**JQA File No. :** KL80150484R
**Issue Date :** January 21, 2016

# TEST REPORT

| | | |
|---|---|---|
| **Applicant** | : | WESTUNITIS CO., LTD. |
| **Address** | : | 29F GRAND FRONT OSAKA South Building, 4-20 Ofukacho, Kita-ku, Osaka 530-0011 JAPAN |
| **Products** | : | InfoLinker |
| **Model No.** | : | WUZ-01B-NB01 |
| **Serial No.** | : | 501550014 |
| **FCC ID** | : | 2AFRZWUZ-01B-NB01 |
| **Test Standard** | : | CFR 47 FCC Rules and Regulations Part 15 |
| **Test Results** | : | **Passed** |
| **Date of Test** | : | October 14 ~ December 2, 2015 |

ilac-MRA VLAC Lab Accreditation VLAC-001-2

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 | : | WESTUNITIS CO., LTD.<br>29F GRAND FRONT OSAKA South Building, 4-20 Ofukacho,<br>Kita-ku, Osaka 530-0011 JAPAN |
| 2. | Products | : | InfoLinker |
| 3. | Model No. | : | WUZ-01B-NB01 |
| 4. | Serial No. | : | 501550014 |
| 5. | Product Type | : | Mass Production |
| 6. | Date of Manufacture | : | June, 2015 |
| 7. | Power Rating | : | 3.7VDC (Lithium-ion Battery WHB-001 300mAh)<br>5.0VDC (USB) |
| 8. | Grounding | : | None |
| 9. | Transmitting Frequency | : | 2402.0 MHz(00CH) – 2480.0MHz(78CH) |
| 10. | Receiving Frequency | : | 2402.0 MHz(00CH) – 2480.0MHz(78CH) |
| 11. | Max. RF Output Power | : | 7.74dBm(Measure Value) |
| 12. | Antenna Type | : | 1/2 λ Type Antenna (Integral) |
| 13. | Antenna Gain | : | -3.0 dBi |
| 14. | Category | : | Spread Spectrum Transmitter(FHSS) |
| 15. | EUT Authorization | : | Certification |
| 16. | Received Date of EUT | : | October 9, 2015 |

17. Channel Plan

The carrier spacing is 1 MHz.
The carrier frequency is designated by the absolute frequency channel number (ARFCN).
The carrier frequency is expressed in the equation shown as follows:

Normal Mode:
Transmitting Frequency (in MHz) = 2402.0 + n
Receiving Frequency (in MHz) = 2402.0 + n
where, n : channel number ($0 \leq n \leq 78$)

## 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:

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

Tested by:

Takeshi Choda
Assistant Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

## 3 Test Procedure

Test Requirements : §15.247, §15.207 and §15.209

Test Procedure : ANSI C63.10–2013
Testing unlicensed wireless devices.

FCC Public Notice DA 00-705, released March 30, 2000.

KDB 447498
RF exposure and equipment authorization requirements

## 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 | InfoLinker | WESTUNITIS | WUZ-01B-NB01 | 501550014 | 2AFRZWUZ-01B-NB01 |
| B | Li-ion Battery | WESTUNITIS | WHB-001 | -- | N/A |

The auxiliary equipment used for testing :

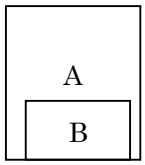
| | Item | Manufacturer | Model No. | Serial No. | FCC ID |
|---|---|---|---|---|---|
| C | Earphone | -- | -- | -- | N/A |
| D | Note PC | Fujitsu | FMV A 05010P | CP660964-01 | None |
| E | AC Adapter (for PC) | Fujitsu | ADP-65JH AB | CP500588-01 | N/A |
| F | Mouse | Hewlett Packard | M-UAE96 | 265986-011 | N/A |
| G | Smart Phone | Sharp | SH-06E | -- | None |

Type of Cable:

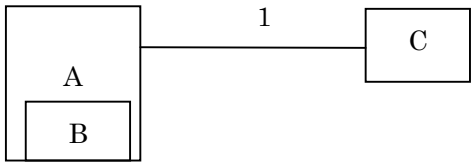
| No. | Description | Identification (Manu. etc.) | Connector Shielded | Cable Shielded | Ferrite Core | Length (m) |
|---|---|---|---|---|---|---|
| 1 | Earphone cable | -- | -- | NO | NO | 1.2 |
| 2 | USB Cable1 | -- | YES | YES | NO | 1.2 |
| 3 | USB Cable2 | -- | YES | YES | NO | 1.8 |
| 4 | DC Cable | -- | -- | NO | YES | 1.8 |
| 5 | AC Cable | -- | -- | NO | NO | 1.0 |

## 6.2 Test Arrangement (Drawings)

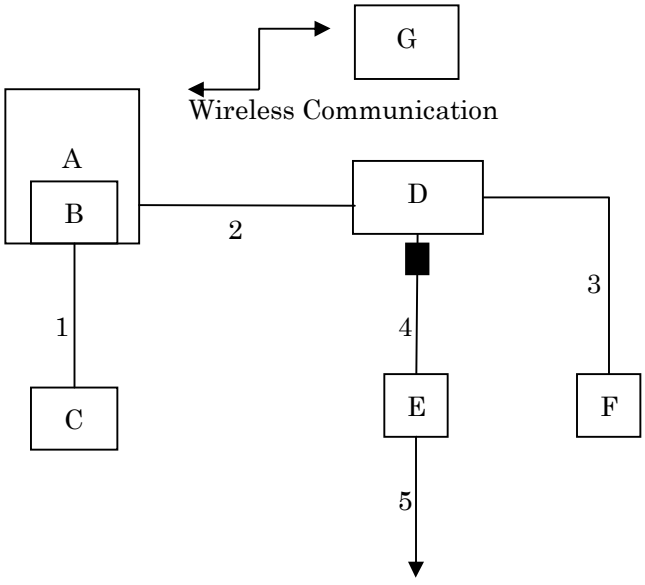
a) Single Unit




b) Earphone used




c) Bluetooth Tx and USB Charging




▌: Ferrite Core

## 6.3 Operating Condition

Power Supply Voltage : 3.7VDC (for Battery)
5.0VDC (for USB)

Transmitting/Receiving
Bluetooth 4.0 + EDR
Transmitting frequency : 2402.0 MHz(0CH) – 2480.0 MHz(78CH)
Receiver frequency : 2402.0 MHz(0CH) – 2480.0 MHz(78CH)

The test were carried under 2 mode shown as follows:
1) BDR
2) EDR
In Spurious Emissions(Conducted) and Radiated Emissions, the worst case is BDR mode.

Modulation Type
1. DH1/ DH3/ DH5 Packet (Modulation Type : GFSK)
2. 2DH1/ 2DH3/ 2DH5 Packet (Modulation Type : pi/4-DQPSK)
3. 3DH1/ 3DH3/ 3DH5 Packet (Modulation Type : 8DPSK)

Other Clock Frequency
1.5GHz (CPU)

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.

The test were carried out using the following test program supplied by applicant;
- Software Name: Real Time Tuning Tool
- Software Version: Version 2.0.0.55
- Storage Location: Controller PC

# 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) | Section 7.1 | Passed | - |
| Minimum Hopping Channel | Section 15.247(a)(1)(iii) | Section 7.2 | Passed | - |
| Occupied Bandwidth | Section 15.247(a)(1) | Section 7.3 | Passed | - |
| Dwell Time | Section 15.247(a)(1)(iii) | Section 7.4 | Passed | - |
| Peak Output Power (Conduction) | Section 15.247(b)(1) | Section 7.5 | Passed | - |
| Peak Power Density (Conduction) | Section 15.247(e) | - | - | - |
| 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 | - |
| SAR Test Exclusion | Section 15.247(i) | Section 7.10 | Passed | - |

## 7.1 Channel Separation

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

### 7.1.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Channel Separation is 1.000 MHz
Channel Separation (Inquiry) is 2.000 MHz

Uncertainty of Measurement Results ± 0.9 %(2σ)

Remarks : _____

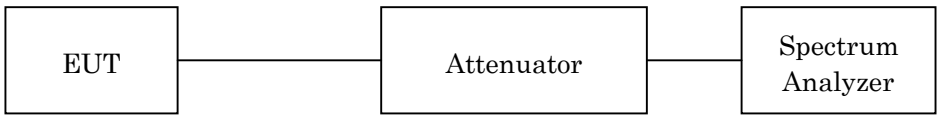
### 7.1.2 Test Instruments

| Shielded Room S4 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Spectrum Analyzer | E4446A | US44300388 (A-39) | Agilent | 2016/08/11 |
| RF Cable | SUCOFLEX102 | 14253/2 (C-52) | HUBER+SUHNER | 2016/08/16 |
| Attenuator | 54A-10 | W5675 (D-28) | Weinschel | 2016/08/16 |

NOTE : The calibration interval of the above test instruments is 12 months.

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

The test system is shown as follows:




The setting of the spectrum analyzer are shown as follows:

| | |
|---|---|
| Res. Bandwidth | 100 kHz |
| Video Bandwidth | 300 kHz |
| Span | 3 MHz / 5 MHz |
| Sweep Time | AUTO |
| Trace | Maxhold |

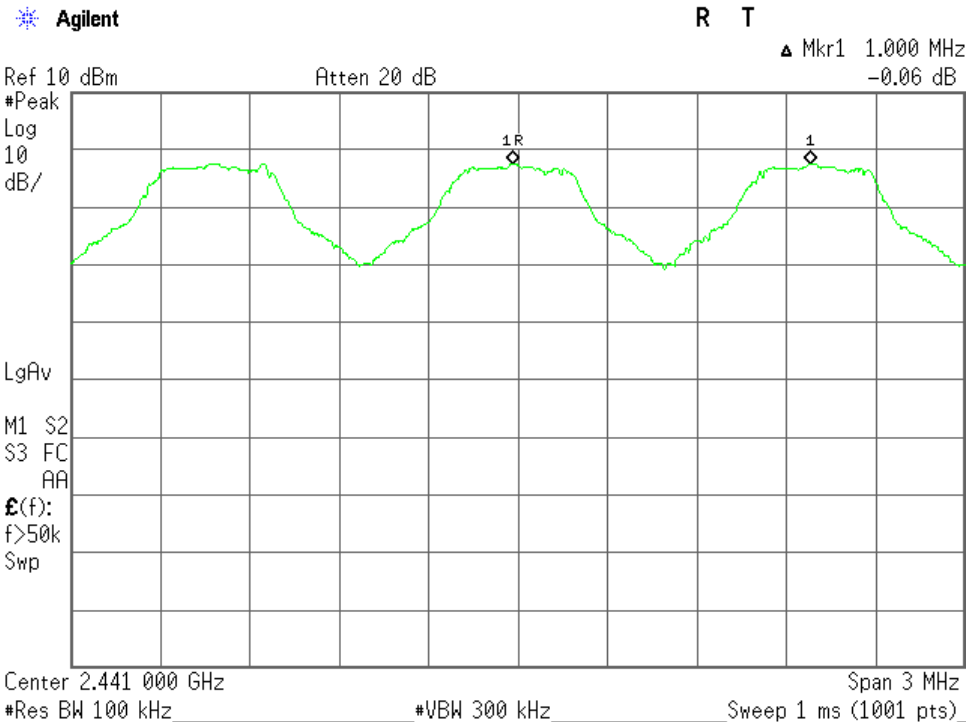
### 7.1.4 Test Data

Test Date :October 14, 2015
Temp.:26°C, Humi:45%

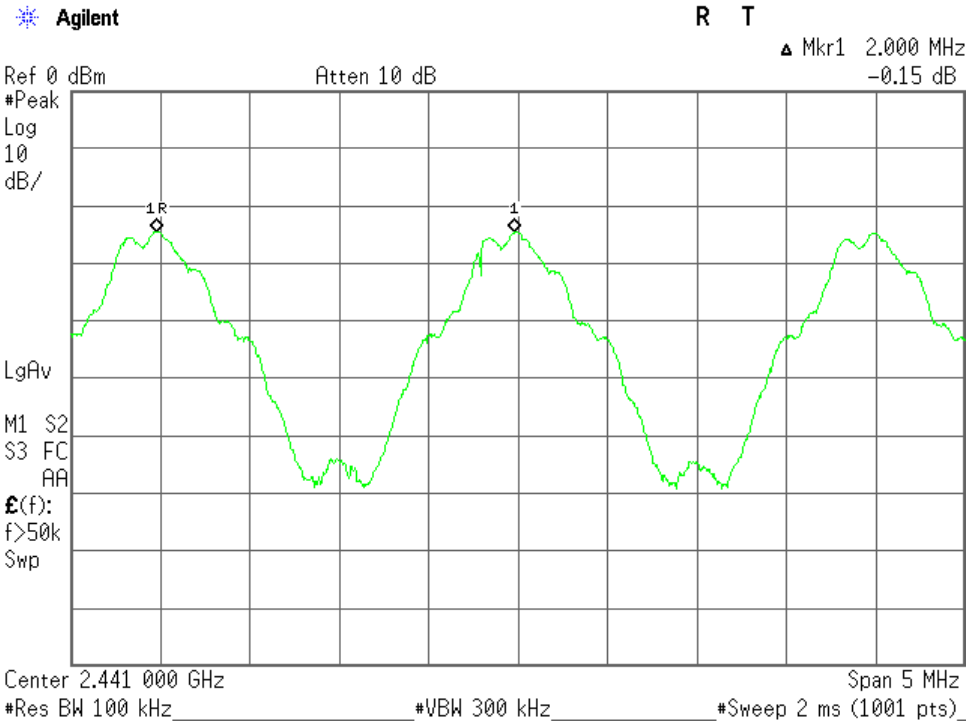
| Mode of EUT | Channel Separation (MHz) | Limit* (MHz) |
|---|---|---|
| Hopping | 1.000 | 0.863 |
| Inquiry | 2.000 | 0.507 |

Note: Two-thirds of the maximum 20 dB bandwidth of the hopping channel or 25 kHz (whichever is greater). Refer to the section 7.3.

Mode of EUT : Hopping



Mode of EUT : Inquiry



## 7.2 Minimum Hopping Channel

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

### 7.2.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Number of Channel is 79
Number of Channel (Inquiry) is 32
Number of Channel (AFH) is 20

Remarks : _____

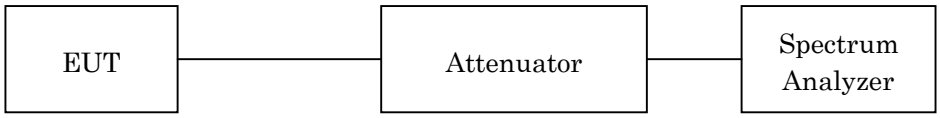
### 7.2.2 Test Instruments

| Shielded Room S4 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Spectrum Analyzer | E4446A | US44300388 (A-39) | Agilent | 2016/08/11 |
| RF Cable | SUCOFLEX102 | 14253/2 (C-52) | HUBER+SUHNER | 2016/08/16 |
| Attenuator | 54A-10 | W5675 (D-28) | Weinschel | 2016/08/16 |

NOTE : The calibration interval of the above test instruments is 12 months.

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

The test system is shown as follows:




The setting of the spectrum analyzer are shown as follows:

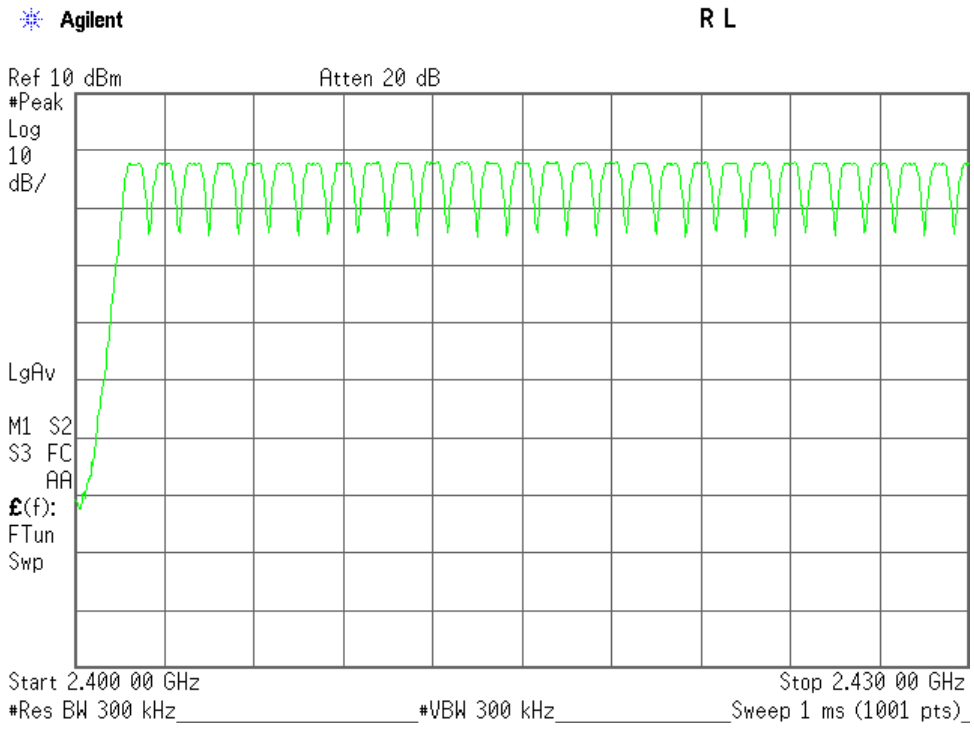
| | |
|---|---|
| Res. Bandwidth | 300 kHz |
| Video Bandwidth | 300 kHz |
| Span | 30 MHz |
| Sweep Time | AUTO |
| Trace | Maxhold |

### 7.2.4 Test Data

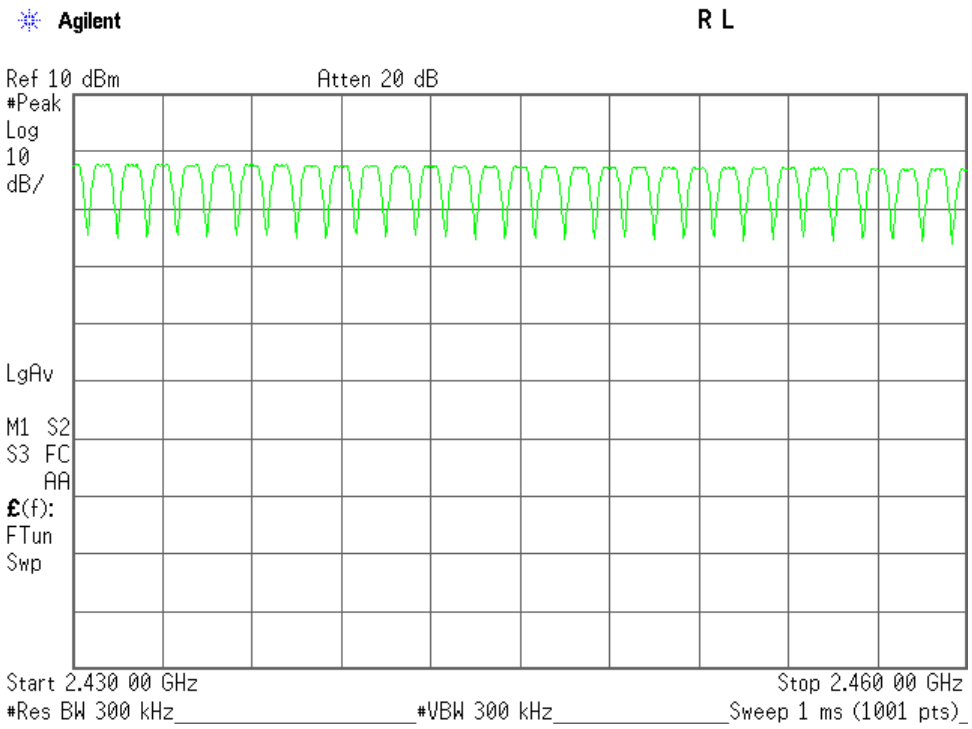
Test Date :October 14, 2015
Temp.:26°C, Humi:45%

| Mode of EUT | Minimum Hopping Channel | Limit |
|---|---|---|
| Hopping | 79 | 15 |
| Inquiry | 32 | 15 |
| AFH(minimum) | 20 | 15 |

