

# FCC Co-location Test Report

**Equipment** : 802.11abgn Bluetooth Mini PCIe module  
**Brand Name** : Fukuda Denshi  
**Model No.** : WPEA-251N(BT)  
**FCC ID** : RFH-DS101WIFI  
**Standard** : 47 CFR FCC Part 15  
**Applicant** : IEI Integration Corp.  
No. 29, Chung-Hsing Rd., Sijhih City,  
New Taipei City 221, Taiwan (R.O.C.)  
**Manufacturer** : SparkLAN Communications, Inc.  
8F., No. 257, Sec. 2, Tiding Blvd., Neihu District,  
Taipei 11493, Taiwan

The product sample received on Jan. 06, 2017 and completely tested on Jan. 21, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

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

Reviewed by:



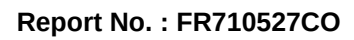
Phoenix Chen / Assistant Manager





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[illegible]

# 1 Test Configuration of EUT

## 1.1 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests |                                                                                                                         |                                                                                   |                                                                                     |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Tests Item                                          | Transmitter Radiated Unwanted Emissions                                                                                 |                                                                                   |                                                                                     |
| Test Condition                                      | Radiated measurement                                                                                                    |                                                                                   |                                                                                     |
| User Position                                       | <input type="checkbox"/> EUT will be placed in fixed position.                                                          |                                                                                   |                                                                                     |
|                                                     | <input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions.             |                                                                                   |                                                                                     |
|                                                     | <input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. |                                                                                   |                                                                                     |
| Operating Mode                                      | <input checked="" type="checkbox"/> 1. WLAN + BT                                                                        |                                                                                   |                                                                                     |
| Orthogonal Planes of EUT                            | X Plane                                                                                                                 | Y Plane                                                                           | Z Plane                                                                             |
|                                                     |                                        |  |  |
| Worst Planes of EUT                                 |                                                                                                                         | V                                                                                 |                                                                                     |

## 1.2 Testing Location Information

| Testing Location                    |               |                                                                                                                                                      |                  |             |
|-------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|
| <input checked="" type="checkbox"/> | HWA YA        | ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.<br>TEL : 886-3-327-3456 FAX : 886-3-327-0973 |                  |             |
| Test Condition                      | Test Site No. | Test Engineer                                                                                                                                        | Test Environment | Test Date   |
| Radiated                            | 03CH09-HY     | Terry                                                                                                                                                | 22.2°C / 51.8%   | 21/Jan/2017 |

Test site registered number [ 553509 ] with FCC.

## 2 CO-LOCATION

### 2.1 Transmitter Radiated Unwanted Emissions

#### 2.1.1 Transmitter Radiated Unwanted Emissions Limit

| Restricted Band Emissions Limit |                       |                         |                      |
|---------------------------------|-----------------------|-------------------------|----------------------|
| Frequency Range (MHz)           | Field Strength (uV/m) | Field Strength (dBuV/m) | Measure Distance (m) |
| 0.009~0.490                     | 2400/F(kHz)           | 48.5 - 13.8             | 300                  |
| 0.490~1.705                     | 24000/F(kHz)          | 33.8 - 23               | 30                   |
| 1.705~30.0                      | 30                    | 29                      | 30                   |
| 30~88                           | 100                   | 40                      | 3                    |
| 88~216                          | 150                   | 43.5                    | 3                    |
| 216~960                         | 200                   | 46                      | 3                    |
| Above 960                       | 500                   | 54                      | 3                    |

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 30 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

| Un-restricted Band Emissions Limit |            |
|------------------------------------|------------|
| RF output power procedure          | Limit (dB) |
| Peak output power procedure        | 20         |
| Average output power procedure     | 30         |

