

# Radio Spectrum TEST REPORT

Report No.: 170300653TWN-001  
Model No.: ATSFOCUS01  
Issued Date: Jul. 10, 2018

**Applicant:** Advanced Thinking Systems Ltd.  
Deepdale House, East Street, Hambledon, Hampshire, United Kingdom, PO7 4RZ

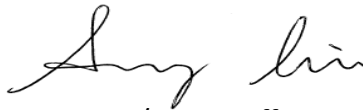
**Test Method/ Standard:** 47 CFR FCC Part 15.247 & ANSI C63.10 2013  
KDB 558074 D01 v04

**Test Site:** 960839

**Test By:** Intertek Testing Services Taiwan Ltd.,  
Hsinchu Laboratory  
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,  
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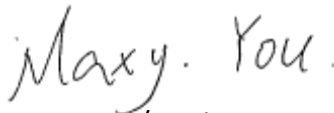
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### Revision History

| Report No.       | Issue Date    | Revision Summary |
|------------------|---------------|------------------|
| 170300653TWN-001 | Jul. 10, 2018 | Original report  |

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## 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 v04                          | Pass   |
| Maximum Peak Conducted Output Power                                         | 15.247(b)(3)<br>KDB 558074 D01 v04<br>KDB 662911 D01 v02r01 | 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, 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   |

## 1. General information

### 1.1. Identification of the EUT

|                            |                                                             |
|----------------------------|-------------------------------------------------------------|
| Product:                   | Multimedia Player                                           |
| Model No.:                 | ATSFOCUS01                                                  |
| Operating Frequency:       | 2402 MHz ~ 2480 MHz                                         |
| Channel Number:            | 40 channels                                                 |
| Frequency of Each Channel: | 2402+2 k MHz, k = 0~39                                      |
| Access scheme:             | GFSK                                                        |
| Rated Power:               | 1. DC 3.7 V from battery<br>2. DC 5 V from USB for charging |
| Power Cord:                | N/A                                                         |
| Sample Received:           | Mar. 17, 2017                                               |
| Test Date(s):              | Jun. 30, 2017 ~ Jul. 26, 2017 & Jul. 04, 2018               |

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.

Note 3: Except where explicitly agreed in writing, all work and services performed by Intertek is subject to our standard Terms and Conditions which can be obtained at our website: <http://www.intertek-twn.com/terms/>. Intertek's responsibility and liability are limited to the terms and conditions of the agreement.

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## 1.2. Description of the EUT

| Modulation mode | Transmit path  |               |
|-----------------|----------------|---------------|
|                 | Chain 0 / Main | Chain 1 / AUX |
| BT4.0           | V              | X             |

## 1.3. Antenna Description

The EUT uses a permanently connected antenna.

Antenna Gain : 2 dBi  
Antenna Type : Chip antenna  
Connector Type : Fixed

#### 1.4. Operation Mode

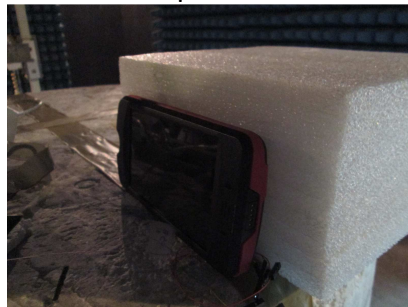
The EUT was supplied with DC 3.7 V from battery.

TX-MODE is based on a specific test program “USBTest3”, and the program can select different frequency and modulation.

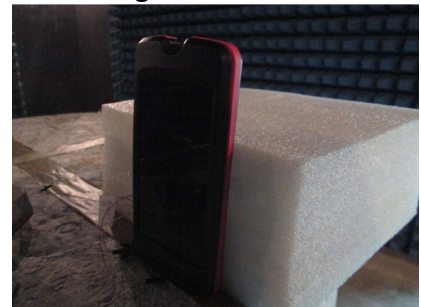
The signal is maximized through rotation and placement in the three orthogonal axes.



**X axis**



**Y axis**



**Z axis**

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

#### 1.5. Applied Test Modes and Channels

| Test items                                     | Mode        | Channel            | Antenna |
|------------------------------------------------|-------------|--------------------|---------|
| Minimum 6 dB Bandwidth                         | BLE         | Low, Middle , High | Chain0  |
| Maximum peak conducted output power            | BLE         | Low, Middle , High | Chain0  |
| Power Spectral Density                         | BLE         | Low, Middle , High | Chain0  |
| RF Antenna Conducted Spurious                  | BLE         | Low, Middle , High | Chain0  |
| Radiated spurious Emission 9kHz~1GHz           | Worst case  |                    |         |
| Radiated Spurious Emission 10GHz~10th Harmonic | BLE         | Low, Middle , High | Chain0  |
| Restricted-Band Band edge                      | BLE         | Low, Middle , High | Chain0  |
| AC Power Line Conducted Emission               | Normal Link |                    |         |

## 1.6. Peripherals Equipment

| Peripherals | Brand | Model No.     | Serial No. | Data cable          |
|-------------|-------|---------------|------------|---------------------|
| Notebook PC | DELL  | Latitude D610 | 2YWZK1S    | RS232 0.5 meter × 1 |

## 2. Minimum 6 dB Bandwidth

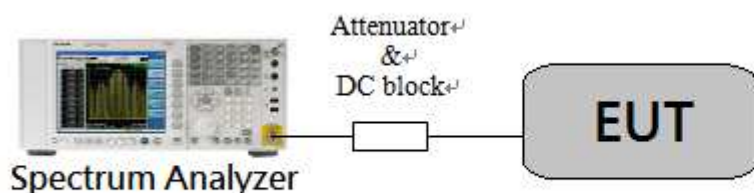
### 2.1. Instrument Setting

| Spectrum 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                                                    |

### 2.2. Test Procedure

- Step 1 The transmitter output was connected to the spectrum analyzer
- Step 2 Test was performed in accordance with clause 8.1 option1 of KDB 558074 D01
- Step 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

### 2.3. Test Diagram



### 2.4. Limit

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

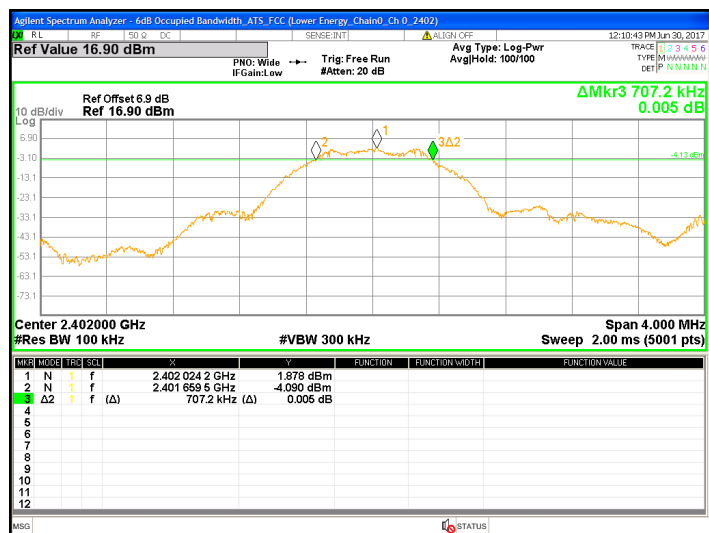
## 2.5. Operating Environment Condition

Temperature (°C) : 25  
Relative Humidity (%) : 50  
Atmospheric Pressure (hPa) : 1008  
Test Date : 6/30/2017

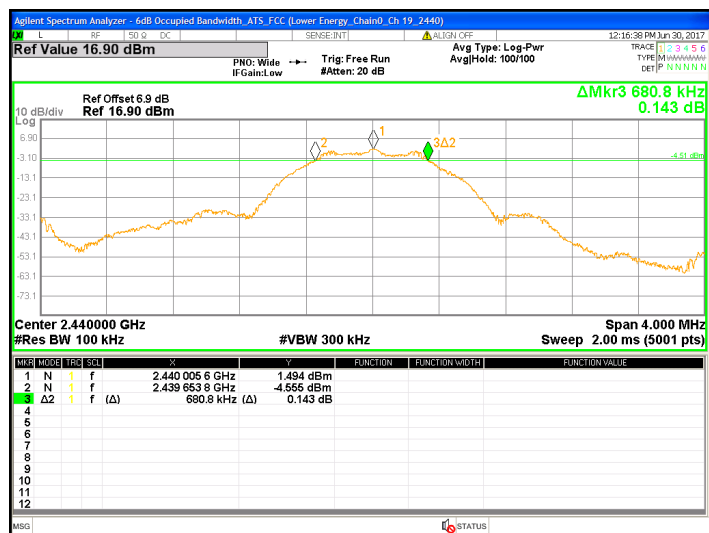
## 2.6. Test Results

| Mode | Channel | Frequency (MHz) | 6dB BW (MHz) | Limit (MHz) |
|------|---------|-----------------|--------------|-------------|
| BLE  | 0       | 2402            | 0.707        | >0.5        |
| BLE  | 19      | 2440            | 0.681        | >0.5        |
| BLE  | 39      | 2480            | 0.680        | >0.5        |

