

# TEST REPORT

Reference No..... : WTS16S0756079E  
FCC ID ..... : 2AENE-ES160630  
Applicant..... : ENTERTAINMENT SOLUTIONS S.L.U.  
Address..... : P.E. MIRAFLORES NAVE 3 - CTRA CASTELLON KM 5.25 (50720)  
ZARAGOZA  
Manufacturer ..... : ENTERTAINMENT SOLUTIONS S.L.U.  
Address..... : P.E. MIRAFLORES NAVE 3 - CTRA CASTELLON KM 5.25 (50720)  
ZARAGOZA  
Product Name..... : Set Top Box  
Model No..... : ESTB-Qpd  
Standards..... : FCC CFR47 Part 15 C Section 15.247:2015  
Date of Receipt sample .... : Jul. 18, 2016  
Date of Test ..... : Jul. 20 - 27, 2016  
Date of Issue..... : Jul. 28, 2016  
Test Result..... : Pass \*

**\*Remarks:**

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**

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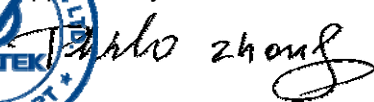
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Compiled by:



Zero Zhou / Test Engineer

Approved by:



Philo Zhong / Manager

## 2 Test Summary

| Test Items                                                        | Test Requirement       | Result |
|-------------------------------------------------------------------|------------------------|--------|
| Radiated Emissions                                                | 15.205(a)<br>15.209(a) | PASS   |
| Conducted Emissions                                               | 15.207(a)              | PASS   |
| Bandwidth                                                         | 15.247(a)(2)           | PASS   |
| Maximum Peak Output Power                                         | 15.247(b)(3),(4)       | PASS   |
| Power Spectral Density                                            | 15.247(e)              | PASS   |
| Band Edge                                                         | 15.247(d)              | PASS   |
| Antenna Requirement                                               | 15.203                 | PASS   |
| Maximum Permissible Exposure<br>(Exposure of Humans to RF Fields) | 1.1307(b)(1)           | PASS   |

### 3 Contents

|                                                               | Page      |
|---------------------------------------------------------------|-----------|
| <b>1 COVER PAGE.....</b>                                      | <b>1</b>  |
| <b>2 TEST SUMMARY .....</b>                                   | <b>2</b>  |
| <b>3 CONTENTS .....</b>                                       | <b>3</b>  |
| <b>4 GENERAL INFORMATION.....</b>                             | <b>5</b>  |
| 4.1 GENERAL DESCRIPTION OF E.U.T. ....                        | 5         |
| 4.2 DETAILS OF E.U.T. ....                                    | 5         |
| 4.3 CHANNEL LIST .....                                        | 5         |
| 4.4 TEST MODE .....                                           | 6         |
| 4.5 TEST FACILITY .....                                       | 6         |
| <b>5 EQUIPMENT USED DURING TEST .....</b>                     | <b>7</b>  |
| 5.1 EQUIPMENTS LIST .....                                     | 7         |
| 5.2 MEASUREMENT UNCERTAINTY .....                             | 8         |
| 5.3 TEST EQUIPMENT CALIBRATION .....                          | 8         |
| <b>6 CONDUCTED EMISSION .....</b>                             | <b>9</b>  |
| 6.1 E.U.T. OPERATION .....                                    | 9         |
| 6.2 EUT SETUP .....                                           | 9         |
| 6.3 MEASUREMENT DESCRIPTION .....                             | 9         |
| 6.4 CONDUCTED EMISSION TEST RESULT .....                      | 10        |
| <b>7 RADIATED EMISSIONS.....</b>                              | <b>14</b> |
| 7.1 EUT OPERATION.....                                        | 14        |
| 7.2 TEST SETUP .....                                          | 15        |
| 7.3 SPECTRUM ANALYZER SETUP .....                             | 16        |
| 7.4 TEST PROCEDURE .....                                      | 17        |
| 7.5 SUMMARY OF TEST RESULTS .....                             | 18        |
| <b>8 BAND EDGE MEASUREMENT .....</b>                          | <b>30</b> |
| 8.1 TEST PRODUCE .....                                        | 30        |
| 8.2 TEST RESULT .....                                         | 31        |
| <b>9 BANDWIDTH MEASUREMENT.....</b>                           | <b>35</b> |
| 9.1 TEST PROCEDURE .....                                      | 35        |
| 9.2 TEST RESULT: .....                                        | 35        |
| <b>10 MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER .....</b>      | <b>42</b> |
| 10.1 TEST PROCEDURE.....                                      | 42        |
| 10.2 TEST RESULT .....                                        | 42        |
| <b>11 POWER SPECTRAL DENSITY .....</b>                        | <b>49</b> |
| 11.1 TEST PROCEDURE.....                                      | 49        |
| 11.2 TEST RESULT .....                                        | 49        |
| <b>12 ANTENNA REQUIREMENT .....</b>                           | <b>56</b> |
| <b>13 RF EXPOSURE.....</b>                                    | <b>57</b> |
| 13.1 REQUIREMENTS.....                                        | 57        |
| 13.2 THE PROCEDURES / LIMIT .....                             | 57        |
| 13.3 MPE CALCULATION METHOD .....                             | 58        |
| <b>14 PHOTOGRAPHS –MODEL ESTB-QPD TEST SETUP PHOTOS .....</b> | <b>59</b> |

14.1 PHOTOGRAPH – RADIATED EMISSION ..... 59

14.2 PHOTOGRAPH – CONDUCTED EMISSION TEST SETUP AT TEST SITE 2# ..... 62

**15 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS ..... 63**

15.1 MODEL ESTB-QPD - EXTERNAL PHOTOS..... 63

15.2 MODEL ESTB-QPD - INTERNAL PHOTOS ..... 69

## 4 General Information

### 4.1 General Description of E.U.T.

Product Name: Set Top Box

Model No.: ESTB-Qpd

Model Difference: N/A

Operation Frequency: 802.11b/g/n HT20: 2412MHz ~ 2462MHz,  
802.11n HT40: 2422MHz~2452MHz

The lowest oscillator: 32.768KHz

Antenna Gain: 2dBi

Type of modulation: IEEE 802.11b (CCK/QPSK/BPSK,11Mbps max.)  
IEEE 802.11g (BPSK/QPSK/16QAM/64QAM,54Mbps max.)  
IEEE 802.11n (BPSK/QPSK/16QAM/64QAM,HT20:72Mbps max.,  
HT40:150Mbps max.)

### 4.2 Details of E.U.T.

Technical Data: (Adapter 1 Input: 100-240VAC 50/60Hz, 0.3A  
Output: DC 12V, 1000mA)  
(Adapter 2 Input: 100-240VAC 50/60Hz, 0.35A  
Output: DC 5V, 2000mA)

Adapter 1: : Manufacturer: QIAN FU DA ELECTRON CO., LTD  
Model No.: QFD015-120100

Adapter 2: : Manufacturer: SHENZHEN KEYU POWER SUPPLY ECHNOLOGY  
CO., LTD  
Model No.: KA23-0502000DES

### 4.3 Channel List

| Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) | Channel No. | Frequency (MHz) |
|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| 1           | 2412            | 2           | 2417            | 3           | 2422            | 4           | 2427            |
| 5           | 2432            | 6           | 2437            | 7           | 2442            | 8           | 2447            |
| 9           | 2452            | 10          | 2457            | 11          | 2462            | 12          | -               |

#### 4.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

| Test Items                     | Mode         | Data Rate | Channel | TX/RX |
|--------------------------------|--------------|-----------|---------|-------|
| Maximum Peak Output Power      | 802.11b      | 11 Mbps   | 1/6/11  | TX    |
|                                | 802.11g      | 54 Mbps   | 1/6/11  | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/6/11  | TX    |
|                                | 802.11n HT40 | 150 Mbps  | 3/6/9   | TX    |
| Power Spectral Density         | 802.11b      | 11 Mbps   | 1/6/11  | TX    |
|                                | 802.11g      | 54 Mbps   | 1/6/11  | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/6/11  | TX    |
|                                | 802.11n HT40 | 150 Mbps  | 3/6/9   | TX    |
| Frequency Range                | 802.11b      | 11 Mbps   | 1/11    | TX    |
|                                | 802.11g      | 54 Mbps   | 1/11    | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/11    | TX    |
|                                | 802.11n HT40 | 150 Mbps  | 3/6/9   | TX    |
| Transmitter Spurious Emissions | 802.11b      | 11 Mbps   | 1/6/11  | TX    |
|                                | 802.11g      | 54 Mbps   | 1/6/11  | TX    |
|                                | 802.11n HT20 | 108 Mbps  | 1/6/11  | TX    |
|                                | 802.11n HT40 | 150 Mbps  | 3/6/9   | TX    |

**Note** :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

#### 4.5 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**  
Waltek Services(Shenzhen) Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files.  
Registration number 7760A-1, October 15, 2015.
- **FCC Test Site 1#– Registration No.: 880581**  
Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, April 29, 2014.
- **FCC Test Site 2#– Registration No.: 328995**  
Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 328995, December 3, 2014.

## 5 Equipment Used during Test

### 5.1 Equipments List

| Conducted Emissions Test Site 1#                              |                            |                      |              |                 |                       |                      |
|---------------------------------------------------------------|----------------------------|----------------------|--------------|-----------------|-----------------------|----------------------|
| Item                                                          | Equipment                  | Manufacturer         | Model No.    | Serial No.      | Last Calibration Date | Calibration Due Date |
| 1.                                                            | EMI Test Receiver          | R&S                  | ESCI         | 100947          | Sep.15,2015           | Sep.14,2016          |
| 2.                                                            | LISN                       | R&S                  | ENV216       | 101215          | Sep.15,2015           | Sep.14,2016          |
| 3.                                                            | Cable                      | Top                  | TYPE16(3.5M) | -               | Sep.15,2015           | Sep.14,2016          |
| Conducted Emissions Test Site 2#                              |                            |                      |              |                 |                       |                      |
| Item                                                          | Equipment                  | Manufacturer         | Model No.    | Serial No.      | Last Calibration Date | Calibration Due Date |
| 1.                                                            | EMI Test Receiver          | R&S                  | ESCI         | 101155          | Sep.15,2015           | Sep.14,2016          |
| 2.                                                            | LISN                       | SCHWARZBECK          | NSLK 8128    | 8128-289        | Sep.15,2015           | Sep.14,2016          |
| 3.                                                            | Limiter                    | York                 | MTS-IMP-136  | 261115-001-0024 | Sep.15,2015           | Sep.14,2016          |
| 4.                                                            | Cable                      | LARGE                | RF300        | -               | Sep.15,2015           | Sep.14,2016          |
| 3m Semi-anechoic Chamber for Radiation Emissions Test site 1# |                            |                      |              |                 |                       |                      |
| Item                                                          | Equipment                  | Manufacturer         | Model No.    | Serial No.      | Last Calibration Date | Calibration Due Date |
| 1                                                             | EMC Analyzer               | Agilent              | E7405A       | MY45114943      | Sep.15,2015           | Sep.14,2016          |
| 2                                                             | Active Loop Antenna        | Beijing Dazhi        | ZN30900A     | -               | Sep.15,2015           | Sep.14,2016          |
| 3                                                             | Trilog Broadband Antenna   | SCHWARZBECK          | VULB9163     | 336             | Sep.15,2015           | Sep.14,2016          |
| 4                                                             | Coaxial Cable (below 1GHz) | Top                  | TYPE16(13M)  | -               | Sep.15,2015           | Sep.14,2016          |
| 5                                                             | Broad-band Horn Antenna    | SCHWARZBECK          | BBHA 9120 D  | 667             | Apr.19,2016           | Apr.18,2017          |
| 6                                                             | Broad-band Horn Antenna    | SCHWARZBECK          | BBHA 9170    | 335             | Apr.19,2016           | Apr.18,2017          |
| 7                                                             | Broadband Preamplifier     | COMPLIANCE DIRECTION | PAP-1G18     | 2004            | Sep.15,2015           | Sep.14,2016          |
| 8                                                             | Coaxial Cable (above 1GHz) | Top                  | 1GHz-25GHz   | EW02014-7       | Sep.15,2015           | Sep.14,2016          |
| 3m Semi-anechoic Chamber for Radiation Emissions Test site 2# |                            |                      |              |                 |                       |                      |
| Item                                                          | Equipment                  | Manufacturer         | Model No.    | Serial No       | Last Calibration Date | Calibration Due Date |
| 1                                                             | Test Receiver              | R&S                  | ESCI         | 101296          | Sep.15,2015           | Sep.14,2016          |
| 2                                                             | Trilog Broadband Antenna   | SCHWARZBECK          | VULB9160     | 9160-3325       | Sep.15,2015           | Sep.14,2016          |
| 3                                                             | Amplifier                  | Compliance pirection | PAP-0203     | 22024           | Sep.15,2015           | Sep.14,2016          |

|                             |                                 | systems inc  |           |            |                       |                      |
|-----------------------------|---------------------------------|--------------|-----------|------------|-----------------------|----------------------|
| 4                           | Cable                           | HUBER+SUHNER | CBL2      | 525178     | Sep.15,2015           | Sep.14,2016          |
| <b>RF Conducted Testing</b> |                                 |              |           |            |                       |                      |
| Item                        | Equipment                       | Manufacturer | Model No. | Serial No. | Last Calibration Date | Calibration Due Date |
| 1.                          | EMC Analyzer<br>(9k~26.5GHz)    | Agilent      | E7405A    | MY45114943 | Sep.15,2015           | Sep.14,2016          |
| 2.                          | Spectrum Analyzer<br>(9k-6GHz)  | R&S          | FSL6      | 100959     | Sep.15,2015           | Sep.14,2016          |
| 3.                          | Signal Analyzer<br>(9k~26.5GHz) | Agilent      | N9010A    | MY50520207 | Sep.15,2015           | Sep.14,2016          |

## 5.2 Measurement Uncertainty

| Parameter                         | Uncertainty                                 |
|-----------------------------------|---------------------------------------------|
| Radio Frequency                   | $\pm 1 \times 10^{-6}$                      |
| RF Power                          | $\pm 1.0$ dB                                |
| RF Power Density                  | $\pm 2.2$ dB                                |
| Radiated Spurious Emissions test  | $\pm 5.03$ dB (Bilog antenna 30M~1000MHz)   |
|                                   | $\pm 4.74$ dB (Horn antenna 1000M~25000MHz) |
| Conducted Spurious Emissions test | $\pm 3.64$ dB (AC mains 150KHz~30MHz)       |

## 5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

## 6 Conducted Emission

|                   |                                                                                                                        |
|-------------------|------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC CFR 47 Part 15 Section 15.207                                                                                      |
| Test Method:      | ANSI C63.10:2013                                                                                                       |
| Test Result:      | PASS                                                                                                                   |
| Frequency Range:  | 150kHz to 30MHz                                                                                                        |
| Class/Severity:   | Class B                                                                                                                |
| Limit:            | 66-56 dB $\mu$ V between 0.15MHz & 0.5MHz<br>56 dB $\mu$ V between 0.5MHz & 5MHz<br>60 dB $\mu$ V between 5MHz & 30MHz |
| Detector:         | Peak for pre-scan (9kHz Resolution Bandwidth)                                                                          |

### 6.1 E.U.T. Operation

Operating Environment :

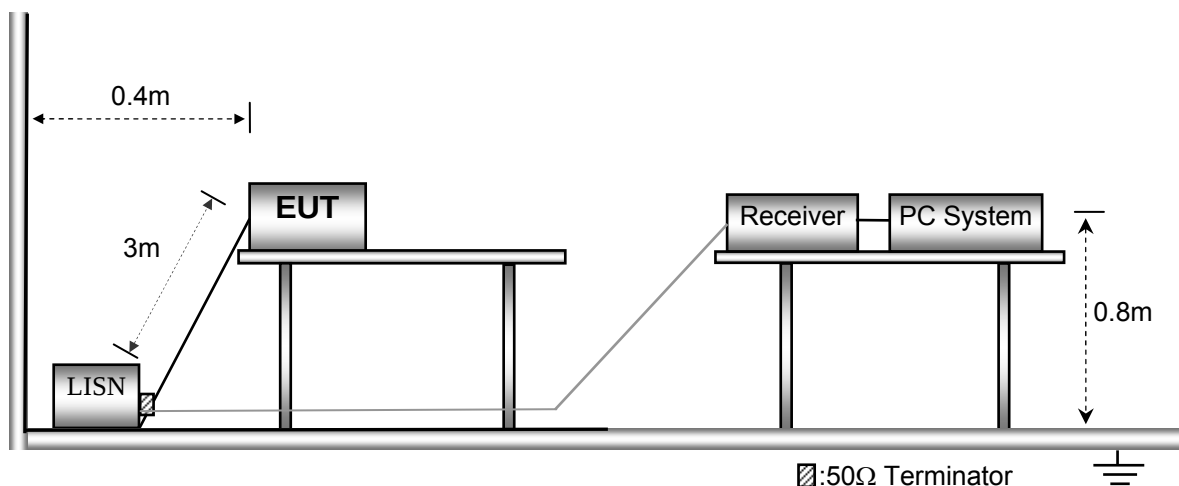
|                       |          |
|-----------------------|----------|
| Temperature:          | 25.5 °C  |
| Humidity:             | 51 % RH  |
| Atmospheric Pressure: | 101.2kPa |

EUT Operation :

The test was performed in Transmitting mode, the test data were shown in the report.

### 6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



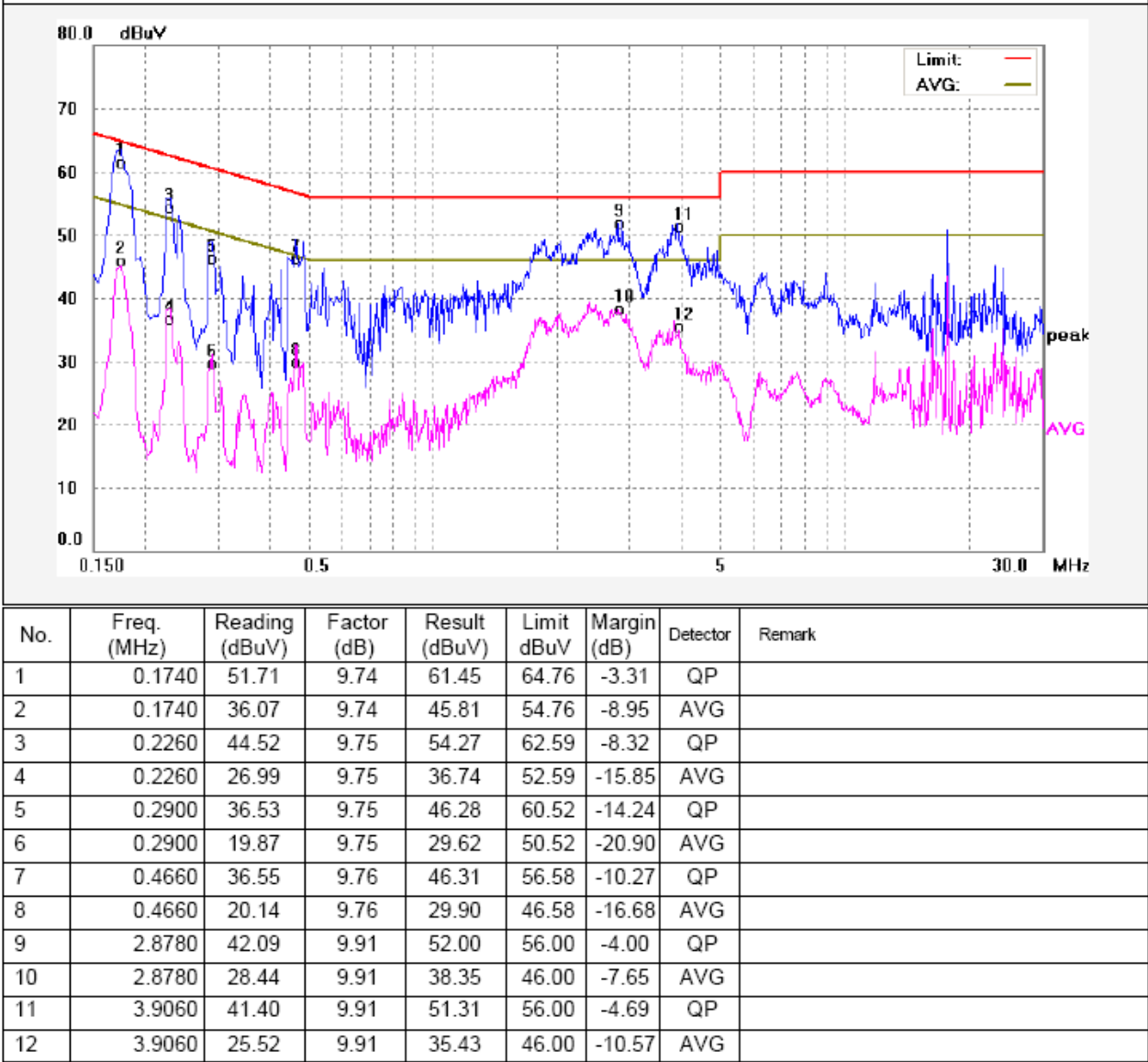
### 6.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