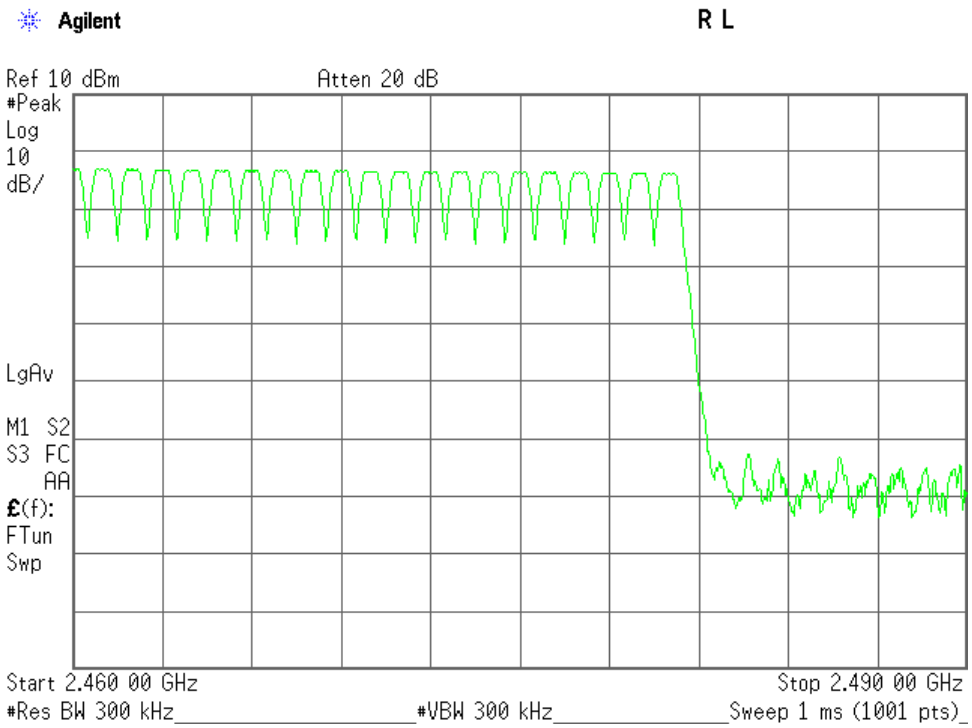
Mode of EUT : Hopping(1/3)



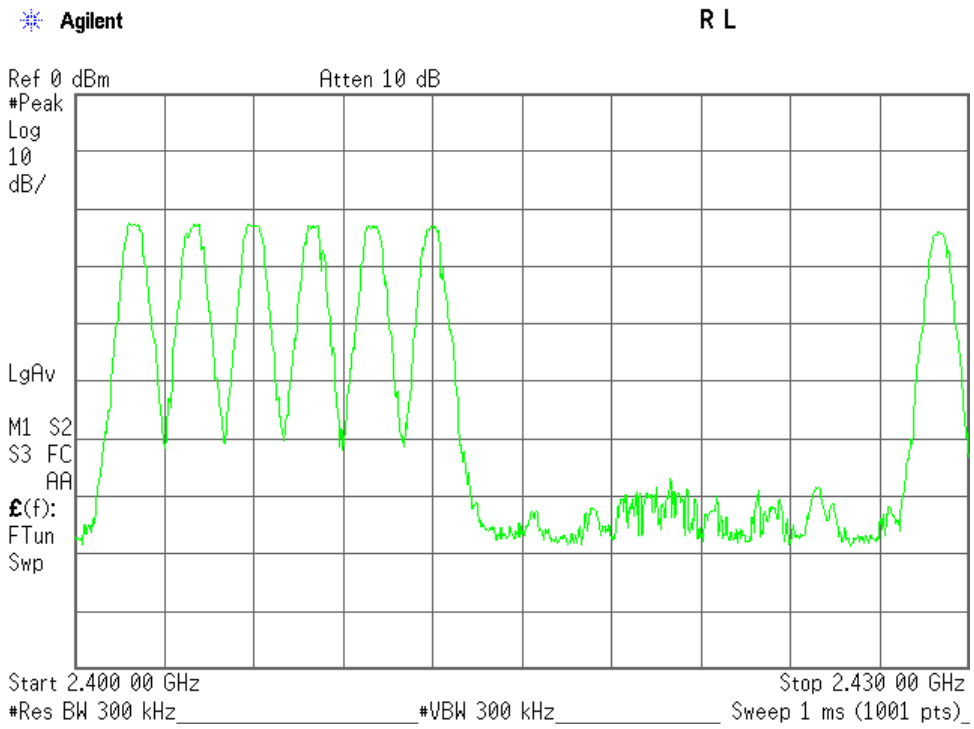
Mode of EUT : Hopping(2/3)



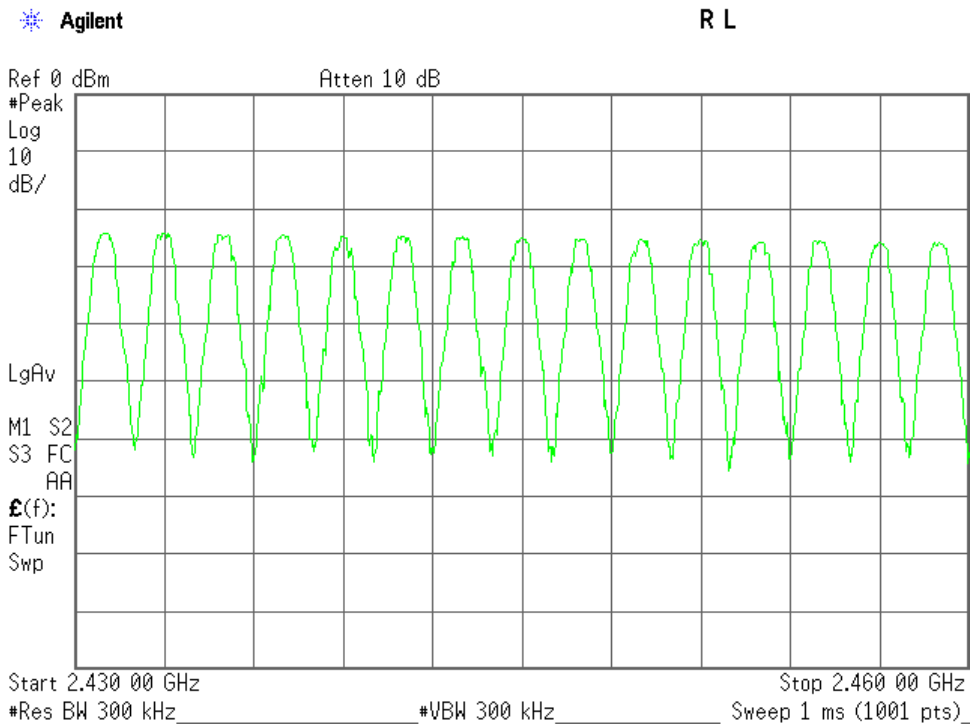

Mode of EUT : Hopping(3/3)



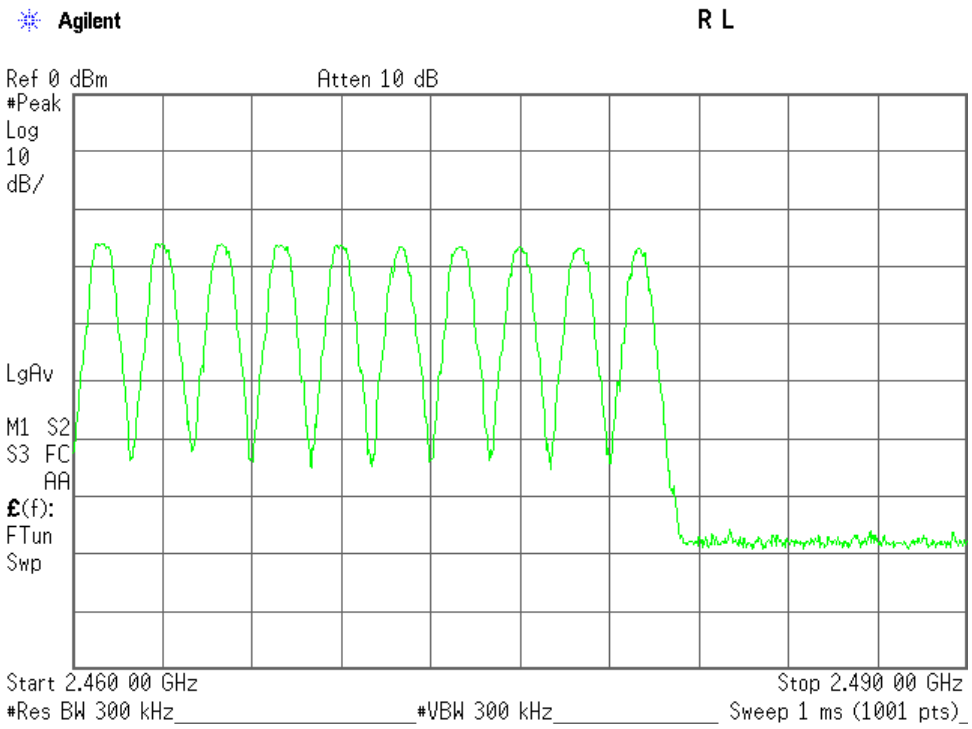
Mode of EUT : Inquiry(1/3)



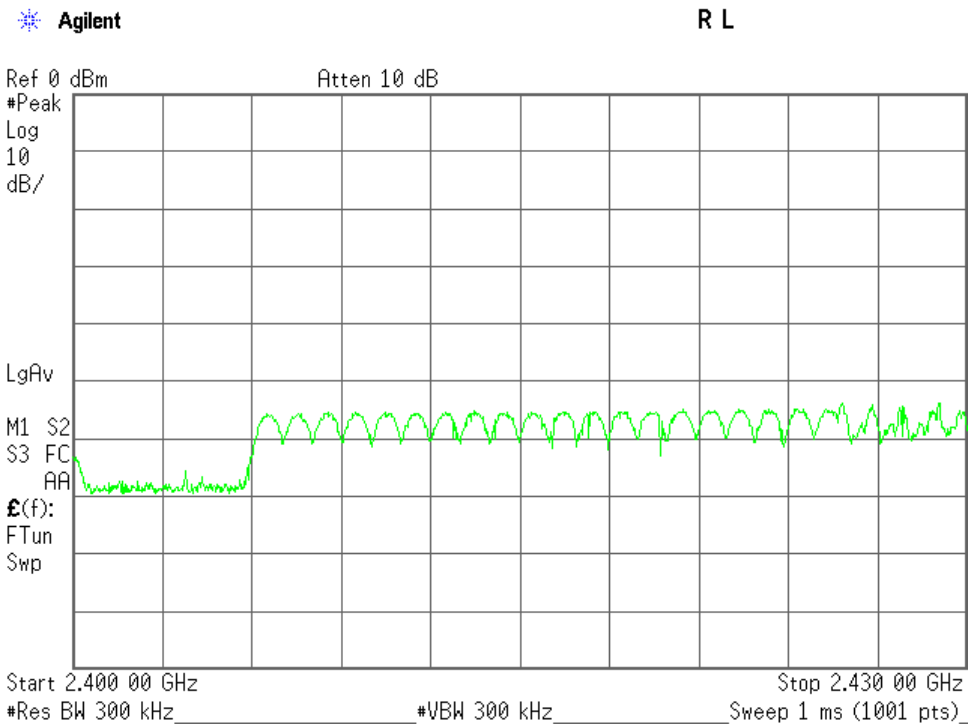

Mode of EUT : Inquiry(2/3)



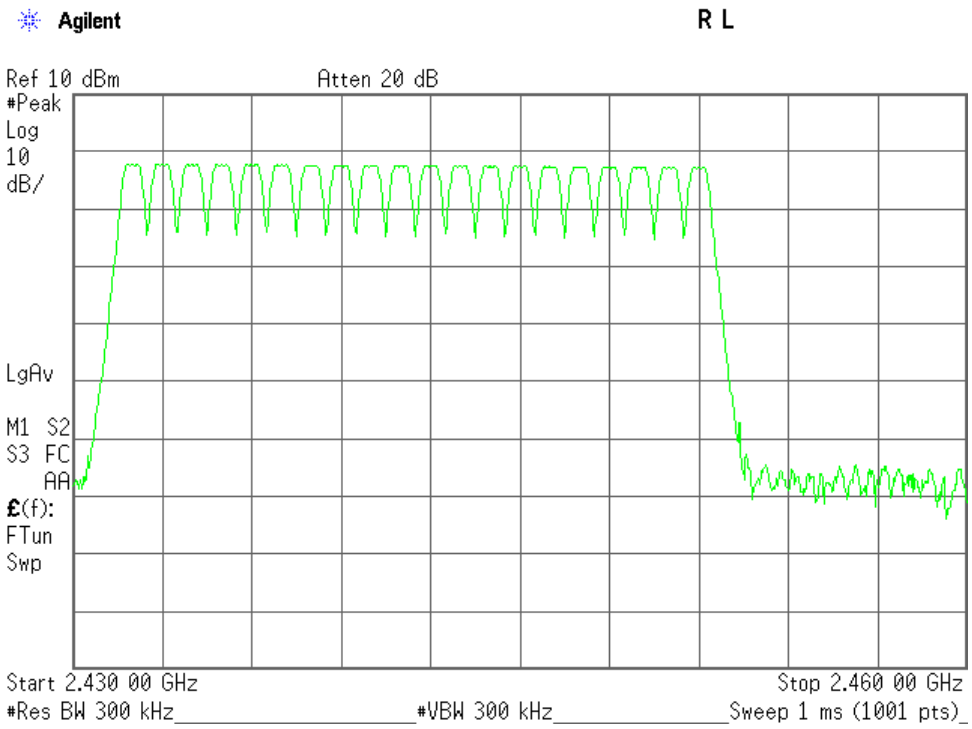
Mode of EUT : Inquiry(3/3)



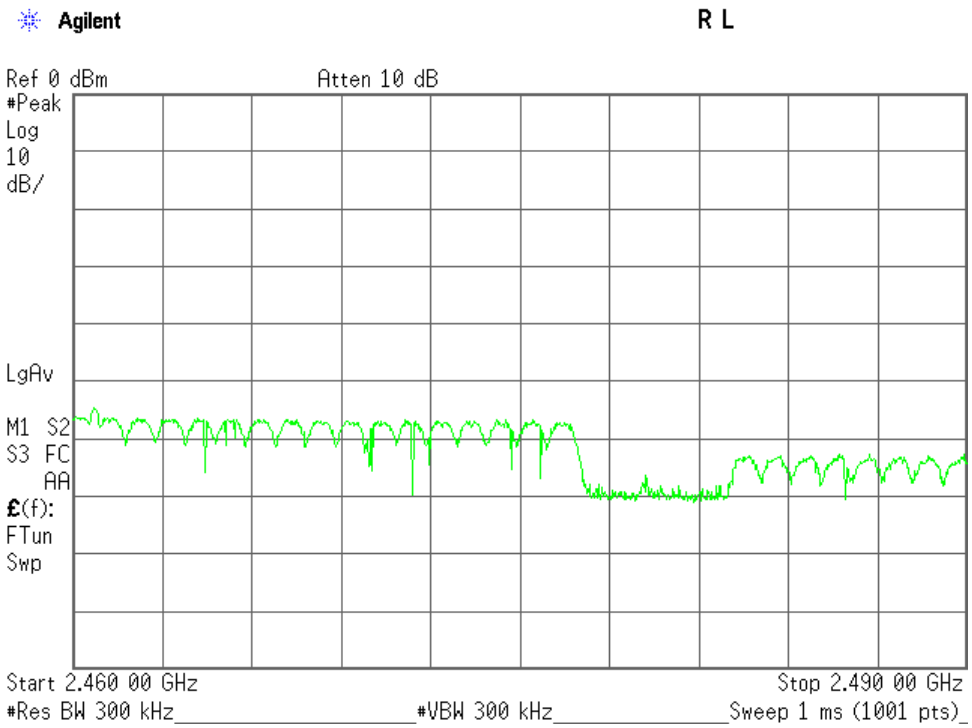

Mode of EUT : AFH(minimum)(1/3)



Mode of EUT : AFH(minimum) (2/3)




Mode of EUT : AFH(minimum) (3/3)



## 7.3 Occupied Bandwidth

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

### 7.3.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

The 99% Bandwidth is 1193.9 kHz at 2441.0 MHz
The 20dB Bandwidth is 1295.0 kHz at 2480.0 MHz

Uncertainty of Measurement Results ± 0.9 %(2σ)

Remarks : _____

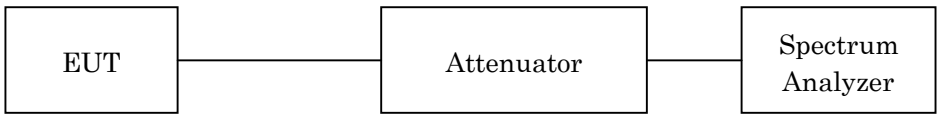
### 7.3.2 Test Instruments

| Shielded Room S4 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Spectrum Analyzer | E4446A | US44300388 (A-39) | Agilent | 2016/08/11 |
| Attenuator | 54A-10 | W5675 (D-28) | Weinschel | 2016/08/16 |
| RF Cable | SUCOFLEX102 | 14253/2 (C-52) | HUBER+SUHNER | 2016/08/16 |

NOTE : The calibration interval of the above test instruments is 12 months.

### 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:

| | |
|---|---|
| Res. Bandwidth | 30 kHz |
| Video Bandwidth | 100 kHz |
| Span | 2 MHz / 3 MHz |
| Sweep Time | AUTO |
| Trace | Maxhold |

### 7.3.4 Test Data

Mode of EUT : BDR+EDR

Test Date :October 14, 2015
Temp.:26°C, Humi:45%

The resolution bandwidth was set to about 1% of emission bandwidth, -20dBc 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 : DH5(Modulation type : GFSK)

| Channel | Frequency (MHz) | 99% Bandwidth (kHz) | -20dBc Bandwidth (kHz) | Two-thirds of the 20 dB bandwidth (kHz) |
|---|---|---|---|---|
| 00 | 2402.0 | 847.9 | 956.2 | 637.5 |
| 39 | 2441.0 | 840.8 | 860.4 | 573.6 |
| 78 | 2480.0 | 834.0 | 859.5 | 573.0 |

2)Packet Setting : 2DH5(Modulation type : pi/4-DQPSK)

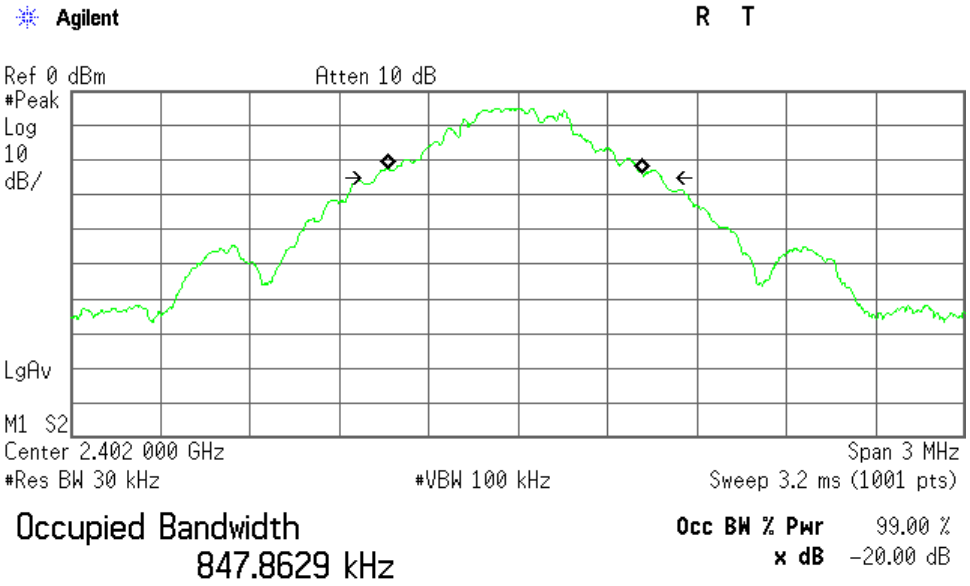
| Channel | Frequency (MHz) | 99% Bandwidth (kHz) | -20dBc Bandwidth (kHz) | Two-thirds of the 20 dB bandwidth (kHz) |
|---|---|---|---|---|
| 00 | 2402.0 | 1172.9 | 1277.0 | 851.3 |
| 39 | 2441.0 | 1177.7 | 1276.0 | 850.7 |
| 78 | 2480.0 | 1185.1 | 1271.0 | 847.3 |

