

## TEST REPORT

**Applicant** : Sharp Corporation, Communication Systems Division  
**Address** : 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima,  
739-0192, Japan

**Products** : Smart Phone  
**Model No.** : 403SH  
**SERIAL NO.** : 004401/11/546630/8  
004401/11/546609/2

**FCC ID** : APYHRO00221

**Test Standard** : CFR 47 FCC Rules and Regulations Part 15

**Test Results** : **Passed**

**Date of Test** : April 28 ~ May 12, 2015



A handwritten signature in black ink, appearing to read 'K. Shibata', is written over a horizontal line.

Kousei Shibata  
Manager  
Japan Quality Assurance Organization  
KITA-KANSAI Testing Center  
SAITO EMC Branch  
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

- 
- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
  - The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
  - The test results presented in this report relate only to the offered test sample.
  - The contents of this test report cannot be used for the purposes, such as advertisement for consumers.
  - This test report shall not be reproduced except in full without the written approval of JQA.
  - VLAC does not approve, certify or warrant the product by this test report.

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**DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT****EUT** : Equipment Under Test**AE** : Associated Equipment**N/A** : Not Applicable**N/T** : Not Tested**EMC** : Electromagnetic Compatibility**EMI** : Electromagnetic Interference**EMS** : Electromagnetic Susceptibility☒ - indicates that the listed condition, standard or equipment is applicable for this report.☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

**1 Description of the Equipment Under Test**

1. Manufacturer : Sharp Corporation, Communication Systems Division  
2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima,  
739-0192, Japan
2. Products : Smart Phone
3. Model No. : 403SH
4. Serial No. : 004401/11/546630/8  
: 004401/11/546609/2
5. Product Type : Pre-production
6. Date of Manufacture : February, 2015
7. Power Rating : 4.0VDC (Lithium-ion Battery UBATIA260AFN1 2030mAh)
8. Grounding : None
9. Transmitting Frequency : WLAN: 2412.0 MHz(01CH) –2462.0MHz(11CH)  
: Bluetooth LE: 2402.0 MHz(00CH) – 2480.0MHz(39CH)
10. Receiving Frequency : WLAN: 2412.0 MHz(01CH) –2462.0MHz(11CH)  
: Bluetooth LE: 2402.0 MHz(00CH) – 2480.0MHz(39CH)
11. Max. RF Output Power : 17.20 dBm(Measure Value of IEEE802.11b)  
: 20.52 dBm(Measure Value of IEEE802.11g)  
: 20.52 dBm(Measure Value of IEEE802.11n)  
: 5.14 dBm(Measure Value of Bluetooth LE)
12. Antenna Type : Inverted-L Type Antenna (Integral)
13. Antenna Gain : 0 dBi
14. Category : DTS
15. EUT Authorization : Certification
16. Received Date of EUT : April 24, 2015

**17. Channel Plan****WLAN:**

The carrier spacing is 5 MHz.

The carrier frequency is designated by the absolute frequency channel number (ARFCN).

The carrier frequency is expressed in the equation shown as follows:

Transmitting Frequency (in MHz) =  $2407.0 + 5 \cdot n$

Receiving Frequency (in MHz) =  $2407.0 + 5 \cdot n$

where,  $n$  : channel number ( $1 \leq n \leq 11$ )

**Bluetooth Low Energy Mode:**

The carrier spacing is 2 MHz.

The carrier frequency is designated by the absolute frequency channel number (ARFCN).

The carrier frequency is expressed in the equation shown as follows:

Transmitting Frequency (in MHz) =  $2402.0 + 2 \cdot n$

Receiving Frequency (in MHz) =  $2402.0 + 2 \cdot n$

where,  $n$  : channel number ( $0 \leq n \leq 39$ )

## 2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 15  
Subpart C – Intentional Radiators

The EUT described in clause 1 was tested according to the applied standard shown above.  
Details of the test configuration is shown in clause 6.

The conclusion for the test items of which are required by the applied standard is indicated under the test result.

- ☒ - The test result was **passed** for the test requirements of the applied standard.
- ☐ - The test result was **failed** for the test requirements of the applied standard.
- ☐ - The test result was **not judged** the test requirements of the applied standard.

In the approval of test results,

- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

Tested by:



Shigeru Kinoshita  
Assistant Manager  
JQA KITA-KANSAI Testing Center  
SAITO EMC Branch



Shigeru Osawa  
Deputy Manager  
JQA KITA-KANSAI Testing Center  
SAITO EMC Branch

### 3 Test Procedure

Test Requirements : §15.247, §15.207 and §15.209

Test Procedure : ANSI C63.10–2009  
Testing unlicensed wireless devices.

KDB 558074 D01  
DTS Meas Guidance v03r02: June 5, 2014.

### 4 Test Location

Japan Quality Assurance Organization (JQA)  
KITA-KANSAI Testing Center  
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan  
SAITO EMC Branch  
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

### 5 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No. : VLAC-001-2 (Expiry date : March 30, 2016)  
VCCI Registration No. : A-0002 (Expiry date : March 30, 2016)  
BSMI Registration No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006  
(Expiry date : September 14, 2016)  
IC Registration No. : 2079E-3, 2079E-4 (Expiry date : July 16, 2017)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.  
(Expiry date : February 22, 2016)

## 6 Description of Test Setup

### 6.1 Test Configuration

The equipment under test (EUT) consists of :

|   | Item        | Manufacturer       | Model No. | Serial No.                                     | FCC ID      |
|---|-------------|--------------------|-----------|------------------------------------------------|-------------|
| A | Smart Phone | Sharp              | 403SH     | 004401/11/546630/8*1)<br>004401/11/546609/2*2) | APYHRO00221 |
| B | AC Adapter  | Sharp              | SHCEJ1    | --                                             | N/A         |
| C | Earphone    | Softbank<br>Mobile | ZTCAA1    | --                                             | N/A         |
| D | DTV Antenna | Sharp              | --        | --                                             | N/A         |

\*1) Used for AC Powerline Conducted Emission and Field Strength of Spurious Emission

\*2) Used for Antenna Conducted Emission

The auxiliary equipment used for testing :

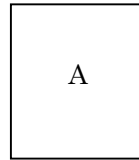
None

Type of Cable:

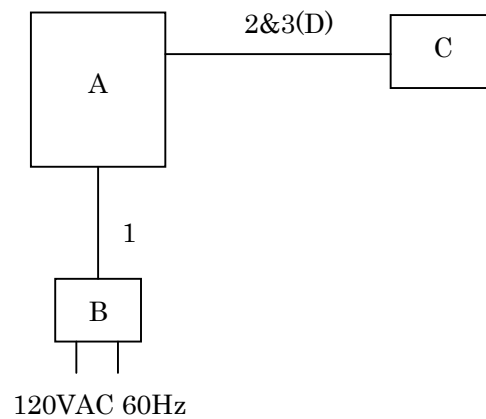
| No. | Description       | Identification<br>(Manu. etc.) | Connector<br>Shielded | Cable<br>Shielded | Ferrite<br>Core | Length<br>(m) |
|-----|-------------------|--------------------------------|-----------------------|-------------------|-----------------|---------------|
| 1   | DC Power Cord     | --                             | --                    | NO                | NO              | 1.5           |
| 2   | Earphone Cable    | --                             | --                    | NO                | NO              | 0.5           |
| 3   | DTV Antenna Cable | --                             | --                    | NO                | NO              | 0.1           |

**6.2 Test Arrangement (Drawings)**

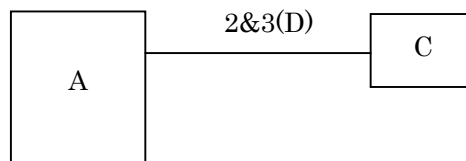
a) Single Unit



b) AC Adapter used



c) Earphone used



### 6.3 Operating Condition

#### Transmitting/Receiving

##### WLAN:

Transmitting frequency : 2412.0 MHz(1CH) – 2462.0 MHz(11CH)

Receiver frequency : 2412.0 MHz(1CH) – 2462.0 MHz(11CH)

##### Bluetooth Low Energy Mode(Bluetooth 4.0 + EDR + LE):

Transmitting frequency : 2402.0 MHz(0CH) – 2480.0 MHz(39CH)

Receiver frequency : 2402.0 MHz(0CH) – 2480.0 MHz(39CH)

#### Modulation Type

1. 802.11b : DSSS

2. 802.11g : OFDM

3. 802.11n : OFDM

4. LE Packet (Modulation Type : GFSK)

#### Other Clock Frequency

19.2MHz,24MHz,27MHz,27.12MHz,48MHz,32.768kHz

The tests were performed in the following worst condition.

| Mode        | Condition        |
|-------------|------------------|
| IEEE802.11b | 11 Mbps          |
| IEEE802.11g | 36 Mbps          |
| IEEE802.11n | MCS2 (19.5 Mbps) |

Note: The worst condition was determined based on the test result of Maximum Peak Output Power(Mid channel).(Main Antenna)

The EUT was rotated through three orthogonal axis (X, Y and Z axis) in radiated measurement.

The EUT with temporary antenna port was used in conducted measurement.



## 7 Test Requirements

### 7.0 Summary of the Test Results

| Test Item                       | FCC Specification         | Reference of the Test Report | Results | Remarks |
|---------------------------------|---------------------------|------------------------------|---------|---------|
| Antenna Requirement             | Section 15.203            | Section 1.12                 | Passed  | -       |
| Channel Separation              | Section 15.247(a)(1)      | -                            | -       | -       |
| Minimum Hopping Channel         | Section 15.247(a)(1)(iii) | -                            | -       | -       |
| Occupied Bandwidth              | Section 15.247(a)(2)      | Section 7.3                  | Passed  | -       |
| Dwell Time                      | Section 15.247(a)(1)(iii) | -                            | -       | -       |
| Peak Output Power (Conduction)  | Section 15.247(b)(3)      | Section 7.5                  | Passed  | -       |
| Peak Power Density (Conduction) | Section 15.247(e)         | Section 7.6                  | Passed  | -       |
| Spurious Emissions (Conduction) | Section 15.247(d)         | Section 7.7                  | Passed  | -       |
| AC Powerline Conducted Emission | Section 15.207            | Section 7.8                  | Passed  | -       |
| Radiated Emission               | Section 15.247(d)         | Section 7.9                  | Passed  | -       |

### 7.1 Channel Separation

For the requirements, ☐ - Applicable ☐ - Tested. ☐ - Not tested by applicant request.]  
☒ - Not Applicable

For the limits, ☐ - Passed ☐ - Failed ☐ - Not judged

### 7.2 Minimum Hopping Channel

For the requirements, ☐ - Applicable ☐ - Tested. ☐ - Not tested by applicant request.]  
☒ - Not Applicable

For the limits, ☐ - Passed ☐ - Failed ☐ - Not judged

### 7.3 Occupied Bandwidth

For the requirements, ☒ - Applicable ☒ - Tested. ☐ - Not tested by applicant request.]  
☐ - Not Applicable

For the limits, ☒ - Passed ☐ - Failed ☐ - Not judged

#### 7.3.1 Worst Point and Measurement Uncertainty

|                                      |               |     |    |               |     |
|--------------------------------------|---------------|-----|----|---------------|-----|
| The 99% Bandwidth of IEEE802.11b is  | <u>12.984</u> | MHz | at | <u>2462.0</u> | MHz |
| The 99% Bandwidth of IEEE802.11g is  | <u>16.502</u> | MHz | at | <u>2462.0</u> | MHz |
| The 99% Bandwidth of IEEE802.11n is  | <u>17.691</u> | MHz | at | <u>2462.0</u> | MHz |
| The 99% Bandwidth of Bluetooth LE is | <u>1089.2</u> | kHz | at | <u>2480.0</u> | MHz |

|                                      |               |     |    |               |     |
|--------------------------------------|---------------|-----|----|---------------|-----|
| The 6dB Bandwidth of IEEE802.11b is  | <u>8.778</u>  | MHz | at | <u>2412.0</u> | MHz |
| The 6dB Bandwidth of IEEE802.11g is  | <u>16.532</u> | MHz | at | <u>2412.0</u> | MHz |
| The 6dB Bandwidth of IEEE802.11n is  | <u>17.697</u> | MHz | at | <u>2462.0</u> | MHz |
| The 6dB Bandwidth of Bluetooth LE is | <u>671.6</u>  | kHz | at | <u>2402.0</u> | MHz |

Uncertainty of Measurement Results +/-0.9 %(2σ)

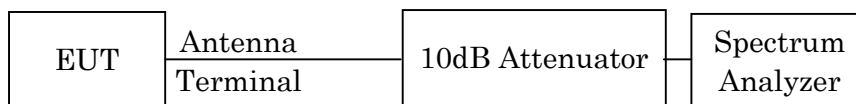
Remarks : \_\_\_\_\_

### 7.3.2 Test Instruments

| Shielded Room S4  |             |              |        |           |          |
|-------------------|-------------|--------------|--------|-----------|----------|
| Type              | Model       | Manufacturer | ID No. | Last Cal. | Interval |
| Spectrum Analyzer | E4446A      | Agilent      | A-39   | 2014/9    | 1 Year   |
| Attenuator        | 54A-10      | Weinschel    | D-28   | 2014/9    | 1 Year   |
| RF Cable          | SUCOFLEX102 | SUHNER       | C-52   | 2014/8    | 1 Year   |

### 7.3.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

|                 | WLAN    | Bluetooth |
|-----------------|---------|-----------|
| Res. Bandwidth  | 100 kHz | 100 kHz   |
| Video Bandwidth | 300 kHz | 300 kHz   |
| Span            | 30 MHz  | 3 MHz     |
| Sweep Time      | AUTO    | AUTO      |
| Trace           | Maxhold | Maxhold   |

### 7.3.4 Test Data

Mode of EUT : WLAN

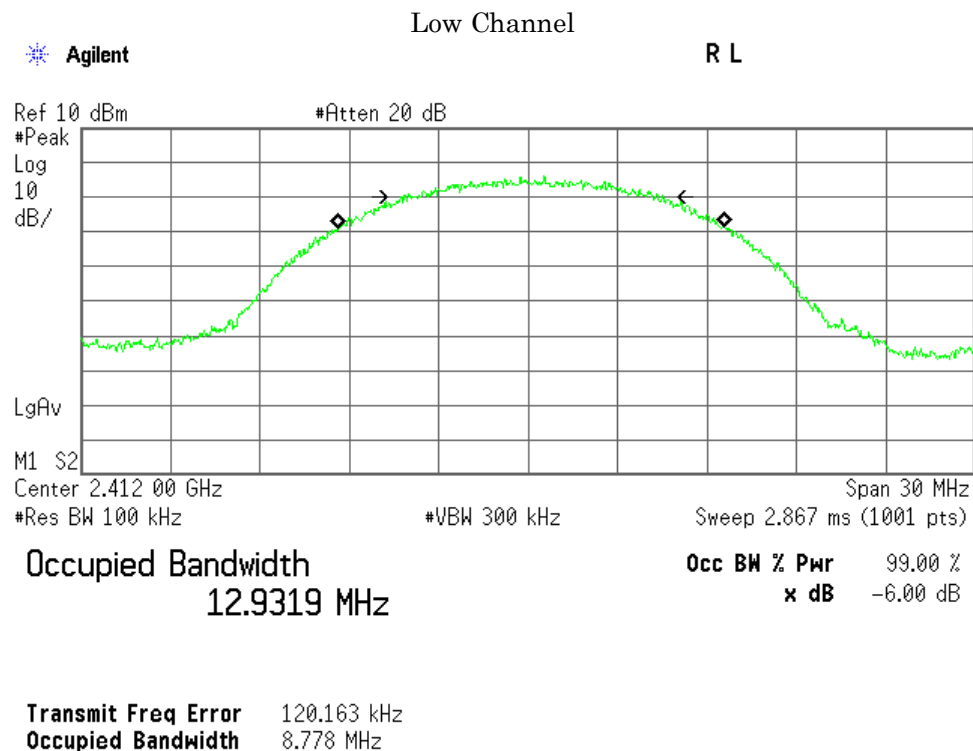
Test Date : May 12, 2015

Temp.:25°C, Humi:60%

The resolution bandwidth was set to 100 kHz, -6dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

#### A) IEEE 802.11b

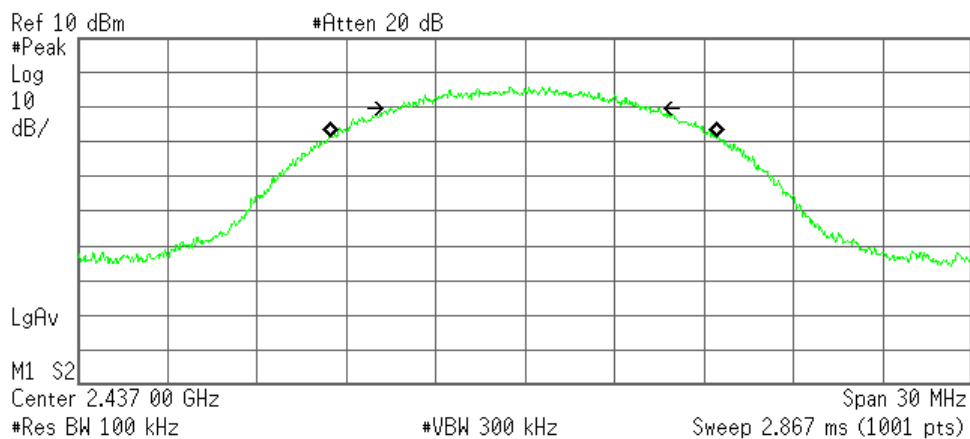
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) | -6dBc Bandwidth (MHz) | Minimum -6dBc Bandwidth Limit (kHz) |
|---------|-----------------|---------------------|-----------------------|-------------------------------------|
| 01      | 2412.0          | 12.932              | 8.778                 | 500                                 |
| 06      | 2437.0          | 12.941              | 8.443                 | 500                                 |
| 11      | 2462.0          | 12.984              | 8.397                 | 500                                 |



## Middle Channel

Agilent

R L



Occupied Bandwidth  
12.9407 MHz

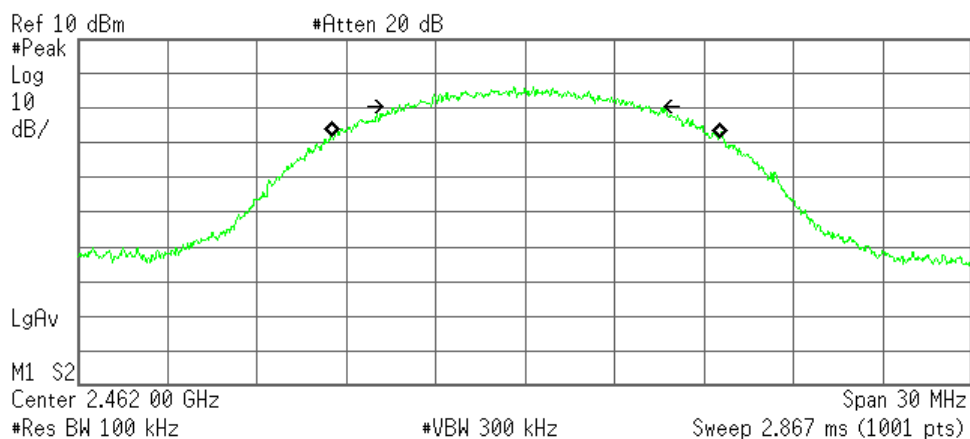
Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error -34.742 kHz  
Occupied Bandwidth 8.443 MHz

## High Channel

Agilent

R T



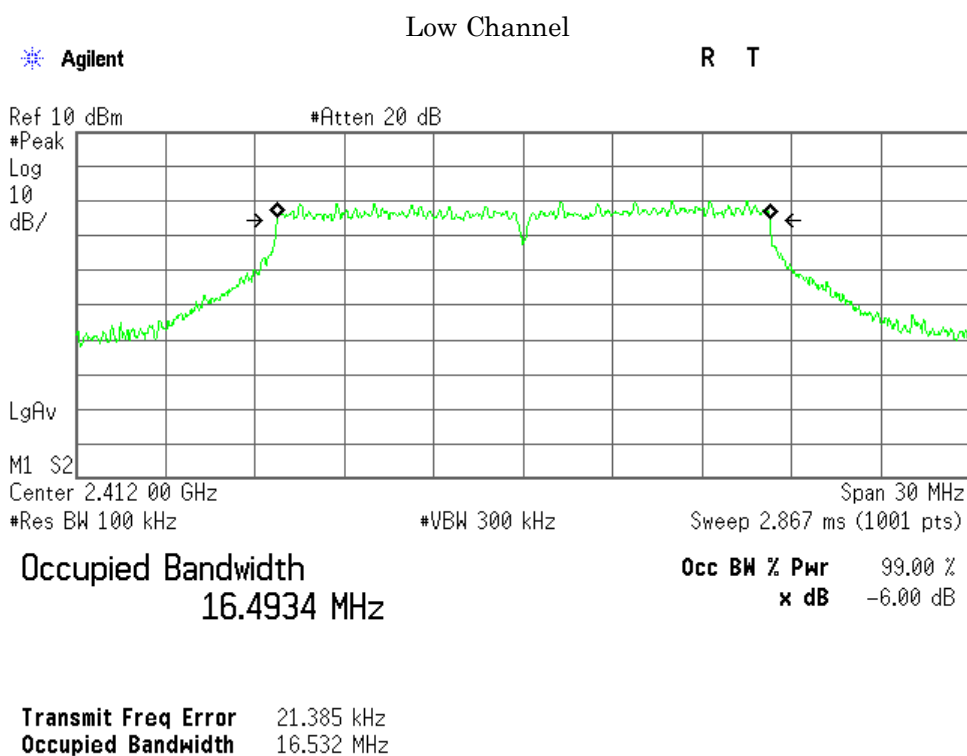
Occupied Bandwidth  
12.9842 MHz

Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error 18.464 kHz  
Occupied Bandwidth 8.397 MHz

## B) IEEE 802.11g

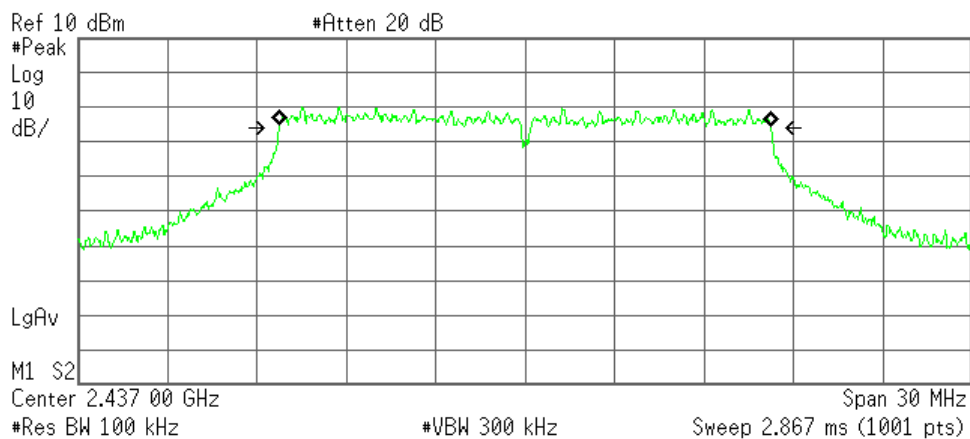
| Channel | Frequency (MHz) | 99% Bandwidth (MHz) | -6dBc Bandwidth (MHz) | Minimum -6dBc Bandwidth Limit (kHz) |
|---------|-----------------|---------------------|-----------------------|-------------------------------------|
| 01      | 2412.0          | 16.493              | 16.532                | 500                                 |
| 06      | 2437.0          | 16.455              | 16.504                | 500                                 |
| 11      | 2462.0          | 16.502              | 16.520                | 500                                 |



## Middle Channel

Agilent

R T



Occupied Bandwidth  
16.4546 MHz

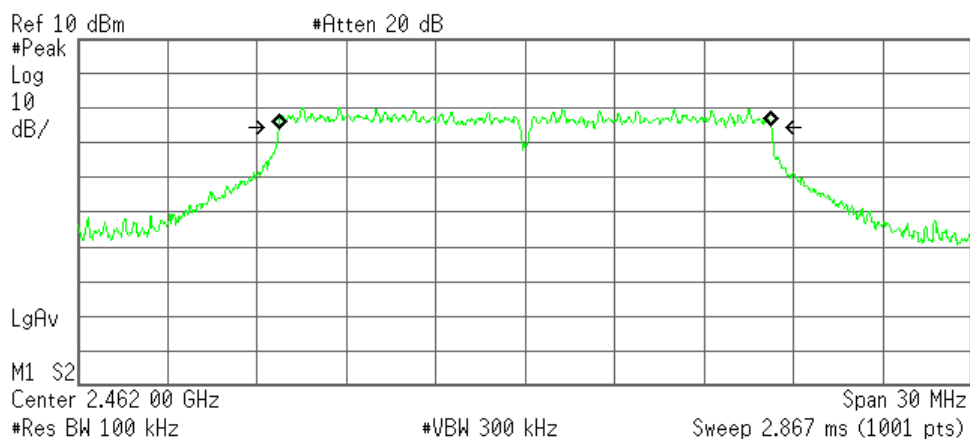
Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error -3.842 kHz  
Occupied Bandwidth 16.504 MHz

## High Channel

Agilent

R L



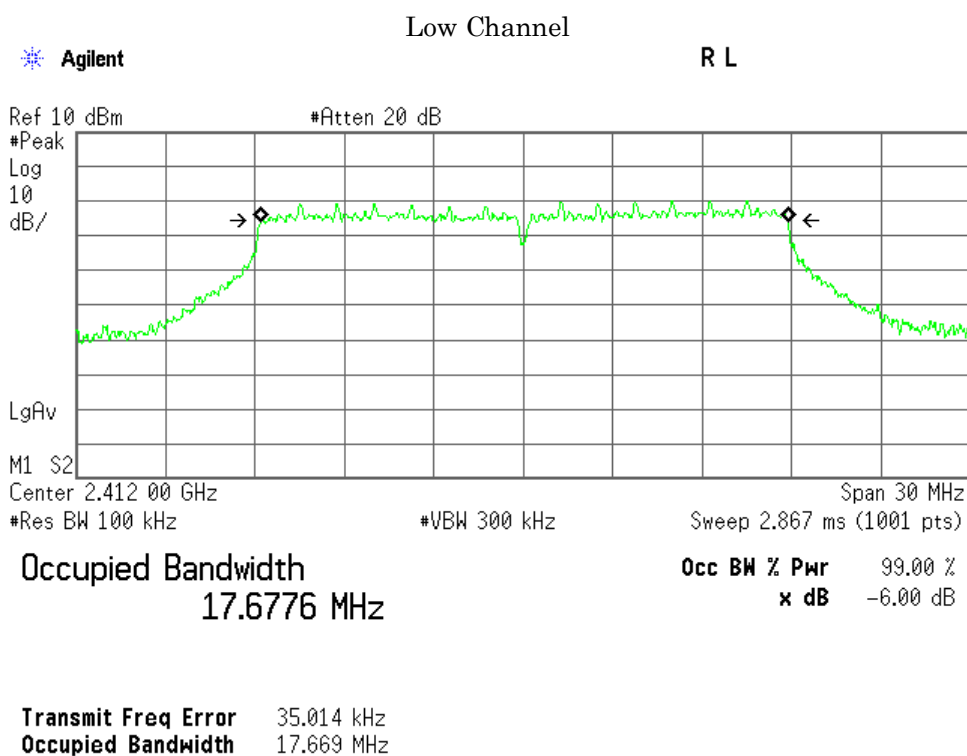
Occupied Bandwidth  
16.5024 MHz

Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error -9.380 kHz  
Occupied Bandwidth 16.520 MHz

## C) IEEE 802.11n

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) | -6dBc Bandwidth (MHz) | Minimum -6dBc Bandwidth Limit (kHz) |
|---------|-----------------|---------------------|-----------------------|-------------------------------------|
| 01      | 2412.0          | 17.678              | 17.669                | 500                                 |
| 06      | 2437.0          | 17.648              | 17.656                | 500                                 |
| 11      | 2462.0          | 17.691              | 17.697                | 500                                 |

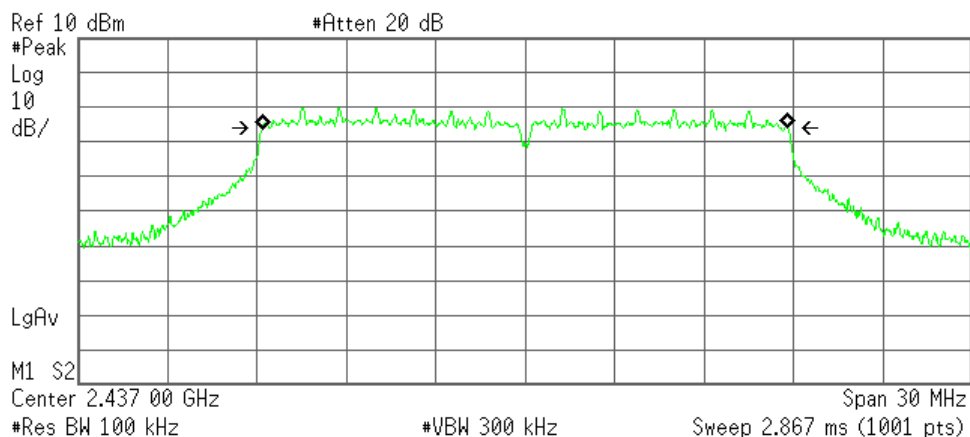




## Middle Channel

Agilent

R T



Occupied Bandwidth  
17.6481 MHz

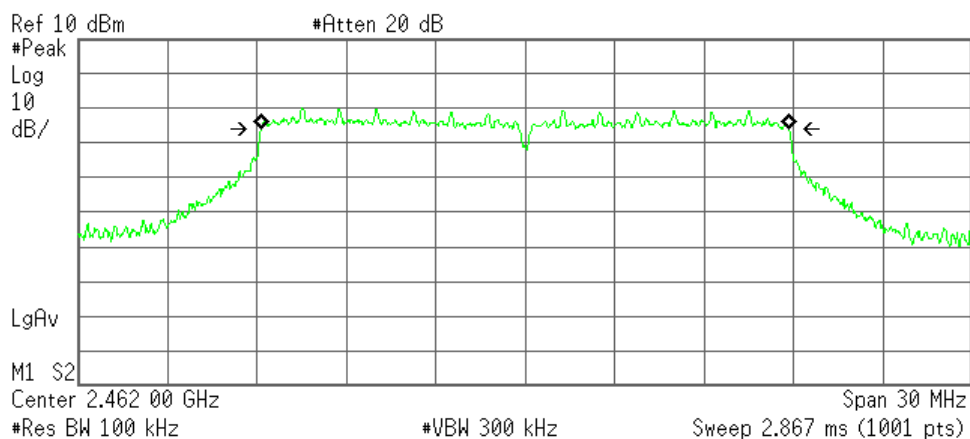
Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error -3.711 kHz  
Occupied Bandwidth 17.656 MHz

## High Channel

Agilent

R L



Occupied Bandwidth  
17.6911 MHz

Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error -5.029 kHz  
Occupied Bandwidth 17.697 MHz

Mode of EUT : Bluetooth Low Energy

Test Date : May 12, 2015

Temp.:25°C, Humi:60%

The resolution bandwidth was set to 100 kHz, -6dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

1)Packet Setting : LE (Modulation type : GFSK)

