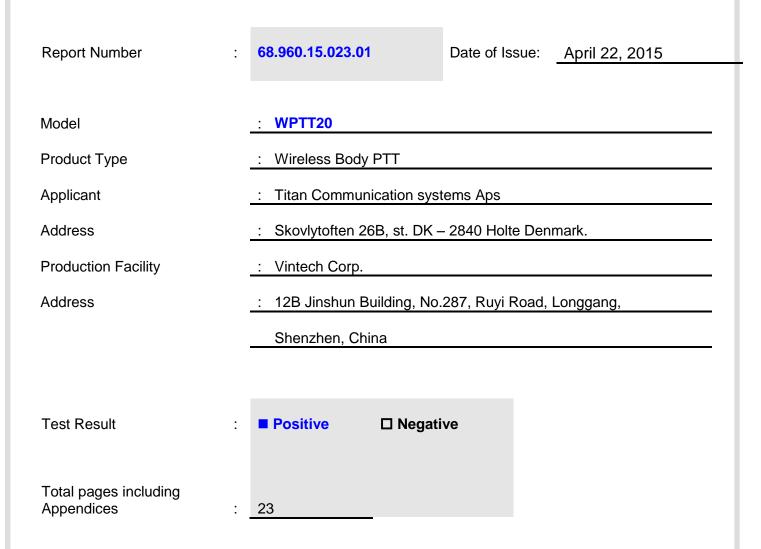


# FCC/IC- TEST REPORT



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## 2 Details about the Test Laboratory

### Details about the Test Laboratory

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China

FCC Registration 502708 Number:

| Telephone: | 86 755 8828 6998 |
|------------|------------------|
| Fax:       | 86 755 8828 5299 |



## **3** Description of the Equipment under Test

### **Description of the Equipment Under Test**

| Product:                      | Wireless Body PTT  |
|-------------------------------|--|
| Model no.:                    | WPTT-20  |
| FCC ID:                       | 2ACD5WPTT20  |
| Rating Voltage:               | DC 3.0V By CR2 Lithium battery   |
| RF Transmission<br>Frequency: | 2402-2480MHz   |
| No. of Operated Channel:      | 40   |
| Modulation:                   | GFSK   |
| Duty Cycle:                   | 65.7%  |
| Antenna Type:                 | Internal Antenna   |
| Antenna Gain:                 | 2.12dBi  |
| Description of the EUT:       | The Equipment Under Test (EUT) is a Wireless Body PTT operated at 2.4GHz |



### 4 Summary of Test Standards

| Test Standards                                      |   |  |  |  |  |  |
|---|---|--|--|--|--|--|
| FCC Part 15 Subpart C                               | FCC Part 15 Subpart C PART 15 - RADIO FREQUENCY DEVICES                 |  |  |  |  |  |
| 10-1-2014 Edition Subpart C - Intentional Radiators |   |  |  |  |  |  |
| RSS-Gen Issue 4                                     | General Requirements for the Certification of Radio Apparatus           |  |  |  |  |  |
| November 2014                                       |   |  |  |  |  |  |
| RSS-210 Issue 8                                     | RSS-210 Issue 8 RSS-210 — Licence-exempt Radio Apparatus (All Frequency |  |  |  |  |  |
| December 2010                                       | Bands): Category I Equipment  |  |  |  |  |  |

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2013).