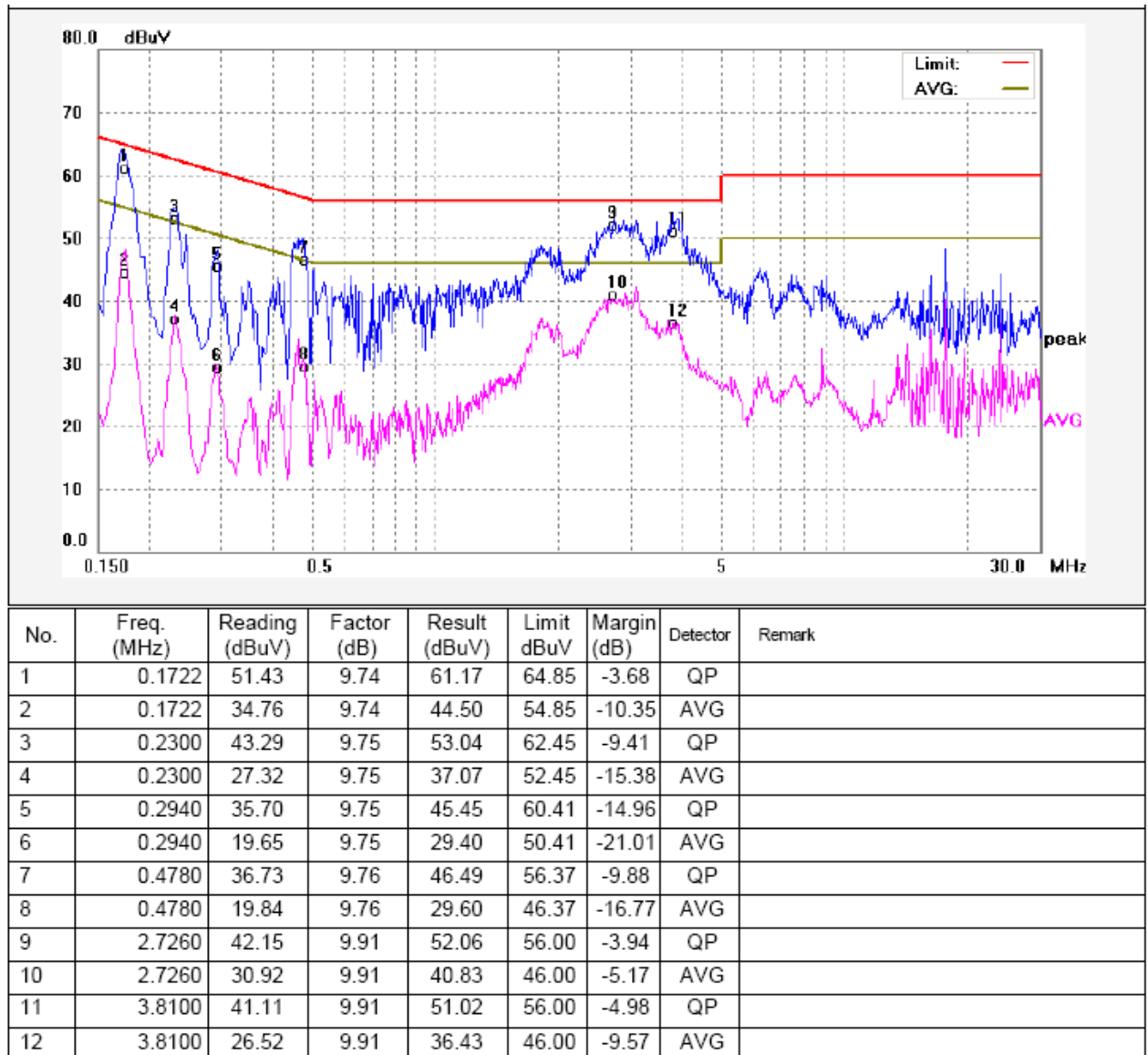
6.4 Conducted Emission Test Result

Adapter 1

Live line:

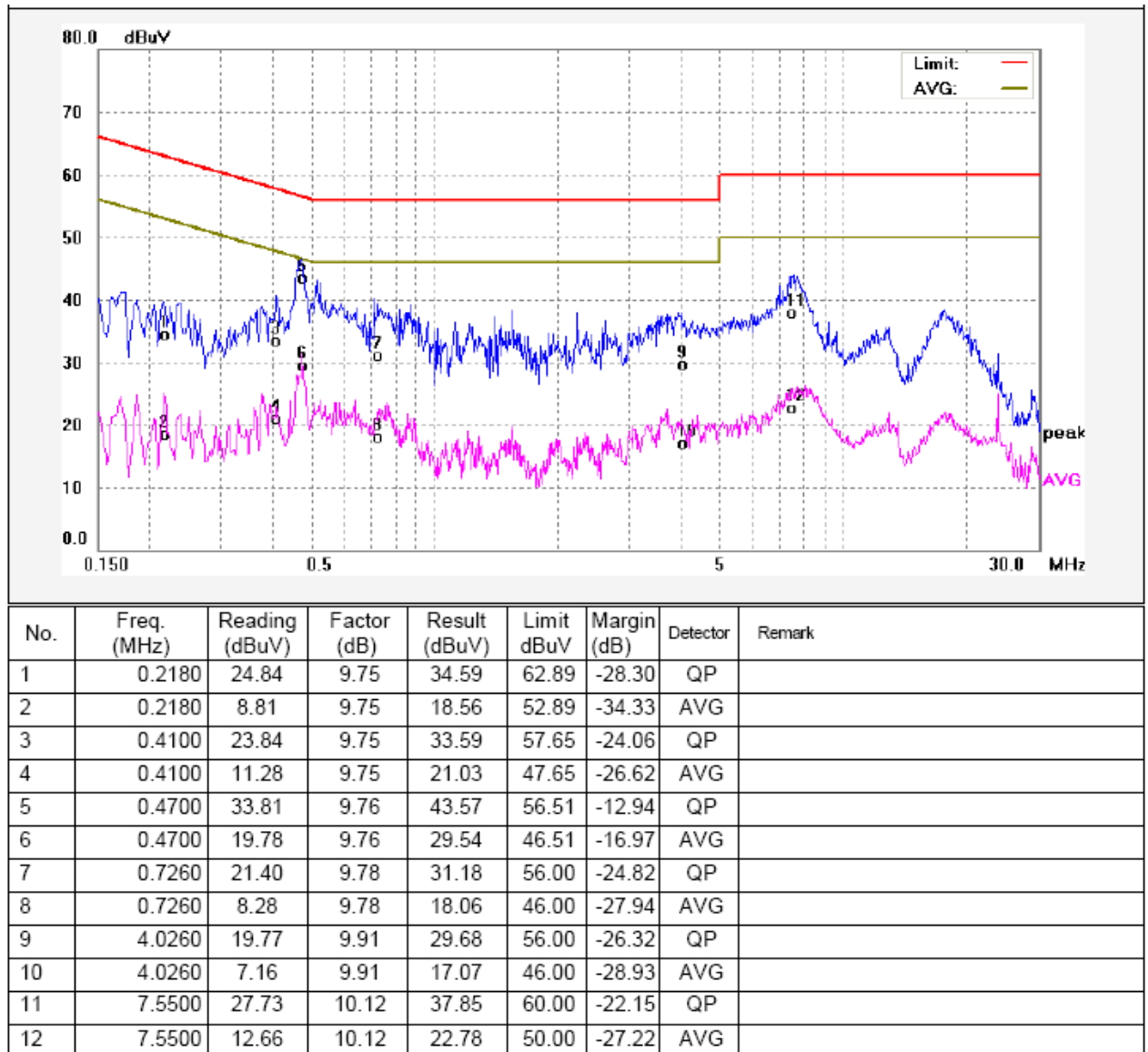


Neutral line:

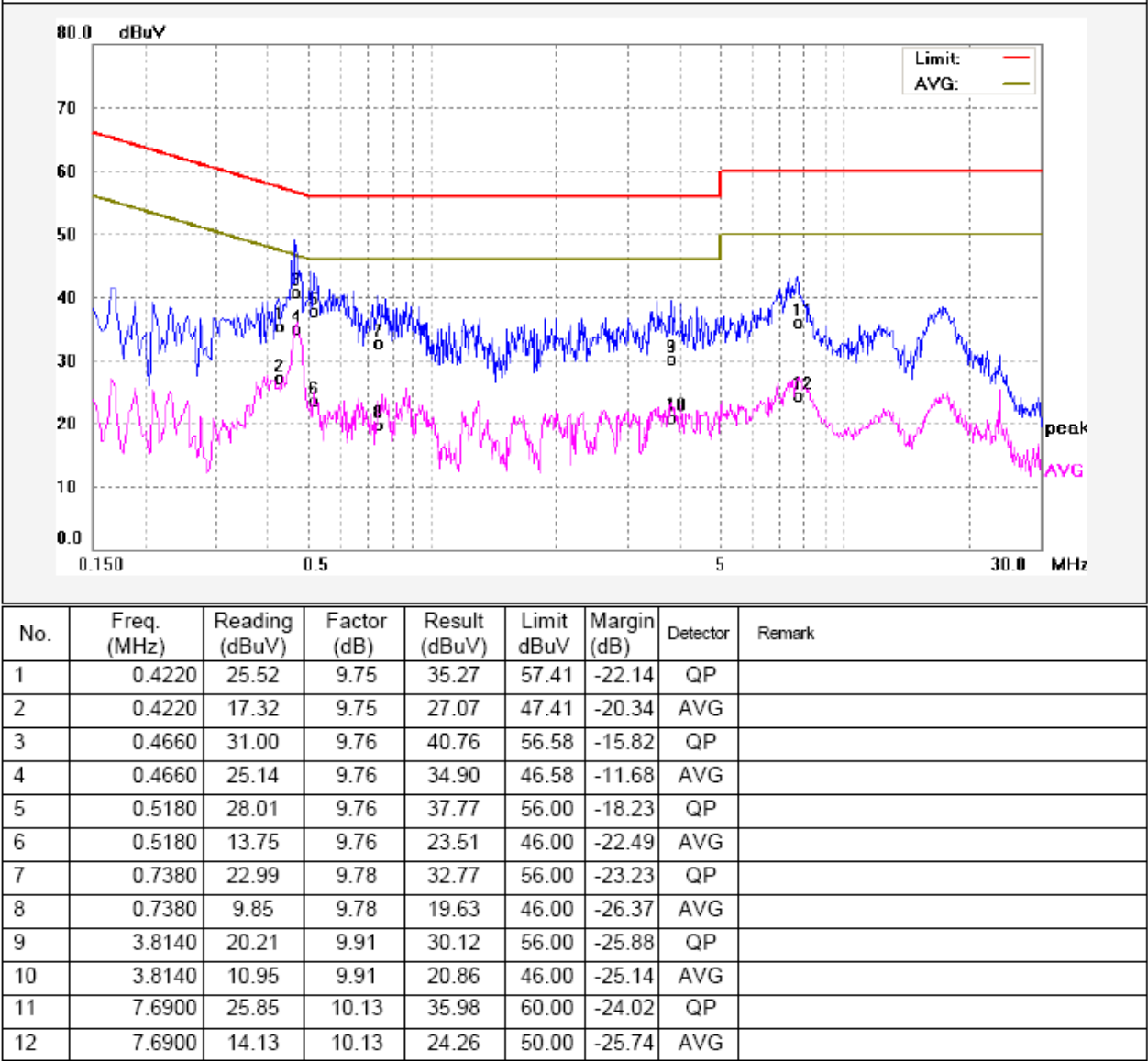


Adapter 2

Live line:



Neutral line:



## 7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: 558074 D01 DTS Meas Guidance v03r05 & ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

| Frequency<br>(MHz) | Field Strength        |                 | Field Strength Limit at 3m Measurement Dist |                                       |
|--------------------|-----------------------|-----------------|---------------------------------------------|---------------------------------------|
|                    | uV/m                  | Distance<br>(m) | uV/m                                        | dBuV/m                                |
| 0.009 ~ 0.490      | $2400/F(\text{kHz})$  | 300             | $10000 * 2400/F(\text{kHz})$                | $20\log^{(2400/F(\text{kHz}))} + 80$  |
| 0.490 ~ 1.705      | $24000/F(\text{kHz})$ | 30              | $100 * 24000/F(\text{kHz})$                 | $20\log^{(24000/F(\text{kHz}))} + 40$ |
| 1.705 ~ 30         | 30                    | 30              | $100 * 30$                                  | $20\log^{(30)} + 40$                  |
| 30 ~ 88            | 100                   | 3               | 100                                         | $20\log^{(100)}$                      |
| 88 ~ 216           | 150                   | 3               | 150                                         | $20\log^{(150)}$                      |
| 216 ~ 960          | 200                   | 3               | 200                                         | $20\log^{(200)}$                      |
| Above 960          | 500                   | 3               | 500                                         | $20\log^{(500)}$                      |

### 7.1 EUT Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1016 mbar

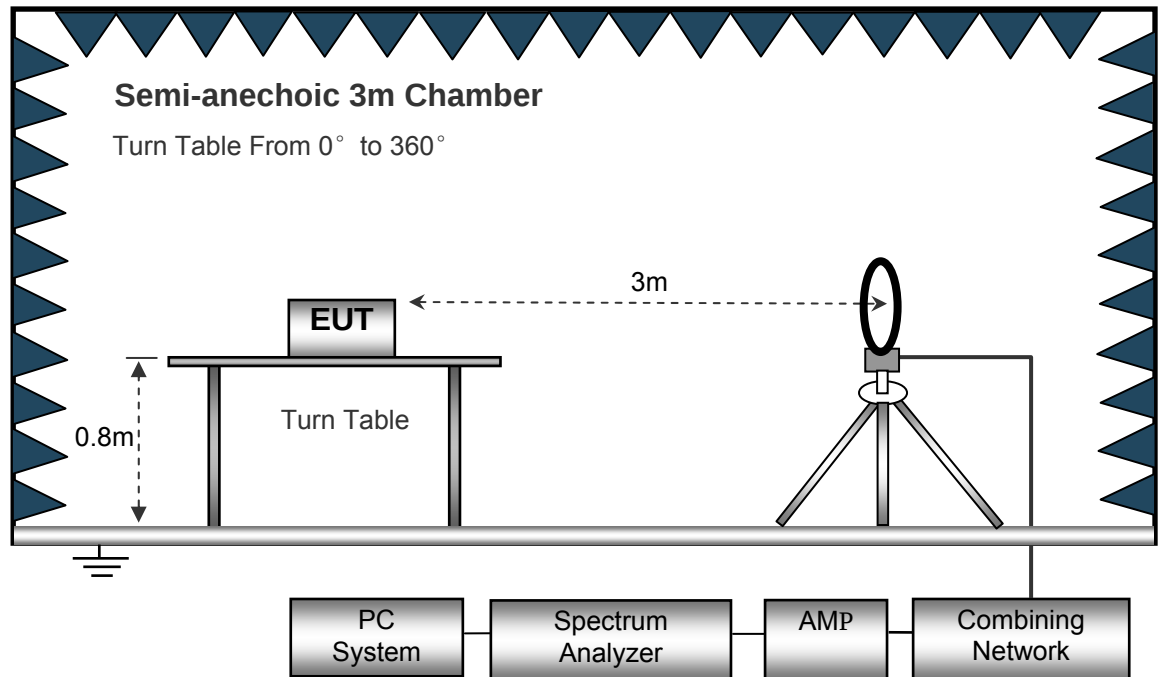
EUT Operation:

The test was performed in transmitting mode, the test data were shown in the report.

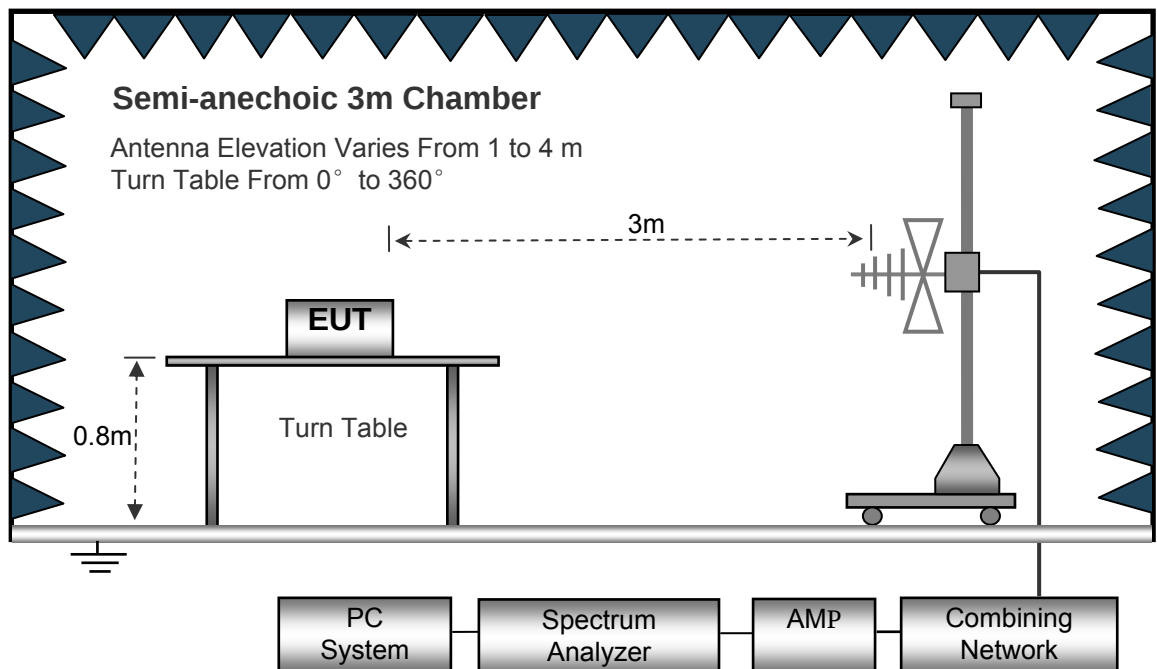
## 7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

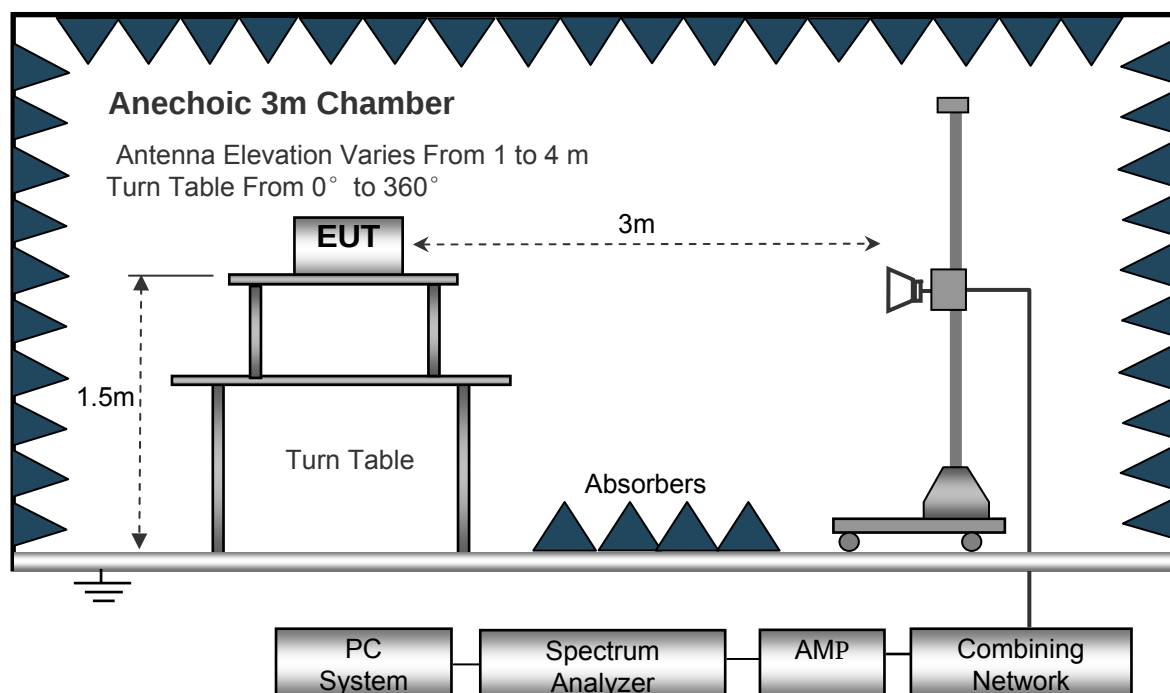
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



### 7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto  
 IF Bandwidth..... 10kHz  
 Video Bandwidth..... 10kHz  
 Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto  
 Detector ..... PK  
 Resolution Bandwidth..... 100kHz  
 Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto  
 Detector ..... PK  
 Resolution Bandwidth..... 1MHz  
 Video Bandwidth..... 3MHz  
 Detector ..... Ave.  
 Resolution Bandwidth..... 1MHz  
 Video Bandwidth..... 10Hz

## 7.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above 1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
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.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

## 7.5 Summary of Test Results

### Test Frequency: 32.768KHz~ 30MHz

| Frequency<br>(MHz) | Measurement<br>results | Detector | Correct<br>factor | Extrapolation<br>factor | Measurement<br>results<br>(calculated) | Limits         | Margin |
|--------------------|------------------------|----------|-------------------|-------------------------|----------------------------------------|----------------|--------|
|                    | dBμV @3m               | PK/QP    | dB/m              | dB                      | dBμV/m<br>@30m                         | dBμV/m<br>@30m | dB     |
| 26.430             | 26.14                  | QP       | 19.90             | 40.00                   | 6.04                                   | 29.54          | -23.50 |