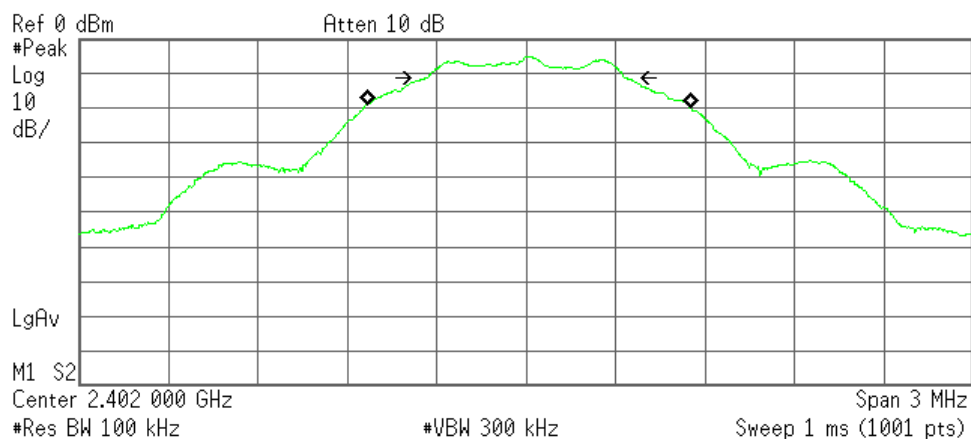
| Channel | Frequency (MHz) | 99% Bandwidth (kHz) | -6dBc Bandwidth (kHz) | Minimum -6dBc Bandwidth Limit (kHz) |
|---------|-----------------|---------------------|-----------------------|-------------------------------------|
| 00      | 2402.0          | 1085.7              | 671.6                 | 500                                 |
| 19      | 2440.0          | 1085.4              | 658.5                 | 500                                 |
| 39      | 2480.0          | 1089.2              | 664.7                 | 500                                 |

1)Packet Setting : LE (Modulation type : GFSK)

Low Channel

Agilent

R L



Occupied Bandwidth

1.0857 MHz

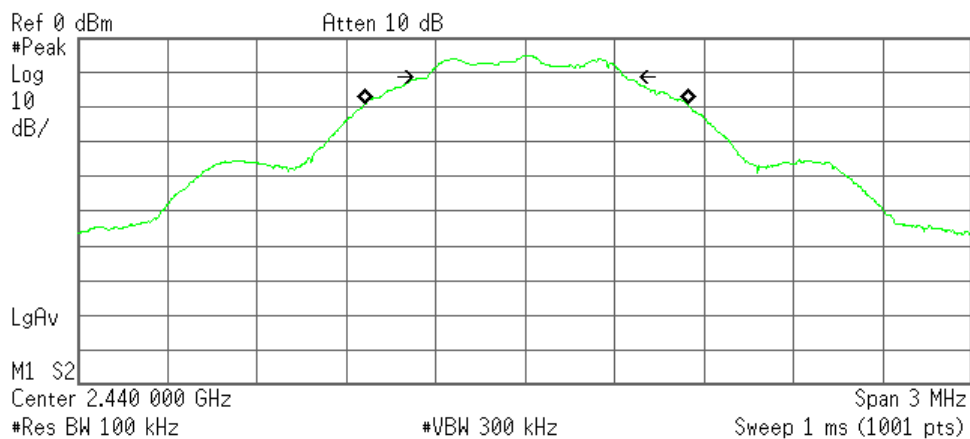
Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error 7.718 kHz  
Occupied Bandwidth 671.583 kHz

## Middle Channel

Agilent

R L



Occupied Bandwidth  
1.0854 MHz

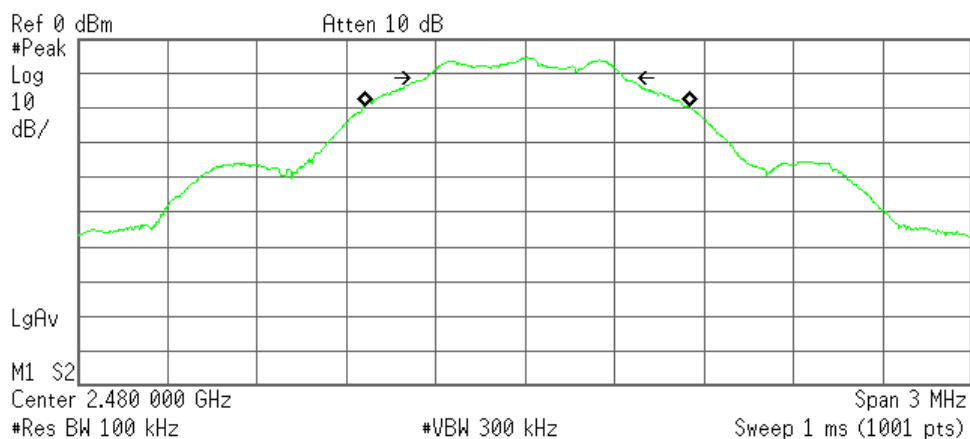
Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error 4.620 kHz  
Occupied Bandwidth 658.504 kHz

## High Channel

Agilent

R T



Occupied Bandwidth  
1.0892 MHz

Occ BW % Pwr 99.00 %  
x dB -6.00 dB

Transmit Freq Error 7.703 kHz  
Occupied Bandwidth 664.707 kHz

**7.4 Dwell Time**

For the requirements, ☐ - Applicable ☐ - Tested. ☐ - Not tested by applicant request.]  
☒ - Not Applicable

For the limits, ☐ - Passed ☐ - Failed ☐ - Not judged

**7.5 Peak Output Power(Conduction)**

For the requirements, ☒ - Applicable ☒ - Tested. ☐ - Not tested by applicant request.]  
☐ - Not Applicable

For the limits, ☒ - Passed ☐ - Failed ☐ - Not judged

**7.5.1 Worst Point and Measurement Uncertainty**

|                                      |              |     |    |               |     |
|--------------------------------------|--------------|-----|----|---------------|-----|
| Peak Output Power of IEEE802.11b is  | <u>17.20</u> | dBm | at | <u>2437.0</u> | MHz |
| Peak Output Power of IEEE802.11g is  | <u>20.52</u> | dBm | at | <u>2412.0</u> | MHz |
| Peak Output Power of IEEE802.11n is  | <u>20.52</u> | dBm | at | <u>2437.0</u> | MHz |
| Peak Output Power of Bluetooth LE is | <u>5.14</u>  | dBm | at | <u>2440.0</u> | MHz |

Uncertainty of Measurement Results at Amplitude +/-0.9 dB(2 $\sigma$ )

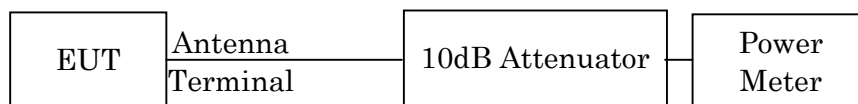
Remarks : \_\_\_\_\_

## 7.5.2 Test Instruments

| Shielded Room S4 |             |              |        |           |          |
|------------------|-------------|--------------|--------|-----------|----------|
| Type             | Model       | Manufacturer | ID No. | Last Cal. | Interval |
| Power Meter      | N1911A      | Agilent      | B-63   | 2014/7    | 1 Year   |
| Power Sensor     | N1921A      | Agilent      | B-64   | 2014/7    | 1 Year   |
| Attenuator       | 54A-10      | Weinschel    | D-28   | 2014/9    | 1 Year   |
| RF Cable         | SUCOFLEX102 | SUHNER       | C-52   | 2014/8    | 1 Year   |

## 7.5.3 Test Method and Test Setup (Diagrammatic illustration)

The Conducted RF Power Output was measured with a power meter, one 10dB attenuator and a short, low loss cable.



## 7.5.4 Test Data

### 1) IEEE 802.11b

Data Rate : 11Mbps

Test Date: April 28, 2015

Temp.: 25 °C, Humi: 47 %

| Transmitting Frequency |       | Correction Factor | Meter Reading | Conducted Peak Output Power |       | Limits | Margin |
|------------------------|-------|-------------------|---------------|-----------------------------|-------|--------|--------|
| CH                     | [MHz] | [dB]              | [dBm]         | [dBm]                       | [mW]  | [dBm]  | [dB]   |
| 01                     | 2412  | 10.01             | 7.02          | 17.03                       | 50.47 | 30.00  | +12.97 |
| 06                     | 2437  | 10.01             | 7.19          | 17.20                       | 52.48 | 30.00  | +12.80 |
| 11                     | 2462  | 10.01             | 7.14          | 17.15                       | 51.88 | 30.00  | +12.85 |

Calculated result at 2437.000 MHz, as the worst point shown on underline:

|                   |   |                      |
|-------------------|---|----------------------|
| Correction Factor | = | 10.01 dB             |
| + ) Meter Reading | = | 7.19 dBm             |
| Result            | = | 17.20 dBm = 52.48 mW |

Minimum Margin: 30.00 - 17.20 = 12.80 (dB)

#### NOTES

1. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

2. Setting of measuring instrument(s) :

|                   |            |
|-------------------|------------|
| Detector Function | Video B.W. |
| Peak              | OFF        |

CH  
06 [MHz]  
2437

| Rate    | Meter Reading [dBm] | Remark |
|---------|---------------------|--------|
| 1Mbps   | 6.91                |        |
| 2Mbps   | 6.87                |        |
| 5.5Mbps | 7.12                |        |
| 11Mbps  | 7.19                | *      |

\* : Worst Rate

All comparison were performed on the same measurement condition.

## 2) IEEE 802.11g

Data Rate : 36Mbps

Test Date: April 28, 2015

Temp.: 25 °C, Humi: 47 %

| Transmitting Frequency |       | Correction Factor | Meter Reading | Conducted Peak Output Power |        | Limits | Margin |
|------------------------|-------|-------------------|---------------|-----------------------------|--------|--------|--------|
| CH                     | [MHz] | [dB]              | [dBm]         | [dBm]                       | [mW]   | [dBm]  | [dB]   |
| 01                     | 2412  | 10.01             | 10.51         | 20.52                       | 112.72 | 30.00  | + 9.48 |
| 06                     | 2437  | 10.01             | 10.40         | 20.41                       | 109.90 | 30.00  | + 9.59 |
| 11                     | 2462  | 10.01             | 9.99          | 20.00                       | 100.00 | 30.00  | +10.00 |

Calculated result at 2412.000 MHz, as the worst point shown on underline:

|                   |   |                       |
|-------------------|---|-----------------------|
| Correction Factor | = | 10.01 dB              |
| + ) Meter Reading | = | 10.51 dBm             |
| Result            | = | 20.52 dBm = 112.72 mW |

Minimum Margin: 30.00 - 20.52 = 9.48 (dB)

## NOTES

- The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
- Setting of measuring instrument(s) :

|                   |            |
|-------------------|------------|
| Detector Function | Video B.W. |
| Peak              | OFF        |

CH [MHz]  
06 2437

| Rate   | Meter Reading [dBm] | Remark |
|--------|---------------------|--------|
| 6Mbps  | 10.25               |        |
| 9Mbps  | 10.21               |        |
| 12Mbps | 10.29               |        |
| 18Mbps | 10.27               |        |
| 24Mbps | 10.18               |        |
| 36Mbps | 10.40               | *      |
| 48Mbps | 10.28               |        |
| 54Mbps | 10.37               |        |

\* : Worst Rate

All comparison were performed on the same measurement condition.

## 3) IEEE 802.11n

Data Rate : MCS2(19.5Mbps)

Test Date: April 28, 2015

Temp.: 25 °C, Humi: 47 %

| Transmitting Frequency |       | Correction Factor | Meter Reading | Conducted Peak Output Power |        | Limits | Margin |
|------------------------|-------|-------------------|---------------|-----------------------------|--------|--------|--------|
| CH                     | [MHz] | [dB]              | [dBm]         | [dBm]                       | [mW]   | [dBm]  | [dB]   |
| 01                     | 2412  | 10.01             | 10.46         | 20.47                       | 111.43 | 30.00  | + 9.53 |
| 06                     | 2437  | 10.01             | 10.51         | 20.52                       | 112.72 | 30.00  | + 9.48 |
| 11                     | 2462  | 10.01             | 10.05         | 20.06                       | 101.39 | 30.00  | + 9.94 |

Calculated result at 2437.000 MHz, as the worst point shown on underline:

|                   |   |                       |
|-------------------|---|-----------------------|
| Correction Factor | = | 10.01 dB              |
| + ) Meter Reading | = | 10.51 dBm             |
| Result            | = | 20.52 dBm = 112.72 mW |

Minimum Margin: 30.00 - 20.52 = 9.48 (dB)

## NOTES

- The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
- Setting of measuring instrument(s) :

|                   |            |
|-------------------|------------|
| Detector Function | Video B.W. |
| Peak              | OFF        |

| CH              | [MHz]         |        |
|-----------------|---------------|--------|
| 06              | 2437          |        |
| Rate            | Meter Reading | Remark |
|                 | [dBm]         |        |
| MCS0 (6.5Mbps)  | 10.07         |        |
| MCS1 (13Mbps)   | 10.24         |        |
| MCS2 (19.5Mbps) | 10.51         | *      |
| MCS3 (26Mbps)   | 10.34         |        |
| MCS4 (39Mbps)   | 10.20         |        |
| MCS5 (52Mbps)   | 10.42         |        |
| MCS6 (58.5Mbps) | 10.24         |        |
| MCS7 (65Mbps)   | 10.40         |        |

\* : Worst Rate

All comparison were performed on the same measurement condition.



## 4) Bluetooth LE(Modulation type : GFSK)

Test Date: May 4, 2015  
Temp.: 25 °C, Humi: 64 %

| Transmitting Frequency |       | Correction Factor | Meter Reading | Conducted Peak Output Power |      | Limits | Margin |
|------------------------|-------|-------------------|---------------|-----------------------------|------|--------|--------|
| CH                     | [MHz] | [dB]              | [dBm]         | [dBm]                       | [mW] | [dBm]  | [dB]   |
| 00                     | 2402  | 10.01             | -4.94         | 5.07                        | 3.21 | 30.00  | +24.93 |
| 19                     | 2440  | 10.01             | -4.87         | 5.14                        | 3.27 | 30.00  | +24.86 |
| 39                     | 2480  | 10.01             | -5.10         | 4.91                        | 3.10 | 30.00  | +25.09 |

Calculated result at 2440.000 MHz, as the worst point shown on underline:

|                   |   |                    |
|-------------------|---|--------------------|
| Correction Factor | = | 10.01 dB           |
| + ) Meter Reading | = | -4.87 dBm          |
| Result            | = | 5.14 dBm = 3.27 mW |

Minimum Margin: 30.00 - 5.14 = 24.86 (dB)

## NOTES

- The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
- Setting of measuring instrument(s) :

|                   |            |
|-------------------|------------|
| Detector Function | Video B.W. |
| Peak              | Off        |

**7.6 Peak Power Density(Conduction)**

For the requirements, ☒ - Applicable ☒ - Tested. ☐ - Not tested by applicant request.]  
☐ - Not Applicable

For the limits, ☒ - Passed ☐ - Failed ☐ - Not judged

**7.6.1 Worst Point and Measurement Uncertainty**

|                                       |              |     |    |               |     |
|---------------------------------------|--------------|-----|----|---------------|-----|
| Peak Power Density of IEEE802.11b is  | <u>1.77</u>  | dBm | at | <u>2437.0</u> | MHz |
| Peak Power Density of IEEE802.11g is  | <u>-3.94</u> | dBm | at | <u>2412.0</u> | MHz |
| Peak Power Density of IEEE802.11n is  | <u>-4.18</u> | dBm | at | <u>2412.0</u> | MHz |
| Peak Power Density of Bluetooth LE is | <u>1.83</u>  | dBm | at | <u>2440.0</u> | MHz |

Uncertainty of Measurement Results at Amplitude +/-1.7 dB(2 $\sigma$ )

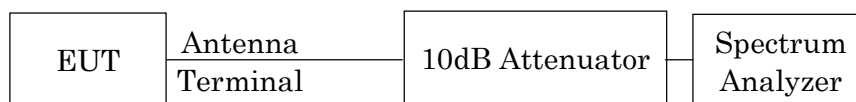
Remarks : \_\_\_\_\_

**7.6.2 Test Instruments**

| Shielded Room S4  |             |              |        |           |          |
|-------------------|-------------|--------------|--------|-----------|----------|
| Type              | Model       | Manufacturer | ID No. | Last Cal. | Interval |
| Spectrum Analyzer | E4446A      | Agilent      | A-39   | 2014/9    | 1 Year   |
| Attenuator        | 54A-10      | Weinschel    | D-28   | 2014/9    | 1 Year   |
| RF Cable          | SUCOFLEX102 | SUHNER       | C-52   | 2014/8    | 1 Year   |

**7.6.3 Test Method and Test Setup (Diagrammatic illustration)**

The Conducted RF Power Output was measured with a power meter, one 10dB attenuator and a short, low loss cable.



## 7.6.4 Test Data

### 1) IEEE 802.11b

Data Rate : 11Mbps

Test Date: May 12, 2015

Temp.: 25 °C, Humi: 60 %

| Transmitting Frequency | Correction Factor | Meter Reading | Conducted Peak Power Density | Limits | Margin |
|------------------------|-------------------|---------------|------------------------------|--------|--------|
| CH [MHz]               | [dB]              | [dBm]         | [dBm] [mW]                   | [dBm]  | [dB]   |
| 01 2412                | 10.01             | -8.72         | 1.29 1.34                    | 8.00   | + 6.71 |
| 06 2437                | 10.01             | -8.24         | 1.77 1.50                    | 8.00   | + 6.23 |
| 11 2462                | 10.01             | -8.49         | 1.52 1.42                    | 8.00   | + 6.48 |

Calculated result at 2437.000 MHz, as the worst point shown on underline:

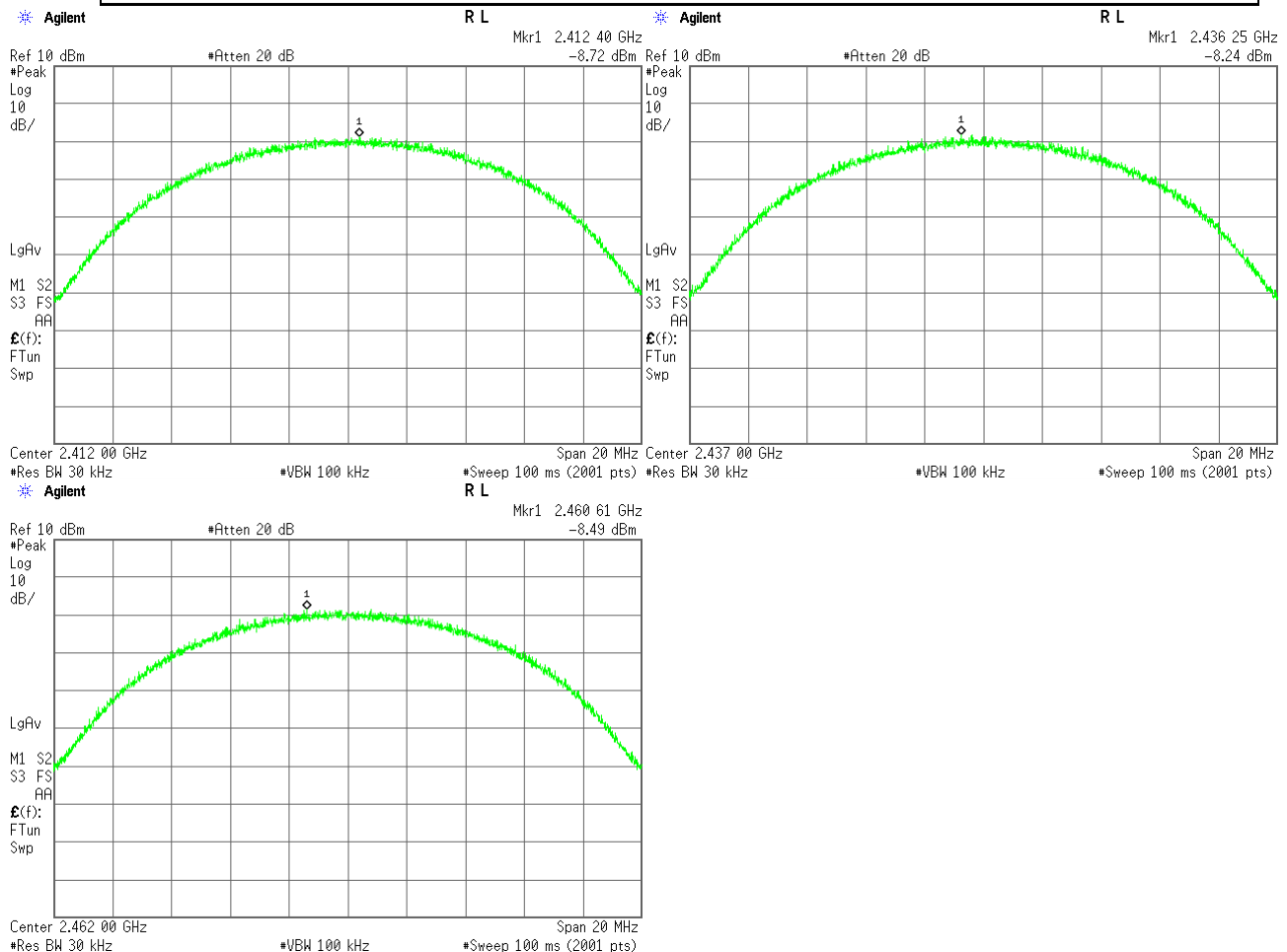
|                   |   |                    |
|-------------------|---|--------------------|
| Correction Factor | = | 10.01 dB           |
| + ) Meter Reading | = | -8.24 dBm          |
| Result            | = | 1.77 dBm = 1.50 mW |

Minimum Margin: 8.00 - 1.77 = 6.23 (dB)

#### NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

| Detector Function | RES B.W. | Video B.W. |
|-------------------|----------|------------|
| Peak              | 30kHz    | 100kHz     |



## 2) IEEE 802.11g

Data Rate : 36Mbps

Test Date: May 12, 2015  
Temp.: 25 °C, Humi: 60 %

| Transmitting Frequency | Correction Factor | Meter Reading | Conducted Peak Power Density | Limits | Margin |
|------------------------|-------------------|---------------|------------------------------|--------|--------|
| CH [MHz]               | [dB]              | [dBm]         | [dBm] [mW]                   | [dBm]  | [dB]   |
| 01 2412                | 10.01             | -13.95        | -3.94 0.40                   | 8.00   | +11.94 |
| 06 2437                | 10.01             | -13.98        | -3.97 0.40                   | 8.00   | +11.97 |
| 11 2462                | 10.01             | -14.34        | -4.33 0.37                   | 8.00   | +12.33 |

Calculated result at 2412.000 MHz, as the worst point shown on underline:

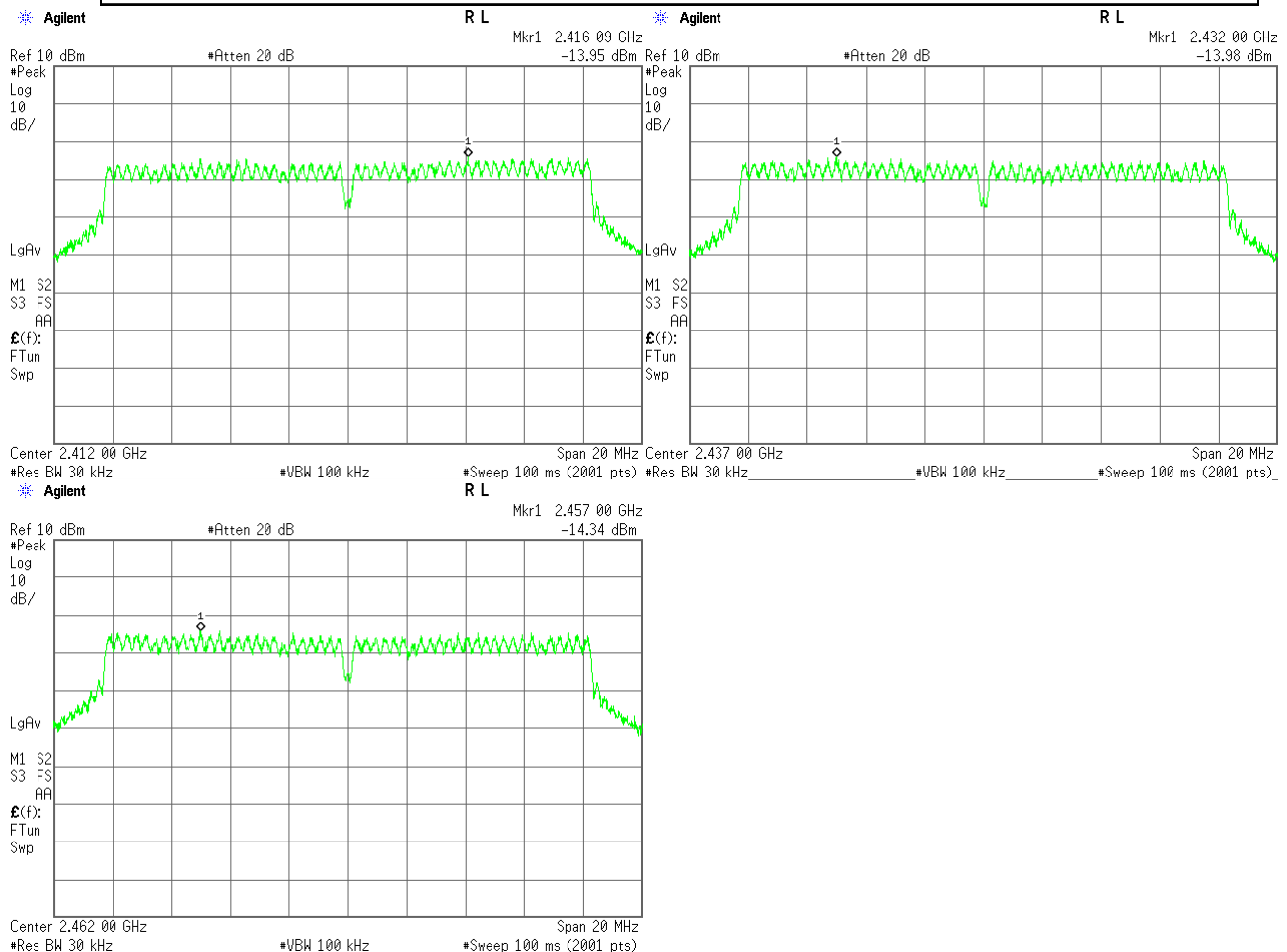
|                   |   |                     |
|-------------------|---|---------------------|
| Correction Factor | = | 10.01 dB            |
| + ) Meter Reading | = | -13.95 dBm          |
| Result            | = | -3.94 dBm = 0.40 mW |

Minimum Margin: 8.00 - -3.94 = 11.94 (dB)

## NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

| Detector Function | RES B.W. | Video B.W. |
|-------------------|----------|------------|
| Peak              | 30kHz    | 100kHz     |



### 3) IEEE 802.11n

Data Rate : MCS2(19.5Mbps)

Test Date: May 12, 2015  
Temp.: 25 °C, Humi: 60 %

| Transmitting Frequency | Correction Factor | Meter Reading | Conducted Peak Power Density | Limits | Margin |
|------------------------|-------------------|---------------|------------------------------|--------|--------|
| CH [MHz]               | [dB]              | [dBm]         | [dBm] [mW]                   | [dBm]  | [dB]   |
| 01 2412                | 10.01             | -14.19        | -4.18 0.38                   | 8.00   | +12.18 |
| 06 2437                | 10.01             | -14.87        | -4.86 0.33                   | 8.00   | +12.86 |
| 11 2462                | 10.01             | -15.17        | -5.16 0.30                   | 8.00   | +13.16 |

Calculated result at 2412.000 MHz, as the worst point shown on underline:

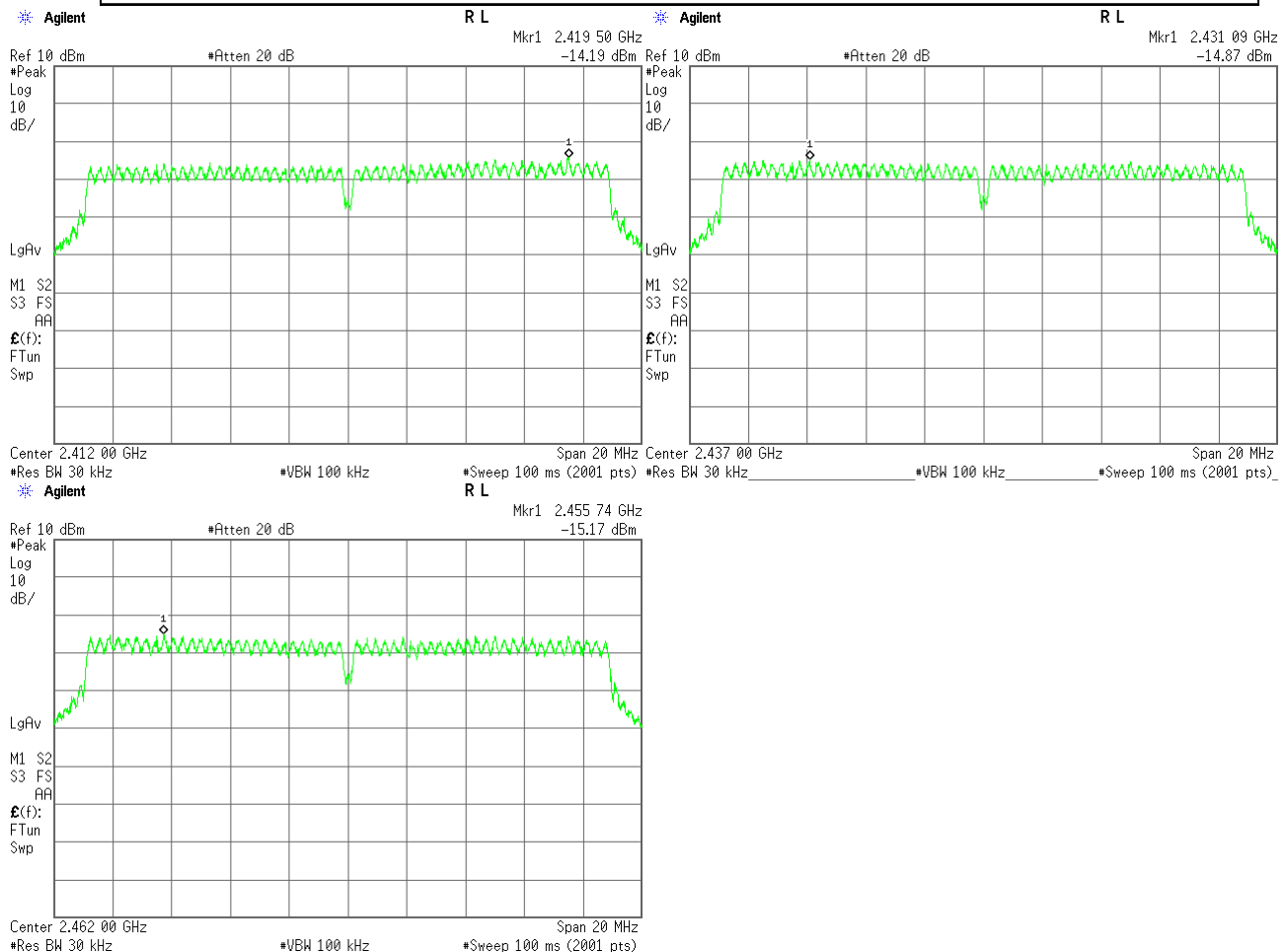
|                   |   |                     |
|-------------------|---|---------------------|
| Correction Factor | = | 10.01 dB            |
| + ) Meter Reading | = | -14.19 dBm          |
| Result            | = | -4.18 dBm = 0.38 mW |

Minimum Margin: 8.00 - -4.18 = 12.18 (dB)

#### NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

| Detector Function | RES B.W. | Video B.W. |
|-------------------|----------|------------|
| Peak              | 30kHz    | 100kHz     |