## 5 Summary of Test Results

| Technical Requirements  |                                 |   |               |             |      |             |
|-------------------------|---------------------------------|---|---------------|-------------|------|-------------|
| FCC Part 15 Sub         | part C, RSS-Gen, F              | RSS-210   |               |             |      |             |
| Test Condition          |                                 | Pages   | -             | est Resul   | -    |             |
|                         | Γ                               |   | T ages        | Pass        | Fail | N/A         |
| §15.207                 | RSS-GEN A8.8                    | Conducted emission<br>AC power port               |               |             |      | $\boxtimes$ |
| §15.247 (b) (1)         | RSS-210 A8.4                    | Conducted peak<br>output power                    | 10            | $\boxtimes$ |      |             |
| §15.247(a)(1)           | RSS-210 A8.2(a)<br>& RSSGEN 6.6 | 20dB bandwidth                                    |               |             |      | $\boxtimes$ |
| §15.247(a)(1)           | RSS-210 A8.1(a)                 | Carrier frequency separation                      |               |             |      | $\square$   |
| §15.247(a)(1)(iii)      | RSS-210 A8.1(b)                 | Number of hopping frequencies                     |               |             |      | $\square$   |
| §15.247(a)(1)(iii)      | RSS-210 A8.1(d)                 | Dwell Time  |               |             |      | $\square$   |
| §15.247(a)(2)           | RSS-210 A8.1(c)                 | 6dB bandwidth and<br>99% Occupied<br>Bandwidth    | 11            | $\boxtimes$ |      |             |
| §15.247(e)              | RSS-210 A8.2(b)                 | Power spectral density                            | 13            | $\boxtimes$ |      |             |
| §15.247(d)              | RSS-210 A8.5                    | Spurious RF conducted emissions                   | 14            | $\boxtimes$ |      |             |
| §15.247(d)              | RSS-210 A8.5                    | Band edge   | 18            | $\boxtimes$ |      |             |
| §15.247(d) &<br>§15.209 | RSS-210 2.5 &<br>RSSGEN 6.13    | Spurious radiated<br>emissions for<br>transmitter | 20            | $\boxtimes$ |      |             |
| §15.203                 | RSSGEN 8.3                      | Antenna requirement                               | See<br>note 1 | $\boxtimes$ |      |             |

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a Embedded Type antenna, which gain is 2.12dBi. According to §15.203 and RSSGEN 8.3, it is considered sufficiently to comply with the provisions of this section.



### 6 General Remarks

#### Remarks

This submittal(s) (test report) is intended for FCC ID: 2ACD5WPTT20 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-210.

### SUMMARY:

All tests according to the regulations cited on page 5 were

Performed

- Not Performed

The Equipment under Test

■ - Fulfills the general approval requirements.

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

Sample Received Date:

Testing Start Date: April 1, 2015

Testing End Date:

April 16, 2015

March 13, 2015

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

Reviewed by:

John 2hi

John Zhi EMC Project Manager

Prepared by:

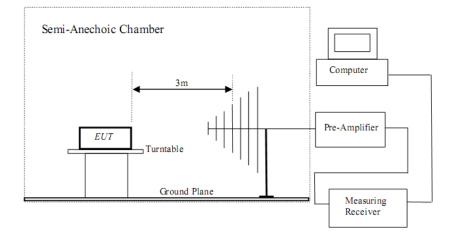
Alen X3000

Alan Xiong EMC Project Engineer

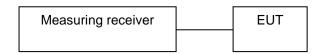


## 7 Test Setups

### 7.1 Radiated test setups



### 7.2 Conducted RF test setups







## 8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| Notebook    | Lenovo       | X240              |             |

Test software: CSR uEnergy Tools 2.0.

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

## 9 Technical Requirement

### 9.1 Conducted peak output power

### **Test Method**

- Use the following spectrum analyzer settings: RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW Sweep = auto, Detector function = peak, Trace = max hold.
- 2. Add a correction factor to the display.
- 3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

### Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

| F | Frequency Range | Limit | Limit |
|---|-----------------|-------|-------|
|   | MHz             | W     | dBm   |
|   | 2400-2483.5     | ≤1    | ≤30   |

Test result as below table

|                        | Conducted Peak |        |
|------------------------|----------------|--------|
| Frequency              | Output Power   | Result |
| MHz                    | dBm            |        |
| Top channel 2402MHz    | -5.57          | Pass   |
| Middle channel 2440MHz | -4.15          | Pass   |
| Bottom channel 2480MHz | -1.78          | Pass   |





## 9.2 6dB bandwidth and 99% Occupied Bandwidth

#### **Test Method**

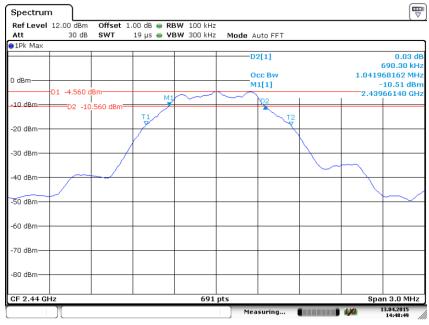
- 1. Use the following spectrum analyzer settings:
- RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
  Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the
  - fundamental emission that might be  $\geq$  6 dB.
- 3. Allow the trace to stabilize, record the X dB Bandwidth value.