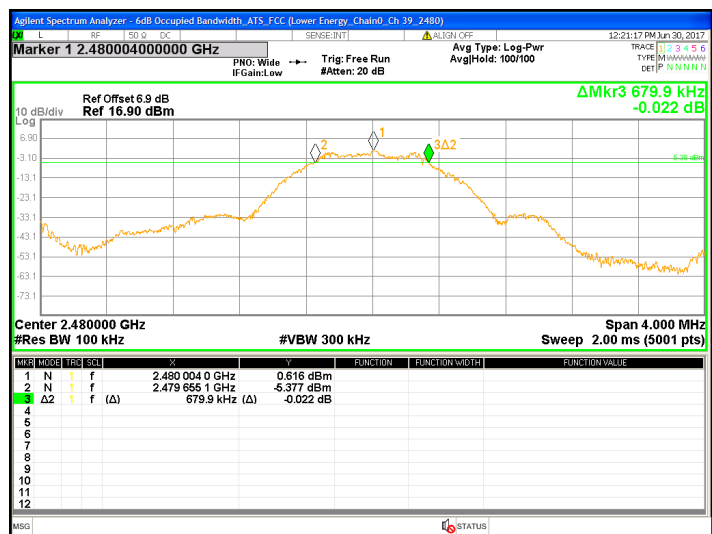
### Chain0 : 6dB Bandwidth @ BLE Mode Ch 0



### Chain0 : 6dB Bandwidth @ BLE Mode Ch 19



### Chain0 : 6dB Bandwidth @ BLE Mode Ch39



### 3. Maximum Peak Conducted Output Power

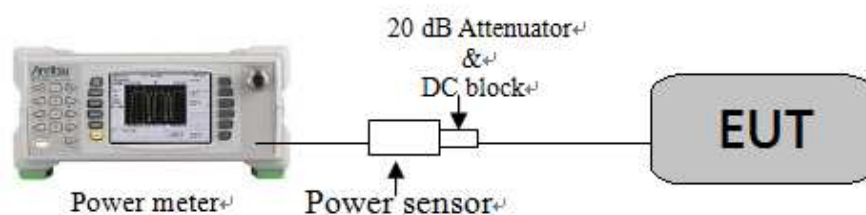
#### 3.1. Instrument Setting

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

#### 3.2. Test Procedure

Test procedures refer to clause 9.1.3 peak power meter method and clause 9.2.3.2 measurement using a gated RF average power meter of KDB 558074 D01.

#### 3.3. Test Diagram



#### 3.4. Limit

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

#### 3.5. Operating Environment Condition

Temperature (°C) : 25  
Relative Humidity (%) : 50  
Atmospheric Pressure (hPa) : 1008  
Test Date : 6/30/2017

### 3.6. Test Results

| Mode | Channel | Pk Output Power (dBm) | Pk Output Power (mW) | Av Output Power (dBm) | Av Output Power (mW) | Limit (dBm) | Margin (dB) |
|------|---------|-----------------------|----------------------|-----------------------|----------------------|-------------|-------------|
| BLE  | 0       | 3.30                  | 2.14                 | 1.35                  | 1.36                 | 30.00       | -26.70      |
| BLE  | 19      | 3.72                  | 2.36                 | 1.66                  | 1.47                 | 30.00       | -26.28      |
| BLE  | 39      | 3.51                  | 2.24                 | 1.15                  | 1.30                 | 30.00       | -26.49      |

## 4. Power Spectral Density

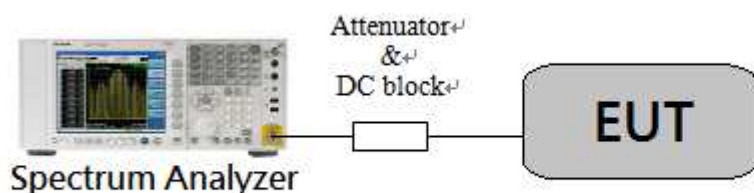
### 4.1. Instrument Setting

| Spectrum 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                      |

### 4.2. Test Procedure

- Step 1 Test procedure refer to clause 10.2 method PKPSD (peak PSD) of KDB 558074 D01.
- Step 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.
- Step 3 Use the peak marker function to determine the maximum amplitude level within the RBW.

### 4.3. Test Diagram



### 4.4. Limit

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

#### 4.5. Operating Environment Condition

Temperature (°C) : 25  
Relative Humidity (%) : 50  
Atmospheric Pressure (hPa) : 1008  
Test Date : 2017/6/30

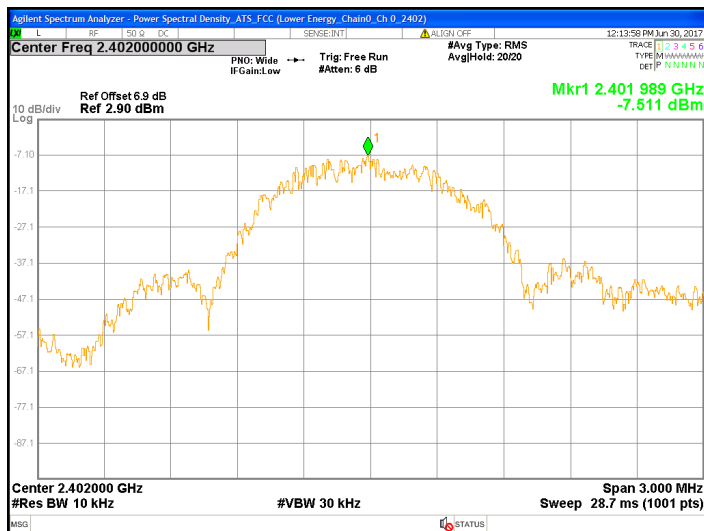
#### 4.6. Test Results

| Mode | Channel | Freq.(MHz) | RBW factor (dB) | PSD in 10 kHz (dBm) | PSD in 3 kHz (dBm) | Limit (dBm) | PSD (dBm) |
|------|---------|------------|-----------------|---------------------|--------------------|-------------|-----------|
| BLE  | 0       | 2402       | 5.229           | -7.511              | -12.74             | 8           | -20.74    |
| BLE  | 19      | 2440       | 5.229           | -8.038              | -13.267            | 8           | -21.267   |
| BLE  | 39      | 2480       | 5.229           | -8.702              | -13.931            | 8           | -21.931   |

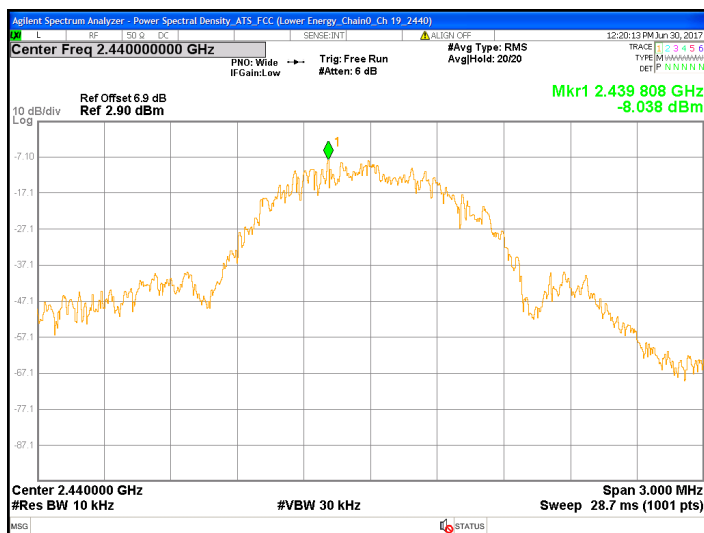
Remark1:  $RBW\ Correction = 10 \cdot \log(10kHz/3kHz) = 5.229$

Remark2:  $PSD\ in\ 3kHz = PSD\ in\ 10kHz - RBW\ Correction$

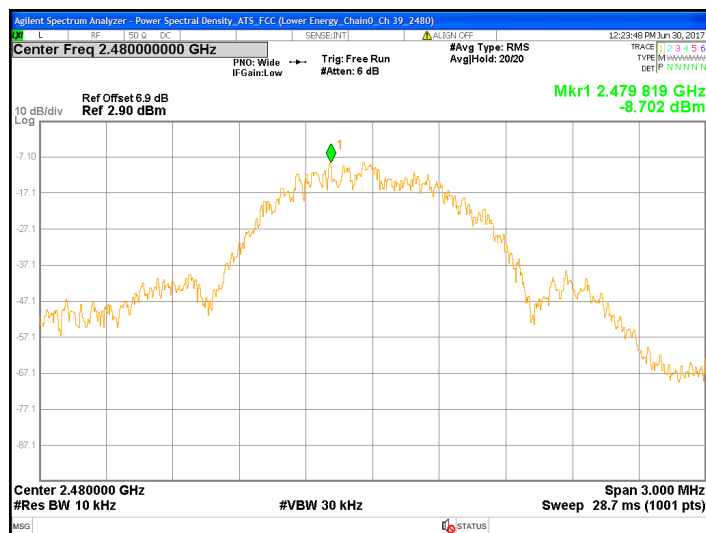
### Chain0 : Power Spectral Density @ BLE Mode Ch 0



### Chain0 : Power Spectral Density @ BLE Mode Ch 19



### Chain0 : Power Spectral Density @ BLE Mode Ch39



## 5. Emissions in Non-Restricted Frequency Bands

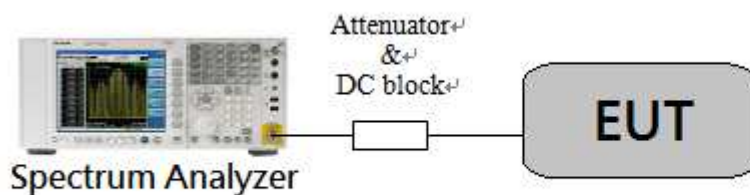
### 5.1. Instrument Setting

| Spectrum Function | Setting (Reference level)     | Setting (Emission level) |
|-------------------|-------------------------------|--------------------------|
| Detector          | Peak                          | Peak                     |
| RBW               | $\geq 100$ kHz                | $\geq 100$ kHz           |
| VBW               | $\geq 3 \times$ RBW           | $\geq 3 \times$ RBW      |
| Sweep             | Auto couple                   | Auto couple              |
| Trace             | Max hold                      | Max hold                 |
| Span              | $\geq 1.5$ time 6dB bandwidth |                          |
| Attenuation       | Auto                          | Auto                     |

### 5.2. Test Procedure

- Step 1 The procedure was used in antenna-port conducted and connected to the spectrum analyzer.
- Step 2 Set instrument center frequency to center frequency.
- Step 3 Use the parameter configured in clause 5.1 to measure
- Step 4 Use the peak marker function to determine the maximum amplitude level.