### Test Frequency: 30MHz ~ 18GHz

| Frequency                | Receiver<br>Reading | Detector    | Turn<br>table<br>Angle | RX Antenna |       | Corrected<br>Factor | Corrected<br>Amplitude | FCC Part<br>15.247/209/205 |        |
|--------------------------|---------------------|-------------|------------------------|------------|-------|---------------------|------------------------|----------------------------|--------|
|                          |                     |             |                        | Height     | Polar |                     |                        | Limit                      | Margin |
| (MHz)                    | (dBμV)              | (PK/QP/Ave) | Degree                 | (m)        | (H/V) | (dB)                | (dBμV/m)               | (dBμV/m)                   | (dB)   |
| 11b: Low Channel 2412MHz |                     |             |                        |            |       |                     |                        |                            |        |
| 223.45                   | 41.05               | QP          | 14                     | 1.6        | H     | -11.62              | 29.43                  | 46.00                      | -16.57 |
| 223.45                   | 36.26               | QP          | 348                    | 1.9        | V     | -11.62              | 24.64                  | 46.00                      | -21.36 |
| 4824.00                  | 50.44               | PK          | 167                    | 1.9        | V     | -1.06               | 49.38                  | 74.00                      | -24.62 |
| 4824.00                  | 46.32               | Ave         | 167                    | 1.9        | V     | -1.06               | 45.26                  | 54.00                      | -8.74  |
| 7236.00                  | 41.08               | PK          | 219                    | 1.2        | H     | 1.33                | 42.41                  | 74.00                      | -31.59 |
| 7236.00                  | 41.96               | Ave         | 219                    | 1.2        | H     | 1.33                | 43.29                  | 54.00                      | -10.71 |
| 2325.88                  | 45.53               | PK          | 46                     | 1.9        | V     | -13.19              | 32.34                  | 74.00                      | -41.66 |
| 2325.88                  | 38.57               | Ave         | 46                     | 1.9        | V     | -13.19              | 25.38                  | 54.00                      | -28.62 |
| 2387.15                  | 44.55               | PK          | 14                     | 1.1        | H     | -13.14              | 31.41                  | 74.00                      | -42.59 |
| 2387.15                  | 38.11               | Ave         | 14                     | 1.1        | H     | -13.14              | 24.97                  | 54.00                      | -29.03 |
| 2489.36                  | 44.02               | PK          | 22                     | 2.0        | V     | -13.08              | 30.94                  | 74.00                      | -43.06 |
| 2489.36                  | 36.69               | Ave         | 22                     | 2.0        | V     | -13.08              | 23.61                  | 54.00                      | -30.39 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11b: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                      | 40.20            | QP          | 31               | 1.7        | H     | -11.62           | 28.58               | 46.00                   | -17.42 |
| 223.45                      | 34.91            | QP          | 181              | 1.1        | V     | -11.62           | 23.29               | 46.00                   | -22.71 |
| 4874.00                     | 50.87            | PK          | 88               | 1.1        | V     | -0.62            | 50.25               | 74.00                   | -23.75 |
| 4874.00                     | 46.82            | Ave         | 88               | 1.1        | V     | -0.62            | 46.20               | 54.00                   | -7.80  |
| 7311.00                     | 41.43            | PK          | 20               | 1.6        | H     | 2.21             | 43.64               | 74.00                   | -30.36 |
| 7311.00                     | 40.70            | Ave         | 20               | 1.6        | H     | 2.21             | 42.91               | 54.00                   | -11.09 |
| 2334.00                     | 46.20            | PK          | 147              | 1.8        | V     | -13.19           | 33.01               | 74.00                   | -40.99 |
| 2334.00                     | 37.68            | Ave         | 147              | 1.8        | V     | -13.19           | 24.49               | 54.00                   | -29.51 |
| 2362.81                     | 43.63            | PK          | 316              | 1.2        | H     | -13.14           | 30.49               | 74.00                   | -43.51 |
| 2362.81                     | 36.65            | Ave         | 316              | 1.2        | H     | -13.14           | 23.51               | 54.00                   | -30.49 |
| 2490.42                     | 42.52            | PK          | 351              | 1.1        | V     | -13.08           | 29.44               | 74.00                   | -44.56 |
| 2490.42                     | 38.98            | Ave         | 351              | 1.1        | V     | -13.08           | 25.90               | 54.00                   | -28.10 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11b: High Channel 2462MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                    | 41.50            | QP          | 139              | 1.2        | H     | -11.62           | 29.88               | 46.00                   | -16.12 |
| 223.45                    | 34.03            | QP          | 239              | 1.1        | V     | -11.62           | 22.41               | 46.00                   | -23.59 |
| 4924.00                   | 50.49            | PK          | 353              | 1.4        | V     | -0.24            | 50.25               | 74.00                   | -23.75 |
| 4924.00                   | 48.19            | Ave         | 353              | 1.4        | V     | -0.24            | 47.95               | 54.00                   | -6.05  |
| 7386.00                   | 41.20            | PK          | 186              | 2.0        | H     | 2.84             | 44.04               | 74.00                   | -29.96 |
| 7386.00                   | 41.93            | Ave         | 186              | 2.0        | H     | 2.84             | 44.77               | 54.00                   | -9.23  |
| 2326.44                   | 46.32            | PK          | 164              | 1.1        | V     | -13.19           | 33.13               | 74.00                   | -40.87 |
| 2326.44                   | 38.89            | Ave         | 164              | 1.1        | V     | -13.19           | 25.70               | 54.00                   | -28.30 |
| 2374.08                   | 43.86            | PK          | 113              | 1.3        | H     | -13.14           | 30.72               | 74.00                   | -43.28 |
| 2374.08                   | 36.56            | Ave         | 113              | 1.3        | H     | -13.14           | 23.42               | 54.00                   | -30.58 |
| 2491.59                   | 43.46            | PK          | 139              | 1.6        | V     | -13.08           | 30.38               | 74.00                   | -43.62 |
| 2491.59                   | 36.84            | Ave         | 139              | 1.6        | V     | -13.08           | 23.76               | 54.00                   | -30.24 |

| Frequency                | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|--------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                          |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                    | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11g: Low Channel 2412MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                   | 41.07            | QP          | 69               | 1.1        | H     | -11.62           | 29.45               | 46.00                   | -16.55 |
| 223.45                   | 35.25            | QP          | 296              | 1.9        | V     | -11.62           | 23.63               | 46.00                   | -22.37 |
| 4824.00                  | 51.95            | PK          | 316              | 1.5        | V     | -1.06            | 50.89               | 74.00                   | -23.11 |
| 4824.00                  | 49.50            | Ave         | 316              | 1.5        | V     | -1.06            | 48.44               | 54.00                   | -5.56  |
| 7236.00                  | 40.17            | PK          | 350              | 1.9        | H     | 1.33             | 41.50               | 74.00                   | -32.50 |
| 7236.00                  | 41.14            | Ave         | 350              | 1.9        | H     | 1.33             | 42.47               | 54.00                   | -11.53 |
| 2310.40                  | 45.19            | PK          | 49               | 1.8        | V     | -13.19           | 32.00               | 74.00                   | -42.00 |
| 2310.40                  | 38.73            | Ave         | 49               | 1.8        | V     | -13.19           | 25.54               | 54.00                   | -28.46 |
| 2388.23                  | 42.53            | PK          | 251              | 2.0        | H     | -13.14           | 29.39               | 74.00                   | -44.61 |
| 2388.23                  | 38.12            | Ave         | 251              | 2.0        | H     | -13.14           | 24.98               | 54.00                   | -29.02 |
| 2488.80                  | 44.45            | PK          | 172              | 1.6        | V     | -13.08           | 31.37               | 74.00                   | -42.63 |
| 2488.80                  | 37.02            | Ave         | 172              | 1.6        | V     | -13.08           | 23.94               | 54.00                   | -30.06 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11g: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                      | 40.98            | QP          | 24               | 1.1        | H     | -11.62           | 29.36               | 46.00                   | -16.64 |
| 223.45                      | 35.47            | QP          | 61               | 1.9        | V     | -11.62           | 23.85               | 46.00                   | -22.15 |
| 4874.00                     | 50.65            | PK          | 190              | 1.9        | V     | -0.62            | 50.03               | 74.00                   | -23.97 |
| 4874.00                     | 48.77            | Ave         | 190              | 1.9        | V     | -0.62            | 48.15               | 54.00                   | -5.85  |
| 7311.00                     | 41.54            | PK          | 298              | 1.3        | H     | 2.21             | 43.75               | 74.00                   | -30.25 |
| 7311.00                     | 41.49            | Ave         | 298              | 1.3        | H     | 2.21             | 43.70               | 54.00                   | -10.30 |
| 2338.87                     | 46.19            | PK          | 232              | 1.2        | V     | -13.19           | 33.00               | 74.00                   | -41.00 |
| 2338.87                     | 38.63            | Ave         | 232              | 1.2        | V     | -13.19           | 25.44               | 54.00                   | -28.56 |
| 2351.47                     | 42.67            | PK          | 284              | 1.9        | H     | -13.14           | 29.53               | 74.00                   | -44.47 |
| 2351.47                     | 36.17            | Ave         | 284              | 1.9        | H     | -13.14           | 23.03               | 54.00                   | -30.97 |
| 2485.06                     | 42.06            | PK          | 343              | 1.4        | V     | -13.08           | 28.98               | 74.00                   | -45.02 |
| 2485.06                     | 37.56            | Ave         | 343              | 1.4        | V     | -13.08           | 24.48               | 54.00                   | -29.52 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11g: High Channel 2462MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                    | 41.79            | QP          | 68               | 1.6        | H     | -11.62           | 30.17               | 46.00                   | -15.83 |
| 223.45                    | 35.83            | QP          | 268              | 1.1        | V     | -11.62           | 24.21               | 46.00                   | -21.79 |
| 4924.00                   | 49.40            | PK          | 211              | 1.5        | V     | -0.24            | 49.16               | 74.00                   | -24.84 |
| 4924.00                   | 47.81            | Ave         | 211              | 1.5        | V     | -0.24            | 47.57               | 54.00                   | -6.43  |
| 7386.00                   | 41.80            | PK          | 69               | 1.4        | H     | 2.84             | 44.64               | 74.00                   | -29.36 |
| 7386.00                   | 41.46            | Ave         | 69               | 1.4        | H     | 2.84             | 44.30               | 54.00                   | -9.70  |
| 2332.02                   | 46.29            | PK          | 96               | 1.5        | V     | -13.19           | 33.10               | 74.00                   | -40.90 |
| 2332.02                   | 38.39            | Ave         | 96               | 1.5        | V     | -13.19           | 25.20               | 54.00                   | -28.80 |
| 2382.91                   | 44.90            | PK          | 10               | 1.8        | H     | -13.14           | 31.76               | 74.00                   | -42.24 |
| 2382.91                   | 38.16            | Ave         | 10               | 1.8        | H     | -13.14           | 25.02               | 54.00                   | -28.98 |
| 2497.56                   | 44.43            | PK          | 96               | 1.3        | V     | -13.08           | 31.35               | 74.00                   | -42.65 |
| 2497.56                   | 38.68            | Ave         | 96               | 1.3        | V     | -13.08           | 25.60               | 54.00                   | -28.40 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11 n20: Low Channel 2412MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                      | 41.08            | QP          | 304              | 1.3        | H     | -11.62           | 29.46               | 46.00                   | -16.54 |
| 223.45                      | 37.31            | QP          | 310              | 1.5        | V     | -11.62           | 25.69               | 46.00                   | -20.31 |
| 4824.00                     | 49.62            | PK          | 344              | 1.3        | V     | -1.06            | 48.56               | 74.00                   | -25.44 |
| 4824.00                     | 49.26            | Ave         | 344              | 1.3        | V     | -1.06            | 48.20               | 54.00                   | -5.80  |
| 7236.00                     | 42.35            | PK          | 49               | 2.0        | H     | 1.33             | 43.68               | 74.00                   | -30.32 |
| 7236.00                     | 41.46            | Ave         | 49               | 2.0        | H     | 1.33             | 42.79               | 54.00                   | -11.21 |
| 2349.30                     | 45.81            | PK          | 14               | 1.9        | V     | -13.19           | 32.62               | 74.00                   | -41.38 |
| 2349.30                     | 38.08            | Ave         | 14               | 1.9        | V     | -13.19           | 24.89               | 54.00                   | -29.11 |
| 2384.63                     | 43.21            | PK          | 263              | 1.6        | H     | -13.14           | 30.07               | 74.00                   | -43.93 |
| 2384.63                     | 36.40            | Ave         | 263              | 1.6        | H     | -13.14           | 23.26               | 54.00                   | -30.74 |
| 2490.31                     | 42.44            | PK          | 179              | 1.8        | V     | -13.08           | 29.36               | 74.00                   | -44.64 |
| 2490.31                     | 38.02            | Ave         | 179              | 1.8        | V     | -13.08           | 24.94               | 54.00                   | -29.06 |

| Frequency                      | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|--------------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                                |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                          | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11 n20: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                         | 41.58            | QP          | 264              | 1.1        | H     | -11.62           | 29.96               | 46.00                   | -16.04 |
| 223.45                         | 37.71            | QP          | 281              | 1.6        | V     | -11.62           | 26.09               | 46.00                   | -19.91 |
| 4874.00                        | 49.49            | PK          | 248              | 1.1        | V     | -0.62            | 48.87               | 74.00                   | -25.13 |
| 4874.00                        | 48.21            | Ave         | 248              | 1.1        | V     | -0.62            | 47.59               | 54.00                   | -6.41  |
| 7311.00                        | 42.86            | PK          | 127              | 1.8        | H     | 2.21             | 45.07               | 74.00                   | -28.93 |
| 7311.00                        | 41.82            | Ave         | 127              | 1.8        | H     | 2.21             | 44.03               | 54.00                   | -9.97  |
| 2339.61                        | 45.38            | PK          | 343              | 1.6        | V     | -13.19           | 32.19               | 74.00                   | -41.81 |
| 2339.61                        | 39.77            | Ave         | 343              | 1.6        | V     | -13.19           | 26.58               | 54.00                   | -27.42 |
| 2389.23                        | 44.17            | PK          | 263              | 2.0        | H     | -13.14           | 31.03               | 74.00                   | -42.97 |
| 2389.23                        | 36.25            | Ave         | 263              | 2.0        | H     | -13.14           | 23.11               | 54.00                   | -30.89 |
| 2484.55                        | 42.10            | PK          | 292              | 1.1        | V     | -13.08           | 29.02               | 74.00                   | -44.98 |
| 2484.55                        | 37.57            | Ave         | 292              | 1.1        | V     | -13.08           | 24.49               | 54.00                   | -29.51 |

| Frequency                    | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|------------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                              |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                        | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| 11 n20: High Channel 2462MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                       | 40.11            | QP          | 27               | 1.4        | H     | -11.62           | 28.49               | 46.00                   | -17.51 |
| 223.45                       | 37.94            | QP          | 203              | 1.8        | V     | -11.62           | 26.32               | 46.00                   | -19.68 |
| 4924.00                      | 48.96            | PK          | 299              | 1.0        | V     | -0.24            | 48.72               | 74.00                   | -25.28 |
| 4924.00                      | 47.47            | Ave         | 299              | 1.0        | V     | -0.24            | 47.23               | 54.00                   | -6.77  |
| 7386.00                      | 44.30            | PK          | 49               | 1.2        | H     | 2.84             | 47.14               | 74.00                   | -26.86 |
| 7386.00                      | 42.10            | Ave         | 49               | 1.2        | H     | 2.84             | 44.94               | 54.00                   | -9.06  |
| 2315.33                      | 46.15            | PK          | 99               | 1.3        | V     | -13.19           | 32.96               | 74.00                   | -41.04 |
| 2315.33                      | 39.13            | Ave         | 99               | 1.3        | V     | -13.19           | 25.94               | 54.00                   | -28.06 |
| 2356.25                      | 42.07            | PK          | 11               | 1.7        | H     | -13.14           | 28.93               | 74.00                   | -45.07 |
| 2356.25                      | 36.75            | Ave         | 11               | 1.7        | H     | -13.14           | 23.61               | 54.00                   | -30.39 |
| 2492.37                      | 43.77            | PK          | 82               | 1.9        | V     | -13.08           | 30.69               | 74.00                   | -43.31 |
| 2492.37                      | 36.27            | Ave         | 82               | 1.9        | V     | -13.08           | 23.19               | 54.00                   | -30.81 |

| Frequency                | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|--------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                          |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                    | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| n40: Low Channel 2422MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                   | 39.53            | QP          | 330              | 1.1        | H     | -11.62           | 27.91               | 46.00                   | -18.09 |
| 223.45                   | 34.82            | QP          | 337              | 1.1        | V     | -11.62           | 23.20               | 46.00                   | -22.80 |
| 4844.00                  | 48.52            | PK          | 55               | 1.8        | V     | -1.06            | 47.46               | 74.00                   | -26.54 |
| 4844.00                  | 47.66            | Ave         | 55               | 1.8        | V     | -1.06            | 46.60               | 54.00                   | -7.40  |
| 7266.00                  | 41.24            | PK          | 256              | 1.2        | H     | 1.33             | 42.57               | 74.00                   | -31.43 |
| 7266.00                  | 38.83            | Ave         | 256              | 1.2        | H     | 1.33             | 40.16               | 54.00                   | -13.84 |
| 2325.77                  | 46.14            | PK          | 331              | 1.9        | V     | -13.19           | 32.95               | 74.00                   | -41.05 |
| 2325.77                  | 38.32            | Ave         | 331              | 1.9        | V     | -13.19           | 25.13               | 54.00                   | -28.87 |
| 2388.97                  | 43.35            | PK          | 9                | 1.8        | H     | -13.14           | 30.21               | 74.00                   | -43.79 |
| 2388.97                  | 36.25            | Ave         | 9                | 1.8        | H     | -13.14           | 23.11               | 54.00                   | -30.89 |
| 2498.55                  | 42.34            | PK          | 156              | 1.2        | V     | -13.08           | 29.26               | 74.00                   | -44.74 |
| 2498.55                  | 38.97            | Ave         | 156              | 1.2        | V     | -13.08           | 25.89               | 54.00                   | -28.11 |

| Frequency                   | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|-----------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                             |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                       | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| n40: Middle Channel 2437MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                      | 39.07            | QP          | 175              | 1.2        | H     | -11.62           | 27.45               | 46.00                   | -18.55 |
| 223.45                      | 34.76            | QP          | 87               | 1.6        | V     | -11.62           | 23.14               | 46.00                   | -22.86 |
| 4874.00                     | 48.97            | PK          | 52               | 1.1        | V     | -0.62            | 48.35               | 74.00                   | -25.65 |
| 4874.00                     | 48.33            | Ave         | 52               | 1.1        | V     | -0.62            | 47.71               | 54.00                   | -6.29  |
| 7311.00                     | 41.04            | PK          | 217              | 1.1        | H     | 2.21             | 43.25               | 74.00                   | -30.75 |
| 7311.00                     | 39.74            | Ave         | 217              | 1.1        | H     | 2.21             | 41.95               | 54.00                   | -12.05 |
| 2333.59                     | 46.82            | PK          | 258              | 1.8        | V     | -13.19           | 33.63               | 74.00                   | -40.37 |
| 2333.59                     | 38.15            | Ave         | 258              | 1.8        | V     | -13.19           | 24.96               | 54.00                   | -29.04 |
| 2366.68                     | 43.05            | PK          | 99               | 1.4        | H     | -13.14           | 29.91               | 74.00                   | -44.09 |
| 2366.68                     | 37.12            | Ave         | 99               | 1.4        | H     | -13.14           | 23.98               | 54.00                   | -30.02 |
| 2495.89                     | 43.73            | PK          | 99               | 1.5        | V     | -13.08           | 30.65               | 74.00                   | -43.35 |
| 2495.89                     | 38.53            | Ave         | 99               | 1.5        | V     | -13.08           | 25.45               | 54.00                   | -28.55 |

| Frequency                 | Receiver Reading | Detector    | Turn table Angle | RX Antenna |       | Corrected Factor | Corrected Amplitude | FCC Part 15.247/209/205 |        |
|---------------------------|------------------|-------------|------------------|------------|-------|------------------|---------------------|-------------------------|--------|
|                           |                  |             |                  | Height     | Polar |                  |                     | Limit                   | Margin |
| (MHz)                     | (dBμV)           | (PK/QP/Ave) | Degree           | (m)        | (H/V) | (dB)             | (dBμV/m)            | (dBμV/m)                | (dB)   |
| n40: High Channel 2452MHz |                  |             |                  |            |       |                  |                     |                         |        |
| 223.45                    | 39.45            | QP          | 206              | 1.2        | H     | -11.62           | 27.83               | 46.00                   | -18.17 |
| 223.45                    | 35.46            | QP          | 349              | 1.8        | V     | -11.62           | 23.84               | 46.00                   | -22.16 |
| 4904.00                   | 49.62            | PK          | 332              | 1.9        | V     | -0.24            | 49.38               | 74.00                   | -24.62 |
| 4904.00                   | 48.76            | Ave         | 332              | 1.9        | V     | -0.24            | 48.52               | 54.00                   | -5.48  |
| 7356.00                   | 40.80            | PK          | 16               | 1.7        | H     | 2.84             | 43.64               | 74.00                   | -30.36 |
| 7356.00                   | 40.51            | Ave         | 16               | 1.7        | H     | 2.84             | 43.35               | 54.00                   | -10.65 |
| 2343.29                   | 45.57            | PK          | 180              | 1.8        | V     | -13.19           | 32.38               | 74.00                   | -41.62 |
| 2343.29                   | 39.59            | Ave         | 180              | 1.8        | V     | -13.19           | 26.40               | 54.00                   | -27.60 |
| 2386.97                   | 43.10            | PK          | 345              | 1.0        | H     | -13.14           | 29.96               | 74.00                   | -44.04 |
| 2386.97                   | 36.74            | Ave         | 345              | 1.0        | H     | -13.14           | 23.60               | 54.00                   | -30.40 |
| 2484.32                   | 43.07            | PK          | 200              | 1.5        | V     | -13.08           | 29.99               | 74.00                   | -44.01 |
| 2484.32                   | 38.41            | Ave         | 200              | 1.5        | V     | -13.08           | 25.33               | 54.00                   | -28.67 |

**Test Frequency: 18GHz~25GHz**

The measurements were more than 20 dB below the limit and not reported

## 8 Band Edge Measurement

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC CFR47 Part 15 Section 15.247                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Test Method:      | 558074 D01 DTS Meas Guidance v03r05 April 08, 2016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Test Limit:       | Regulation 15.247 (d), In any 100 kHz 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 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided 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 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). |
| Test Mode:        | Transmitting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

