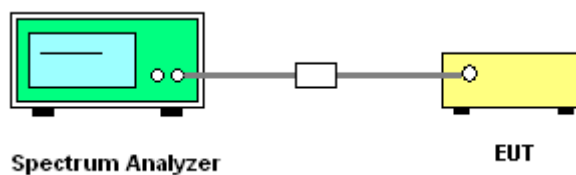
##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

##### 3.1.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW)  $\geq 3 * RBW$ .
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup

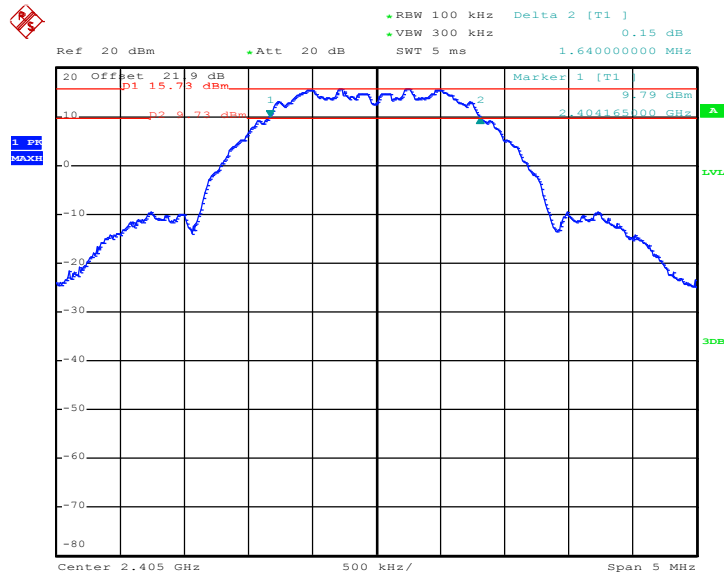




### 3.1.5 Test Result of 6dB Bandwidth

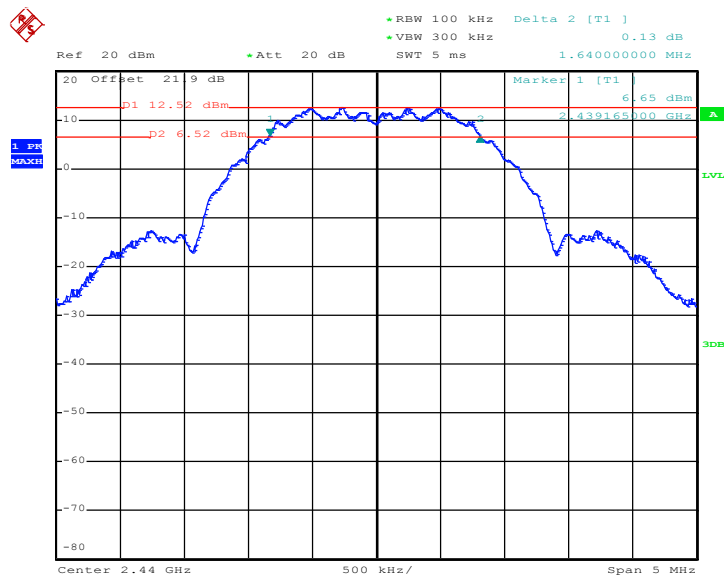
Please refer to Appendix A.

