



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Remote Controller

MODEL NUMBER: WUP-005

FCC ID: POO-R237999

REPORT NUMBER: 32JE0252-AP-01-A

ISSUE DATE: July 2, 2012

*Prepared for*

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NVLAP LAB CODE: 200572-0

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\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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Revision History

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Mitsumi Electric Co., Ltd.  
 2-11-2, Tsurumaki, Tama-shi, Tokyo, 206-8567 Japan

**EUT DESCRIPTION:** Remote Controller

**MODEL:** WUP-005

**SERIAL NUMBER:** DP1001

**DATE TESTED:** June 21 to 28, 2012

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Pass         |

UL Japan, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Japan, Inc based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Japan, Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Japan, Inc. will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by any government agency.

Approved & Released For UL Japan, Inc. By:

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN.

UL Japan, Inc. is accredited by NVLAP, Laboratory Code 200572-0

The full scope of accreditation can be viewed at

<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor} \\ & \text{(dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

#### EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

| Test room<br>(semi-anechoic chamber) | Conducted emission<br>(+dB) |
|--------------------------------------|-----------------------------|
|                                      | 150kHz-30MHz                |
| No.1                                 | 3.1dB                       |
| No.2                                 | 3.3dB                       |
| No.3                                 | 3.7dB                       |
| No.4                                 | 3.2dB                       |

| Test room<br>(semi-anechoic chamber) | Radiated emission |                  |                 |                |                 |                   |                   |
|--------------------------------------|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
|                                      | (3m*)(+dB)        |                  |                 |                | (1m*)(+dB)      |                   | (0.5m*)(+dB)      |
|                                      | 9kHz<br>-30MHz    | 30MHz<br>-300MHz | 300MHz<br>-1GHz | 1GHz<br>-10GHz | 10GHz<br>-18GHz | 18GHz<br>-26.5GHz | 26.5GHz<br>-40GHz |
| No.1                                 | 4.2dB             | 5.0dB            | 5.1dB           | 4.7dB          | 5.7dB           | 4.4dB             | 4.3dB             |
| No.2                                 | 4.1dB             | 5.2dB            | 5.1dB           | 4.8dB          | 5.6dB           | 4.3dB             | 4.2dB             |
| No.3                                 | 4.5dB             | 5.0dB            | 5.2dB           | 4.8dB          | 5.6dB           | 4.5dB             | 4.2dB             |
| No.4                                 | 4.7dB             | 5.2dB            | 5.2dB           | 4.8dB          | 5.6dB           | 5.1dB             | 4.2dB             |

\*3m/1m/0.5m = Measurement distance

| Power meter (+dB) |            |
|-------------------|------------|
| Below 1GHz        | Above 1GHz |
| 1.0dB             | 1.0dB      |

| Antenna terminal conducted emission and Power density (+dB) |           |            | Antenna terminal conducted emission (+dB) |               | Channel power (+dB) |
|---|-----------|------------|---|---------------|---------------------|
| Below 1GHz  | 1GHz-3GHz | 3GHz-18GHz | 18GHz-26.5GHz                             | 26.5GHz-40GHz |                     |
| 1.0dB   | 1.1dB     | 2.7dB      | 3.2dB                                     | 3.3dB         | 1.5dB               |

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth Remote control unit.

The radio module is manufactured by CSR.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

| Frequency Range<br>(MHz) | Mode       | Output Power<br>(dBm) | Output Power<br>(mW) |
|--------------------------|------------|-----------------------|----------------------|
| 2402 - 2480              | Basic GFSK | -0.08                 | 0.98                 |

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna with a maximum gain of -0.91dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was CSR BlueCore Bluetooth, v2.4.0.0.

The test utility software used during testing was CSR BlueTest3, v2.4 Release Build.

### 5.5. WORST-CASE CONFIGURATIONS AND MODE

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

All final tests in the GFSK mode were made at 1 Mb/s.

The EUT was investigated in three different positions, X, Y, & Z and turned out the X (Horizontal), Y (Vertical) were worst-position. This worst position will be set for all radiated emissions testing.

**5.6. DESCRIPTION OF TEST SETUP****SUPPORT EQUIPMENT FOR ALL TESTS EXCEPT FOR CONDUCTED EMISSION TEST**

| PERIPHERAL SUPPORT EQUIPMENT LIST |              |              |          |                        |        |
|-----------------------------------|--------------|--------------|----------|------------------------|--------|
| No.                               | Description  | Manufacturer | Model    | Serial Number          | FCC ID |
| A                                 | Switch Board | Mitsumi      | -        | -                      | N/A    |
| B                                 | Laptop PC    | IBM          | 2373-L32 | L3-NHT4A               | DoC    |
| C                                 | AC Adaptor   | IBM          | 08K8208  | 11S08K8208Z1Z9MA5686XR | N/A    |

**SUPPORT EQUIPMENT FOR CONDUCTED EMISSION TEST**

| PERIPHERAL SUPPORT EQUIPMENT LIST |             |              |          |               |        |
|-----------------------------------|-------------|--------------|----------|---------------|--------|
| No.                               | Description | Manufacturer | Model    | Serial Number | FCC ID |
| A                                 | JIG         | Mitsumi      | -        | -             | N/A    |
| B                                 | AC Adaptor  | Mitsumi      | -        | No.15         | DoC    |
| C                                 | LCD Monitor | Ben Q        | EW2730-B | ETNAB07468SL0 | N/A    |

**I/O CABLES FOR ALL TESTS EXCEPT FOR CONDUCTED EMISSION TEST**

| I/O CABLE LIST |      |                     |                |            |              |         |
|----------------|------|---------------------|----------------|------------|--------------|---------|
| Cable No.      | Port | # of Identical port | Connector Type | Cable Type | Cable Length | Remarks |
| 1              | USB  | 1                   | USB            | Shielded   | 2.3          | -       |
| 2              | USB  | 1                   | USB            | Shielded   | 0.5          | -       |
| 3              | DC   | 1                   | DC             | Unshielded | 1.4          | -       |
| 4              | DC   | 1                   | DC             | Unshielded | 1.8          | -       |
| 5              | AC   | 1                   | AC             | Unshielded | 1.0          | -       |
| 6              | DC   | 1                   | DC             | Unshielded | 2.3          | -       |

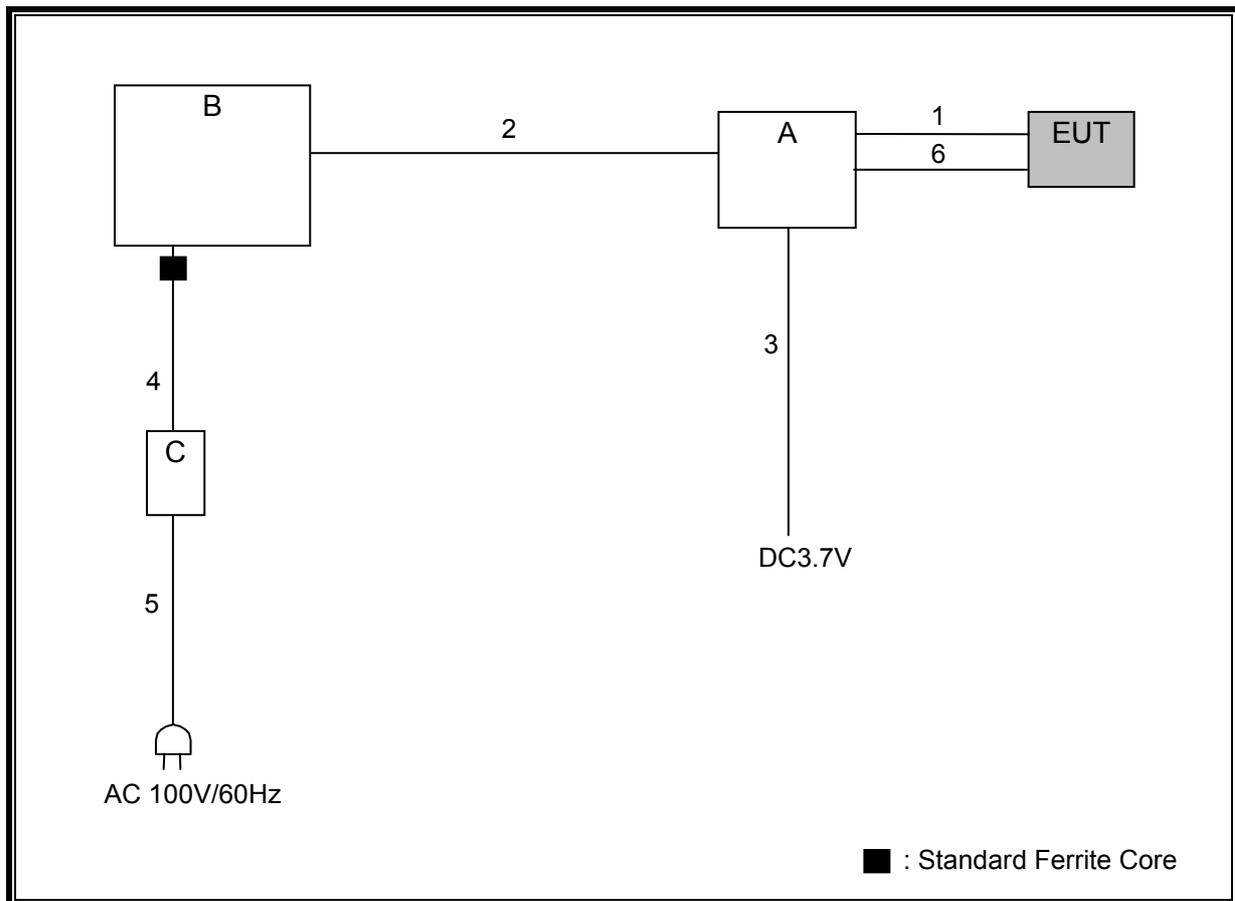
**I/O CABLES FOR CONDUCTED EMISSION TEST**