### 5.3. Test Diagram



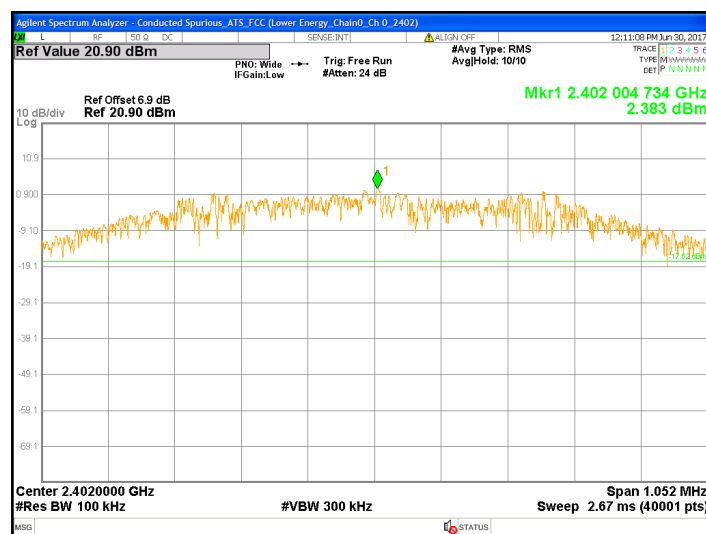
### 5.4. Limit

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

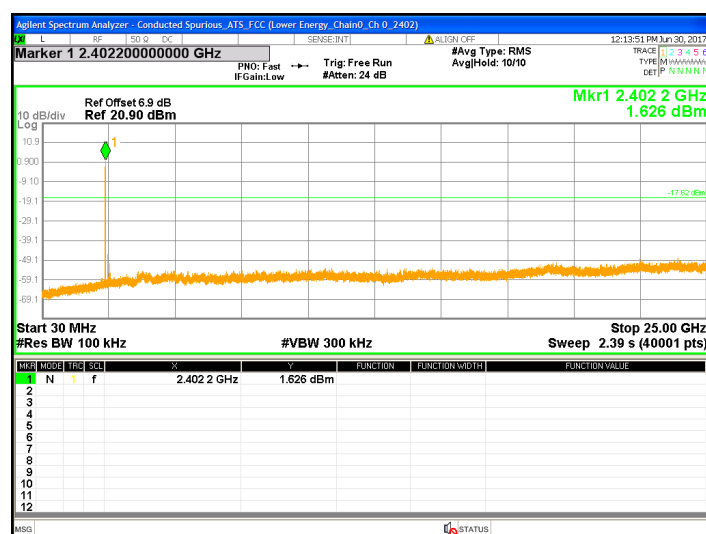
|                              |           |
|------------------------------|-----------|
| Temperature (°C) :           | 25        |
| Relative Humidity (%) :      | 50        |
| Atmospheric Pressure (hPa) : | 1008      |
| Test Date :                  | 6/30/2017 |

## 5.6. Test results

### Chain0 : Conducted Spurious @ BLE Mode Ch 0



### Chain0 : Conducted Spurious @ BLE Mode Ch 0





Agilent Spectrum Analyzer - Conducted Spurious\_ ATIS\_FCC (Lower Energy\_Chain0\_Ch 39\_2480)

RF Freq 150.01 DC SENSE:INT

ALIGN OFF

12:21:28 PM Jun 30, 2017

Ref Value 16.90 dBm

PN0: Wide IF Gain: Low

Trig: Free Run

#Avg Type: RMS

AvgHold: 10/10

TRACE [1] 2 x 5

TYPE [M] H A A A A A A A A A

DET [P] N N N N N N

Mkr1 2.479 999 595 GHz

0.649 dBm

10 dB/div

Ref Offset 6.9 dB

Ref 16.90 dBm

Log

6.90

-3.10

-13.1

-23.1

-33.1

-43.1

-53.1

-63.1

-73.1

Center 2.4800000 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 1.020 MHz

Sweep 2.67 ms (40001 pts)

MSG

STATUS

[illegible]

## 6. Emissions in Restricted Frequency Bands (Radiated emission measurements)

### 6.1. Instrument Setting

| Receiver function | Setting (Below 1GHz)                                                          | Setting (Above 1GHz) |
|-------------------|-------------------------------------------------------------------------------|----------------------|
| Detector          | QP                                                                            | Peak                 |
| RBW               | 9-150 kHz ; 200-300 Hz<br>0.15-30 MHz ; 9-10 kHz<br>30-1000 MHz ; 100-120 kHz | 1MHz                 |
| VBW               | $\geq 3 \times \text{RBW}$                                                    | 3MHz                 |
| Sweep             | Auto couple                                                                   | Auto couple          |
| Start Frequency   | 9 KHz                                                                         | 1GHz                 |
| Stop Frequency    | 1 GHz                                                                         | Tenth harmonic       |
| Attenuation       | Auto                                                                          | Auto                 |

### 6.2. Test Procedure

- Step 1 Configure the EUT according to ANSI C63.10:2013. The EUT was placed on the top of the turntable 0.8 meter (below 1GHz) and 1.5 meter (above 1GHz) above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- Step 2 Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
- Step 3 The height of the receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of the both horizontal and vertical polarization.
- Step 4 If find the frequencies above the limit or below within 3dB, the antenna tower was scan (from 1m to 4m) and then the turntable was rotated to find the maximum reading.
- Step 5 Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.
- Step 6 For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for reading in spectrum analyzer.  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
- Step 7 If the emissions level of the EUT in peak mode was 3dB lower than the average limit

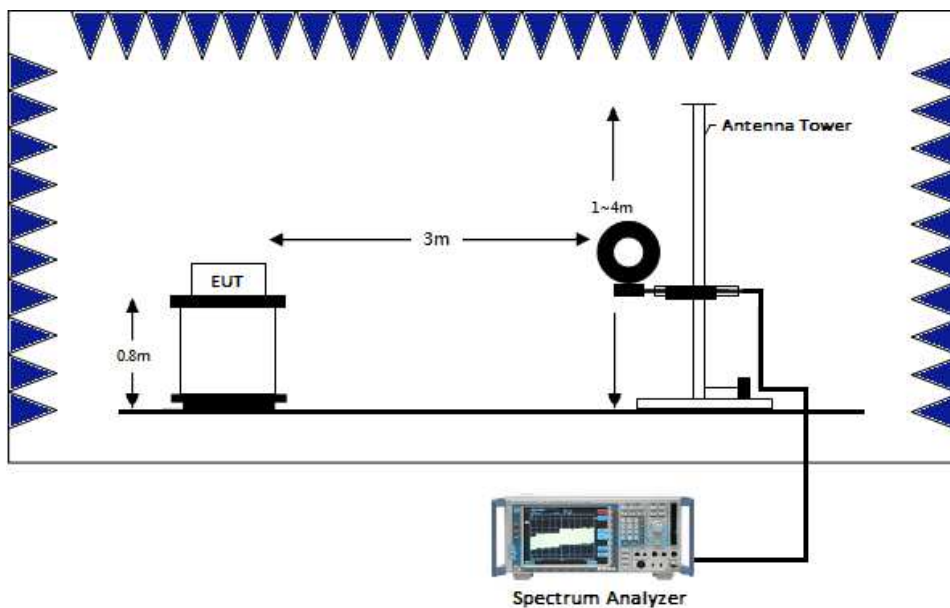
specified then testing will be stopped and peak values of the EUT will be reported. Otherwise, the emissions which do not have 3dB margin will be measured using the quasi-peak method for below 1GHz.