3)Packet Setting : 3DH5(Modulation type : 8DPSK)

| Channel | Frequency (MHz) | 99% Bandwidth (kHz) | -20dBc Bandwidth (kHz) | Two-thirds of the 20 dB bandwidth (kHz) |
|---|---|---|---|---|
| 00 | 2402.0 | 1180.7 | 1286.0 | 857.3 |
| 39 | 2441.0 | 1193.9 | 1294.0 | 862.7 |
| 78 | 2480.0 | 1193.2 | 1295.0 | 863.3 |

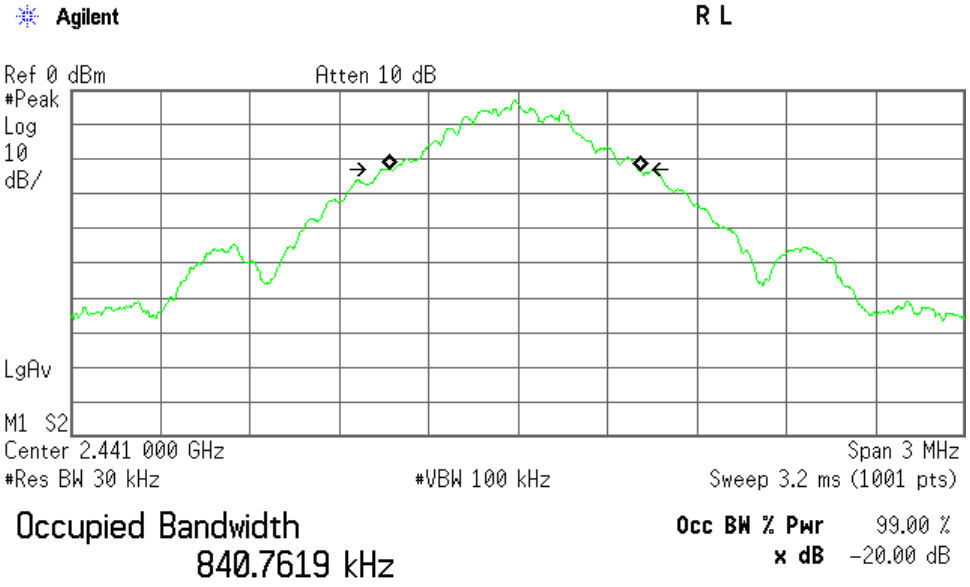
1)Packet Setting : DH5(Modulation type : GFSK)

Low Channel



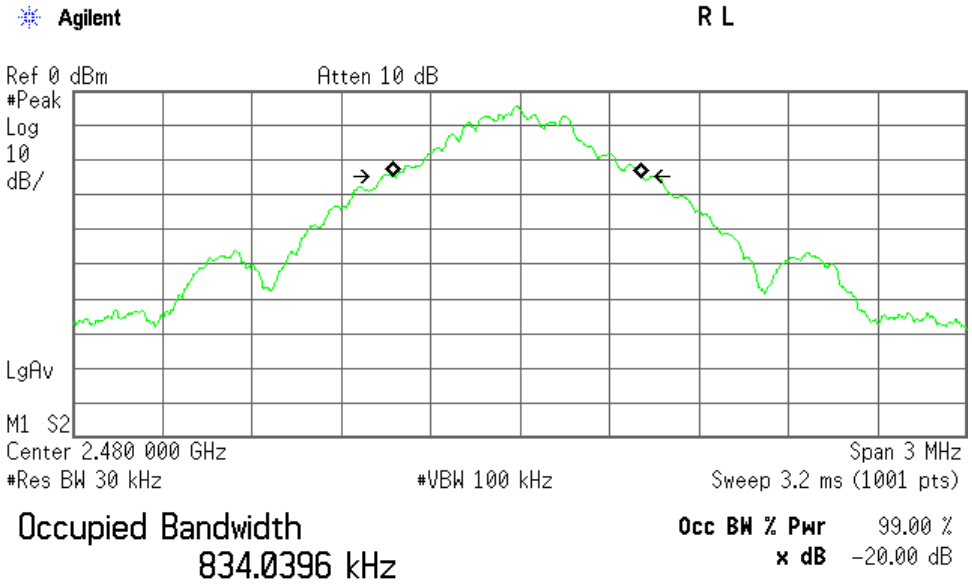

**Transmit Freq Error** −10.056 kHz
**Occupied Bandwidth** 956.175 kHz

Middle Channel



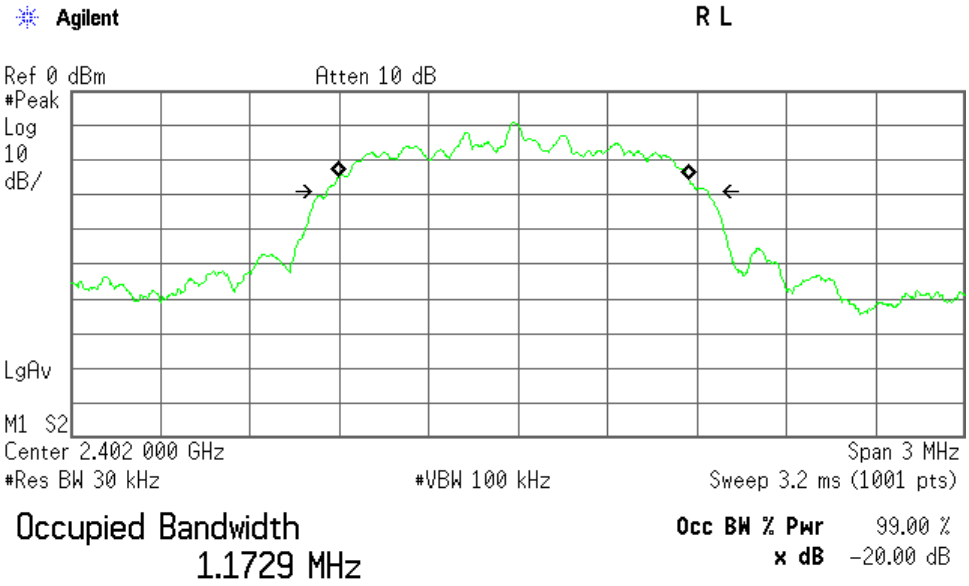

**Transmit Freq Error** −10.796 kHz
**Occupied Bandwidth** 860.423 kHz

High Channel



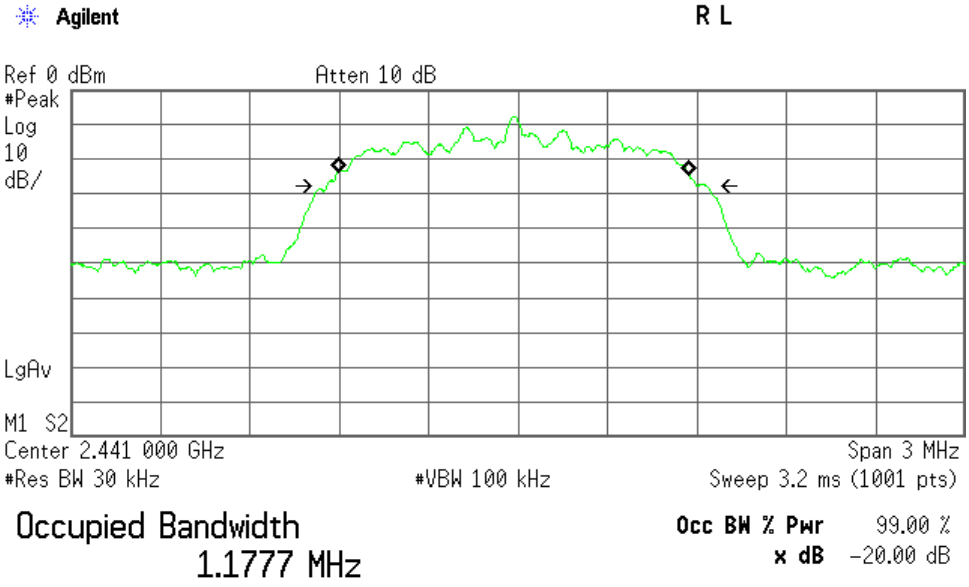
2)Packet Setting : 2DH5(Modulation type : pi/4-DQPSK)

Low Channel



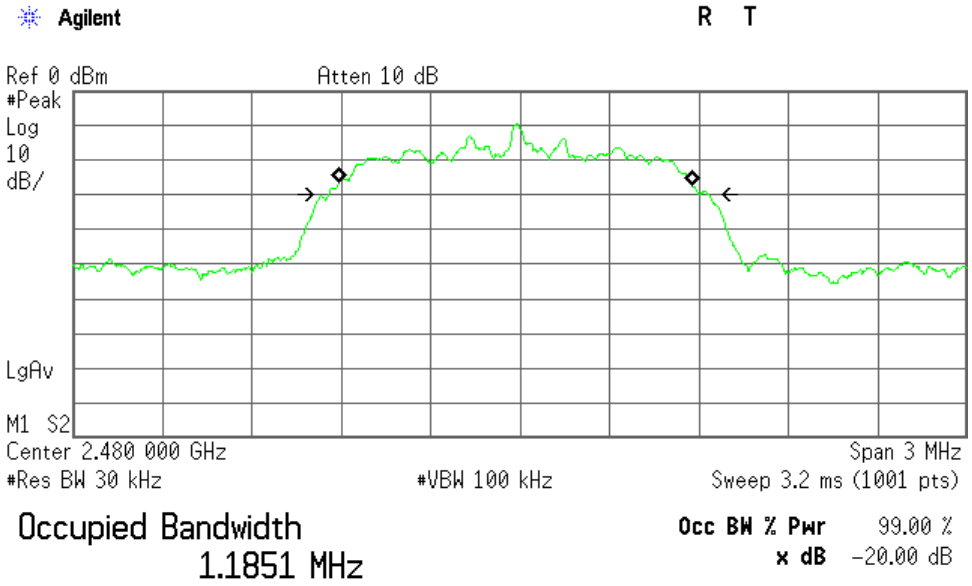

| | |
|---|---|
| **Transmit Freq Error** | -13.486 kHz |
| **Occupied Bandwidth** | 1.277 MHz |

Middle Channel




| | |
|---|---|
| **Transmit Freq Error** | -14.571 kHz |
| **Occupied Bandwidth** | 1.276 MHz |

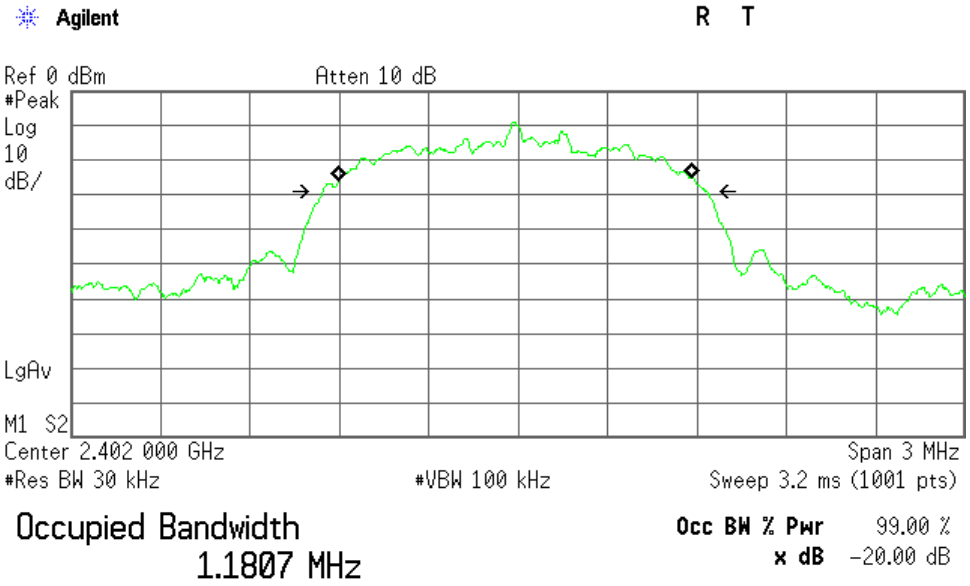
High Channel




| | |
|---|---|
| **Transmit Freq Error** | -14.518 kHz |
| **Occupied Bandwidth** | 1.271 MHz |

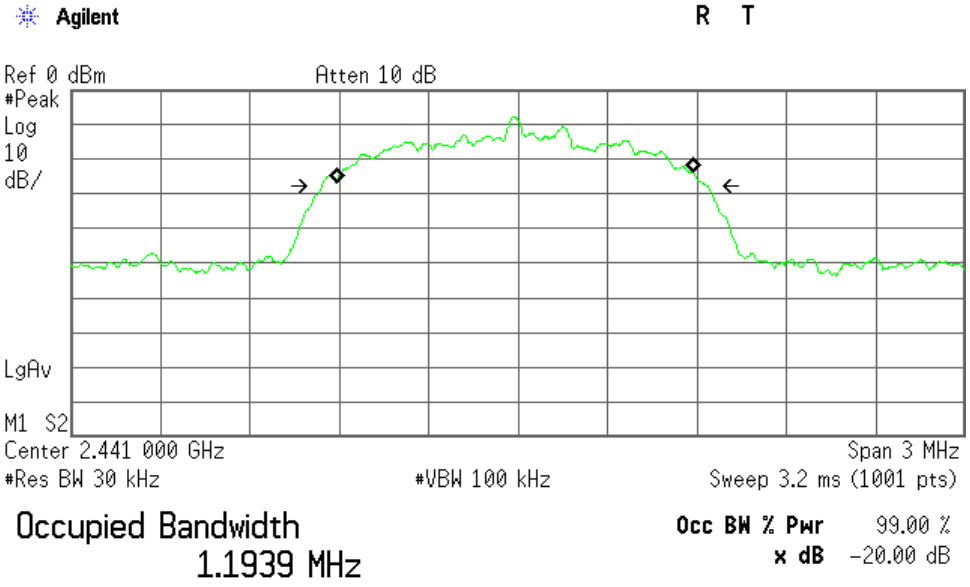
3)Packet Setting : 3 DH5(Modulation type : 8DPSK)

Low Channel



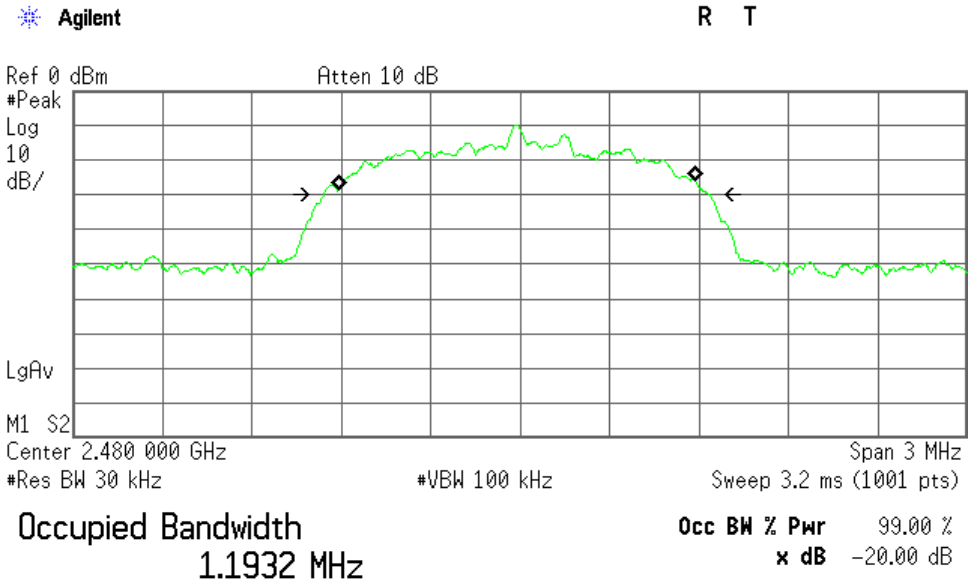

| | |
|---|---|
| **Transmit Freq Error** | -9.558 kHz |
| **Occupied Bandwidth** | 1.286 MHz |

Middle Channel




| | |
|---|---|
| **Transmit Freq Error** | -13.372 kHz |
| **Occupied Bandwidth** | 1.294 MHz |

High Channel




| | |
|---|---|
| **Transmit Freq Error** | -12.494 kHz |
| **Occupied Bandwidth** | 1.295 MHz |

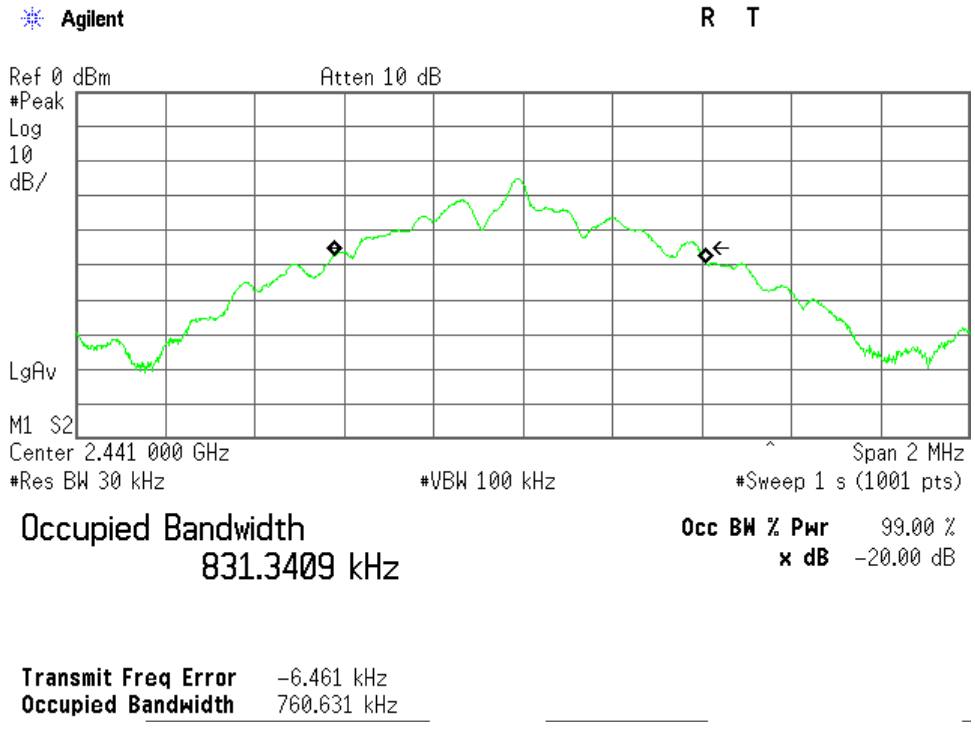
Mode of EUT : Inquiry

Test Date :October 14, 2015
Temp.:26°C, Humi:45%

The resolution bandwidth was set to about 1% of emission bandwidth, -20dBc 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.

| Frequency (MHz) | 99% Bandwidth (kHz) | -20dBc Bandwidth (kHz) | Two-thirds of the 20 dB bandwidth (kHz) |
|---|---|---|---|
| 2441.0 | 831.3 | 760.6 | 507.1 |

Middle Channel



## 7.4 Dwell Time

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

### 7.4.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Dwell Time is 310.0 msec
Dwell Time (Inquiry) is 78.8 msec
Dwell Time (AFH) is 310.0 msec

Uncertainty of Measurement Results ± 0.6 %(2σ)

Remarks : _____

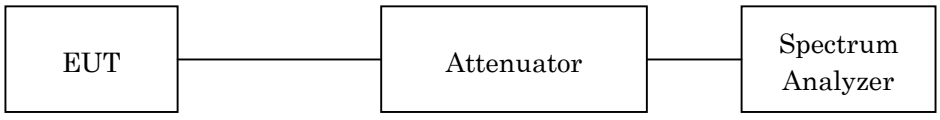
### 7.4.2 Test Instruments

| Shielded Room S4 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Spectrum Analyzer | E4446A | US44300388 (A-39) | Agilent | 2016/08/11 |
| Attenuator | 54A-10 | W5675 (D-28) | Weinschel | 2016/08/16 |
| RF Cable | SUCOFLEX102 | 14253/2 (C-52) | HUBER+SUHNER | 2016/08/16 |

NOTE : The calibration interval of the above test instruments is 12 months.