### Limit

|                                 | Limit         | [kHz]           |                               |  |  |
|---------------------------------|---------------|-----------------|-------------------------------|--|--|
| ≥500                            |               |                 |                               |  |  |
| est result                      |               |                 |                               |  |  |
| Frequency                       | 6dB bandwidth | 99% Bandwidt    | h Result                      |  |  |
| MHz                             | kHz           | kHz             |                               |  |  |
| Top channel 2402MHz             | 690.3         | 1046.3          | Pass                          |  |  |
| Middle channel 2440MHz          | 690.3         | 1042.0          | Pass                          |  |  |
| Bottom channel 2480MHz          | 699.0         | 1042.0          | Pass                          |  |  |
|                                 |               |                 |                               |  |  |
|                                 | 2402          | MHz             |                               |  |  |
| Spectrum                        |               |                 |                               |  |  |
| RefLevel 12.00 dBn<br>Att 30 dB |               |                 |                               |  |  |
| ● 1Pk Max                       |               |                 |                               |  |  |
|                                 |               | D2[1]           | -0.24 dB<br>690.30 kHz        |  |  |
| 0 dBm                           |               | Occ Bw<br>M1[1] | 1.046309696 MHz<br>-11.72 dBm |  |  |
| -10 dBm                         | dBm M1        |                 | 2.40166570 GHz                |  |  |
| -10 dBin D2 -:                  | .2.000 dBm    | T2              |                               |  |  |
| -20 dBm                         | T1<br>P       |                 |                               |  |  |
| -30 dBm                         |               |                 |                               |  |  |
| -50 dBin                        |               |                 | ~                             |  |  |
| -40 dBm                         |               |                 | <u> </u>                      |  |  |
|                                 |               |                 |                               |  |  |
|                                 |               |                 |                               |  |  |
| -60 dBm                         |               |                 |                               |  |  |
| -70 dBm                         |               |                 |                               |  |  |
| 70 dB.H                         |               |                 |                               |  |  |
| -80 dBm                         |               |                 |                               |  |  |
| CF 2.402 GHz                    | 691           | pts             | Span 3.0 MHz                  |  |  |
|                                 |               |                 | 13.04.2015                    |  |  |



#### 2440MHz



Date: 13.APR.2015 14:48:49

#### 2480MHz



Date: 13.APR.2015 14:50:48

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## 9.3 Power spectral density

#### **Test Method**

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

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

### Limit

Limit [dBm]

≤8

Test result

|                        | Power spectral |        |
|------------------------|----------------|--------|
| Frequency              | density        | Result |
| MHz                    | dBm            |        |
| Top channel 2402MHz    | -20.40         | Pass   |
| Middle channel 2440MHz | -20.19         | Pass   |
| Bottom channel 2480MHz | -17.52         | Pass   |
|                        |                |        |