Step 8 For testing above 1GHz, The emissions level of the EUT in peak mode was lower than average limit, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

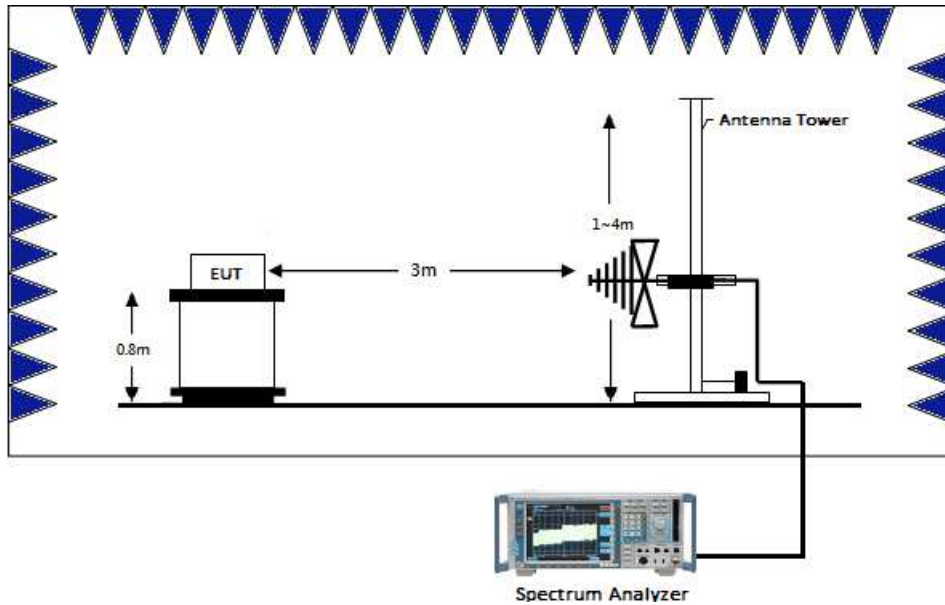
Step 9 In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be quasi-peak measured by receiver.

### 6.3. Test Diagram

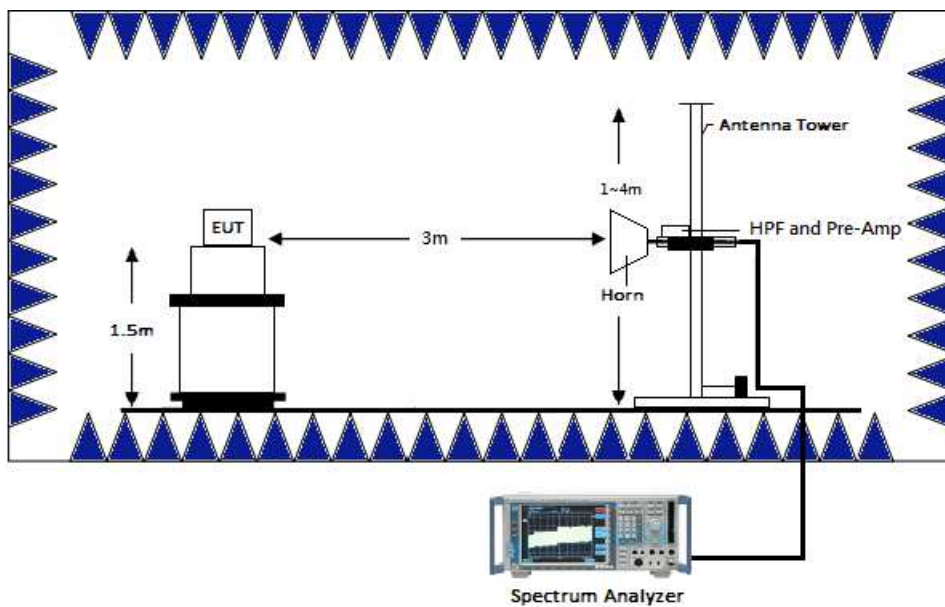
#### 6.3.1. Radiated emission from 9kHz to 30MHz uses Loop Antenna:



### 6.3.2. Radiated emission below 1GHz using Bilog Antenna



### 6.3.3. Radiated emission above 1GHz using Horn Antenna



#### 6.4. Limit

| Frequency(MHz) | Field Strength(uV/m) | Measurement distance(m) |
|----------------|----------------------|-------------------------|
| 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

#### 6.5. Operating Environment Condition

Temperature (°C) : 25  
Relative Humidity (%) : 50  
Atmospheric Pressure (hPa) : 1008  
Test Date : 7/4/2017

## 6.6. Test Result

### 6.6.1. Measurement results: frequencies 9kHz to 30MHz

The test was performed on EUT low/middle/high channels. The worst case occurred at middle channel.

| Mode | Channel | Detector | Freq. (MHz) | Factor (dB/m) | Reading (dBuV/m) | Corrected Reading (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|------|---------|----------|-------------|---------------|------------------|----------------------------|----------------|-------------|
| BLE  | 19      | QP       | 0.02        | 20.23         | 34.83            | 55.06                      | 121.58         | -66.52      |
| BLE  | 19      | QP       | 0.03        | 20.35         | 35.27            | 55.62                      | 118.06         | -62.44      |
| BLE  | 19      | QP       | 0.04        | 20.13         | 33.74            | 53.87                      | 115.56         | -61.69      |
| BLE  | 19      | QP       | 0.05        | 19.79         | 26.83            | 46.62                      | 113.62         | -67.00      |
| BLE  | 19      | QP       | 0.08        | 19.35         | 55.84            | 75.19                      | 109.54         | -34.35      |

Remark: Factor = Antenna Factor + Cable Loss

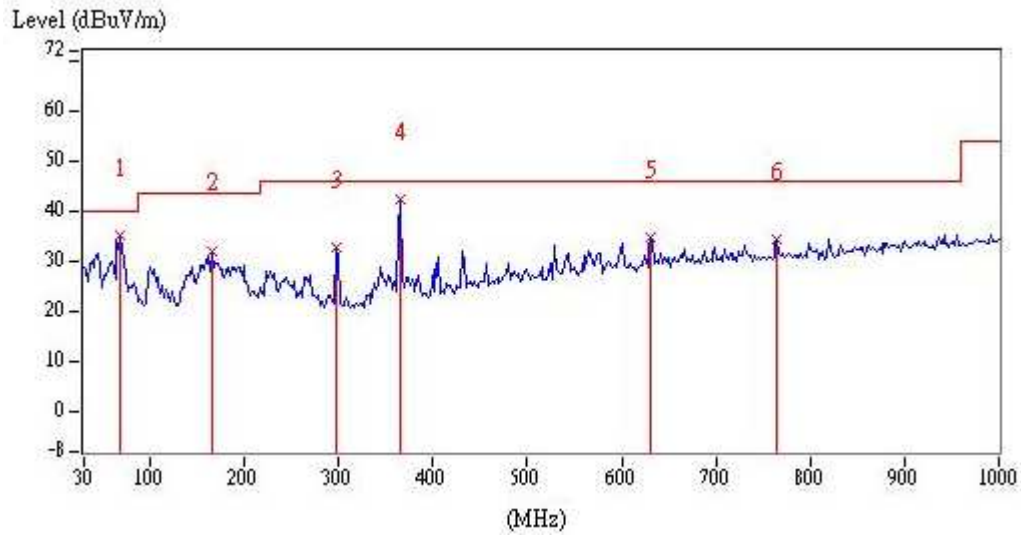
### 6.6.2. Measurement results: frequencies below 1 GHz

The test was performed on EUT low/middle/high channels. The worst case occurred at middle channel.

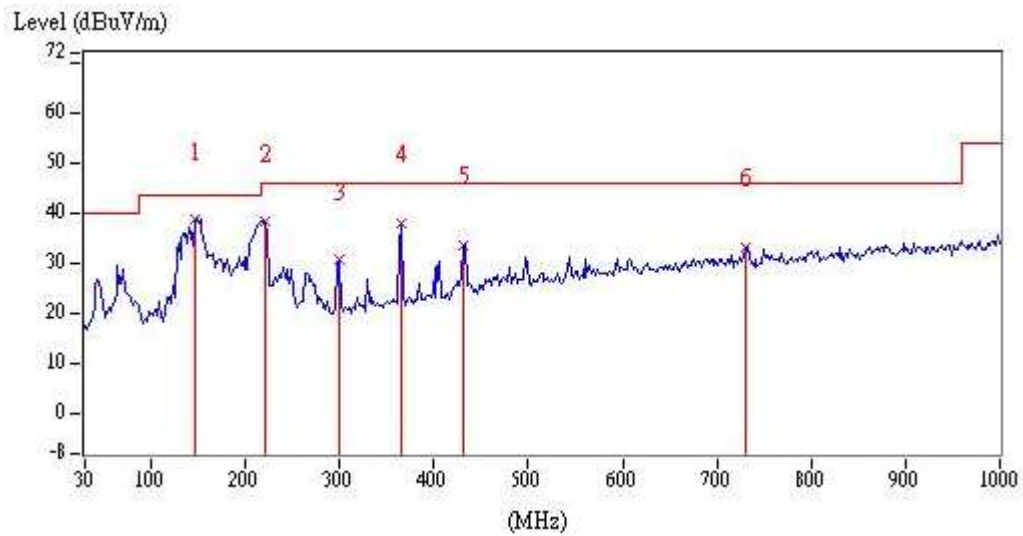
| Mode | Ch | Chain  | Ant Polarity | Detector | Freq. (MHz) | Factor (dB/m) | Reading (dBuV/m) | Corrected Reading (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|------|----|--------|--------------|----------|-------------|---------------|------------------|----------------------------|----------------|-------------|
| BLE  | 19 | Chain0 | V            | QP       | 68.80       | 18.39         | 16.69            | 35.08                      | 40.00          | -4.92       |
| BLE  | 19 | Chain0 | V            | QP       | 165.80      | 20.61         | 11.42            | 32.04                      | 43.50          | -11.46      |
| BLE  | 19 | Chain0 | V            | QP       | 297.72      | 21.70         | 10.97            | 32.67                      | 46.00          | -13.33      |
| BLE  | 19 | Chain0 | V            | QP       | 365.62      | 23.44         | 18.90            | 42.34                      | 46.00          | -3.66       |
| BLE  | 19 | Chain0 | V            | QP       | 631.40      | 29.55         | 5.11             | 34.67                      | 46.00          | -11.33      |
| BLE  | 19 | Chain0 | V            | QP       | 765.26      | 31.74         | 2.48             | 34.22                      | 46.00          | -11.78      |
| BLE  | 19 | Chain0 | H            | QP       | 146.40      | 20.46         | 18.28            | 38.74                      | 43.50          | -4.76       |
| BLE  | 19 | Chain0 | H            | QP       | 220.12      | 18.77         | 19.61            | 38.38                      | 46.00          | -7.62       |
| BLE  | 19 | Chain0 | H            | QP       | 299.66      | 21.74         | 9.00             | 30.74                      | 46.00          | -15.26      |
| BLE  | 19 | Chain0 | H            | QP       | 365.62      | 23.44         | 14.62            | 38.06                      | 46.00          | -7.94       |
| BLE  | 19 | Chain0 | H            | QP       | 431.58      | 25.30         | 8.31             | 33.62                      | 46.00          | -12.38      |
| BLE  | 19 | Chain0 | H            | QP       | 730.34      | 31.21         | 2.10             | 33.31                      | 46.00          | -12.69      |