| I/O CABLE LIST |      |                     |                |            |              |         |
|----------------|------|---------------------|----------------|------------|--------------|---------|
| Cable No.      | Port | # of Identical port | Connector Type | Cable Type | Cable Length | Remarks |
| 1              | USB  | 1                   | USB            | Shielded   | 2.5          | -       |
| 2              | DC   | 1                   | DC             | Unshielded | 1.5          | -       |
| 3              | AC   | 1                   | AC             | Unshielded | 1.5          | -       |
| 4              | HDMI | 1                   | HDMI           | Shielded   | 3.0          | -       |
| 5              | AC   | 1                   | AC             | Unshielded | 1.8          | -       |

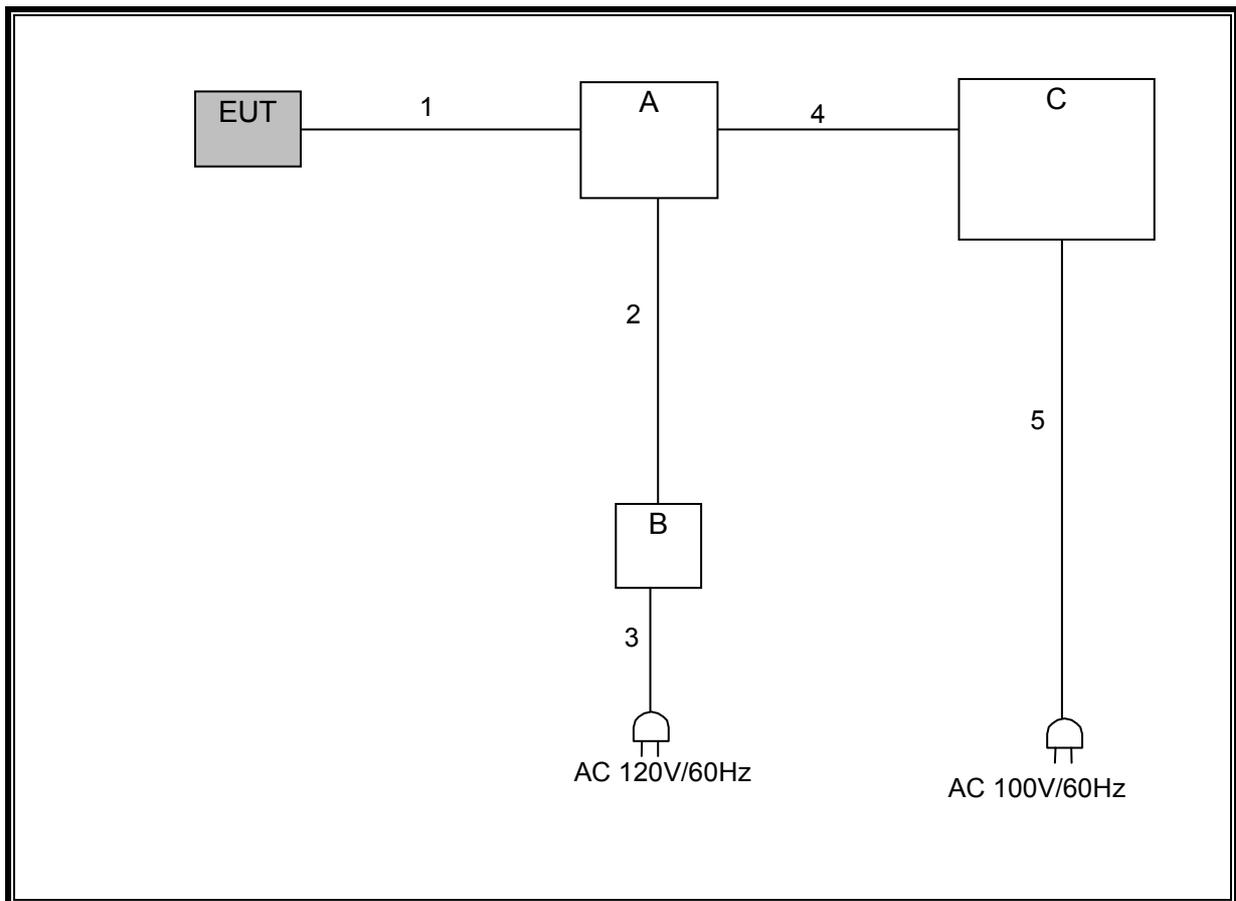
**TEST SETUP**

The EUT is connected to a Jig board and host laptop computer via a USB cable during the tests. Test software exercised the radio module.

**SETUP DIAGRAM FOR ALL TESTS EXCEPT FOR CONDUCTED EMISSION TEST**



**SETUP DIAGRAM FOR CONDUCTED EMISSION TEST**



**TEST AND MEASUREMENT EQUIPMENT**

The following test and measurement equipment was utilized for the tests documented in this report:

| Control No. | Instrument                  | Manufacturer             | Model No   | Serial No                      | Test Item | Calibration Date * Interval(month) |
|-------------|-----------------------------|--------------------------|--|--------------------------------|-----------|------------------------------------|
| MSA-03      | Spectrum Analyzer           | Agilent                  | E4448A   | MY44020357                     | AT/RE     | 2011/11/23 * 12                    |
| MPM-08      | Power Meter                 | Anritsu                  | ML2495A  | 6K00003338                     | AT        | 2011/09/13 * 12                    |
| MPSE-11     | Power sensor                | Anritsu                  | MA2411B  | 011737                         | AT        | 2011/09/13 * 12                    |
| MAT-19      | Attenuator(6dB)(above 1GHz) | HIROSE ELECTRIC CO.,LTD. | AT-106   | -                              | AT        | 2012/01/12 * 12                    |
| MCC-138     | Microwave cable             | HUBER+SUHNER             | SUCOFLEX 102   | 37953/2                        | AT        | 2011/10/28 * 12                    |
| MOS-14      | Thermo-Hygrometer           | Custom                   | CTH-201  | -                              | AT        | 2012/02/06 * 12                    |
| MMM-11      | Digital HiTESTER            | Hioki                    | 3805   | 060100600                      | AT        | 2012/05/18 * 12                    |
| MDPS-12     | DC Power Supply             | Kikusui                  | PAK35-10A  | LF002314                       | AT        | Pre Check                          |
| MAEC-04     | Semi Anechoic Chamber(NSA)  | TDK                      | Semi Anechoic Chamber 3m   | DA-10005                       | RE/CE     | 2012/02/29 * 12                    |
| MOS-15      | Thermo-Hygrometer           | Custom                   | CTH-180  | -                              | RE/CE     | 2012/02/06 * 12                    |
| MJM-07      | Measure                     | PROMART                  | SEN1955  | -                              | RE/CE     | -                                  |
| COTS-MEMI   | EMI measurement program     | TSJ                      | TEPTO-DV   | -                              | RE/CE     | -                                  |
| MHA-21      | Horn Antenna 1-18GHz        | Schwarzbeck              | BBHA9120D  | 9120D-557                      | RE        | 2011/08/11 * 12                    |
| MCC-141     | Microwave Cable             | Junkosha                 | MWX221   | 1203S212(1m)<br>/ 1204S062(5m) | RE        | 2012/04/23 * 12                    |
| MPA-12      | MicroWave System Amplifier  | Agilent                  | 83017A   | MY39500780                     | RE        | 2012/03/28 * 12                    |
| MHA-17      | Horn Antenna 15-40GHz       | Schwarzbeck              | BBHA9170   | BBHA9170307                    | RE        | 2011/06/17 * 12                    |
| MHF-06      | High Pass Filter 3.5-24GHz  | TOKIMEC                  | TF323DCA   | 601                            | RE        | 2012/05/30 * 12                    |
| MAEC-03     | Semi Anechoic Chamber(NSA)  | TDK                      | Semi Anechoic Chamber 3m   | DA-10005                       | RE        | 2012/02/24 * 12                    |
| MOS-13      | Thermo-Hygrometer           | Custom                   | CTH-180  | -                              | RE        | 2012/02/06 * 12                    |
| MJM-06      | Measure                     | PROMART                  | SEN1955  | -                              | RE        |                                    |
| MSA-10      | Spectrum Analyzer           | Agilent                  | E4448A   | MY46180655                     | RE        | 2012/02/03 * 12                    |
| MTR-07      | Test Receiver               | Rohde & Schwarz          | ESCI   | 100635                         | RE/CE     | 2012/04/05 * 12                    |
| MBA-03      | Biconical Antenna           | Schwarzbeck              | BBA9106  | 1915                           | RE        | 2011/10/15 * 12                    |
| MLA-03      | Logperiodic Antenna         | Schwarzbeck              | USLP9143   | 174                            | RE        | 2011/10/15 * 12                    |
| MCC-51      | Coaxial cable               | UL Japan                 | -  | -                              | RE        | 2011/07/15 * 12                    |
| MAT-09      | Attenuator(6dB)             | Weinschel Corp           | 2  | BK7973                         | RE        | 2011/11/02 * 12                    |
| MPA-13      | Pre Amplifier               | SONOMA INSTRUMENT        | 310  | 260834                         | RE        | 2012/03/16 * 12                    |
| MLS-06      | LISN(AMN)                   | Schwarzbeck              | NSLK8127   | 8127363                        | CE(AE)    | 2012/02/06 * 12                    |
| MLS-07      | LISN(AMN)                   | Schwarzbeck              | NSLK8127   | 8127364                        | CE(EUT)   | 2012/02/09 * 12                    |
| MTA-31      | Terminator                  | TME                      | CT-01  | -                              | CE        | 2012/01/11 * 12                    |
| MAT-66      | Attenuator(13dB)            | JFW Industries, Inc.     | 50FP-013H2 N   | -                              | CE        | 2012/01/28 * 12                    |
| MSA-05      | Spectrum Analyzer           | Advantest                | R3273  | 160400285                      | CE        | 2011/11/23 * 12                    |
| MAT-67      | Attenuator(13dB)            | JFW Industries, Inc.     | 50FP-013H2 N   | -                              | CE        | 2012/01/28 * 12                    |
| MCC-113     | Coaxial cable               | Fujikura/Suhner/TSJ      | 5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform 141-PE(1m)/RFM-E121(Switcher) | -/04178                        | CE        | 2011/07/04 * 12                    |

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test Item:

RE: Radiated emission, CE: Conducted emission, AT: Antenna Terminal Conducted test

## 6. ANTENNA PORT TEST RESULTS

### 6.1. BASIC DATA RATE GFSK MODULATION

#### 6.1.1. 20 dB AND 99% BANDWIDTH

##### LIMIT

None; for reporting purposes only.

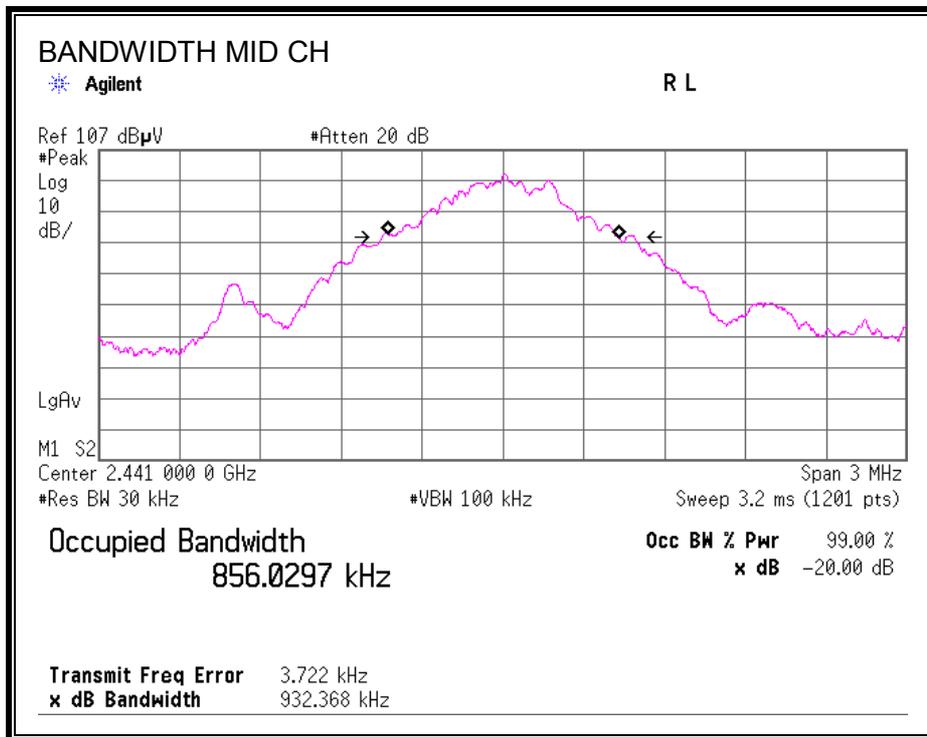
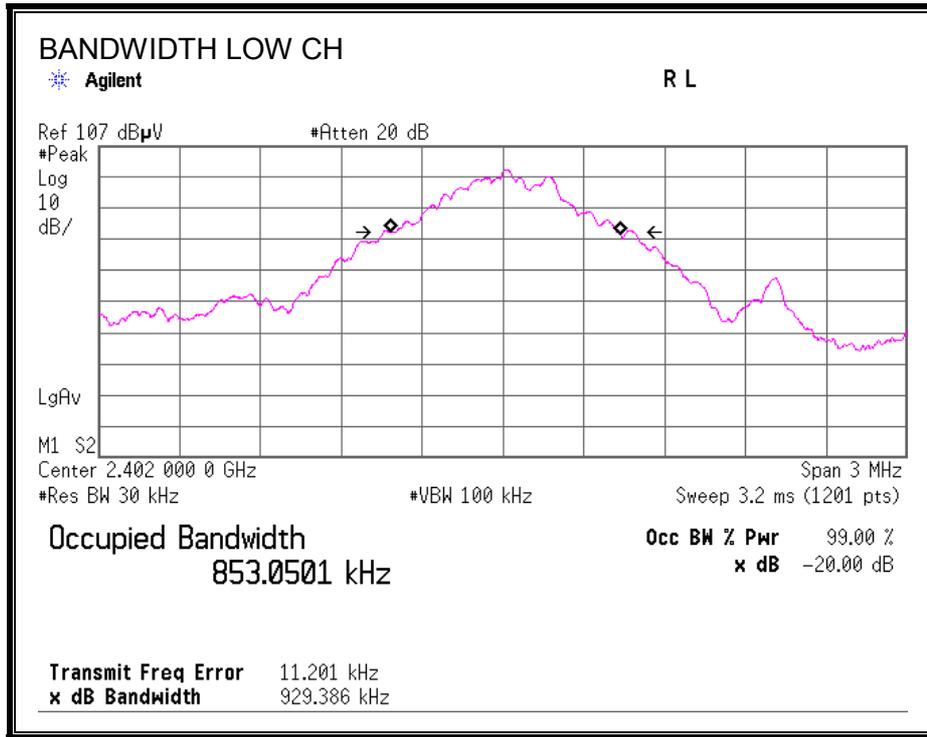
##### TEST PROCEDURE

