

# EMC

## TEST REPORT

**Report No.:** 161200059TWN-001**Model No.:** PAD06**Issued Date:** Dec. 28, 2016

**Applicant:** Philio Technology Corporation  
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New Taipei City 24257, Taiwan

**Test Method/ Standard:** 47 CFR FCC Part 15.247 & ANSI C63.10 2013  
KDB 558074 D01 v03r05

**Test Site:** 93910

**Test By:** Intertek Testing Services Taiwan Ltd.,  
Hsinchu Laboratory  
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**Revision History**

| Report No.       | Issue Date    | Revision Summary |
|------------------|---------------|------------------|
| 161200059TWN-001 | Dec. 28, 2016 | Original report  |

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## 1. Summary of Test Data

| Test Requirement                                                            | Applicable Rule<br>(Section 15.247)   | Result |
|-----------------------------------------------------------------------------|---------------------------------------|--------|
| Minimum 6 dB Bandwidth                                                      | 15.247(a)(2)<br>KDB 558074 D01 v03r05 | Pass   |
| Maximum Peak Conducted Output Power                                         | 15.247(b)(3)<br>KDB 558074 D01 v03r05 | Pass   |
| Power Spectral Density                                                      | 15.247(e)                             | Pass   |
| Emissions In Non-Restricted Frequency Bands                                 | 15.247(d)                             | Pass   |
| Emissions In Restricted Frequency Bands<br>(Radiated emission measurements) | 15.247(d), 15.205,<br>15.209          | Pass   |
| Emission On The Band Edge                                                   | 15.247(d), 15.205                     | Pass   |
| AC Power Line Conducted Emission                                            | 15.207                                | Pass   |
| Antenna Requirement                                                         | 15.203                                | Pass   |

## 2. General Information

### 2.1 Identification of the EUT

Product: Smart Dimmer Socket

Model No: PAD06

Brand name:



Operating Frequency: 2405 MHz ~ 2475 MHz

Channel Number: 15 channels

Frequency of Each Channel: 2405+5 k MHz, k=0~14

Access scheme: O-DQPSK

Rated Power: 100-240 Vac, 50-60 Hz

Power Cord: N/A

Sample receiving date: Dec. 07, 2016

Sample condition: Workable

Test Date(s): Dec. 12, 2016 ~ Dec. 27, 2016

Note 1: The test report only allows to be revised within three years from its original issued date unless further standard or the requirement was noticed.

Note 2: When determining the test conclusion, the Measurement Uncertainty of test has been considered.

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## 2.2 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 0 dBi  
Antenna Type : Monopole Antenna  
Connector Type : Fixed

## 2.3 Operation mode

TX-MODE is based on Power on.

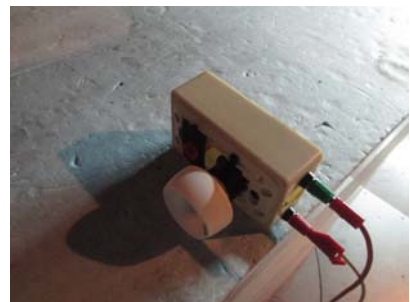
The signal is maximized through rotation and placement in the three orthogonal axes.



**X axis**



**Y axis**



**Z axis**

After verifying three axes, we found the maximum electromagnetic field was occurred at Z axis. The final test data was executed under this configuration.

## 2.4 Applied test modes and channels

| Test items                                        | Mode          | Channel | Antenna |
|---------------------------------------------------|---------------|---------|---------|
| Minimum 6 dB Bandwidth                            | Zigbee        | 1,8,15  | Chain0  |
| Maximum peak conducted output power               | Zigbee        | 1,8,15  | Chain0  |
| Power Spectral Density                            | Zigbee        | 1,8,15  | Chain0  |
| RF Antenna Conducted Spurious                     | Zigbee        | 1,8,15  | Chain0  |
| Radiated spurious Emission<br>9kHz~1GHz           | Ch Low        |         |         |
| Radiated Spurious Emission<br>10GHz~10th Harmonic | Zigbee        | 1,8,15  | Chain0  |
| Restricted-Band Band edge                         | Zigbee        | 1,8,15  | Chain0  |
| AC Power Line Conducted Emission                  | Light on high |         |         |

### 3. Minimum 6 dB Bandwidth

#### 3.1 Operating environment

|                           |                                       |     |
|---------------------------|---------------------------------------|-----|
| Temperature:              | 25                                    | °C  |
| Relative Humidity:        | 50                                    | %   |
| Atmospheric Pressure      | 1008                                  | hPa |
| Requirement & Test method | 15.247(a)(2)<br>KDB 558074 D01 v03r05 |     |

#### 3.2 Limit for minimum 6dB bandwidth

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

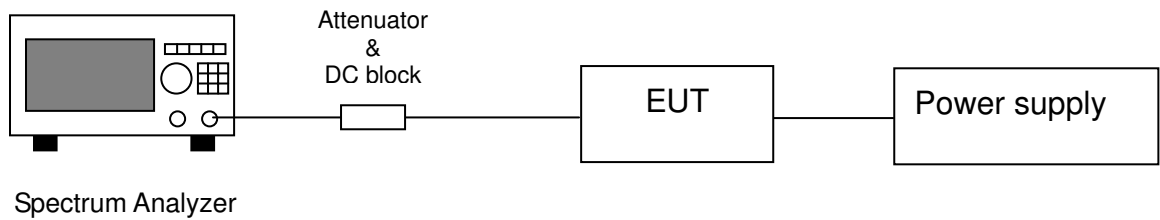
#### 3.3 Measuring instrument setting

| Spectrum analyzer settings |                                                         |
|----------------------------|---------------------------------------------------------|
| Spectrum Analyzer function | Setting                                                 |
| Detector                   | Peak                                                    |
| RBW                        | 100kHz                                                  |
| VBW                        | $\geq 3 \times \text{RBW}$                              |
| Sweep                      | Auto couple                                             |
| Trace                      | Allow the trace to stabilize.                           |
| Span                       | Between two times and five times the occupied bandwidth |
| Attenuation                | Auto                                                    |

#### 3.4 Test procedure

1. The transmitter output was connected to the spectrum analyzer.
2. Test was performed in accordance with clause 8.1 option1 of KDB 558074 D01
3. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

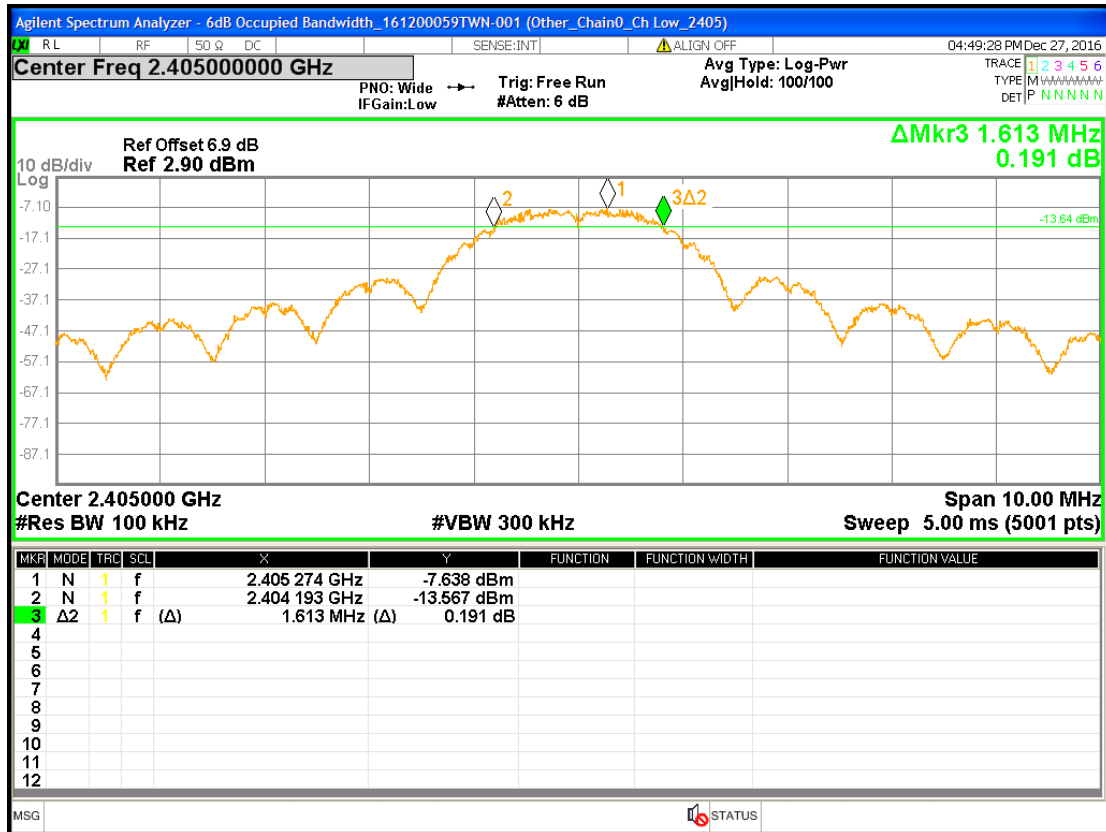
### 3.5 Test diagram



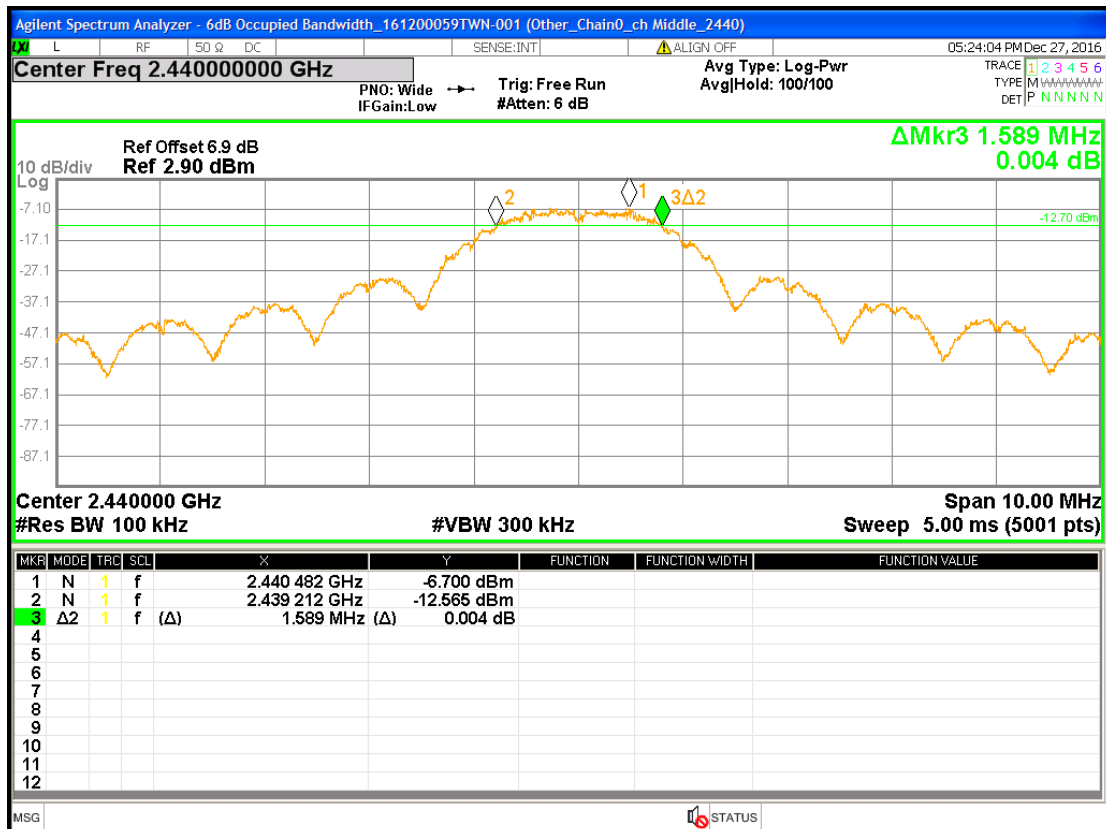
### 3.6 Test results

| Mode   | Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (MHz) | Pass/Fail |
|--------|---------|-----------------|---------------------|-------------|-----------|
| Zigbee | 1       | 2405            | 1.613               | > 0.5       | Pass      |
|        | 8       | 2440            | 1.589               | > 0.5       | Pass      |
|        | 15      | 2475            | 1.509               | > 0.5       | Pass      |