Remark: Factor = Antenna Factor + Cable Loss

## Vertical



## Horizontal



### 6.6.3. Measurement results: frequency above 1GHz to 25GHz

| Mode | Ch | Ant Polarity | Detector | Freq. (MHz) | Pream p(dB) | Factor (dB/m) | Reading (dBμV/m) | Corrected Reading (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|------|----|--------------|----------|-------------|-------------|---------------|------------------|----------------------------|----------------|-------------|
| BLE  | 0  | V            | PK       | 1600        | 38.73       | 30.80         | 14.27            | 45.07                      | 74.00          | -28.93      |
| BLE  | 0  | V            | PK       | 4804        | 40.06       | 2.99          | 52.60            | 55.59                      | 74.00          | -18.41      |
| BLE  | 0  | V            | AV       | 4804        | 40.06       | 2.99          | 50.34            | 53.33                      | 54.00          | -0.67       |
| BLE  | 19 | V            | PK       | 1060        | 39.17       | 29.08         | 13.71            | 42.79                      | 74.00          | -31.21      |
| BLE  | 19 | V            | PK       | 1328        | 38.95       | 29.51         | 11.71            | 41.22                      | 74.00          | -32.78      |
| BLE  | 19 | V            | PK       | 1596        | 38.73       | 30.76         | 21.94            | 52.70                      | 74.00          | -21.30      |
| BLE  | 19 | V            | PK       | 4884        | 39.93       | 3.30          | 51.84            | 55.14                      | 74.00          | -18.86      |
| BLE  | 19 | V            | AV       | 4884        | 39.93       | 3.30          | 49.77            | 53.07                      | 54.00          | -0.93       |
| BLE  | 39 | V            | PK       | 1596        | 38.73       | 30.76         | 22.79            | 53.55                      | 74.00          | -20.45      |
| BLE  | 39 | V            | PK       | 2128        | 38.6        | 34.91         | 15.80            | 50.71                      | 74.00          | -23.29      |
| BLE  | 39 | V            | PK       | 4960        | 39.8        | 3.59          | 51.70            | 55.29                      | 74.00          | -18.71      |
| BLE  | 39 | V            | AV       | 4960        | 39.8        | 3.59          | 49.61            | 53.20                      | 54.00          | -0.80       |
| BLE  | 0  | H            | PK       | 1064        | 39.17       | 29.08         | 15.53            | 44.61                      | 74.00          | -29.39      |
| BLE  | 0  | H            | PK       | 1596        | 38.73       | 30.76         | 22.39            | 53.14                      | 74.00          | -20.86      |
| BLE  | 0  | H            | PK       | 1860        | 38.51       | 33.43         | 13.97            | 47.40                      | 74.00          | -26.60      |
| BLE  | 0  | H            | PK       | 2124        | 38.6        | 34.90         | 12.77            | 47.68                      | 74.00          | -26.32      |
| BLE  | 0  | H            | PK       | 4804        | 40.06       | 2.99          | 49.27            | 52.26                      | 74.00          | -21.74      |
| BLE  | 19 | H            | PK       | 1600        | 38.73       | 30.80         | 17.28            | 48.08                      | 74.00          | -25.92      |
| BLE  | 19 | H            | PK       | 4884        | 39.93       | 3.30          | 49.59            | 52.89                      | 74.00          | -21.11      |
| BLE  | 39 | H            | PK       | 1224        | 39.04       | 29.34         | 12.56            | 41.90                      | 74.00          | -32.10      |
| BLE  | 39 | H            | PK       | 1244        | 39.02       | 29.38         | 12.82            | 42.20                      | 74.00          | -31.80      |
| BLE  | 39 | H            | PK       | 1596        | 38.73       | 30.76         | 16.47            | 47.23                      | 74.00          | -26.77      |
| BLE  | 39 | H            | PK       | 4960        | 39.8        | 3.59          | 48.43            | 52.03                      | 74.00          | -21.97      |

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

## 7. Emission on Band Edge

### 7.1. Instrument Setting

| Spectrum Function | Setting                                      |
|-------------------|----------------------------------------------|
| Detector          | Peak                                         |
| RBW               | 1MHz                                         |
| VBW               | 3MHz                                         |
| Sweep             | Auto couple                                  |
| Restrict bands    | 2310 MHz ~ 2390 MHz<br>2483.5 MHz ~ 2500 MHz |
| Attenuation       | Auto                                         |

### 7.2. Test Procedure

The test procedure is the same as Emissions in Restricted Frequency Bands (Radiated emission measurements).

### 7.3. Operating Environment Condition

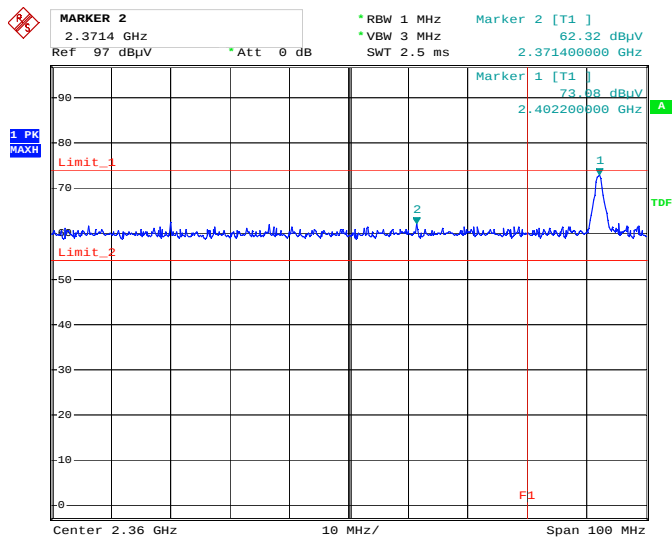
Temperature (°C) : 25  
Relative Humidity (%) : 50  
Atmospheric Pressure (hPa) : 1008  
Test Date : 6/30/2017~7/5/2017

### 7.4. Test Results

| Frequency (MHz) | Spectrum Analyzer Detector | Ant. Pol. (H/V) | Correction Factor (dB/m) | Reading (dBμV) | Corrected Reading (dBμV/m) | Limit @ 3 m (dBμV/m) | Margin (dB) | Restricted band (MHz) |
|-----------------|----------------------------|-----------------|--------------------------|----------------|----------------------------|----------------------|-------------|-----------------------|
| 2371.40         | PK                         | V               | 33.76                    | 28.56          | 62.32                      | 74                   | -11.68      | 2310~2390             |
| 2390.00         | AV                         | V               | 33.85                    | 15.01          | 48.86                      | 54                   | -5.14       |                       |
| 2486.70         | PK                         | V               | 34.32                    | 26.73          | 61.05                      | 74                   | -12.95      | 2483.5~2500           |
| 2483.50         | AV                         | V               | 34.30                    | 13.59          | 47.89                      | 54                   | -6.11       |                       |

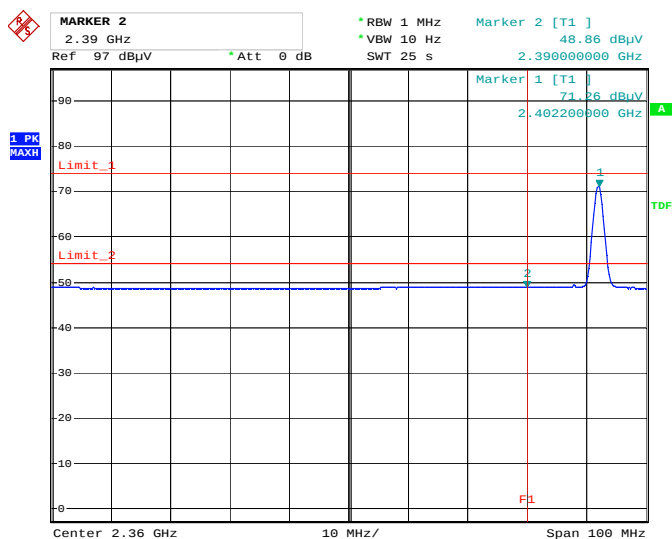
Remark: Correction Factor = Antenna Factor + Cable Loss