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

The test system is shown as follows:




The setting of the spectrum analyzer are shown as follows:

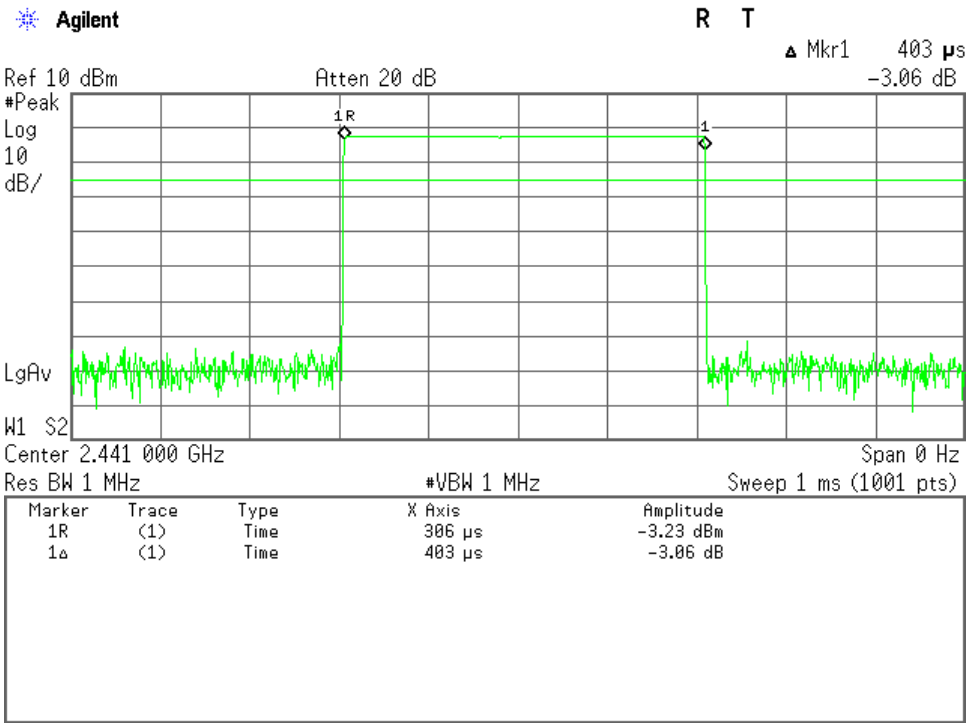
| | |
|---|---|
| Res. Bandwidth | 1 MHz |
| Video Bandwidth | 1 MHz |
| Span | Zero Span |

### 7.4.4 Test Data

Test Date :October 14, 2015
Temp.:26°C, Humi:45%

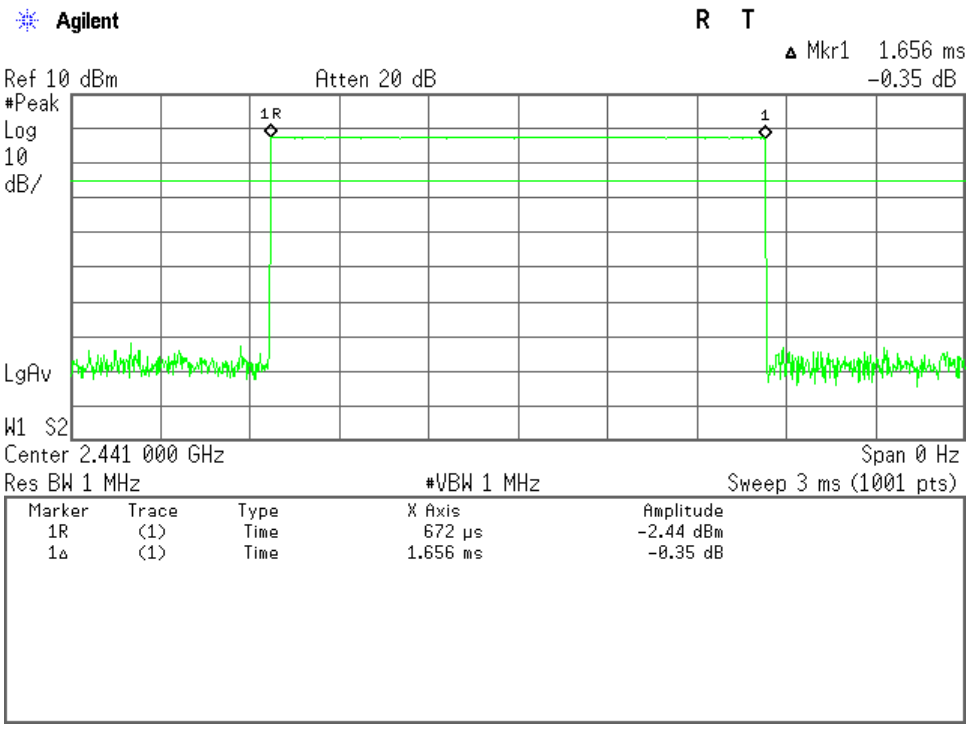
| Mode of EUT | Dwell Time (msec) | Limit (msec) |
|---|---|---|
| DH1 | 129.0 | 400 |
| DH3 | 265.0 | 400 |
| DH5 | 310.0 | 400 |
| Inquiry | 78.8 | 400 |

DH1(Modulation type : GFSK)



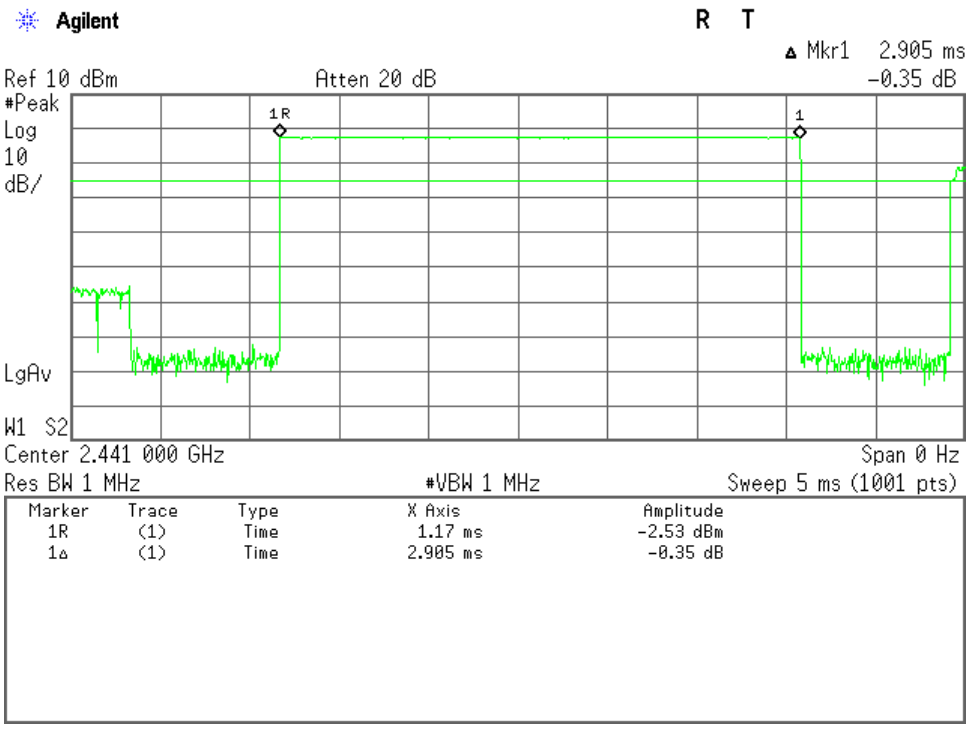

Note : The system makes worst case 1600 hops per second or 1 time slot has a length of 625 µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 79 channels. So the system has each channel 10.1266 times per second and so for 31.6 seconds the system have 320.0 times of appearance.
Each tx-time per appearance is 0.403 ms.
Dwell time = 320.0 * 0.403 = 129.0 ms

DH3(Modulation type : GFSK)



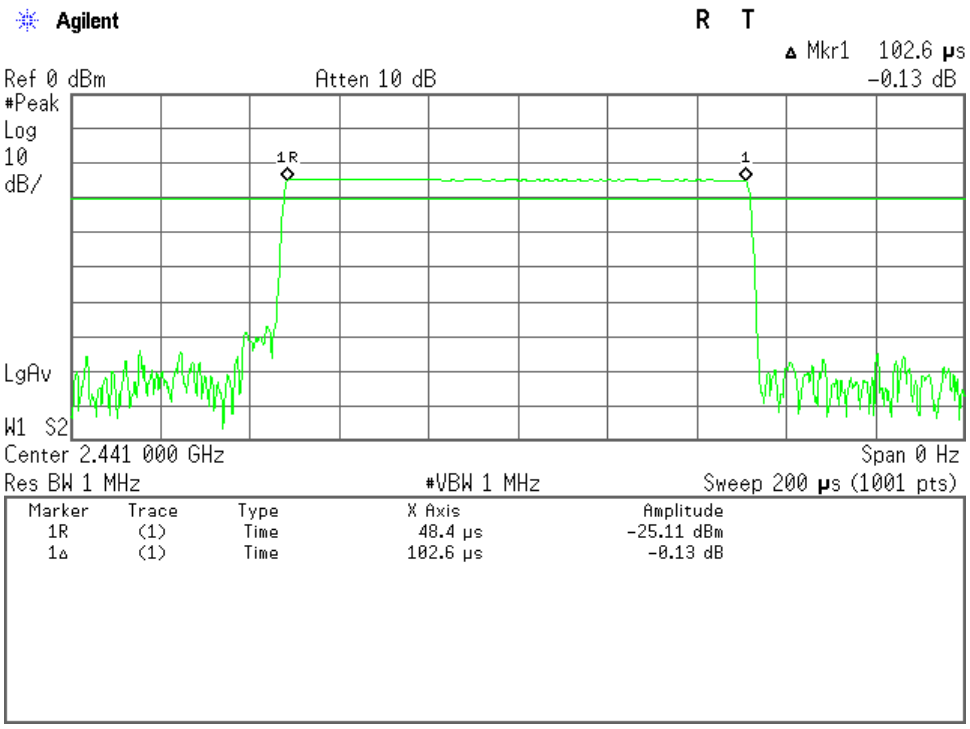

Note : A DH3 Packet need 3 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 400 hops per second with 79 channels. So the system have each channel 5.063 times per second and so for 31.6 seconds the system have 160.0 times of appearance.
Each tx-time per appearance is 1.656 ms.
Dwell time = 160.0 * 1.656 = 265.0 ms

DH5(Modulation type : GFSK)




Note : A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 266.667 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.7 times of appearance.
Each tx-time per appearance is 2.905 ms.
Dwell time = 106.7 * 2.905 = 310.0 ms

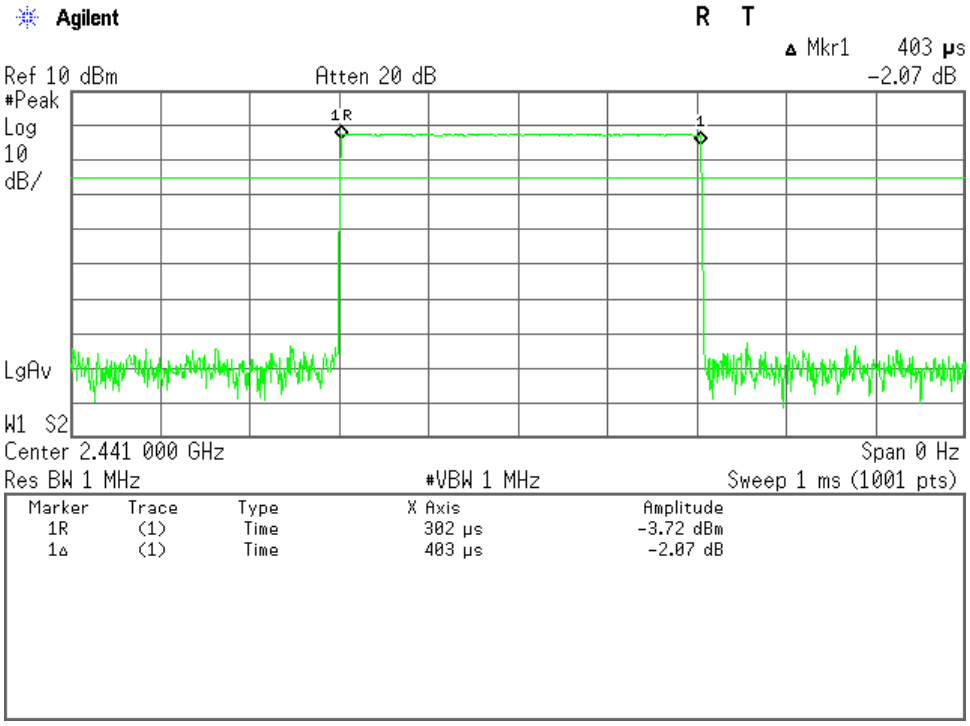
Inquiry




Note : The system have 32 hopping channel in Inquiry mode.
The time period = 32 * 0.4 = 12.8 seconds
In maximum case the Bluetooth system have three blocks of 2560 ms in 12.8 s period. One block has 256 burst at each hopping channel.
Each tx-time per appearance is 0.1026 ms.
Dwell time = 0.1026 * 256 * 3 = 78.8 ms

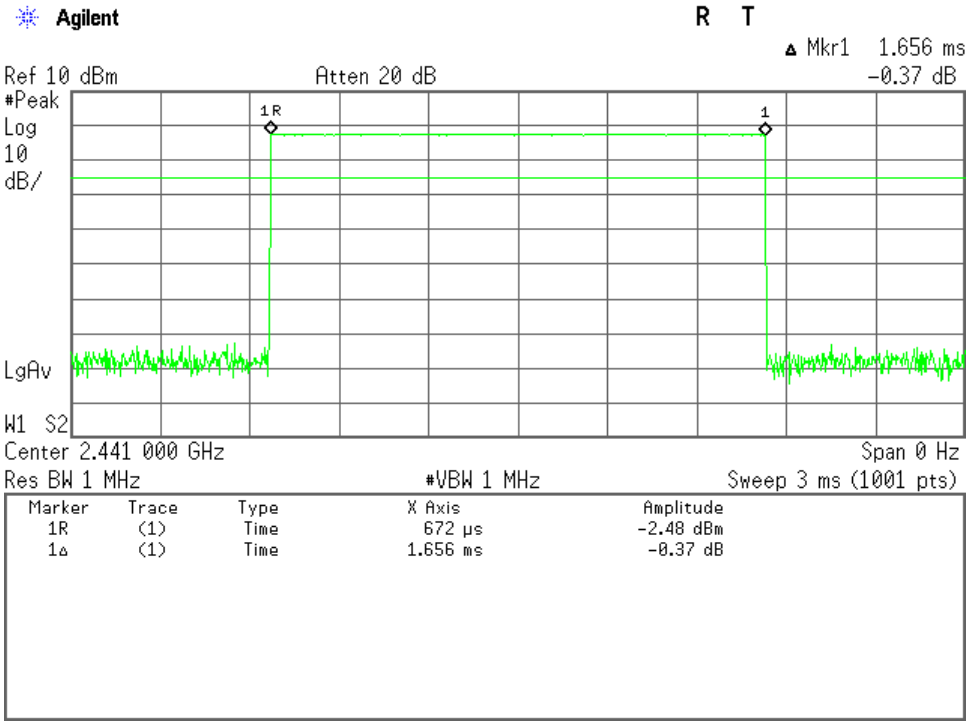
| Mode of EUT | Dwell Time (msec) | Limit (msec) |
|---|---|---|
| DH1(AFH) | 129.0 | 400 |
| DH3(AFH) | 265.0 | 400 |
| DH5(AFH) | 310.0 | 400 |

DH1(AFH mode, Modulation type : GFSK)



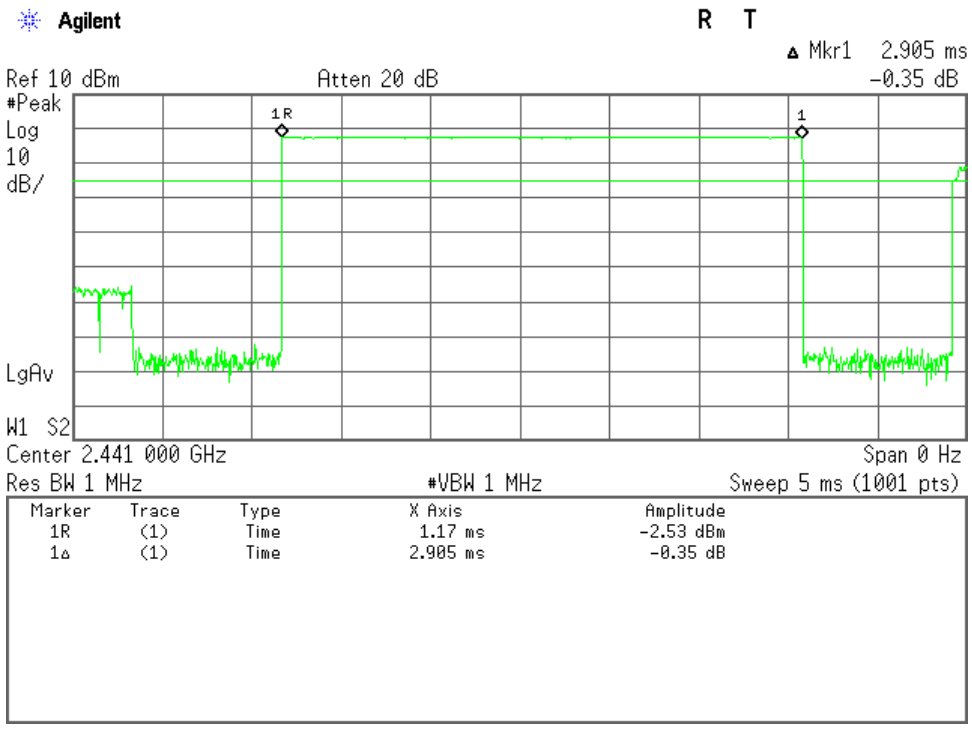

Note : The system makes worst case 1600 hops per second or 1 time slot has a length of 625 µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 800 hops per second with 20 channels. So the system has each channel 40 times per second and so for 8 seconds the system have 320.0 times of appearance.
Each tx-time per appearance is 0.403 ms.
Dwell time = 320.0 * 0.403 = 129.0 ms

DH3(AFH mode, Modulation type : GFSK)




Note : A DH3 Packet need 3 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 400 hops per second with 20 channels. So the system have each channel 20 times per second and so for 8 seconds the system have 160.0 times of appearance.
Each tx-time per appearance is 1.656 ms.
Dwell time = 160.0 * 1.656 = 265.0 ms

DH5(AFH mode, Modulation type : GFSK)




Note : A DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 266.667 hops per second with 20 channels. So the system have each channel 13.33335 times per second and so for 8 seconds the system have 106.7 times of appearance.
Each tx-time per appearance is 2.905 ms.
Dwell time = 106.7 * 2.905 = 310.0 ms

## 7.5 Peak Output Power(Conduction)

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

### 7.5.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Peak Output Power is 7.74 dBm at 2402.0 MHz

Uncertainty of Measurement Results ± 0.9 dB(2σ)

Remarks : _____

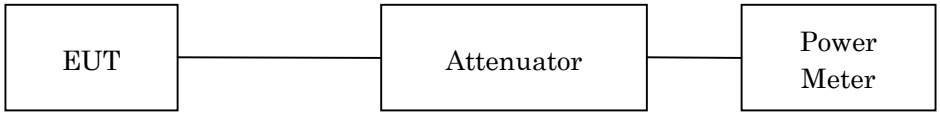
### 7.5.2 Test Instruments

| Shielded Room S4 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Power Meter | N1911A | GB45100291 (B-63) | Agilent | 2016/07/16 |
| Power Sensor | N1921A | US44510470 (B-64) | Agilent | 2016/07/16 |
| Attenuator | 54A-10 | W5675 (D-28) | Weinschel | 2016/08/16 |

NOTE : The calibration interval of the above test instruments is 12 months.