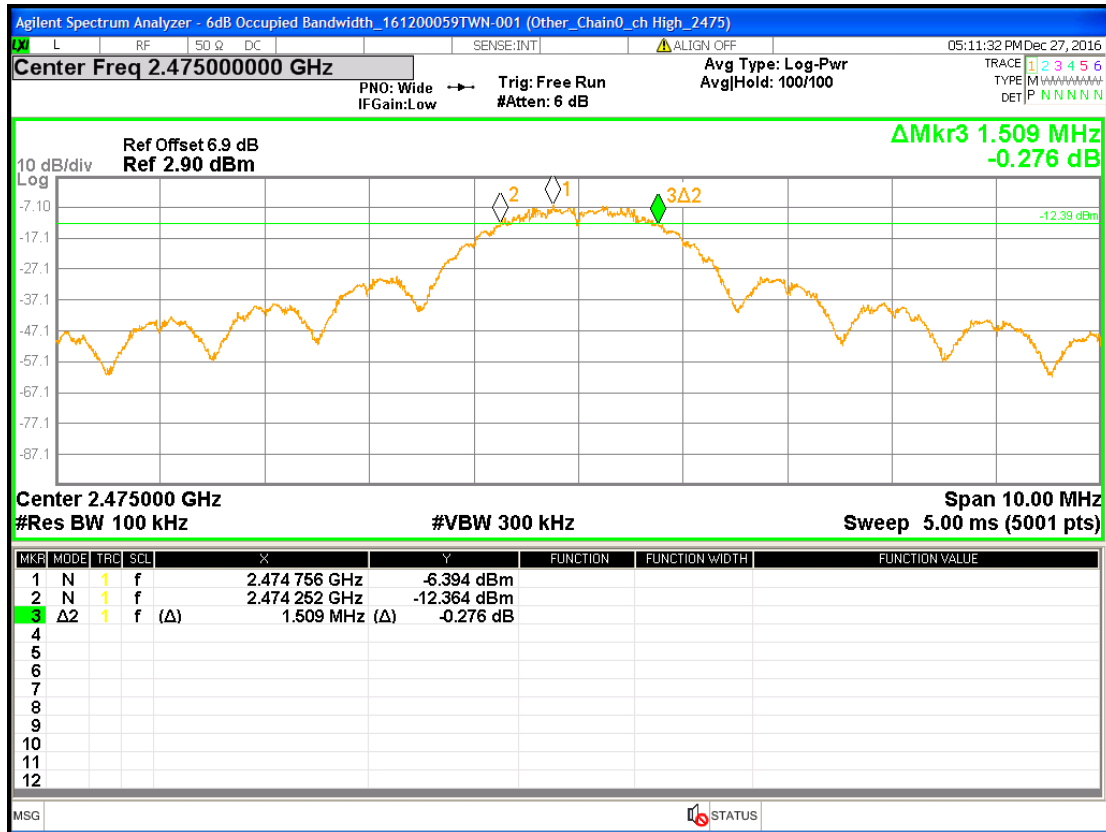
### Chain0 : 6dB Bandwidth @ Zigbee mode Ch low



### Chain0 : 6dB Bandwidth @ Zigbee mode Ch middle



## Chain0 : 6dB Bandwidth @ Zigbee mode Ch high



## 4. Maximum Peak Conducted Output Power

### 4.1 Operating environment

|                           |                                       |     |
|---------------------------|---------------------------------------|-----|
| Temperature:              | 25                                    | °C  |
| Relative Humidity:        | 50                                    | %   |
| Atmospheric Pressure      | 1008                                  | hPa |
| Requirement & Test method | 15.247(b)(3)<br>KDB 558074 D01 v03r05 |     |

### 4.2 Limit for maximum peak conducted output power

For systems using digital modulation in the 2400-2483.5 MHz: 1 Watt (30dBm)

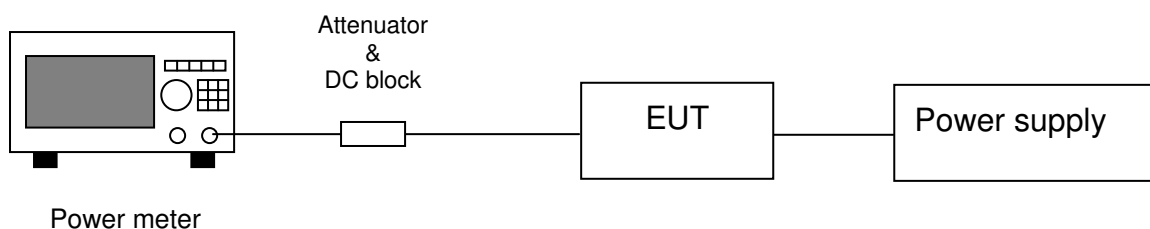
### 4.3 Measuring instrument setting

| Power meter |                                                            |
|-------------|------------------------------------------------------------|
| Power meter | Setting                                                    |
| Bandwidth   | 65MHz bandwidth is greater than the EUT emission bandwidth |
| Detector    | Peak & Average                                             |

### 4.4 Test procedure

Test procedures refer to clause 9.1.2 peak power meter method and clause 9.2.3.2 measurement using a gated RF average power meter of KDB 558074 D01.

### 4.5 Test diagram



#### 4.6 Test result

| Mode   | Channel | Frequency (MHz) | Maximum (PK) (dBm) | Maximum (PK) (mW) | Limit (dBm) | Margin (dB) |
|--------|---------|-----------------|--------------------|-------------------|-------------|-------------|
| Zigbee | 1       | 2405            | 0.92               | 1.24              | 30          | -29.08      |
|        | 8       | 2440            | 1.21               | 1.32              | 30          | -28.79      |
|        | 15      | 2475            | 0.49               | 1.12              | 30          | -29.51      |

## 5. Power Spectral Density

### 5.1 Operating environment

|                           |                                    |     |
|---------------------------|------------------------------------|-----|
| Temperature:              | 25                                 | °C  |
| Relative Humidity:        | 50                                 | %   |
| Atmospheric Pressure      | 1008                               | hPa |
| Requirement & Test method | 15.247(e)<br>KDB 558074 D01 v03r05 |     |

### 5.2 Limit for power spectrum density

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

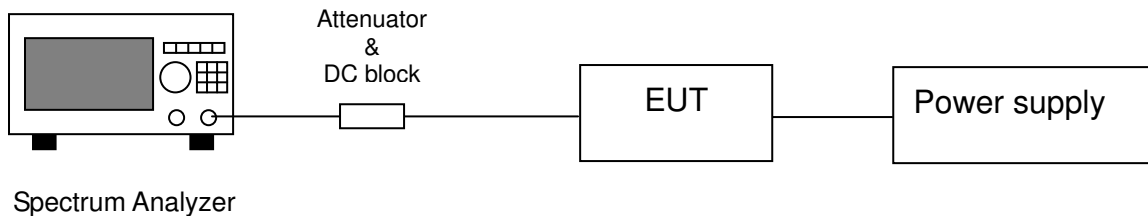
### 5.3 Measuring instrument setting

| Spectrum analyzer settings |                           |
|----------------------------|---------------------------|
| Spectrum Analyzer function | Setting                   |
| Detector                   | Peak                      |
| RBW                        | $\geq 3$ kHz              |
| VBW                        | $\geq 3 \times$ RBW       |
| Sweep                      | Auto couple               |
| Trace                      | Max hold                  |
| Span                       | 1.5 times x 6dB bandwidth |
| Attenuation                | Auto                      |

## 5.4 Test procedure

1. Test procedure refer to clause 10.2 method PKPSD (peak PSD) of KDB 558074 D01.
2. Using the maximum conducted output power in the fundamental emission demonstrates compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
3. Use the peak marker function to determine the maximum amplitude level within the RBW.

## 5.5 Test diagram



## 5.6 Test results

| Mode   | Channel | Frequency (MHz) | RBW factor | PSD in 10kHz | PSD in 3kHz |      | Limit (dBm) | Margin (dB) |
|--------|---------|-----------------|------------|--------------|-------------|------|-------------|-------------|
|        |         |                 |            |              | (dBm)       | (mW) |             |             |
| Zigbee | 1       | 2405            | 5.23       | -15.21       | -20.44      | 0.01 | 8           | -28.44      |
|        | 8       | 2440            | 5.23       | -14.41       | -19.64      | 0.01 | 8           | -27.64      |
|        | 15      | 2475            | 5.23       | -14.37       | -19.60      | 0.01 | 8           | -27.60      |

Remark: RBW Correction:  $10 \cdot \log(10\text{kHz}/3\text{kHz})$

### Chain0 : Power Spectral Density @ Zigbee mode Ch low



### Chain0 : Power Spectral Density @ Zigbee mode Ch middle



### Chain0 : Power Spectral Density @ Zigbee mode Ch high



## 6. Emissions In Non-Restricted Frequency Bands

### 6.1 Operating environment

|                      |           |     |
|----------------------|-----------|-----|
| Temperature:         | 20        | °C  |
| Relative Humidity:   | 55        | %   |
| Atmospheric Pressure | 1008      | hPa |
| Requirement          | 15.247(d) |     |

### 6.2 Limit for emissions in non-restricted frequency bands

The peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz

### 6.3 Measuring instruments setting

#### Reference level measurement

| Spectrum analyzer settings |                               |
|----------------------------|-------------------------------|
| Spectrum Analyzer function | Setting                       |
| Detector                   | Peak                          |
| RBW                        | $\geq 100$ kHz                |
| VBW                        | $\geq 3 \times$ RBW           |
| Sweep                      | Auto couple                   |
| Trace                      | Max hold                      |
| Span                       | $\geq 1.5$ time 6dB bandwidth |
| Attenuation                | Auto                          |

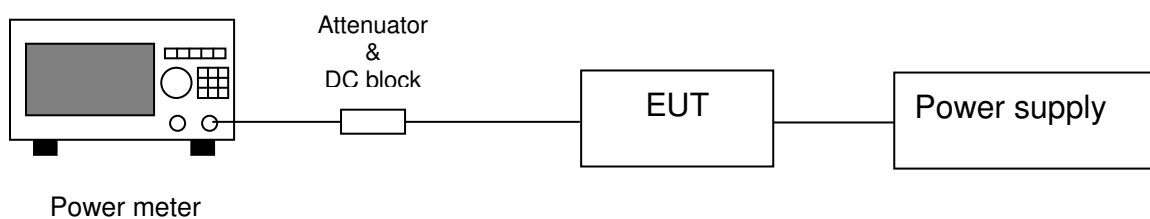
## Emission level measurement

| Spectrum analyzer settings |                     |
|----------------------------|---------------------|
| Spectrum Analyzer function | Setting             |
| Detector                   | Peak                |
| RBW                        | $\geq 100$ kHz      |
| VBW                        | $\geq 3 \times$ RBW |
| Sweep                      | Auto couple         |
| Trace                      | Max hold            |
| Attenuation                | Auto                |