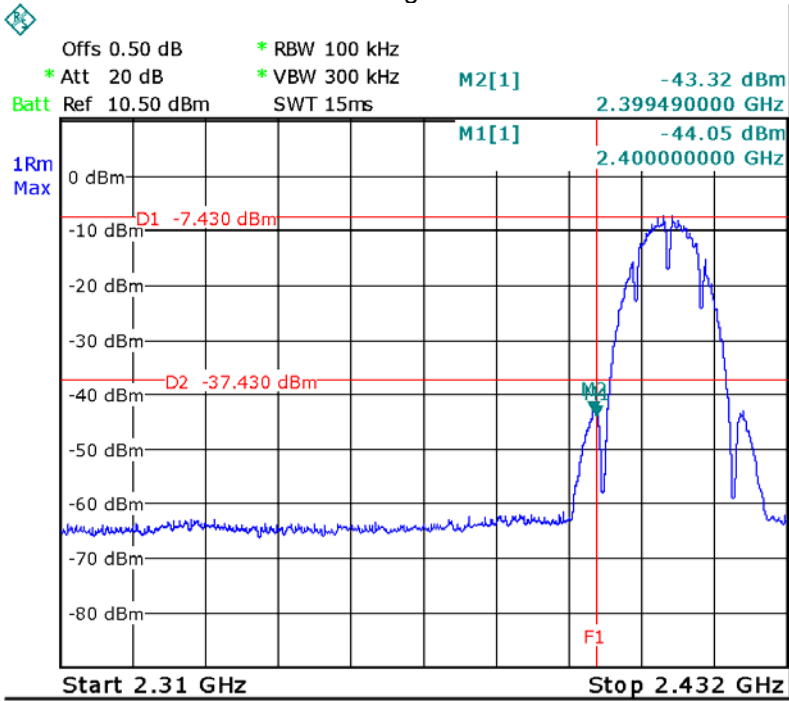
### 8.1 Test Produce

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 measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

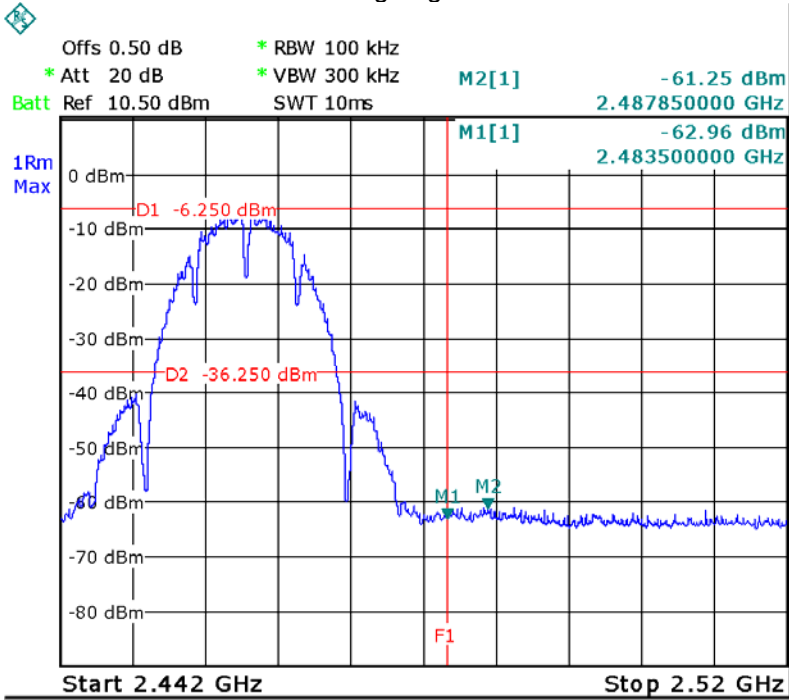
8.2 Test Result

11b

Band edge-left side

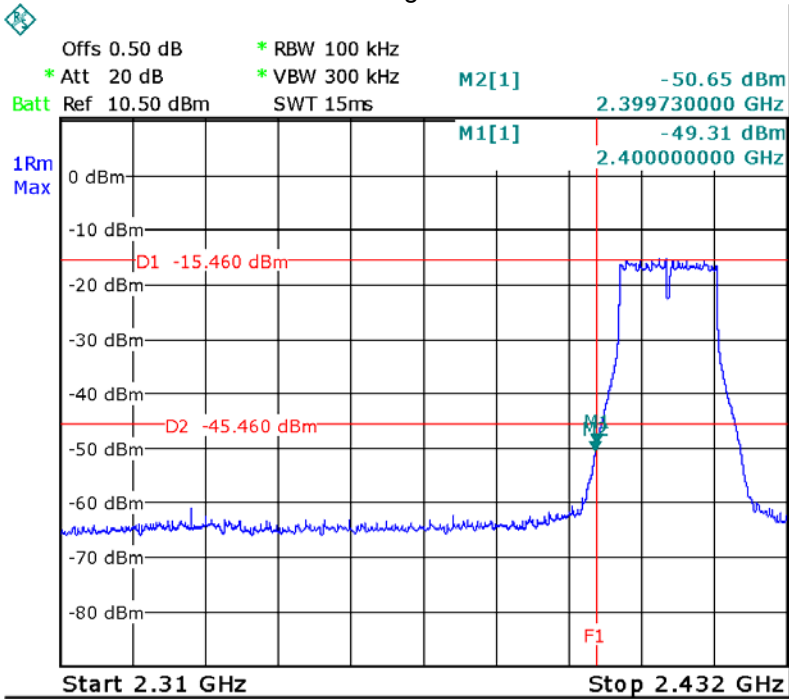


Band edge-right side

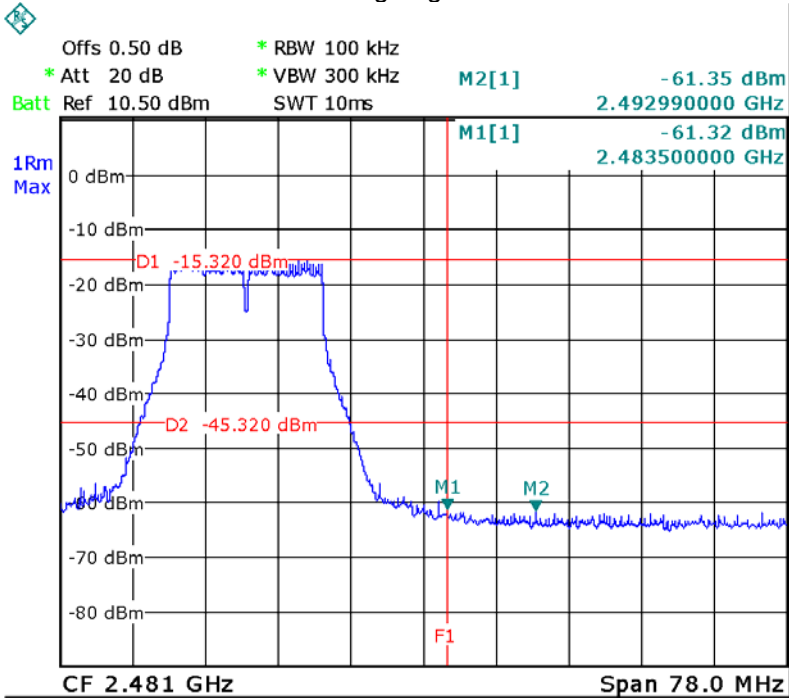


11g

Band edge-left side

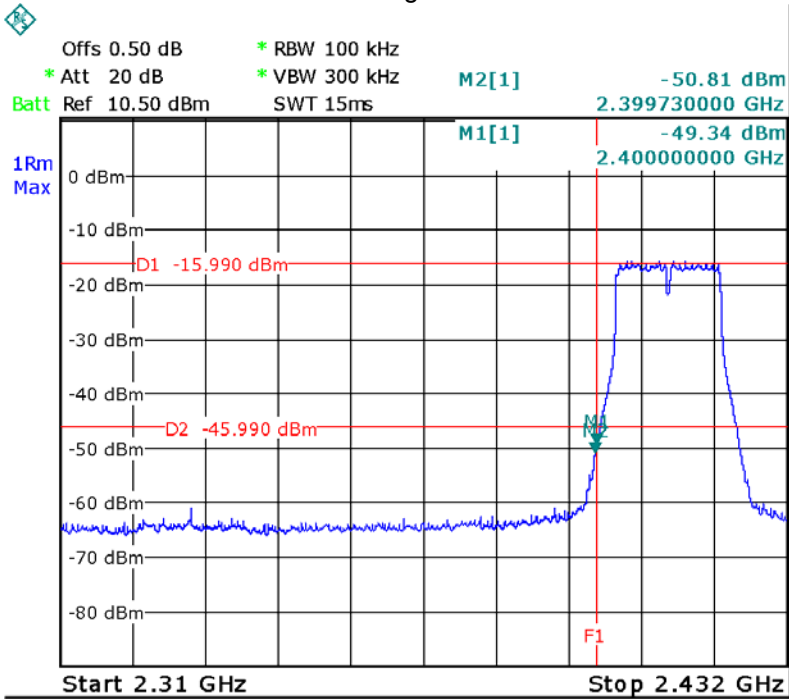


Band edge-right side

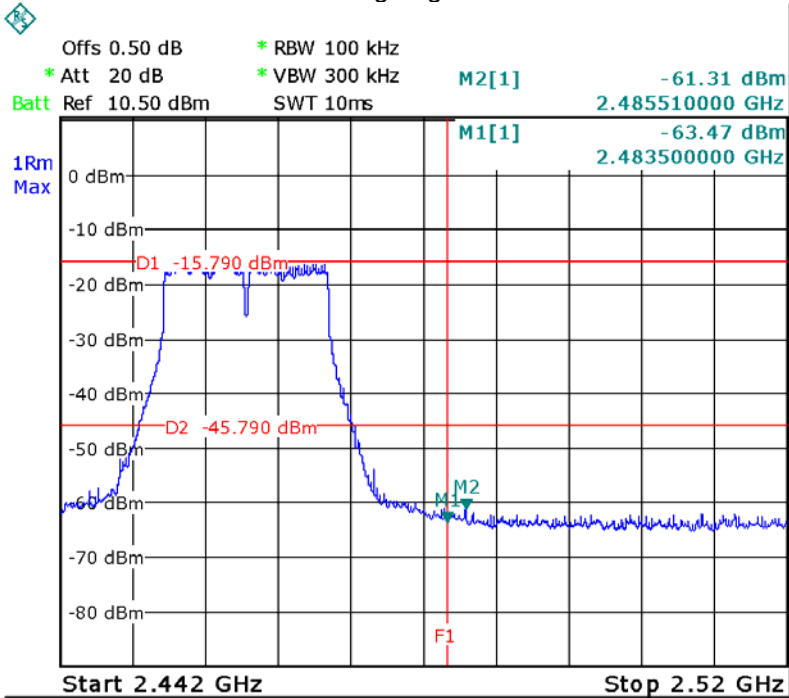


11 N20

Band edge-left side

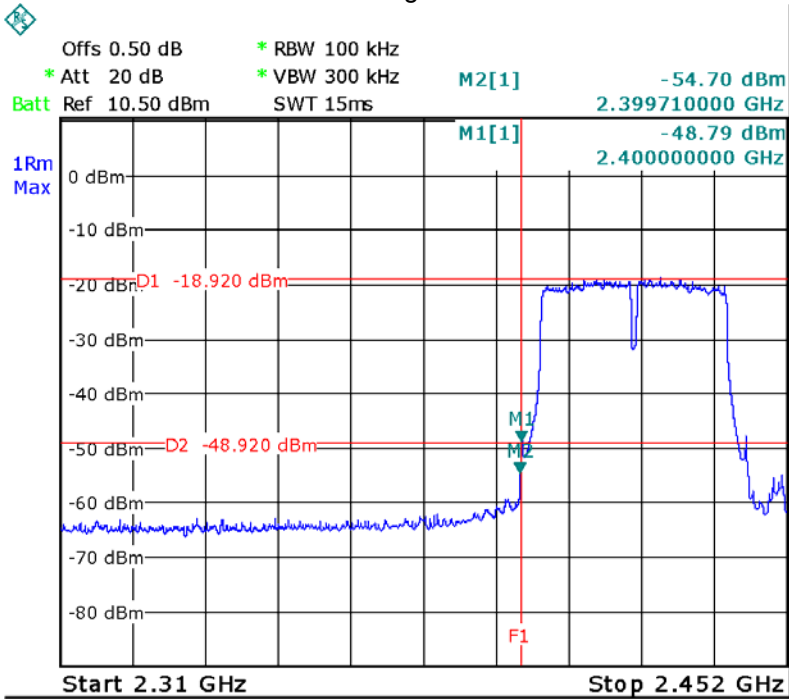


Band edge-right side

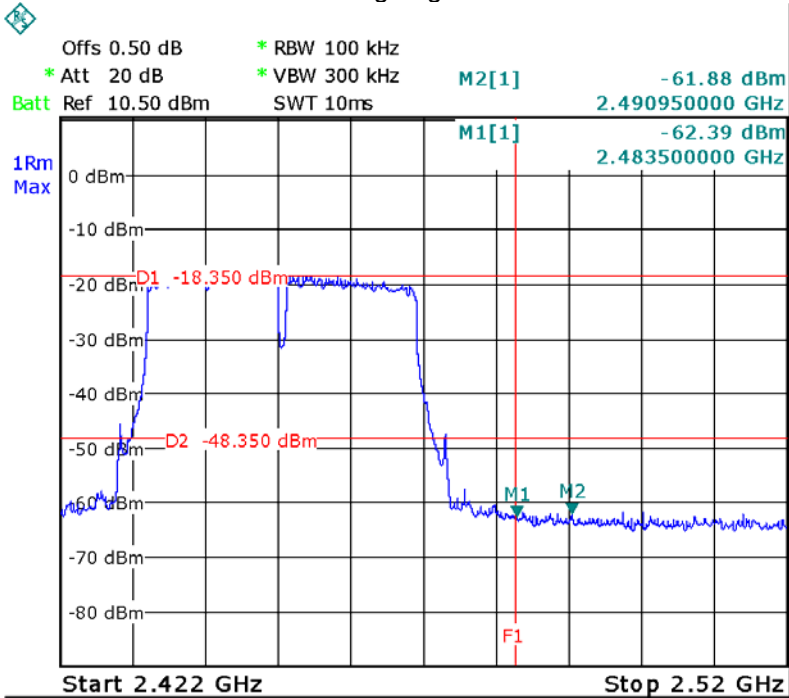


11 N40

Band edge-left side



Band edge-right side



## 9 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance v03r05 April 08, 2016

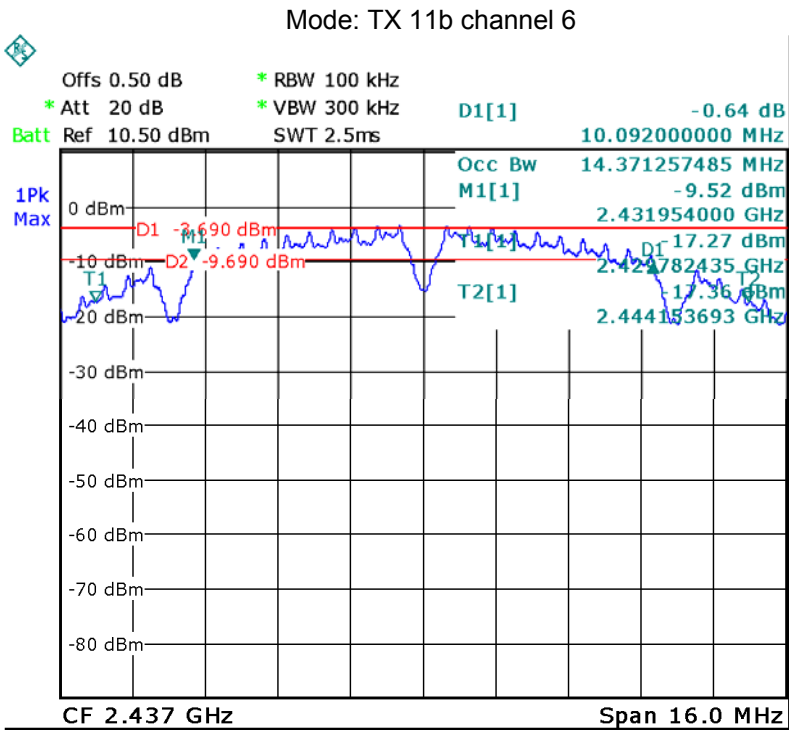
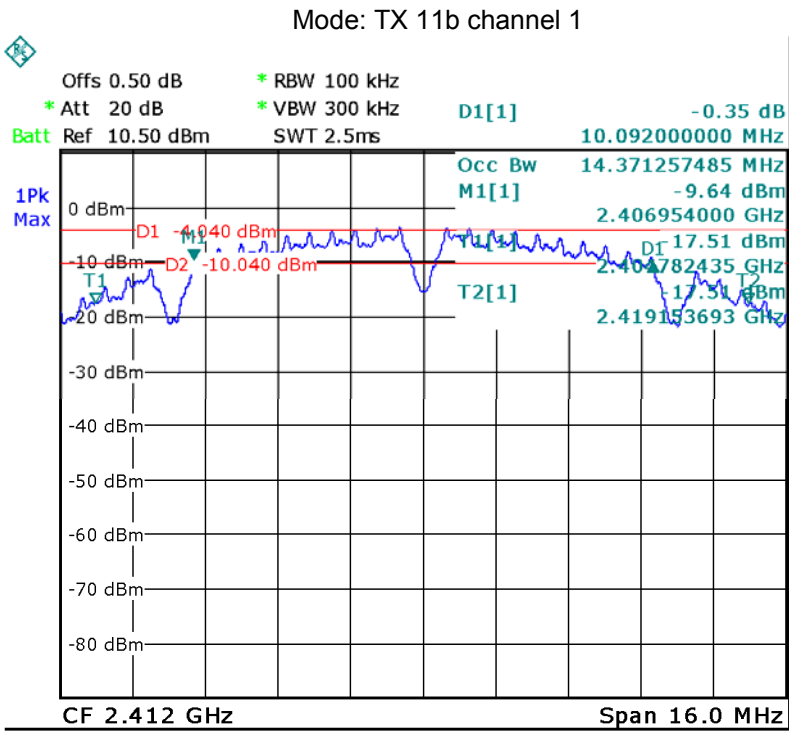
### 9.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

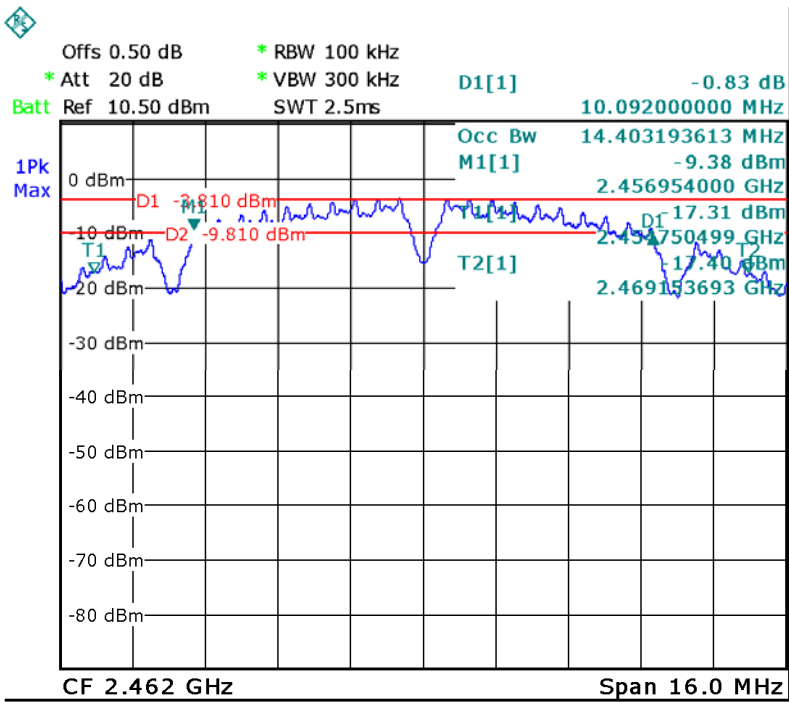
### 9.2 Test Result:

| Operation mode | 6dB Bandwidth (MHz) |           |            |
|----------------|---------------------|-----------|------------|
| TX 11b         | Channel 1           | Channel 6 | Channel 11 |
|                | 10.092              | 10.092    | 10.092     |
| TX 11g         | Channel 1           | Channel 6 | Channel 11 |
|                | 16.617              | 16.617    | 16.617     |
| TX 11n HT20    | Channel 1           | Channel 6 | Channel 11 |
|                | 17.838              | 17.838    | 17.838     |
| TX 11n HT40    | Channel 3           | Channel 6 | Channel 9  |
|                | 36.560              | 36.560    | 36.560     |

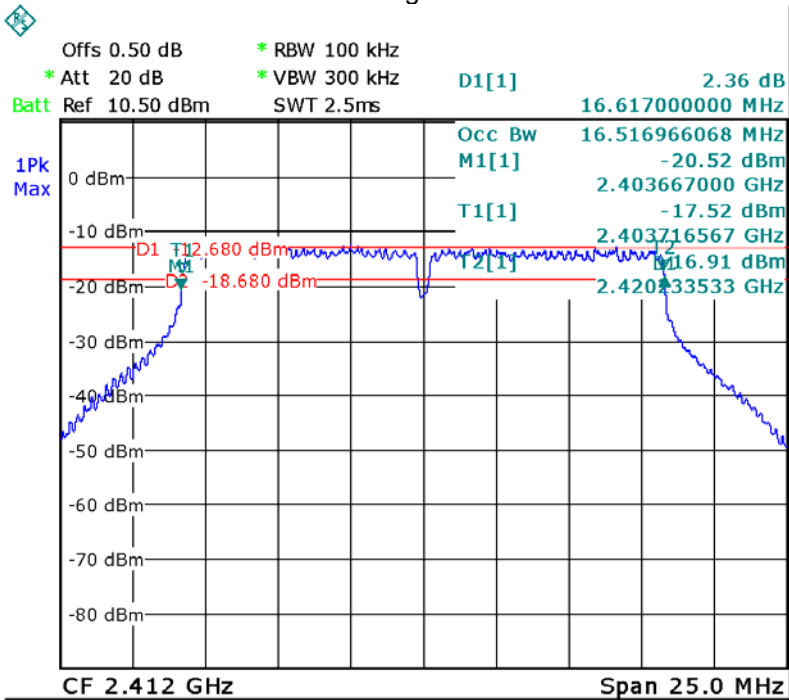
Test result plot as follows:

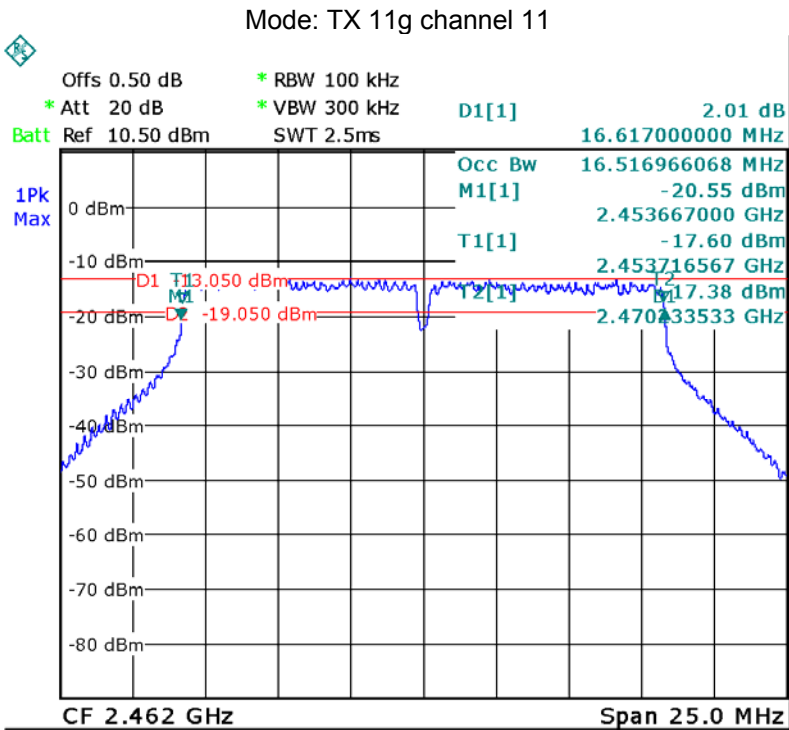
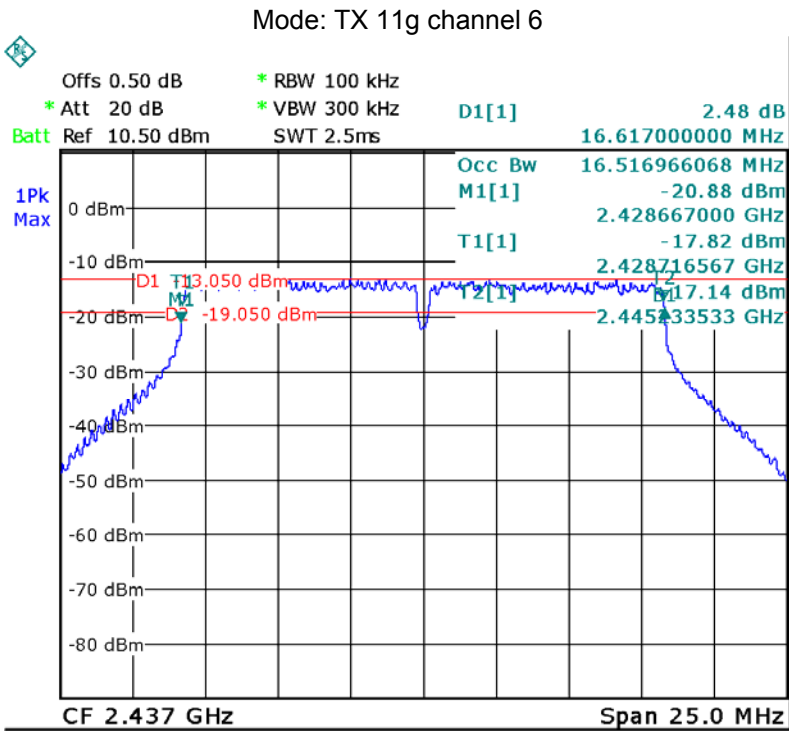


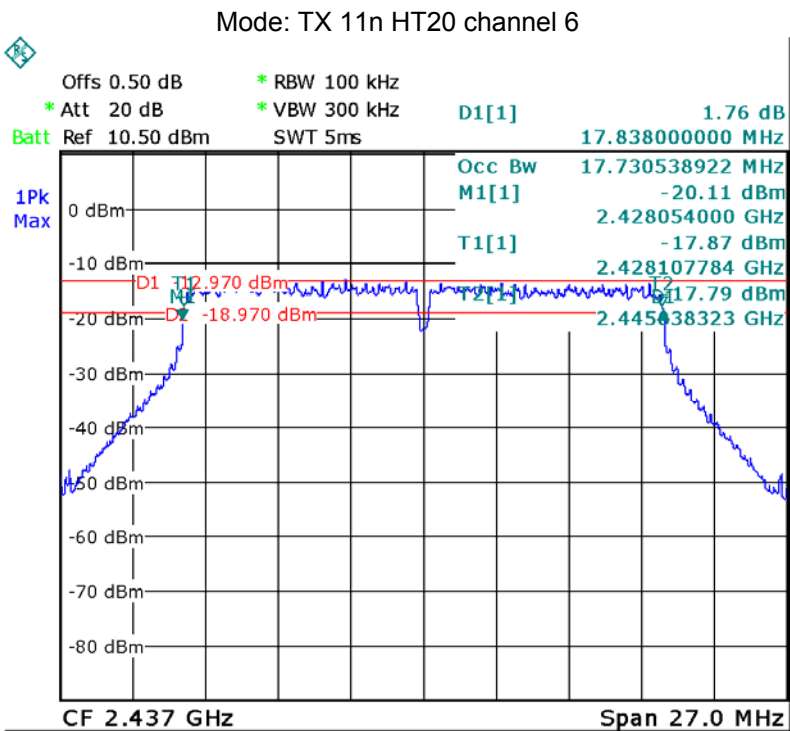
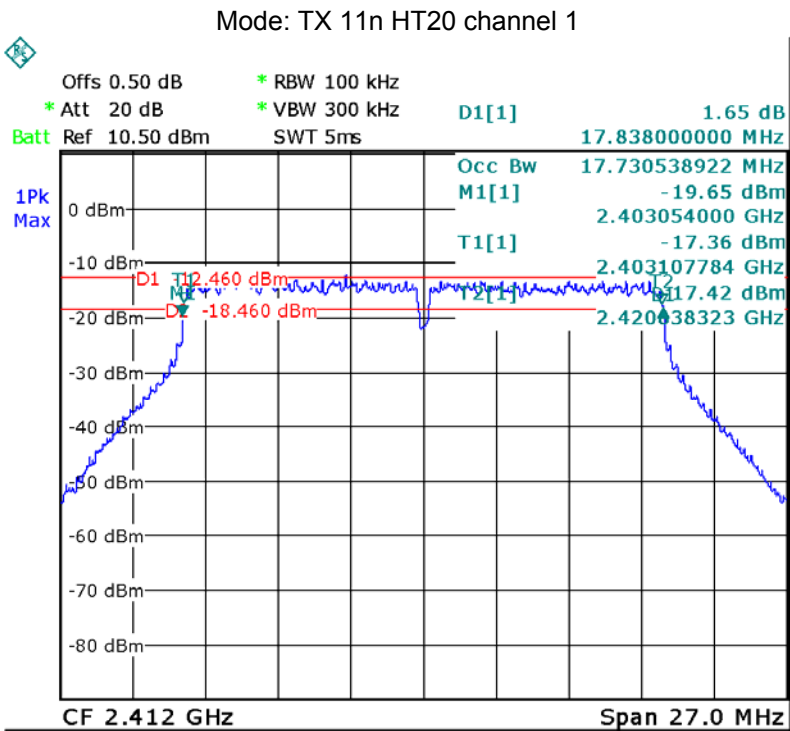
Mode: TX 11b channel 11

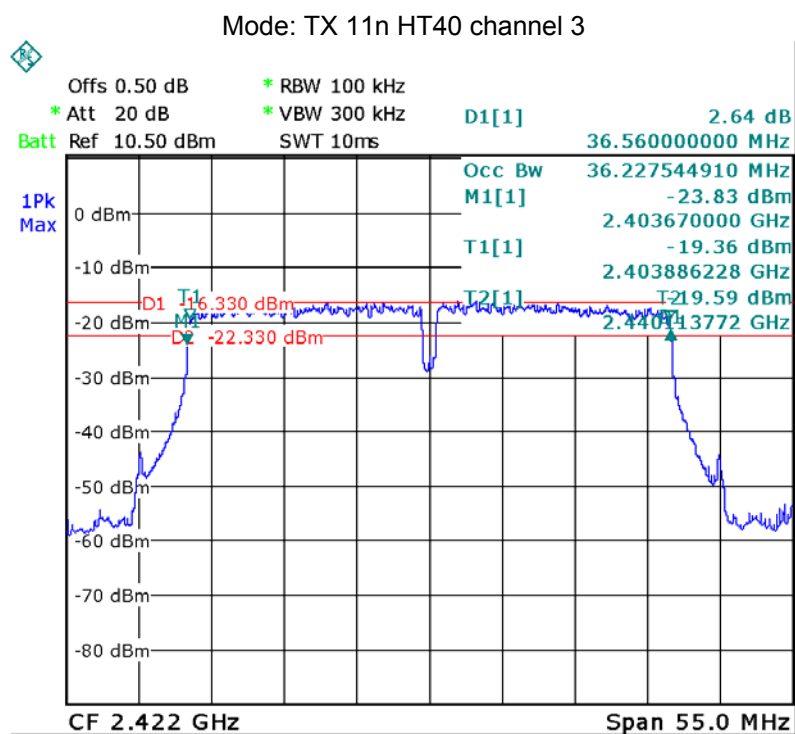
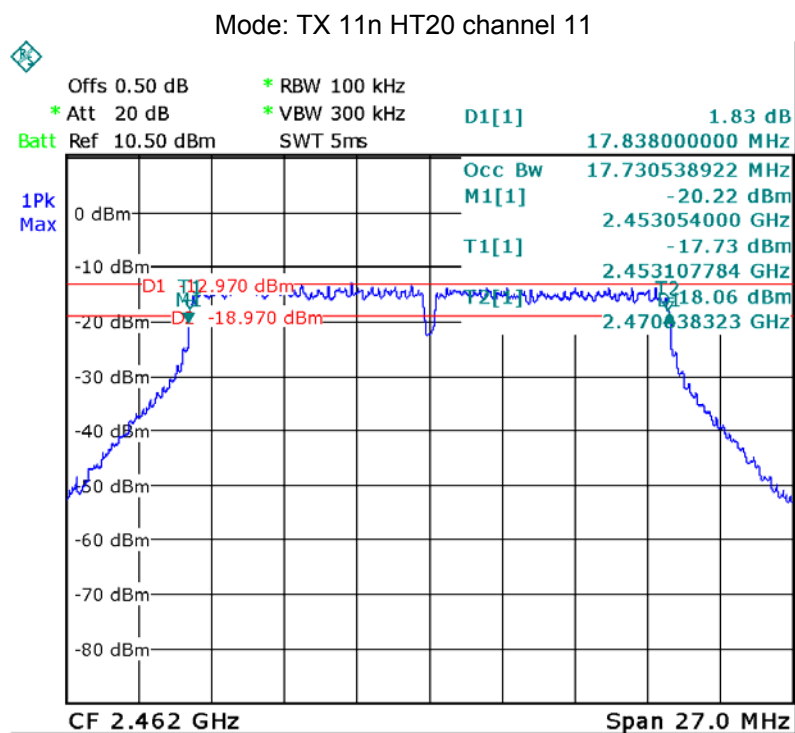


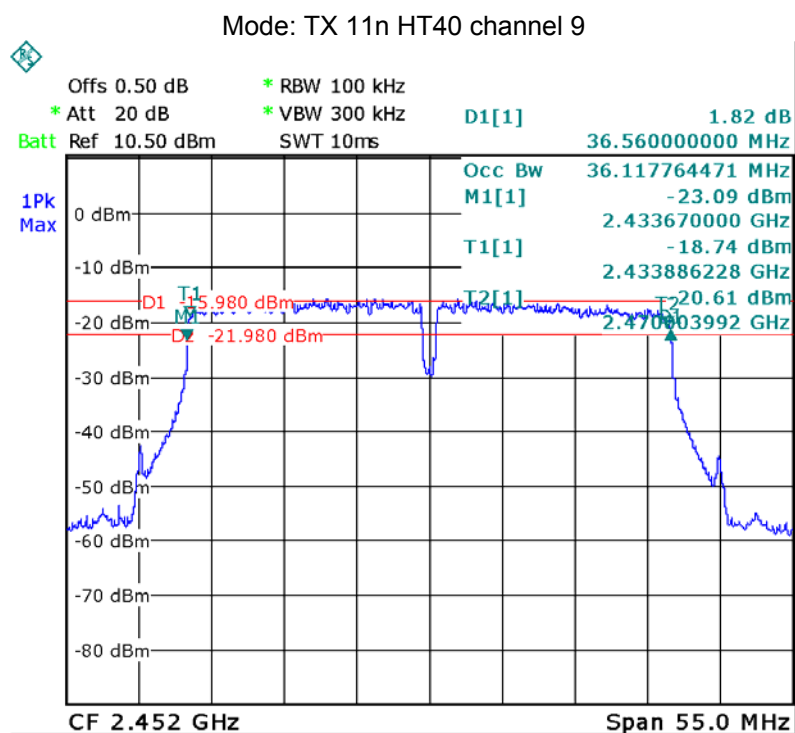
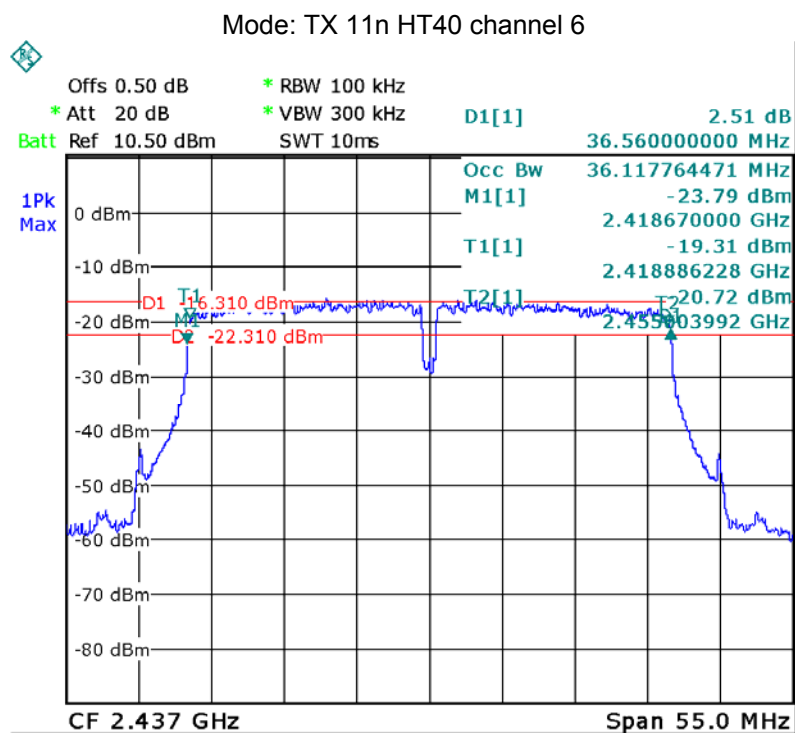
Mode: TX 11g channel 1











## 10 Maximum conducted (average) output power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance v03r05 April 08, 2016

### 10.1 Test Procedure

558074 D01 DTS Meas Guidance v03r05 April 08, 2016 section 9.2.2

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 3MHz. Sweep = auto; Detector Function =RMS, Set the span to at least 1.5 times the 6 dB bandwidth.
3. Keep the EUT in transmitting at lowest, Middle and highest channel individually. Record the max value.

### 10.2 Test Result

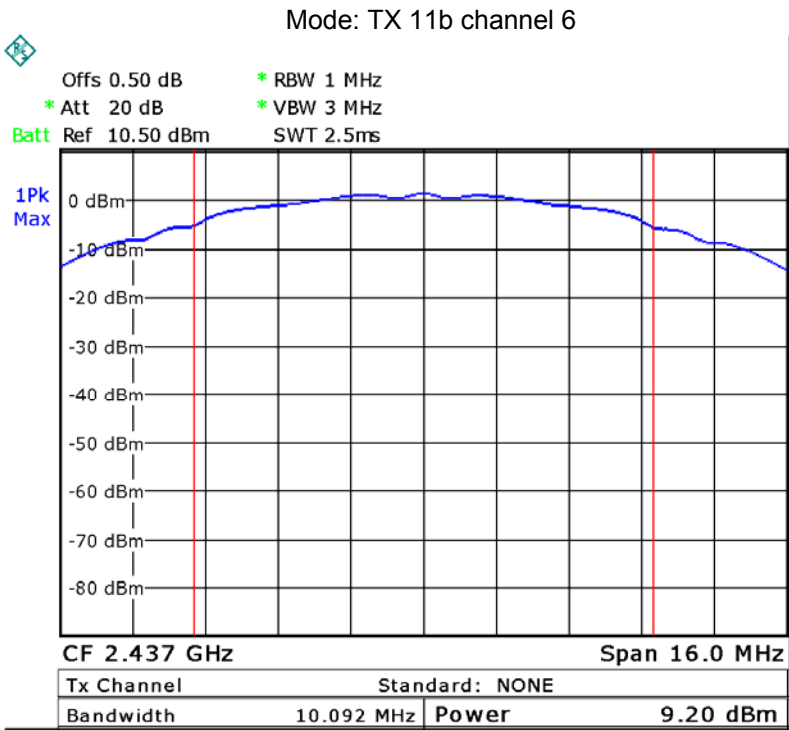
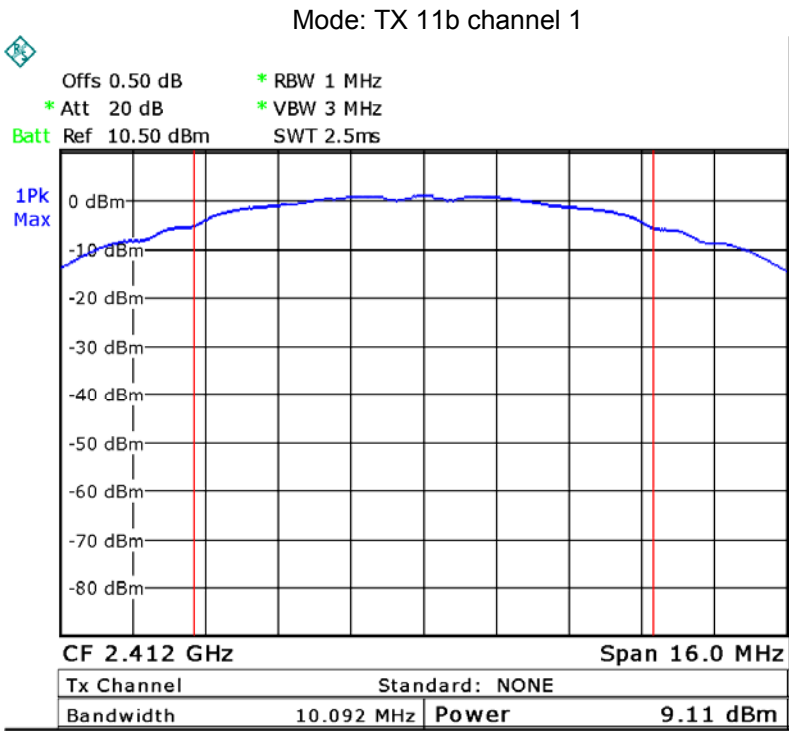
| Test mode :TX 11b                             |         |         |
|-----------------------------------------------|---------|---------|
| Maximum conducted(average) output power (dBm) |         |         |
| 2412MHz                                       | 2437MHz | 2462MHz |
| 9.11                                          | 9.20    | 9.22    |
| Limit: 1W/30dBm                               |         |         |

| Test mode :TX 11g                             |         |         |
|-----------------------------------------------|---------|---------|
| Maximum conducted(average) output power (dBm) |         |         |
| 2412MHz                                       | 2437MHz | 2462MHz |
| 9.35                                          | 9.07    | 9.04    |
| Limit: 1W/30dBm                               |         |         |