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

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



### 7.5.4 Test Data

1)DH5(Modulation type : GFSK)

Test Date: October 14, 2015
Temp.: 26 °C, Humi: 45 %

| Transmitting Frequency | | Correction Factor | Meter Reading | Conducted Peak Output Power | | Limits | Margin |
|---|---|---|---|---|---|---|---|
| CH | [MHz] | [dB] | [dBm] | [dBm] | [mW] | [dBm] | [dB] |
| 00 | 2402 | 9.64 | -1.90 | 7.74 | 5.94 | 20.97 | +13.23 |
| 39 | 2441 | 9.65 | -2.10 | 7.55 | 5.69 | 20.97 | +13.42 |
| 78 | 2480 | 9.65 | -3.23 | 6.42 | 4.39 | 20.97 | +14.55 |

Calculated result at 2402.000 MHz, as the worst point shown on underline:

| | | | |
|---|---|---|---|
| | Correction Factor | = | 9.64 dB |
| + ) | Meter Reading | = | -1.90 dBm |
| | Result | = | 7.74 dBm = 5.94 mW |

Minimum Margin: 20.97 - 7.74 = 13.23 (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 |

2) 2DH5(Modulation type : pi/4-DQPSK)

Test Date: October 14, 2015
Temp.: 26 °C, Humi: 45 %

| Transmitting Frequency | | Correction Factor | Meter Reading | Conducted Peak Output Power | | Limits | Margin |
|---|---|---|---|---|---|---|---|
| CH | [MHz] | [dB] | [dBm] | [dBm] | [mW] | [dBm] | [dB] |
| 00 | 2402 | 9.64 | -5.51 | 4.13 | 2.59 | 20.97 | +16.84 |
| 39 | 2441 | 9.65 | -5.14 | 4.51 | 2.82 | 20.97 | +16.46 |
| 78 | 2480 | 9.65 | -6.85 | 2.80 | 1.91 | 20.97 | +18.17 |

Calculated result at 2441.000 MHz, as the worst point shown on underline:

| | | | |
|---|---|---|---|
| | Correction Factor | = | 9.65 dB |
| + ) | Meter Reading | = | -5.14 dBm |
| | Result | = | 4.51 dBm = 2.82 mW |

Minimum Margin: 20.97 - 4.51 = 16.46 (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 |

3) 3DH5(Modulation type : 8DPSK)

Test Date: October 14, 2015
Temp.: 26 °C, Humi: 45 %

| Transmitting Frequency | | Correction Factor | Meter Reading | Conducted Peak Output Power | | Limits | Margin |
|---|---|---|---|---|---|---|---|
| CH | [MHz] | [dB] | [dBm] | [dBm] | [mW] | [dBm] | [dB] |
| 00 | 2402 | 9.64 | -4.92 | 4.72 | 2.96 | 20.97 | +16.25 |
| 39 | 2441 | 9.65 | -4.66 | 4.99 | 3.16 | 20.97 | +15.98 |
| 78 | 2480 | 9.65 | -6.59 | 3.06 | 2.02 | 20.97 | +17.91 |

Calculated result at 2441.000 MHz, as the worst point shown on underline:

| | | | |
|---|---|---|---|
| | Correction Factor | = | 9.65 dB |
| + ) | Meter Reading | = | -4.66 dBm |
| | Result | = | 4.99 dBm = 3.16 mW |

Minimum Margin: 20.97 - 4.99 = 15.98 (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 |

## 7.6 Peak Power Density(Conduction)

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

Remarks : _____

## 7.7 Spurious Emissions(Conduction)

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

### 7.7.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Uncertainty of Measurement Results

| | | |
|---|---|---|
| 9 kHz – 1 GHz | ± 1.4 | dB(2σ) |
| 1 GHz – 18 GHz | ± 1.7 | dB(2σ) |
| 18 GHz – 40 GHz | ± 2.3 | dB(2σ) |

Remarks : _____

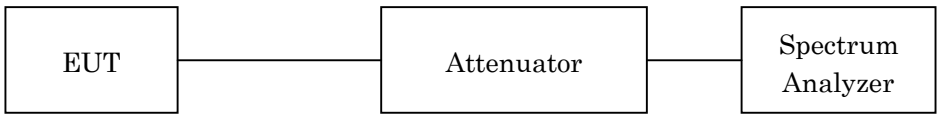
### 7.7.2 Test Instruments

| Shielded Room S4 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Spectrum Analyzer | E4446A | US44300388 (A-39) | Agilent | 2016/08/11 |
| Attenuator | 54A-10 | W5675 (D-28) | Weinschel | 2016/08/16 |
| RF Cable | SUCOFLEX102 | 14253/2 (C-52) | HUBER+SUHNER | 2016/08/16 |

NOTE : The calibration interval of the above test instruments is 12 months.

### 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:

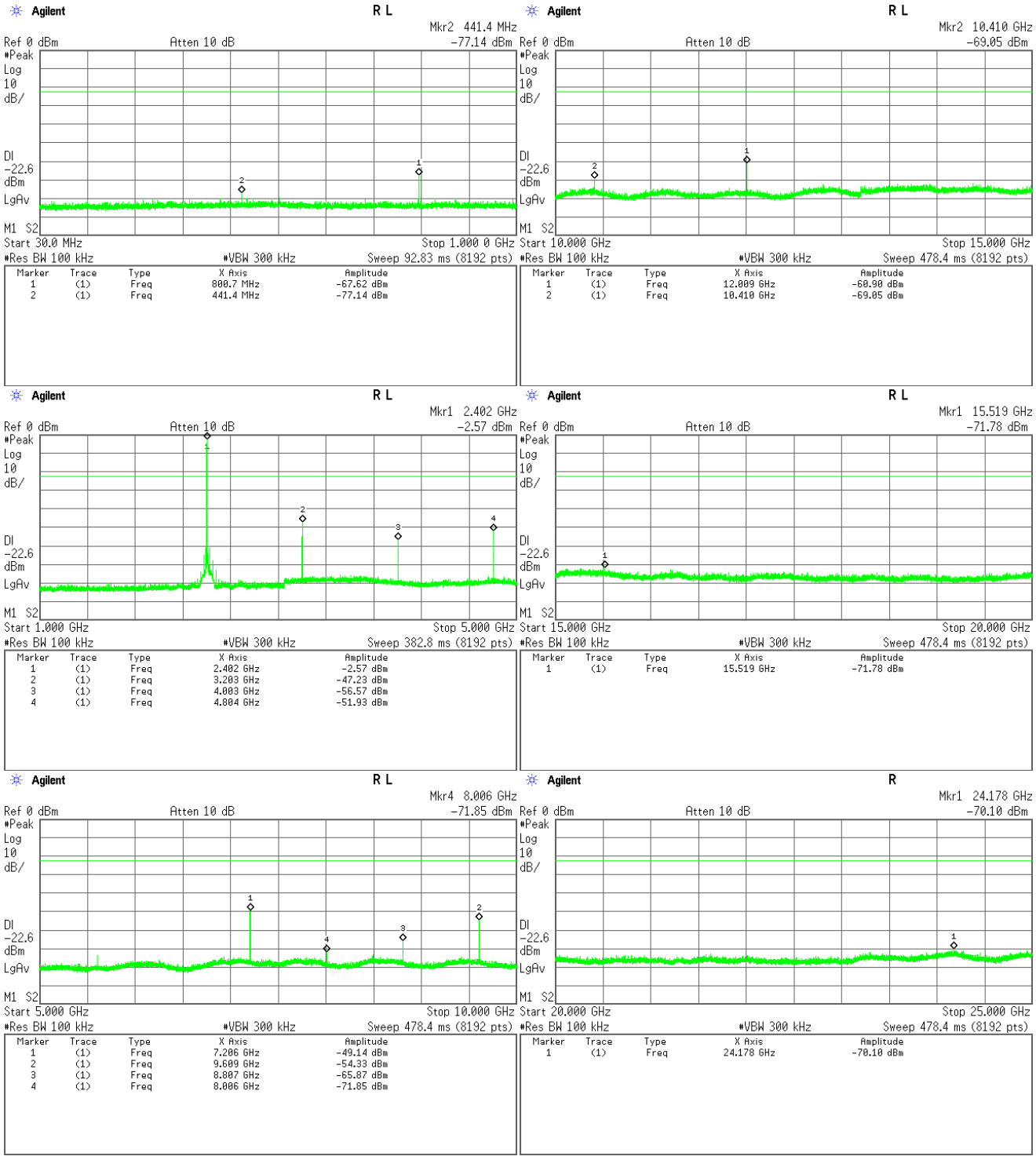
| | | |
|---|---|---|
| Frequency Range | 30 MHz - 25 GHz | Band-Edge |
| Res. Bandwidth | 100 kHz | 100 kHz |
| Video Bandwidth | 300 kHz | 300 kHz |
| Sweep Time | AUTO | AUTO |
| Trace | Maxhold | Maxhold |

### 7.7.4 Test Data

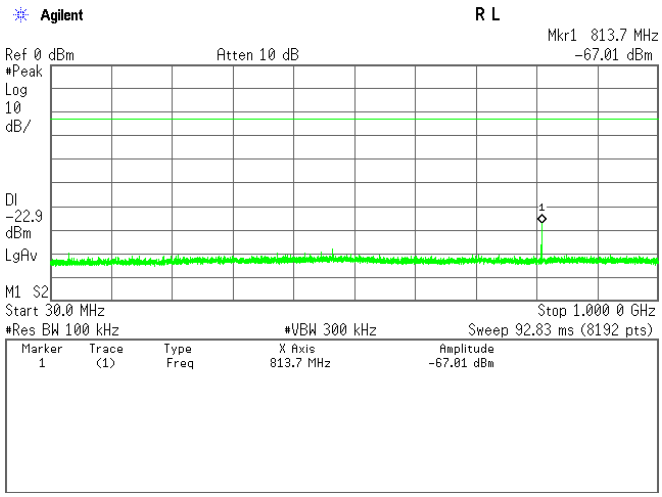
Test Date :October 14, 2015
Temp.:26°C, Humi:45%

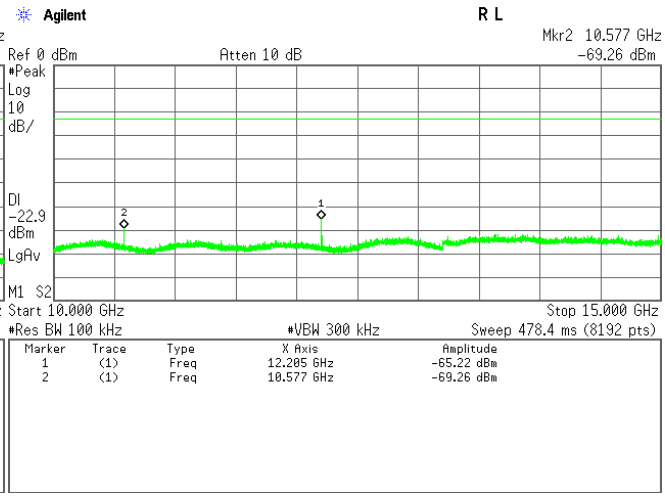
Mode of EUT : BDR (worst case)