#### 6 dB Bandwidth Plot on Channel 11



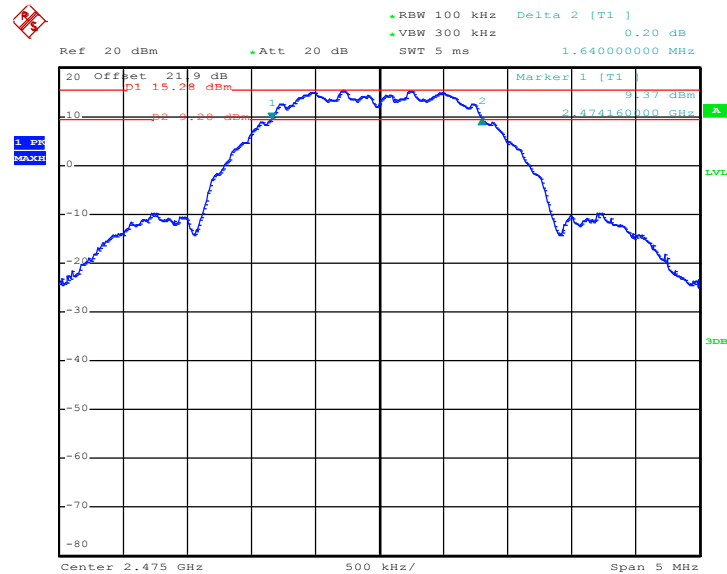
Date: 26.MAR.2020 21:35:00

#### 6 dB Bandwidth Plot on Channel 18



Date: 26.MAR.2020 22:06:07

### 6 dB Bandwidth Plot on Channel 25

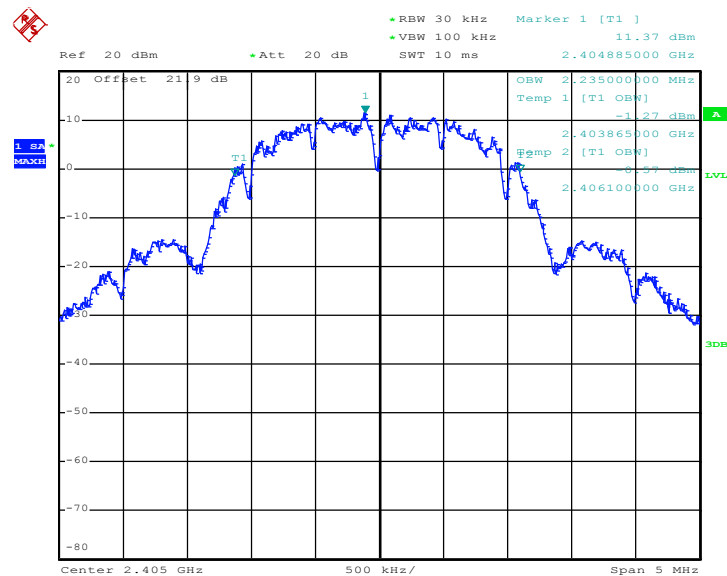


Date: 26.MAR.2020 21:48:21

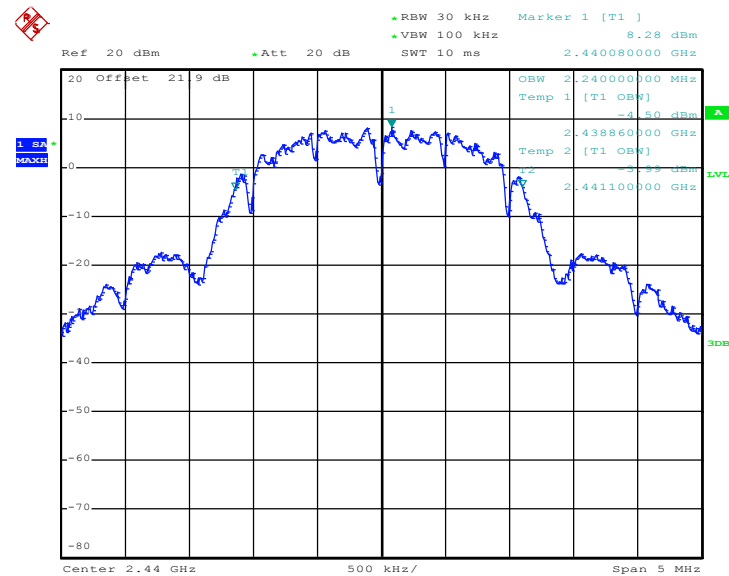
### 3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