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

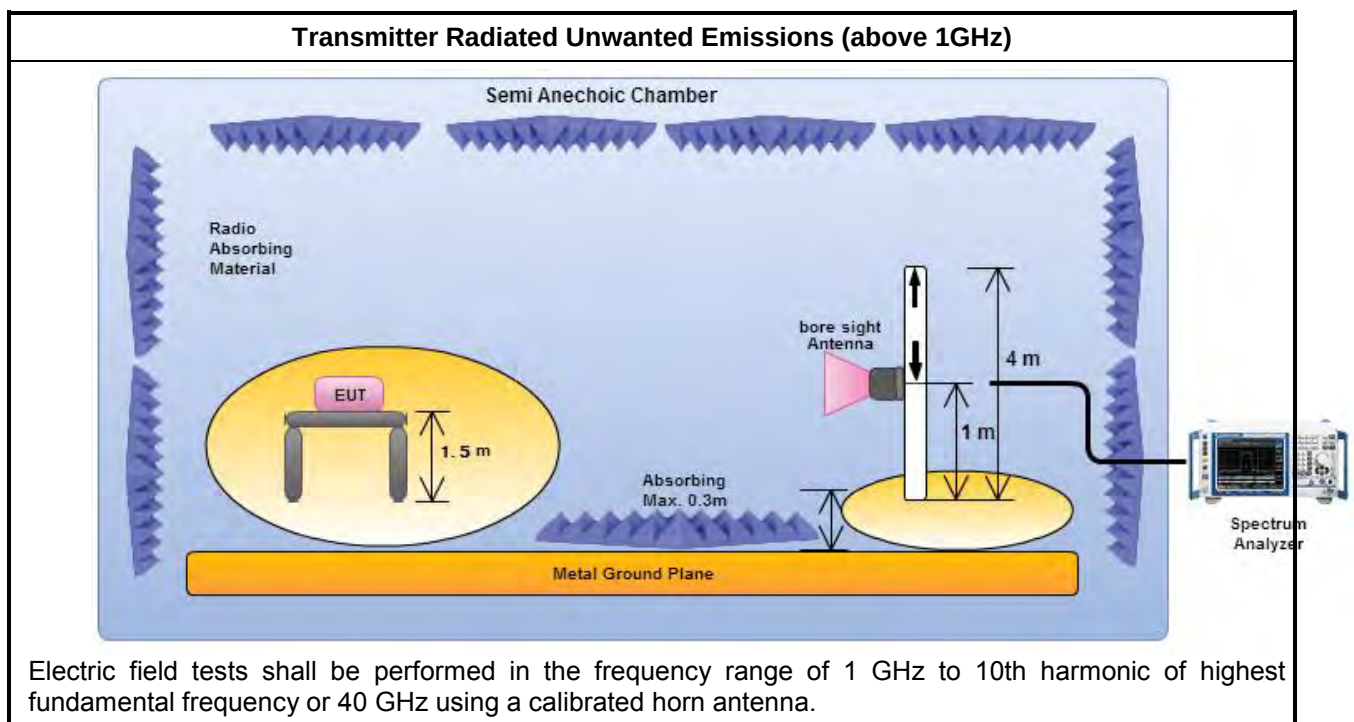
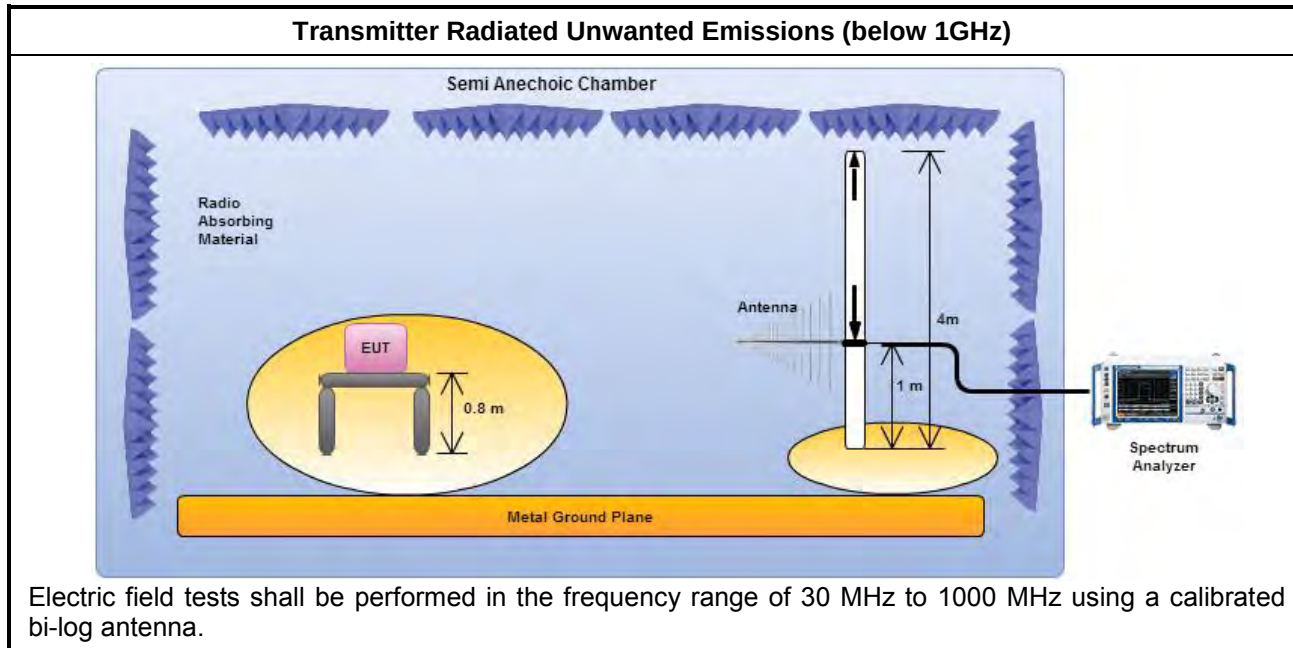
#### 2.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