### 6.4 Test procedure

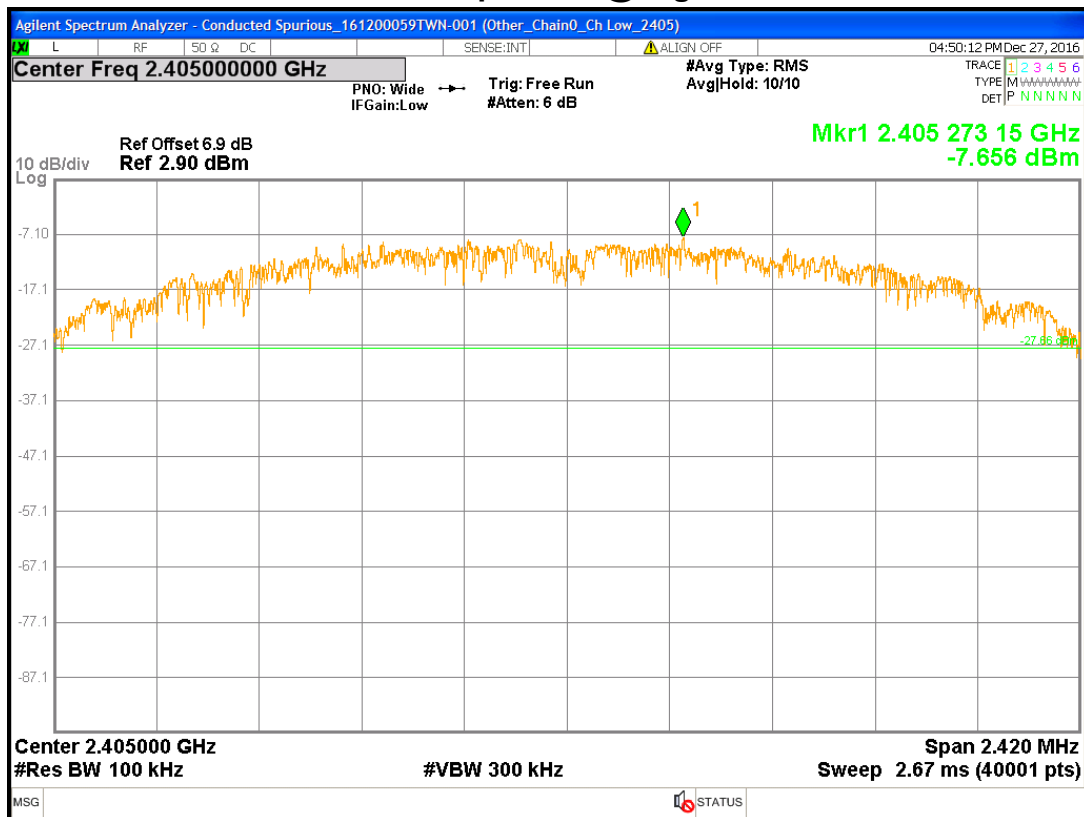
1. The procedure was used in antenna-port conducted and connected to the spectrum analyzer.
2. Set instrument center frequency to center frequency
3. Use the parameter configured in clause 6.3 to measure
4. Use the peak marker function to determine the maximum amplitude level.

### 6.5 Test diagram

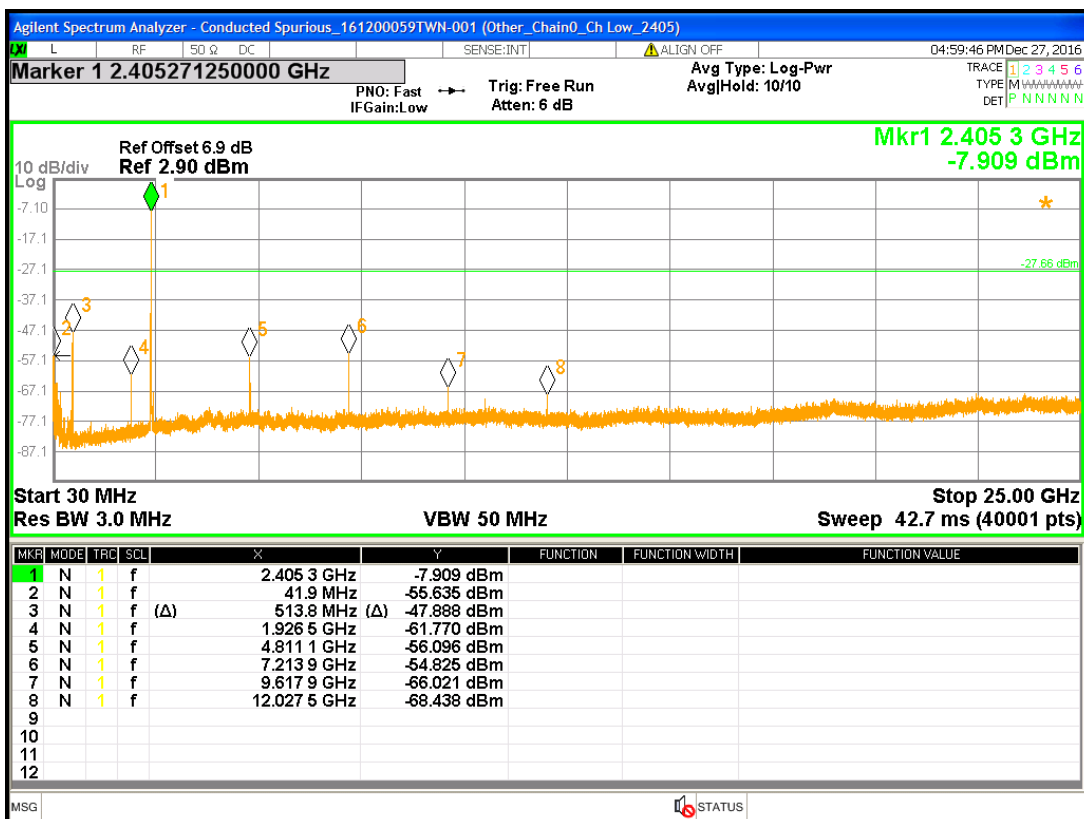


## 6.6 Test results

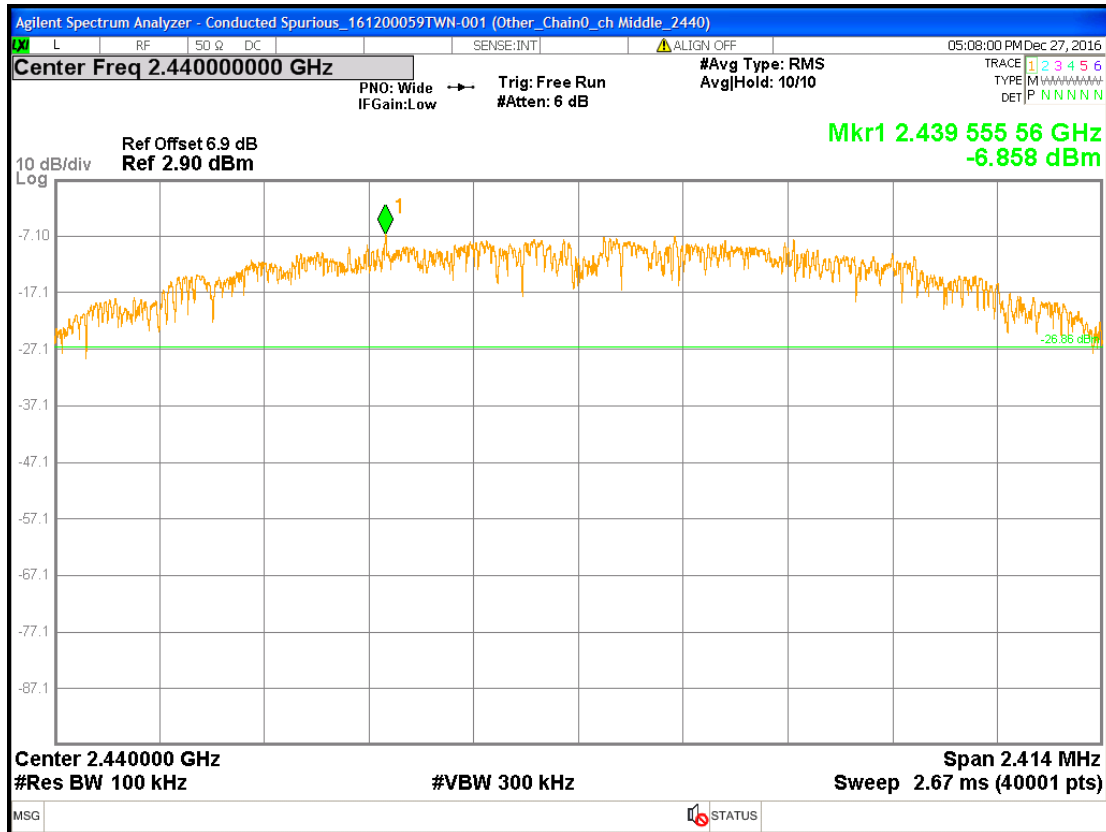
### Chain0 : Conducted Spurious @ Zigbee mode Ch low



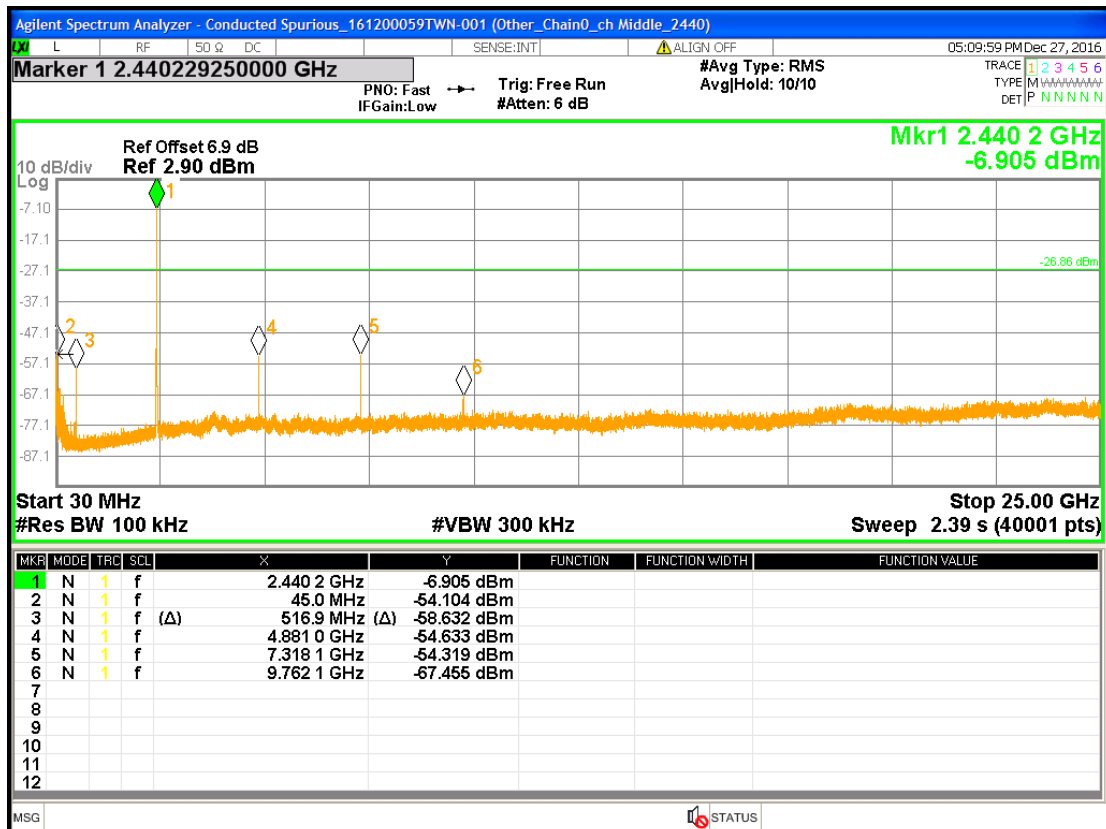
### Chain0 : Conducted Spurious @ Zigbee mode Ch low