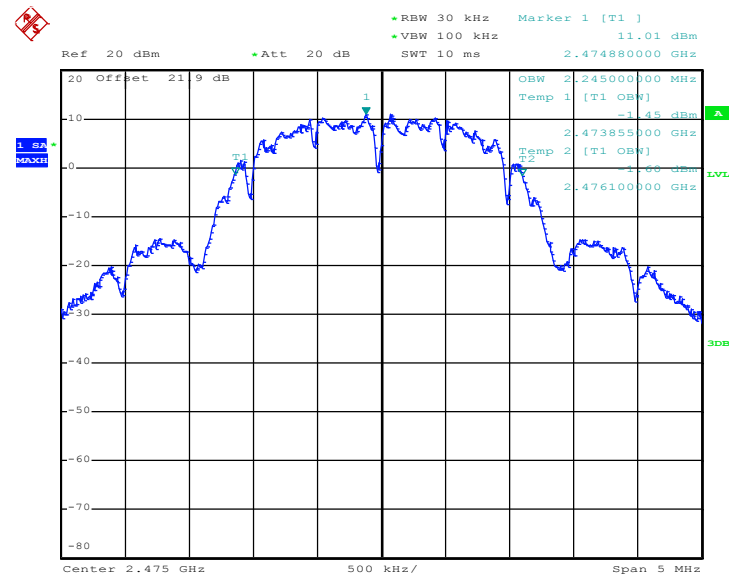
#### 99% Bandwidth Plot on Channel 11



Date: 26.MAR.2020 21:33:06

**99% Occupied Bandwidth Plot on Channel 18**


Date: 26.MAR.2020 22:04:45

**99% Occupied Bandwidth Plot on Channel 25**


Date: 26.MAR.2020 21:51:56

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

## 3.2 Output Power Measurement

### 3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

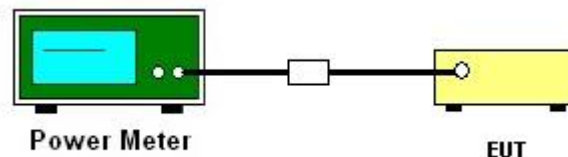
### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.2.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Average Output Power

Please refer to Appendix A.

### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

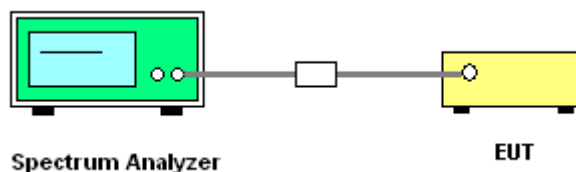
#### 3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

#### 3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

#### 3.3.4 Test Setup

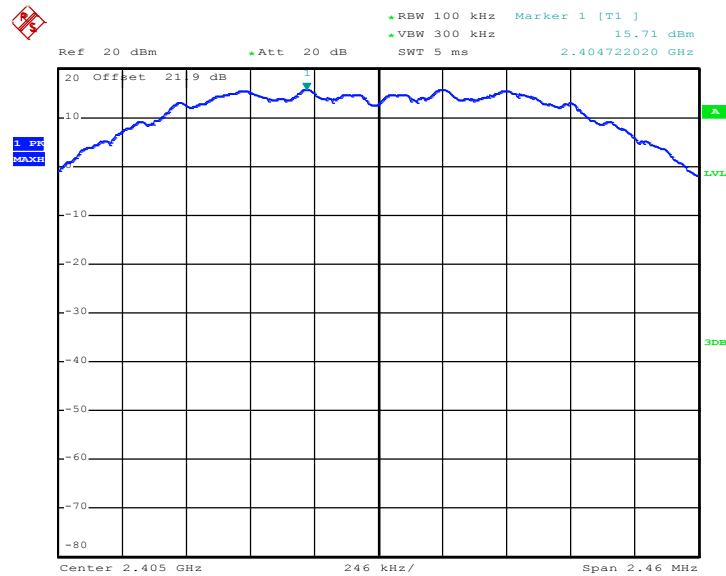


#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

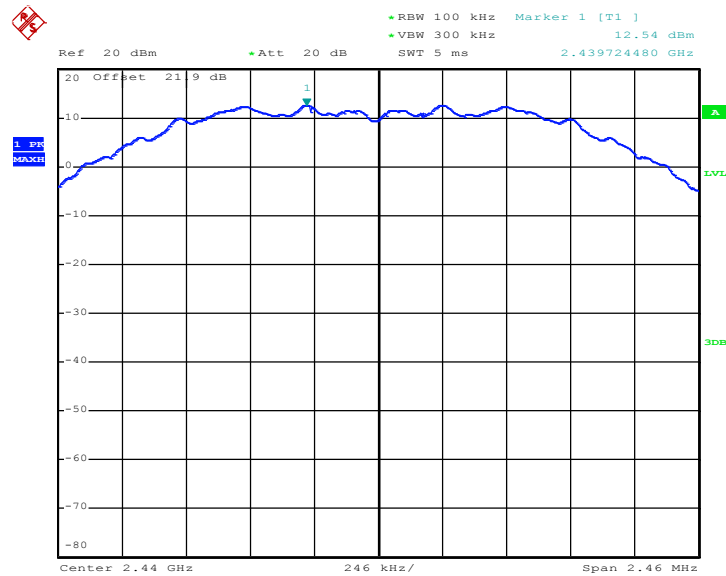
### 3.3.6 Test Result of Power Spectral Density Plots (100kHz)