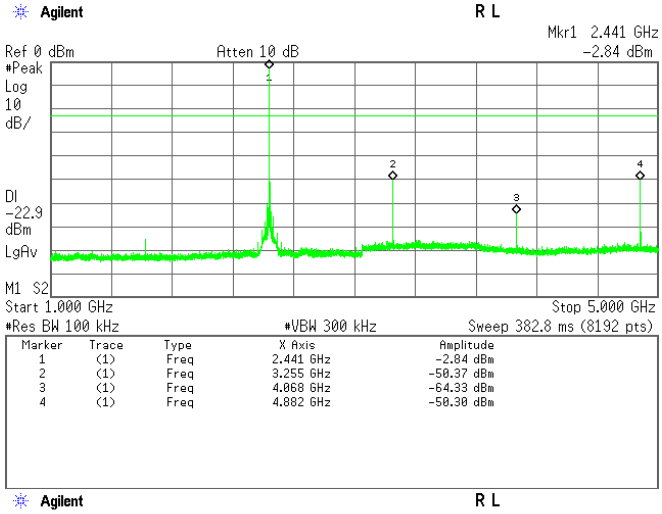
Low Channel

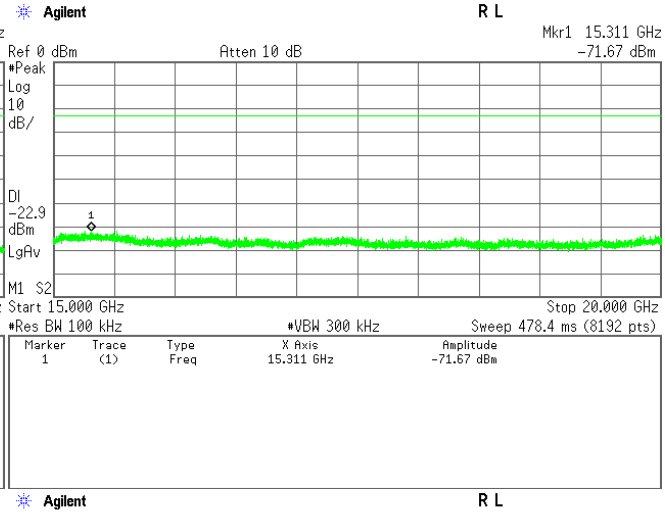


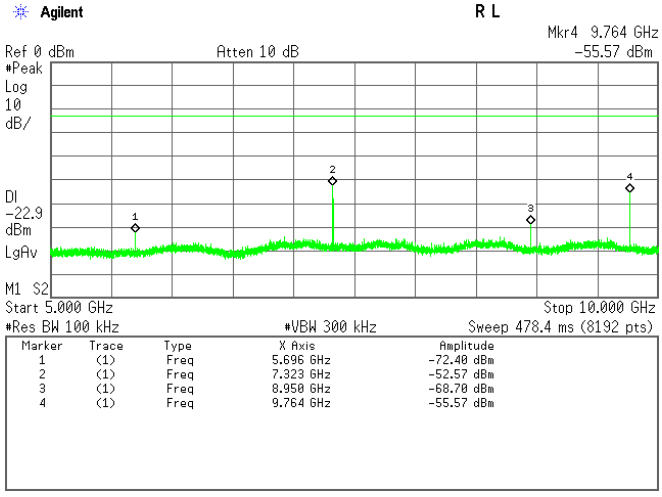
Middle Channel

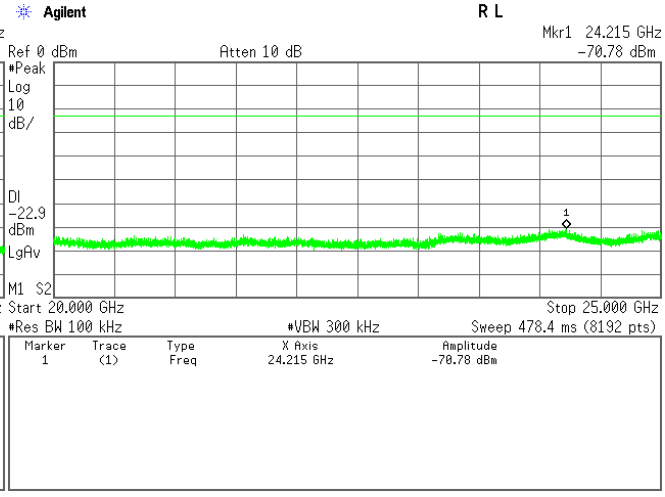


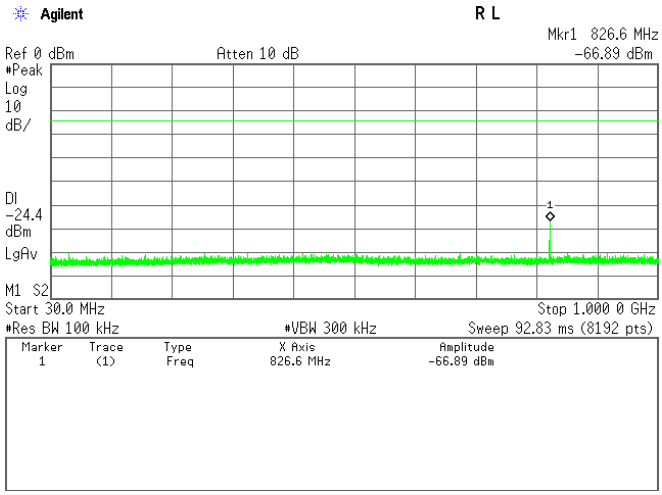



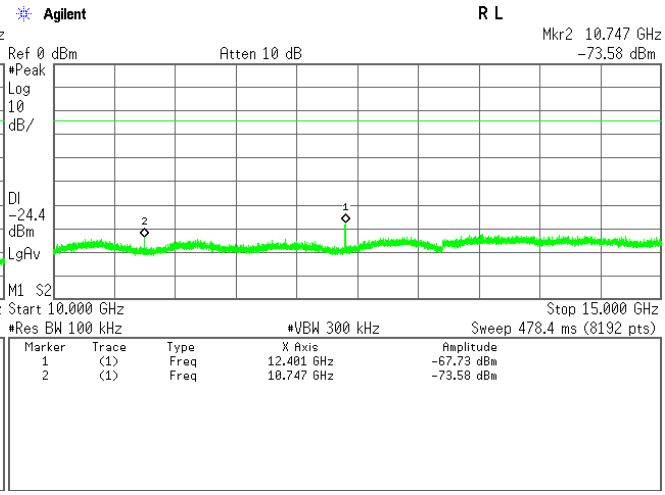



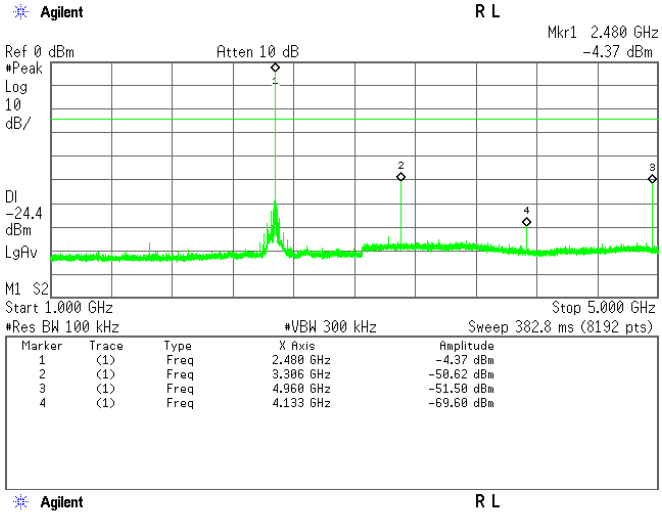



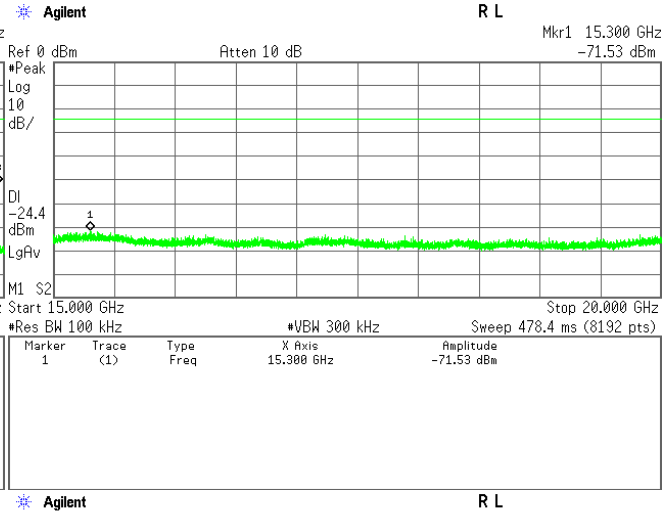



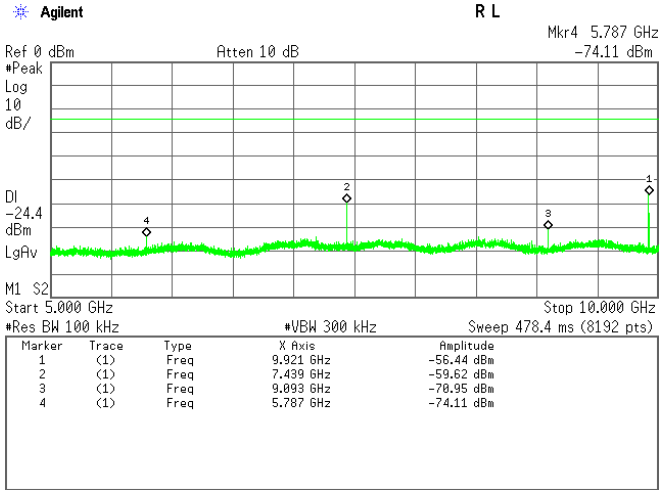
High Channel

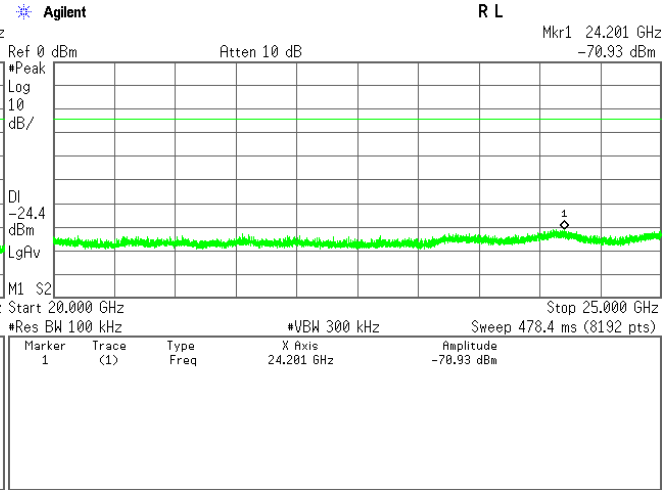


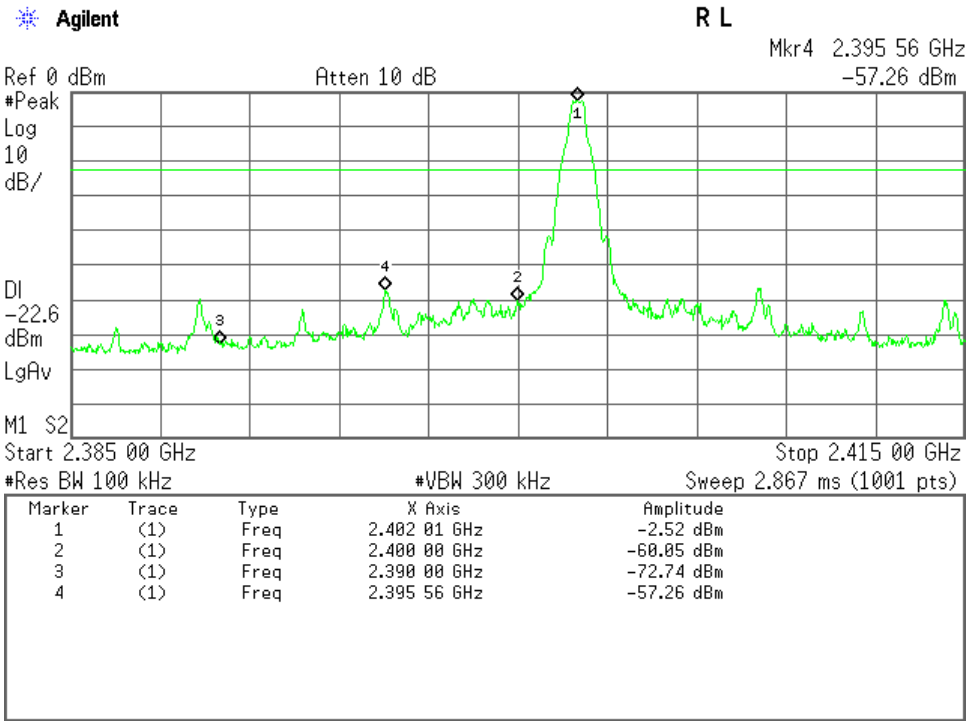



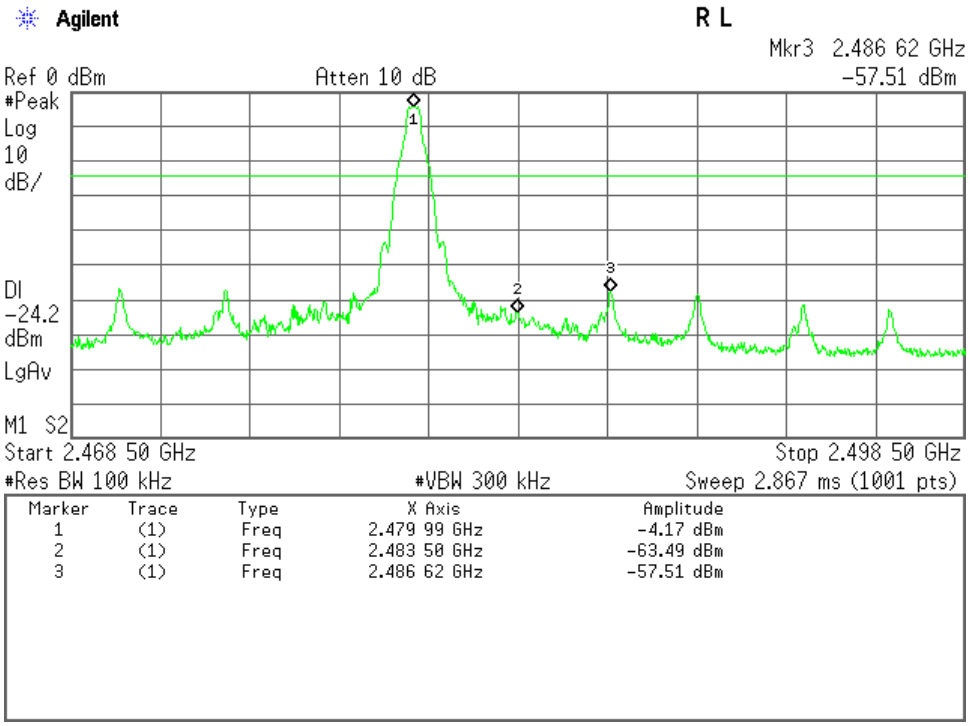



**Band-Edge Emission**

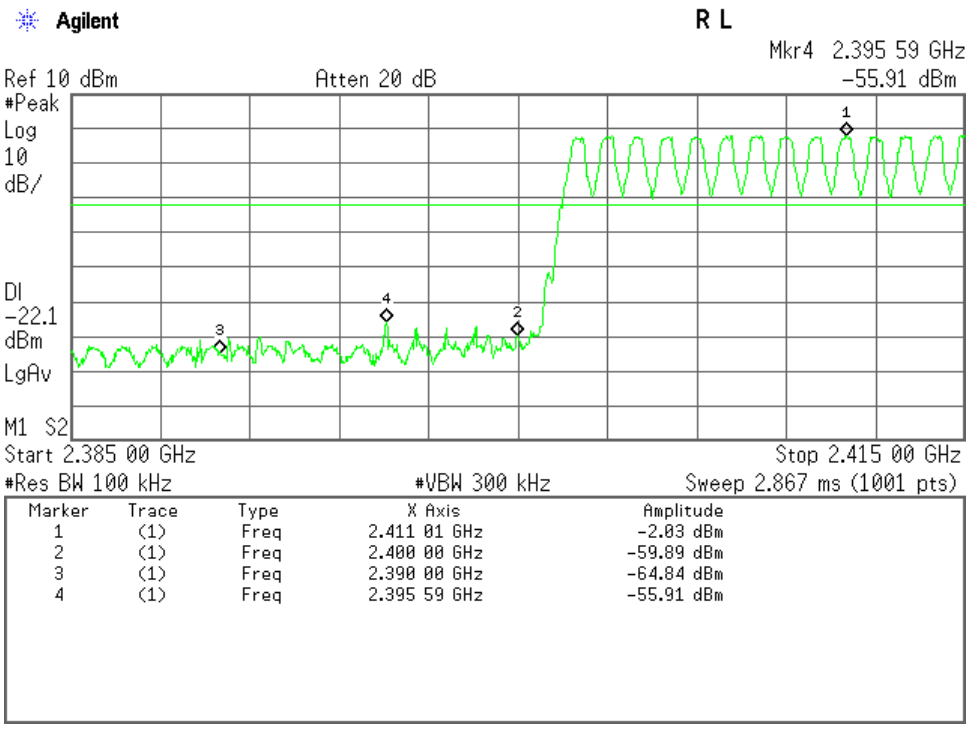
Low Channel(Hopping off), Band-Edge Emission



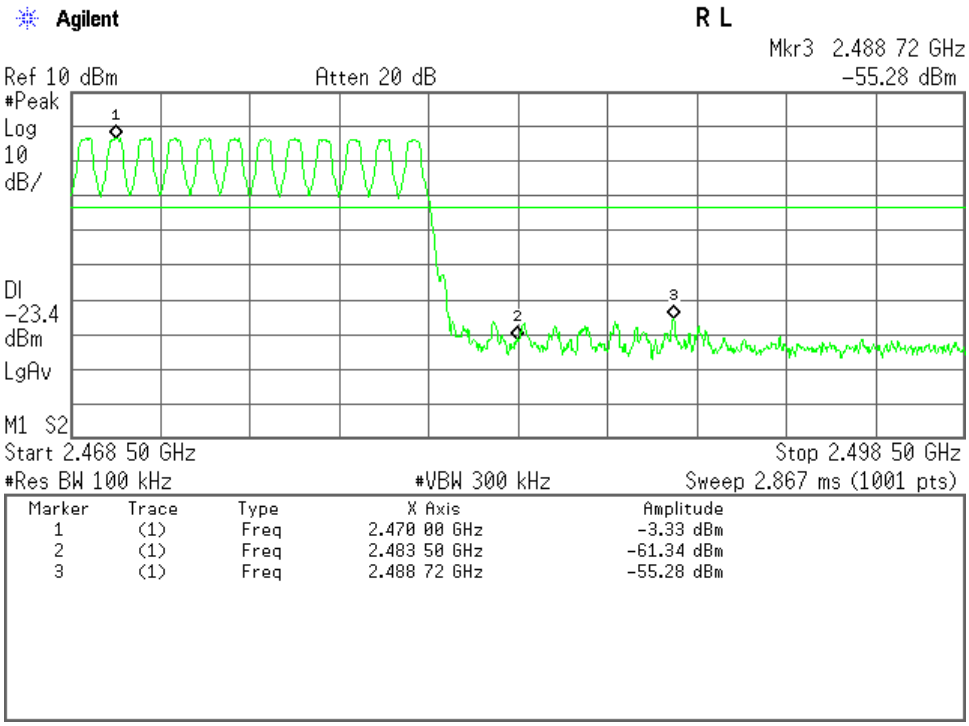

High Channel(Hopping off), Band-Edge Emission



Low Channel(Hopping on), Band-Edge Emission




High Channel(Hopping on), Band-Edge Emission



## 7.8 AC Powerline Conducted Emission

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

### 7.8.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Quasi-Peak) 20.7 dB at 0.150 MHz

Uncertainty of Measurement Results ± 2.6 dB(2σ)

Remarks :

### 7.8.2 Test Instruments

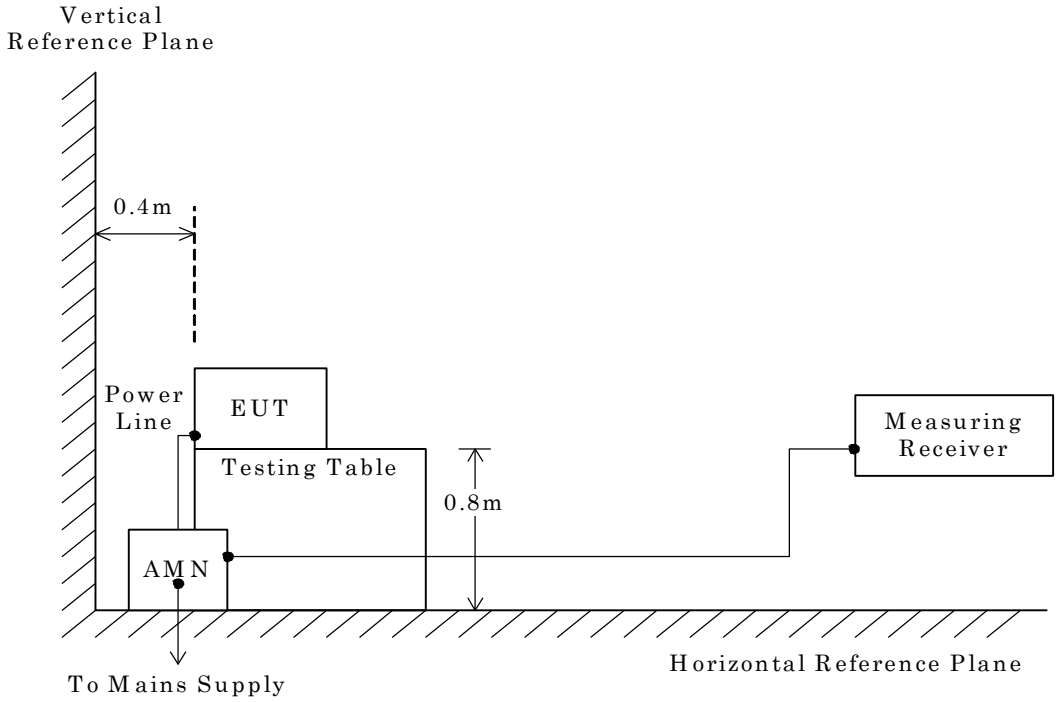
| Shielded Room S1 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Test Receiver | ESU 26 | 100170 (A-6) | Rohde & Schwarz | 2016/04/25 |
| RF Cable | RG223/U | --- (H-9) | HUBER+SUHNER | 2016/07/09 |
| AMN | KNW-407FR | 8-2019-1 (D-103) | Kyoritsu | 2016/10/15 |

NOTE : The calibration interval of the above test instruments is 12 months.

### 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

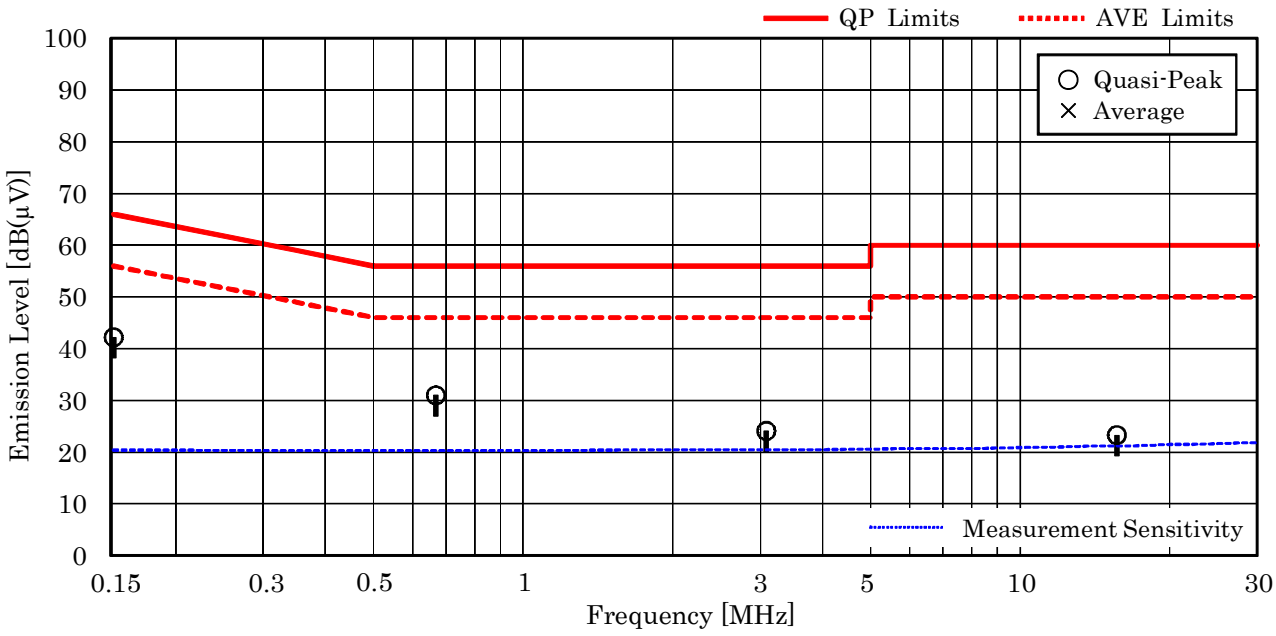
Mode of EUT : All modes have been investigated and the worst case mode for channel (39ch: 2441MHz) has been listed.

**Test voltage : 120VAC 60Hz**

Test Date: December 2, 2015
Temp.: 20 °C, Humi.: 44 %

**Measured phase : L1**

| Frequency [MHz] | Corr. Factor [dB] | Meter Readings [dB(μV)] QP | AVE | Limits [dB(μV)] QP | AVE | Results [dB(μV)] QP | AVE | Margin [dB] QP | AVE | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.150 | 10.4 | 31.8 | -- | 66.0 | 56.0 | 42.2 | -- | +23.8 | -- | - |
| 0.668 | 10.3 | 20.7 | -- | 56.0 | 46.0 | 31.0 | -- | +25.0 | -- | - |
| 3.087 | 10.5 | 13.6 | -- | 56.0 | 46.0 | 24.1 | -- | +31.9 | -- | - |
| 3.765 | 10.5 | < 10.0 | -- | 56.0 | 46.0 | < 20.5 | -- | > +35.5 | -- | - |
| 4.079 | 10.5 | < 10.0 | -- | 56.0 | 46.0 | < 20.5 | -- | > +35.5 | -- | - |
| 15.656 | 11.2 | 12.1 | -- | 60.0 | 50.0 | 23.3 | -- | +36.7 | -- | - |



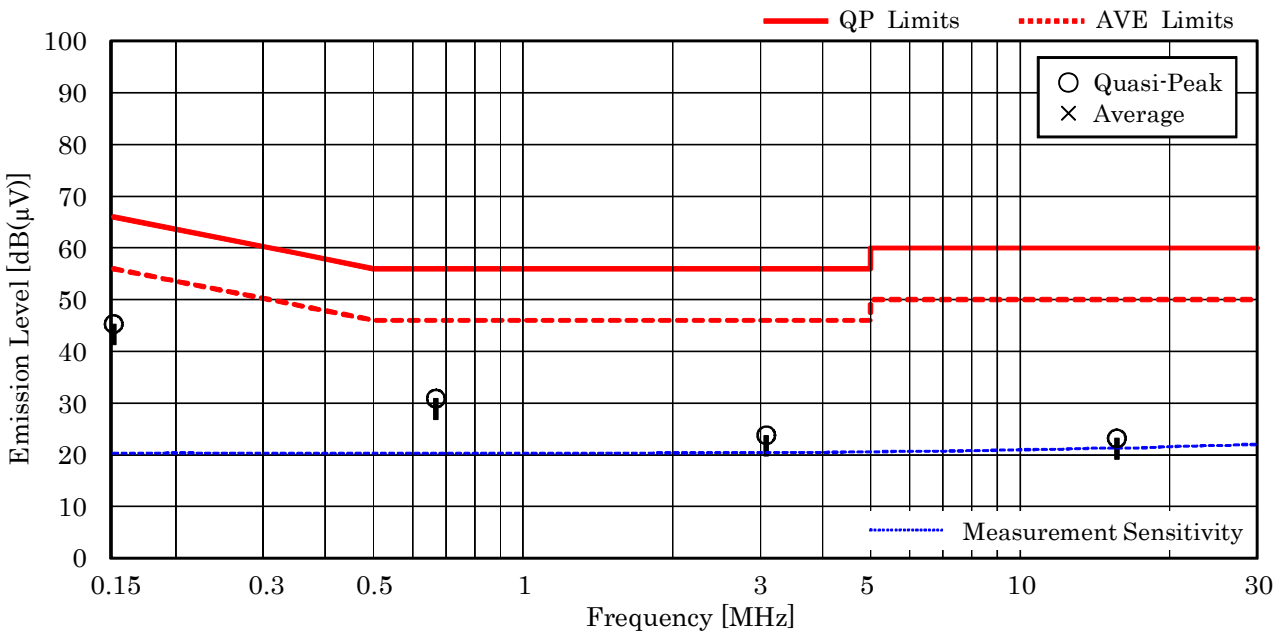

NOTES
1. The spectrum was checked from 0.15 MHz to 30 MHz.
2. The correction factor includes the AMN insertion loss and the cable loss.
3. The symbol of "<" means "or less".
4. The symbol of ">" means "more than".
5. The symbol of "--" means "not applicable".
6. Calculated result at 0.150 MHz, as the worst point shown on underline:
   Correction Factor + Meter Reading (QP) = 10.4 + 31.8 = 42.2 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: December 2, 2015
Temp.: 20 °C, Humi.: 44 %