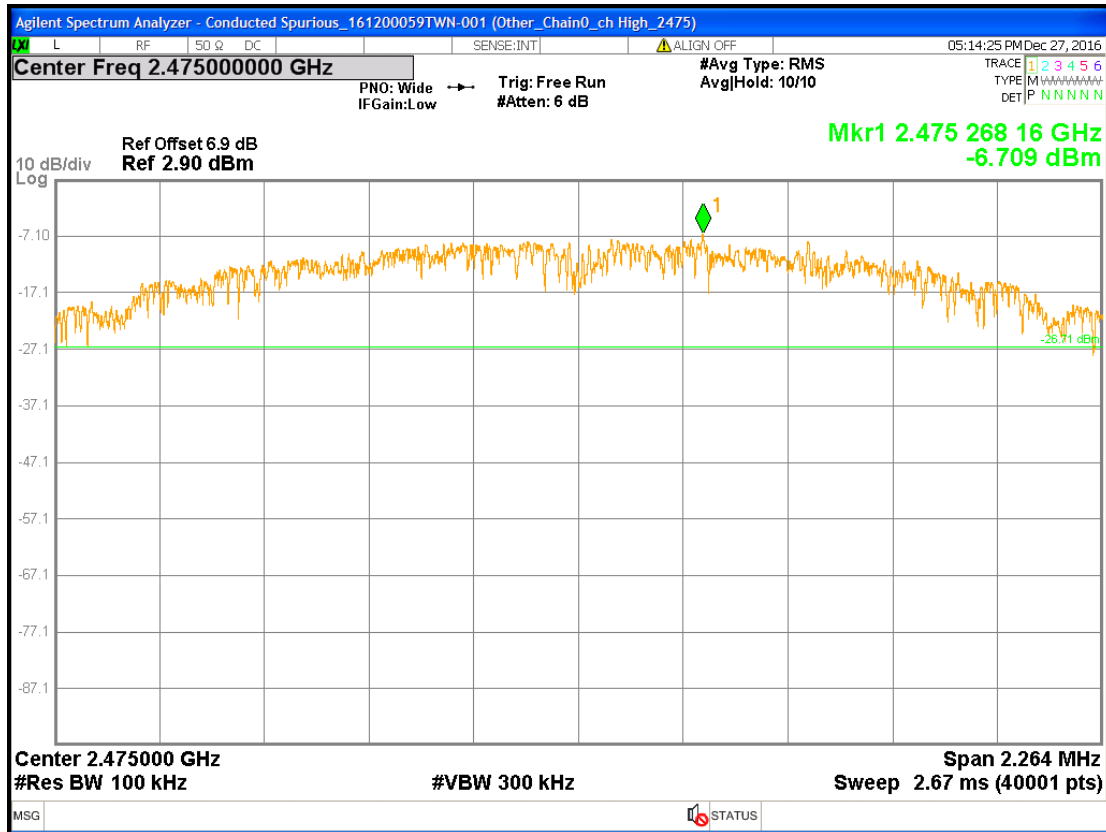
### Chain0 : Conducted Spurious @ Zigbee mode Ch middle



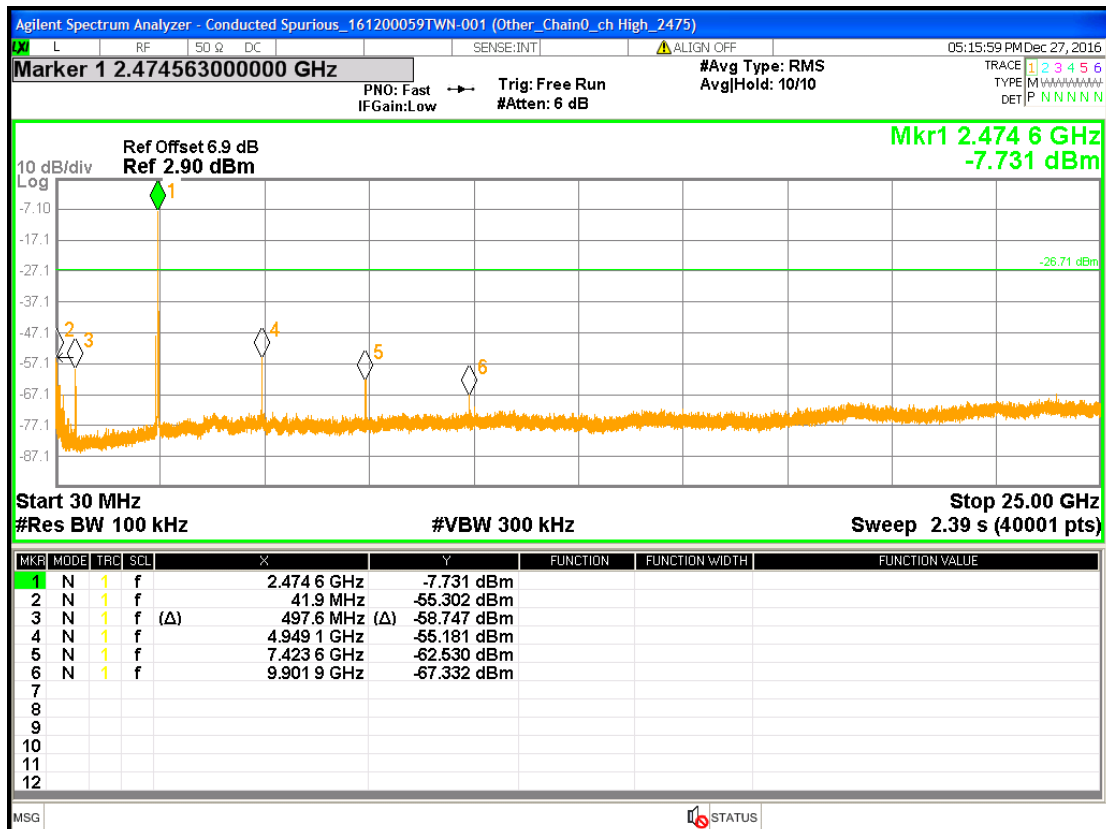
### Chain0 : Conducted Spurious @ Zigbee mode Ch middle



### Chain0 : Conducted Spurious @ Zigbee mode Ch high



### Chain0 : Conducted Spurious @ Zigbee mode Ch high



## 7. Emissions In Restricted Frequency Bands (Radiated emission measurements)

### 7.1 Operating environment

|                      |                           |     |
|----------------------|---------------------------|-----|
| Temperature:         | 20                        | °C  |
| Relative Humidity:   | 55                        | %   |
| Atmospheric Pressure | 1008                      | hPa |
| Requirement          | 15.247(d), 15.205, 15.209 |     |

### 7.2 Limit for emission in restricted frequency bands (Radiated emission measurement)

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009~0.490     | 2400/F(kHz)                       | 300                           |
| 0.490~1.705     | 2400/F(kHz)                       | 30                            |
| 1.705~30        | 30                                | 30                            |
| 30-88           | 100                               | 3                             |
| 88-216          | 150                               | 3                             |
| 216-960         | 200                               | 3                             |
| Above 960       | 500                               | 3                             |

Remark:

1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

### 7.3 Measuring instrument setting

#### Below 1GHz measurement

| Receiver settings |                                                                             |
|-------------------|-----------------------------------------------------------------------------|
| Receiver function | Setting                                                                     |
| Detector          | QP                                                                          |
| RBW               | 9-150 kHz ; 200-300 Hz<br>0.15-30 MHz; 9-10 kHz<br>30-1000 MHz; 100-120 kHz |
| VBW               | $\geq 3 \times \text{RBW}$                                                  |
| Sweep             | Auto couple                                                                 |
| Attenuation       | Auto                                                                        |

#### Above 1GHz measurement

| Spectrum analyzer settings |                           |
|----------------------------|---------------------------|
| Spectrum Analyzer function | Setting                   |
| Detector                   | Peak                      |
| RBW                        | 1MHz                      |
| VBW                        | 3MHz for Peak and Average |
| Sweep                      | Auto couple               |
| Start Frequency            | 1GHz                      |
| Stop Frequency             | Tenth harmonic            |
| Attenuation                | Auto                      |

## 7.4 Test procedure

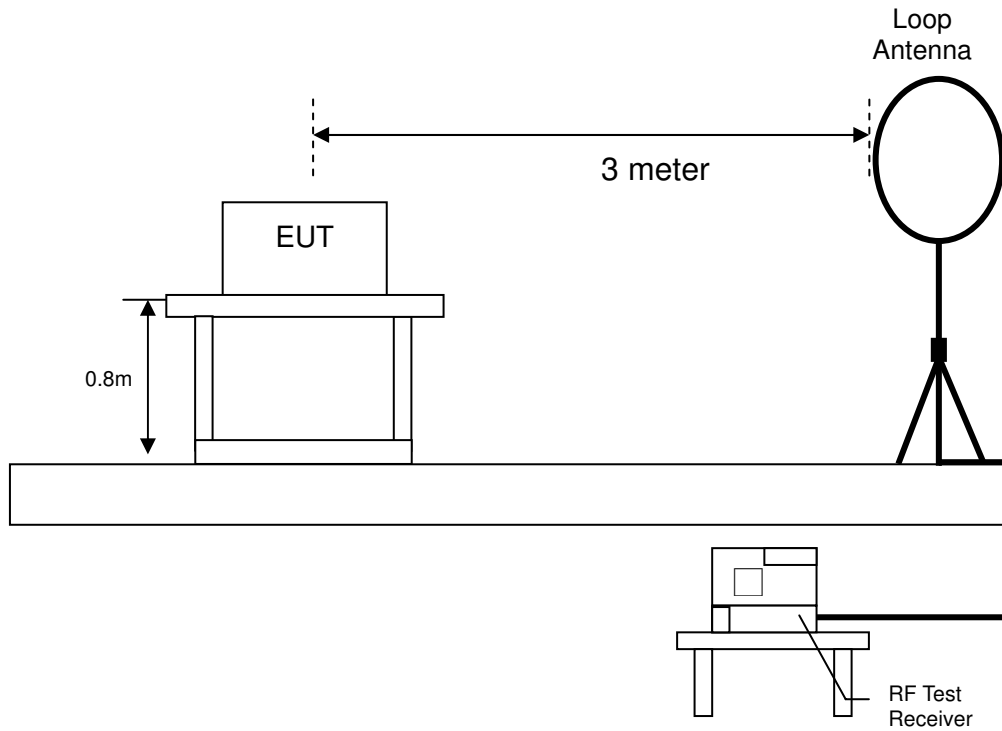
Radiated emissions were investigated cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 3MHz VBW record Peak and Average reading (15.209 paragraph) on the report.