### 2.1.3 Test Procedures

| Test Method                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). |
| <input checked="" type="checkbox"/> | The average emission levels shall be measured in [duty cycle $\geq 98$ or duty factor].                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <input checked="" type="checkbox"/> | For the transmitter unwanted emissions shall be measured using following options below:                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <input checked="" type="checkbox"/> | Refer as KDB 558074, clause 11 for unwanted emissions into non-restricted bands.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <input checked="" type="checkbox"/> | Refer as KDB 558074, clause 12 for unwanted emissions into restricted bands.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <input type="checkbox"/>            | Refer as KDB 558074, clause 12.2.5.1 and 9.2.1 Option 1 (spectral trace averaging)                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <input type="checkbox"/>            | Refer as KDB 558074, clause 12.2.5.2 and 9.2.1 Option 2 (slow sweep speed).                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). VBW $\geq 1/T$ , where T is pulse time.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <input type="checkbox"/>            | Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <input checked="" type="checkbox"/> | Refer as KDB 558074, clause 12.2.4 and 9.1.1 measurement procedure peak limit.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <input type="checkbox"/>            | Refer as KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <input checked="" type="checkbox"/> | For radiated measurement, refer as KDB 558074, clause 12.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <input type="checkbox"/>            | Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <input checked="" type="checkbox"/> | Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1 GHz and test distance is 3m.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <input type="checkbox"/>            | For conducted and cabinet radiation measurement, refer as KDB 558074, clause 12.2.2.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <input type="checkbox"/>            | For conducted unwanted emissions into non-restricted bands (relative emission limits).<br>Devices with multiple transmit chains:<br>Refer as KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.                                                                                                 |
| <input type="checkbox"/>            | For conducted unwanted emissions into restricted bands (absolute emission limits).<br>Devices with multiple transmit chains using options given below:<br>(1) Measure and sum the spectra across the outputs or<br>(2) Measure and add 10 log(N) dB                                                                                                                                                                                                                                                                         |