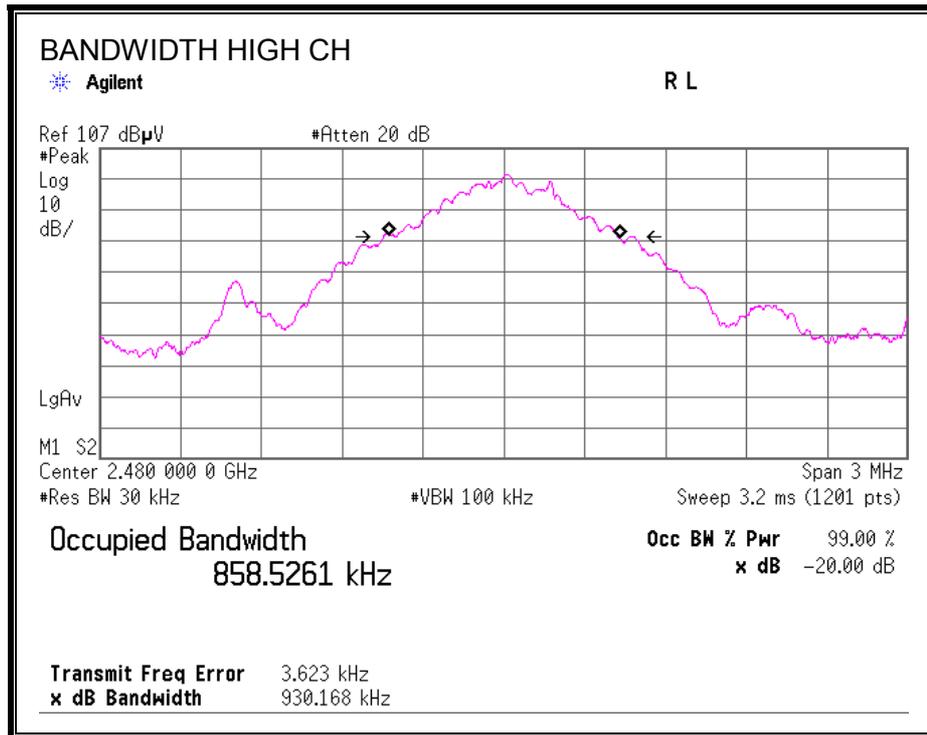
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

##### RESULTS

| Channel | Frequency<br>(MHz) | 20 dB Bandwidth<br>(kHz) | 99% Bandwidth<br>(kHz) |
|---------|--------------------|--------------------------|------------------------|
| Low     | 2402               | 929.386                  | 853.050                |
| Middle  | 2441               | 932.368                  | 856.030                |
| High    | 2480               | 930.168                  | 858.526                |

**20 dB BANDWIDTH**





## 6.1.2. HOPPING FREQUENCY SEPARATION

### LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

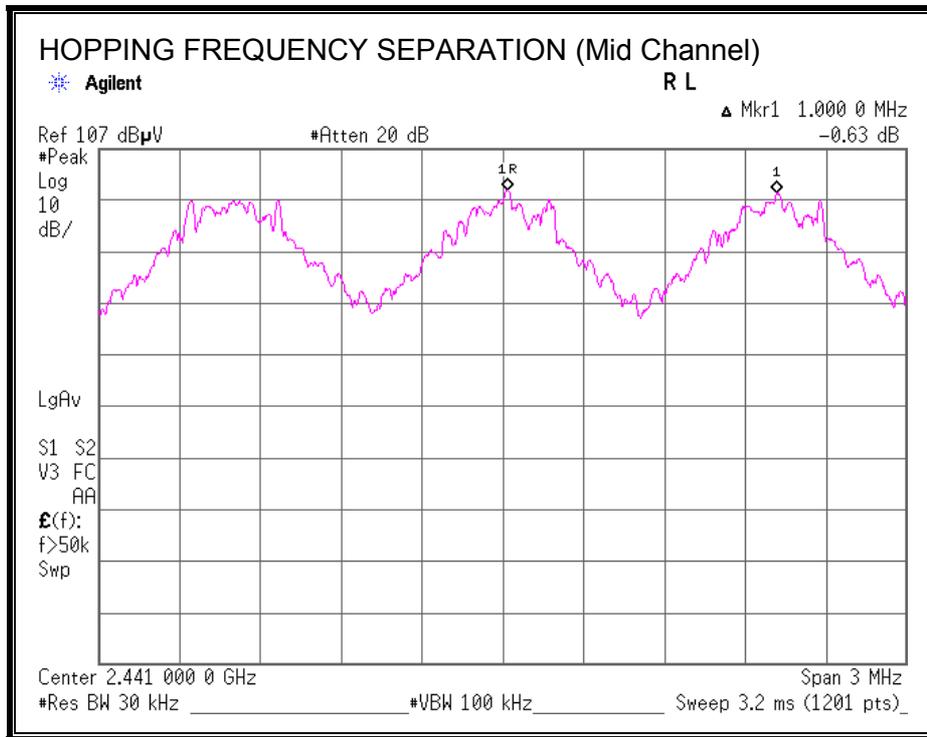
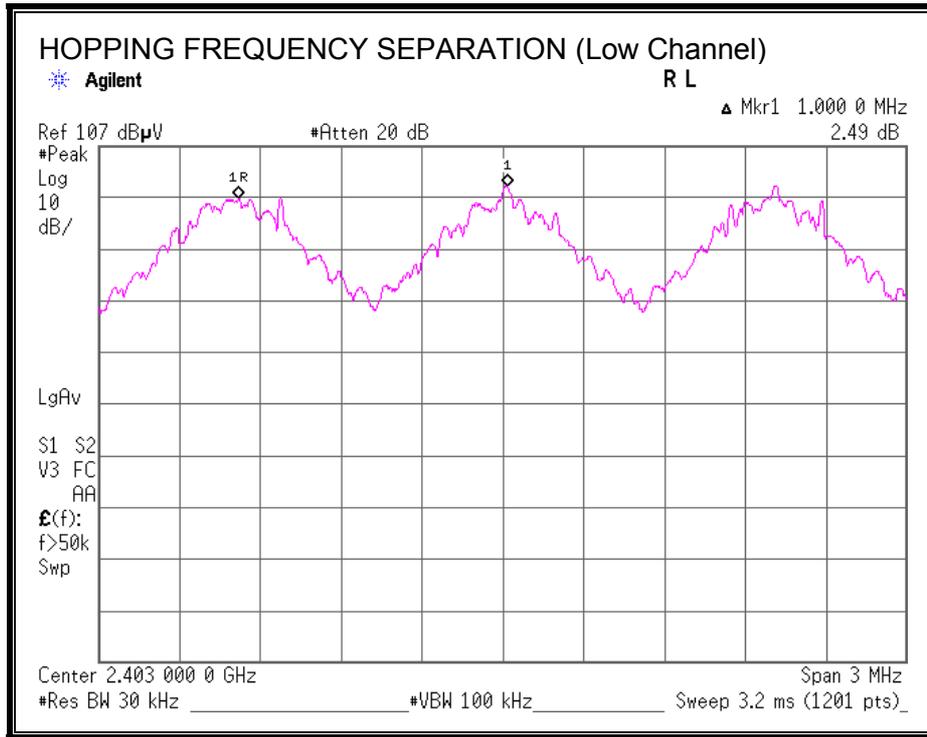
### TEST PROCEDURE