## 4) Bluetooth LE(Modulation type : GFSK)

Test Date: May 12, 2015

Temp.: 25 °C, Humi: 60 %

| Transmitting Frequency | Correction Factor | Meter Reading | Conducted Peak Power Density | Limits | Margin |
|------------------------|-------------------|---------------|------------------------------|--------|--------|
| CH [MHz]               | [dB]              | [dBm]         | [dBm] [mW]                   | [dBm]  | [dB]   |
| 00 2402                | 10.01             | -8.29         | 1.72 1.48                    | 8.00   | + 6.28 |
| 19 2440                | 10.01             | -8.18         | 1.83 1.52                    | 8.00   | + 6.17 |
| 39 2480                | 10.01             | -8.41         | 1.60 1.44                    | 8.00   | + 6.40 |

Calculated result at 2440.000 MHz, as the worst point shown on underline:

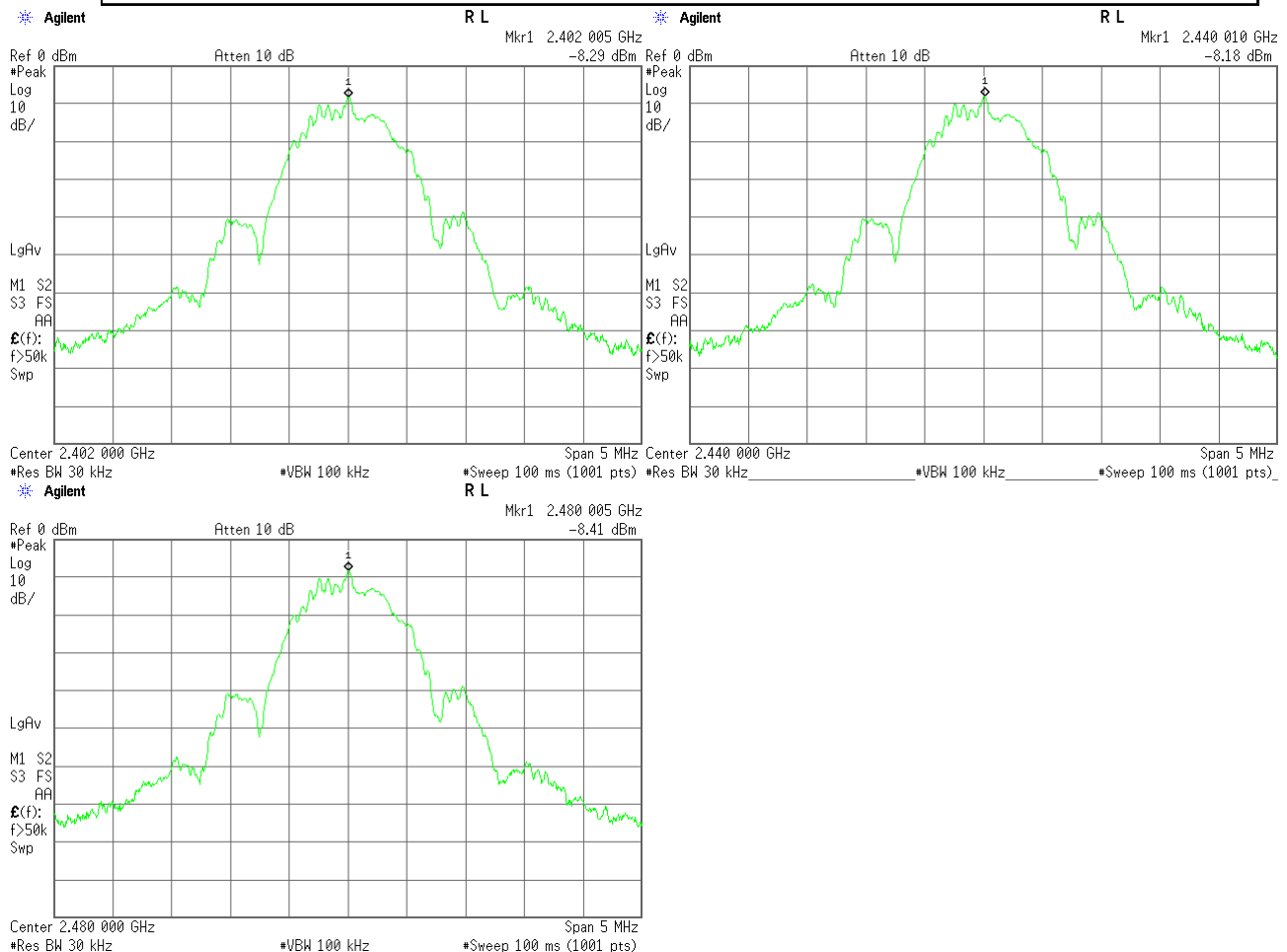
|                   |   |                    |
|-------------------|---|--------------------|
| Correction Factor | = | 10.01 dB           |
| + ) Meter Reading | = | -8.18 dBm          |
| Result            | = | 1.83 dBm = 1.52 mW |

Minimum Margin: 8.00 - 1.83 = 6.17 (dB)

## NOTES

1. The peak power density complied with the limit using 30 kHz resolution bandwidth of Spectrum Analyzer.
2. The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.
3. Setting of measuring instrument(s) :

| Detector Function | RES B.W. | Video B.W. |
|-------------------|----------|------------|
| Peak              | 30kHz    | 100kHz     |



**7.7 Spurious Emissions(Conduction)**

For the requirements, ☒ - Applicable ☒ - Tested. ☐ - Not tested by applicant request.]  
☐ - Not Applicable

For the limits, ☒ - Passed ☐ - Failed ☐ - Not judged

**7.7.1 Worst Point and Measurement Uncertainty**

Uncertainty of Measurement Results

|               |               |                 |
|---------------|---------------|-----------------|
| 9 kHz – 1GHz  | <u>+/-1.4</u> | dB(2 $\sigma$ ) |
| 1GHz – 18GHz  | <u>+/-1.7</u> | dB(2 $\sigma$ ) |
| 18GHz – 40GHz | <u>+/-2.3</u> | dB(2 $\sigma$ ) |

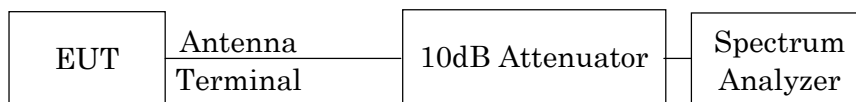
Remarks : \_\_\_\_\_

**7.7.2 Test Instruments**

| Shielded Room S4  |             |              |        |           |          |
|-------------------|-------------|--------------|--------|-----------|----------|
| Type              | Model       | Manufacturer | ID No. | Last Cal. | Interval |
| Spectrum Analyzer | E4446A      | Agilent      | A-39   | 2014/9    | 1 Year   |
| Attenuator        | 54A-10      | Weinschel    | D-28   | 2014/9    | 1 Year   |
| RF Cable          | SUCOFLEX102 | SUHNER       | C-52   | 2014/8    | 1 Year   |

**7.7.3 Test Method and Test Setup (Diagrammatic illustration)**

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

|                 |                 |           |
|-----------------|-----------------|-----------|
| Frequency Range | 30 MHz - 25 GHz | Band-Edge |
| Res. Bandwidth  | 100 kHz         | 100 kHz   |
| Video Bandwidth | 300 kHz         | 300 kHz   |
| Sweep Time      | AUTO            | AUTO      |
| Trace           | Maxhold         | Maxhold   |