### 9.4 Spurious RF conducted emissions

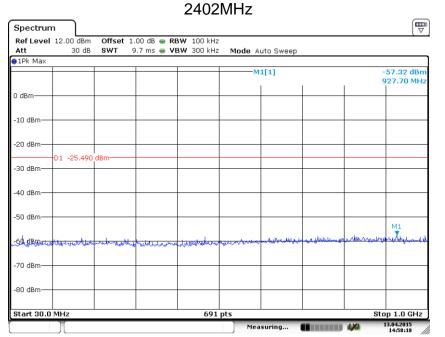
#### **Test Method**

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

Limit

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

### **Spurious RF conducted emissions**



Date: 13.APR.2015 14:58:19

EMC\_SZ\_FR\_21.00 FCC Release 2014-03-20



| Ref Level<br>Att | 12.00 dBm<br>30 dB | Offset<br>SWT | 1.00 dB 👄 R<br>96 ms 👄 V | BW 1 MHz<br>BW 3 MHz   | Mode Aut | n Sween    |          |         |                       |
|------------------|--------------------|---------------|--------------------------|--|----------|------------|----------|---------|-----------------------|
| ●1Pk Max         | 00 00              | 0             |                          |  | Mode Add | 0 00000    |          |         |                       |
|                  |                    |               |                          |  | M        | 1[1]       |          | :       | -5.49 dB<br>2.4070 GF |
|                  |                    |               |                          |  |          |            |          |         |                       |
| -10 dBm          |                    |               |                          |  |          |            |          |         |                       |
| -20 dBm          |                    |               |                          |  |          |            |          |         |                       |
| -30 dBm          | D1 -25.490         | dBm           |                          |  |          |            |          |         |                       |
| -40 dBm          |                    |               |                          |  |          | La Mariana |          |         |                       |
|                  | mandarate          | andrehand     | rlaunderna               | and an and the state of the sta | wohnth   | www.n      | why your | hundrer | nuhuru                |
| -60 dBm          |                    |               |                          |  |          |            |          |         |                       |
| -70 dBm          |                    |               |                          |  |          |            |          |         |                       |
| -80 dBm          |                    |               |                          |  |          |            |          |         |                       |
| Start 1.0 G      | H7                 |               |                          | 691  | nte      |            |          | Stor    | 25.0 GH               |

Date: 13.APR.2015 14:57:44

#### 2440MHz

| Spectrum            |                            |  |                                       |
|---------------------|----------------------------|--|---------------------------------------|
| Ref Level 12.00 dBm | Offset 1.00 dB  RBW 100 kH |  | · · · · · · · · · · · · · · · · · · · |
| Att 30 dB           | SWT 9.7 ms 👄 VBW 300 kH    | Iz Mode Auto Sweep   |                                       |
|                     |                            | M1[1]  | -57.67 dBm<br>867.30 MHz              |
| 0 dBm               |                            |  |                                       |
| -10 dBm             |                            |  |                                       |
| -20 dBm             | d0                         |  |                                       |
| -30 dBm             | abm                        |  |                                       |
| -40 dBm             |                            |  |                                       |
| -50 dBm             |                            |  | M1                                    |
| 169. ABOOM Martine  | would she would wonth      | and the second | washered the hearth duth the areas    |
| -70 dBm             |                            |  |                                       |
| -80 dBm             |                            |  |                                       |
| CF 515.0 MHz        | 69                         | 1 pts  | Span 970.0 MHz                        |
|                     |                            | Measuring  | 13.04.2015<br>14:57:05                |

Date: 13.APR.2015 14:57:05

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| Ref Level 12<br>Att | .00 dBm Offse<br>30 dB SWT | et 1.00 dB 👄 R<br>96 ms 👄 V |           | lode Auto Sweep   |  |           |                      |
|---------------------|----------------------------|-----------------------------|-----------|---|--|-----------|----------------------|
| ●1Pk Max            |                            |                             |           |   |  |           |                      |
|                     |                            |                             |           | M1[1]   |  |           | -4.03 dE<br>2.4410 G |
|                     |                            |                             |           |   |  |           |                      |
| -10 dBm             |                            |                             |           |   |  |           |                      |
| -20 dBm             |                            |                             |           |   |  |           |                      |
| -30 dBm             | -24.030 dBm                |                             |           |   |  |           |                      |
| -40 dBm             |                            |                             |           | und M.A.  |  |           |                      |
| -50-86m             | renterret                  | motherworkship              | - whether | ynar warden werden w | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | nonmenter | market               |
| -60 dBm             |                            |                             |           |   | _                                      |           |                      |
| -70 dBm             |                            |                             |           |   |  |           |                      |
| -80 dBm             |                            |                             |           |   |  |           |                      |
| Start 1.0 GHz       |                            |                             | 691 pt    |   |  | Eton      | 25.0 GF              |