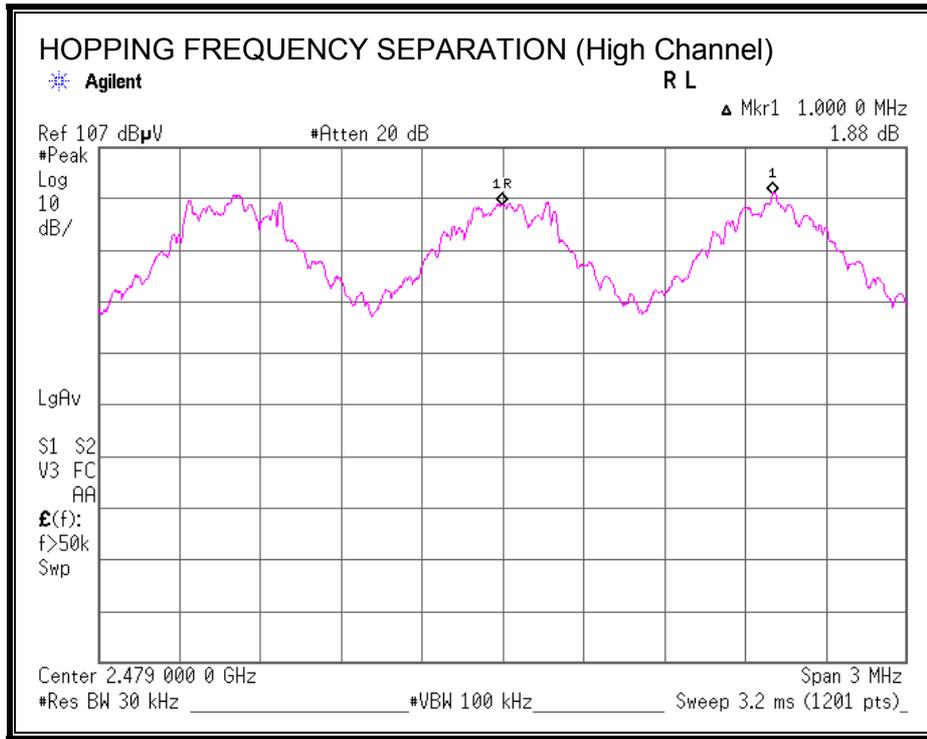
The transmitter output is connected to a spectrum analyzer. The RBW is set to 30 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

### RESULTS

Pass

**HOPPING FREQUENCY SEPARATION**





### 6.1.3. NUMBER OF HOPPING CHANNELS

#### LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

#### TEST PROCEDURE

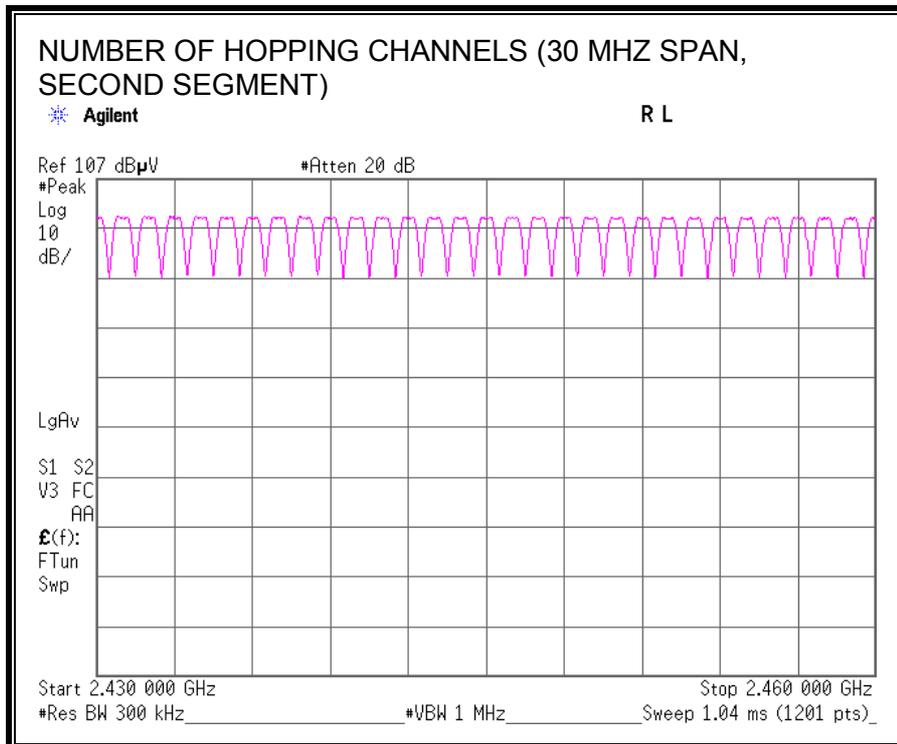
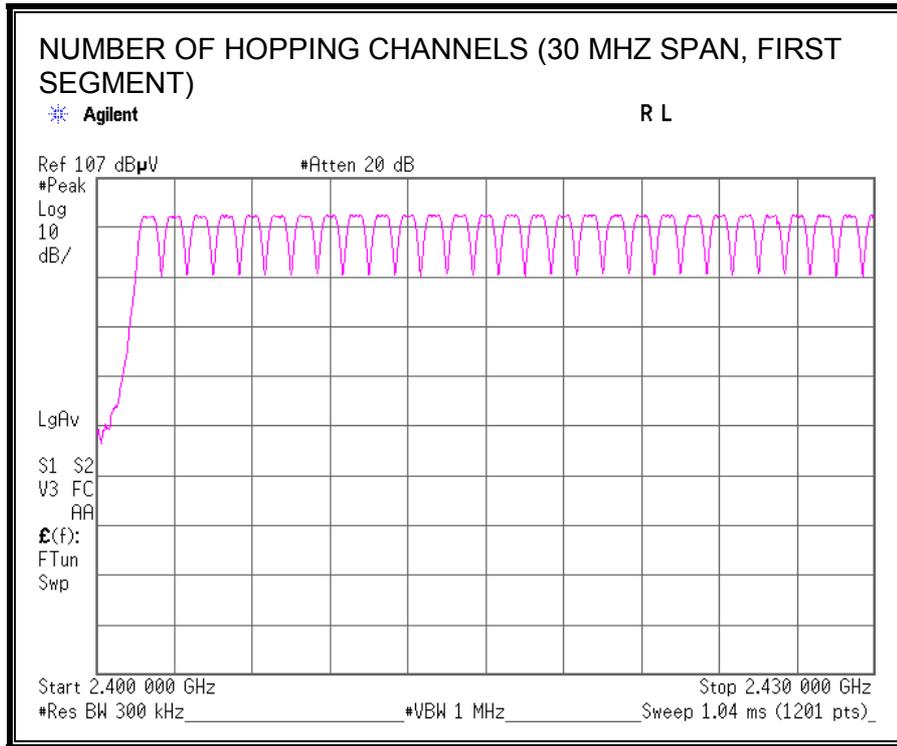
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

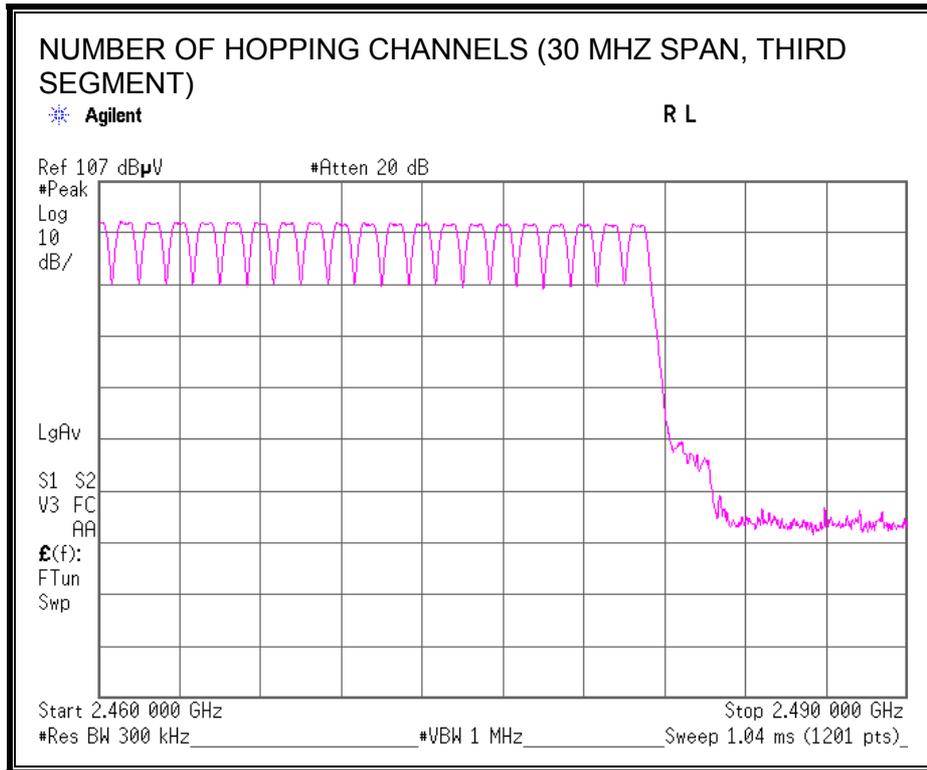
Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification 2.0.