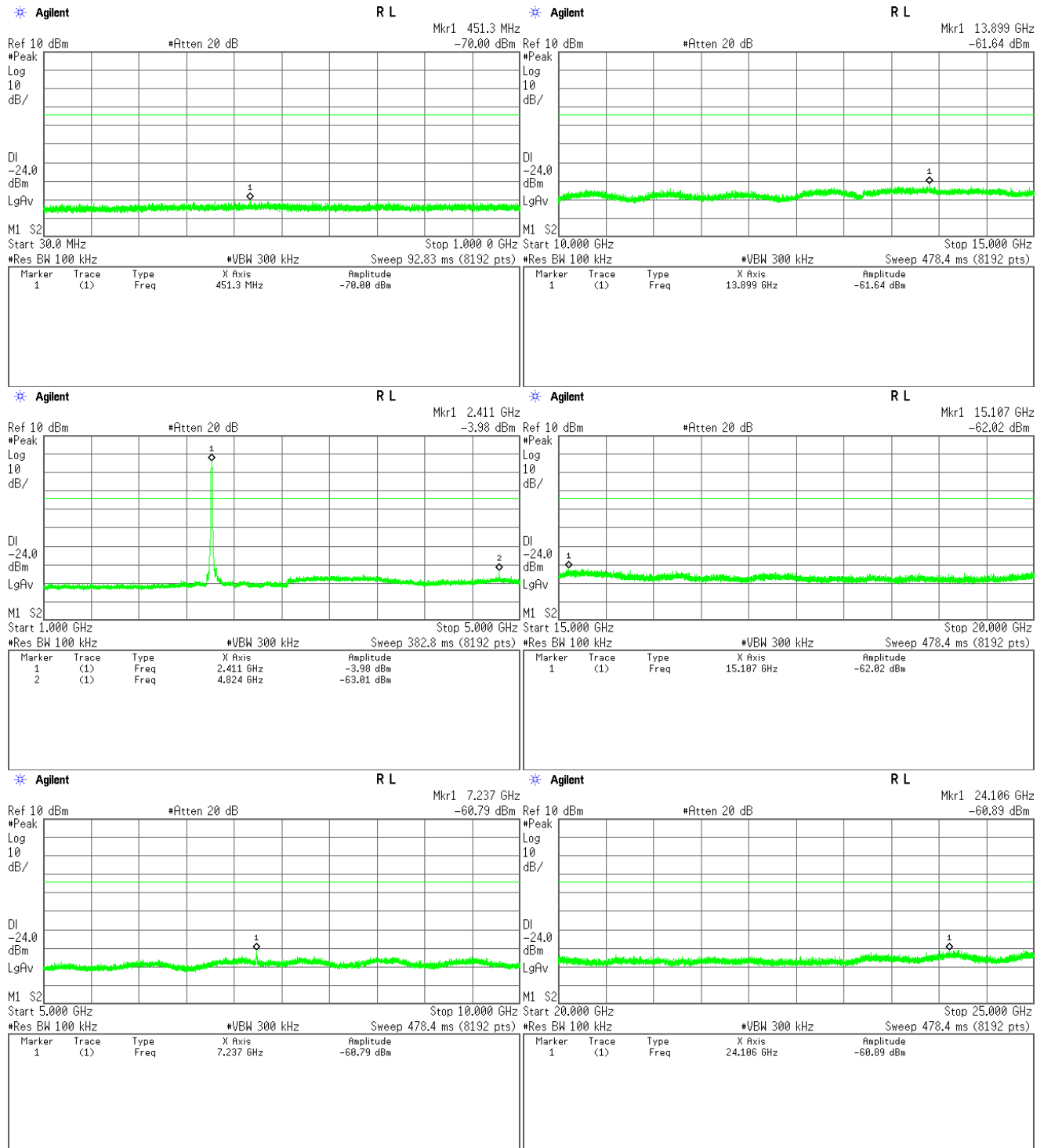
## 7.7.4 Test Data

Test Date : May 12, 2015

Temp.:25°C, Humi:60%

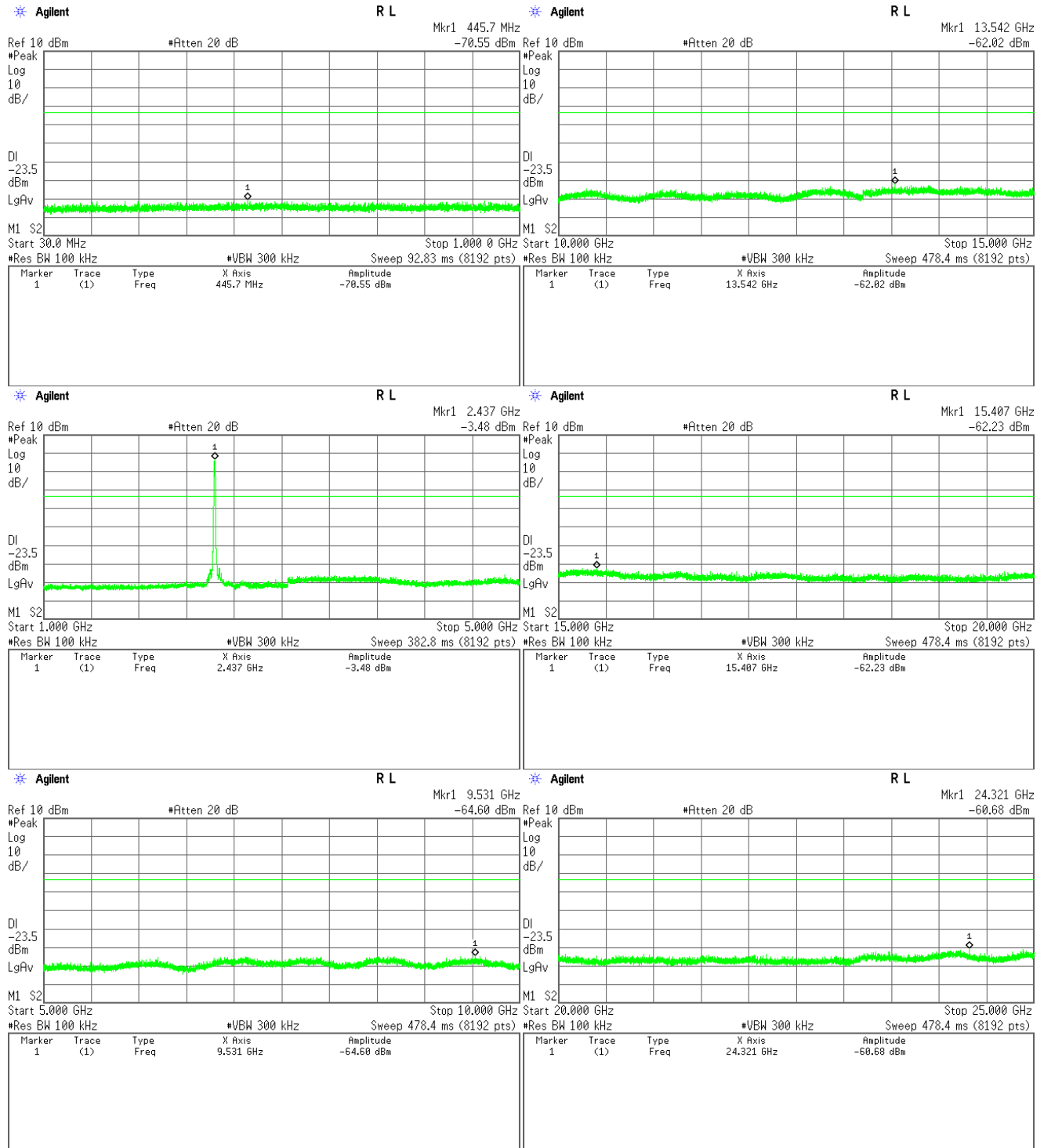
### 1) IEEE 802.11b

#### Low Channel

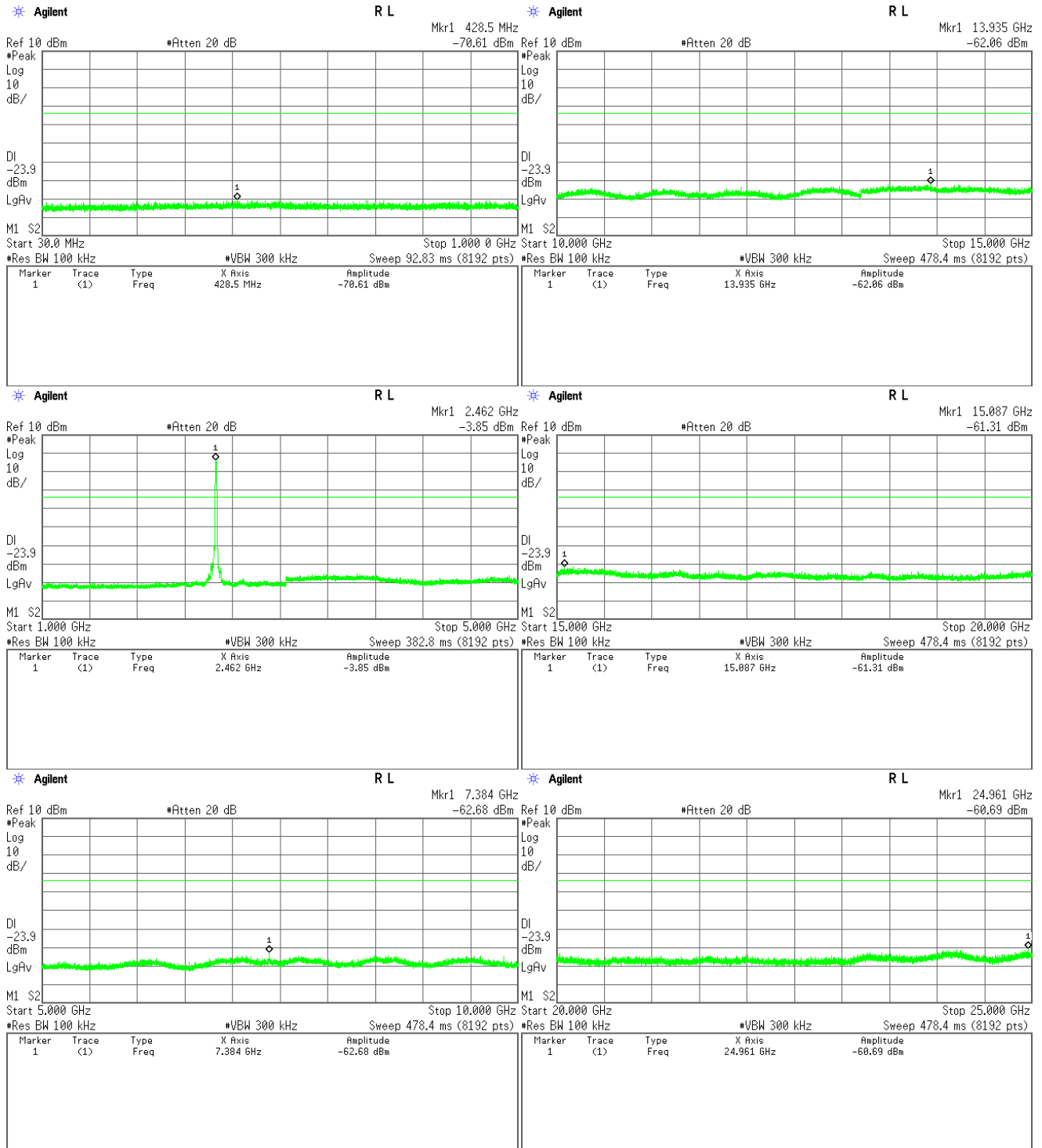




## Middle Channel

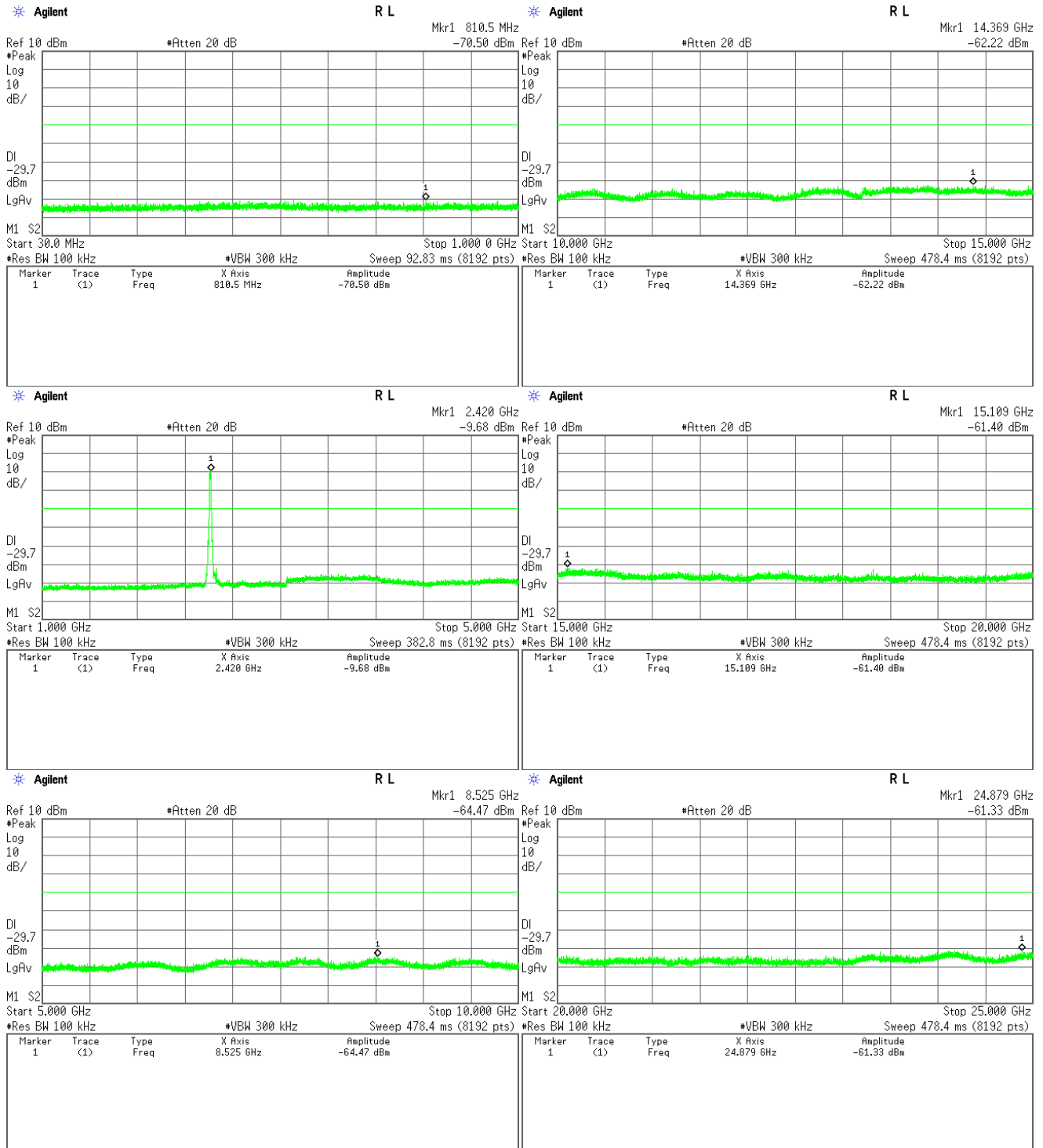


## High Channel

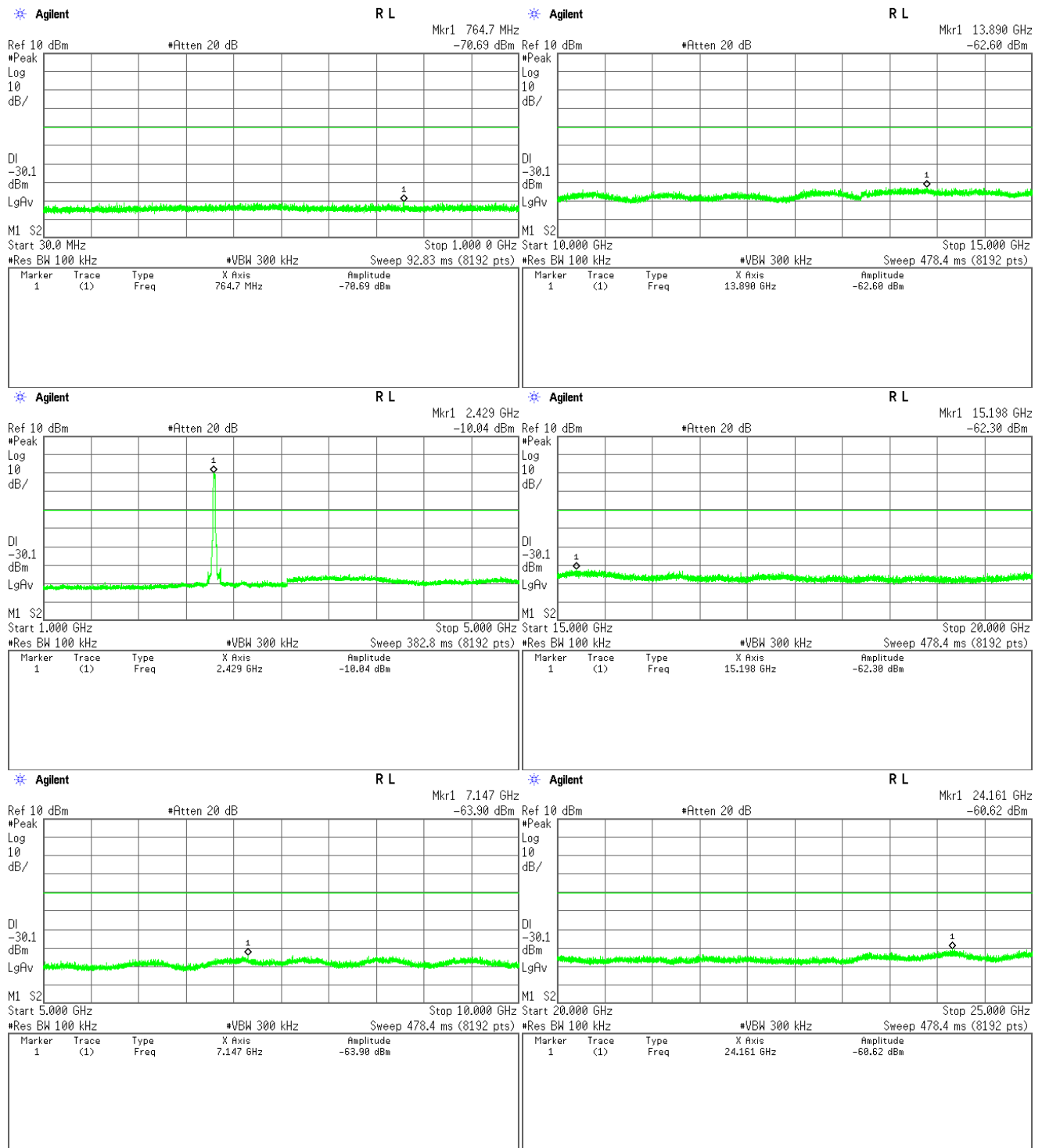


## 2- IEEE 802.11g

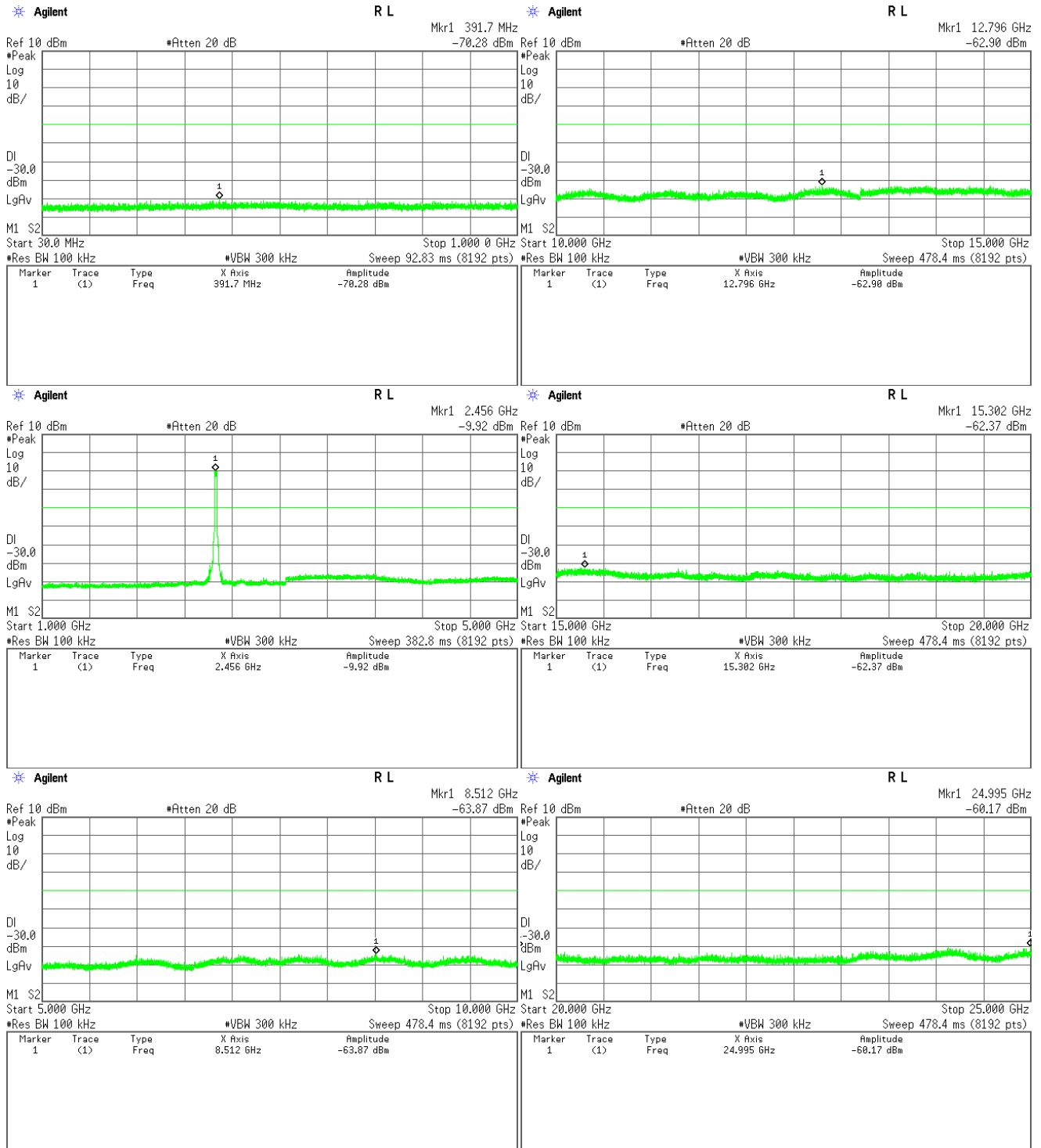
### Low Channel



## Middle channel

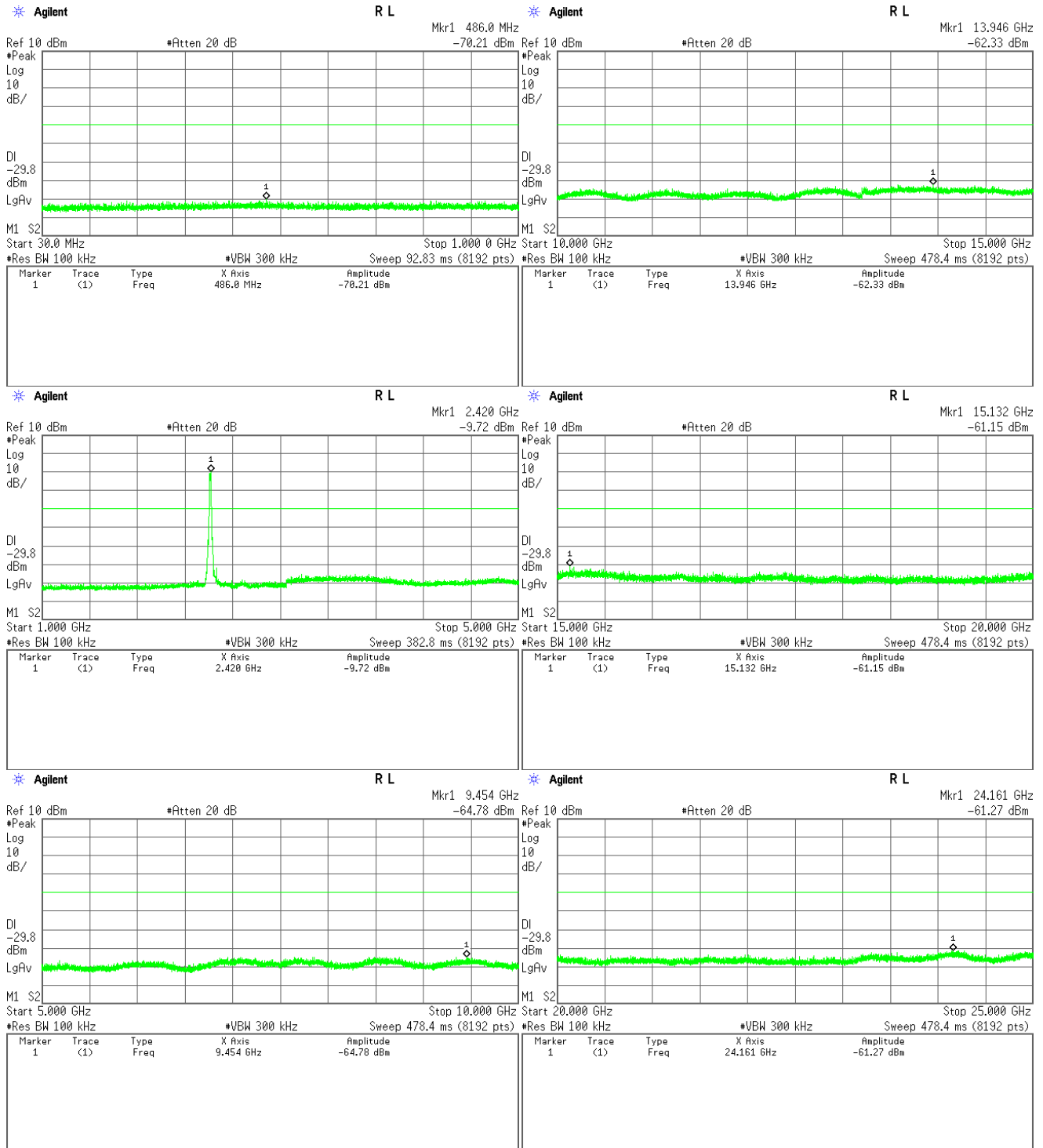


## High Channel

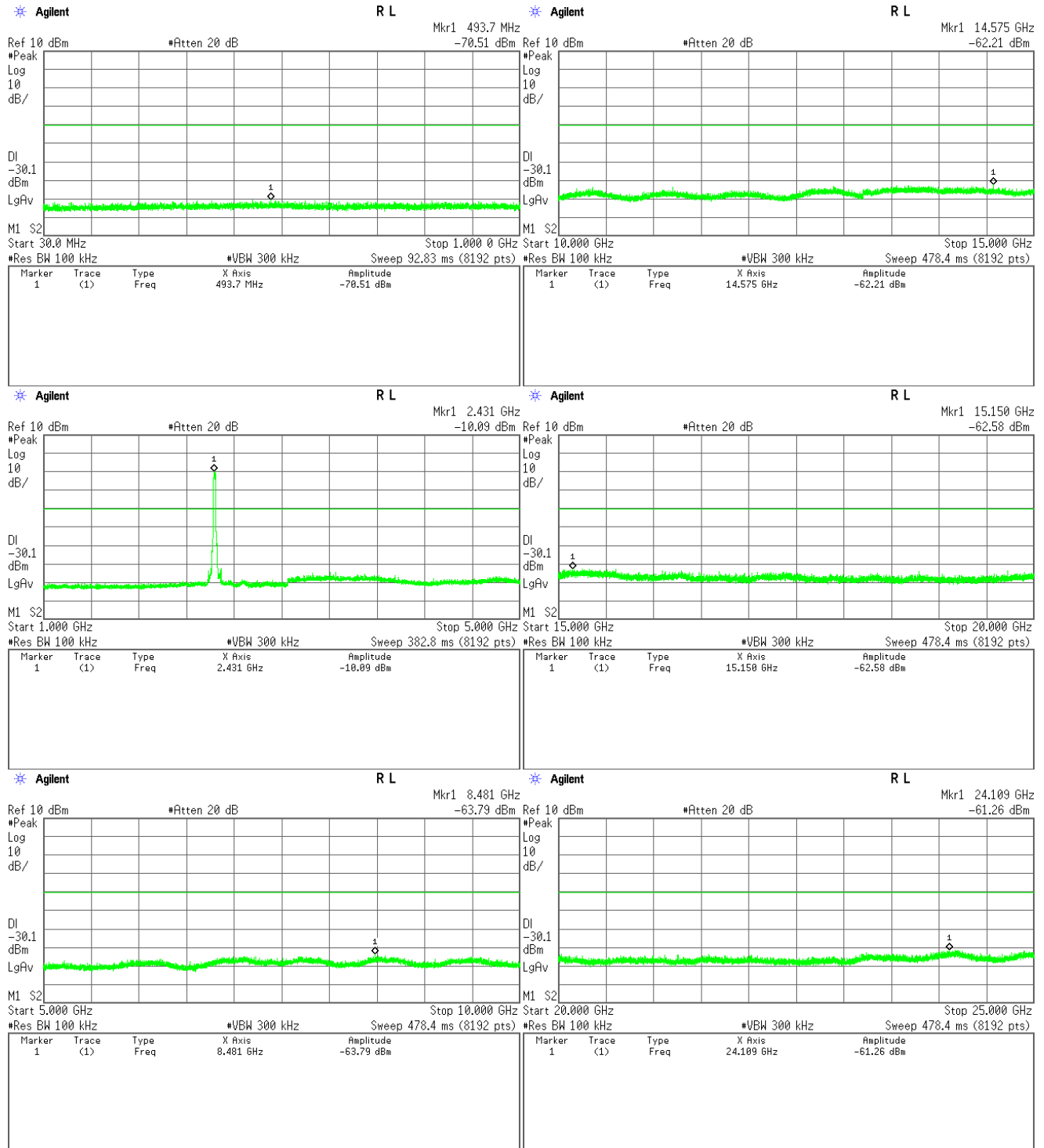


## 3) IEEE 802.11n

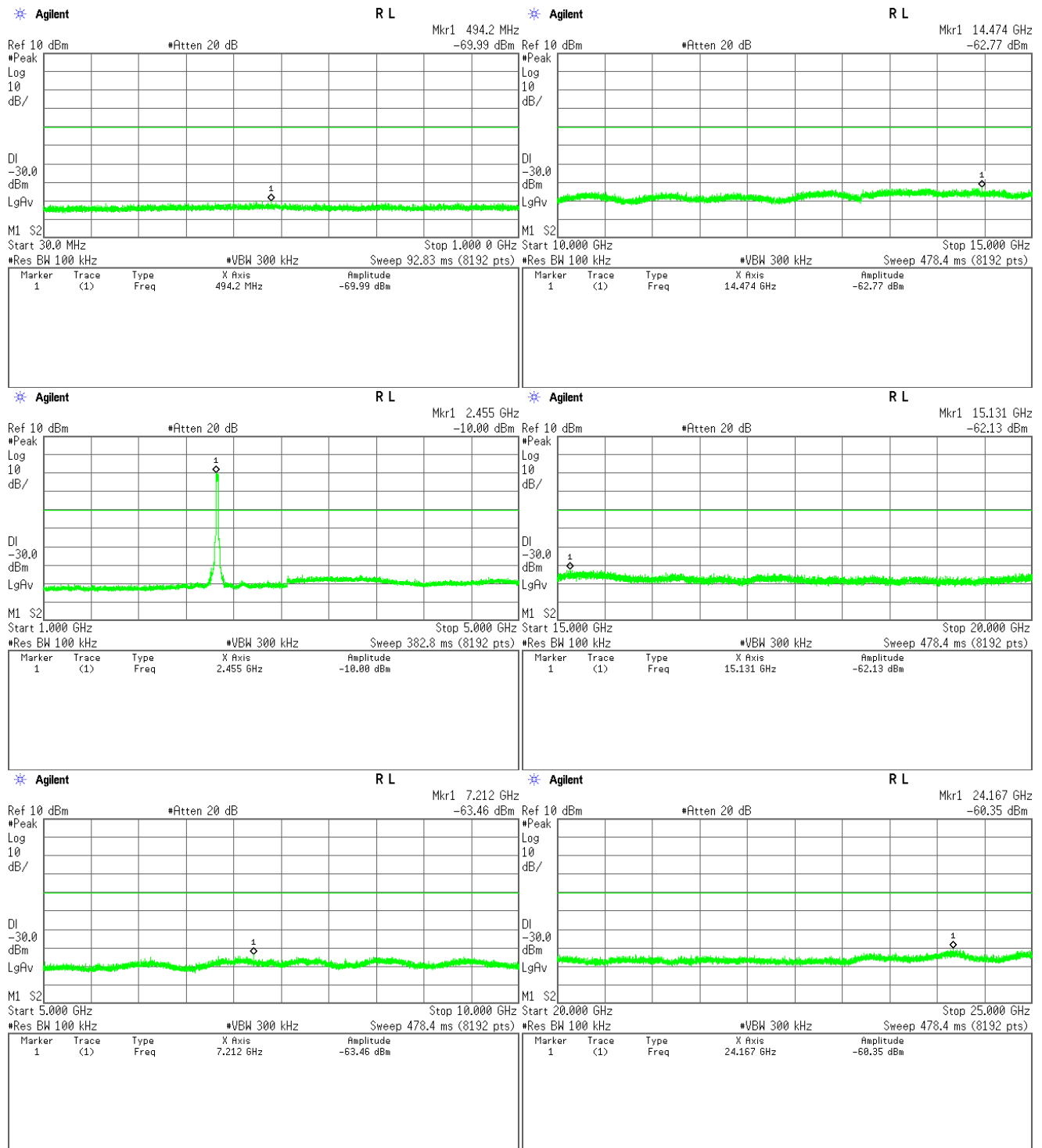
### Low Channel



## Middle Channel



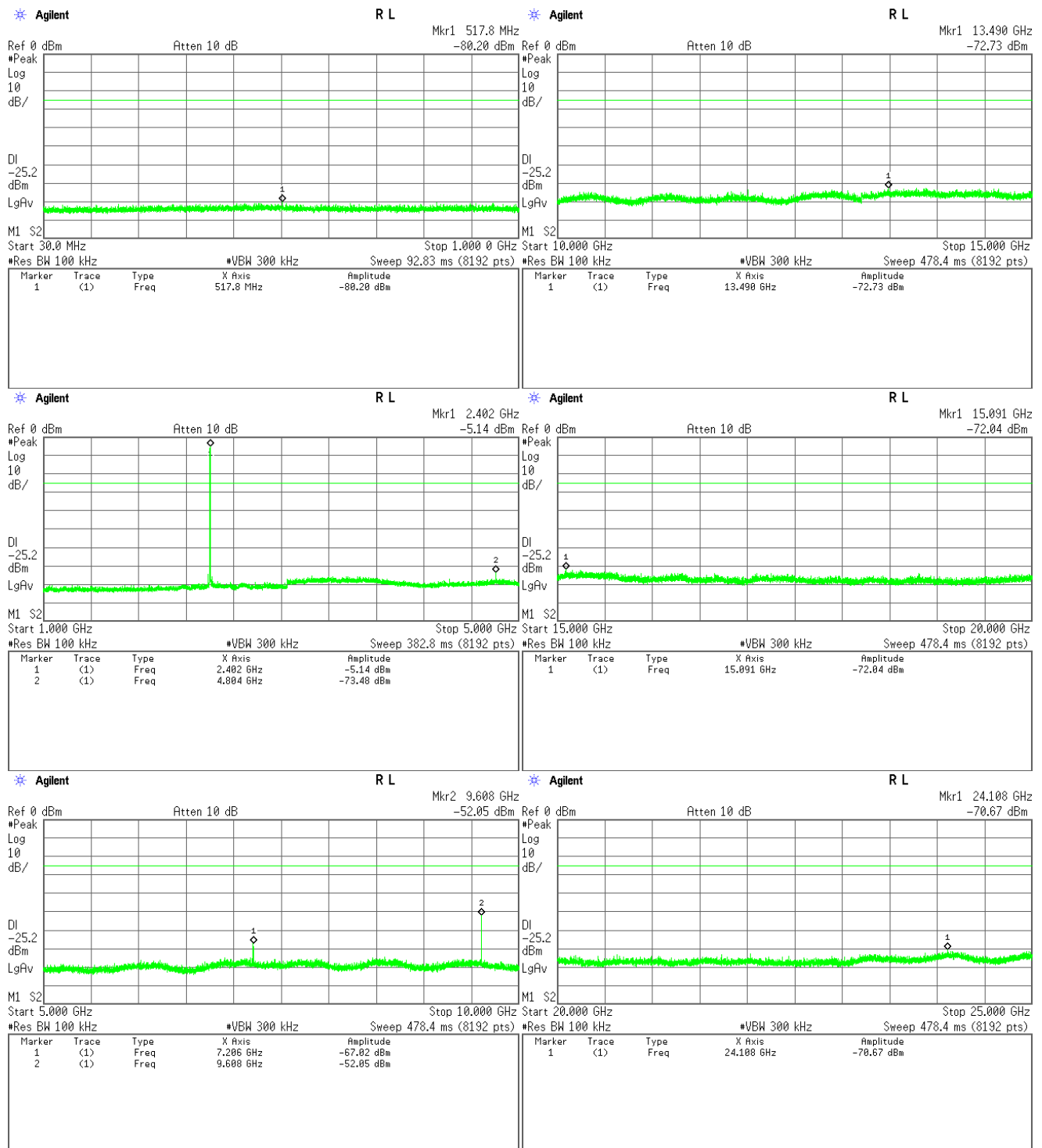
## High Channel



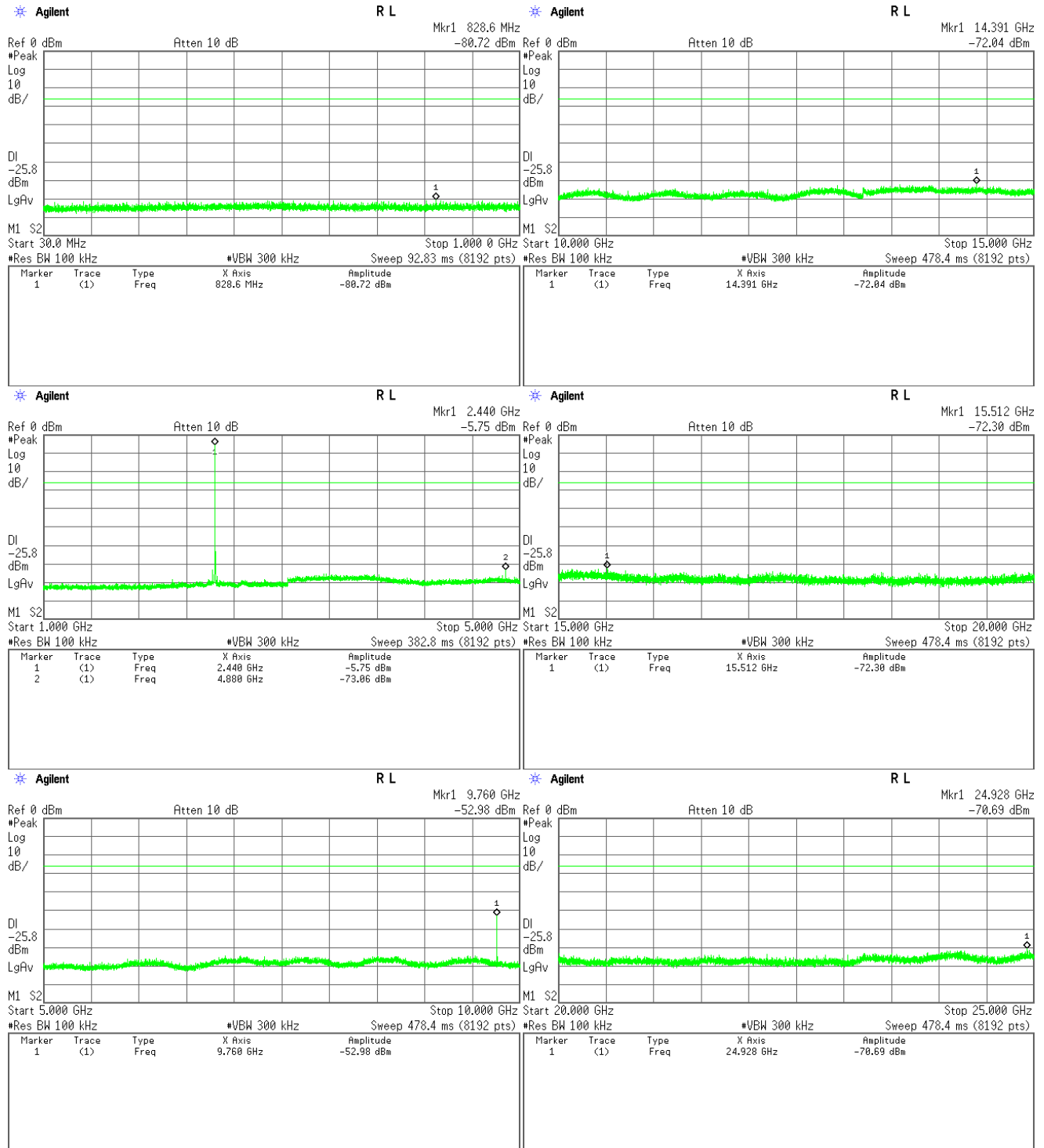


## 4) Bluetooth Low Energy

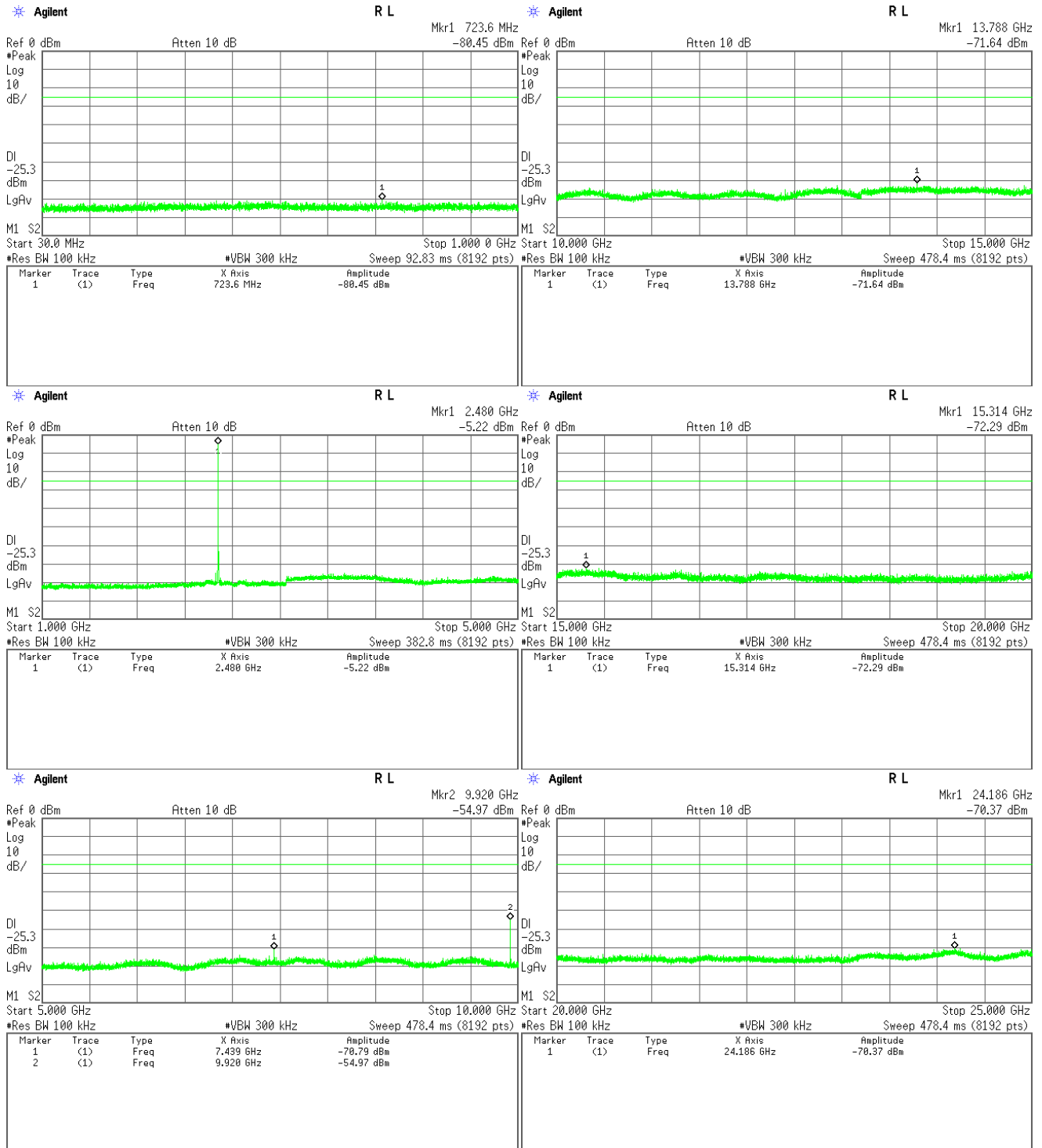
### Low Channel



## Middle Channel



## High Channel



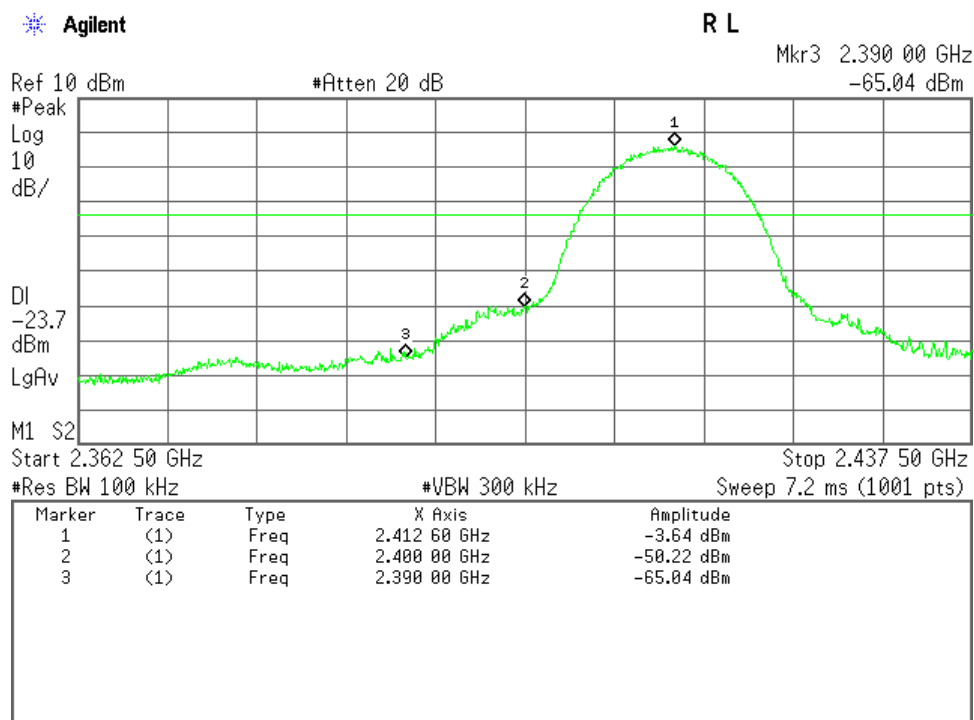
## Band-Edge Emission

Test Date : May 12, 2015

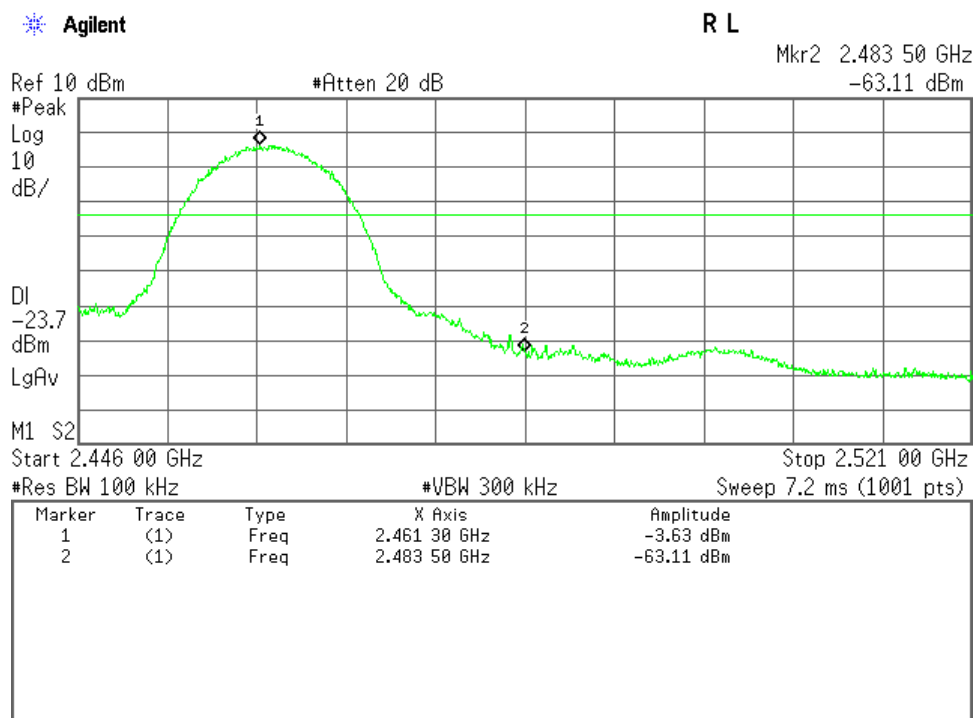
Temp.:25°C, Humi:60%

1) IEEE 802.11b

### Low Channel

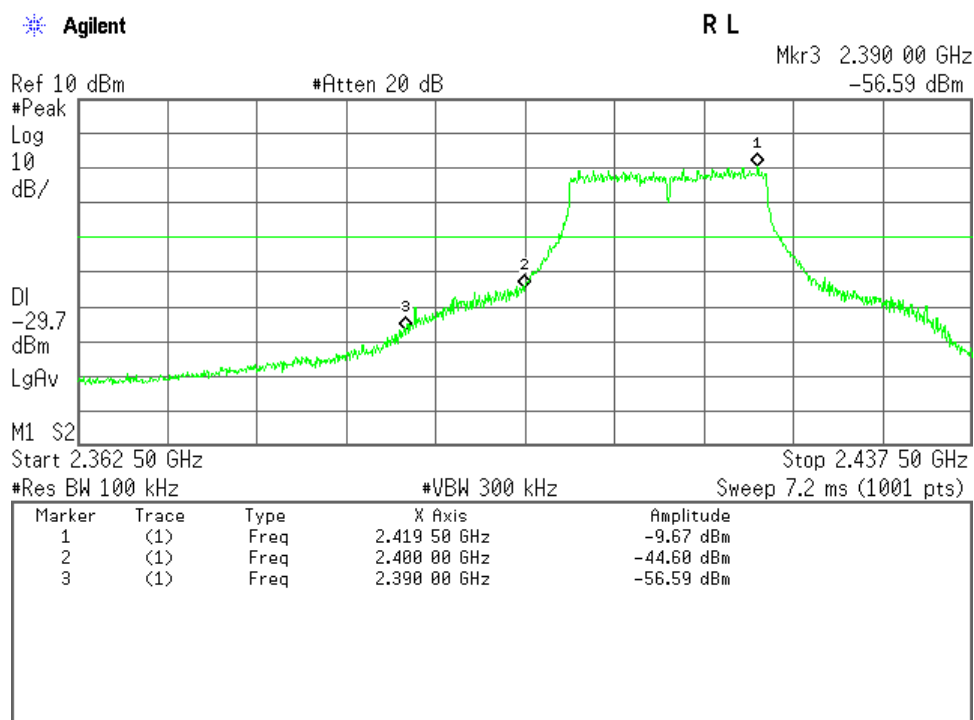


### High Channel

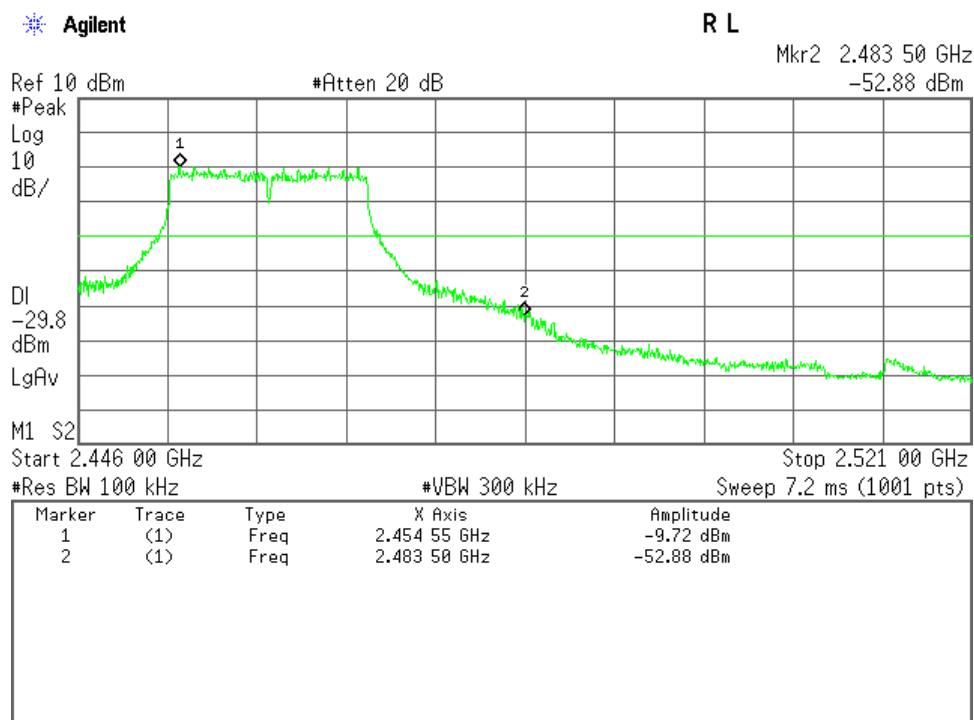


## 2) IEEE 802.11g

### Low Channel

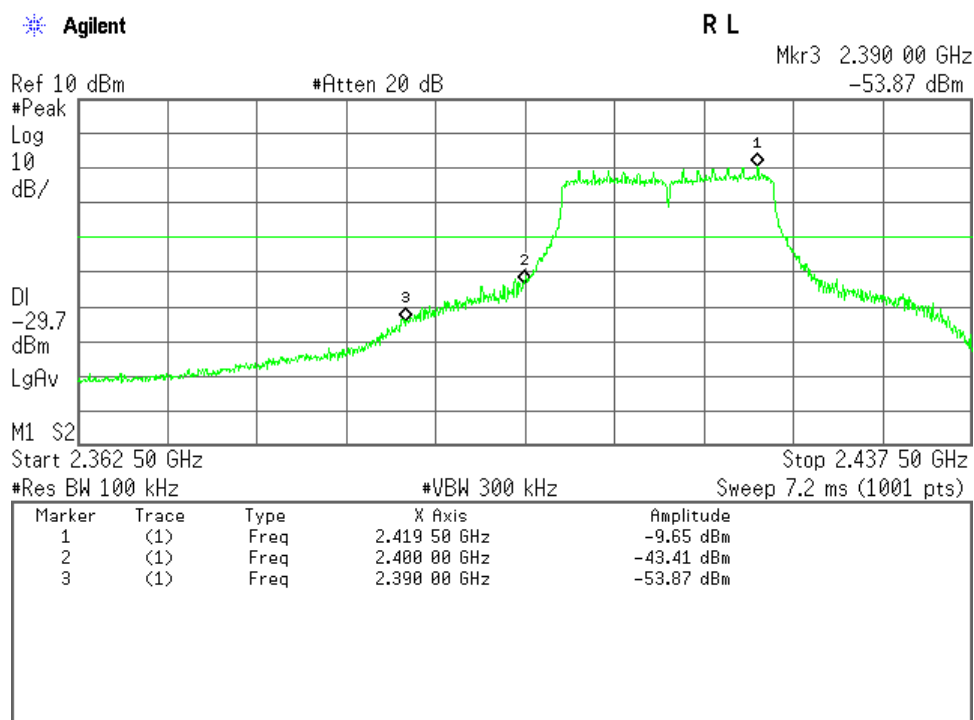


### High Channel

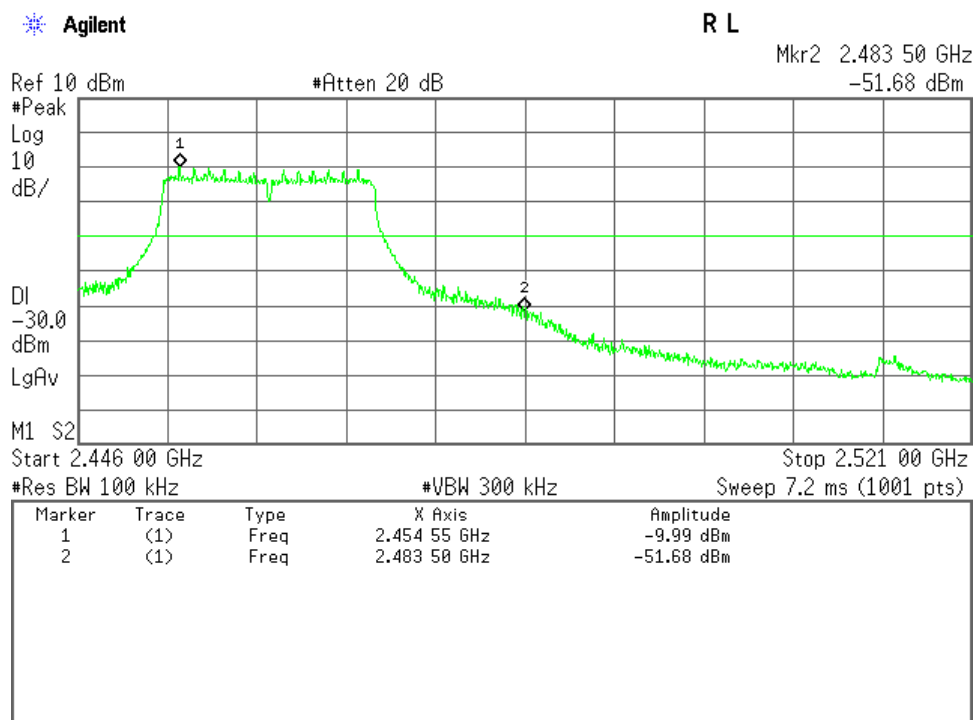


## 3) IEEE 802.11n

### Low Channel

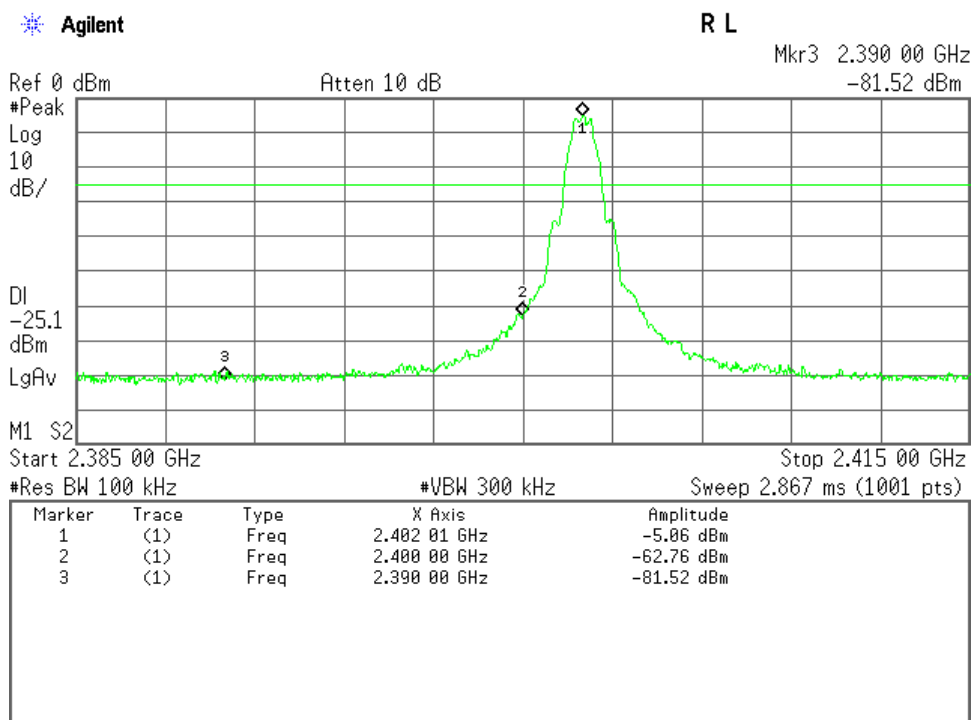


### High Channel

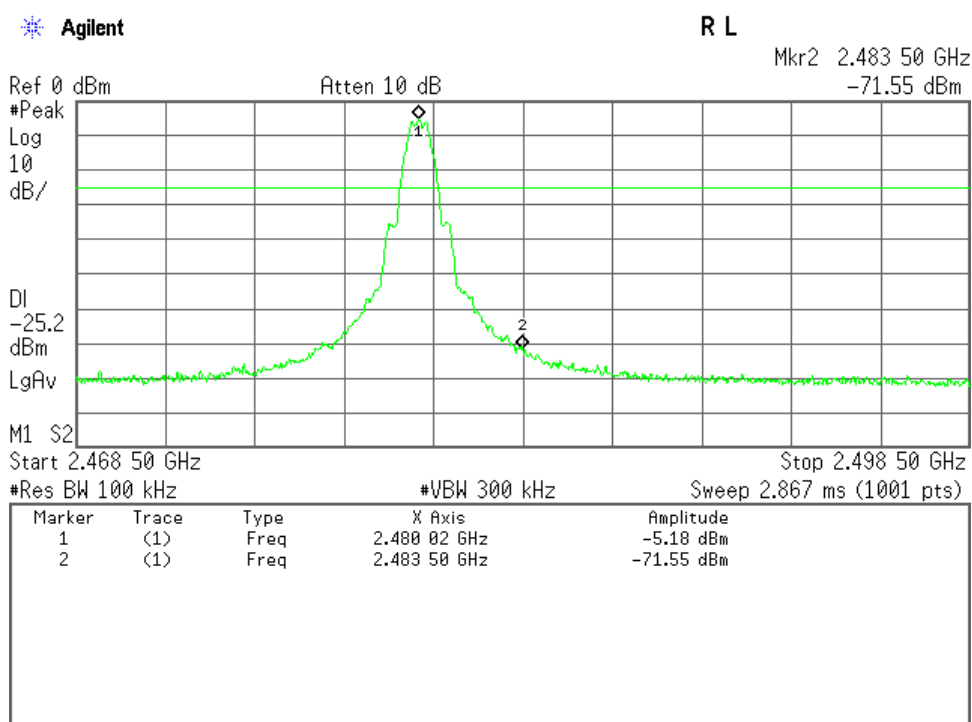


## 4) Bluetooth Low Energy

### Low Channel



### High Channel



**7.8 AC Powerline Conducted Emission**

For the requirements, ☒ - Applicable ☒ - Tested. ☐ - Not tested by applicant request.]  
☐ - Not Applicable

For the limits, ☒ - Passed ☐ - Failed ☐ - Not judged

**7.8.1 Worst Point and Measurement Uncertainty**

Min. Limit Margin (Quasi-Peak) 9.6 dB at 0.61 MHz

Uncertainty of Measurement Results +/-2.6 dB(2 $\sigma$ )

Remarks : Bluetooth mode

**7.8.2 Test Instruments**

| Measurement Room M2 |          |                 |        |           |          |
|---------------------|----------|-----------------|--------|-----------|----------|
| Type                | Model    | Manufacturer    | ID No. | Last Cal. | Interval |
| Test Receiver       | ESU 26   | Rohde & Schwarz | A-6    | 2015/4    | 1 Year   |
| AMN (main)          | KNW-407R | Kyoritsu        | D-39   | 2014/9    | 1 Year   |
| RF Cable            | RG223/U  | SUHNER          | H-34   | 2014/6    | 1 Year   |



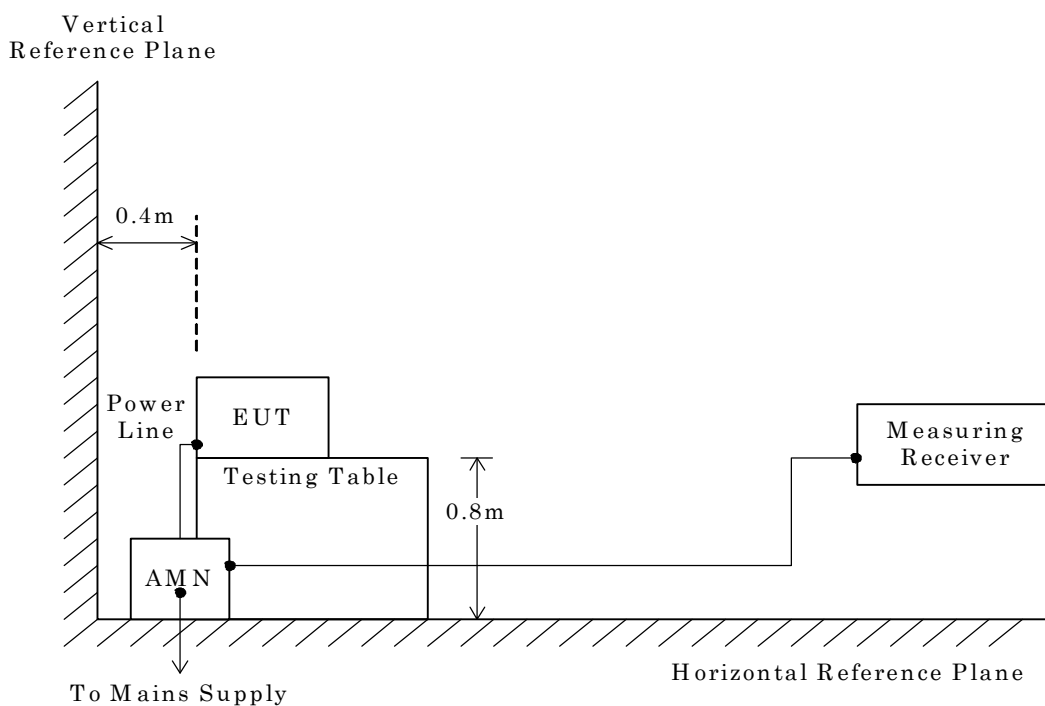
### 7.8.3 Test Method and Test Setup (Diagrammatic illustration)

The preliminary tests were performed using the scan mode of test receiver or spectrum analyzer to observe the emissions characteristics of the EUT.

The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for final tests.

– Side View –



#### NOTE

AMN : Artificial Mains Network

## 7.8.4 Test Data

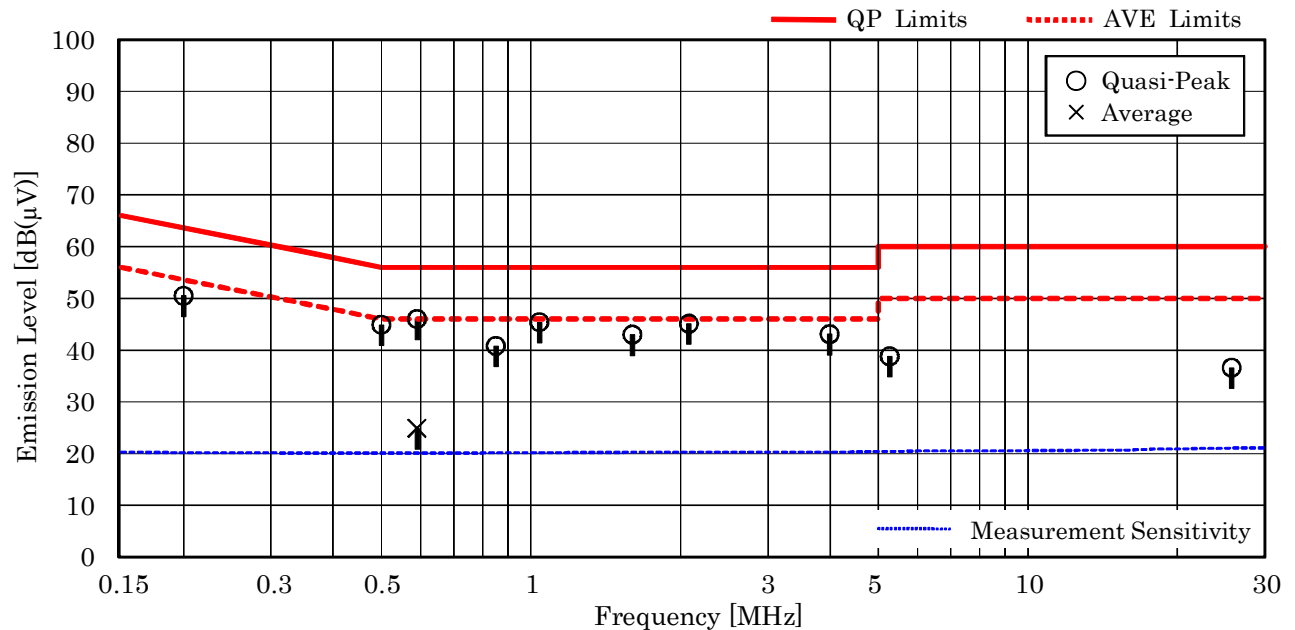
- 1) Mode of EUT : (WLAN) All modes have been investigated and the worst case mode for channel (06ch: 2437MHz / IEEE 802.11b, IEEE 802.11g and IEEE 802.11n) has been listed.

Test voltage : 120VAC 60Hz

Test Date: May 7, 2015  
Temp.: 21 °C, Humi.: 55 %

Measured phase : L1

| Frequency<br>[MHz] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] |      | Limits<br>[dB(μV)] |      | Results<br>[dB(μV)] |      | Margin<br>[dB] |       | Remarks |
|--------------------|-------------------------|----------------------------|------|--------------------|------|---------------------|------|----------------|-------|---------|
|                    |                         | QP                         | AVE  | QP                 | AVE  | QP                  | AVE  | QP             | AVE   |         |
| 0.200              | 10.2                    | 40.3                       | --   | 63.6               | 53.6 | 50.5                | --   | +13.1          | --    | -       |
| 0.500              | 10.1                    | 34.8                       | --   | 56.0               | 46.0 | 44.9                | --   | +11.1          | --    | -       |
| 0.590              | 10.1                    | 35.9                       | 14.8 | 56.0               | 46.0 | 46.0                | 24.9 | +10.0          | +21.1 | -       |
| 0.850              | 10.2                    | 30.6                       | --   | 56.0               | 46.0 | 40.8                | --   | +15.2          | --    | -       |
| 1.040              | 10.2                    | 35.2                       | --   | 56.0               | 46.0 | 45.4                | --   | +10.6          | --    | -       |
| 1.600              | 10.3                    | 32.7                       | --   | 56.0               | 46.0 | 43.0                | --   | +13.0          | --    | -       |
| 2.080              | 10.3                    | 34.8                       | --   | 56.0               | 46.0 | 45.1                | --   | +10.9          | --    | -       |
| 3.990              | 10.3                    | 32.8                       | --   | 56.0               | 46.0 | 43.1                | --   | +12.9          | --    | -       |
| 5.270              | 10.4                    | 28.4                       | --   | 60.0               | 50.0 | 38.8                | --   | +21.2          | --    | -       |
| 25.710             | 11.0                    | 25.6                       | --   | 60.0               | 50.0 | 36.6                | --   | +23.4          | --    | -       |



### NOTES

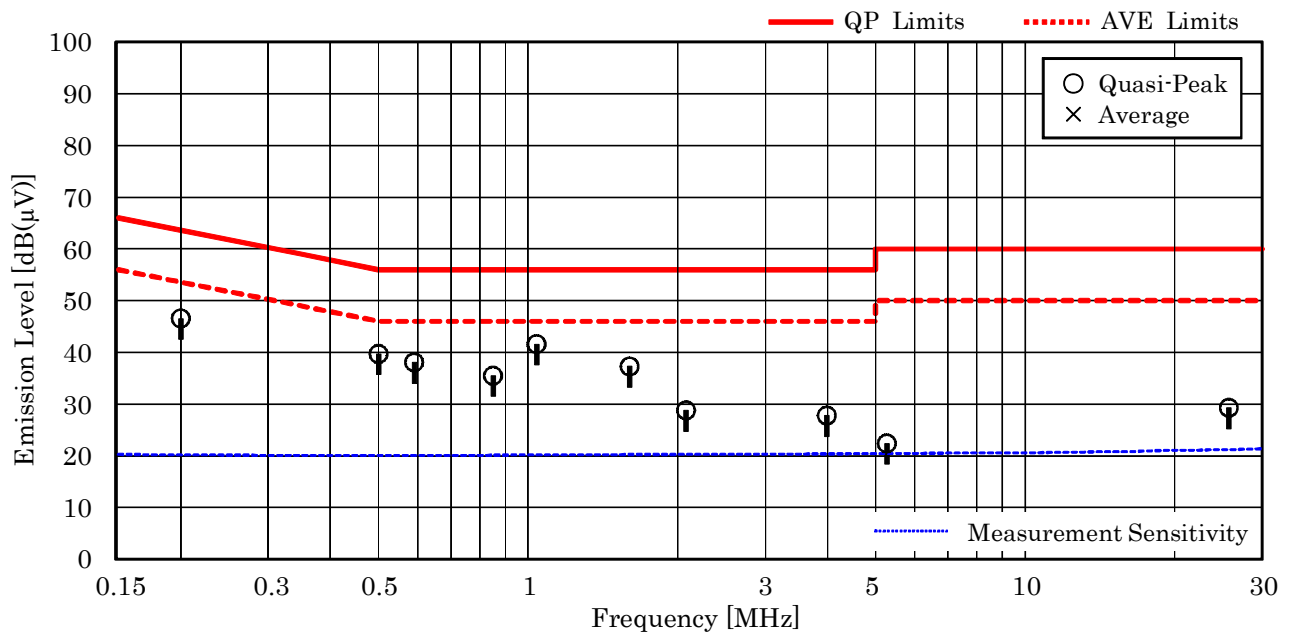
1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 0.590 MHz, as the worst point shown on underline:  
Correction Factor + Meter Reading (QP) = 10.1 + 35.9 = 46.0 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

Test voltage : 120VAC 60Hz

Test Date: May 7, 2015  
Temp.: 21 °C, Humi.: 55 %

Measured phase : L2

| Frequency<br>[MHz] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] |     | Limits<br>[dB(μV)] |      | Results<br>[dB(μV)] |     | Margin<br>[dB] |     | Remarks |
|--------------------|-------------------------|----------------------------|-----|--------------------|------|---------------------|-----|----------------|-----|---------|
|                    |                         | QP                         | AVE | QP                 | AVE  | QP                  | AVE | QP             | AVE |         |
| 0.200              | 10.2                    | 36.4                       | --  | 63.6               | 53.6 | 46.6                | --  | +17.0          | --  | -       |
| 0.500              | 10.1                    | 29.6                       | --  | 56.0               | 46.0 | 39.7                | --  | +16.3          | --  | -       |
| 0.590              | 10.1                    | 28.0                       | --  | 56.0               | 46.0 | 38.1                | --  | +17.9          | --  | -       |
| 0.850              | 10.2                    | 25.3                       | --  | 56.0               | 46.0 | 35.5                | --  | +20.5          | --  | -       |
| 1.040              | 10.3                    | 31.3                       | --  | 56.0               | 46.0 | 41.6                | --  | +14.4          | --  | -       |
| 1.600              | 10.3                    | 27.0                       | --  | 56.0               | 46.0 | 37.3                | --  | +18.7          | --  | -       |
| 2.080              | 10.3                    | 18.5                       | --  | 56.0               | 46.0 | 28.8                | --  | +27.2          | --  | -       |