The EUT for testing is arranged on a turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

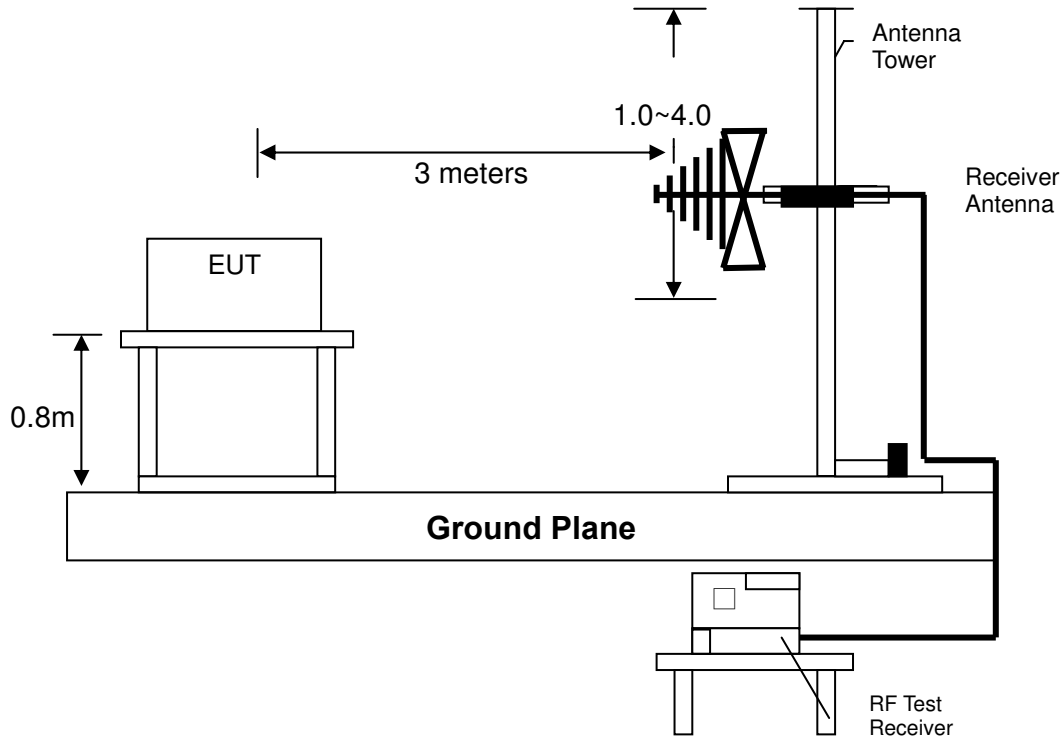
The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

## 7.5 Test configuration

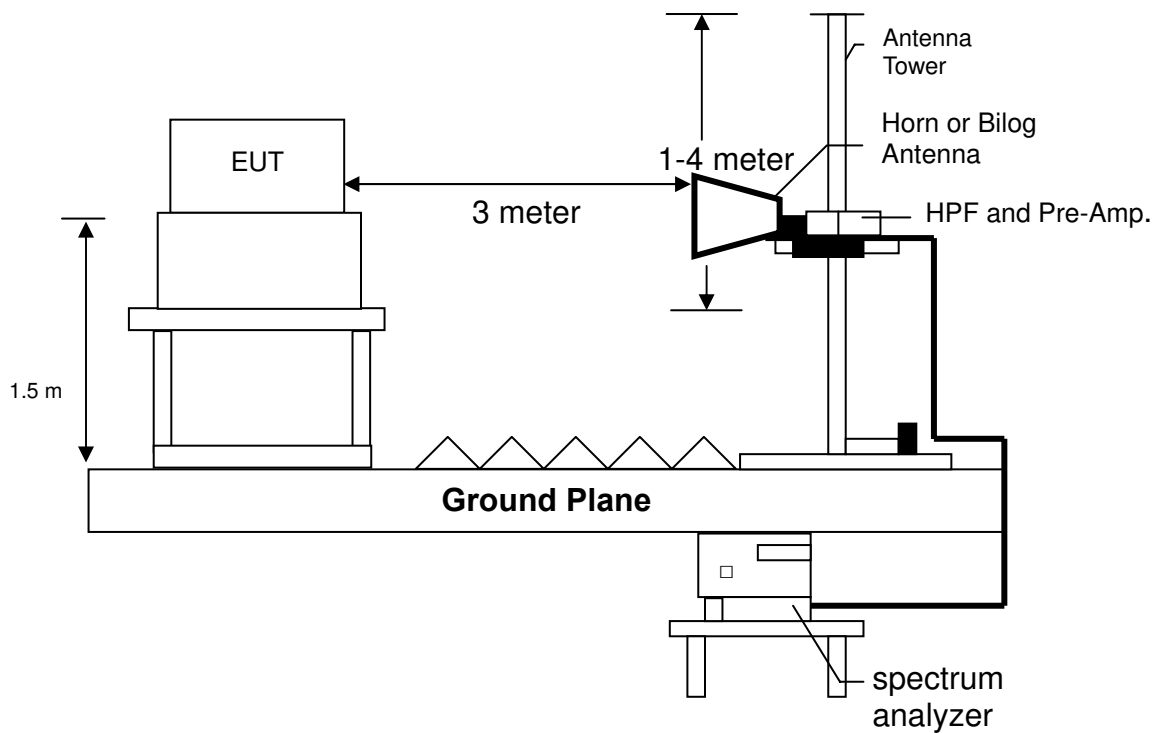
### 7.5.1 Radiated emission from 9kHz to 30MHz uses Loop Antenna:



### 7.5.2 Radiated emission below 1GHz using Bilog Antenna



### 7.5.3 Radiated emission above 1GHz using Horn Antenna



## 7.6 Test result

### 7.6.1 Measurement results: frequencies 9kHz to 30MHz

The test was performed on EUT under Zigbee continuously transmitting mode. The worst case occurred at channel Low.

EUT : PAD06  
Test mode : Channel Low

| Polarity<br>(circle) | Frequency<br>(MHz) | Detection<br>value | Factor<br>(dB/m) | Reading<br>(dBμV) | Value<br>(dBμV/m) | Limit<br>@ 3m<br>(dBμV/m) | Tolerance<br>(dB) |
|----------------------|--------------------|--------------------|------------------|-------------------|-------------------|---------------------------|-------------------|
| Plane                | 0.02               | QP                 | 20.92            | 46.29             | 67.20             | 121.58                    | -54.38            |
| Plane                | 0.05               | QP                 | 20.83            | 52.90             | 73.73             | 113.62                    | -39.89            |
| Plane                | 0.06               | QP                 | 20.82            | 48.30             | 69.12             | 112.04                    | -42.92            |
| Plane                | 0.07               | QP                 | 20.81            | 48.55             | 69.36             | 110.70                    | -41.34            |
| Plane                | 0.10               | QP                 | 20.77            | 11.10             | 31.87             | 107.60                    | -75.73            |
| Plane                | 0.13               | QP                 | 20.77            | 37.43             | 58.20             | 105.33                    | -47.13            |
| Plane                | 0.15               | QP                 | 20.77            | 33.97             | 54.74             | 104.08                    | -49.34            |

Remark: Corr. Factor = Antenna Factor + Cable Loss

## 7.6.2 Measurement results: frequencies below 1 GHz

The test was performed on EUT under Zigbee continuously transmitting mode. The worst case occurred at channel low

EUT : PAD06  
Worst Case : Channel Low

| Antenna Polarized (V/H) | Freq. (MHz) | Receiver Detector | Corr. Factor (dB/m) | Reading (dBμV) | Corrected Level (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) |
|-------------------------|-------------|-------------------|---------------------|----------------|--------------------------|----------------------|-------------|
| Vertical                | 43.58       | QP                | 14.49               | 12.74          | 35.24                    | 40.00                | -4.76       |
| Vertical                | 47.46       | QP                | 13.75               | 24.76          | 34.21                    | 40.00                | -5.79       |
| Vertical                | 70.74       | QP                | 13.83               | 20.92          | 39.52                    | 40.00                | -0.48       |
| Vertical                | 76.56       | QP                | 15.52               | 10.49          | 37.43                    | 40.00                | -2.57       |
| Vertical                | 196.84      | QP                | 20.94               | 10.68          | 36.33                    | 43.50                | -7.17       |
| Vertical                | 208.48      | QP                | 26.45               | 6.62           | 39.24                    | 43.50                | -4.26       |
| Horizontal              | 130.88      | QP                | 13.53               | 26.11          | 34.81                    | 43.50                | -8.69       |
| Horizontal              | 185.20      | QP                | 12.54               | 21.72          | 34.89                    | 43.50                | -8.61       |
| Horizontal              | 196.84      | QP                | 14.17               | 27.10          | 36.05                    | 43.50                | -7.45       |
| Horizontal              | 208.48      | QP                | 15.36               | 18.13          | 36.11                    | 43.50                | -7.39       |
| Horizontal              | 220.12      | QP                | 18.30               | 9.41           | 37.79                    | 46.00                | -8.21       |
| Horizontal              | 233.70      | QP                | 26.89               | 5.30           | 37.51                    | 46.00                | -8.49       |

Remark: Corr. Factor = Antenna Factor + Cable Loss

### 7.6.3 Measurement results: frequency above 1GHz

EUT : PAD06

| Mode                   | Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Ant.<br>Pol.<br>(H/V) | Preamp.<br>Gain<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBμV) | Corrected<br>Reading<br>(dBμV/m) | Limit<br>@ 3 m<br>(dBμV/m) | Margin<br>(dB) |
|------------------------|--------------------|----------------------------------|-----------------------|-------------------------|--------------------------------|-------------------|----------------------------------|----------------------------|----------------|
| Zigbee<br>Ch Low       | 4810               | PK                               | V                     | 40.12                   | -0.08                          | 56.35             | 56.27                            | 74.00                      | -17.73         |
|                        | 4810               | AV                               | V                     | 40.12                   | -0.08                          | 41.95             | 41.87                            | 54.00                      | -12.13         |
|                        | 7215               | PK                               | V                     | 38.10                   | 8.13                           | 59.78             | 67.91                            | 74.00                      | -6.09          |
|                        | 7215               | AV                               | V                     | 38.10                   | 8.13                           | 44.72             | 52.85                            | 54.00                      | -1.15          |
|                        | 9620               | PK                               | V                     | 38.15                   | 11.37                          | 44.04             | 55.41                            | 74.00                      | -18.59         |
|                        | 9620               | AV                               | V                     | 38.15                   | 11.37                          | 29.19             | 40.56                            | 54.00                      | -13.44         |
|                        | 12025              | PK                               | V                     | 38.81                   | 13.18                          | 43.80             | 56.98                            | 74.00                      | -17.02         |
|                        | 12025              | AV                               | V                     | 38.81                   | 13.18                          | 27.86             | 41.04                            | 54.00                      | -12.96         |
|                        | 4810               | PK                               | H                     | 40.12                   | -0.08                          | 58.76             | 58.68                            | 74.00                      | -15.32         |
|                        | 4810               | AV                               | H                     | 40.12                   | -0.08                          | 43.15             | 43.07                            | 54.00                      | -10.93         |
|                        | 7215               | PK                               | H                     | 38.10                   | 8.13                           | 52.76             | 60.89                            | 74.00                      | -13.11         |
|                        | 7215               | AV                               | H                     | 38.10                   | 8.13                           | 37.43             | 45.56                            | 54.00                      | -8.44          |
|                        | 9620               | PK                               | H                     | 38.15                   | 11.37                          | 42.95             | 54.32                            | 74.00                      | -19.68         |
|                        | 9620               | AV                               | H                     | 38.15                   | 11.37                          | 27.89             | 39.26                            | 54.00                      | -14.74         |
| Zigbee<br>Ch<br>Middle | 4880               | PK                               | V                     | 39.99                   | 0.15                           | 56.76             | 56.91                            | 74.00                      | -17.09         |
|                        | 4880               | AV                               | V                     | 39.99                   | 0.15                           | 41.93             | 42.08                            | 54.00                      | -11.92         |
|                        | 7320               | PK                               | V                     | 38.01                   | 8.45                           | 59.84             | 68.29                            | 74.00                      | -5.71          |
|                        | 7320               | AV                               | V                     | 38.01                   | 8.45                           | 44.73             | 53.18                            | 54.00                      | -0.82          |
|                        | 9760               | PK                               | V                     | 38.34                   | 11.23                          | 40.25             | 51.48                            | 74.00                      | -22.52         |
|                        | 12200              | PK                               | V                     | 38.66                   | 13.18                          | 41.67             | 54.85                            | 74.00                      | -19.15         |
|                        | 12200              | AV                               | V                     | 38.66                   | 13.18                          | 26.89             | 40.07                            | 54.00                      | -13.93         |
|                        | 4880               | PK                               | H                     | 39.99                   | 0.15                           | 55.47             | 55.62                            | 74.00                      | -18.38         |
|                        | 4880               | AV                               | H                     | 39.99                   | 0.15                           | 40.22             | 40.37                            | 54.00                      | -13.63         |
|                        | 7320               | PK                               | H                     | 38.01                   | 8.45                           | 51.98             | 60.43                            | 74.00                      | -13.57         |
|                        | 7320               | AV                               | H                     | 38.01                   | 8.45                           | 36.94             | 45.39                            | 54.00                      | -8.61          |
|                        | 9760               | PK                               | H                     | 38.34                   | 11.23                          | 42.00             | 53.23                            | 74.00                      | -20.77         |