**PSD 100kHz Plot on Channel 11**

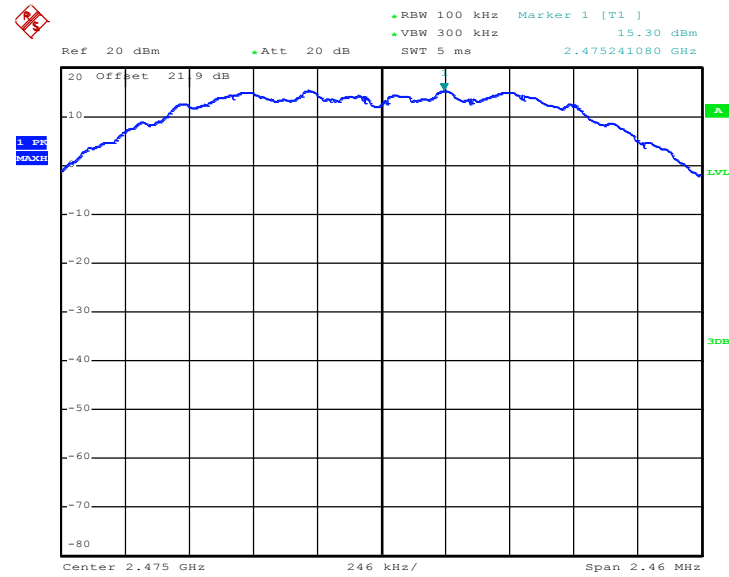


Date: 26.MAR.2020 21:36:40

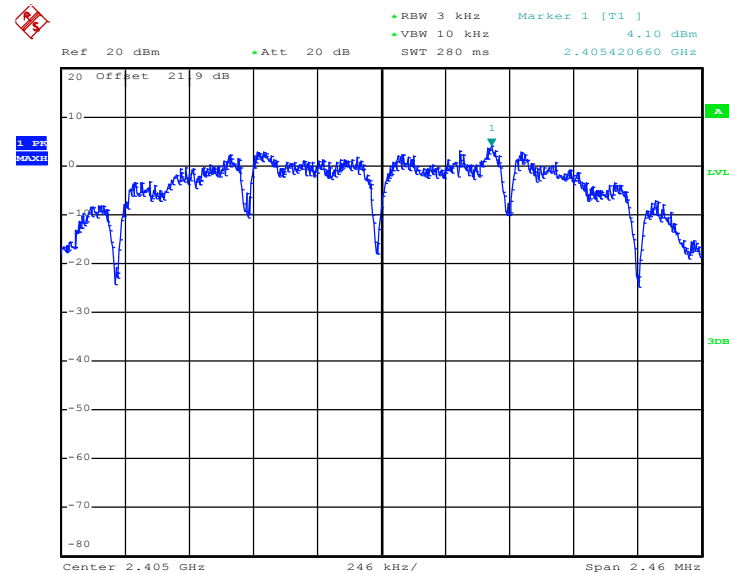
**PSD 100kHz Plot on Channel 18**



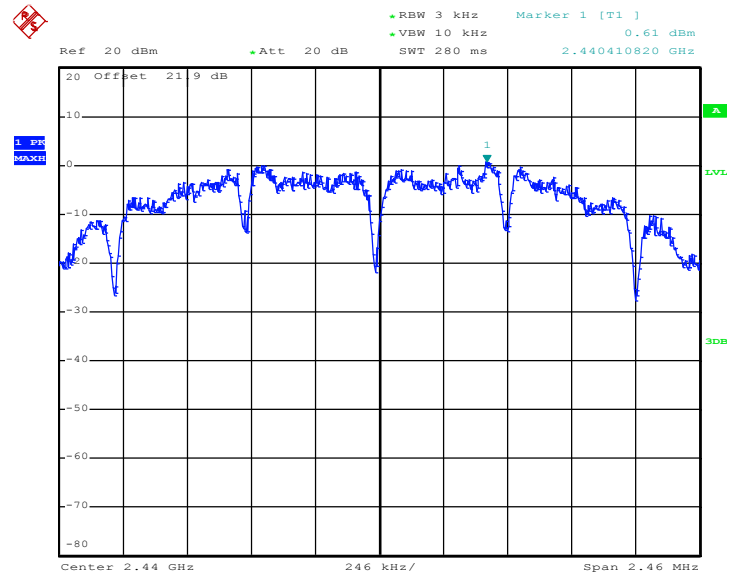
Date: 26.MAR.2020 22:08:15

**PSD 100kHz Plot on Channel 25**


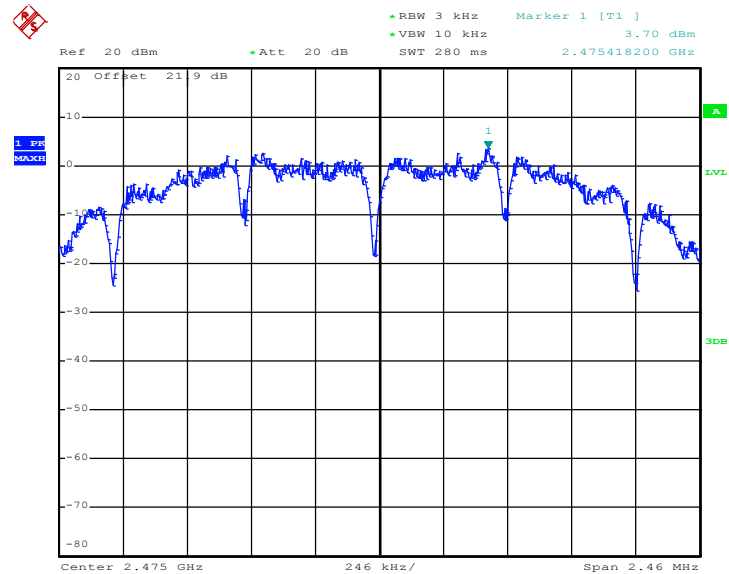
Date: 26.MAR.2020 21:49:23

**3.3.7 Test Result of Power Spectral Density Plots (3kHz)**
**PSD 3kHz Plot on Channel 11**


Date: 26.MAR.2020 21:36:00

**PSD 3kHz Plot on Channel 18**


Date: 26.MAR.2020 22:06:58