#### RESULTS

79 Channels observed.

**NUMBER OF HOPPING CHANNELS**





**6.1.4. AVERAGE TIME OF OCCUPANCY**

**LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 5 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to 31.6 \* (# of pulses in 5 s / 5 s) \* pulse width.

This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 79), is always less than 0.4s regardless of packet size (DH1, DH3 or DH5). This is confirmed in the test report for N=79.

**RESULTS**

| Mode | Number of transmission<br>in a 31.6(79 Hopping x 0.4)<br>/ 12.8(32 Hopping x 0.4)second period | Length of<br>transmission time<br>[msec] | Result<br>[msec] | Limit<br>[msec] |
|------|--|--|------------------|-----------------|
| DH1  | 50.6 times / 5 sec. x 31.6 sec. = 320 times  | 0.524                                    | 168              | 400             |
| DH3  | 25.6 times / 5 sec. x 31.6 sec. = 162 times  | 1.783                                    | 289              | 400             |
| DH5  | 16.4 times / 5 sec. x 31.6 sec. = 104 times  | 3.033                                    | 315              | 400             |

Sample Calculation

Result = Number of transmission x Length of transmission time

\*Average data of 5 tests.(except Inquiry)

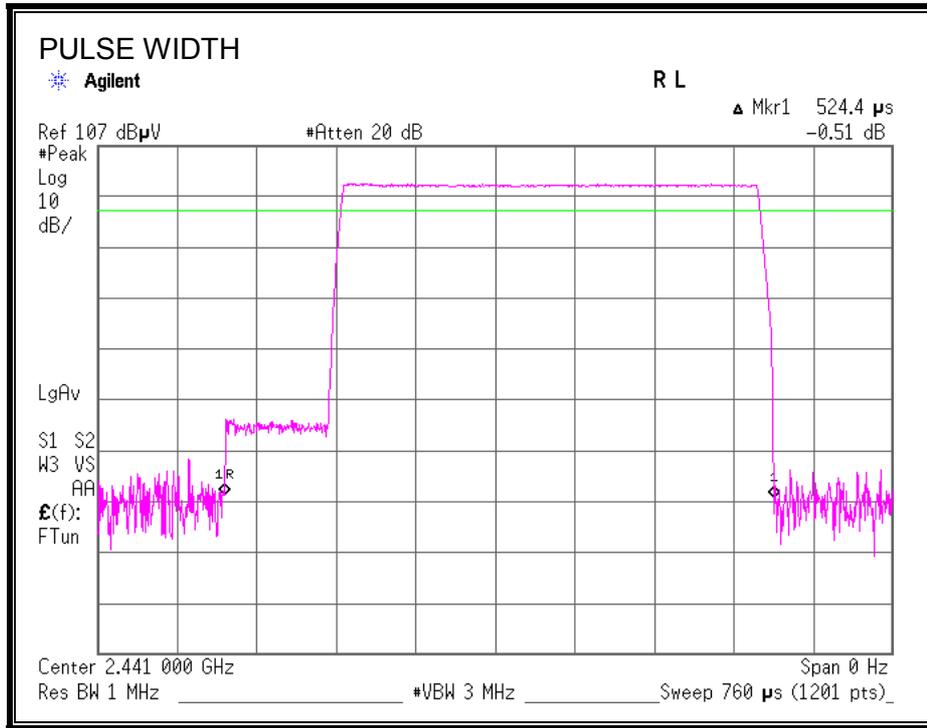
| Mode | Sampling [times] |    |    |    |    | Average<br>[times] |
|------|------------------|----|----|----|----|--------------------|
|      | 1                | 2  | 3  | 4  | 5  |                    |
| DH1  | 50               | 51 | 51 | 51 | 50 | 50.6               |
| DH3  | 25               | 26 | 26 | 25 | 26 | 25.6               |
| DH5  | 17               | 16 | 17 | 16 | 16 | 16.4               |