## 2.1.4 Test Setup



## 2.1.5 Transmitter Unwanted Emissions

Refer as Appendix A

### 3 Test Equipment and Calibration Data

**Radiated**

| Instrument               | Manufacturer   | Model No.               | Serial No.         | Spec.        | Calibration Date | Calibration Due Date |
|--------------------------|----------------|-------------------------|--------------------|--------------|------------------|----------------------|
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M                  | 03CH03-HY          | 30MHz~1GHz   | 28/Nov/2016      | 27/Nov/2017          |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M                  | 03CH03-HY          | 1GHz~18GHz   | 16/Dec/2016      | 15/Dec/2017          |
| Amplifier                | HP             | 8447D                   | 2944A08033         | 10kHz~1.3GHz | 10/May/2016      | 09/May/2017          |
| Amplifier                | KEYSIGHT       | 83017A                  | MY53270197         | 1GHz~26.5GHz | 29/Aug/2016      | 28/Aug/2017          |
| Spectrum                 | R&S            | FSV40                   | 101513             | 9kHz~40GHz   | 16/Feb/2016      | 15/Feb/2017          |
| Bilog Antenna            | SCHAFFNER      | CBL 6112D               | 2723               | 30MHz~1GHz   | 01/Oct/2016      | 30/Sep/2017          |
| Horn Antenna             | SCHWARZBECK    | BBHA 9120D              | BBHA 9120D<br>1531 | 1GHz~18GHz   | 22/Apr/2016      | 21/Apr/2017          |
| Horn Antenna             | SCHWARZBECK    | BBHA 9170               | BBHA 9170154       | 18GHz~40GHz  | 29/Jan/2016      | 28/Jan/2017          |
| Amplifier                | MITEQ          | JS44-18004000-3<br>3-8P | 1840917            | 18GHz~40GHz  | 02/Jun/2015      | 01/Jun/2017          |
| Loop Antenna             | TESEQ          | HLA 6120                | 31244              | 9kHz~30MHz   | 02/Feb/2015      | 01/Feb/2017          |
| RF-Cable-high            | SUHNER         | SUHNER                  | CB222              | 1GHz~40GHz   | 28/Oct/2016      | 27/Oct/2017          |
| RF Cable-R03m            | Jye Bao        | RG142                   | CB021              | 9kHz~1GHz    | 27/Oct/2016      | 26/Oct/2017          |



Summary

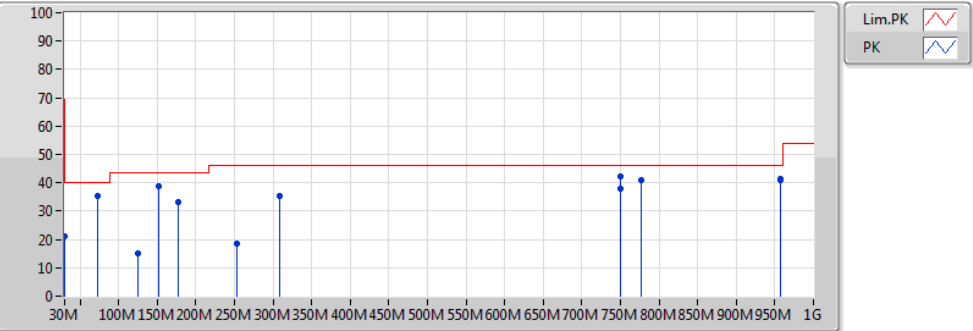
| Mode                                | Result | Type | Freq(Hz) | Level | Limit | Margin(dB) | Factor(dB) | Dist(m) | Condition | Azimuth(°) | Height(m) | Comments |
|-------------------------------------|--------|------|----------|-------|-------|------------|------------|---------|-----------|------------|-----------|----------|
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 749.44M  | 42.25 | 46.00 | -3.75      | -6.28      | 3       | Vertical  | NaN        | NaN       | -        |