| 3.990              | 10.3                    | 17.5                       | --  | 56.0               | 46.0 | 27.8                | --  | +28.2          | --  | -       |
| 5.270              | 10.4                    | 12.0                       | --  | 60.0               | 50.0 | 22.4                | --  | +37.6          | --  | -       |
| 25.710             | 11.2                    | 18.1                       | --  | 60.0               | 50.0 | 29.3                | --  | +30.7          | --  | -       |



## NOTES

1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 1.040 MHz, as the worst point shown on underline:  
Correction Factor + Meter Reading (QP) = 10.3 + 31.3 = 41.6 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

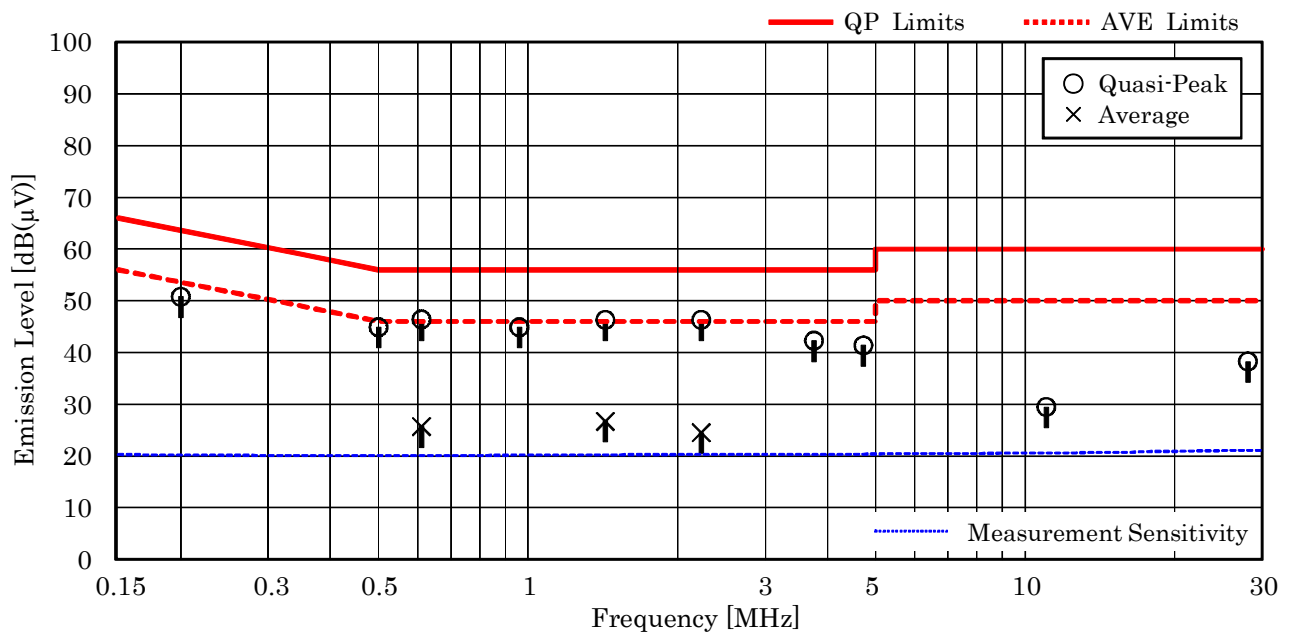
## 2) Mode of EUT : Bluetooth Low Energy

Test voltage : 120VAC 60Hz

Test Date: May 7, 2015  
Temp.: 21 °C, Humi.: 55 %

Measured phase : L1

| Frequency<br>[MHz] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] |      | Limits<br>[dB(μV)] |      | Results<br>[dB(μV)] |      | Margin<br>[dB] |       | Remarks |
|--------------------|-------------------------|----------------------------|------|--------------------|------|---------------------|------|----------------|-------|---------|
|                    |                         | QP                         | AVE  | QP                 | AVE  | QP                  | AVE  | QP             | AVE   |         |
| 0.200              | 10.2                    | 40.6                       | --   | 63.6               | 53.6 | 50.8                | --   | +12.8          | --    | -       |
| 0.500              | 10.1                    | 34.8                       | --   | 56.0               | 46.0 | 44.9                | --   | +11.1          | --    | -       |
| 0.610              | 10.1                    | 36.3                       | 15.6 | 56.0               | 46.0 | 46.4                | 25.7 | + 9.6          | +20.3 | -       |
| 0.960              | 10.3                    | 34.6                       | --   | 56.0               | 46.0 | 44.9                | --   | +11.1          | --    | -       |
| 1.430              | 10.3                    | 36.0                       | 16.4 | 56.0               | 46.0 | 46.3                | 26.7 | + 9.7          | +19.3 | -       |
| 2.230              | 10.3                    | 36.0                       | 14.2 | 56.0               | 46.0 | 46.3                | 24.5 | + 9.7          | +21.5 | -       |
| 3.760              | 10.3                    | 32.0                       | --   | 56.0               | 46.0 | 42.3                | --   | +13.7          | --    | -       |
| 4.730              | 10.4                    | 31.0                       | --   | 56.0               | 46.0 | 41.4                | --   | +14.6          | --    | -       |
| 11.030             | 10.6                    | 18.9                       | --   | 60.0               | 50.0 | 29.5                | --   | +30.5          | --    | -       |
| 28.080             | 11.1                    | 27.2                       | --   | 60.0               | 50.0 | 38.3                | --   | +21.7          | --    | -       |



### NOTES

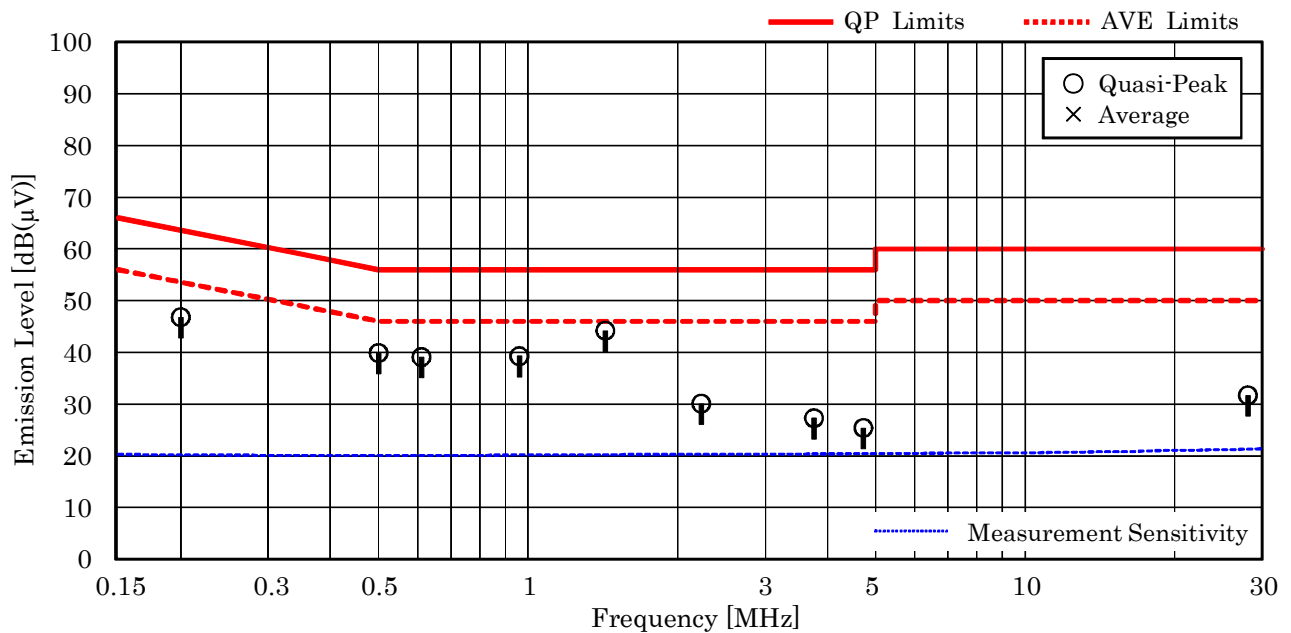
- The spectrum was checked from 0.15 MHz to 30 MHz.
- The correction factor includes the AMN insertion loss and the cable loss.
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- The symbol of "--" means "not applicable".
- Calculated result at 0.610 MHz, as the worst point shown on underline:  
Correction Factor + Meter Reading (QP) = 10.1 + 36.3 = 46.4 dB(μV)
- QP : Quasi-Peak Detector / AVE : Average Detector
- Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

Test voltage : 120VAC 60Hz

Test Date: May 7, 2015  
Temp.: 21 °C, Humi.: 55 %

Measured phase : L2

| Frequency<br>[MHz] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] |     | Limits<br>[dB(μV)] |      | Results<br>[dB(μV)] |     | Margin<br>[dB] |     | Remarks |
|--------------------|-------------------------|----------------------------|-----|--------------------|------|---------------------|-----|----------------|-----|---------|
|                    |                         | QP                         | AVE | QP                 | AVE  | QP                  | AVE | QP             | AVE |         |
| 0.200              | 10.2                    | 36.6                       | --  | 63.6               | 53.6 | 46.8                | --  | +16.8          | --  | -       |
| 0.500              | 10.1                    | 29.8                       | --  | 56.0               | 46.0 | 39.9                | --  | +16.1          | --  | -       |
| 0.610              | 10.1                    | 29.0                       | --  | 56.0               | 46.0 | 39.1                | --  | +16.9          | --  | -       |
| 0.960              | 10.2                    | 29.1                       | --  | 56.0               | 46.0 | 39.3                | --  | +16.7          | --  | -       |
| 1.430              | 10.3                    | 33.9                       | --  | 56.0               | 46.0 | 44.2                | --  | +11.8          | --  | -       |
| 2.230              | 10.3                    | 19.8                       | --  | 56.0               | 46.0 | 30.1                | --  | +25.9          | --  | -       |
| 3.760              | 10.3                    | 17.0                       | --  | 56.0               | 46.0 | 27.3                | --  | +28.7          | --  | -       |
| 4.730              | 10.4                    | 15.0                       | --  | 56.0               | 46.0 | 25.4                | --  | +30.6          | --  | -       |
| 11.030             | 10.6                    | < 10.0                     | --  | 60.0               | 50.0 | < 20.6              | --  | > +39.4        | --  | -       |
| 28.080             | 11.3                    | 20.4                       | --  | 60.0               | 50.0 | 31.7                | --  | +28.3          | --  | -       |



## NOTES

1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 1.430 MHz, as the worst point shown on underline:  
Correction Factor + Meter Reading (QP) = 10.3 + 33.9 = 44.2 dB(μV)
7. QP : Quasi-Peak Detector / AVE : Average Detector
8. Test receiver setting(s) : CISPR QP 9 kHz / Average 9 kHz

**7.9 Radiated Emission**

The requirements are ☒ - Applicable ☒ - Tested. ☐ - Not tested by applicant request.]  
☐ - Not Applicable

☒ - Passed ☐ - Failed ☐ - Not judged

**7.9.1 Worst Point and Measurement Uncertainty**

|                                    |                    |               |                   |
|------------------------------------|--------------------|---------------|-------------------|
| Min. Limit Margin (Average)        | <u>5.1</u> dB      | at            | <u>2390.0</u> MHz |
| Uncertainty of Measurement Results | 9 kHz – 30 MHz     | <u>+/-3.0</u> | dB(2 $\sigma$ )   |
|                                    | 30 MHz – 300 MHz   | <u>+/-3.8</u> | dB(2 $\sigma$ )   |
|                                    | 300 MHz – 1000 MHz | <u>+/-4.8</u> | dB(2 $\sigma$ )   |
|                                    | 1 GHz – 6 GHz      | <u>+/-4.7</u> | dB(2 $\sigma$ )   |
|                                    | 6 GHz – 18 GHz     | <u>+/-4.6</u> | dB(2 $\sigma$ )   |
|                                    | 18 GHz – 40 GHz    | <u>+/-5.5</u> | dB(2 $\sigma$ )   |

Remarks : IEEE802.11n mode, Y axis position.