### Restricted Band Bandedge @ ch 0 pk Mode



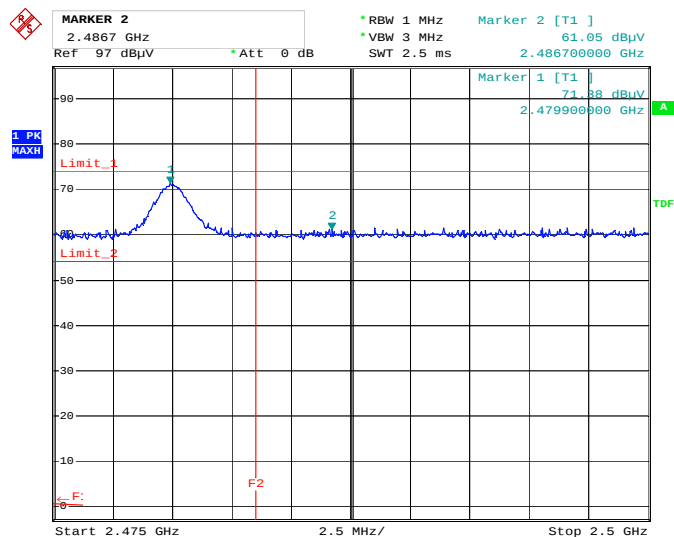
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### Restricted Band Bandedge @ ch 0 av Mode



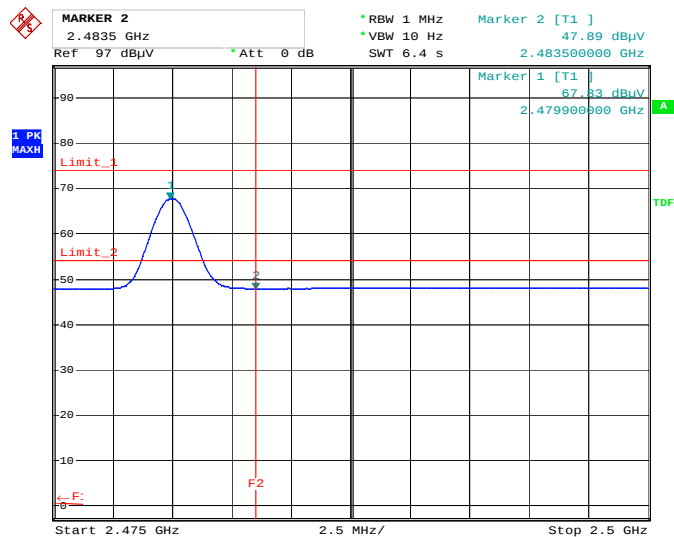
Date: 5.JUL.2017 12:25:58

### Restricted Band Bandedge @ ch 39 pk Mode



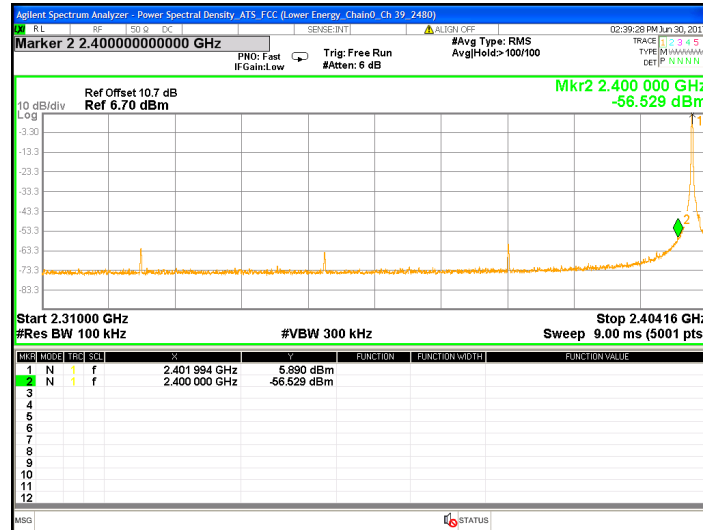
Date: 5.JUL.2017 12:31:38

### Restricted Band Bandedge @ ch 39 av Mode

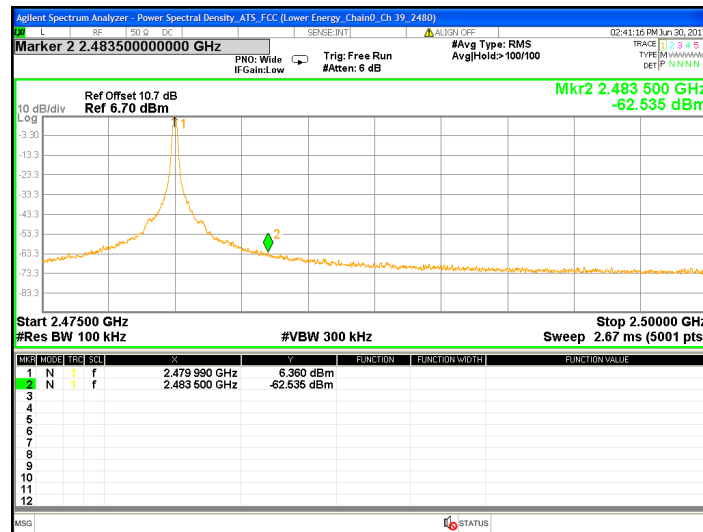


Date: 5.JUL.2017 12:32:37

### Authorized Band Bandedge @ BLE ch0



### Authorized Band Bandedge @ BLE ch39



## 8. AC Power Line Conducted Emission

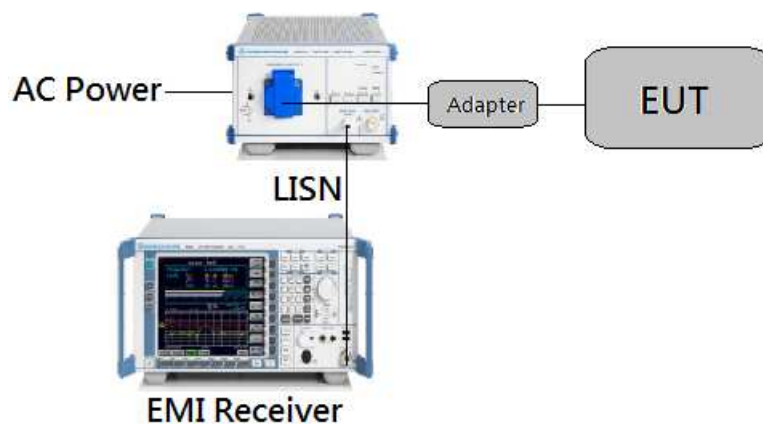
### 8.1. Instrument Setting

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

### 8.2. Test Procedure

- Step 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.
- Step 2 Connect EUT or host of EUT to the power mains through a line impedance stabilization network.
- Step 3 All the companion devices are connected to the other LISN. The LISN should provide 50 $\mu$ H/50ohms coupling impedance.
- Step 4 The frequency range from 150 kHz to 30MHz was searched.
- Step 5 Set the test-receiver system to peak detector and specified bandwidth with maximum hold mode.
- Step 6 The measurement has to be done between each power line and ground at the power terminal.

### 8.3. Test Diagram



#### 8.4. Limit

| Frequency(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      |

#### 8.5. Operating Environment Condition

Temperature (°C) : 25  
 Relative Humidity (%) : 50  
 Atmospheric Pressure (hPa) : 1008  
 Test Date : 7/24/2017 & 7/04/2018

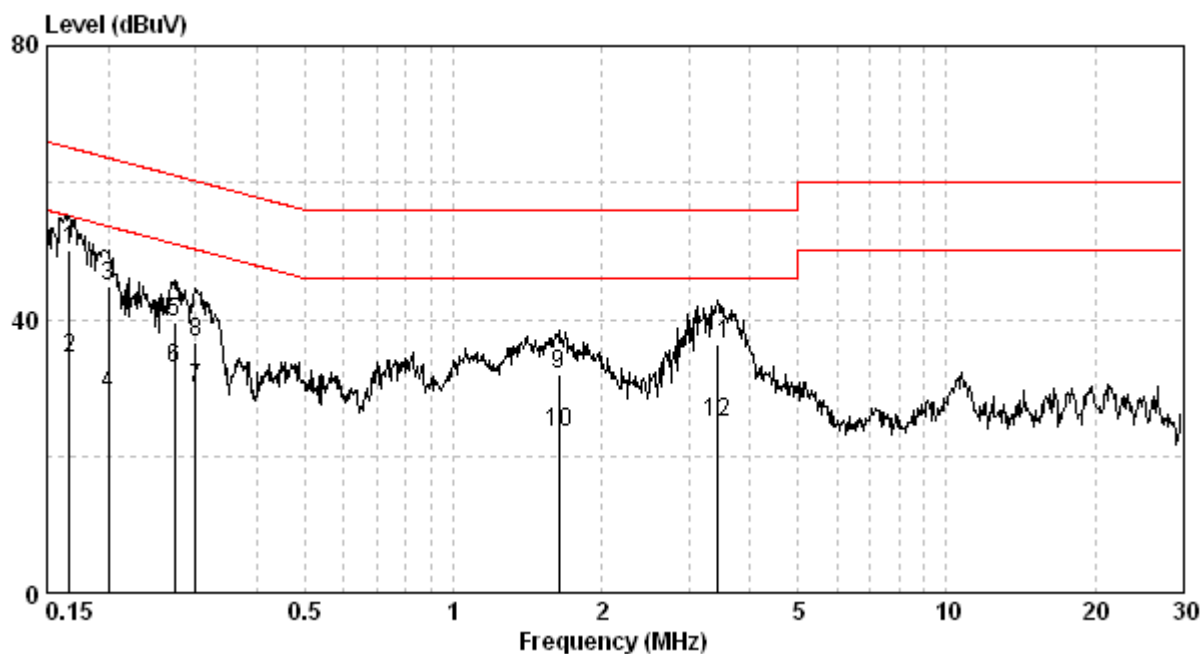
## 8.6. Test Results

|                       |           |     |               |               |
|-----------------------|-----------|-----|---------------|---------------|
| Phase:                | Live Line |     |               |               |
| Temperature:          | 25        | °C  | Model No.:    | ATSFOCUS01    |
| Relative Humidity:    | 55        | %   | Test Date:    | Jul. 24, 2017 |
| Atmospheric Pressure: | 1009      | hPa | Test voltage: | 120Vac, 60 Hz |