Result

| Mode                                | Result | Type | Freq(Hz) | Level | Limit | Margin(dB) | Factor(dB) | Dist(m) | Condition  | Azimuth(°) | Height(m) | Comments |
|-------------------------------------|--------|------|----------|-------|-------|------------|------------|---------|------------|------------|-----------|----------|
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 30M      | 21.31 | 40.00 | -18.69     | -14.14     | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 125.16M  | 15.29 | 43.50 | -28.21     | -18.33     | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 253.32M  | 18.68 | 46.00 | -27.32     | -15.88     | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 749.75M  | 37.97 | 46.00 | -8.03      | -6.28      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 957.12M  | 41.33 | 46.00 | -4.67      | -2.34      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | QP   | 776.92M  | 41.12 | 46.00 | -4.88      | -5.87      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 72.48M   | 35.19 | 40.00 | -4.81      | -24.21     | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 151.72M  | 38.77 | 43.50 | -4.73      | -18.56     | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 177.54M  | 33.21 | 43.50 | -10.29     | -20.20     | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 309.26M  | 35.17 | 46.00 | -10.83     | -15.17     | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 749.44M  | 42.25 | 46.00 | -3.75      | -6.28      | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 957.12M  | 41.03 | 46.00 | -4.97      | -2.34      | 3       | Vertical   | NaN        | NaN       | -        |

Radiated-below 1GHz\_Mode 1



Adapter Mode  
ENT = A+B  
EUT = Y axis

| Type | Freq(Hz) | Level | Limit | Margin(dB) | Factor(dB) | Dist(m) | Condition  | Azimuth(°) | Height(m) | Comments |
|------|----------|-------|-------|------------|------------|---------|------------|------------|-----------|----------|
| PK   | 30M      | 21.31 | 40.00 | -18.69     | -14.14     | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 125.16M  | 15.29 | 43.50 | -28.21     | -18.33     | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 253.32M  | 18.68 | 46.00 | -27.32     | -15.88     | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 749.75M  | 37.97 | 46.00 | -8.03      | -6.28      | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 957.12M  | 41.33 | 46.00 | -4.67      | -2.34      | 3       | Horizontal | NaN        | NaN       | -        |
| QP   | 776.92M  | 41.12 | 46.00 | -4.88      | -5.87      | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 72.48M   | 35.19 | 40.00 | -4.81      | -24.21     | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 151.72M  | 38.77 | 43.50 | -4.73      | -18.56     | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 177.54M  | 33.21 | 43.50 | -10.29     | -20.20     | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 309.26M  | 35.17 | 46.00 | -10.83     | -15.17     | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 749.44M  | 42.25 | 46.00 | -3.75      | -6.28      | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 957.12M  | 41.03 | 46.00 | -4.97      | -2.34      | 3       | Vertical   | NaN        | NaN       | -        |



Summary

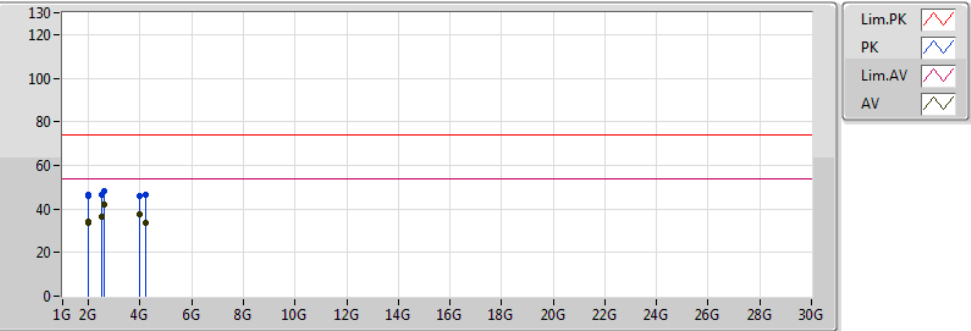
| Mode                                | Result | Type | Freq(Hz) | Level | Limit | Margin(dB) | Factor(dB) | Dist(m) | Condition  | Azimuth(°) | Height(m) | Comments |
|-------------------------------------|--------|------|----------|-------|-------|------------|------------|---------|------------|------------|-----------|----------|
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 2.621G   | 42.16 | 54.00 | -11.84     | -3.22      | 3       | Horizontal | NaN        | NaN       | -        |