Date: 13.APR.2015 14:55:49

#### 2480MHz

| Spectrum                 |                                     |                  |                                |                                       |
|--------------------------|-------------------------------------|------------------|--------------------------------|---------------------------------------|
| Ref Level 12.00 dBm      | Offset 1.00 dB 👄 RE                 | 3W 100 kHz       |                                | · · · · · · · · · · · · · · · · · · · |
| Att 30 dB                | SWT 9.7 ms 👄 VE                     | 3W 300 kHz Mode  | Auto Sweep                     |                                       |
| 1Pk Max                  |                                     |                  |                                |                                       |
|                          |                                     |                  | M1[1]                          | -57.59 dBr                            |
|                          |                                     |                  | 1 1                            | 826.60 MH                             |
| 0 dBm                    |                                     |                  |                                |                                       |
|                          |                                     |                  |                                |                                       |
| -10 dBm                  |                                     |                  |                                |                                       |
|                          |                                     |                  |                                |                                       |
| -20 dBm                  |                                     |                  |                                |                                       |
| D1 -21.690               | J dBm                               |                  |                                |                                       |
| -30 dBm                  |                                     |                  |                                |                                       |
|                          |                                     |                  |                                |                                       |
| -40 dBm                  |                                     |                  |                                |                                       |
|                          |                                     |                  |                                |                                       |
| -50 dBm                  |                                     |                  |                                |                                       |
| -50 dbiii                |                                     |                  |                                | M1                                    |
| 60 dBm - Hunner          | Marthan Martin Martin               |                  | was mult a heating will a made |                                       |
| Child Berry and and many | www.madelendlend.ch. Marchald frees | housedhoreaction |                                |                                       |
| -70 dBm                  |                                     |                  |                                |                                       |
| -/U UBM                  |                                     |                  |                                |                                       |
| 00.40                    |                                     |                  |                                |                                       |
| -80 dBm                  |                                     |                  |                                |                                       |
|                          |                                     | 601              |                                |                                       |
| Start 30.0 MHz           |                                     | 691 pts          |                                | Stop 1.0 GHz                          |
|                          |                                     | Me               | easuring 🚺                     | 13.04.2015<br>14:54:41                |

Date: 13.APR.2015 14:54:41

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| Ref Level<br>Att | 12.00 dBm<br>30 dB | Offset<br>SWT | 1.00 dB 👄 RE<br>96 ms 👄 VE |          | Mode Aut   | o Sween      |                  |           |                        |
|------------------|--------------------|---------------|----------------------------|----------|------------|--------------|------------------|-----------|------------------------|
| ●1Pk Max         | 00 40              | 0.111         |                            |          | Houe Au    | 0 011000     |                  |           |                        |
| -                |                    |               |                            |          | M          | 1[1]         |                  |           | -1.69 dBi<br>2.4760 GH |
|                  |                    |               |                            |          |            |              |                  |           |                        |
| -10 dBm          |                    |               |                            |          |            |              |                  |           |                        |
| -20 dBm          | D1 -21.690         | )_dBm         |                            |          |            |              |                  |           |                        |
| -30 dBm          |                    |               |                            |          |            |              |                  |           |                        |
| -40 dBm          |                    |               | muunnund                   |          |            | Mr. Corres h | Ah 1 is now      | at me and | And A                  |
| -50 dBm          | untwichthe         | hand          | mannanan                   | www.me.m | P. Marco a |              | v . • 00 00 + 00 |           | - market               |
| -60 dBm—         |                    |               |                            |          |            |              |                  |           |                        |
| -70 dBm—         |                    |               |                            |          |            |              |                  |           |                        |
| -80 dBm          |                    |               |                            |          |            |              |                  |           |                        |
| Start 1.0 0      |                    |               |                            | 691      | nte        |              |                  | Etor      | 25.0 GH                |

Date: 13.APR.2015 14:54:13

## 9.5 Band edge

#### **Test Method**

1 Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 kHz, VBW  $\ge$  RBW, Sweep = auto, Detector function = peak, Trace = max hold.

- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

### Limit

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

### **Test result**

| Spectrur    | n<br>12.00 dBm     |             | RBW 100 kHz     |               |                |                      |
|-------------|--------------------|-------------|-----------------|---------------|----------------|----------------------|
| Att         | 12.00 aBr<br>30 dB |             |                 | Mode Auto Swi | een            |                      |
| 1Pk Max     | 00 66              |             | • 1811 000 Mile | Hous Auto om  | 000            |                      |
|             |                    |             |                 | M1[1]         |                | -6.32 dBn            |
|             |                    |             |                 |               |                | 2.402180 GHz         |
| D dBm       |                    |             |                 | M2[1]         |                | -59.45 dBn           |
|             |                    |             |                 |               |                | 2.390000 GH          |
| -10 dBm—    |                    |             |                 |               |                |                      |
|             |                    |             |                 |               |                |                      |
| -20 dBm—    |                    |             |                 |               |                |                      |
|             | D1 -26.32          | 0 dBm       |                 |               |                |                      |
| -30 dBm—    |                    |             |                 |               |                |                      |
|             |                    |             |                 |               |                |                      |
| -40 dBm—    |                    |             |                 |               |                |                      |
|             |                    |             |                 |               |                | МЗ и                 |
| -50 dBm—    |                    |             |                 |               |                |                      |
| no data da  |                    |             |                 |               | den an hala ta | M2                   |
| -80 dBfn-b- |                    |             |                 |               | ****           | nd francisco contine |
| -70 dBm     |                    |             |                 |               |                |                      |
| -70 uBm-    |                    |             |                 |               |                |                      |
| -80 dBm     |                    |             |                 |               |                |                      |
| -80 aBm—    |                    |             |                 |               |                |                      |
| Start 2.31  | CH2                |             | 691 pt          |               |                | Stop 2.405 GHz       |
| larker      | 3.12               |             | 591 pc          |               |                | 000p 2.400 GHZ       |
|             | f                  | X-value     | Y-value         | Function      | Eun            | iction Result        |
| M1          | 1                  | 2.40218 GHz | -6.32 dBm       | ranction      | Fui            | iccion Result        |
| M2          | 1                  | 2.39 GHz    |                 |               |                |                      |
| M3          | 1                  | 2.4 GHz     |                 |               |                |                      |

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| Spectrum    |          |         |                |                            |        |              |       |   |
|-------------|----------|---------|----------------|----------------------------|--------|--------------|-------|---|
| Ref Level 1 |          |         |                | RBW 100 kHz                |        |              | _     |   |
| Att         | 30 dE    | SWT 75  | .9 µs 👄 '      | <b>/BW</b> 300 kHz         | Mode A | uto FF       | T     |   |
| 0 dBm M1    |          |         |                |                            |        | 3[1]<br>1[1] |       | -51.60 dBr<br>2.4835000 GH<br>-2.17 dBr<br>2.4799850 GH |
| -10 dBm     |          |         |                |                            |        |              |       |   |
| -20 dBm     | 1 -22.17 | 0 dBm   |                |                            |        |              |       |   |
| -30 dBm     | h        |         |                |                            |        |              |       |   |
| -50 dBm     | - when   | MB      |                |                            |        |              |       |   |
| -60 dBm     |          | m       | www.           | m                          | mon    | Am           | M2    |   |
| -70 dBm     |          |         |                |                            |        |              | · · · |   |
| -80 dBm     |          |         |                |                            |        |              |       |   |
| Start 2.477 | GHz      |         |                | 691                        | pts    |              |       | Stop 2.51 GHz   |
| Marker      |          |         |                |                            |        |              |       |   |
| Type Ref    |          | X-value | E CUE          | <u>Y-value</u><br>-2.17 dB | Func   | tion         | Fu    | nction Result   |
| M1<br>M2    | 1        | 2.47998 | 5 GHZ<br>5 GHZ | -2.17 dB                   |        |              |       |   |
| M3          | 1        |         | 5 GHz          | -51.60 dB                  |        |              |       |   |
|             | )[       |         |                |                            | Mea    | suring       |       | 13.04.2015<br>15:01:06                                  |

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## 9.6 Spurious radiated emissions for transmitter