**PSD 3kHz Plot on Channel 25**


Date: 26.MAR.2020 21:48:47

### 3.4 Conducted Band Edges and Spurious Emission Measurement

#### 3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

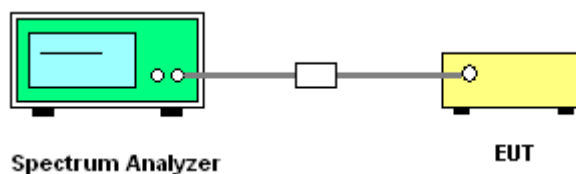
#### 3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

#### 3.4.3 Test Procedure

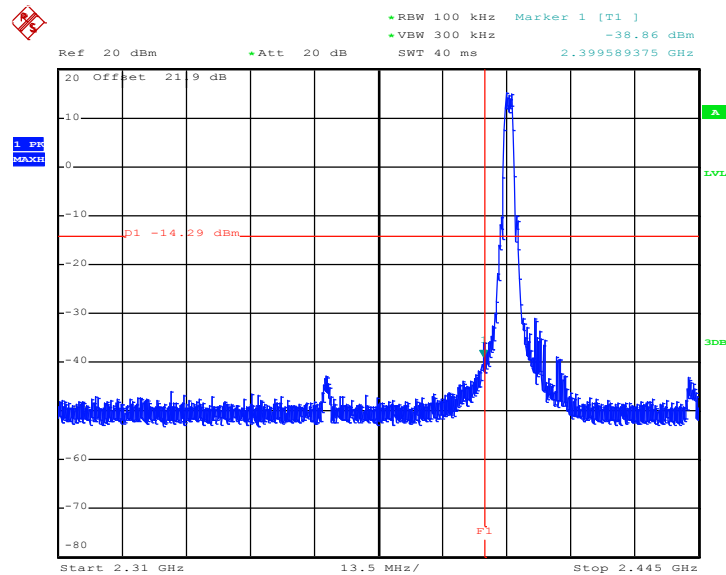
1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

#### 3.4.4 Test Setup



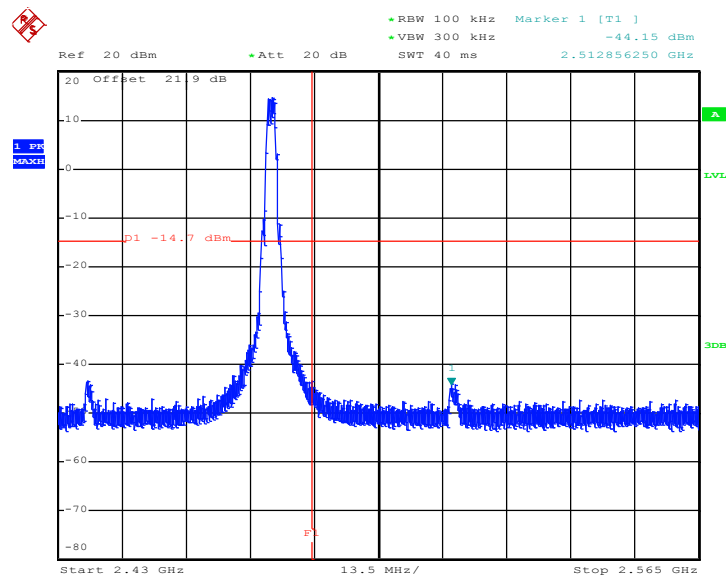
### 3.4.5 Test Result of Conducted Band Edges Plots