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre\_Amplifier Gain

| Mode              | Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Ant.<br>Pol.<br>(H/V) | Preamp.<br>Gain<br>(dB) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBμV) | Corrected<br>Reading<br>(dBμV/m) | Limit<br>@ 3 m<br>(dBμV/m) | Margin<br>(dB) |
|-------------------|--------------------|----------------------------------|-----------------------|-------------------------|--------------------------------|-------------------|----------------------------------|----------------------------|----------------|
| Zigbee<br>Ch High | 4950               | PK                               | V                     | 39.86                   | 0.38                           | 55.75             | 56.13                            | 74.00                      | -17.87         |
|                   | 4950               | AV                               | V                     | 39.86                   | 0.38                           | 40.99             | 41.37                            | 54.00                      | -12.63         |
|                   | 7425               | PK                               | V                     | 37.92                   | 8.78                           | 57.28             | 66.06                            | 74.00                      | -7.94          |
|                   | 7425               | AV                               | V                     | 37.92                   | 8.78                           | 42.46             | 51.24                            | 54.00                      | -2.76          |
|                   | 9900               | PK                               | V                     | 38.54                   | 11.09                          | 42.32             | 53.41                            | 74.00                      | -20.59         |
|                   | 4950               | PK                               | H                     | 39.86                   | 0.38                           | 50.32             | 50.70                            | 74.00                      | -23.30         |
|                   | 7425               | PK                               | H                     | 37.92                   | 8.78                           | 51.54             | 60.32                            | 74.00                      | -13.68         |
|                   | 7425               | AV                               | H                     | 37.92                   | 8.78                           | 36.79             | 45.57                            | 54.00                      | -8.43          |
|                   | 9900               | PK                               | H                     | 38.54                   | 11.09                          | 41.03             | 52.12                            | 74.00                      | -21.88         |

Remark: Correction Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Pre\_Amplifier Gain

## 8. Emission On Band Edge

### 8.1 Operating environment

|                      |                    |     |
|----------------------|--------------------|-----|
| Temperature:         | 25                 | °C  |
| Relative Humidity:   | 50                 | %   |
| Atmospheric Pressure | 1008               | hPa |
| Requirement          | 15.247(d), 15.205, |     |

### 8.2 Measuring instrument setting

| Spectrum analyzer settings |                           |
|----------------------------|---------------------------|
| Spectrum Analyzer function | Setting                   |
| Detector                   | Peak                      |
| RBW                        | 1MHz                      |
| VBW                        | 3MHz for Peak and Average |
| Sweep                      | Auto couple               |
| Restrict bands             | 2310~2390MHz              |
|                            | 2483.5 ~2500MHz           |
| Attenuation                | Auto                      |

### 8.3 Test procedure

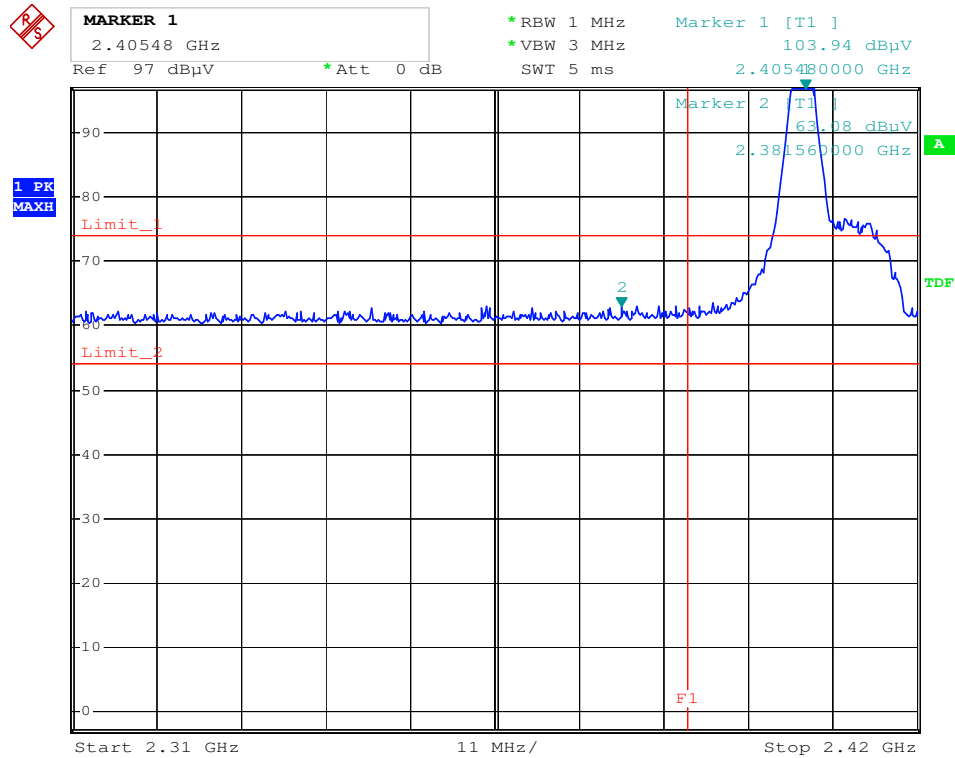
The test procedure is the same as clause 7.4

## 8.4 Test results

EUT : PAD06

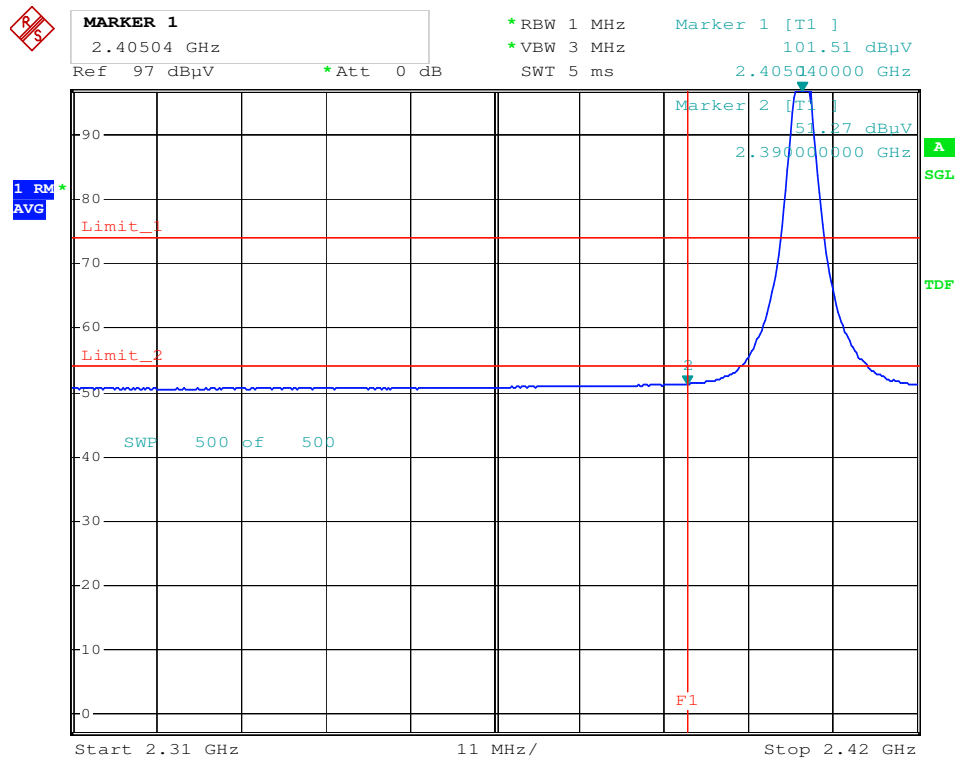
| Mode                                                    | Frequency<br>(MHz) | Spectrum<br>Analyzer<br>Detector | Ant.<br>Pol.<br>(H/V) | Correction<br>Factor<br>(dB/m) | Reading<br>(dBμV) | Corrected<br>Reading<br>(dBμV/m) | Limit<br>@ 3 m<br>(dBμV/m) | Margin<br>(dB) | Restricted<br>band<br>(MHz) |
|---------------------------------------------------------|--------------------|----------------------------------|-----------------------|--------------------------------|-------------------|----------------------------------|----------------------------|----------------|-----------------------------|
| Zigbee                                                  | 2381.56            | PK                               | V                     | 33.81                          | 29.27             | 63.08                            | 74                         | -10.92         | 2310~2390                   |
|                                                         | 2390.00            | AV                               | V                     | 33.85                          | 17.42             | 51.27                            | 54                         | -2.73          |                             |
|                                                         | 2484.38            | PK                               | V                     | 34.31                          | 29.10             | 63.41                            | 74                         | -10.59         | 2483.5~2500                 |
|                                                         | 2483.50            | AV                               | V                     | 34.30                          | 18.27             | 52.57                            | 54                         | -1.43          |                             |
| Remark: Correction Factor = Antenna Factor + Cable Loss |                    |                                  |                       |                                |                   |                                  |                            |                |                             |