## 7.9.2 Test Instruments

| Anechoic Chamber A2   |                   |                 |        |           |          |
|-----------------------|-------------------|-----------------|--------|-----------|----------|
| Type                  | Model             | Manufacturer    | ID No. | Last Cal. | Interval |
| Test Receiver         | ESU 26            | Rohde & Schwarz | A-6    | 2015/4    | 1 Year   |
| Loop Antenna          | HFH2-Z2           | Rohde & Schwarz | C-2    | 2014/8    | 1 Year   |
| RF Cable              | RG213/U           | SUHNER          | H-28   | 2014/8    | 1 Year   |
| Biconical Antenna     | VHA9103/BBA9106   | Schwarzbeck     | C-30   | 2014/5    | 1 Year   |
| Log-periodic Antenna  | UHALP9108-A1      | Schwarzbeck     | C-31   | 2014/5    | 1 Year   |
| RF Cable              | S 10162 B-11 etc. | SUHNER          | H-4    | 2015/4    | 1 Year   |
| Site Attenuation      | --                | ----            | H-15   | 2015/1    | 1 Year   |
| Pre-Amplifier         | TPA0118-36        | TOYO            | A-37   | 2014/5    | 1 Year   |
| Pre-Amplifier         | RP1826G-45H       | EMCS            | A-53   | 2014/7    | 1 Year   |
| Horn Antenna          | 91888-2           | EATON           | C-41-1 | 2014/7    | 1 Year   |
| Horn Antenna          | 91889-2           | EATON           | C-41-2 | 2014/7    | 1 Year   |
| Horn Antenna          | 3160-04           | EMCO            | C-55   | 2014/6    | 1 Year   |
| Horn Antenna          | 3160-05           | EMCO            | C-56   | 2014/6    | 1 Year   |
| Horn Antenna          | 3160-06           | EMCO            | C-57   | 2014/6    | 1 Year   |
| Horn Antenna          | 3160-07           | EMCO            | C-58   | 2014/6    | 1 Year   |
| Horn Antenna          | 3160-08           | EMCO            | C-59   | 2014/6    | 1 Year   |
| Horn Antenna          | 3160-09           | EMCO            | C-48   | 2014/7    | 1 Year   |
| Attenuator            | 54A-10            | Weinschel       | D-29   | 2014/9    | 1 Year   |
| Attenuator            | 2-10              | Weinschel       | D-79   | 2014/11   | 1 Year   |
| Band Rejection Filter | BRM50701          | MICRO-TRONICS   | D-93   | 2015/2    | 1 Year   |
| RF Cable              | SUCOFLEX104       | SUHNER          | C-66   | 2015/1    | 1 Year   |
| RF Cable              | SUCOFLEX104       | SUHNER          | C-67   | 2015/1    | 1 Year   |
| RF Cable              | SUCOFLEX102EA     | SUHNER          | C-69   | 2015/1    | 1 Year   |
| SVSWR                 | --                | ----            | H-19   | 2015/2    | 1 Year   |
| Pre-Amplifier         | 310N              | SONOMA          | A-17   | 2015/4    | 1 Year   |

### 7.9.3 Test Method and Test Setup (Diagrammatic illustration)

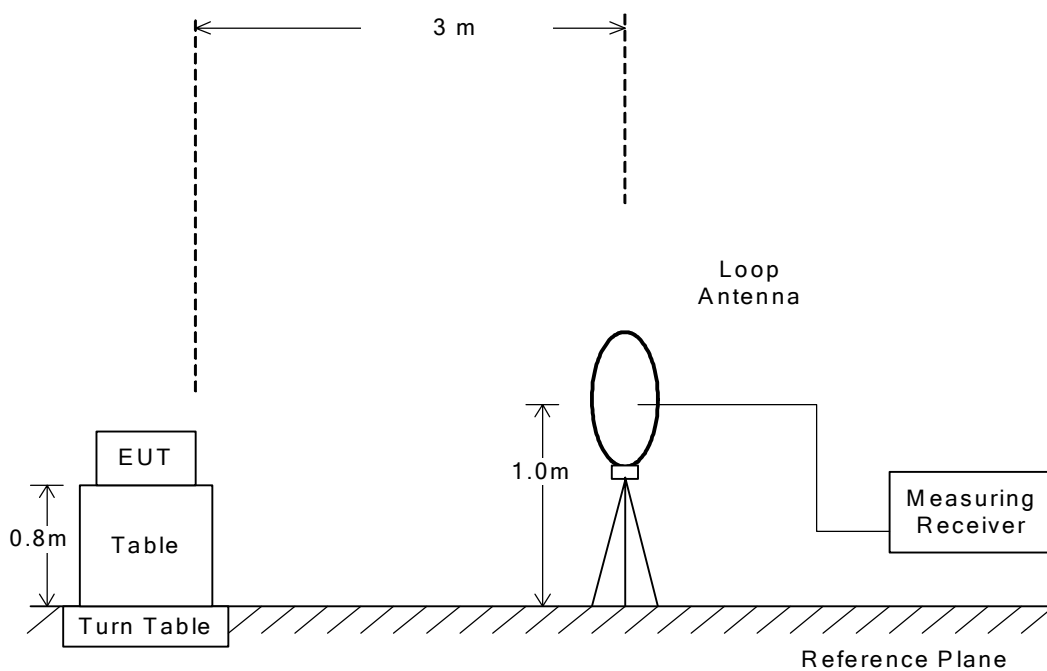
#### 7.9.3.1 Radiated Emission 9 kHz – 30 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for the final tests.

– Side View –





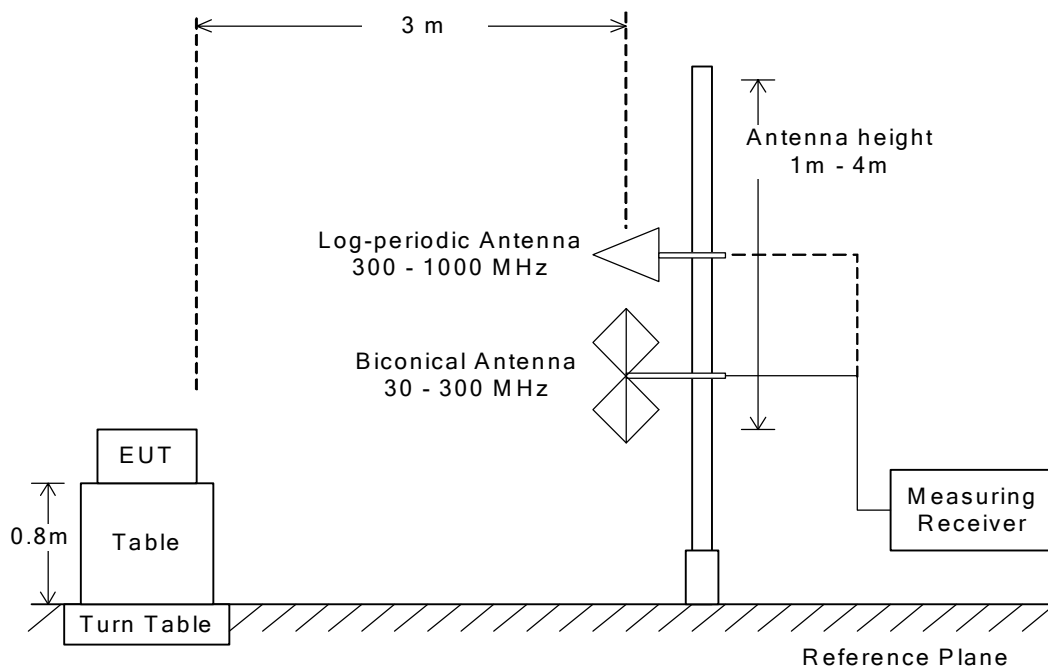
### 7.9.3.2 Radiated Emission 30 MHz – 1000 MHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for the final tests.

– Side View –



### 7.9.3.3 Radiated Emission above 1 GHz

The preliminary tests were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT.

The EUT configuration(in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions.

This configurations was used for the final tests.

The setting of the measuring instruments are shown as follows:

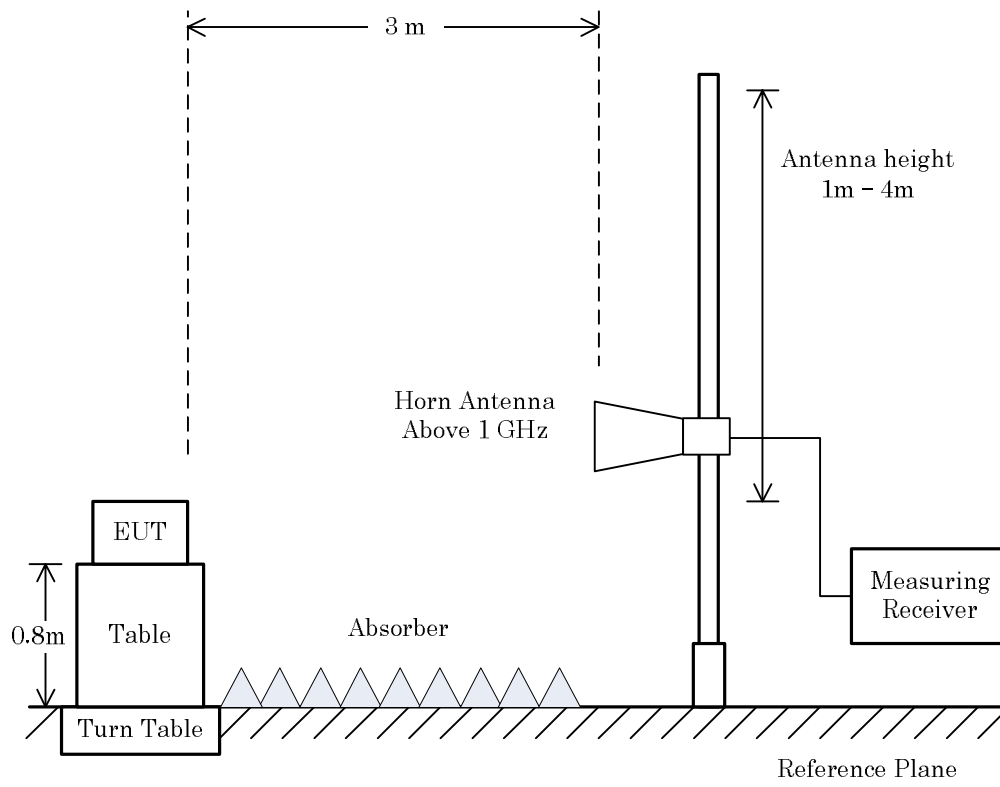
| Type              | Peak           | Average          |
|-------------------|----------------|------------------|
| Detector Function | Peak           | Peak             |
| Res. Bandwidth    | 1 MHz          | 1 MHz            |
| Video Bandwidth   | 3 MHz          | $\geq 1/T * 1$ ) |
| Video Filtering   | Linear Voltage | Linear Voltage   |
| Sweep Time        | AUTO           | AUTO             |
| Trace             | Max Hold       | Max Hold         |

Note: 1. T: Minimum transmission duration

Average (VBW) Setting:

| Mode                        | Interval<br>(msec) | Cycle<br>(msec) | Duty cycle<br>(%) | Burst on period(T)<br>(msec) | Min. VBW(1/T)<br>(kHz) | VBW Setting<br>(kHz)) |
|-----------------------------|--------------------|-----------------|-------------------|------------------------------|------------------------|-----------------------|
| IEEE802.11b(11Mbps)         | 0.02               | 0.94            | 97.9%             | 0.92                         | 1.09                   | 2.00                  |
| IEEE802.11g(36Mbps)         | 0.02               | 0.26            | 92.3%             | 0.24                         | 4.17                   | 5.00                  |
| IEEE802.11n(19.5Mbps(MCS2)) | 0.02               | 0.47            | 95.7%             | 0.45                         | 2.22                   | 3.00                  |
| Bluetooth LE                | 0.23               | 0.63            | 63.5%             | 0.40                         | 2.50                   | 3.00                  |

– Side View –



**NOTE**

The antenna height is scanned depending on the EUT's size and mounting height.

## 7.9.4 Test Data

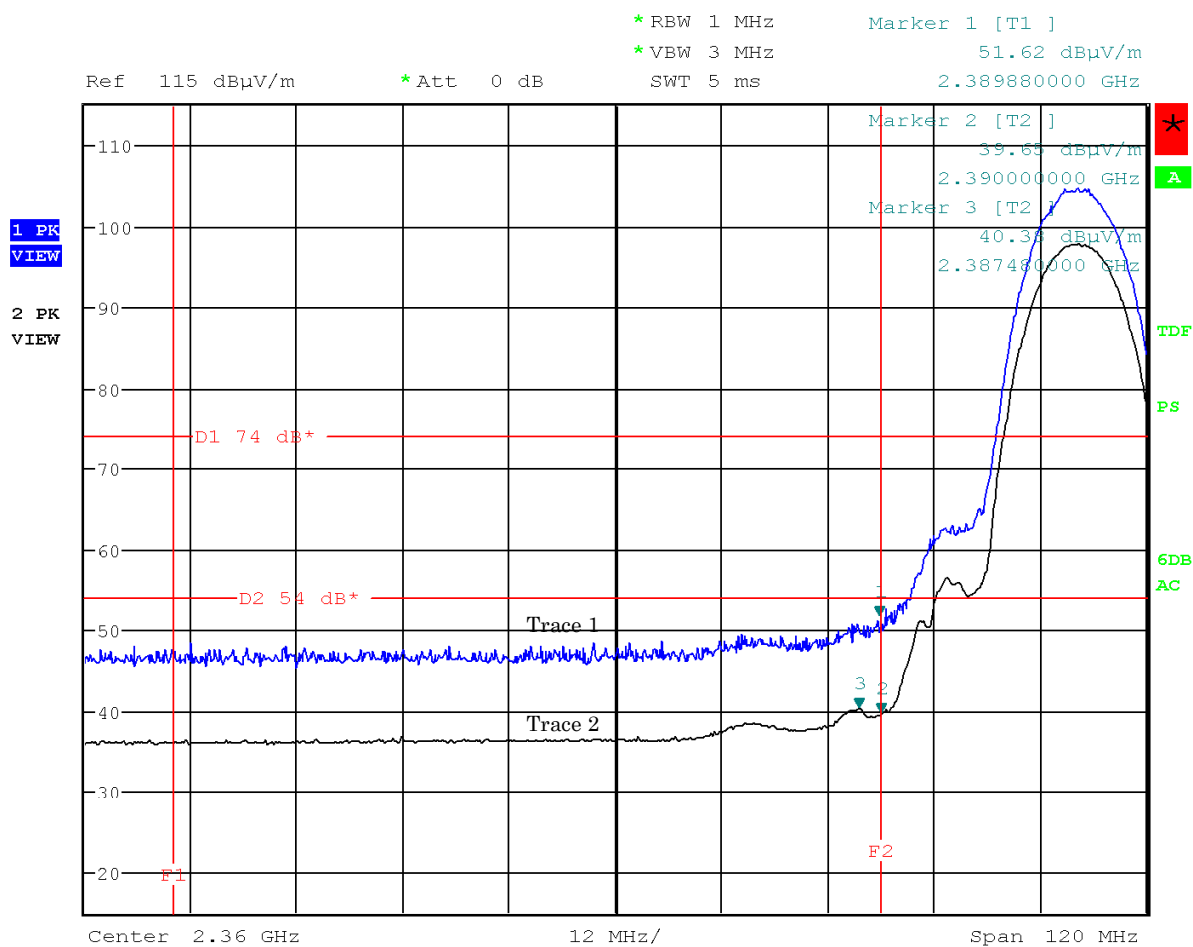
### 7.9.4.1 Band-edge Compliance

Test Date : April 29, 2015

Temp.:24°C, Humi:52%

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11b)

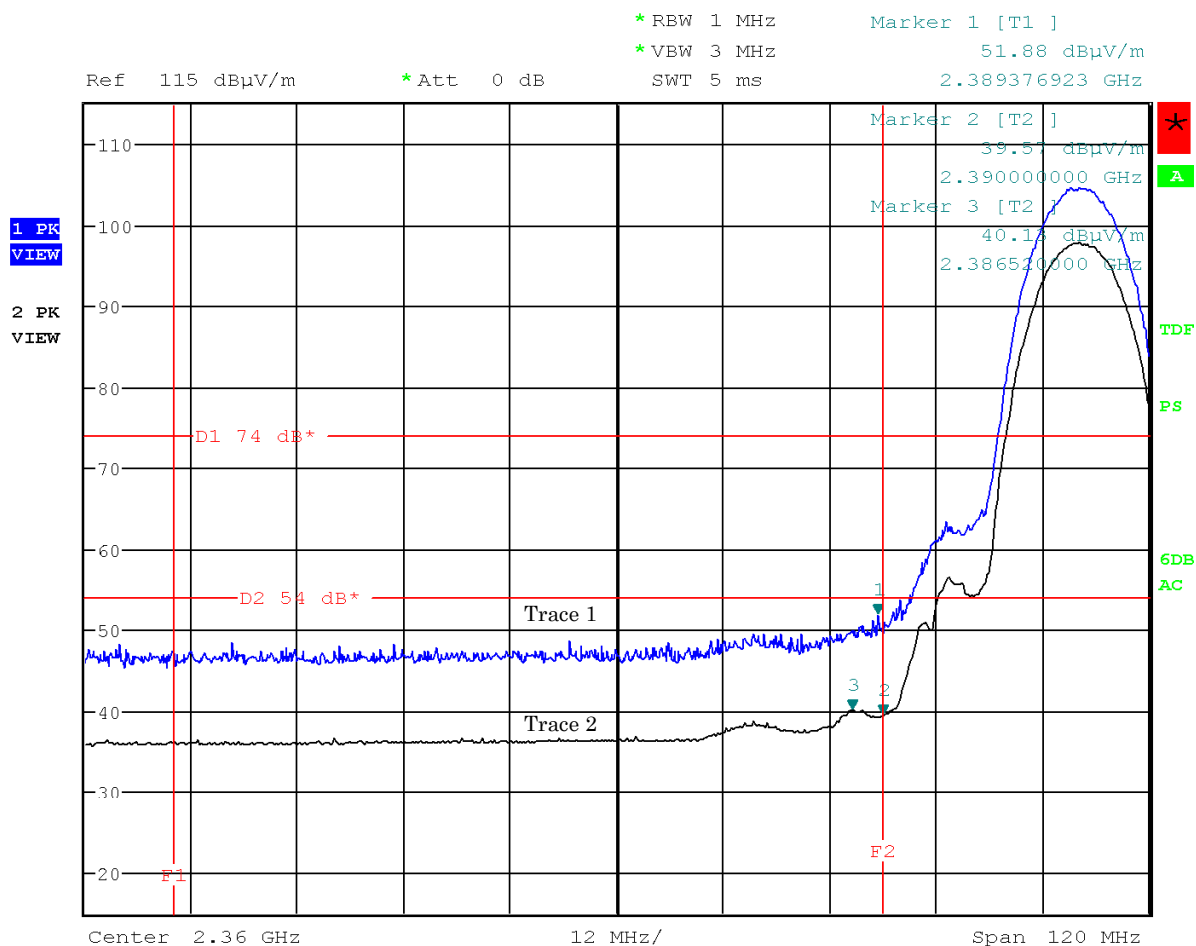
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11b)

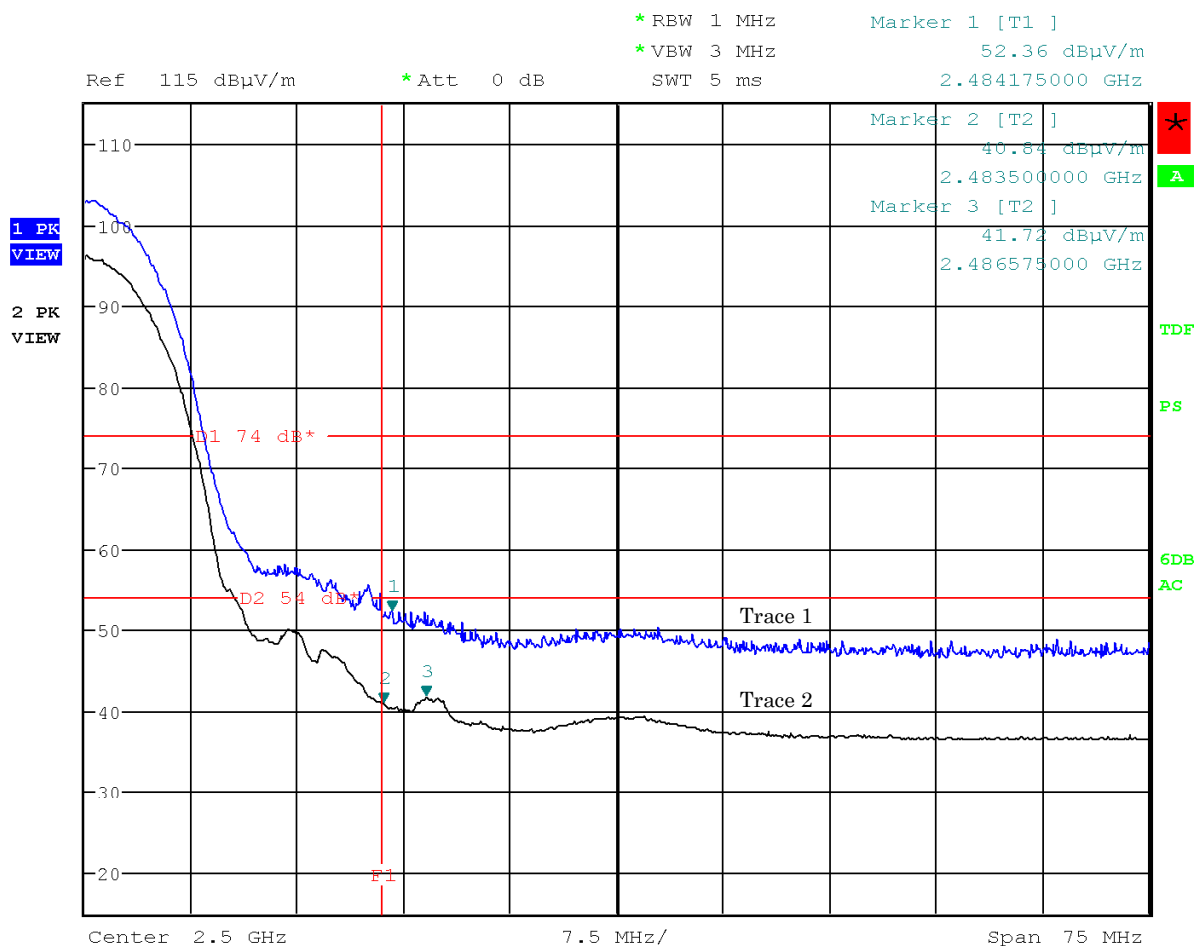
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11b)

Antenna Polarization : Horizontal

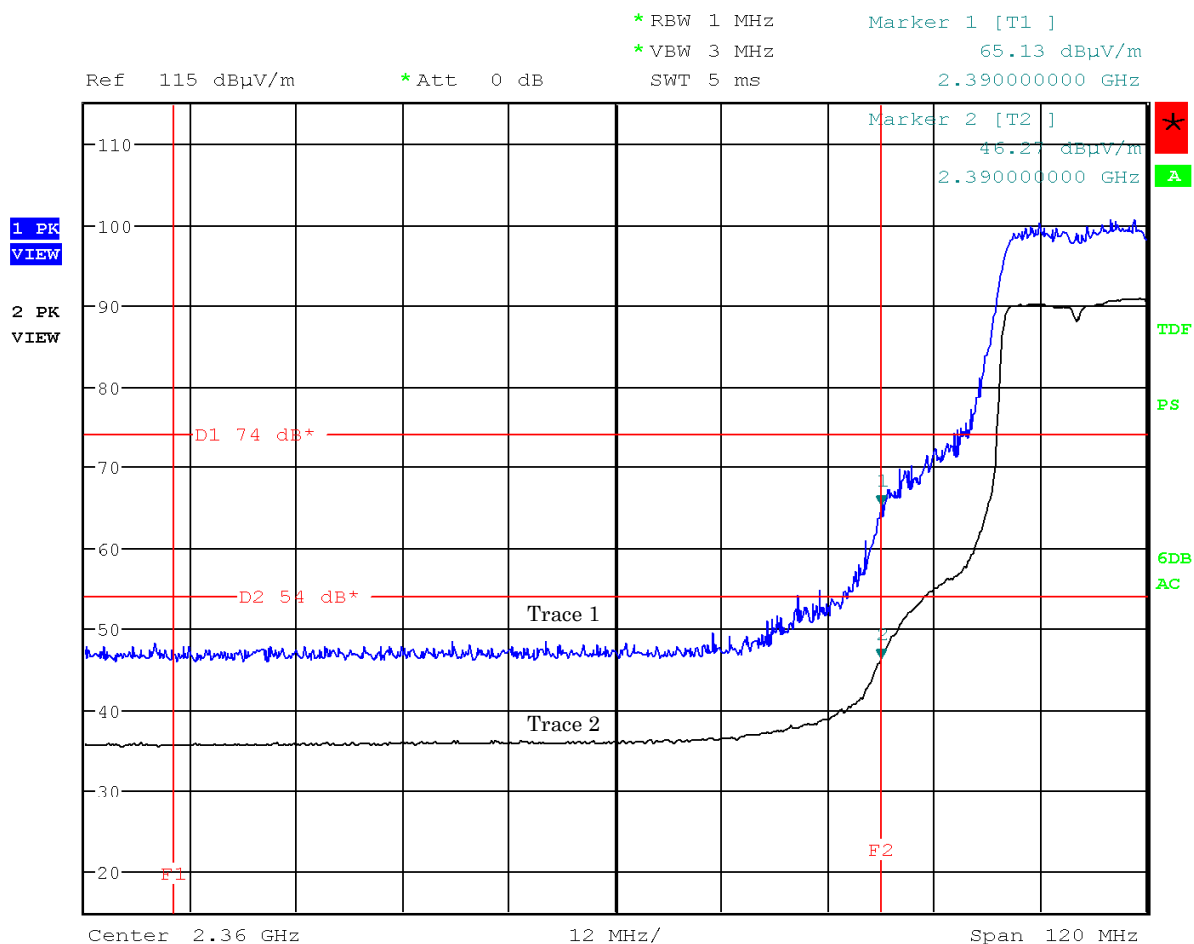


Note: The trace 1 is Peak . The trace 2 is Average.



Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11g)

Antenna Polarization : Horizontal

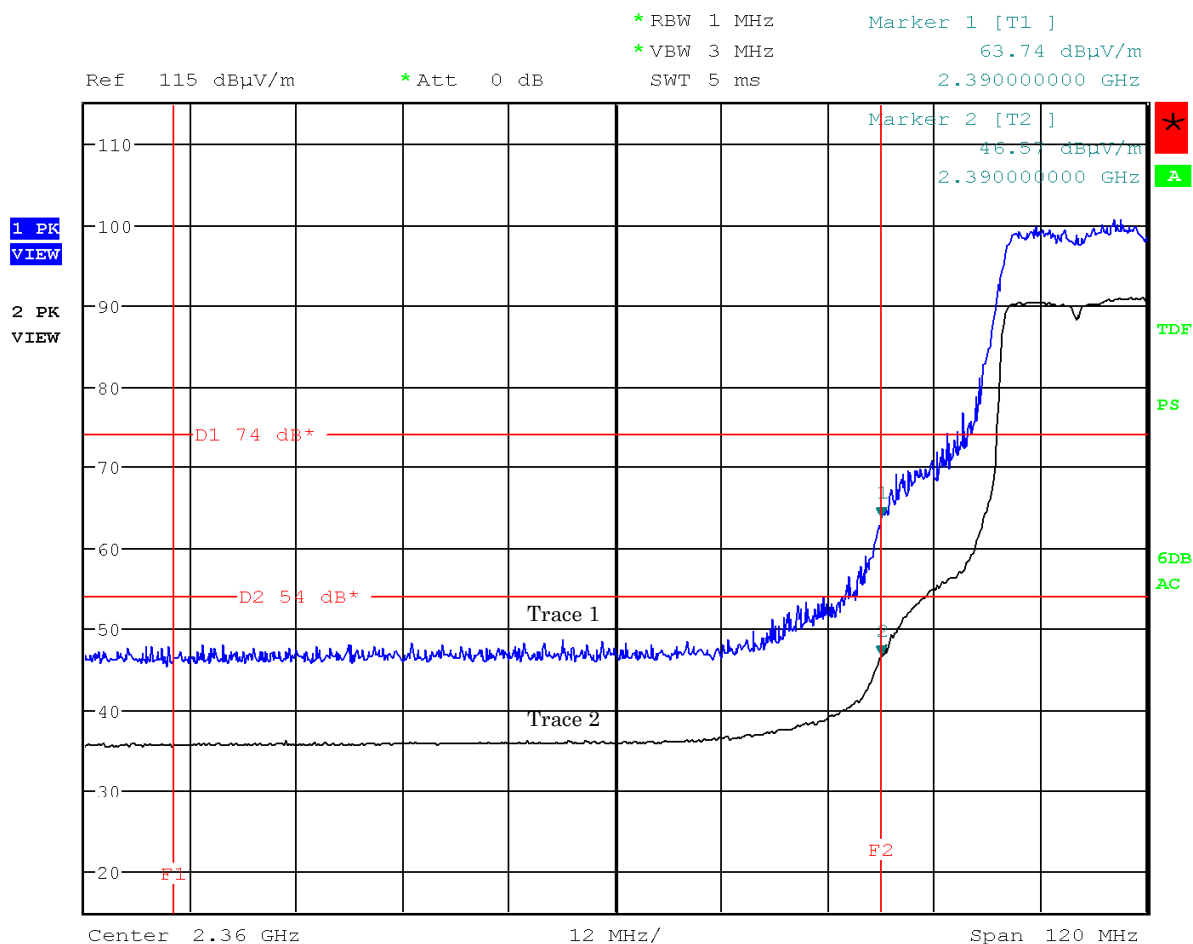


Note: The trace 1 is Peak . The trace 2 is Average.



Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11g)

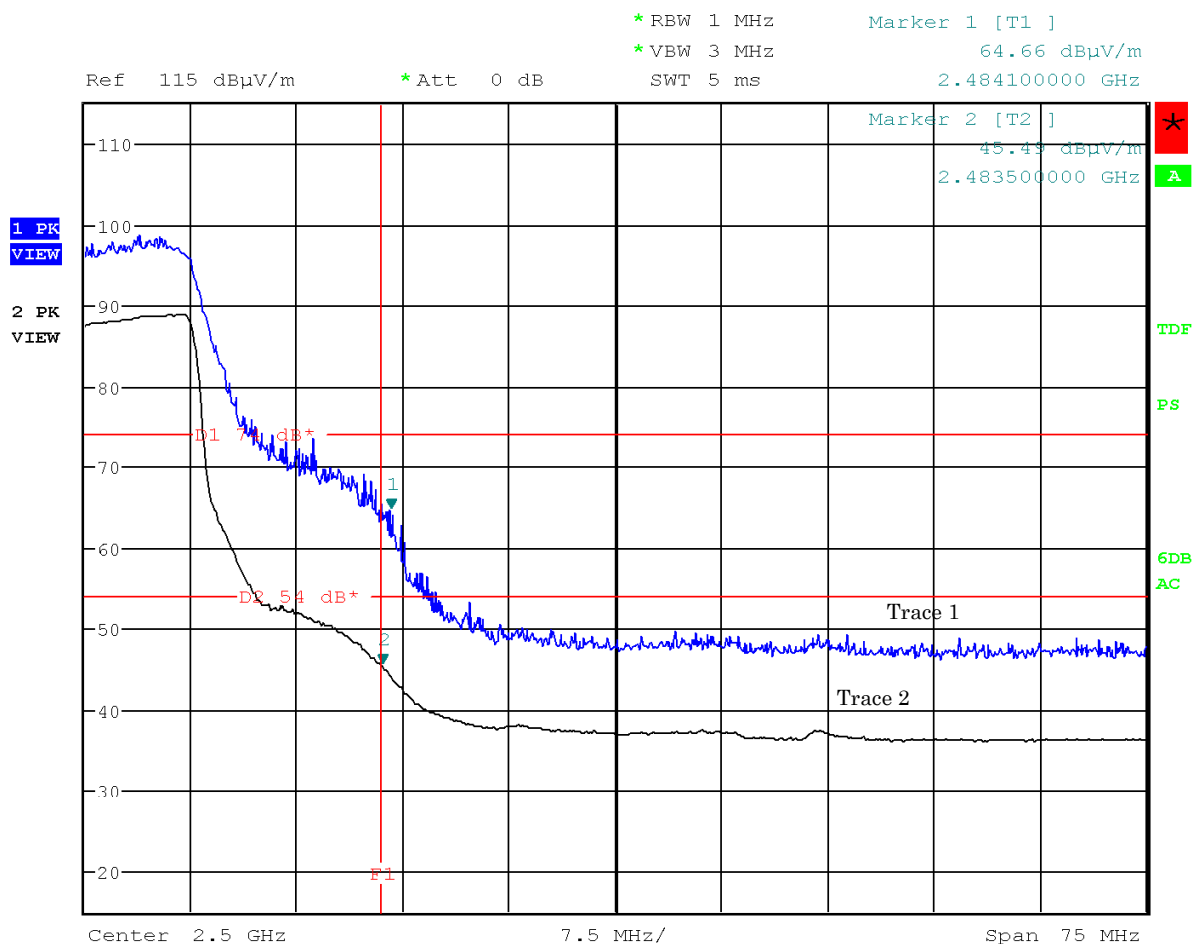
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11g)

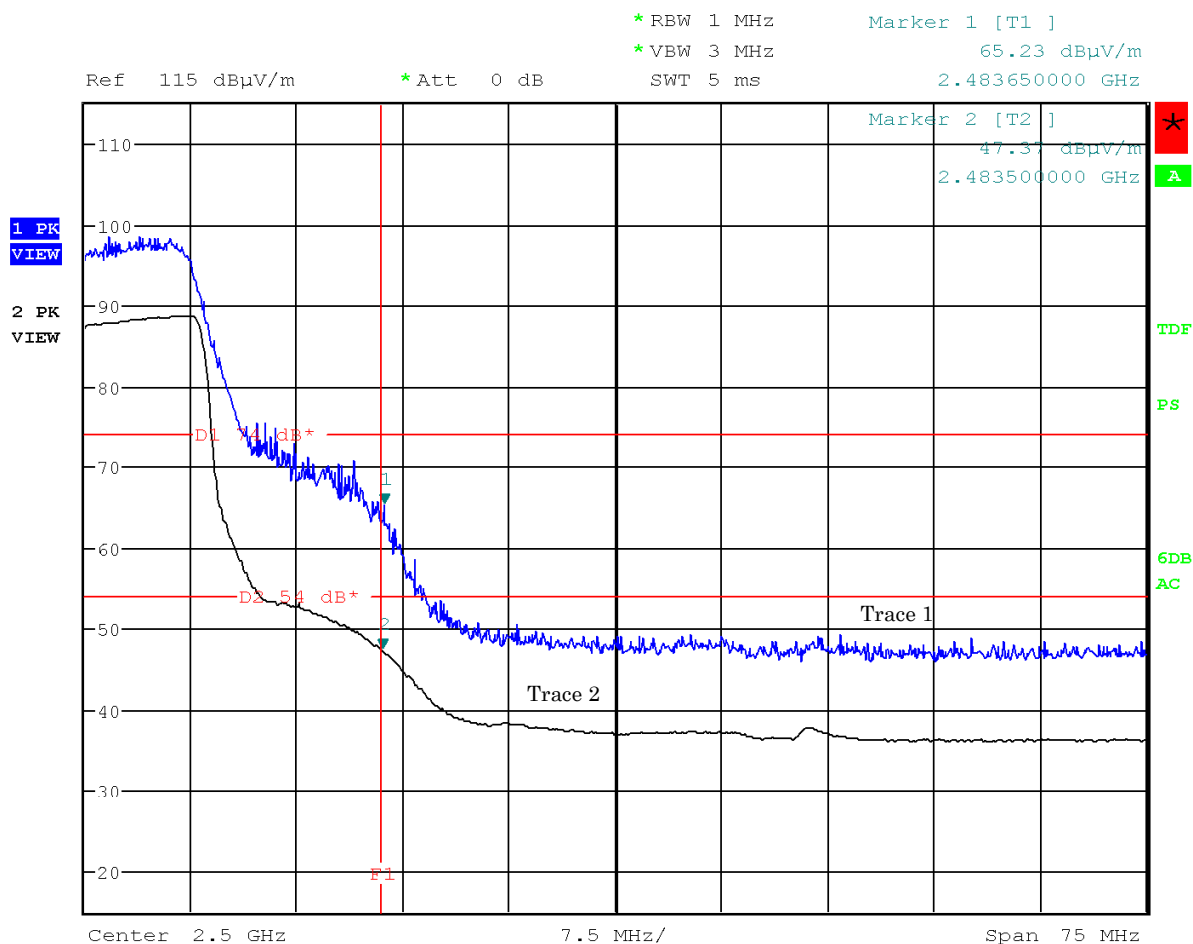
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11g)

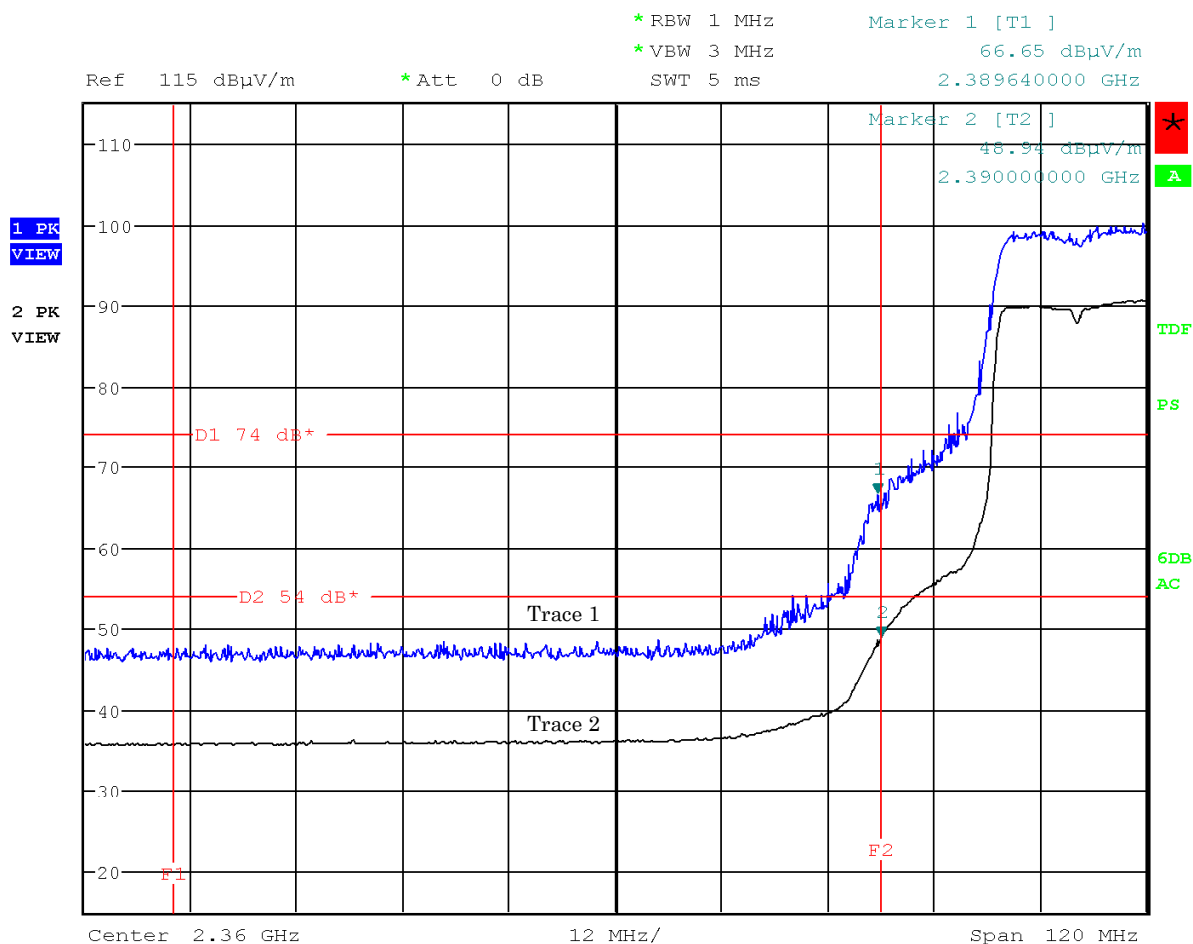
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11n)

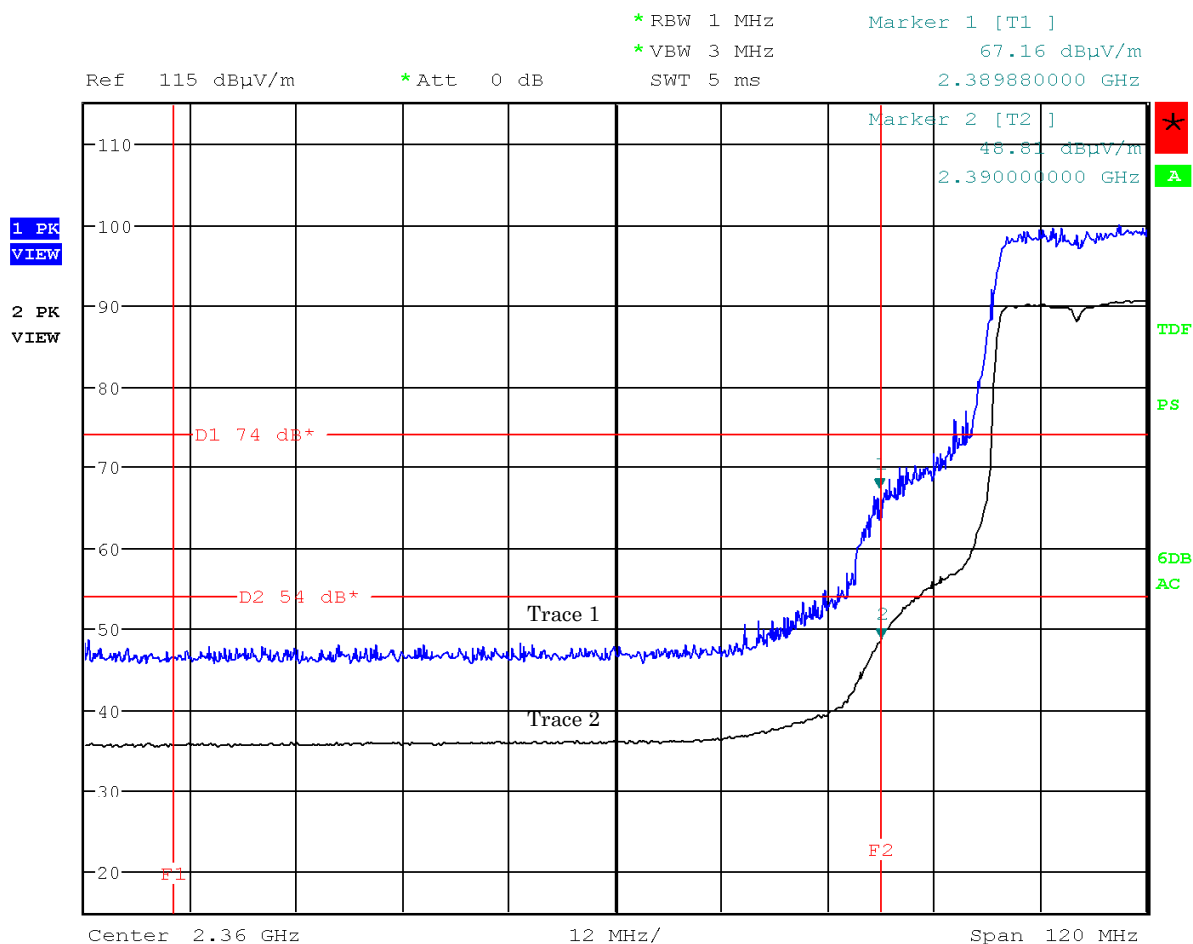
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 1ch: 2412 MHz, (IEEE 802.11n)

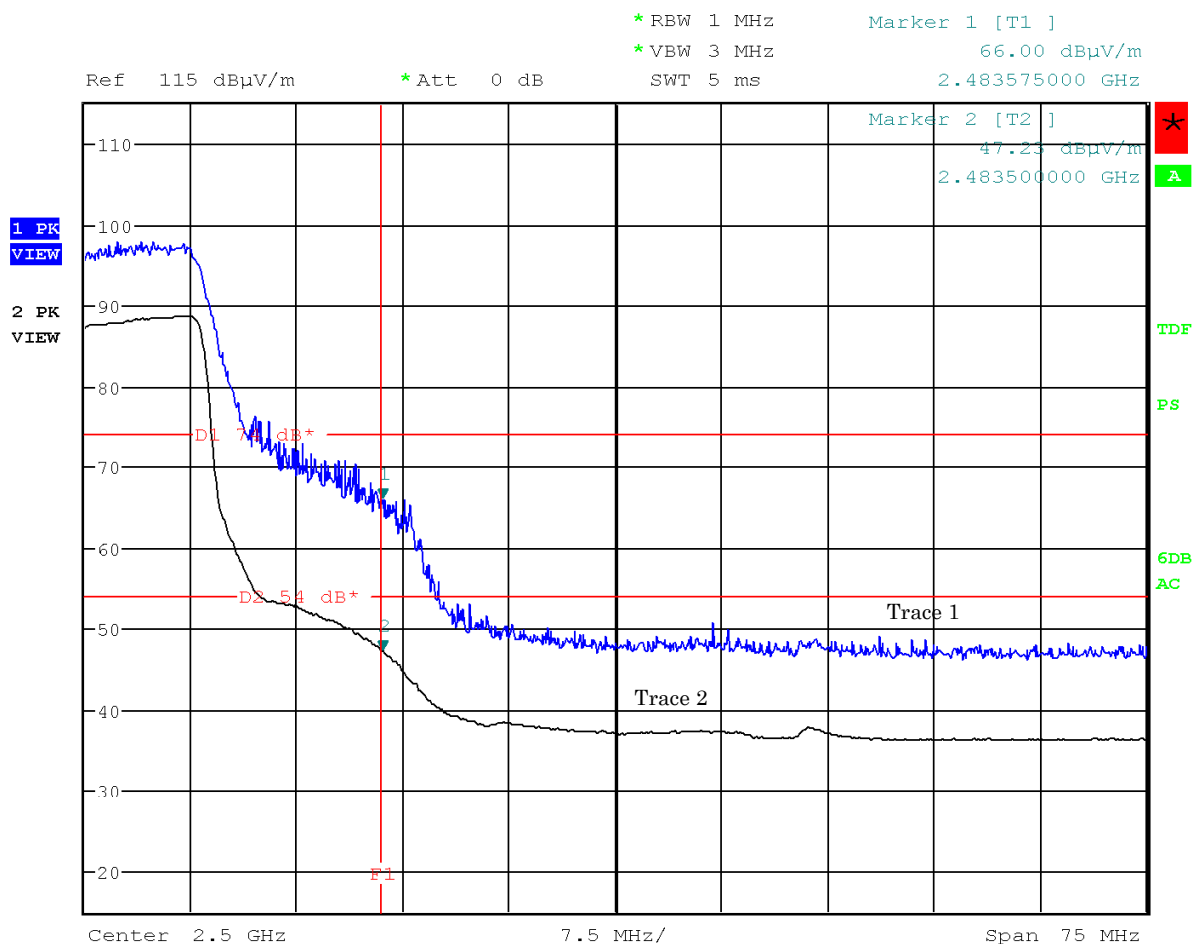
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11n)

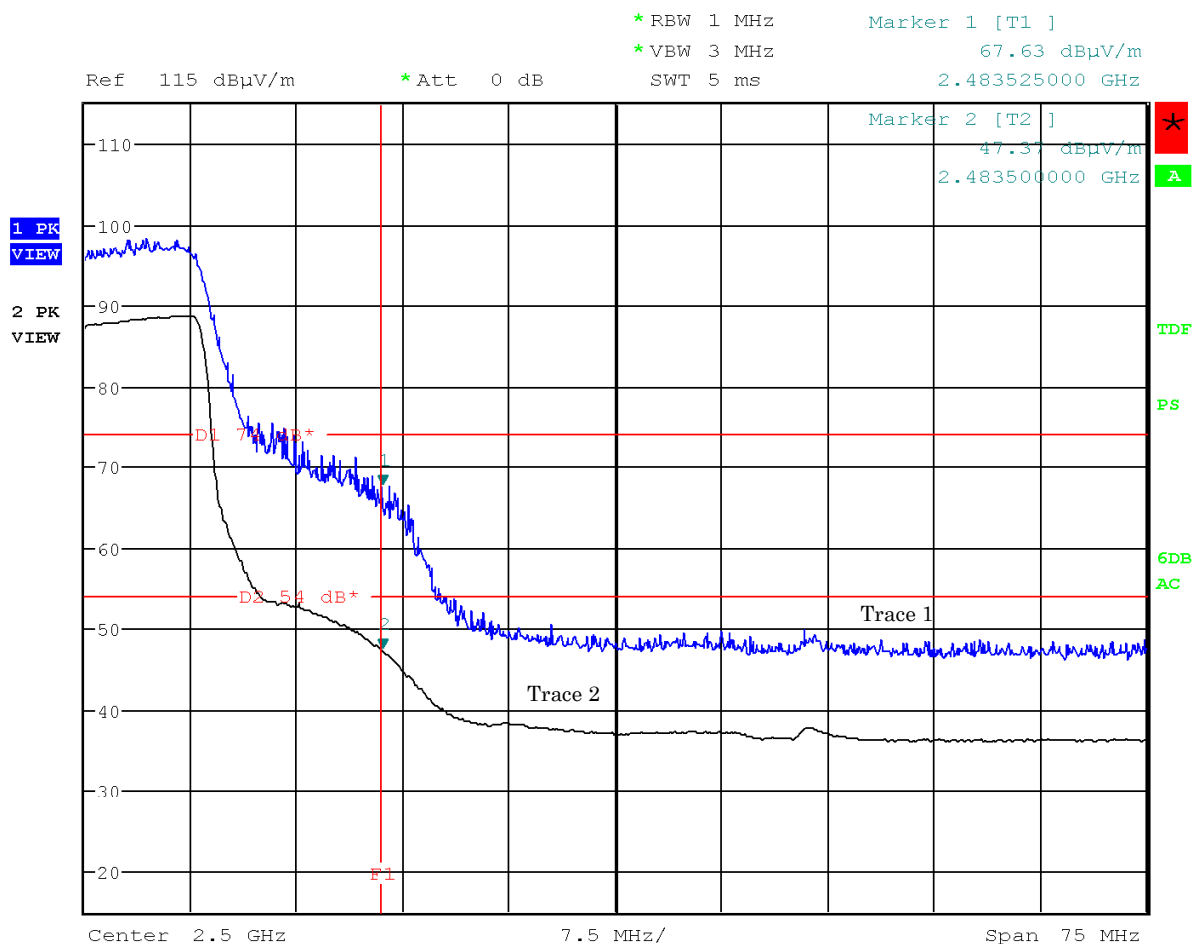
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : 11ch: 2462 MHz, (IEEE 802.11n)

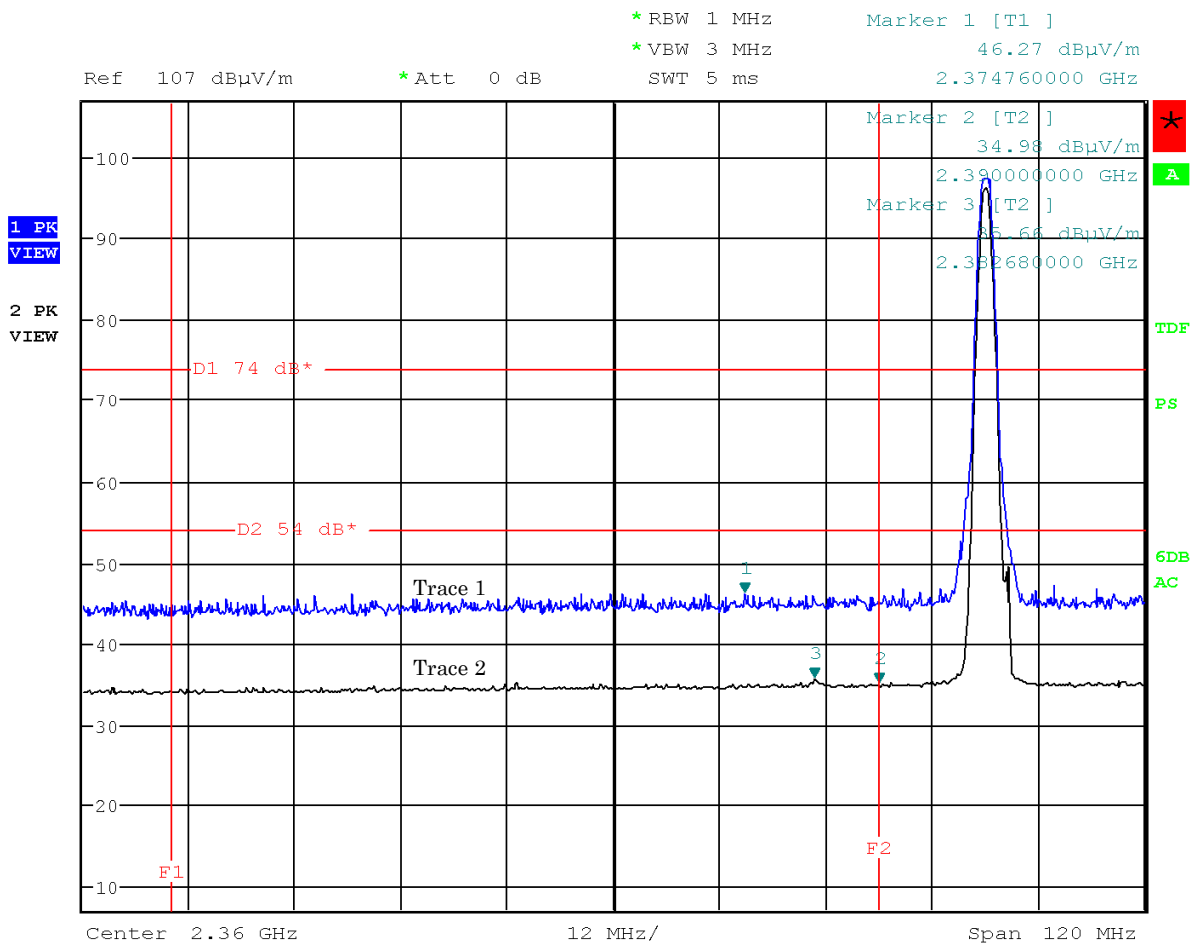
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : Bluetooth Low Energy, Hopping off (0ch: 2402 MHz)

Antenna Polarization : Horizontal

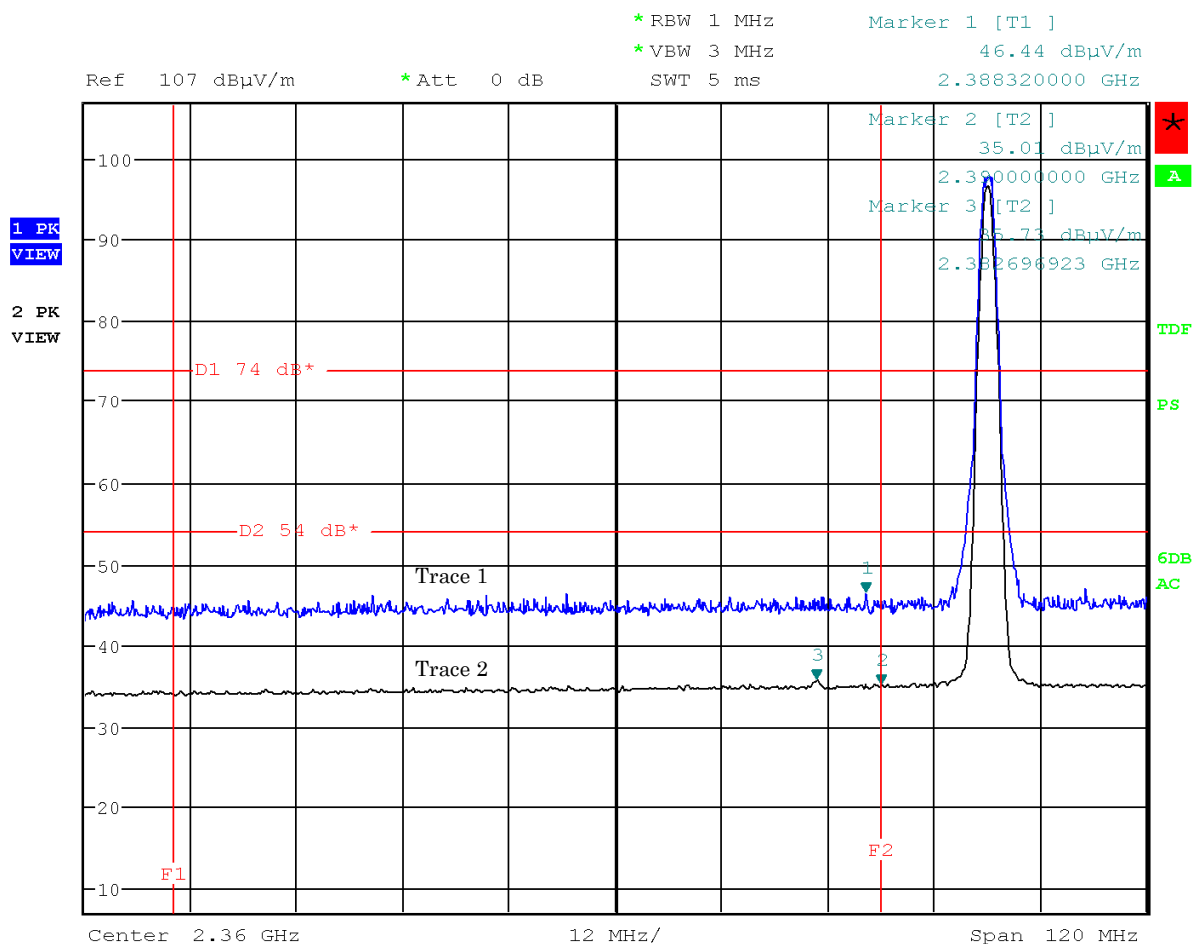


Note: The trace 1 is Peak . The trace 2 is Average.



Mode of EUT : Bluetooth Low Energy, Hopping off (0ch: 2402 MHz)

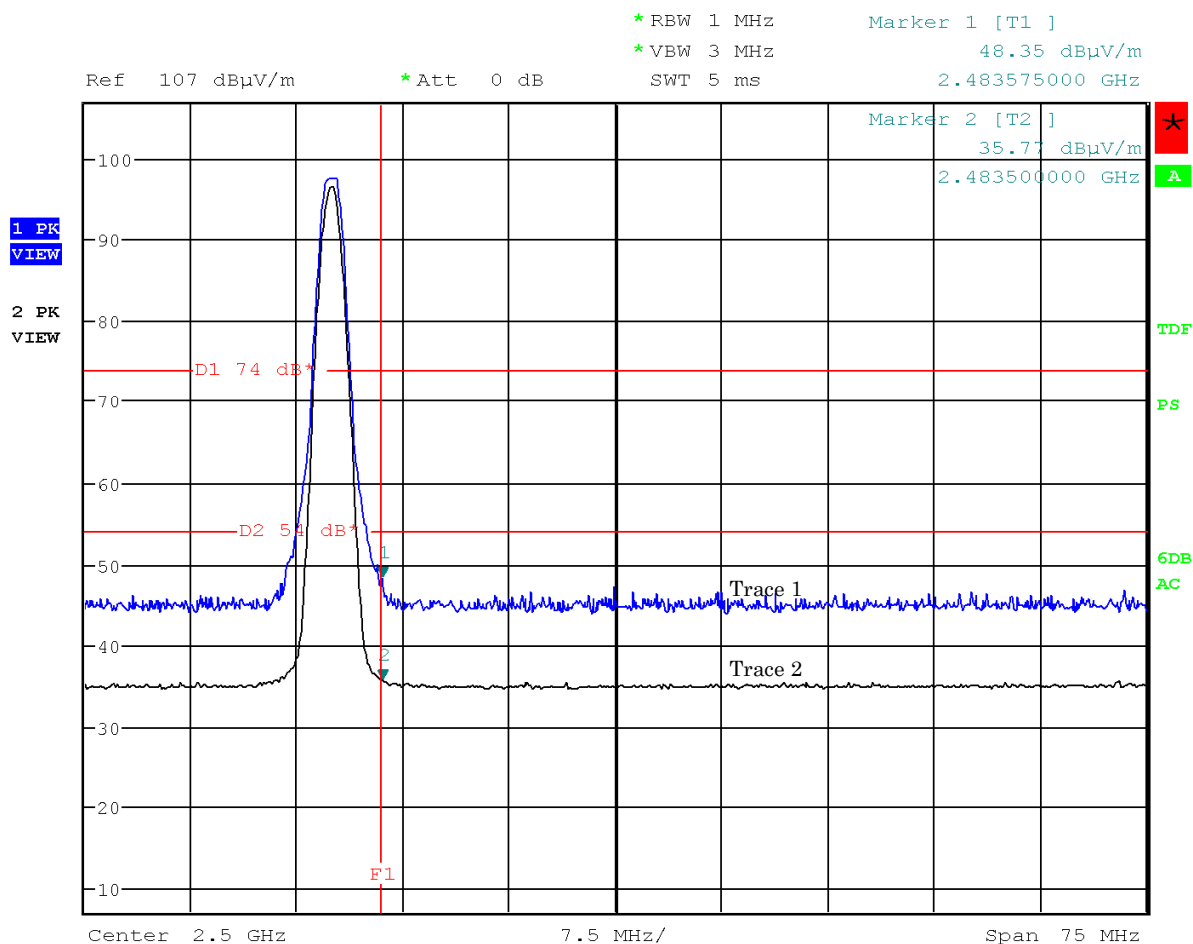
Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : Bluetooth Low Energy, Hopping off (39ch: 2480 MHz)

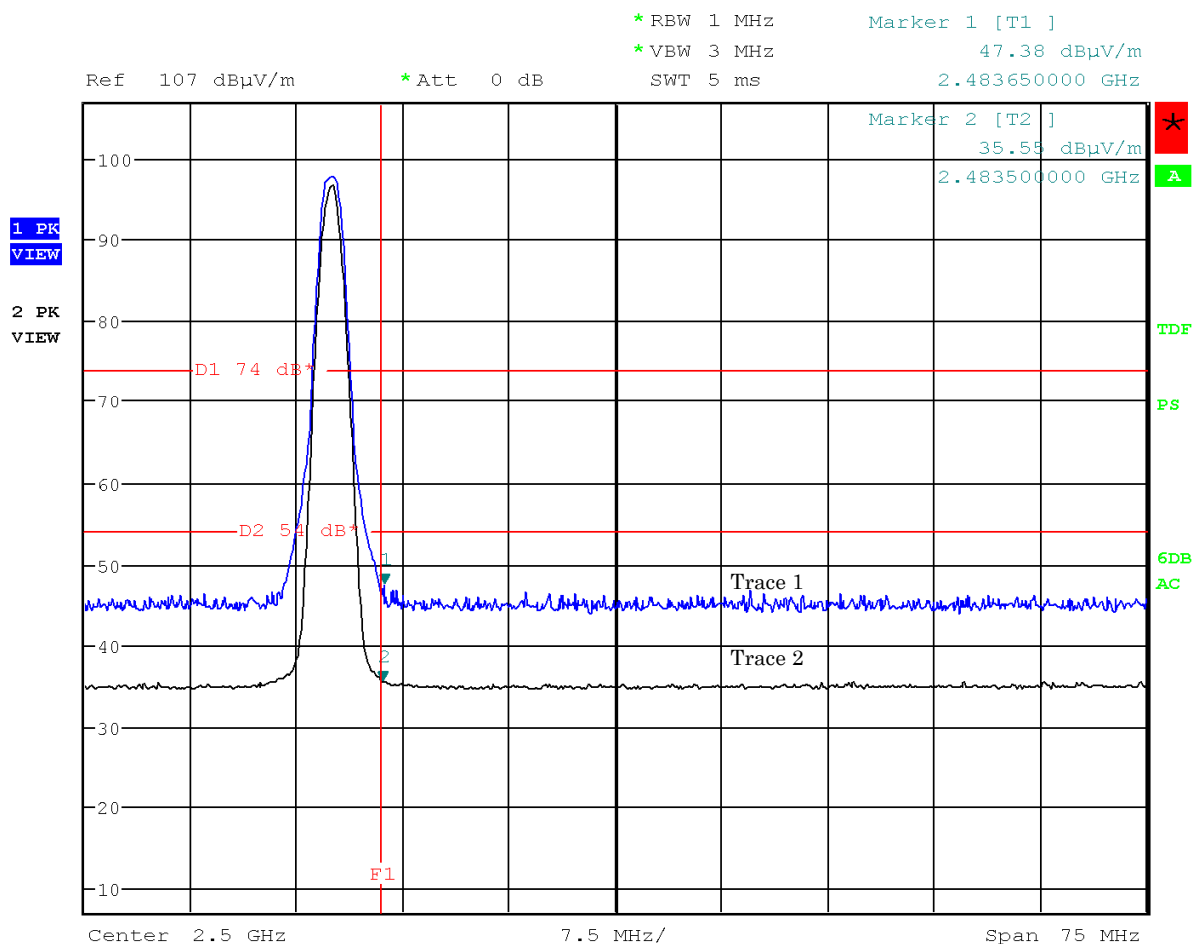
Antenna Polarization : Horizontal



Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : Bluetooth Low Energy, Hopping off (39ch: 2480 MHz)

Antenna Polarization : Vertical



Note: The trace 1 is Peak . The trace 2 is Average.