**Measured phase : L2**

| Frequency [MHz] | Corr. Factor [dB] | Meter Readings [dB(μV)] QP | AVE | Limits [dB(μV)] QP | AVE | Results [dB(μV)] QP | AVE | Margin [dB] QP | AVE | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.150 | 10.3 | 35.0 | -- | 66.0 | 56.0 | 45.3 | -- | +20.7 | -- | - |
| 0.668 | 10.3 | 20.6 | -- | 56.0 | 46.0 | 30.9 | -- | +25.1 | -- | - |
| 3.087 | 10.5 | 13.3 | -- | 56.0 | 46.0 | 23.8 | -- | +32.2 | -- | - |
| 3.765 | 10.5 | < 10.0 | -- | 56.0 | 46.0 | < 20.5 | -- | > +35.5 | -- | - |
| 4.079 | 10.5 | < 10.0 | -- | 56.0 | 46.0 | < 20.5 | -- | > +35.5 | -- | - |
| 15.656 | 11.3 | 11.9 | -- | 60.0 | 50.0 | 23.2 | -- | +36.8 | -- | - |




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 0.150 MHz, as the worst point shown on underline:
   Correction Factor + Meter Reading (QP) = 10.3 + 35.0 = 45.3 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

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

### 7.9.1 Test Results

For the standard, ☑ - **Passed** ☐ - **Failed** ☐ - **Not judged**

Min. Limit Margin (Average) 13.1 dB at 800.0 MHz

| Uncertainty of Measurement Results | | |
|---|---|---|
| 9 kHz – 30 MHz | ± 3.0 | dB(2σ) |
| 30 MHz – 300 MHz | ± 3.8 | dB(2σ) |
| 300 MHz – 1000 MHz | ± 4.8 | dB(2σ) |
| 1 GHz – 6 GHz | ± 4.7 | dB(2σ) |
| 6 GHz – 18 GHz | ± 4.6 | dB(2σ) |
| 18 GHz – 40 GHz | ± 5.5 | dB(2σ) |

Remarks : Y axis Position

### 7.9.2 Test Instruments

| Anechoic Chamber A2 | | | | |
|---|---|---|---|---|
| **Type** | **Model** | **Serial No. (ID)** | **Manufacturer** | **Cal. Due** |
| Test Receiver | ESU 26 | 100170 (A-6) | Rohde & Schwarz | 2016/04/25 |
| Loop Antenna | HFH2-Z2 | 872096/25 (C-2) | Rohde & Schwarz | 2016/07/26 |
| RF Cable | RG213/U | --- (H-28) | HUBER+SUHNER | 2016/07/26 |
| Pre-Amplifier | 310N | 304573 (A-17) | SONOMA | 2016/04/15 |
| Biconical Antenna | VHA9103/BBA9106 | 2355 (C-30) | Schwarzbeck | 2016/05/24 |
| Log-periodic Antenna | UHALP9108-A1 | 0694 (C-31) | Schwarzbeck | 2016/05/24 |
| RF Cable | S 10162 B-11 etc. | --- (H-4) | HUBER+SUHNER | 2016/04/15 |
| Site Attenuation | -- | --- (H-15) | ---- | 2016/01/05 |
| Pre-Amplifier | TPA0118-36 | 1010 (A-37) | TOYO | 2016/05/11 |
| Double-Ridge Guide Horn Antenna | TR17206 | 73370006 (C-29) | ADVANTEST | 2016/06/23 |
| Horn Antenna | 91888-2 | 562 (C-41-1) | EATON | 2016/06/16 |
| Horn Antenna | 91889-2 | 568 (C-41-2) | EATON | 2016/06/16 |
| Horn Antenna | 3160-04 | 9903-1053 (C-55) | EMCO | 2016/06/29 |
| Horn Antenna | 3160-05 | 9902-1061 (C-56) | EMCO | 2016/06/29 |
| Horn Antenna | 3160-06 | 9712-1045 (C-57) | EMCO | 2016/06/29 |
| Horn Antenna | 3160-07 | 9902-1113 (C-58) | EMCO | 2016/06/29 |
| Horn Antenna | 3160-08 | 9904-1099 (C-59) | EMCO | 2016/06/29 |
| Horn Antenna | 3160-09 | 9808-1117 (C-48) | EMCO | 2016/06/28 |
| Attenuator | 54A-10 | W5713 (D-29) | Weinschel | 2016/08/16 |
| Attenuator | 2-10 | BA6214 (D-79) | Weinschel | 2016/11/19 |
| RF Cable | SUCOFLEX104 | 267479/4 (C-66) | HUBER+SUHNER | 2016/01/19 |
| RF Cable | SUCOFLEX104 | 267414/4 (C-67) | HUBER+SUHNER | 2016/01/19 |
| RF Cable | SUCOFLEX102EA | 3041/2EA (C-69) | HUBER+SUHNER | 2016/01/19 |
| Band Rejection Filter | BRM50701 | 029 (D-93) | MICRO-TRONICS | 2016/02/08 |
| SVSWR | -- | --- (H-19) | ---- | 2016/02/27 |

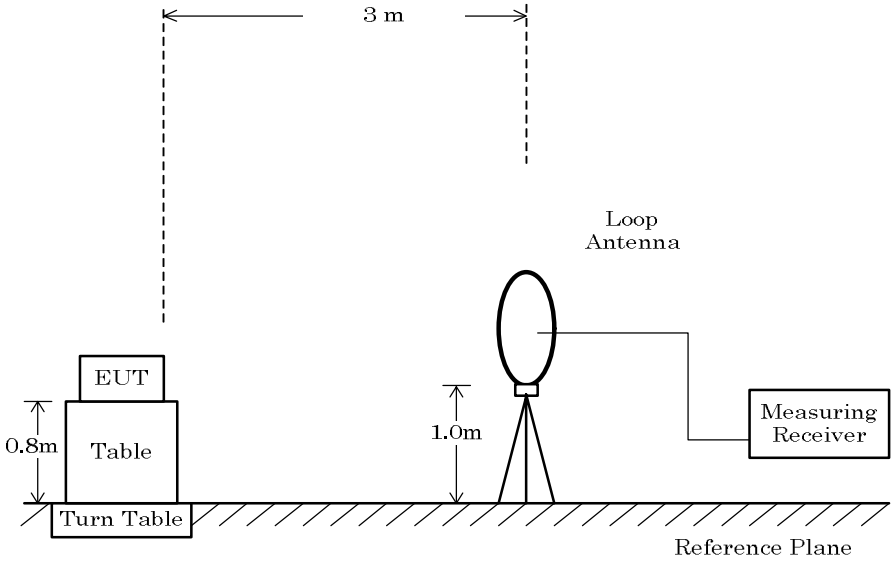
NOTE : The calibration interval of the above test instruments is 12 months.

### 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.
The measurement were performed about three antenna orientations (parallel, perpendicular, and ground-parallel).
This configurations was used for the final tests.

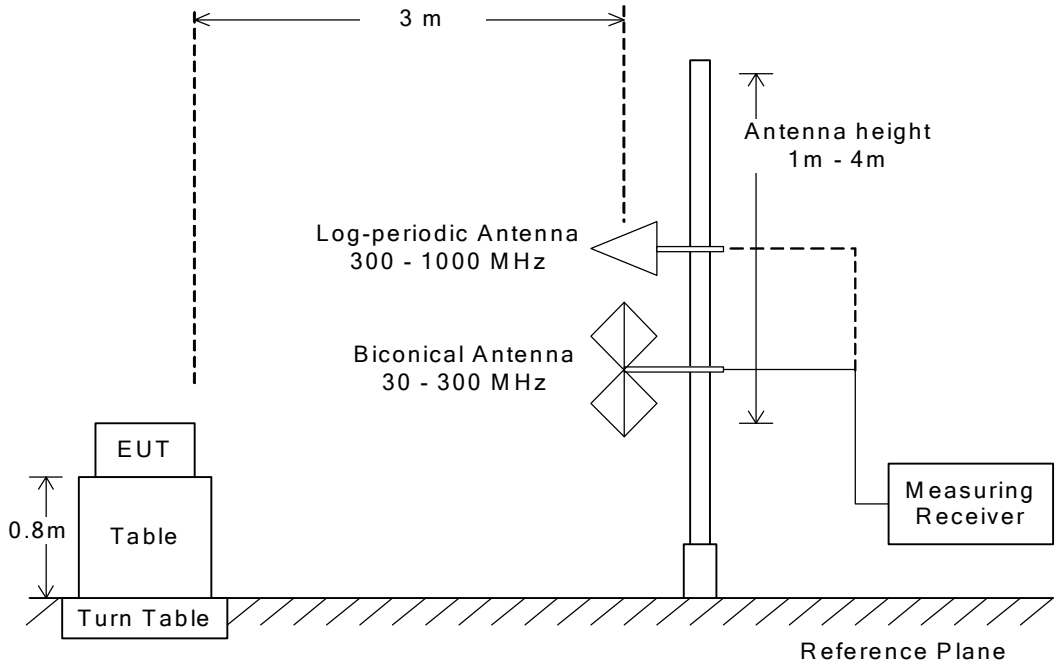
– Side View –



### 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:

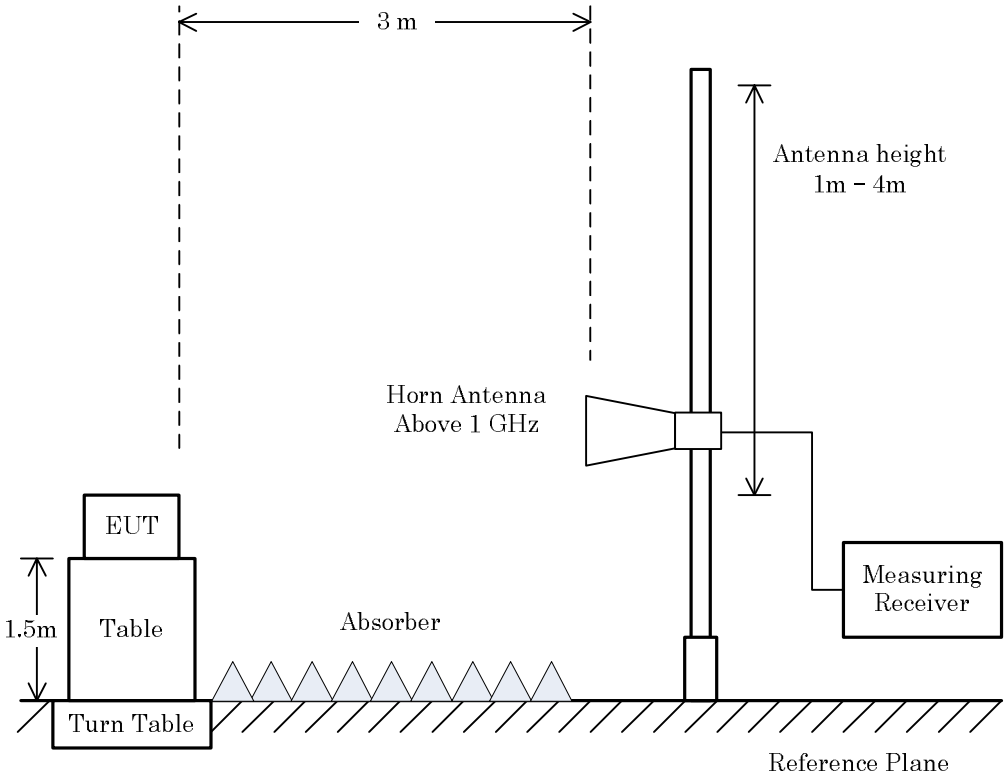
| Type | Peak | Average |
|---|---|---|
| Detector Function | Peak | Peak |
| Res. Bandwidth | 1 MHz | 1 MHz |
| Video Bandwidth | 3 MHz | ≥ 1/T *1) |
| Video Filtering | Linear Voltage | Linear Voltage |
| Sweep Time | AUTO | AUTO |
| Trace | Max Hold | Max Hold |

Note: 1. T: Minimum transmission duration

Average (VBW) Setting:

| Mode | Interval | Cycle | Duty cycle | Burst on period(T) | Min. VBW(1/T) | VBW Setting |
|---|---|---|---|---|---|---|
| | (msec) | (msec) | (%) | (msec) | (kHz) | (kHz)) |
| BDR(DH5) | 0.87 | 3.75 | 76.8% | 2.91 | 0.34 | 0.50 |

– Side View –



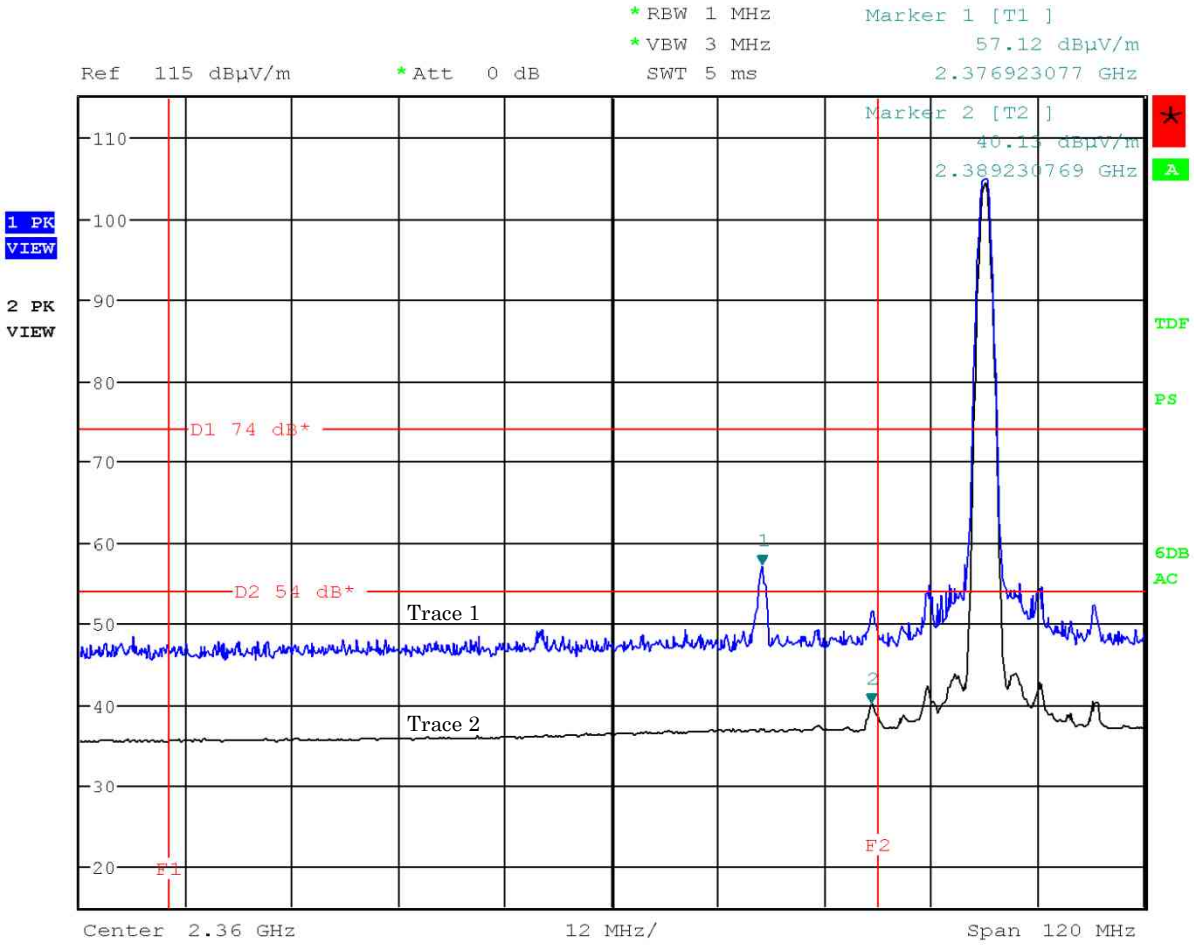

NOTE
When the EUT is manipulated through three different orientations, the scan height upper range for the measurement antenna is limited to 2.5 m or 0.5 m above the top of the EUT.

### 7.9.4 Test Data

#### 7.9.4.1 Band-edge Compliance

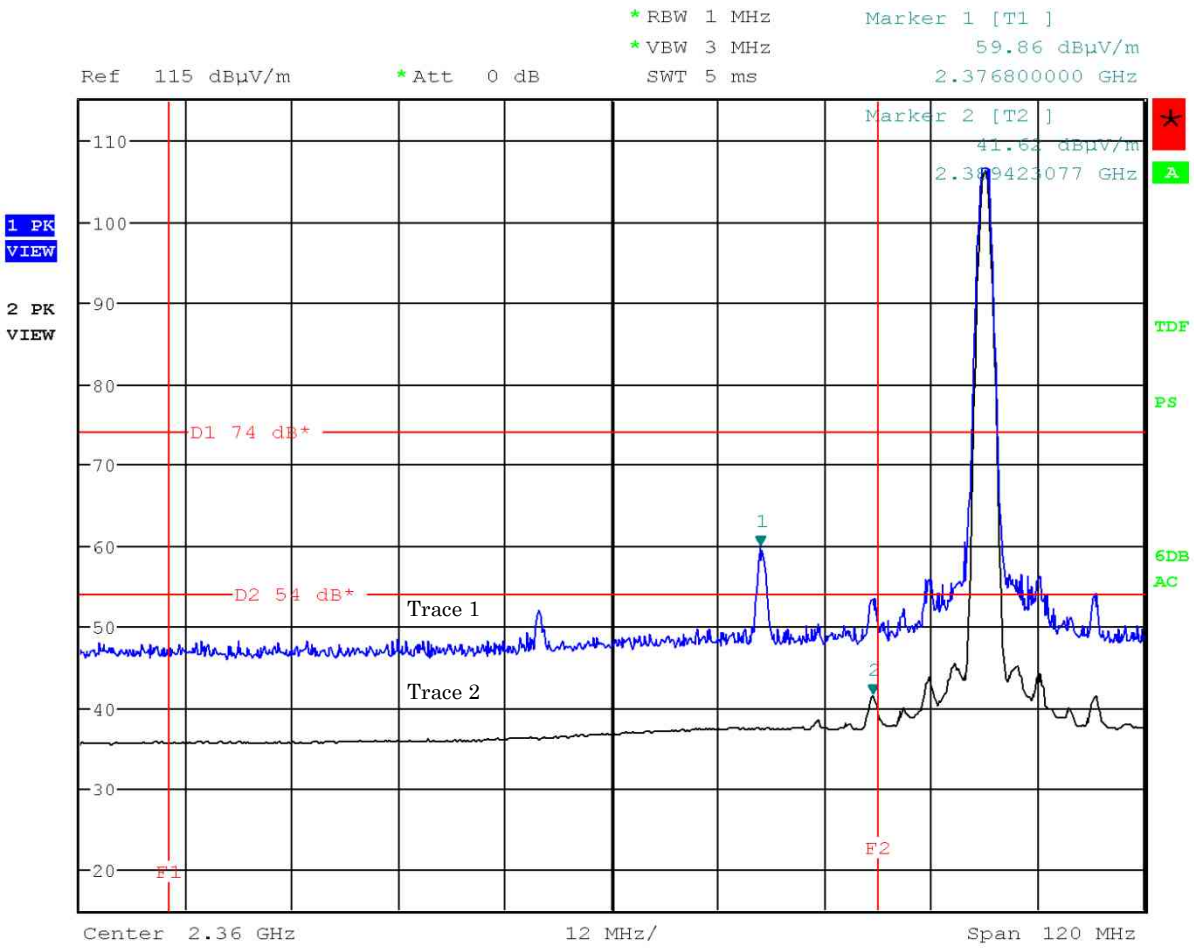
Test Date :October 15, 2015
Temp.:23°C, Humi:48%

Mode of EUT : BDR, Hopping off (0ch: 2402 MHz) (worst case)
Antenna Polarization : Horizontal