### Chain0 : Restricted-Band Band edge @ Zigbee Ch low Peak



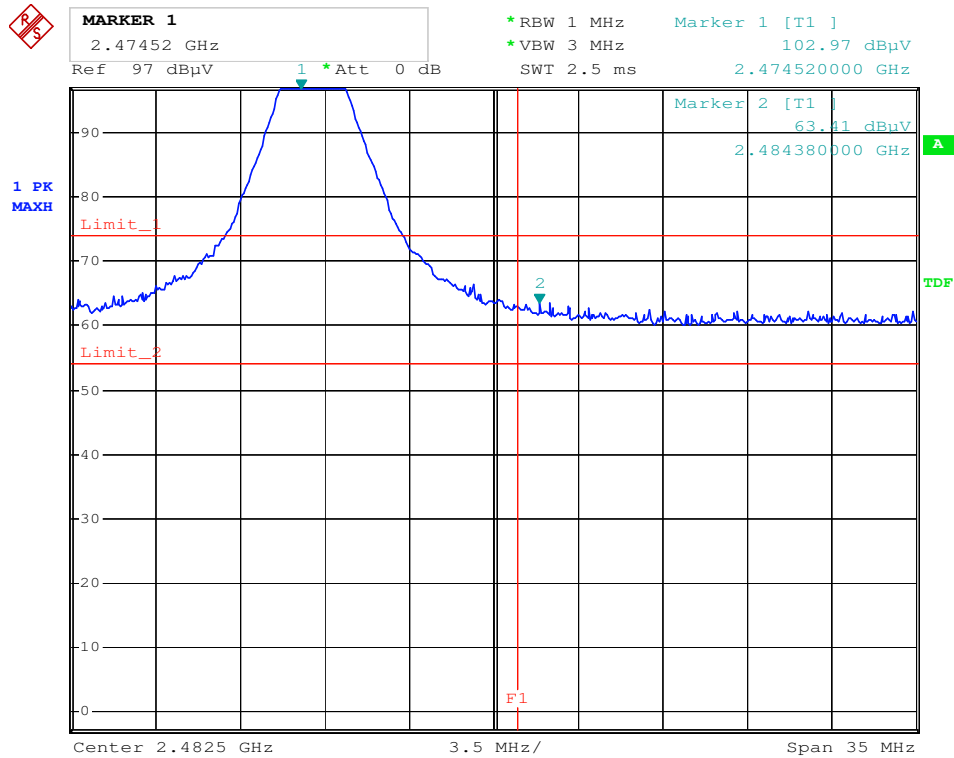
Date: 23.DEC.2016 09:45:08

### Chain0 : Restricted-Band Band edge @ Zigbee Ch low Average



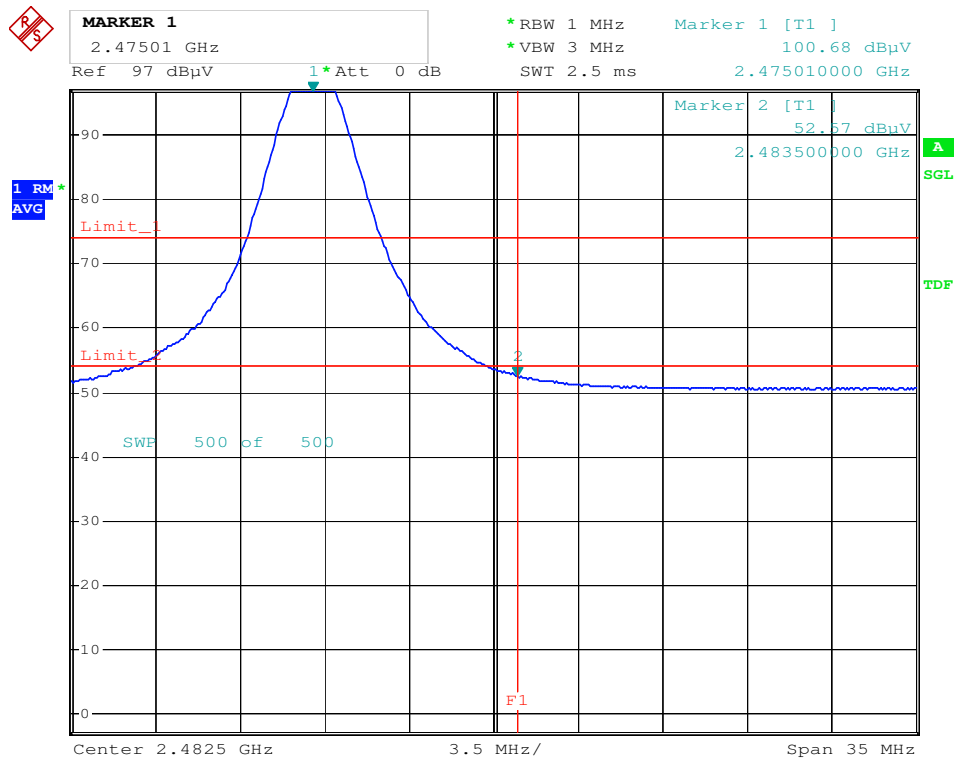
Date: 23.DEC.2016 09:46:03

### Chain0 : Restricted-Band Band edge @ Zigbee Ch high Peak



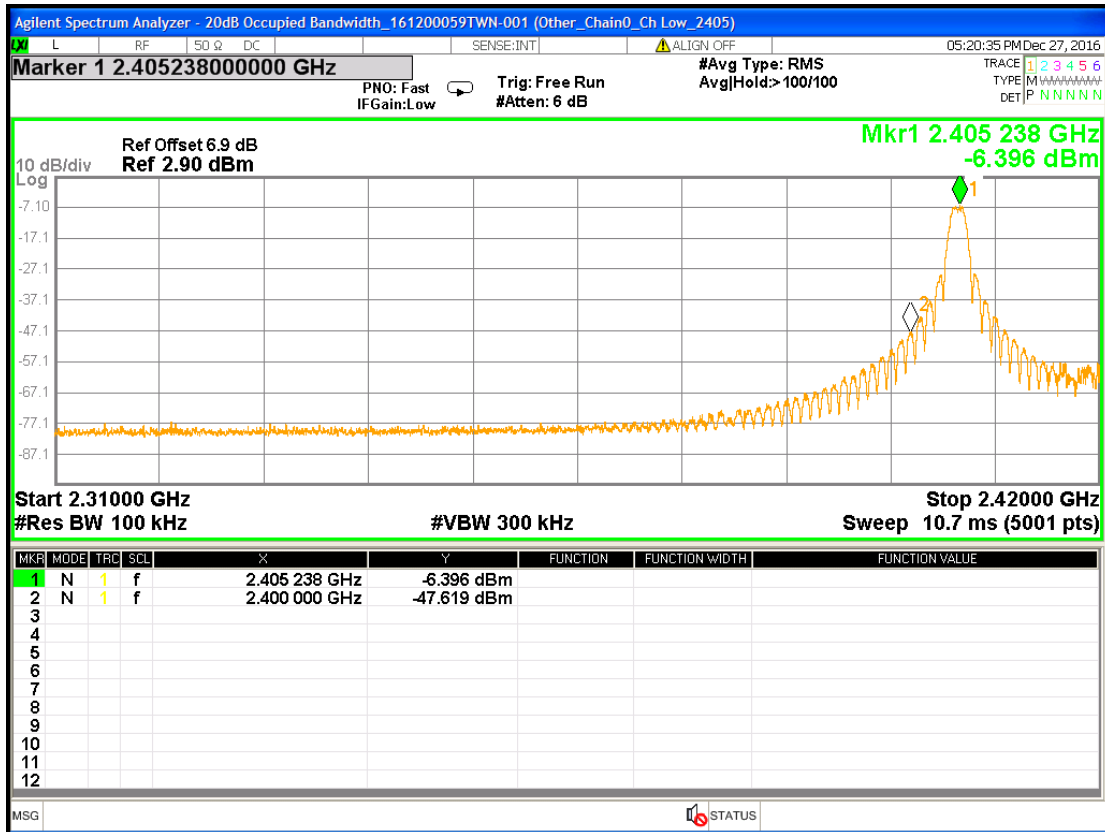
Date: 23.DEC.2016 09:59:31

### Chain0 : Restricted-Band Band edge @ Zigbee Ch high Average

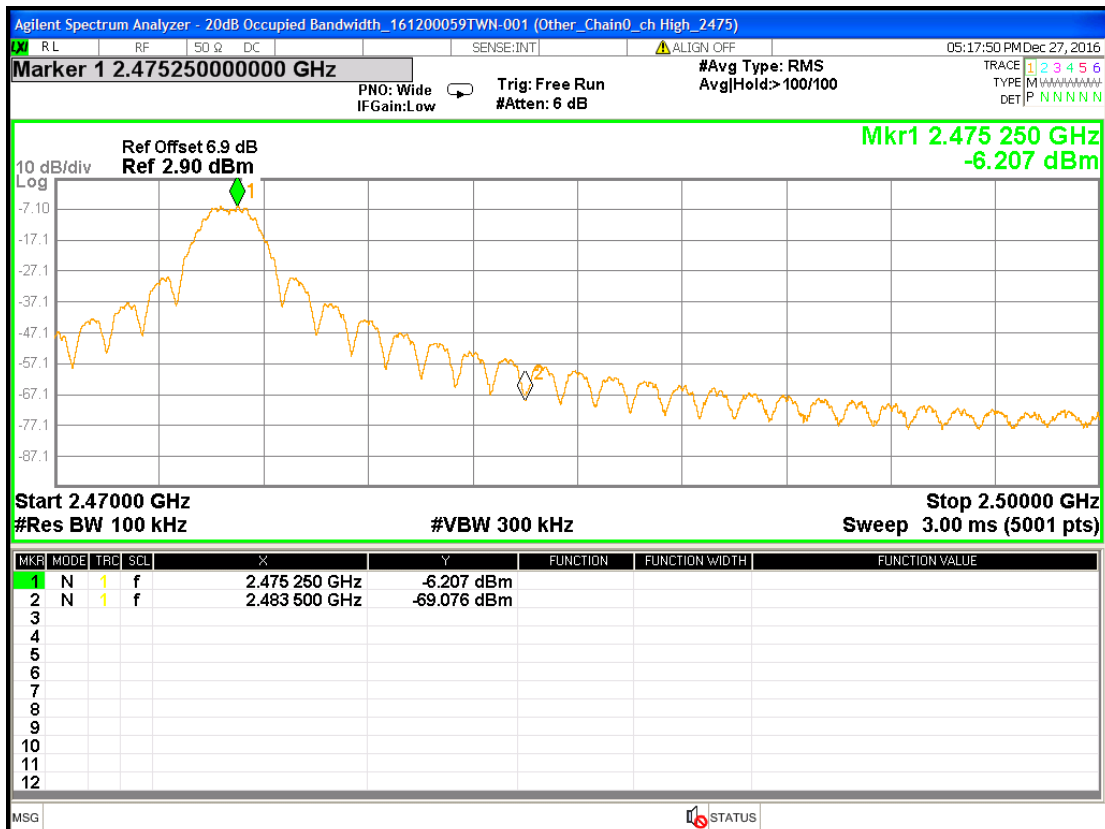


Date: 23.DEC.2016 10:00:12

### Chain0 : Authorized-Band Band edge @ Zigbee mode Ch low



### Chain0 : Authorized-Band Band edge @ Zigbee mode Ch high



## 9. AC Power Line Conducted Emission

### 9.1 Operating environment

|                      |        |     |
|----------------------|--------|-----|
| Temperature:         | 20     | °C  |
| Relative Humidity:   | 58     | %   |
| Atmospheric Pressure | 1009   | hPa |
| Requirement          | 15.207 |     |

### 9.2 Limit for AC power line conducted emission

| Freq.<br>(MHz) | Conducted Limit (dBuV) |          |
|----------------|------------------------|----------|
|                | Q.P.                   | Ave.     |
| 0.15~0.50      | 66 – 56*               | 56 – 46* |
| 0.50~5.00      | 56                     | 46       |
| 5.00~30.0      | 60                     | 50       |

### 9.3 Measuring instrument setting

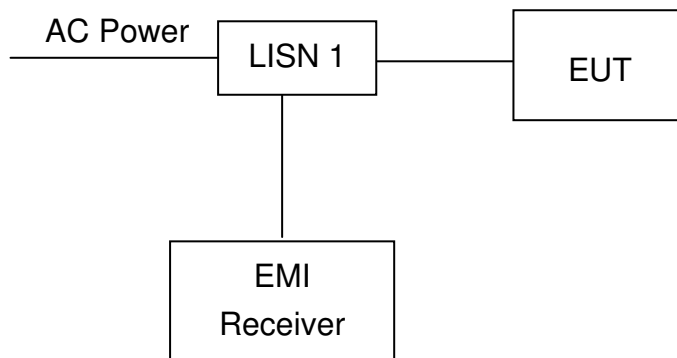
| Receiver settings |         |
|-------------------|---------|
| Receiver function | Setting |
| Detector          | QP      |
| Start frequency   | 0.15MHz |
| Stop frequency    | 30MHz   |
| IF bandwidth      | 9 kHz   |
| Attenuation       | 10dB    |

### 9.4 Test procedure

1. Configure the EUT according to ANSI C63.10:2013. The EUT or host of EHT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network.

3. All the companion devices are connected to the other LISN. The LISN should provide 50 $\mu$ H/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30MHz was searched
5. Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
6. The measurement has to be done between each power line and ground at the power terminal.