#### 7.9.4.2 Other Spurious Emission (9kHz – 30MHz)

Test Date : April 30, 2015

Temp.:22°C, Humi:48%

Mode of EUT : WLAN/Bluetooth LE

Results : No spurious emissions in the range 20dB below the limit.

#### 7.9.4.3 Other Spurious Emission (30MHz – 1000MHz)

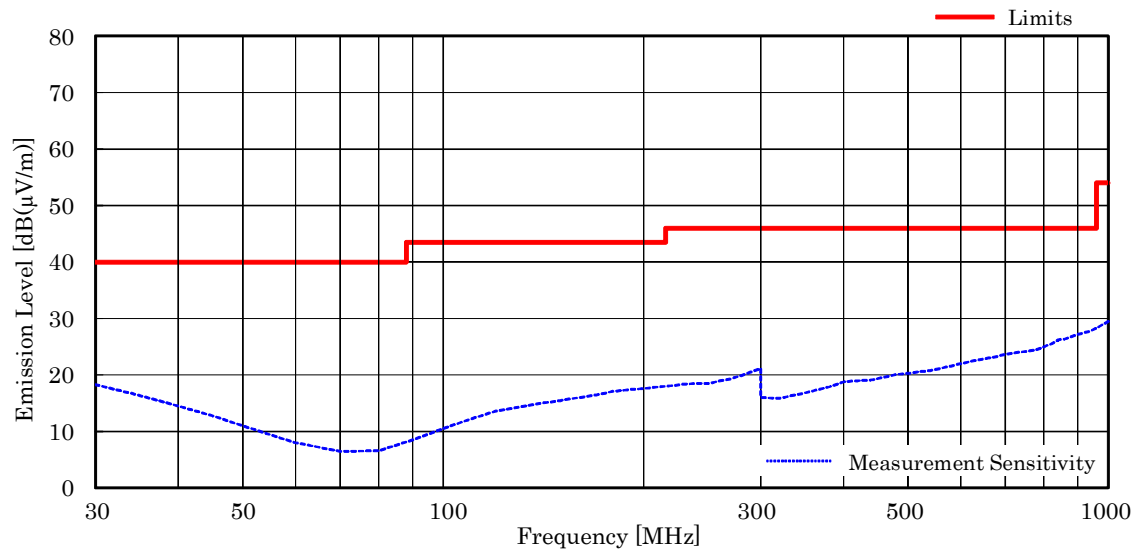
Mode of EUT : (WLAN) All modes have been investigated and the worst case mode for channel (06ch: 2437MHz / IEEE802.11b, IEEE802.11g and IEEE802.11n) has been listed.

Test Date: April 30, 2015

Temp.: 22 °C, Humi: 48 %

Antenna pole : Horizontal

| Frequency<br>[MHz] | Antenna<br>Factor<br>[dB(1/m)] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] | Limits<br>[dB(μV/m)] | Results<br>[dB(μV/m)] | Margin<br>[dB] | Remarks |
|--------------------|--------------------------------|-------------------------|----------------------------|----------------------|-----------------------|----------------|---------|
| 62.10              | 7.7                            | -27.1                   | < 27.0                     | 40.0                 | < 7.6                 | > +32.4        | -       |



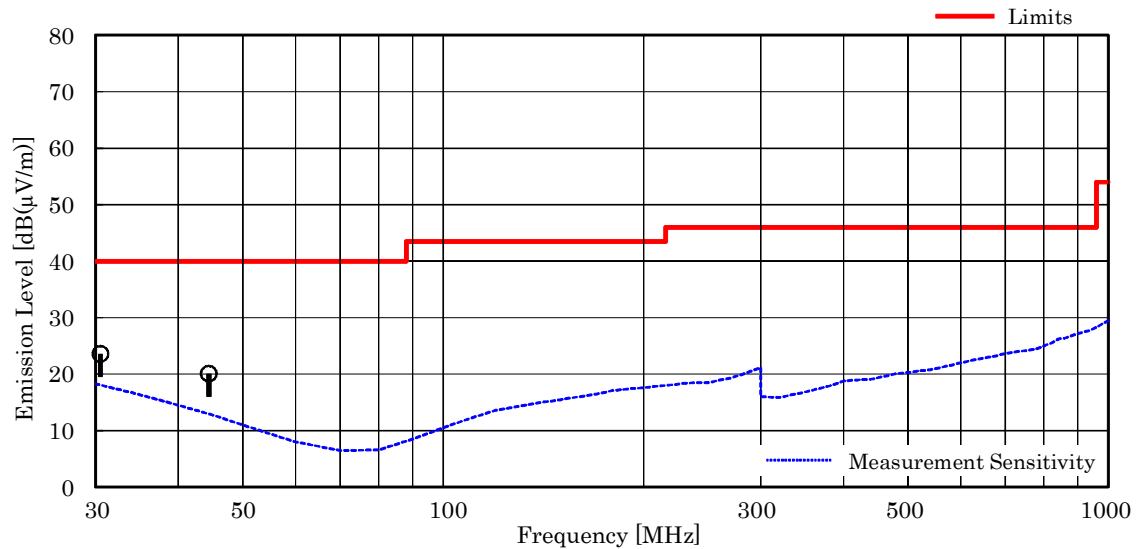
#### NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 62.10 MHz, as the worst point shown on underline:  
Antenna Factor + Coorection Factor + Meter Reading = 7.7 + (-27.1) + <27.0 = <7.6 dB(μV/m)  
Antenna Height : 2.15 m, Turntable Angle : 264 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

Test Date: April 30, 2015  
Temp.: 22 °C, Humi: 48 %

Antenna pole : Vertical

| Frequency<br>[MHz] | Antenna<br>Factor<br>[dB(1/m)] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] | Limits<br>[dB(μV/m)] | Results<br>[dB(μV/m)] | Margin<br>[dB] | Remarks |
|--------------------|--------------------------------|-------------------------|----------------------------|----------------------|-----------------------|----------------|---------|
| 30.54              | 18.6                           | -27.5                   | 32.5                       | 40.0                 | 23.6                  | +16.4          | -       |
| 44.44              | 13.3                           | -27.3                   | 34.1                       | 40.0                 | 20.1                  | +19.9          | -       |
| 62.98              | 7.5                            | -27.1                   | < 27.0                     | 40.0                 | < 7.4                 | > +32.6        | -       |



NOTES

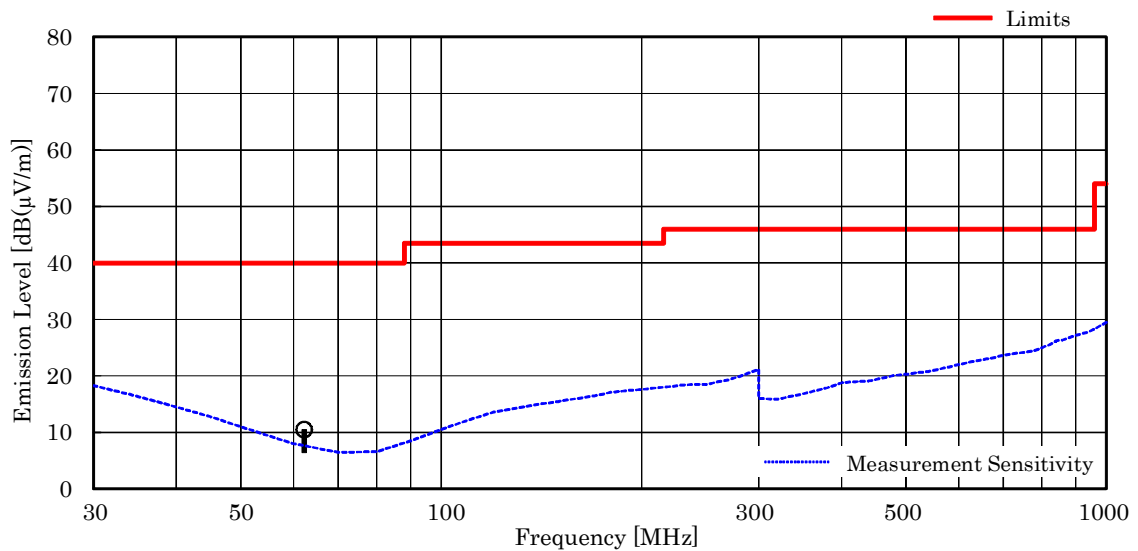
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 30.54 MHz, as the worst point shown on underline:  
Antenna Factor + Coorection Factor + Meter Reading = 18.6 + (-27.5) + 32.5 = 23.6 dB(μV/m)  
Antenna Height : 1.00 m, Turntable Angle : 322 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

Mode of EUT : Bluetooth Low Energy

Test Date: April 30, 2015  
Temp.: 22 °C, Humi: 48 %

Antenna pole : Horizontal

| Frequency<br>[MHz] | Antenna<br>Factor<br>[dB(1/m)] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] | Limits<br>[dB(μV/m)] | Results<br>[dB(μV/m)] | Margin<br>[dB] | Remarks |
|--------------------|--------------------------------|-------------------------|----------------------------|----------------------|-----------------------|----------------|---------|
| 62.25              | 7.6                            | -27.1                   | 30.0                       | 40.0                 | 10.5                  | +29.5          | -       |



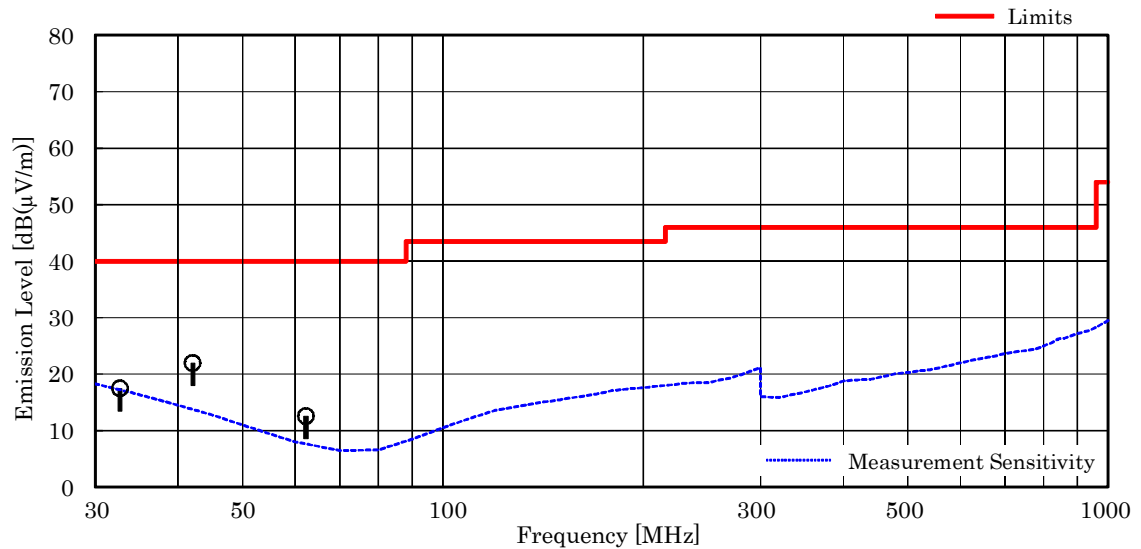
## NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 62.25 MHz, as the worst point shown on underline:  
Antenna Factor + Coorection Factor + Meter Reading = 7.6 + (-27.1) + 30.0 = 10.5 dB(μV/m)  
Antenna Height : 3.12 m, Turntable Angle : 249 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

Test Date: April 30, 2015  
Temp.: 22 °C, Humi: 48 %

Antenna pole : Vertical

| Frequency<br>[MHz] | Antenna<br>Factor<br>[dB(1/m)] | Corr.<br>Factor<br>[dB] | Meter Readings<br>[dB(μV)] | Limits<br>[dB(μV/m)] | Results<br>[dB(μV/m)] | Margin<br>[dB] | Remarks |
|--------------------|--------------------------------|-------------------------|----------------------------|----------------------|-----------------------|----------------|---------|
| 32.69              | 17.7                           | -27.5                   | 27.3                       | 40.0                 | 17.5                  | +22.5          | -       |
| 42.05              | 14.2                           | -27.3                   | 35.1                       | 40.0                 | 22.0                  | +18.0          | -       |
| 62.25              | 7.6                            | -27.1                   | 32.1                       | 40.0                 | 12.6                  | +27.4          | -       |



NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 42.05 MHz, as the worst point shown on underline:  
Antenna Factor + Coorection Factor + Meter Reading = 14.2 + (-27.3) + 35.1 = 22.0 dB(μV/m)  
Antenna Height : 1.00 m, Turntable Angle : 150 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

#### 7.9.4.4 Other Spurious Emission (Above 1000MHz)

##### 7.9.4.4.1 Mode of TX

##### 7.9.4.4.1.1 IEEE802.11b

Test Date: April 29, 2015

Temp.: 24 °C, Humi: 52 %

| Frequency                     | Antenna | Corr.     | Meter Readings [dB(μV)] |        |          |        | Limits     |      | Results    |        | Margin  | Remarks |
|-------------------------------|---------|-----------|-------------------------|--------|----------|--------|------------|------|------------|--------|---------|---------|
|                               | Factor  | Factor    | Horizontal              |        | Vertical |        | [dB(μV/m)] |      | [dB(μV/m)] |        | [dB]    |         |
|                               | [MHz]   | [dB(1/m)] | [dB]                    | PK     | AVE      | PK     | AVE        | PK   | AVE        | PK     | AVE     |         |
| Test condition : Tx Low Ch    |         |           |                         |        |          |        |            |      |            |        |         |         |
| 4824.0                        | 27.3    | -16.1     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8 |         |
| 12060.0                       | 33.6    | -25.9     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.7     | < 35.7 | > +18.3 |         |
| 19296.0                       | 40.5    | -42.8     | 50.1                    | 42.3   | < 50.0   | 41.6   | 74.0       | 54.0 | 47.8       | 40.0   | +14.0   |         |
| Test condition : TX Middle Ch |         |           |                         |        |          |        |            |      |            |        |         |         |
| 4874.0                        | 27.3    | -16.1     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8 |         |
| 7311.0                        | 29.8    | -16.8     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 51.0     | < 41.0 | > +13.0 |         |
| 12185.0                       | 33.5    | -26.3     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.2     | < 35.2 | > +18.8 |         |
| 19496.0                       | 40.5    | -42.8     | < 50.0                  | 42.0   | < 50.0   | 40.8   | 74.0       | 54.0 | < 47.7     | 39.7   | +14.3   |         |
| Test condition : TX High Ch   |         |           |                         |        |          |        |            |      |            |        |         |         |
| 4924.0                        | 27.3    | -16.0     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.3     | < 39.3 | > +14.7 |         |
| 7386.0                        | 29.8    | -16.9     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 50.9     | < 40.9 | > +13.1 |         |
| 12310.0                       | 33.4    | -26.6     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 44.8     | < 34.8 | > +19.2 |         |
| 19696.0                       | 40.5    | -42.9     | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.6     | < 37.6 | > +16.4 |         |
| 22158.0                       | 40.6    | -43.3     | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.3     | < 37.3 | > +16.7 |         |

Calculated result at 7311.0 MHz, as the worst point shown on underline:

|                   |   |                |
|-------------------|---|----------------|
| Antenna Factor    | = | 29.8 dB(1/m)   |
| Corr. Factor      | = | -16.8 dB       |
| + ) Meter Reading | = | <28.0 dB(μV)   |
| Result            | = | <41.0 dB(μV/m) |

Minimum Margin: 54.0 - <41.0 = >13.0 (dB)

#### NOTES

- Test Distance : 3 m
- The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
- The correction factor is shown as follows:
  - Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
  - Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
  - Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- PK : Peak / AVE : Average



### 7.9.4.4.1.2 IEEE802.11g

Test Date: April 29, 2015

Temp.: 24 °C, Humi: 52 %

| Frequency                     | Antenna<br>Factor | Corr.<br>Factor | Meter Readings [dB(μV)] |        |          |        | Limits     |      | Results    |        | Margin<br>[dB] | Remarks |
|-------------------------------|-------------------|-----------------|-------------------------|--------|----------|--------|------------|------|------------|--------|----------------|---------|
|                               |                   |                 | Horizontal              |        | Vertical |        | [dB(μV/m)] |      | [dB(μV/m)] |        |                |         |
| [MHz]                         | [dB(1/m)]         | [dB]            | PK                      | AVE    | PK       | AVE    | PK         | AVE  | PK         | AVE    |                |         |
| Test condition : Tx Low Ch    |                   |                 |                         |        |          |        |            |      |            |        |                |         |
| 4824.0                        | 27.3              | -16.1           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8        |         |
| 12060.0                       | 33.6              | -25.9           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.7     | < 35.7 | > +18.3        |         |
| 19296.0                       | 40.5              | -42.8           | 50.1                    | 42.3   | < 50.0   | 41.6   | 74.0       | 54.0 | 47.8       | 40.0   | +14.0          |         |
| Test condition : TX Middle Ch |                   |                 |                         |        |          |        |            |      |            |        |                |         |
| 4874.0                        | 27.3              | -16.1           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8        |         |
| 7311.0                        | 29.8              | -16.8           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 51.0     | < 41.0 | > +13.0        |         |
| 12185.0                       | 33.5              | -26.3           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.2     | < 35.2 | > +18.8        |         |
| 19496.0                       | 40.5              | -42.8           | < 50.0                  | 42.0   | < 50.0   | 40.8   | 74.0       | 54.0 | < 47.7     | 39.7   | +14.3          |         |
| Test condition : TX High Ch   |                   |                 |                         |        |          |        |            |      |            |        |                |         |
| 4924.0                        | 27.3              | -16.0           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.3     | < 39.3 | > +14.7        |         |
| 7386.0                        | 29.8              | -16.9           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 50.9     | < 40.9 | > +13.1        |         |
| 12310.0                       | 33.4              | -26.6           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 44.8     | < 34.8 | > +19.2        |         |
| 19696.0                       | 40.5              | -42.9           | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.6     | < 37.6 | > +16.4        |         |
| 22158.0                       | 40.6              | -43.3           | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.3     | < 37.3 | > +16.7        |         |

Calculated result at 7311.0 MHz, as the worst point shown on underline:

|                   |   |                |
|-------------------|---|----------------|
| Antenna Factor    | = | 29.8 dB(1/m)   |
| Corr. Factor      | = | -16.8 dB       |
| + ) Meter Reading | = | <28.0 dB(μV)   |
| Result            | = | <41.0 dB(μV/m) |

Minimum Margin: 54.0 - <41.0 = >13.0 (dB)

#### NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
  - Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
  - Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
  - Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

### 7.9.4.4.1.3 IEEE802.11n

Test Date: April 29, 2015

Temp.: 24 °C, Humi: 52 %

| Frequency                     | Antenna | Corr.     | Meter Readings [dB(μV)] |        |          |        | Limits     |      | Results    |        | Margin  | Remarks |
|-------------------------------|---------|-----------|-------------------------|--------|----------|--------|------------|------|------------|--------|---------|---------|
|                               | Factor  | Factor    | Horizontal              |        | Vertical |        | [dB(μV/m)] |      | [dB(μV/m)] |        | [dB]    |         |
|                               | [MHz]   | [dB(1/m)] | [dB]                    | PK     | AVE      | PK     | AVE        | PK   | AVE        | PK     | AVE     |         |
| Test condition : Tx Low Ch    |         |           |                         |        |          |        |            |      |            |        |         |         |
| 4824.0                        | 27.3    | -16.1     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8 |         |
| 12060.0                       | 33.6    | -25.9     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.7     | < 35.7 | > +18.3 |         |
| 19296.0                       | 40.5    | -42.8     | 50.1                    | 42.3   | < 50.0   | 41.6   | 74.0       | 54.0 | 47.8       | 40.0   | +14.0   |         |
| Test condition : TX Middle Ch |         |           |                         |        |          |        |            |      |            |        |         |         |
| 4874.0                        | 27.3    | -16.1     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8 |         |
| 7311.0                        | 29.8    | -16.8     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 51.0     | < 41.0 | > +13.0 |         |
| 12185.0                       | 33.5    | -26.3     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.2     | < 35.2 | > +18.8 |         |
| 19496.0                       | 40.5    | -42.8     | < 50.0                  | 42.0   | < 50.0   | 40.8   | 74.0       | 54.0 | < 47.7     | 39.7   | +14.3   |         |
| Test condition : TX High Ch   |         |           |                         |        |          |        |            |      |            |        |         |         |
| 4924.0                        | 27.3    | -16.0     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.3     | < 39.3 | > +14.7 |         |
| 7386.0                        | 29.8    | -16.9     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 50.9     | < 40.9 | > +13.1 |         |
| 12310.0                       | 33.4    | -26.6     | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 44.8     | < 34.8 | > +19.2 |         |
| 19696.0                       | 40.5    | -42.9     | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.6     | < 37.6 | > +16.4 |         |
| 22158.0                       | 40.6    | -43.3     | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.3     | < 37.3 | > +16.7 |         |

Calculated result at 7311.0 MHz, as the worst point shown on underline:

|                   |   |                |
|-------------------|---|----------------|
| Antenna Factor    | = | 29.8 dB(1/m)   |
| Corr. Factor      | = | -16.8 dB       |
| + ) Meter Reading | = | <28.0 dB(μV)   |
| Result            | = | <41.0 dB(μV/m) |

Minimum Margin: 54.0 - <41.0 = >13.0 (dB)

#### NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
3. The correction factor is shown as follows:
  - Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
  - Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
  - Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

#### 7.9.4.4.1.4 Bluetooth Low Energy

Test Date: April 29, 2015

Temp.: 24 °C, Humi: 52 %

| Frequency                     | Antenna<br>Factor | Corr.<br>Factor | Meter Readings [dB(μV)] |        |          |        | Limits     |      | Results    |        | Margin<br>[dB] | Remarks |
|-------------------------------|-------------------|-----------------|-------------------------|--------|----------|--------|------------|------|------------|--------|----------------|---------|
|                               |                   |                 | Horizontal              |        | Vertical |        | [dB(μV/m)] |      | [dB(μV/m)] |        |                |         |
|                               | [MHz]             | [dB(1/m)]       | [dB]                    | PK     | AVE      | PK     | AVE        | PK   | AVE        | PK     | AVE            |         |
| Test condition : Tx Low Ch    |                   |                 |                         |        |          |        |            |      |            |        |                |         |
| 4804.0                        | 27.3              | -16.1           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.2     | < 39.2 | > +14.8        |         |
| 12010.0                       | 33.7              | -25.8           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.9     | < 35.9 | > +18.1        |         |
| 19216.0                       | 40.5              | -42.9           | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.6     | < 37.6 | > +16.4        |         |
| Test condition : TX Middle Ch |                   |                 |                         |        |          |        |            |      |            |        |                |         |
| 4880.0                        | 27.3              | -16.0           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.3     | < 39.3 | > +14.7        |         |
| 7320.0                        | 29.8              | -16.8           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 51.0     | < 41.0 | > +13.0        |         |
| 12200.0                       | 33.5              | -26.3           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 45.2     | < 35.2 | > +18.8        |         |
| 19520.0                       | 40.4              | -42.8           | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.6     | < 37.6 | > +16.4        |         |
| Test condition : TX High Ch   |                   |                 |                         |        |          |        |            |      |            |        |                |         |
| 4960.0                        | 27.3              | -16.0           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 49.3     | < 39.3 | > +14.7        |         |
| 7440.0                        | 29.8              | -17.0           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 50.8     | < 40.8 | > +13.2        |         |
| 12400.0                       | 33.5              | -26.8           | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0       | 54.0 | < 44.7     | < 34.7 | > +19.3        |         |
| 19840.0                       | 40.4              | -43.0           | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.4     | < 37.4 | > +16.6        |         |
| 22320.0                       | 40.6              | -43.4           | < 50.0                  | < 40.0 | < 50.0   | < 40.0 | 74.0       | 54.0 | < 47.2     | < 37.2 | > +16.8        |         |

Calculated result at 7320.0 MHz, as the worst point shown on underline:

|                   |   |                |
|-------------------|---|----------------|
| Antenna Factor    | = | 29.8 dB(1/m)   |
| Corr. Factor      | = | -16.8 dB       |
| + ) Meter Reading | = | <28.0 dB(μV)   |
| Result            | = | <41.0 dB(μV/m) |

Minimum Margin: 54.0 - <41.0 = >13.0 (dB)

#### NOTES

- Test Distance : 3 m
- The spectrum was checked from 1 GHz to 25 GHz (10th harmonic of the highest fundamental frequency).
- The correction factor is shown as follows:
  - Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
  - Corr. Factor [dB] = Cable Loss + 10dB Pad Att. - Pre-Amp. Gain [dB] (7.6 - 18.0GHz)
  - Corr. Factor [dB] = Cable Loss - Pre-Amp. Gain [dB] (over 18 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- PK : Peak / AVE : Average

### 7.9.4.4.2 Mode of RX (WLAN)

Test Date: April 29, 2015

Temp.: 24 °C, Humi: 52 %

| Frequency<br><br>[MHz]        | Antenna<br>Factor<br>[dB(1/m)] | Corr.<br>Factor<br>[dB] | Meter Readings [dB(μV)] |        |          |        | Limits<br>[dB(μV/m)] |      | Results<br>[dB(μV/m)] |        | Margin<br>[dB] | Remarks |
|-------------------------------|--------------------------------|-------------------------|-------------------------|--------|----------|--------|----------------------|------|-----------------------|--------|----------------|---------|
|                               |                                |                         | Horizontal              |        | Vertical |        | PK                   | AVE  | PK                    | AVE    |                |         |
|                               |                                |                         | PK                      | AVE    | PK       | AVE    |                      |      |                       |        |                |         |
| Test condition : RX Middle Ch |                                |                         |                         |        |          |        |                      |      |                       |        |                |         |
| 2437.0                        | 21.5                           | -18.8                   | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0                 | 54.0 | < 40.7                | < 30.7 | > +23.3        |         |
| 4874.0                        | 27.3                           | -16.4                   | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0                 | 54.0 | < 48.9                | < 38.9 | > +15.1        |         |
| 7311.0                        | 29.8                           | -17.1                   | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0                 | 54.0 | < 50.7                | < 40.7 | > +13.3        |         |

Calculated result at 4874.0 MHz, as the worst point shown on underline:

Antenna Factor = 27.3 dB(1/m)

Corr. Factor = -16.4 dB

+ ) Meter Reading = <28.0 dB(μV)

Result = <38.9 dB(μV/m)

Minimum Margin: 54.0 - <38.9 =>15.1 (dB)

#### NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 1 GHz to 7.5 GHz .
3. The correction factor is shown as follows:  
Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average

### 7.9.4.4.3 Mode of RX (Bluetooth Low Energy)

Test Date: April 29, 2015

Temp.: 24 °C, Humi: 52 %

| Frequency<br>[MHz]            | Antenna<br>Factor<br>[dB(1/m)] | Corr.<br>Factor<br>[dB] | Meter Readings [dB(μV)] |        |          |        | Limits<br>[dB(μV/m)] |      | Results<br>[dB(μV/m)] |        | Margin<br>[dB] | Remarks |
|-------------------------------|--------------------------------|-------------------------|-------------------------|--------|----------|--------|----------------------|------|-----------------------|--------|----------------|---------|
|                               |                                |                         | Horizontal              |        | Vertical |        | PK                   | AVE  | PK                    | AVE    |                |         |
|                               |                                |                         | PK                      | AVE    | PK       | AVE    |                      |      |                       |        |                |         |
| Test condition : RX Middle Ch |                                |                         |                         |        |          |        |                      |      |                       |        |                |         |
| 2440.0                        | 21.5                           | -18.8                   | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0                 | 54.0 | < 40.7                | < 30.7 | > +23.3        |         |
| 4880.0                        | 27.3                           | -16.3                   | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0                 | 54.0 | < 49.0                | < 39.0 | > +15.0        |         |
| 7320.0                        | 29.8                           | -17.1                   | < 38.0                  | < 28.0 | < 38.0   | < 28.0 | 74.0                 | 54.0 | < 50.7                | < 40.7 | > +13.3        |         |

Calculated result at 7320.0 MHz, as the worst point shown on underline:

Antenna Factor = 29.8 dB(1/m)

Corr. Factor = -17.1 dB

+ ) Meter Reading = <28.0 dB(μV)

Result = <40.7 dB(μV/m)

Minimum Margin: 54.0 - <40.7 =>13.3 (dB)

#### NOTES

1. Test Distance : 3 m

2. The spectrum was checked from 1 GHz to 7.5 GHz .

3. The correction factor is shown as follows:

Corr. Factor [dB] = Cable Loss + 20dB Pad Att. - Pre-Amp. Gain [dB] (1.0 - 7.6GHz)

4. The symbol of "<" means "or less".

5. The symbol of ">" means "more than".

6. PK : Peak / AVE : Average