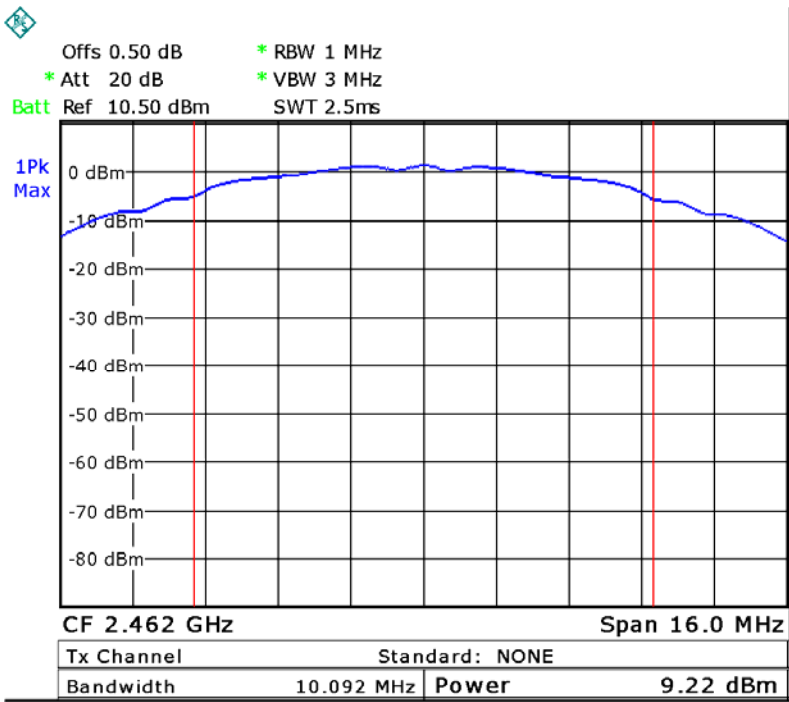
| Test mode :TX 11n HT20                        |         |         |
|-----------------------------------------------|---------|---------|
| Maximum conducted(average) output power (dBm) |         |         |
| 2412MHz                                       | 2437MHz | 2462MHz |
| 9.38                                          | 9.08    | 9.04    |
| Limit: 1W/30dBm                               |         |         |

| Test mode : TX 11n HT40            |         |         |
|------------------------------------|---------|---------|
| 10 Maximum Peak Output Power (dBm) |         |         |
| 2422MHz                            | 2437MHz | 2452MHz |
| 9.22                               | 9.37    | 9.42    |
| Limit: 1W/30dBm                    |         |         |

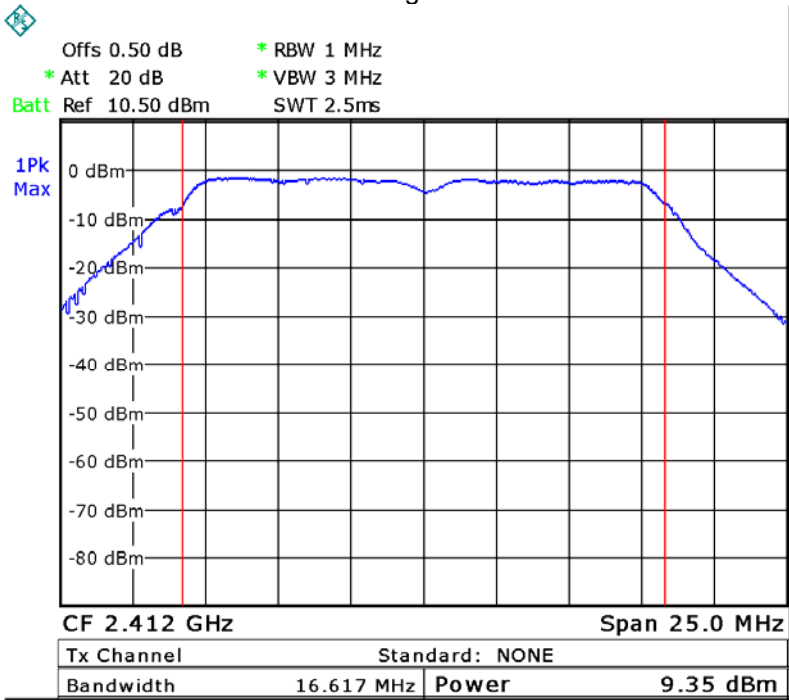
Test result plot as follows:

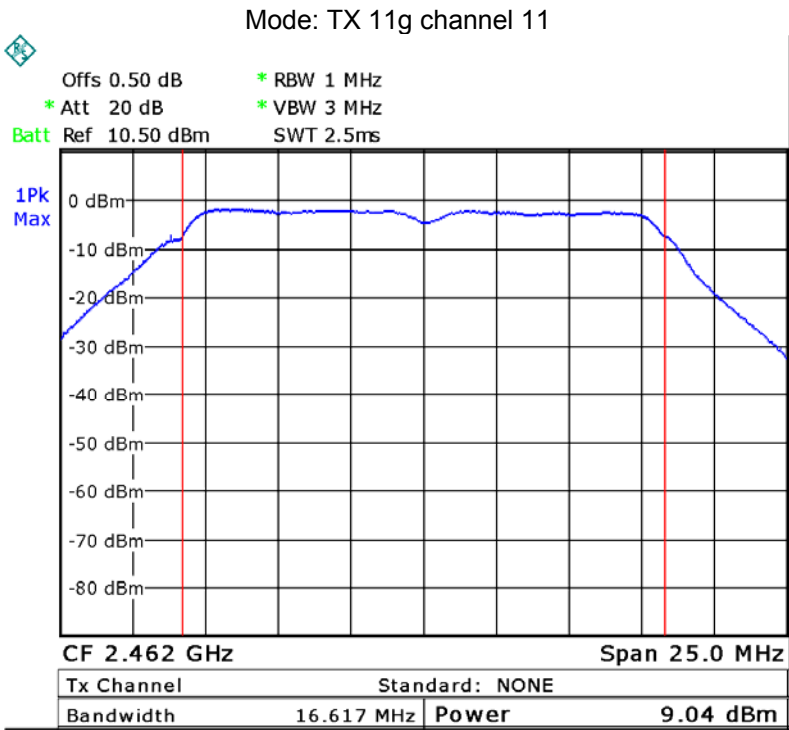
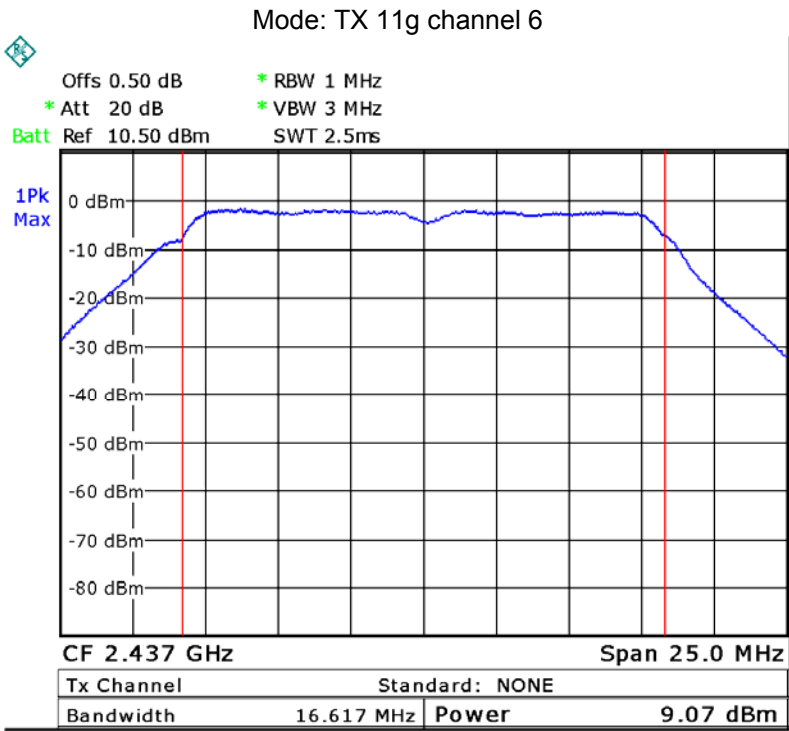


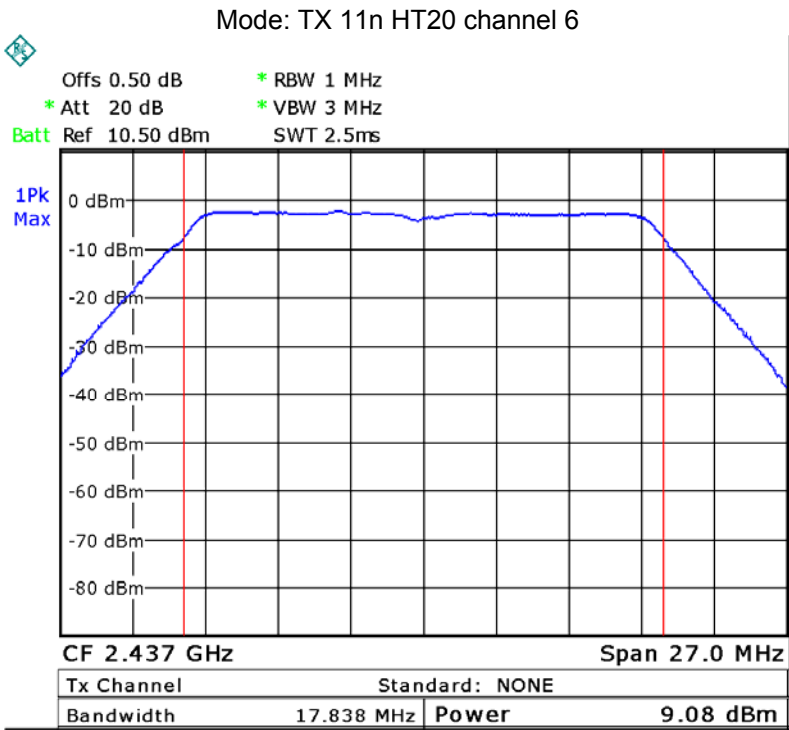
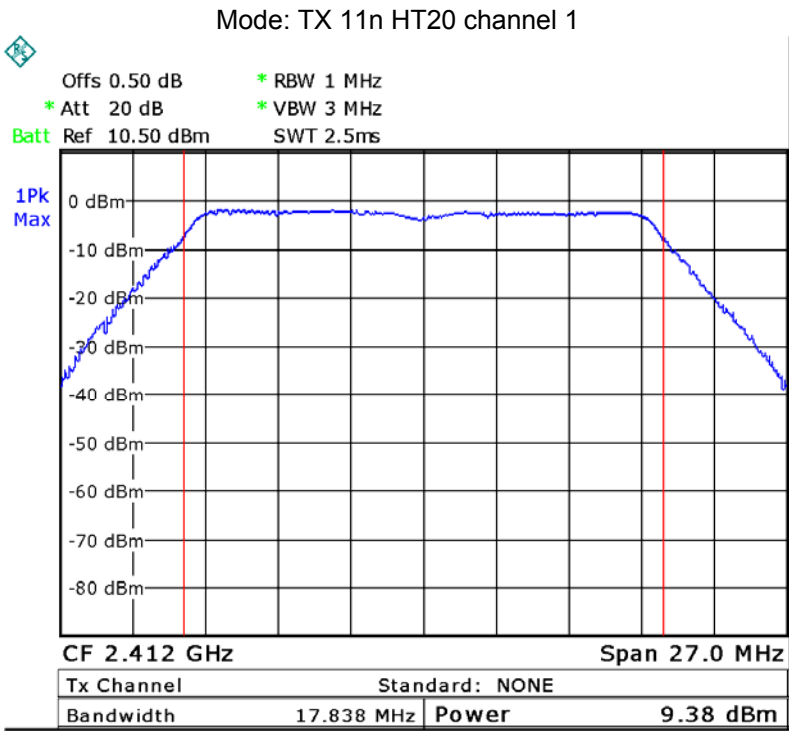
Mode: TX 11b channel 11

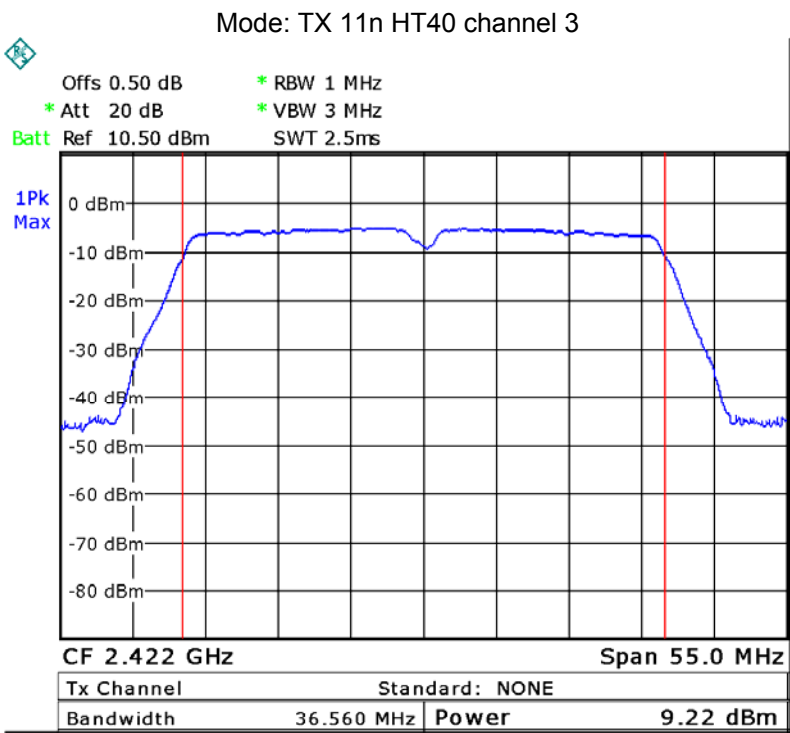
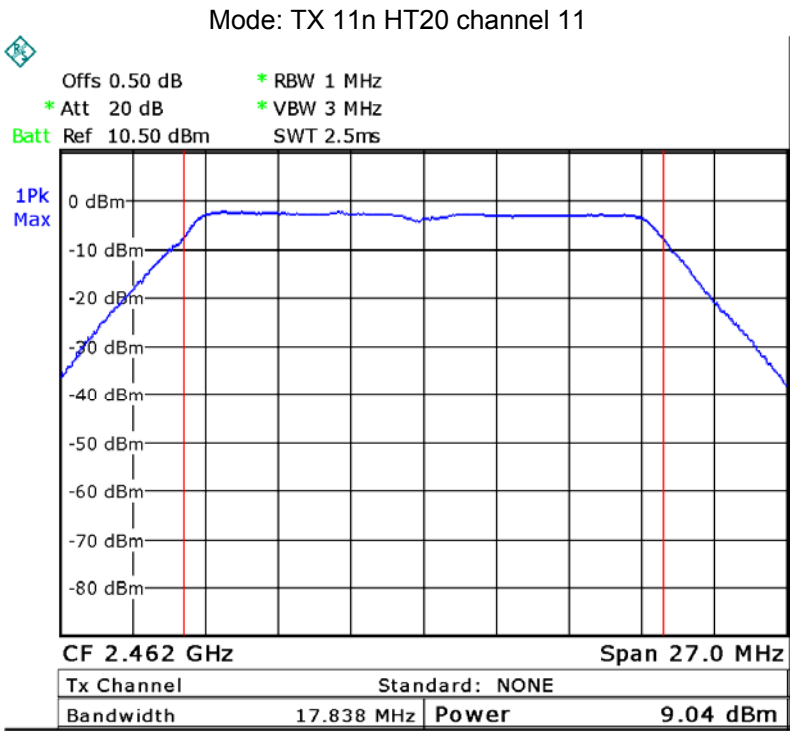


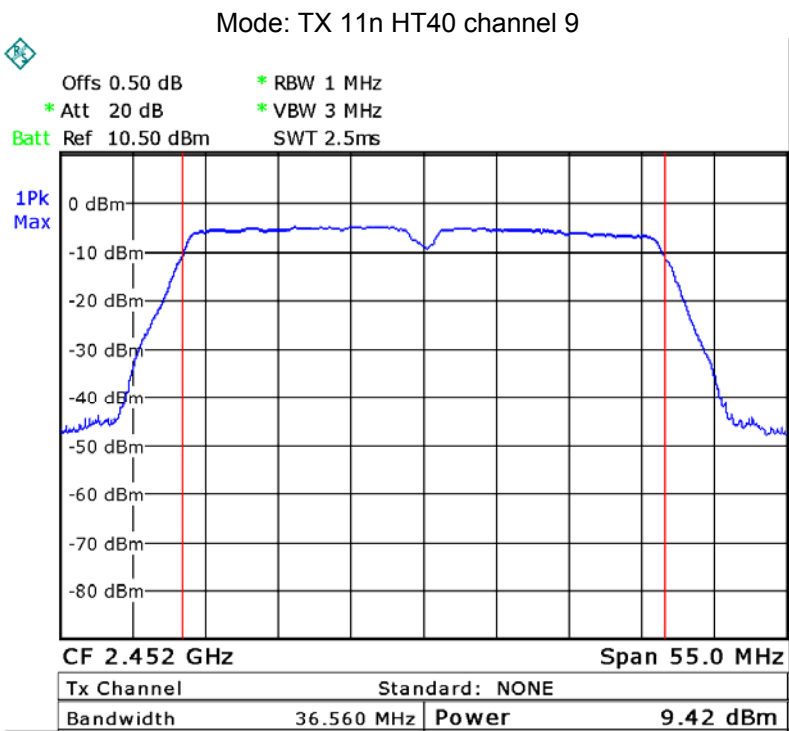
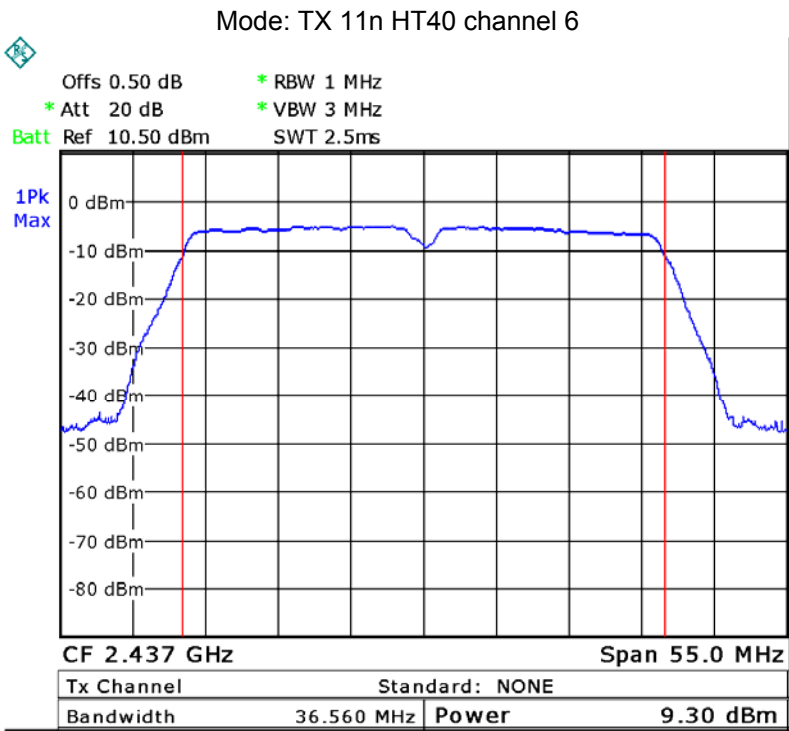
Mode: TX 11g channel 1











## 11 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 DTS Meas Guidance v03r05 April 08, 2016

### 11.1 Test Procedure

558074 D01 DTS Meas Guidance v03r05 April 08, 2016 section 10.2

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

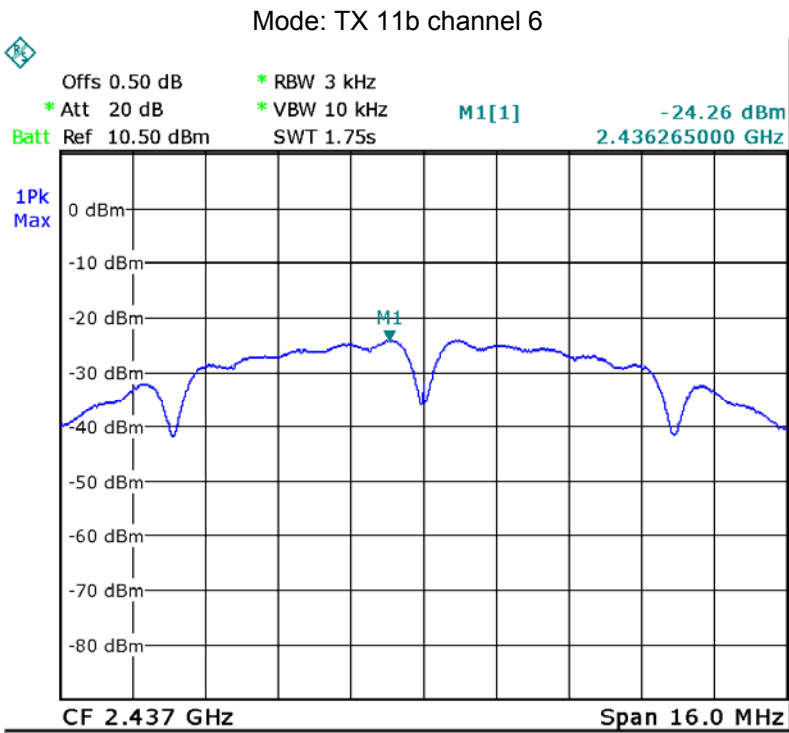
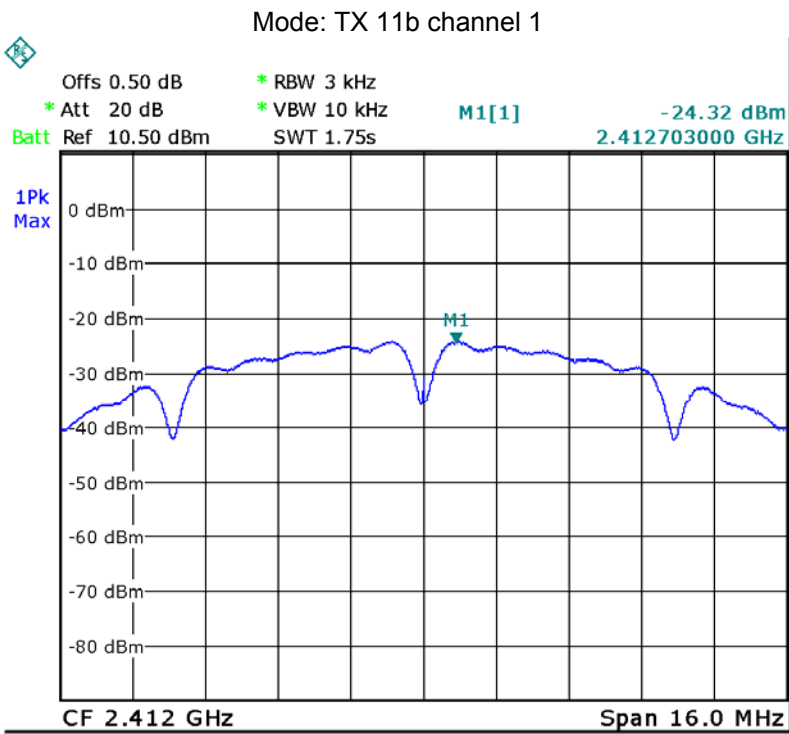
### 11.2 Test Result