### 9.5 Test diagram



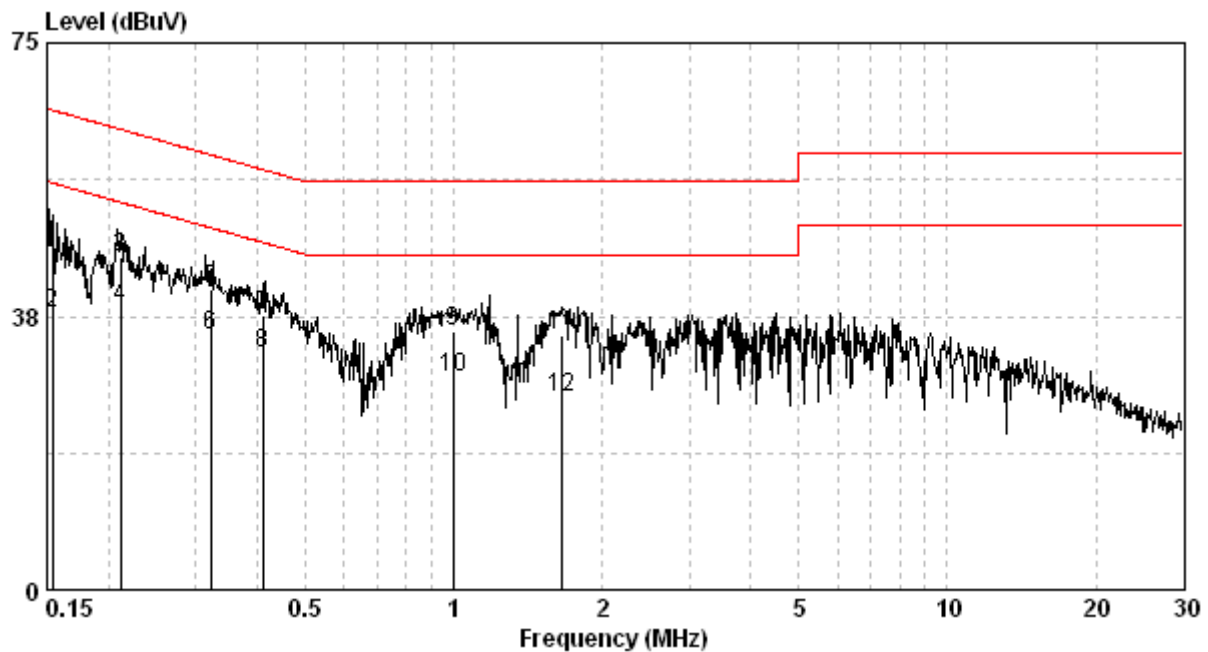
## 9.6 Test results

Phase: Live Line  
Model No.: PAD06  
Test Condition: Light on high

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Level<br>Qp<br>(dBuV) | Limit<br>Qp<br>(dBuV) | Level<br>Av<br>(dBuV) | Limit<br>Av<br>(dBuV) | Margin<br>(dB) |        |
|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------|--------|
|                    |                         |                       |                       |                       |                       | Qp             | Av     |
| 0.154              | 9.74                    | 46.11                 | 65.78                 | 38.03                 | 55.78                 | -19.67         | -17.75 |
| 0.212              | 9.74                    | 45.71                 | 63.14                 | 38.75                 | 53.14                 | -17.43         | -14.39 |
| 0.322              | 9.76                    | 41.18                 | 59.66                 | 34.77                 | 49.66                 | -18.48         | -14.89 |
| 0.410              | 9.77                    | 37.71                 | 57.64                 | 32.55                 | 47.64                 | -19.93         | -15.09 |
| 1.000              | 9.81                    | 35.47                 | 56.00                 | 29.16                 | 46.00                 | -20.53         | -16.84 |
| 1.662              | 9.87                    | 34.84                 | 56.00                 | 26.42                 | 46.00                 | -21.16         | -19.58 |

Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)

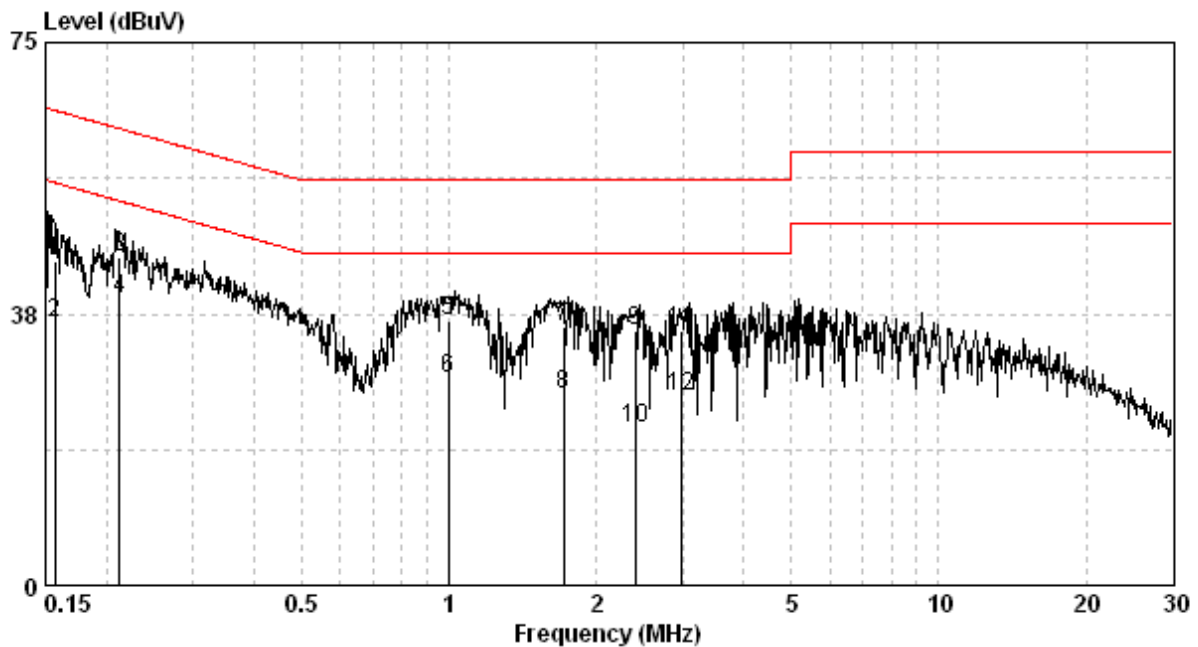


Phase: Neutral Line  
Model No.: PAD06  
Test Condition: Normal link

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Level<br>Qp<br>(dBuV) | Limit<br>Qp<br>(dBuV) | Level<br>Av<br>(dBuV) | Limit<br>Av<br>(dBuV) | Margin<br>(dB)<br>Qp | Av     |
|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|--------|
| 0.156              | 9.74                    | 44.87                 | 65.65                 | 36.29                 | 55.65                 | -20.77               | -19.36 |
| 0.213              | 9.74                    | 45.41                 | 63.10                 | 39.48                 | 53.10                 | -17.69               | -13.61 |
| 1.000              | 9.85                    | 36.63                 | 56.00                 | 28.46                 | 46.00                 | -19.37               | -17.54 |
| 1.716              | 9.88                    | 35.68                 | 56.00                 | 26.47                 | 46.00                 | -20.32               | -19.53 |
| 2.396              | 9.90                    | 35.13                 | 56.00                 | 21.78                 | 46.00                 | -20.87               | -24.22 |
| 2.993              | 9.91                    | 35.13                 | 56.00                 | 26.15                 | 46.00                 | -20.87               | -19.85 |

## Remark:

1. Correction Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



## Appendix A: Test equipment list

| Equipment                      | Brand                        | Model No.           | Serial No.  | Calibration Date | Next Calibration Date |
|--------------------------------|------------------------------|---------------------|-------------|------------------|-----------------------|
| ESCI EMI Test Receiver         | Rohde & Schwarz              | ESCI                | 100018      | 2016/11/30       | 2017/11/29            |
| Spectrum Analyzer              | Rohde & Schwarz              | FSP30               | 100137      | 2016/08/16       | 2017/08/15            |
| Horn Antenna (1-18G)           | SHWARZBECK                   | BBHA 9120 D         | 9120D-456   | 2014/08/29       | 2017/08/27            |
| Horn Antenna (14-42G)          | SHWARZBECK                   | BBHA 9170           | BBHA9170159 | 2014/09/16       | 2017/09/14            |
| Broadband Antenna              | SHWARZBECK                   | VULB 9168           | 9168-172    | 2016/03/22       | 2017/03/21            |
| Pre-Amplifier                  | EMC Co.                      | EMC12635SE          | 980205      | 2016/10/08       | 2017/10/07            |
| Pre-Amplifier                  | MITEQ                        | JS4-26004000--27-8A | 828825      | 2016/09/12       | 2017/09/11            |
| Power Meter                    | Anritsu                      | ML2495A             | 0844001     | 2016/11/09       | 2017/11/08            |
| Power Sensor                   | Anritsu                      | MA2411B             | 0738452     | 2016/11/09       | 2017/11/08            |
| Signal Analyzer                | Agilent                      | N9030A              | MY51380492  | 2016/09/13       | 2017/09/12            |
| 966-2(A) Cable 9kHz~26.5GHz    | SUHNER                       | SMA / EX 100        | N/A         | 2016/05/05       | 2017/05/04            |
| 966-2(B) Cable 9kHz~26.5GHz    | SUHNER                       | SUCOFLEX 104P       | CB0005      | 2016/05/04       | 2017/05/03            |
| RF Cable 9kHz~26.5GHz          | SUHNER                       | SUCOFLEX 102        | CB0006      | 2016/05/05       | 2017/05/04            |
| 966-2_3m Semi-Anechoic Chamber | 966_2                        | CEM-966_2           | N/A         | 2016/02/24       | 2017/02/22            |
| High Pass Filter               | Reactel                      | 7HS-3G/18G-S 11     | N/A         | 2016/06/03       | 2017/06/02            |
| Active Loop Antenna            | SCHWARZBECK MESS-ELEKTRO NIC | FMZB1519            | 1519-067    | 2016/03/03       | 2017/03/02            |
| Attenuator                     | PASTERNAK                    | N/A                 | PA7001-20   | 2016/05/06       | 2017/05/05            |
| Attenuator                     | EMCI                         | N/A                 | AT-N0619    | 2016/05/06       | 2017/05/05            |

| Equipment                       | Brand     | Model No.    | Serial No.   | Calibration Date | Next Calibration |
|---------------------------------|-----------|--------------|--------------|------------------|------------------|
| EMI Receiver                    | R&S       | ESCI         | 100059       | 2016/11/21       | 2017/11/20       |
| Two-Line V-Network              | R&S       | ENV216       | 101159       | 2016/06/02       | 2017/06/01       |
| Artificial Mains Network (LISN) | SCHAFFNER | MN2050D      | 1586         | 2016/05/25       | 2017/05/24       |
| CON-1 Shielded Room             | N/A       | N/A          | N/A          | NCR              | NCR              |
| CON-1 Cable                     | SUHNER    | SUCOFLEX-104 | 26438414     | 2016/05/05       | 2017/05/04       |
| Test software                   | Audix     | e3           | 4.2004-1-12k | NCR              | NCR              |

Note: No Calibration Required (NCR).

## Appendix B: Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of  $k=2$ .

| Item                                                                                                         | Uncertainty |
|--------------------------------------------------------------------------------------------------------------|-------------|
| Vertically polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m    | 5.14 dB     |
| Horizontally polarized radiated disturbances from 30MHz~1GHz in a semi-anechoic chamber at a distance of 3m  | 5.22 dB     |
| Vertically polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m    | 3.64 dB     |
| Horizontally polarized Radiated disturbances from 1GHz~18GHz in a semi-anechoic chamber at a distance of 3m  | 3.64 dB     |
| Vertically polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m   | 2.7 dB      |
| Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m | 2.7 dB      |
| Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m                         | 3.53 dB     |
| Emission on the Band Edge Test                                                                               | 3.64 dB     |
| RF Antenna Conducted Spurious Test                                                                           | 0.85 dB     |
| Maximum Output Power Test                                                                                    | 0.42 dB     |
| 20dB Bandwidth Test                                                                                          | 0.85 dB     |
| Carrier Frequency Separation Test                                                                            | 0.85 dB     |
| Number of Hopping Frequencies Test                                                                           | 0.85 dB     |
| Time of Occupancy (Dwell Time) Test                                                                          | 0.85 dB     |
| AC Power Line Conducted Emission                                                                             | 2.47 dB     |