| 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     |
| 0.167              | 9.70                    | 50.19                 | 65.12                 | 34.20                 | 55.12                 | -14.93         | -20.92 |
| 0.200              | 9.70                    | 44.90                 | 63.62                 | 28.94                 | 53.62                 | -18.72         | -24.68 |
| 0.272              | 9.70                    | 39.65                 | 61.07                 | 32.71                 | 51.07                 | -21.42         | -18.36 |
| 0.300              | 9.70                    | 36.53                 | 60.24                 | 29.91                 | 50.24                 | -23.71         | -20.33 |
| 1.636              | 9.72                    | 31.83                 | 56.00                 | 23.44                 | 46.00                 | -24.17         | -22.56 |
| 3.417              | 9.75                    | 36.43                 | 56.00                 | 24.81                 | 46.00                 | -19.57         | -21.19 |

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Over Limit (dB) = Level (dBuV) – Limit (dBuV)

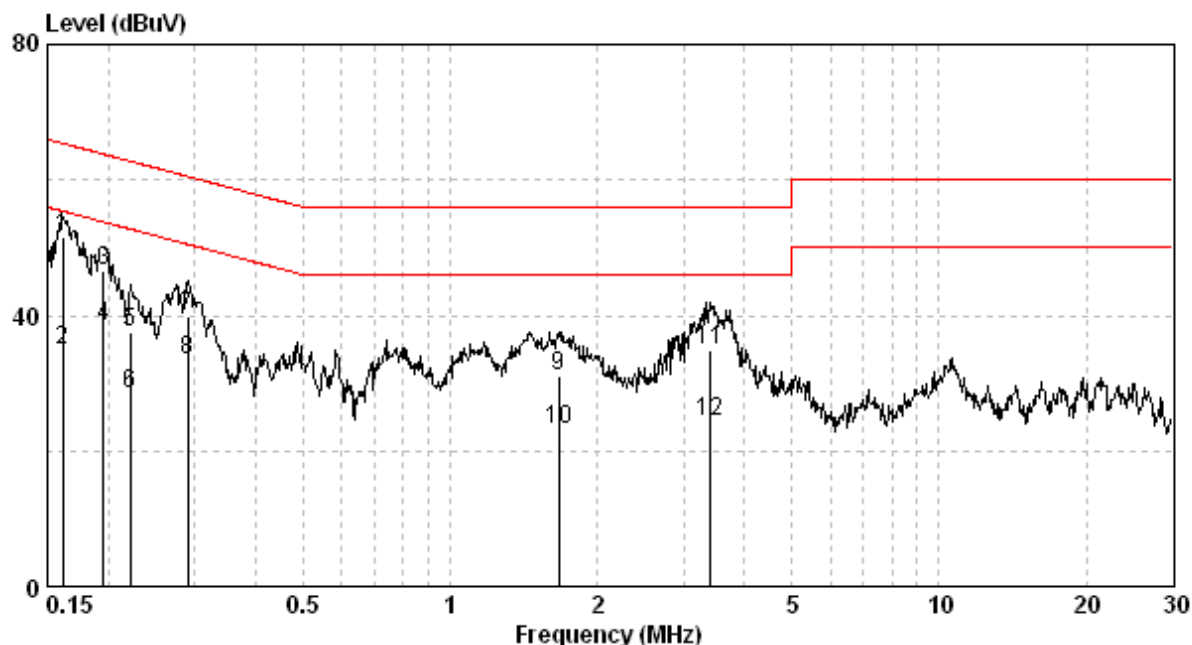


|                       |              |     |               |               |
|-----------------------|--------------|-----|---------------|---------------|
| Phase:                | Neutral Line |     |               |               |
| Temperature:          | 25           | °C  | Model No.:    | ATSFOCUS01    |
| Relative Humidity:    | 55           | %   | Test Date:    | Jul. 24, 2017 |
| Atmospheric Pressure: | 1009         | hPa | Test voltage: | 120Vac, 60 Hz |

| 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     |
| 0.162              | 9.73                    | 51.58                 | 65.38                 | 34.73                 | 55.38                 | -13.80         | -20.65 |
| 0.195              | 9.73                    | 46.48                 | 63.80                 | 38.28                 | 53.80                 | -17.32         | -15.52 |
| 0.222              | 9.73                    | 37.53                 | 62.74                 | 28.52                 | 52.74                 | -25.21         | -24.22 |
| 0.291              | 9.73                    | 39.91                 | 60.50                 | 33.35                 | 50.50                 | -20.59         | -17.15 |
| 1.671              | 9.74                    | 31.20                 | 56.00                 | 23.08                 | 46.00                 | -24.80         | -22.92 |
| 3.399              | 9.75                    | 34.88                 | 56.00                 | 24.28                 | 46.00                 | -21.12         | -21.72 |

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Over Limit (dB) = Level (dBuV) – Limit (dBuV)

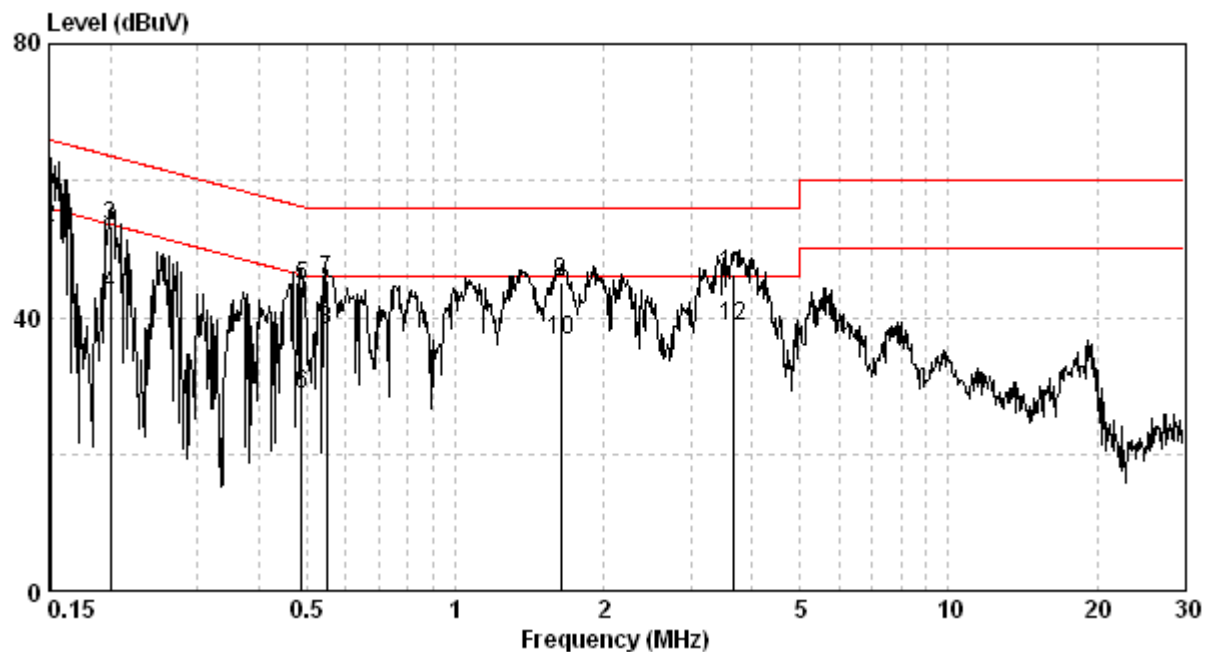


|                       |           |     |               |               |
|-----------------------|-----------|-----|---------------|---------------|
| Phase:                | Live Line |     |               |               |
| Temperature:          | 25        | °C  | Model No.:    | ATSF0CUS01    |
| Relative Humidity:    | 55        | %   | Test Date:    | Jul. 04, 2018 |
| Atmospheric Pressure: | 1009      | hPa | Test voltage: | 240Vac, 60 Hz |

| Frequency (MHz) | Corr. Factor (dB) | Reading QP (dBuV) | Level QP (dBuV) | Limit QP (dBuV) | Reading AV (dBuV) | Level AV (dBuV) | Limit AV (dBuV) | Margin (dB) QP | AV     |
|-----------------|-------------------|-------------------|-----------------|-----------------|-------------------|-----------------|-----------------|----------------|--------|
| 0.151           | 9.73              | 51.73             | 61.46           | 65.96           | 43.34             | 53.07           | 55.96           | -4.50          | -2.89  |
| 0.200           | 9.73              | 43.67             | 53.40           | 63.62           | 33.65             | 43.38           | 53.62           | -10.22         | -10.24 |
| 0.489           | 9.74              | 34.94             | 44.68           | 56.19           | 18.93             | 28.67           | 46.19           | -11.50         | -17.52 |
| 0.549           | 9.75              | 35.60             | 45.35           | 56.00           | 28.35             | 38.10           | 46.00           | -10.65         | -7.90  |
| 1.636           | 9.82              | 35.23             | 45.05           | 56.00           | 26.87             | 36.69           | 46.00           | -10.95         | -9.31  |
| 3.681           | 9.85              | 36.33             | 46.18           | 56.00           | 28.88             | 38.73           | 46.00           | -9.82          | -7.27  |