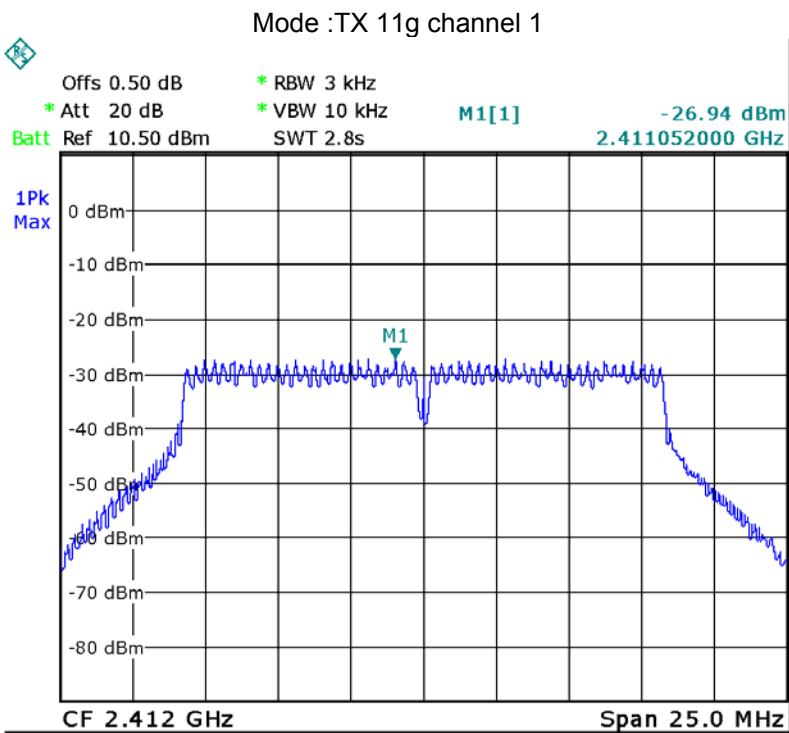
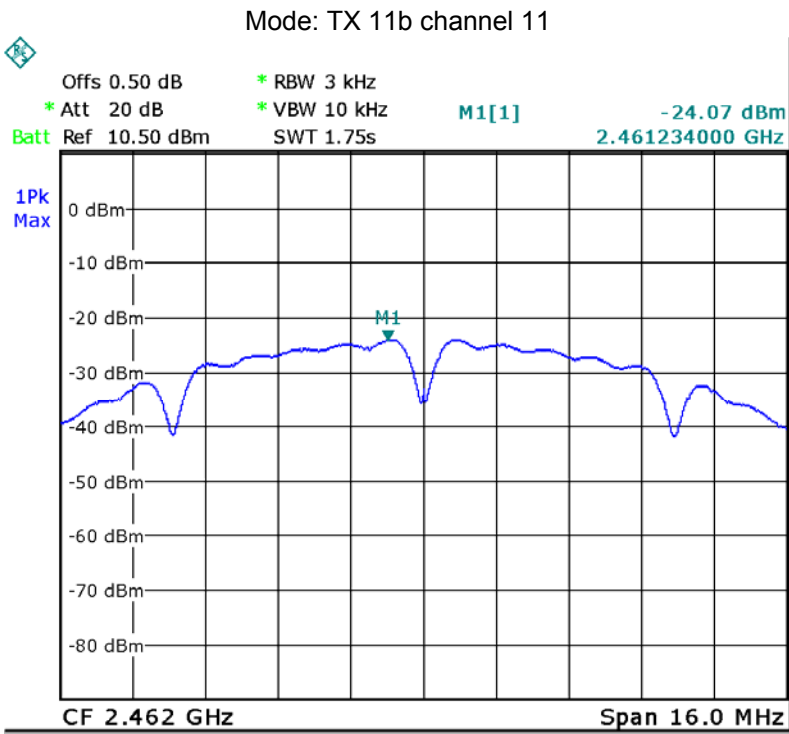
| Test mode :TX 11b      |         |         |
|------------------------|---------|---------|
| Power Spectral density |         |         |
| 2412MHz                | 2437MHz | 2462MHz |
| -24.32                 | -24.26  | -24.07  |
| Limit: 8dBm per 3kHz   |         |         |

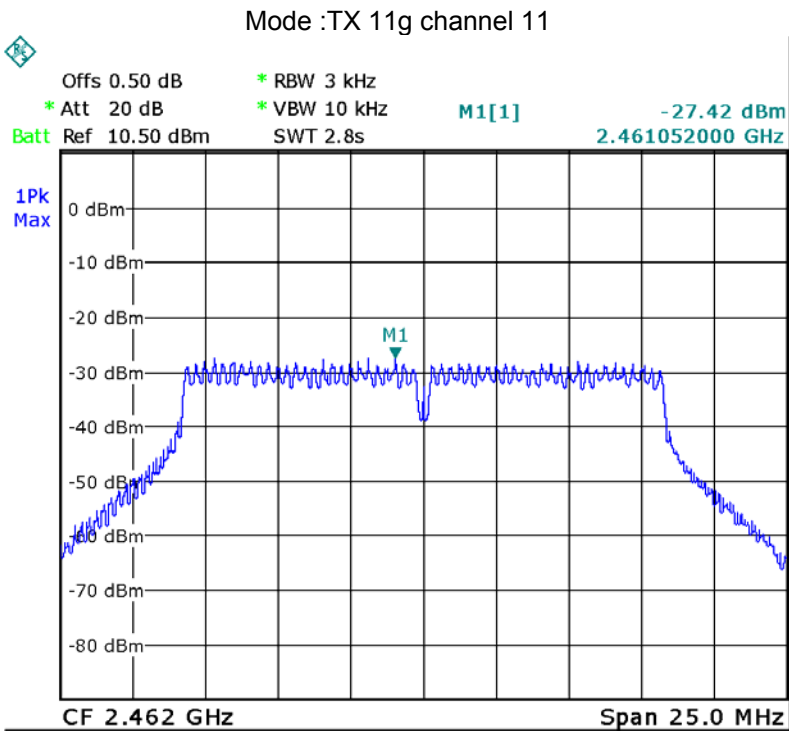
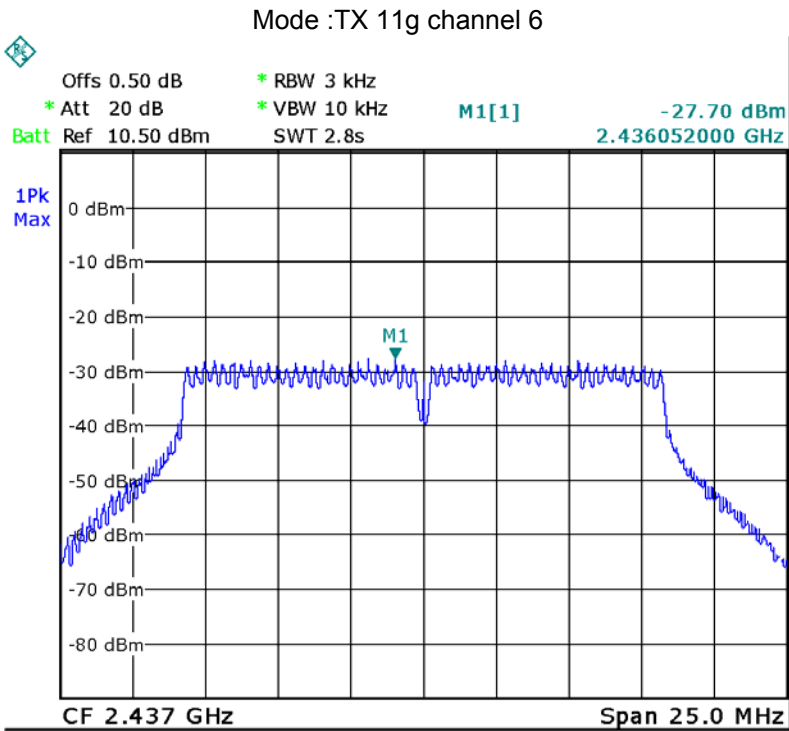
| Test mode :TX 11g      |         |         |
|------------------------|---------|---------|
| Power Spectral density |         |         |
| 2412MHz                | 2437MHz | 2462MHz |
| -26.94                 | -27.70  | -27.42  |
| Limit: 8dBm per 3kHz   |         |         |

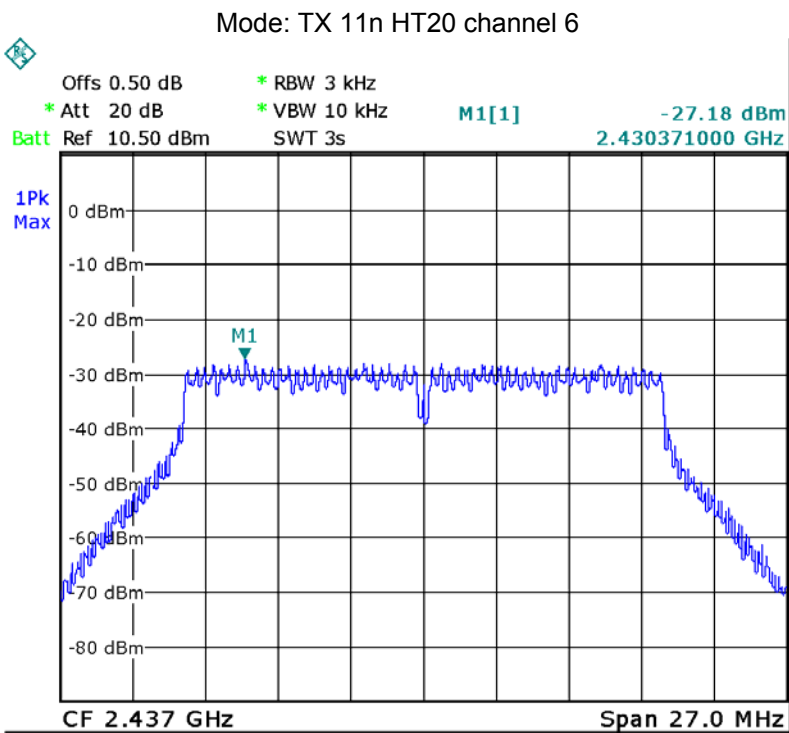
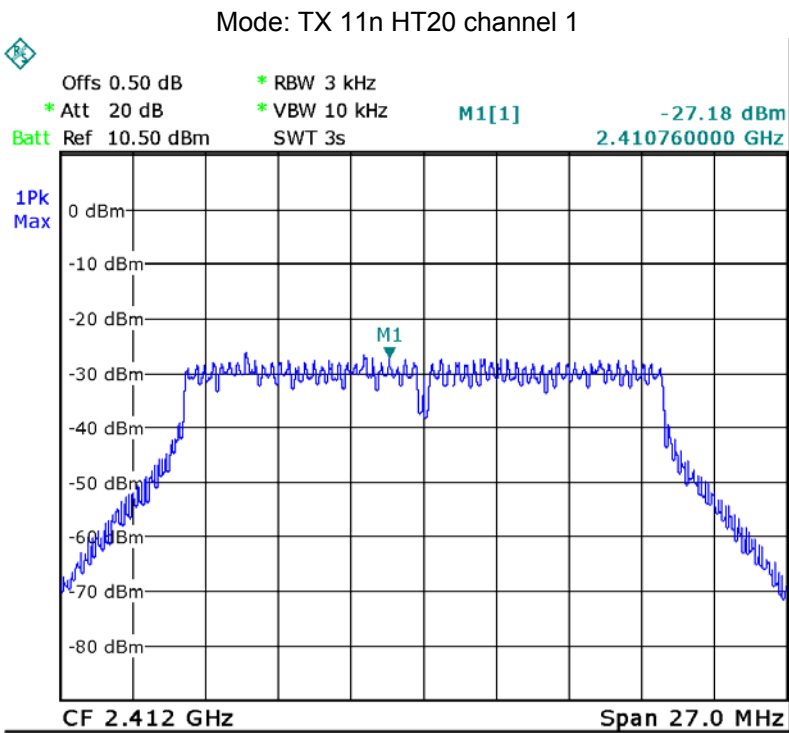
| Test mode :TX 11n HT20 |         |         |
|------------------------|---------|---------|
| Power Spectral density |         |         |
| 2412MHz                | 2437MHz | 2462MHz |
| -27.18                 | -27.18  | -27.54  |
| Limit: 8dBm per 3kHz   |         |         |

| Test mode : TX 11n HT40       |         |         |
|-------------------------------|---------|---------|
| Power Spectral (dBm per 3kHz) |         |         |
| 2422MHz                       | 2437MHz | 2452MHz |
| -26.70                        | -29.97  | -28.29  |
| Limit: 8dBm per 3kHz          |         |         |

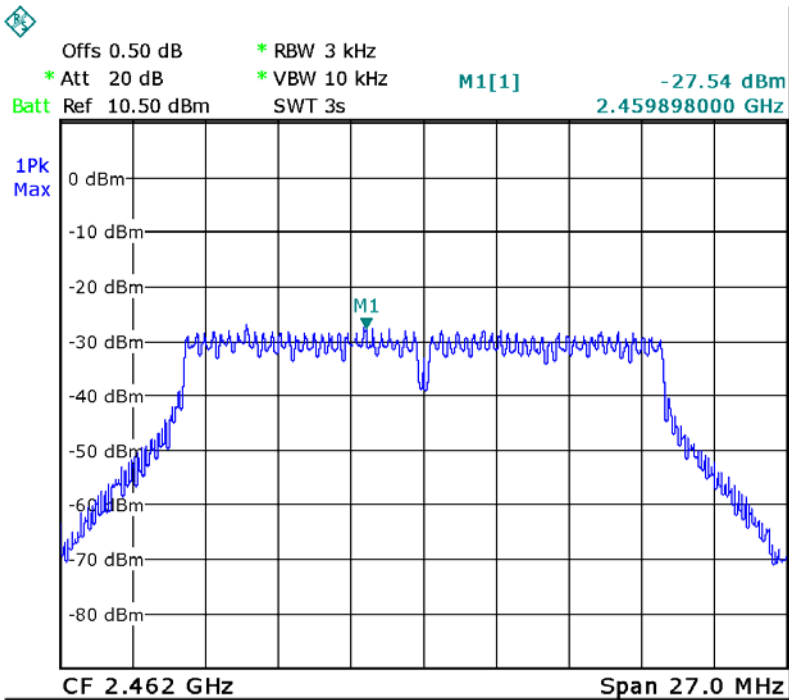




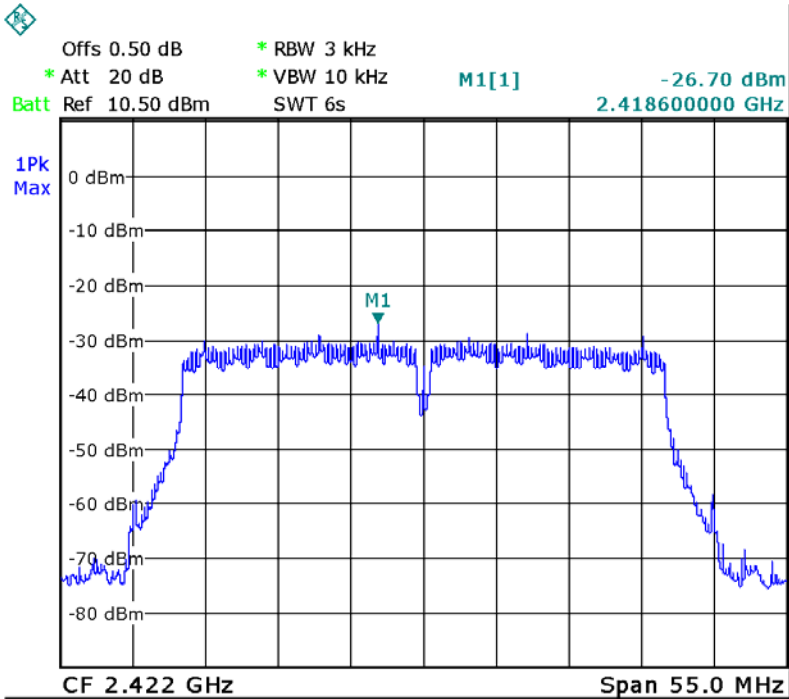


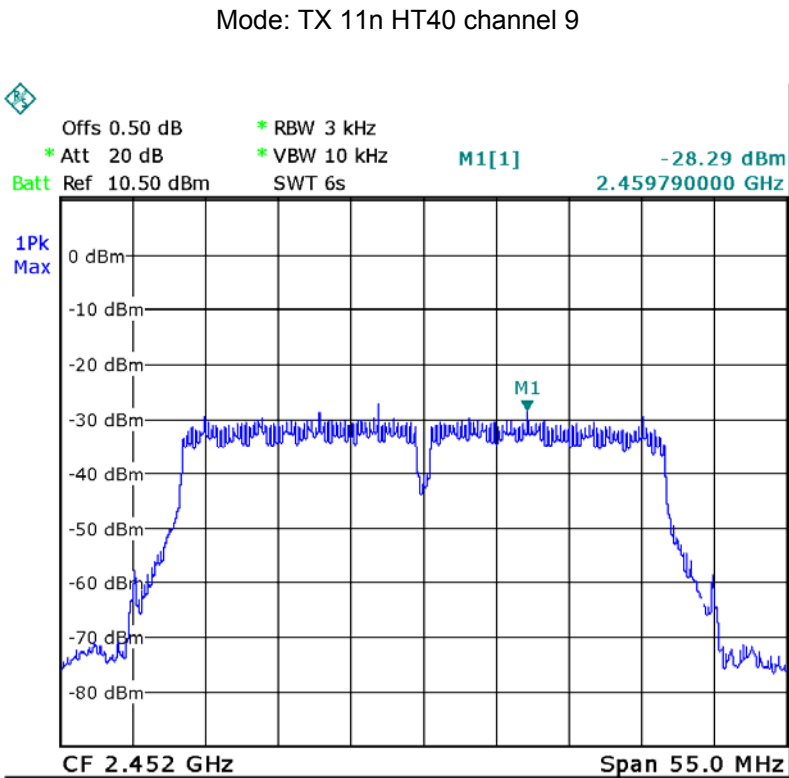
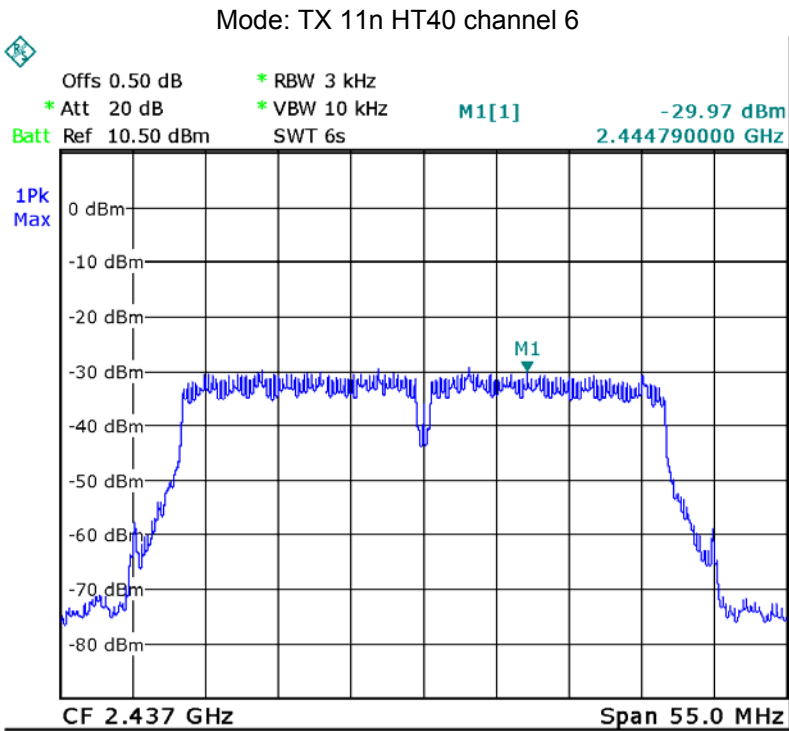


Mode: TX 11n HT20 channel 11



Mode: TX 11n HT40 channel 3





## 12 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

This device uses of an antennas that uses a specified coupling to the intentional radiator. Antenna connectors complied with the requirement.