Result

| Mode                                | Result | Type | Freq(Hz) | Level | Limit | Margin(dB) | Factor(dB) | Dist(m) | Condition  | Azimuth(°) | Height(m) | Comments |
|-------------------------------------|--------|------|----------|-------|-------|------------|------------|---------|------------|------------|-----------|----------|
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 2G       | 33.68 | 54.00 | -20.32     | -5.21      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 2.621G   | 42.16 | 54.00 | -11.84     | -3.22      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 4.231G   | 33.68 | 54.00 | -20.32     | 1.29       | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 2G       | 46.39 | 74.00 | -27.61     | -5.21      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 2.621G   | 48.36 | 74.00 | -25.64     | -3.22      | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 4.231G   | 46.29 | 74.00 | -27.71     | 1.29       | 3       | Horizontal | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 2G       | 34.21 | 54.00 | -19.79     | -5.21      | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 2.52G    | 36.24 | 54.00 | -17.76     | -3.52      | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | AV   | 4G       | 37.49 | 54.00 | -16.51     | 0.72       | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 2G       | 46.12 | 74.00 | -27.88     | -5.21      | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 2.52G    | 46.48 | 74.00 | -27.52     | -3.52      | 3       | Vertical   | NaN        | NaN       | -        |
| Mode 1.Normal,AC110/60Hz,EUT Y,L1-6 | Pass   | PK   | 4G       | 46.02 | 74.00 | -27.98     | 0.72       | 3       | Vertical   | NaN        | NaN       | -        |

Radiated-above 1GHz\_Mode 1



Adapter Mode  
ENT = A+B  
EUT = Y axis

EUT :  
Model :

| Type | Freq(Hz) | Level | Limit | Margin(dB) | Factor(dB) | Dist(m) | Condition  | Azimuth(°) | Height(m) | Comments |
|------|----------|-------|-------|------------|------------|---------|------------|------------|-----------|----------|
| AV   | 2G       | 33.68 | 54.00 | -20.32     | -5.21      | 3       | Horizontal | NaN        | NaN       | -        |
| AV   | 2.621G   | 42.16 | 54.00 | -11.84     | -3.22      | 3       | Horizontal | NaN        | NaN       | -        |
| AV   | 4.231G   | 33.68 | 54.00 | -20.32     | 1.29       | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 2G       | 46.39 | 74.00 | -27.61     | -5.21      | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 2.621G   | 48.36 | 74.00 | -25.64     | -3.22      | 3       | Horizontal | NaN        | NaN       | -        |
| PK   | 4.231G   | 46.29 | 74.00 | -27.71     | 1.29       | 3       | Horizontal | NaN        | NaN       | -        |
| AV   | 2G       | 34.21 | 54.00 | -19.79     | -5.21      | 3       | Vertical   | NaN        | NaN       | -        |
| AV   | 2.52G    | 36.24 | 54.00 | -17.76     | -3.52      | 3       | Vertical   | NaN        | NaN       | -        |
| AV   | 4G       | 37.49 | 54.00 | -16.51     | 0.72       | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 2G       | 46.12 | 74.00 | -27.88     | -5.21      | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 2.52G    | 46.48 | 74.00 | -27.52     | -3.52      | 3       | Vertical   | NaN        | NaN       | -        |
| PK   | 4G       | 46.02 | 74.00 | -27.98     | 0.72       | 3       | Vertical   | NaN        | NaN       | -        |