#### **Test Method**

- 1. The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Use the following spectrum analyzer settings: Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

### Limit

According to part 15.247(d), the radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

| Frequency<br>MHz | Field Strength<br>uV/m | Field Strength<br>dBµV/m | Detector |
|------------------|------------------------|--------------------------|----------|
| 30-88            | 100                    | 40                       | QP       |
| 88-216           | 150                    | 43.5                     | QP       |
| 216-960          | 200                    | 46                       | QP       |
| 960-1000         | 500                    | 54                       | QP       |
| Above 1000       | 500                    | 54                       | AV       |
| Above 1000       | 5000                   | 74                       | PK       |



#### Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

#### Transmitting spurious emission test result as below:

Emission

#### 2402MHz

|         | Frequency | Level             | Polarization | Limit  | Detector | Margin | Result |
|---------|-----------|-------------------|--------------|--------|----------|--------|--------|
|         | MHz       | dBuV/m            |              | dBµV/m |          | dBµV/m |        |
|         | 279.96    | 39.03             | Horizontal   | 46     | QP       | 6.97   | Pass   |
|         | 875.84    | 38.22             | Vertical     | 46     | QP       | 7.78   | Pass   |
|         | *4804     | 41.62             | Horizontal   | 74     | PK       | 32.38  | Pass   |
|         | *4804     | 41.16             | Vertical     | 74     | PK       | 32.84  | Pass   |
| 2440MHz |           |                   |              |        |          |        |        |
|         | Frequency | Emission<br>Level | Polarization | Limit  | Detector | Margin | Result |
|         | MHz       | dBuV/m            |              | dBµV/m |          | dBµV/m |        |
|         | *4880     | 42.47             | Horizontal   | 74     | PK       | 31.53  | Pass   |
|         | *4880     | 45.38             | Vertical     | 74     | PK       | 28.62  | Pass   |

#### 2480MHz

| Frequency | Emission<br>Level | Polarization | Limit  | Detector | Margin | Result |
|-----------|-------------------|--------------|--------|----------|--------|--------|
| MHz       | dBuV/m            |              | dBµV/m |          | dBµV/m |        |
| *4960     | 41.86             | Horizontal   | 74     | PK       | 31.14  | Pass   |
| *4960     | 47.63             | Vertical     | 74     | PK       | 26.37  | Pass   |

#### Remark:

- (1) AV Emission Level= PK Emission Level+20log (dutycycle)
- (2) Data of measurement within 30-1000MHz frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- (3) "\*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.



# **10 Test Equipment List**

### List of Test Instruments

|    | DESCRIPTION                               | MANUFACTURER    | MODEL NO. | SERIAL NO. | CAL. DUE<br>DATE |
|----|---|-----------------|-----------|------------|------------------|
| С  | Signal Analyzer                           | Rohde & Schwarz | FSV40     | 101030     | 2015-8-17        |
|    | EMI Test Receiver                         | Rohde & Schwarz | ESR 26    | 101269     | 2015-8-17        |
| DE | Trilog Super<br>Broadband Test<br>Antenna | Schwarzbeck     | VULB 9163 | 707        | 2017-8-17        |
| RE | Horn Antenna                              | Rohde & Schwarz | HF907     | 102294     | 2017-8-17        |
|    | Pre-amplifier                             | Rohde & Schwarz | SCU 18    | 102230     | 2015-8-17        |
|    | 3m Semi-anechoic<br>chamber               | TDK             | 9X6X6     |            | 2019-5-29        |

C - Conducted RF tests

Conducted peak output power

- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density
- Spurious RF conducted emissions
- Band edge



## **11 System Measurement Uncertainty**

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

| System I | Measurement | Uncertainty |
|----------|-------------|-------------|
|          |             |             |

| Items              | Extended Uncertainty   |
|--------------------|--|
| Radiation emission | Horizontal: 4.83dB; (30MHz-1GHz)<br>Vertical: 4.91dB; (30MHz-1GHz) |
|                    | Horizontal: 4.89dB; (1Hz-18GHz)<br>Vertical: 4.88dB; (1Hz-18GHz)   |