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Over Limit (dB) = Level (dBuV) – Limit (dBuV)

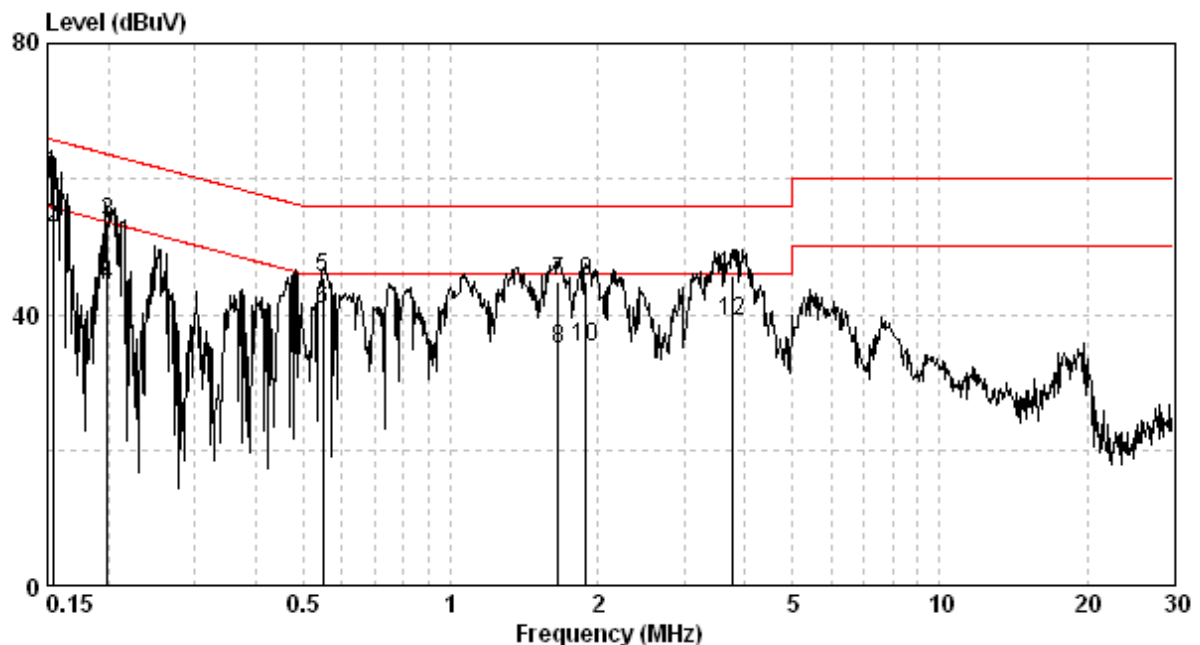


|                       |              |     |               |               |
|-----------------------|--------------|-----|---------------|---------------|
| Phase:                | Neutral Line |     |               |               |
| Temperature:          | 25           | °C  | Model No.:    | ATSFOCUS01    |
| Relative Humidity:    | 55           | %   | Test Date:    | Jul. 04, 2018 |
| Atmospheric Pressure: | 1009         | hPa | Test voltage: | 240Vac, 60 Hz |

| Frequency<br>(MHz) | Corr.<br>Factor<br>(dB) | Reading<br>QP<br>(dBuV) | Level<br>QP<br>(dBuV) | Limit<br>QP<br>(dBuV) | Reading<br>AV<br>(dBuV) | Level<br>AV<br>(dBuV) | Limit<br>AV<br>(dBuV) | Margin<br>(dB) |        |
|--------------------|-------------------------|-------------------------|-----------------------|-----------------------|-------------------------|-----------------------|-----------------------|----------------|--------|
|                    |                         |                         |                       |                       |                         |                       |                       | QP             | AV     |
| 0.154              | 9.74                    | 50.82                   | 60.56                 | 65.78                 | 42.97                   | 52.71                 | 55.78                 | -5.22          | -3.07  |
| 0.199              | 9.74                    | 44.00                   | 53.74                 | 63.67                 | 34.42                   | 44.16                 | 53.67                 | -9.93          | -9.51  |
| 0.549              | 9.75                    | 35.69                   | 45.45                 | 56.00                 | 30.85                   | 40.61                 | 46.00                 | -10.55         | -5.39  |
| 1.662              | 9.82                    | 35.02                   | 44.84                 | 56.00                 | 25.11                   | 34.94                 | 46.00                 | -11.16         | -11.06 |
| 1.888              | 9.83                    | 35.10                   | 44.93                 | 56.00                 | 25.34                   | 35.17                 | 46.00                 | -11.07         | -10.83 |
| 3.759              | 9.86                    | 35.85                   | 45.70                 | 56.00                 | 29.18                   | 39.03                 | 46.00                 | -10.30         | -6.97  |

Remark:

1. Corr. Factor (dB) = AMN Factor (dB) + Cable Loss (dB)
2. Over Limit (dB) = Level (dBuV) – Limit (dBuV)



## Appendix A: Test equipment list

| Test Equipment/<br>Test site   | Brand                          | Model No.           | Serial No.  | Calibration<br>Date | Next<br>Calibration<br>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    | 2017/04/05          | 2018/04/04                  |
| 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         | 2016/08/16          | 2017/08/15                  |
| 966-2(B) Cable 9kHz~26.5GHz    | SUHNER                         | SUCOFLEX 104P       | CB0005      | 2016/08/16          | 2017/08/15                  |
| RF Cable 9kHz~26.5GHz          | SUHNER                         | SUCOFLEX 102        | CB0006      | 2017/05/04          | 2018/05/03                  |
| 966-2_3m Semi-Anechoic Chamber | 966_2                          | CEM-966_2           | N/A         | 2017/03/29          | 2018/03/28                  |
| High Pass Filter               | Wainwright                     | WHKX3.0/18G-12SS    | N/A         | 2017/06/02          | 2018/06/01                  |
| Active Loop Antenna            | SCHWARZBECK<br>MESS-ELEKTRONIC | FMZB1519            | 1519-067    | 2017/03/30          | 2018/03/29                  |

Note: No Calibration Required (NCR).

| Test Equipment/<br>Test site | Brand  | Model No.   | Serial No.  | Calibration<br>Date | Next<br>Calibration<br>Date |
|------------------------------|--------|-------------|-------------|---------------------|-----------------------------|
| EMI Test Receiver            | R&S    | ESR7        | 101822      | 2017/06/01          | 2018/05/31                  |
| Two-Line<br>V-Network        | R&S    | ENV216      | 101160      | 2016/11/16          | 2017/11/15                  |
| Two-Line<br>-V-Network       | R&S    | ESH3-Z5     | 838979/014  | 2016/09/30          | 2017/09/29                  |
| CON-2<br>Shielded Room       | N/A    | N/A         | N/A         | NCR                 | NCR                         |
| CON-2 Cable                  | SUHNER | BNC / RG-58 | 2146637     | 2017/05/08          | 2018/05/07                  |
| Test software                | Audix  | e3          | 4.20040112L | NCR                 | NCR                         |

Note: No Calibration Required (NCR).

| Test Equipment/<br>Test site | Brand  | Model No.    | Serial No.  | Calibration<br>Date | Next<br>Calibration<br>Date |
|------------------------------|--------|--------------|-------------|---------------------|-----------------------------|
| EMI Receiver                 | R&S    | ESCI         | 100059      | 2017/11/13          | 2018/11/12                  |
| Two-Line<br>V-Network        | R&S    | ENV216       | 101159      | 2018/06/01          | 2019/05/31                  |
| Two-Line<br>-V-Network       | R&S    | ESH3-Z5      | 825562/003  | 2017/09/04          | 2018/09/03                  |
| CON-1<br>Shielded Room       | N/A    | N/A          | N/A         | NCR                 | NCR                         |
| CON-1 Cable                  | SUHNER | SUCOFLEX-104 | 26438414    | 2018/05/03          | 2019/05/02                  |
| Test software                | Audix  | e3           | 4.20040112L | 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   | 2.68 dB     |
| Horizontally polarized Radiated disturbances from 18GHz~40GHz in a semi-anechoic chamber at a distance of 3m | 2.68 dB     |
| Radiated disturbances from 9kHz~30MHz in a semi-anechoic chamber at a distance of 3m                         | 3.54 dB     |
| Emission on the Band Edge Test                                                                               | 3.64 dB     |
| RF Antenna Conducted Spurious Test                                                                           | 1.22 dB     |
| Maximum Output Power Test                                                                                    | 0.42 dB     |
| 20dB Bandwidth Test                                                                                          | 1.22 dB     |
| Carrier Frequency Separation Test                                                                            | 1.22 dB     |
| Number of Hopping Frequencies Test                                                                           | 1.22 dB     |
| Time of Occupancy (Dwell Time) Test                                                                          | 1.22 dB     |
| AC Power Line Conducted Emission                                                                             | 2.48 dB     |