Sample Calculation

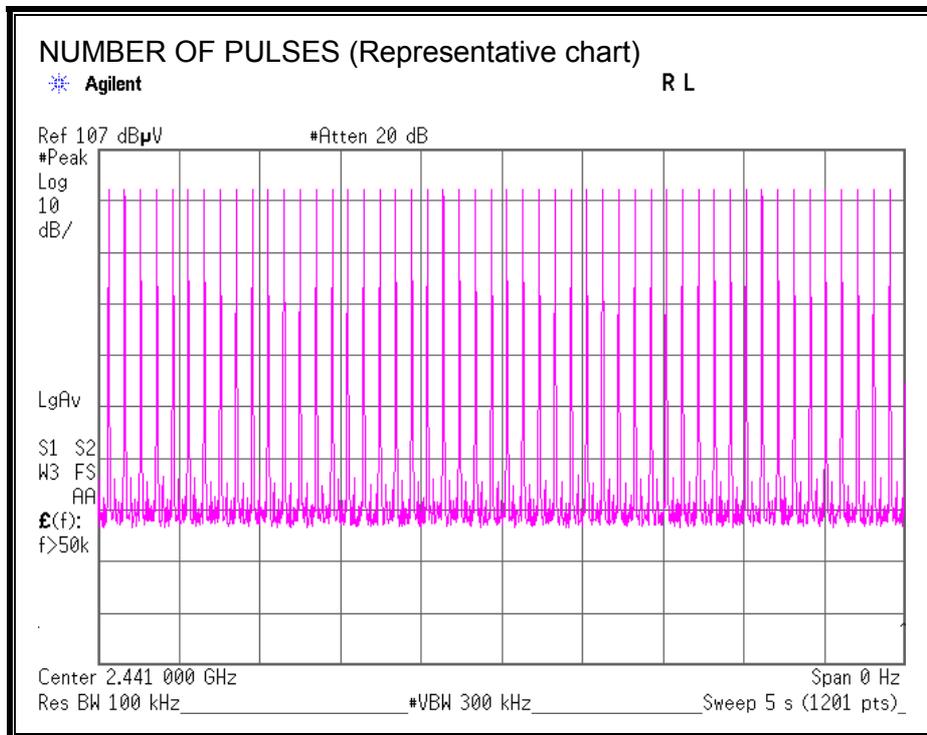
Average= Summation(Sampling 1 to 5) / 5

**DH1**

**PULSE WIDTH**

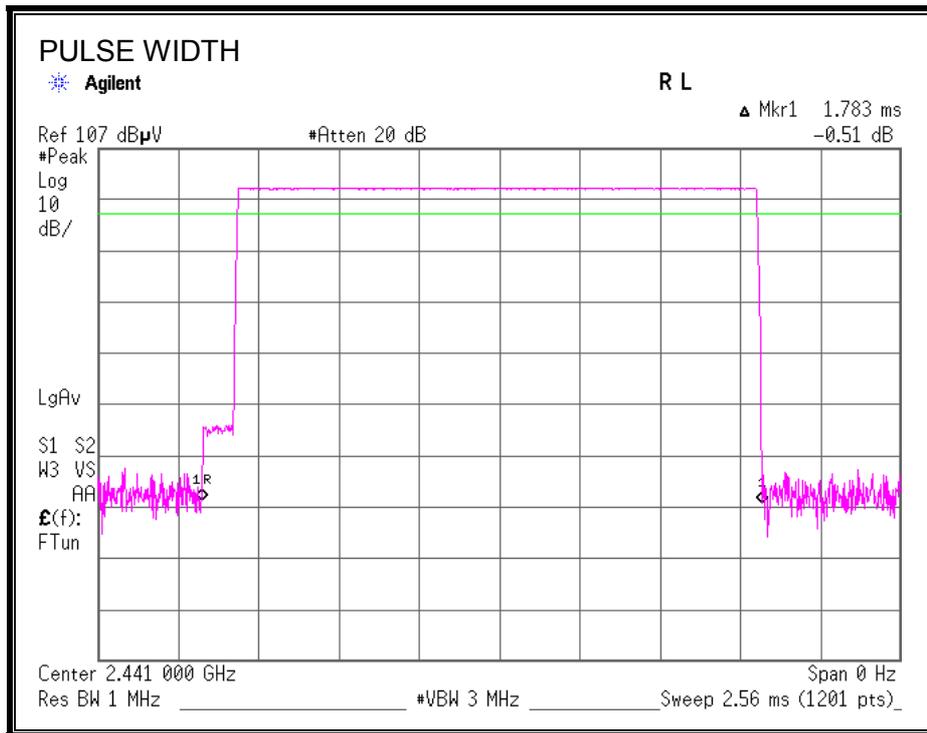


**NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD**

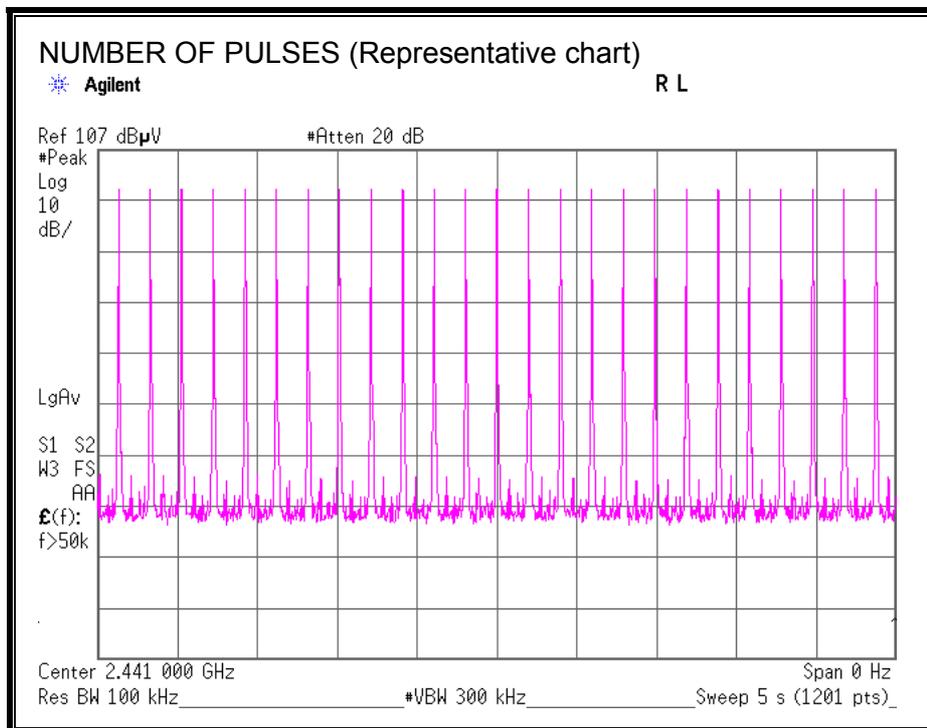


**DH3**

**PULSE WIDTH**

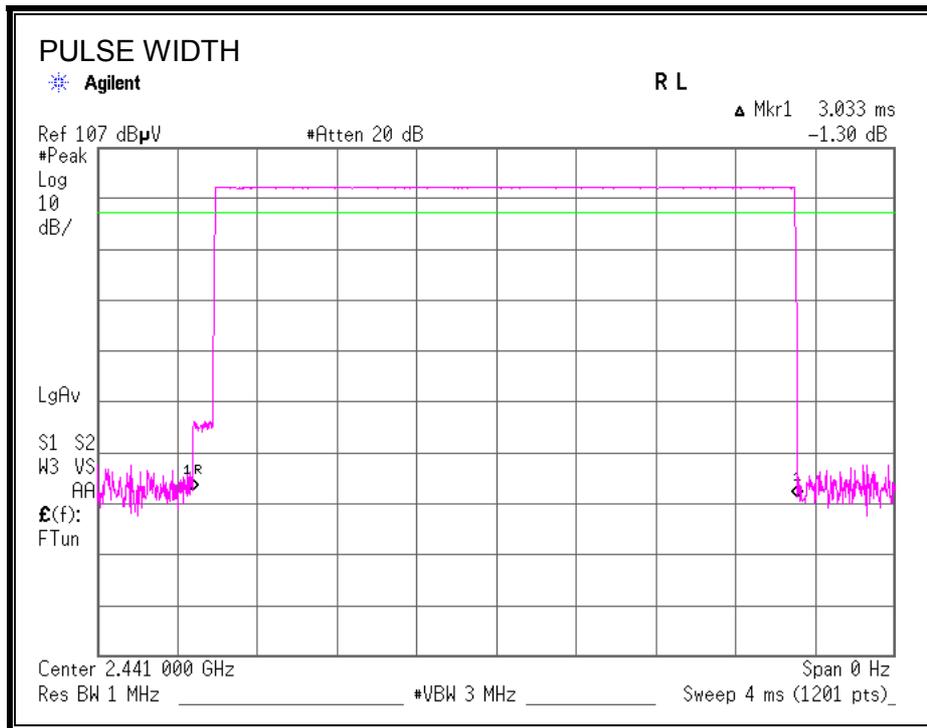


**NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD**

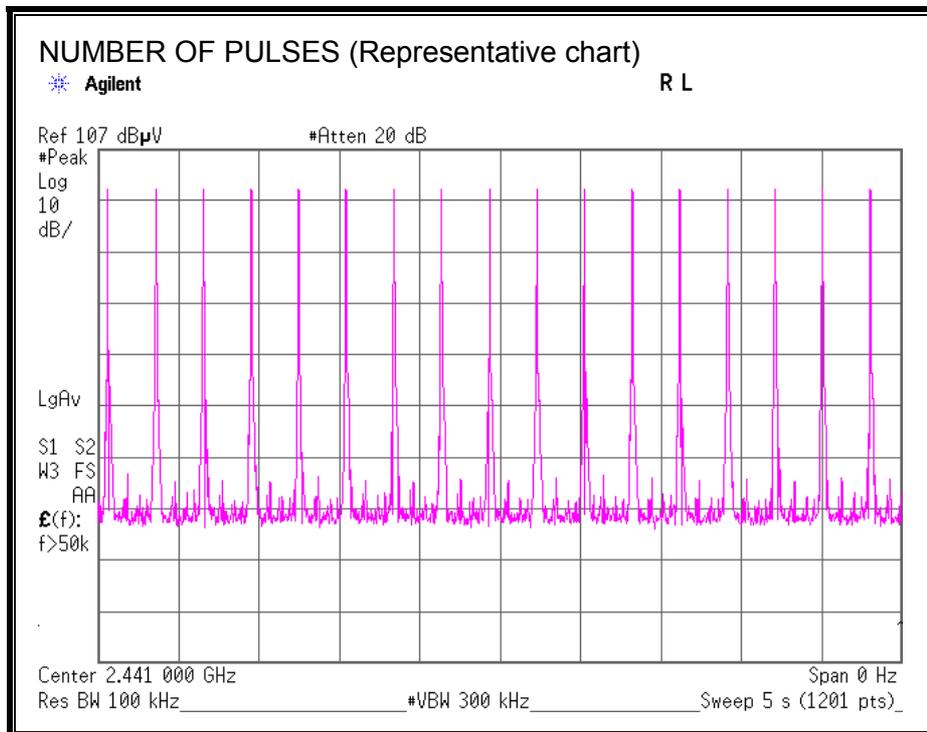


**DH5**

**PULSE WIDTH**



**NUMBER OF PULSES IN 5 SECOND OBSERVATION PERIOD**



**6.1.5. MAXIMUM PEAK OUTPUT POWER****LIMIT**

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.  
Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.  
However, the limit level 125mW of AFH mode was used for the test.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

| Mode | Freq.<br>[MHz] | Reading<br>Power Meter(PK)<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |      | Limit |      | Margin<br>[dB] |
|------|----------------|-------------------------------------|-----------------------|----------------|--------|------|-------|------|----------------|
|      |                |                                     |                       |                | [dBm]  | [mW] | [dBm] | [mW] |                |
| DH5  | 2402.0         | -7.62                               | 1.43                  | 6.11           | -0.08  | 0.98 | 20.96 | 125  | 21.04          |
| DH5  | 2441.0         | -7.78                               | 1.44                  | 6.11           | -0.23  | 0.95 | 20.96 | 125  | 21.19          |
| DH5  | 2480.0         | -8.32                               | 1.44                  | 6.11           | -0.77  | 0.84 | 20.96 | 125  | 21.73          |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