### Low Band Edge Plot on Channel 11



Date: 26.MAR.2020 21:37:05

### High Band Edge Plot on Channel 25

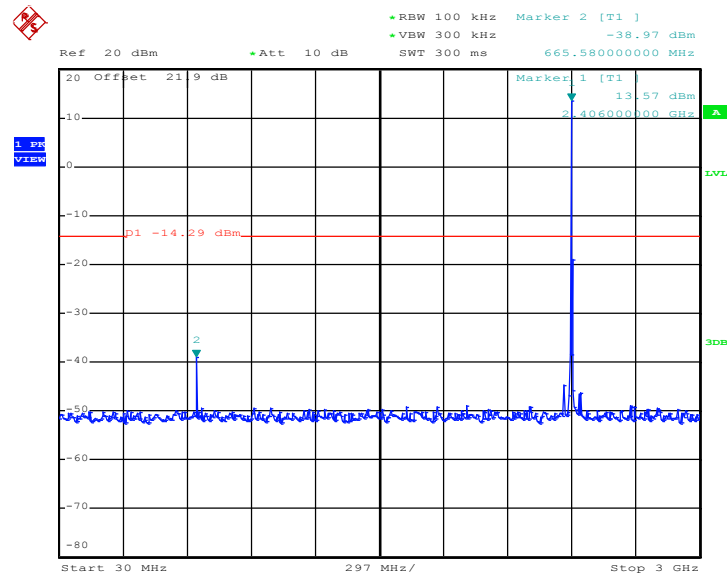


Date: 26.MAR.2020 21:49:46



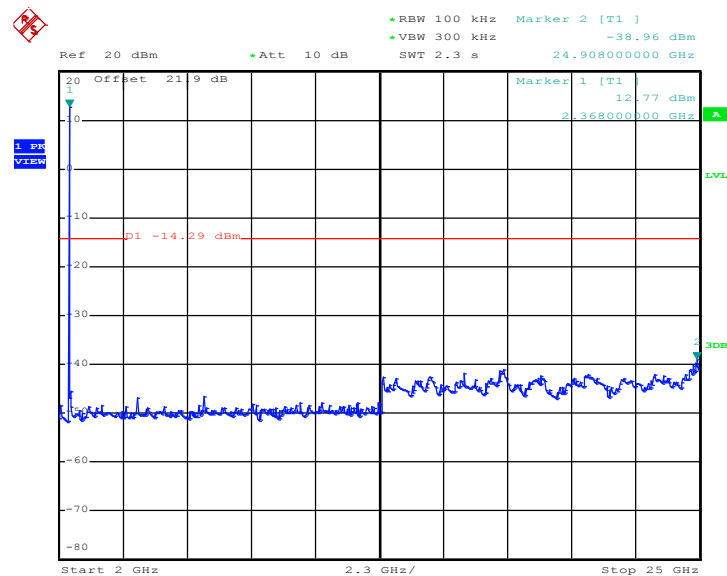
### 3.4.6 Test Result of Conducted Spurious Emission Plots