## 13 RF Exposure

Test Requirement: FCC Part 1.1307

Evaluation Method: FCC Part 2.1091 & KDB 447498 D01 General RF Exposure Guidance v06

### 13.1 Requirements

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

### 13.2 The procedures / limit

#### (A) Limits for Occupational / Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-3.0               | 614                               | 1.63                              | (100)*                                   | 6                                                                |
| 3.0-30                | 1842 / f                          | 4.89 / f                          | (900 / f)*                               | 6                                                                |
| 30-300                | 61.4                              | 0.163                             | 1.0                                      | 6                                                                |
| 300-1500              |                                   |                                   | F/300                                    | 6                                                                |
| 1500-100,000          |                                   |                                   | 5                                        | 6                                                                |

#### (B) Limits for General Population / Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
|-----------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| 0.3-1.34              | 614                               | 1.63                              | (100)*                                   | 30                                                               |
| 1.34-30               | 824/f                             | 2.19/f                            | (180/f)*                                 | 30                                                               |
| 30-300                | 27.5                              | 0.073                             | 0.2                                      | 30                                                               |
| 300-1500              |                                   |                                   | F/1500                                   | 30                                                               |
| 1500-100,000          |                                   |                                   | 1.0                                      | 30                                                               |

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

### 13.3 MPE Calculation Method

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = output power to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

From the peak EUT RF output power, the minimum mobile separation distance, R=20cm, as well as the gain of the used antenna, the RF power density can be obtained

| Antenna Gain (dBi) | Antenna Gain (numeric) | Maximum conducted Output Power (dBm) | Maximum conducted Output Power (mW) | Power Density (mW/cm <sup>2</sup> ) | Limit of Power Density (mW/cm <sup>2</sup> ) |
|--------------------|------------------------|--------------------------------------|-------------------------------------|-------------------------------------|----------------------------------------------|
| 2.00               | 1.585                  | 9.42                                 | 8.75                                | 0.002759                            | 1                                            |

## 14 Photographs –Model ESTB-Qpd Test Setup Photos

### 14.1 Photograph – Radiated Emission

Test frequency 32.768KHz to 30MHz Test Site 2#

Adapter 1

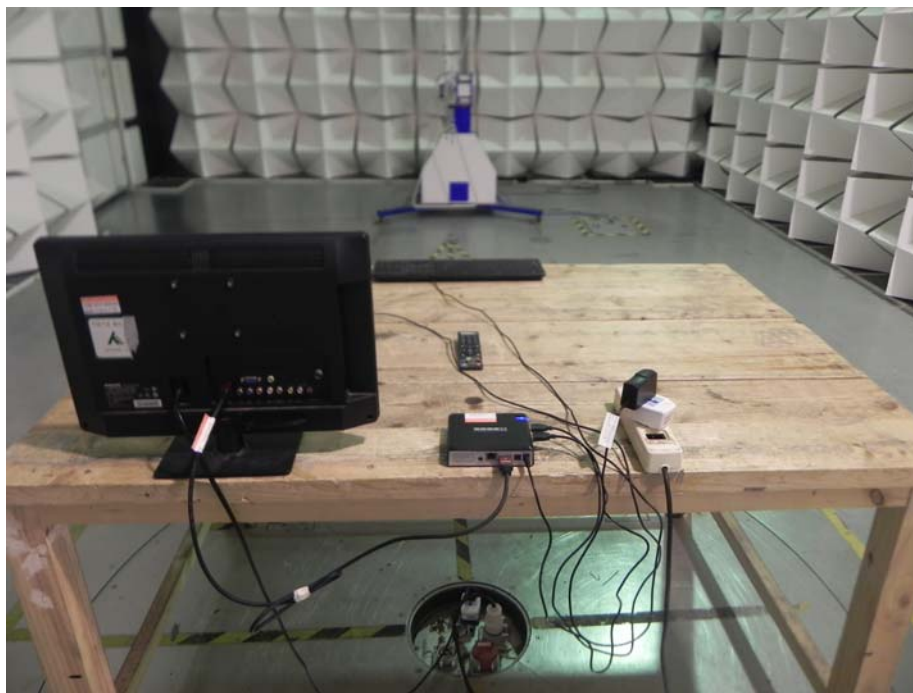


Adapter 2

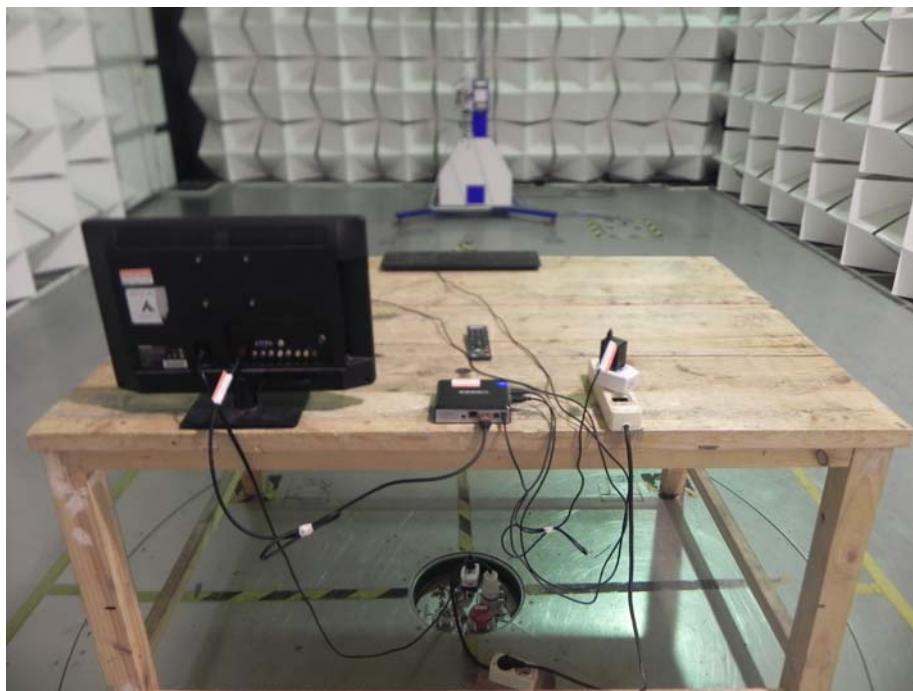


Test frequency from 30MHz to 1GHz Test Site 2#

Adapter 1



Adapter 2



Test frequency above 1GHz Test Site 1#  
Adapter 1



Adapter 2



## 14.2 Photograph – Conducted Emission Test Setup at Test Site 2#

Adapter 1



Adapter 2

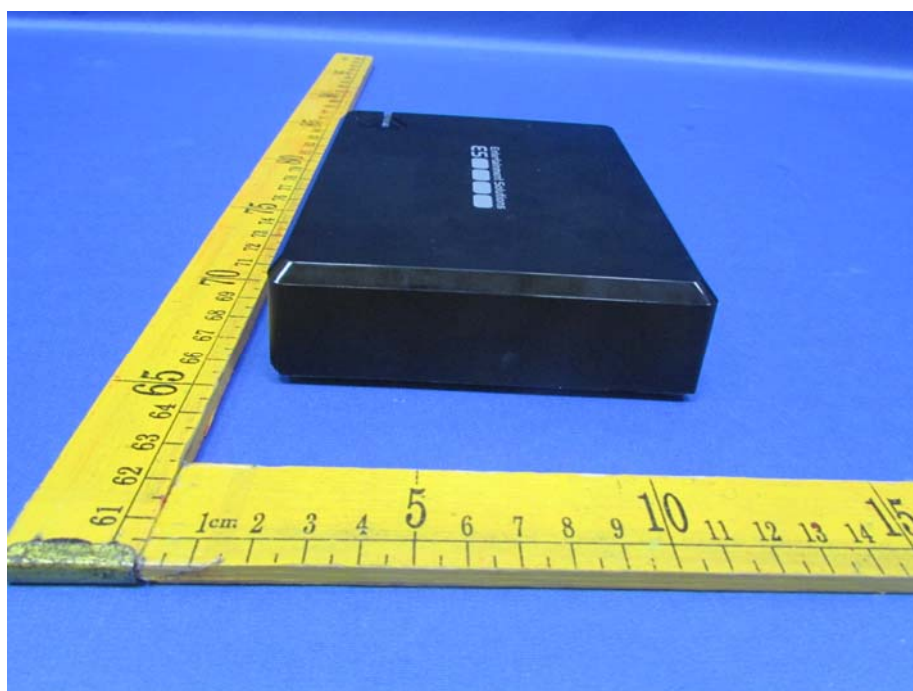


## 15 Photographs - Constructional Details

### 15.1 Model ESTB-Qpd - External Photos









Adapter 1



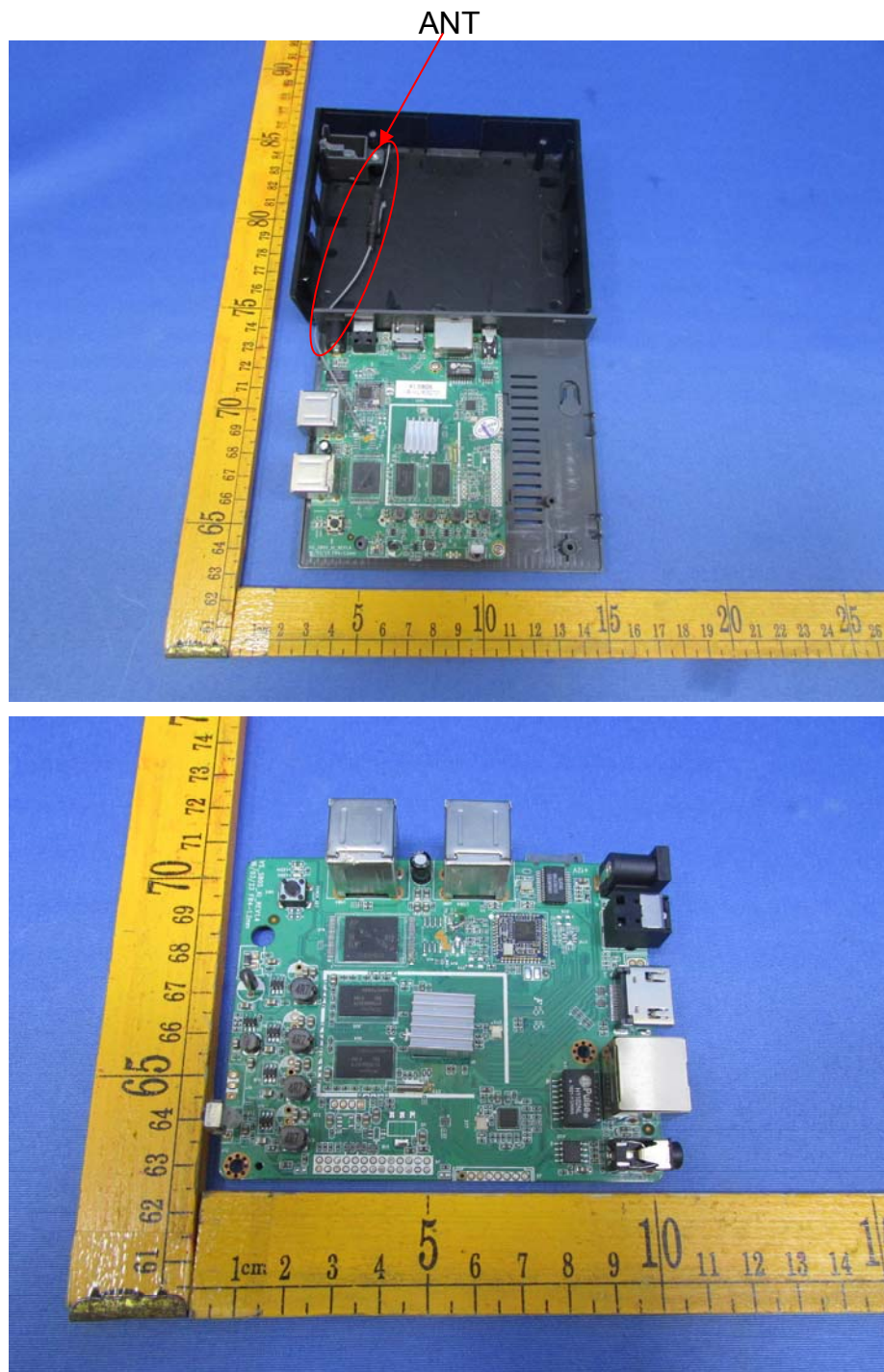


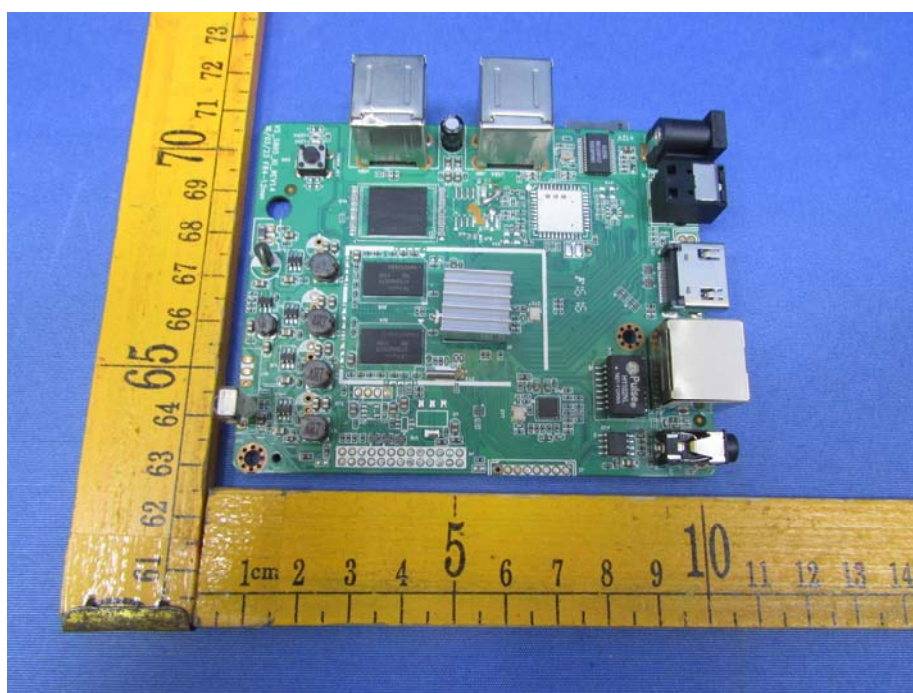
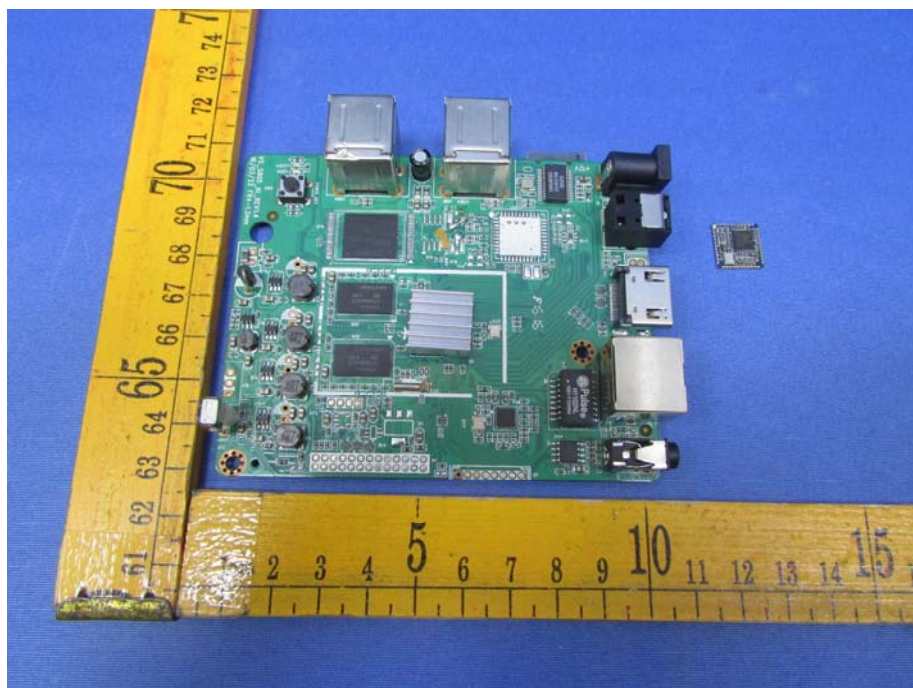
Adapter 2

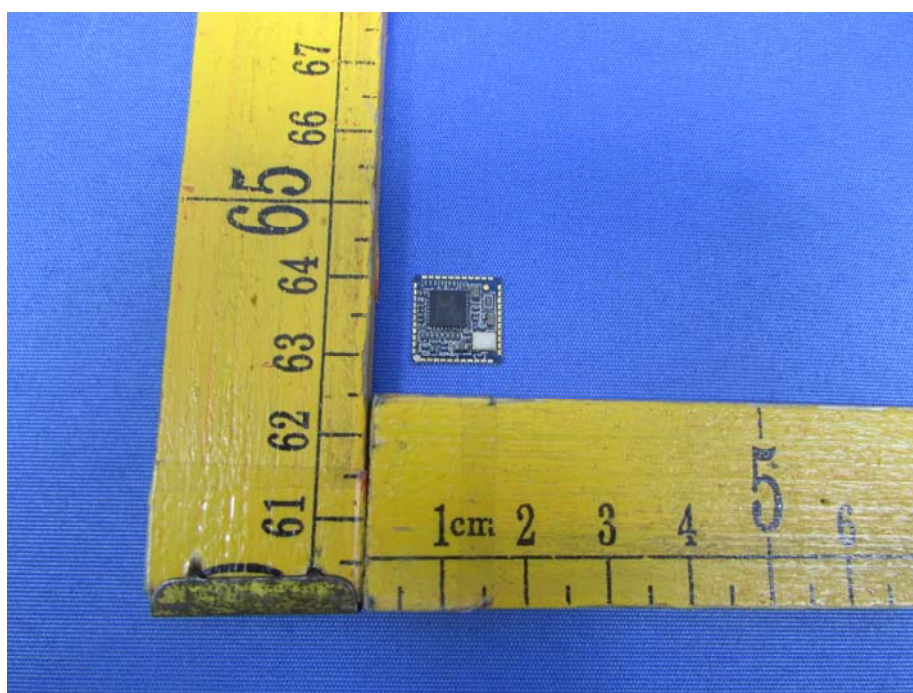
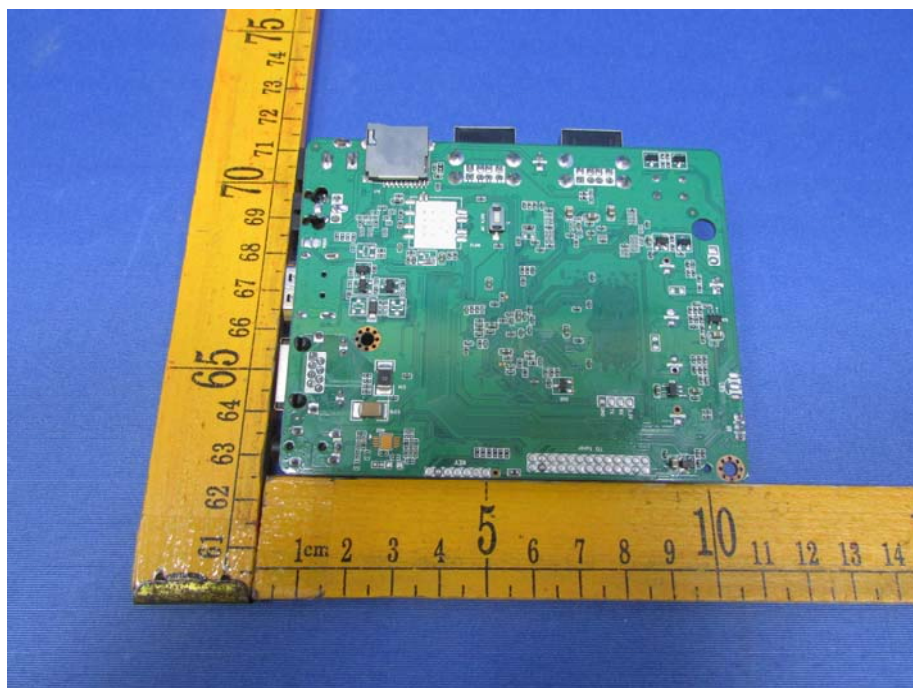


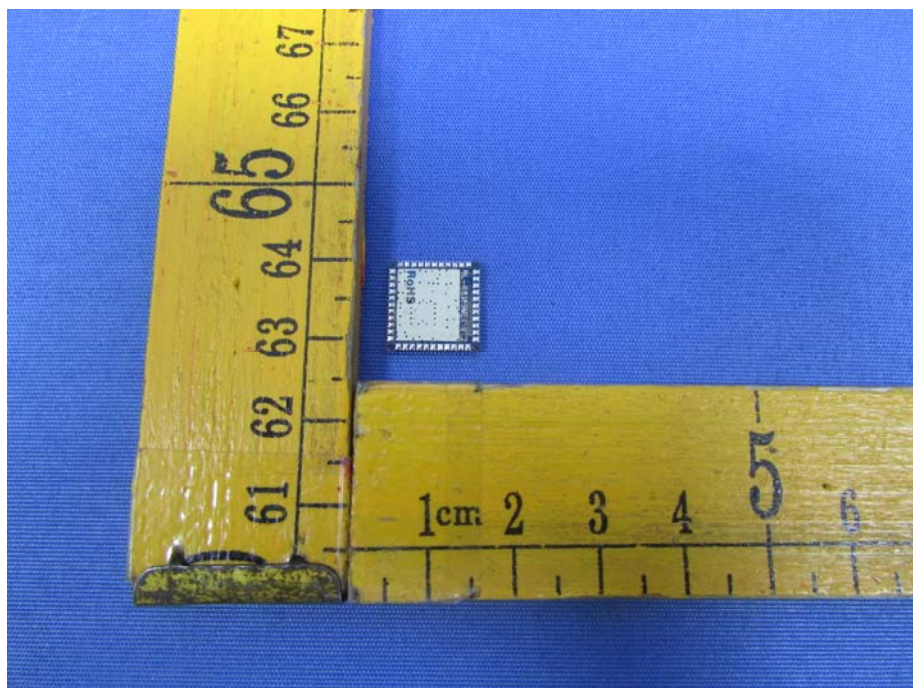


## 15.2 Model ESTB-Qpd - Internal Photos









=====End of Report=====