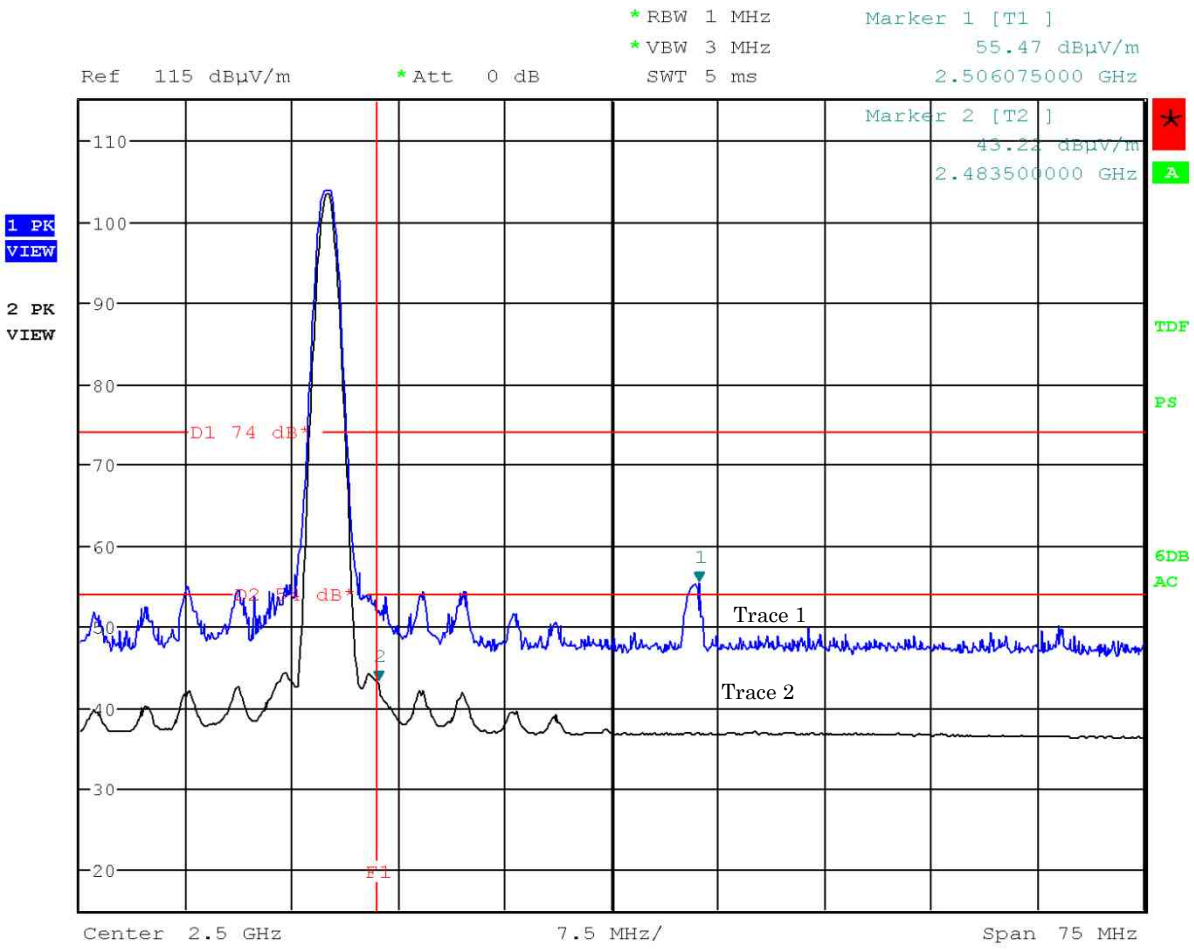

Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : BDR, Hopping off (0ch: 2402 MHz) (worst case)
Antenna Polarization : Vertical



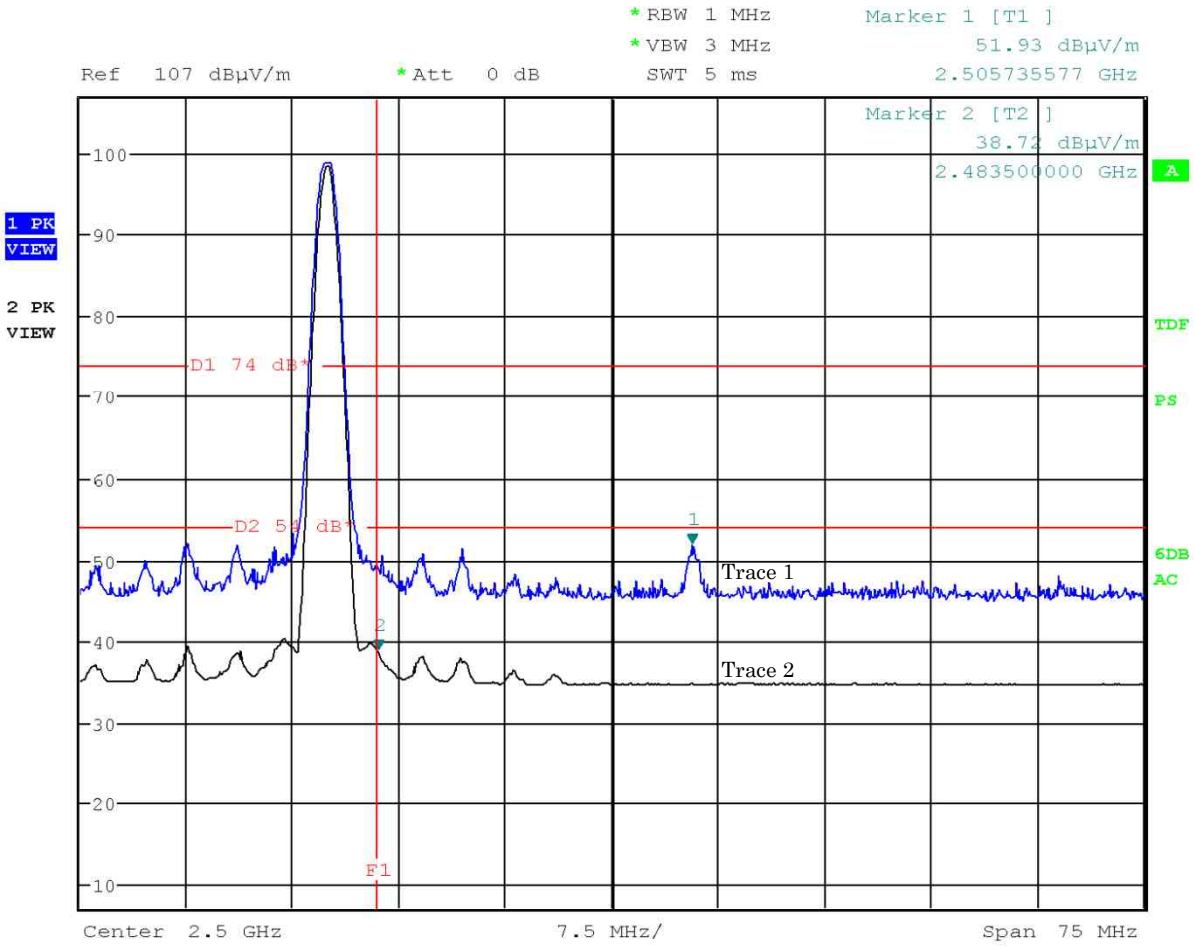

Note: The trace 1 is Peak . The trace 2 is Average.

Mode of EUT : BDR, Hopping off (78ch: 2480 MHz) (worst case)
Antenna Polarization : Horizontal




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

Mode of EUT : BDR, Hopping off (78ch: 2480 MHz) (worst case)
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 :November 30, 2015
Temp.:19°C, Humi:54%

Mode of EUT : All modes have been investigated and the worst case mode has been listed.
Results : No spurious emissions in the range 20dB below the limit.

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

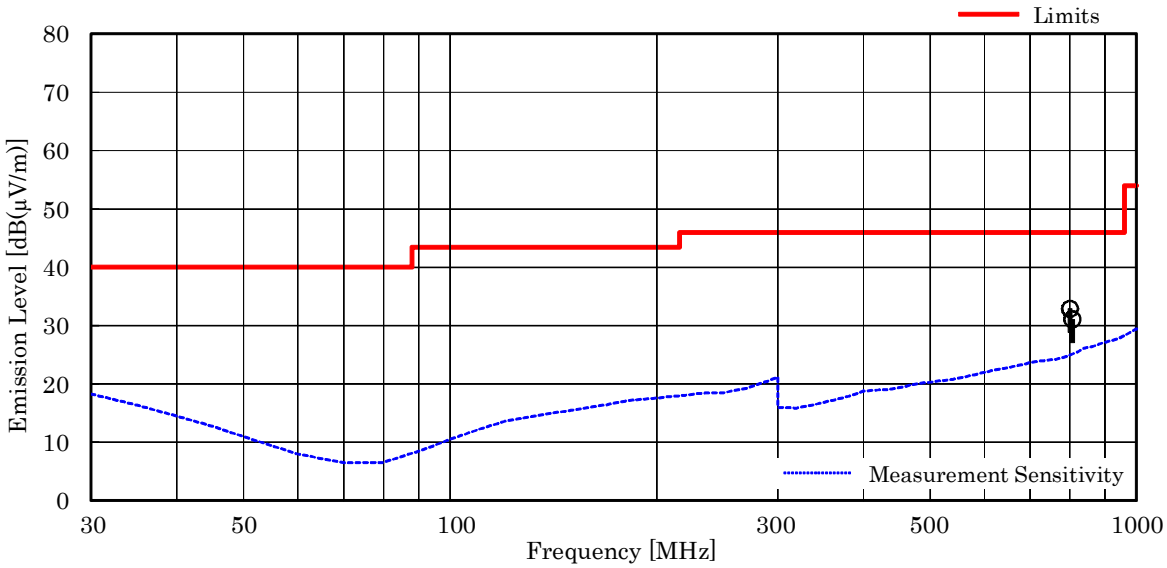
Mode of EUT : All modes have been investigated and the worst case mode has been listed.

**Test voltage : 120VAC 60Hz**

Test Date: November 30, 2015
Temp.: 19 °C, Humi: 54 %

**Antenna pole : Horizontal**

| Frequency [MHz] | Antenna Factor [dB(1/m)] | Corr. Factor [dB] | Meter Readings [dB(μV)] | Limits [dB(μV/m)] | Results [dB(μV/m)] | Margin [dB] | Remarks |
|---|---|---|---|---|---|---|---|
| 800.00 | 20.7 | -22.9 | 35.1 | 46.0 | 32.9 | +13.1 | - |
| 806.39 | 20.8 | -22.9 | 33.2 | 46.0 | 31.1 | +14.9 | - |



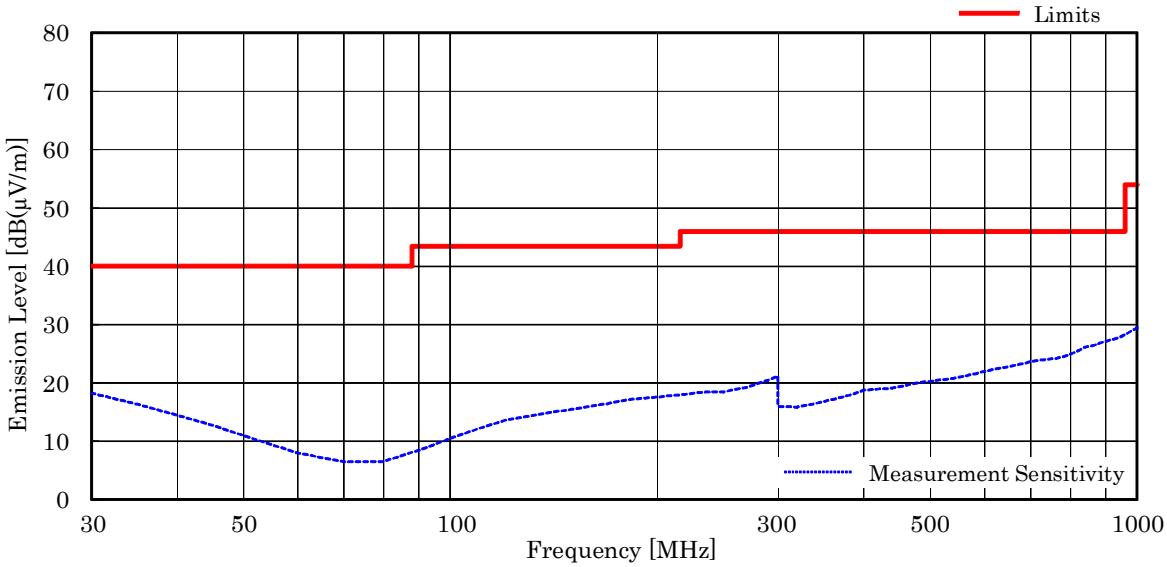

NOTES
1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 1000 MHz.
3. The correction factor is composed of cable loss, pad attenuation and/or amplifier gain.
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. Calculated result at 800.00 MHz, as the worst point shown on underline:
   Antenna Factor + Coorection Factor + Meter Reading = 20.7 + (-22.9) + 35.1 = 32.9 dB(μV/m)
   Antenna Height : 1.12 m, Turntable Angle : 182 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

**Test voltage : 120VAC 60Hz**

Test Date: November 30, 2015
Temp.: 19 °C, Humi: 54 %

**Antenna pole : Vertical**

| Frequency [MHz] | Antenna Factor [dB(1/m)] | Corr. Factor [dB] | Meter Readings [dB(μV)] | Limits [dB(μV/m)] | Results [dB(μV/m)] | Margin [dB] | Remarks |
|---|---|---|---|---|---|---|---|
| 800.00 | 20.7 | -22.9 | < 27.0 | 46.0 | < 24.8 | > +21.2 | - |
| 806.39 | 20.8 | -22.9 | < 27.0 | 46.0 | < 24.9 | > +21.1 | - |




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 806.39 MHz, as the worst point shown on underline:
   Antenna Factor + Coorection Factor + Meter Reading = 20.8 + (-22.9) + <27.0 = <24.9 dB(μV/m)
   Antenna Height : 1.16 m, Turntable Angle : 323 °
7. Test receiver setting(s) : CISPR QP 120 kHz (QP : Quasi-Peak)

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

Mode of EUT : BDR (worst case)

Test Date: October 15, 2015
Temp.: 23 °C, Humi: 48 %

| Frequency | Antenna Factor | Corr. Factor | D.C.F. | Meter Readings [dB(μV)] Horizontal | | Vertical | | Limits [dB(μV/m)] | | Results [dB(μV/m)] | | Margin [dB] | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [MHz] | [dB(1/m)] | [dB] | [dB] | PK | AVE | PK | AVE | PK | AVE | PK | AVE | | |
| **Test condition : Tx Low Ch** | | | | | | | | | | | | | |
| 4003.2 | 32.7 | -32.6 | -24.7 | 47.0 | 41.4 | 47.3 | 41.5 | 74.0 | 54.0 | 47.4 | 16.9 | +26.6 | |
| 4804.0 | 32.9 | -31.7 | -24.7 | 57.3 | 55.1 | 52.9 | 50.0 | 74.0 | 54.0 | 58.5 | 31.6 | +15.5 | |
| 12010.0 | 39.1 | -29.1 | -24.7 | 48.5 | 40.6 | 48.0 | 39.1 | 74.0 | 54.0 | 58.5 | 25.9 | +15.5 | |
| 19216.0 | 40.5 | -35.6 | -24.7 | < 50.0 | < 40.0 | < 50.0 | < 40.0 | 74.0 | 54.0 | < 54.9 | < 20.2 | > +19.1 | |
| **Test condition : TX Middle Ch** | | | | | | | | | | | | | |
| 4068.3 | 32.6 | -32.5 | -24.7 | 46.1 | 38.9 | 47.4 | 41.3 | 74.0 | 54.0 | 47.5 | 16.7 | +26.5 | |
| 4882.0 | 33.0 | -31.6 | -24.7 | 58.1 | 56.2 | 54.2 | 51.5 | 74.0 | 54.0 | 59.5 | 32.9 | +14.5 | |
| 7323.0 | 36.6 | -31.3 | -24.7 | 54.5 | 51.6 | # 53.5 | 49.9 | 74.0 | 54.0 | 59.8 | 32.2 | +14.2 | |
| 12205.0 | 38.8 | -29.6 | -24.7 | 47.4 | 38.7 | # 48.4 | 40.2 | 74.0 | 54.0 | 57.6 | 24.7 | +16.4 | |
| 19528.0 | 40.4 | -35.5 | -24.7 | < 50.0 | < 40.0 | < 50.0 | < 40.0 | 74.0 | 54.0 | < 54.9 | < 20.2 | > +19.1 | |
| **Test condition : TX High Ch** | | | | | | | | | | | | | |
| 4133.3 | 32.2 | -32.5 | -24.7 | 46.3 | 38.8 | 45.4 | 36.5 | 74.0 | 54.0 | 46.0 | 13.8 | +28.0 | |
| 4960.0 | 33.2 | -31.5 | -24.7 | 58.8 | 57.0 | 56.2 | 54.2 | 74.0 | 54.0 | 60.5 | 34.0 | +13.5 | |
| 7440.0 | 36.7 | -31.3 | -24.7 | 51.4 | 49.6 | 52.1 | 48.3 | 74.0 | 54.0 | 57.5 | 30.3 | +16.5 | |
| 12400.0 | 38.8 | -29.9 | -24.7 | 46.4 | 37.3 | 46.4 | 36.3 | 74.0 | 54.0 | 55.3 | 21.5 | +18.7 | |
| 19840.0 | 40.4 | -35.6 | -24.7 | < 50.0 | < 40.0 | < 50.0 | < 40.0 | 74.0 | 54.0 | < 54.8 | < 20.1 | > +19.2 | |
| 22320.0 | 40.6 | -35.5 | -24.7 | < 50.0 | < 40.0 | < 50.0 | < 40.0 | 74.0 | 54.0 | < 55.1 | < 20.4 | > +18.9 | |

Calculated result at 4960.0 MHz, as the worst point shown on underline:

| | | | |
|---|---|---|---|
| | Antenna Factor | = | 33.2 dB(1/m) |
| | Corr. Factor | = | -31.5 dB |
| | D.C.F.(For AVE only) | = | -24.7 dB |
| + ) | Meter Reading | = | 58.8 dB(μV) |
| | Result | = | 60.5 dB(μV/m) |

Minimum Margin: 74.0 - 60.5 = 13.5 (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 - Pre-Amp. Gain [dB]
4. The symbol of "<" means "or less".
5. The symbol of ">" means "more than".
6. PK : Peak / AVE : Average
7. D.C.F. Calculation. (D.C.F. ; Duty Cycle Correction Factor)
   - Time to cycle through all channels = t = T [ms] x 20 (AFH minimum hopping channels), where T = burst on duration
   - 100 ms / t = h --> Round up to next highest integer, to account for worst case, H
   - The Worst Case Dwell Time [ms] = T x H (For this case, T = 2.91 ms, H =2, 2.91 x 2 = 5.82)
   - D.C.F. [dB] = 20 x log(The Worst Case Dwell Time / 100 [ms]) = 20 x log(5.82 /100) = -24.7

## 7.10 SAR Test Exclusion

### 7.10.1 Maximum Output Power (Average)

| Mode | Ch# | Frequency (MHz) | Average Power (dBm) | |
|---|---|---|---|---|
| | | | Measured | Spec. Max. |
| Bluetooth | 0 | 2402 | 7.64 | 8.0 |
| | 39 | 2441 | 7.34 | |
| | 78 | 2480 | 6.25 | |

Power measurement is required for the transmission mode configuration with the highest maximum output power specified for production units. (Bluetooth configurations are considered separately.)

- When the same highest maximum output power specification applies to multiple transmission modes, the largest channel bandwidth configuration with the lowest order modulation and lowest data rate is measured.
- When the same highest maximum output power is specified for multiple largest channel bandwidth configurations with the same lowest order modulation or lowest order modulation and lowest data rate, power measurement is required for all equivalent Bluetooth configurations with the same maximum output power.

### 7.10.2 Standalone SAR Test Exclusion Considerations (KDB 447498 D01)

The 1 g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by;
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0, where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz.
- Power and distance are rounded to the nearest mW and mm before calculation.
- The result is rounded to one decimal place for comparison.
- When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied.

***SAR exclusion calculations for antenna ≤ 50 mm from the user***

| Band | Freq. (MHz) | Max. Power | | Distance (mm) | Threshold | Test Exclusion |
|---|---|---|---|---|---|---|
| | | (dBm) | (mW) | | | |
| Bluetooth | 2480 | 8.0 | 6 | < 5 | 1.9 | YES |

The minimum user separation distance was assumed to be 0 mm for the purpose of the SAR exclusion calculations.

<u>Conclusion:</u>
The device qualifies for the Standalone SAR test exclusion because the computed value is < 3.