#### Conducted Spurious Emission Plot on Zigbee Channel 11

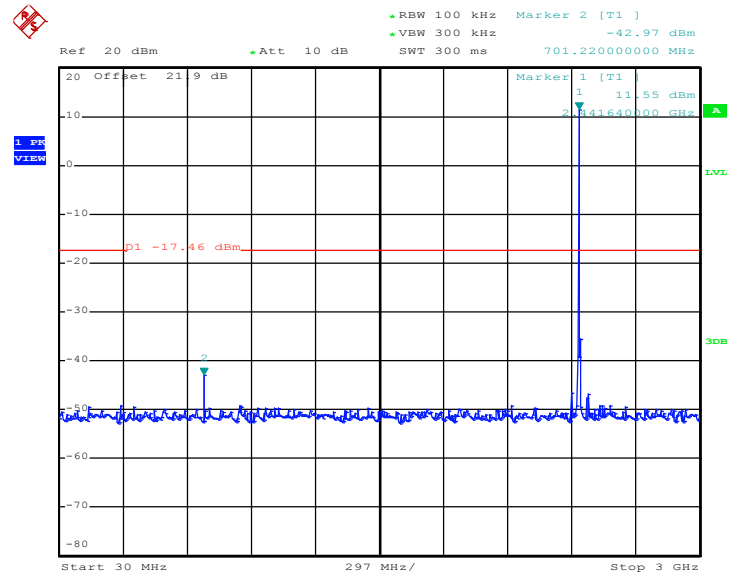


Date: 26.MAR.2020 21:37:23

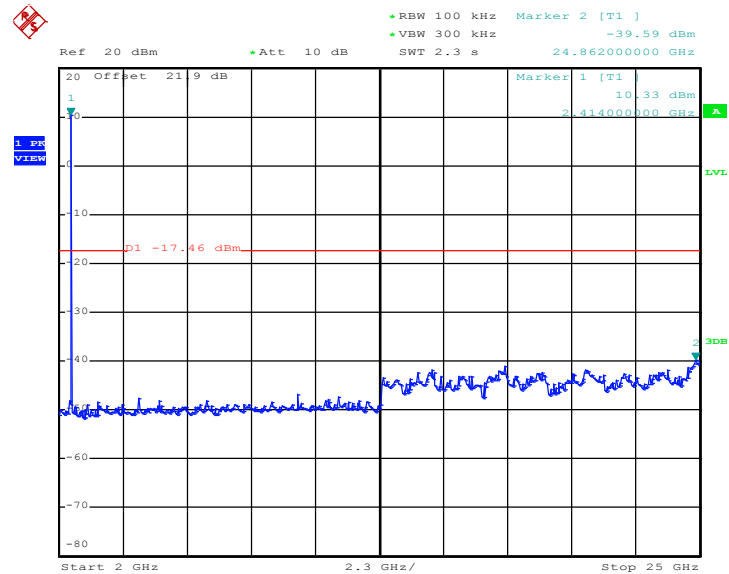
#### Conducted Spurious Emission Plot on Zigbee Channel 11



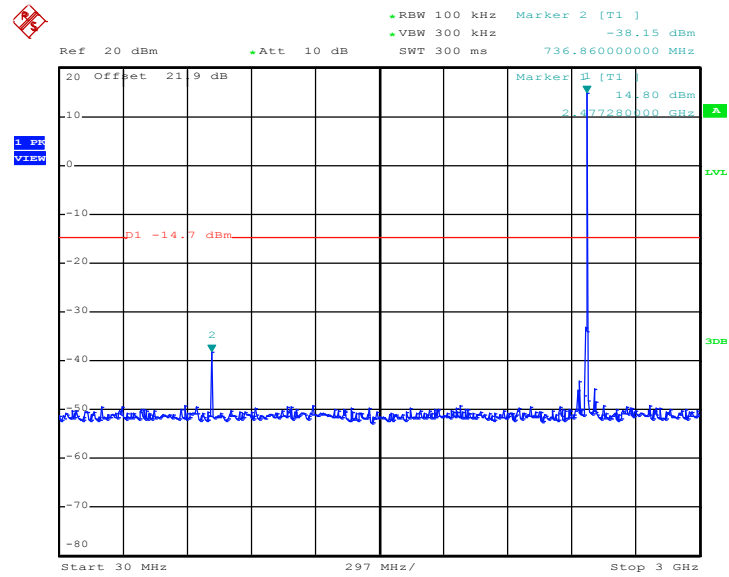
Date: 26.MAR.2020 21:37:41

**Conducted Spurious Emission Plot on Zigbee Channel 18**


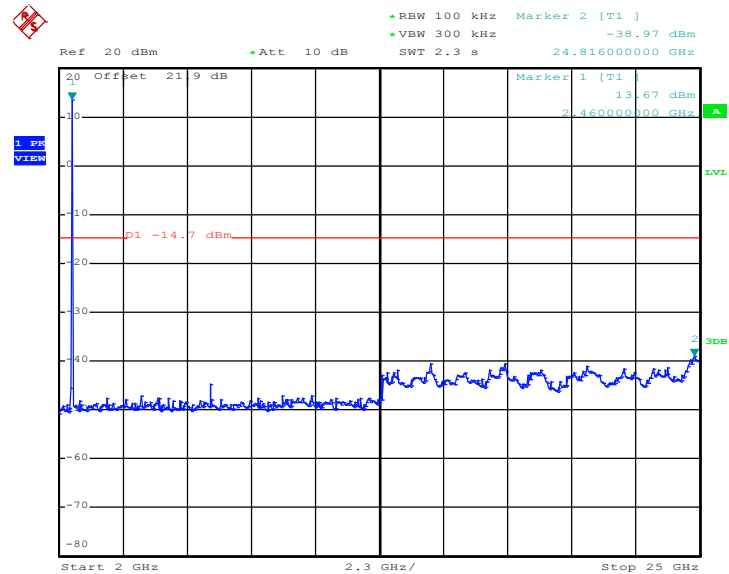
Date: 26.MAR.2020 22:09:35

**Conducted Spurious Emission Plot on Zigbee Channel 18**


Date: 26.MAR.2020 22:09:55

**Conducted Spurious Emission Plot on Zigbee Channel 25**


Date: 26.MAR.2020 21:50:22

**Conducted Spurious Emission Plot on Zigbee Channel 25**


Date: 26.MAR.2020 21:51:26



## **3.5 Antenna Requirements**

### **3.5.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

### **3.5.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.5.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

| Instrument              | Manufacturer    | Model No.  | Serial No.        | Characteristics | Calibration Date | Test Date     | Due Date      | Remark              |
|-------------------------|-----------------|------------|-------------------|-----------------|------------------|---------------|---------------|---------------------|
| Hygrometer              | Testo           | 608-H2     | 41410069          | N/A             | Jun. 17, 2019    | Mar. 26, 2020 | Jun. 16, 2020 | Conducted (TH05-HY) |
| Power Sensor            | DARE            | RPR3006W   | 16I00054S<br>NO10 | 10MHz~6GHz      | Dec. 23, 2019    | Mar. 26, 2020 | Dec. 22, 2020 | Conducted (TH05-HY) |
| Signal Analyzer         | Rohde & Schwarz | FSV40      | 101566            | 10Hz~40GHz      | Jul. 15, 2019    | Mar. 26, 2020 | Jul. 14, 2020 | Conducted (TH05-HY) |
| Spectrum Analyzer       | Rohde & Schwarz | FSP40      | 100055            | 9kHz~40GHz      | Aug. 14, 2019    | Mar. 26, 2020 | Aug. 13, 2020 | Conducted (TH05-HY) |
| Switch Control Manframe | E-IUSTRUMENT    | ETF-1405-0 | EC190006<br>7     | N/A             | Aug. 15, 2019    | Mar. 26, 2020 | Aug. 14, 2020 | Conducted (TH05-HY) |

**Appendix A. Test Result of Conducted Test Items**

|                |           |                    |       |    |
|----------------|-----------|--------------------|-------|----|
| Test Engineer: | Kai Liao  | Temperature:       | 21~25 | °C |
| Test Date:     | 2020/3/26 | Relative Humidity: | 51~54 | %  |

**TEST RESULTS DATA**  
**6dB and 99% Occupied Bandwidth**

| Mod.   | Data Rate | NTX | CH. | Freq. (MHz) | 99% Occupied BW (MHz) | 6dB BW (MHz) | 6dB BW Limit (MHz) | Pass/Fail |
|--------|-----------|-----|-----|-------------|-----------------------|--------------|--------------------|-----------|
| Zigbee | 250K      | 1   | 11  | 2405        | 2.235                 | 1.640        | 0.50               | Pass      |
| Zigbee | 250K      | 1   | 18  | 2440        | 2.240                 | 1.640        | 0.50               | Pass      |
| Zigbee | 250K      | 1   | 25  | 2475        | 2.245                 | 1.640        | 0.50               | Pass      |

**TEST RESULTS DATA**  
**Average Power Table**

| Mod.   | Data Rate | NTX | CH. | Freq. (MHz) | Average Conducted Power (dBm) | Conducted Power Limit (dBm) | DG (dBi) | EIRP Power (dBm) | EIRP Power Limit (dBm) | Pass /Fail |
|--------|-----------|-----|-----|-------------|-------------------------------|-----------------------------|----------|------------------|------------------------|------------|
| Zigbee | 250K      | 1   | 11  | 2405        | 19.60                         | 30.00                       | 1.00     | 20.60            | 36.00                  | Pass       |
| Zigbee | 250K      | 1   | 18  | 2440        | 16.40                         | 30.00                       | 1.00     | 17.40            | 36.00                  | Pass       |
| Zigbee | 250K      | 1   | 25  | 2475        | 19.20                         | 30.00                       | 1.00     | 20.20            | 36.00                  | Pass       |

**TEST RESULTS DATA**  
**Peak Power Density**

| Mod.   | Data Rate | NTX | CH. | Freq. (MHz) | Peak PSD (dBm /100kHz) | Peak PSD (dBm /3kHz) | DG (dBi) | Peak PSD Limit (dBm /3kHz) | Pass/Fail |
|--------|-----------|-----|-----|-------------|------------------------|----------------------|----------|----------------------------|-----------|
| Zigbee | 250K      | 1   | 11  | 2405        | 15.71                  | 4.10                 | 1.00     | 8.00                       | Pass      |
| Zigbee | 250K      | 1   | 18  | 2440        | 12.54                  | 0.61                 | 1.00     | 8.00                       | Pass      |
| Zigbee | 250K      | 1   | 25  | 2475        | 15.30                  | 3.70                 | 1.00     | 8.00                       | Pass      |

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.