**6.1.6. AVERAGE POWER****LIMIT**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

**RESULTS**

| Mode | Freq.<br>[MHz] | Reading<br>Power Meter(AV)<br>[dBm] | Cable<br>Loss<br>[dB] | Atten.<br>[dB] | Result |      |
|------|----------------|-------------------------------------|-----------------------|----------------|--------|------|
|      |                |                                     |                       |                | [dBm]  | [mW] |
| DH5  | 2402.0         | -8.98                               | 1.43                  | 6.11           | -1.44  | 0.72 |
| DH5  | 2441.0         | -9.10                               | 1.44                  | 6.11           | -1.55  | 0.70 |
| DH5  | 2480.0         | -9.77                               | 1.44                  | 6.11           | -2.22  | 0.60 |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

## 6.1.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### TEST PROCEDURE

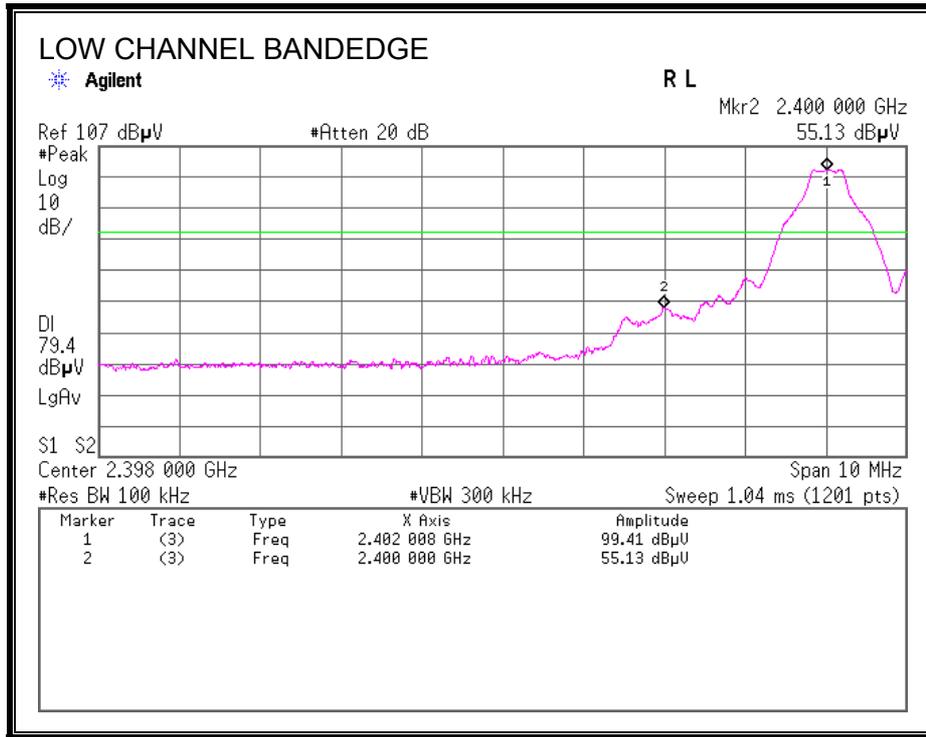
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 9 kHz to 25 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

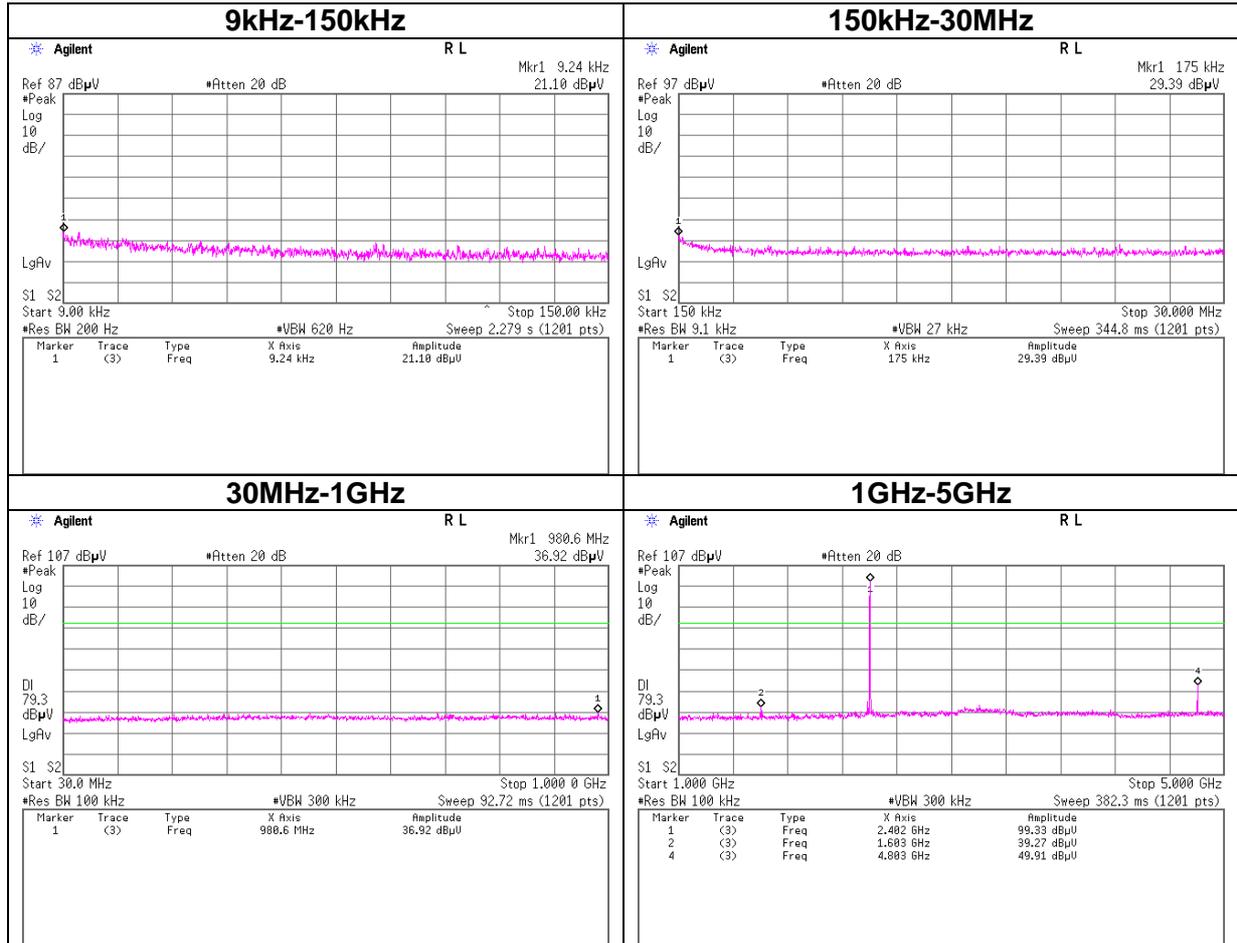
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### RESULTS

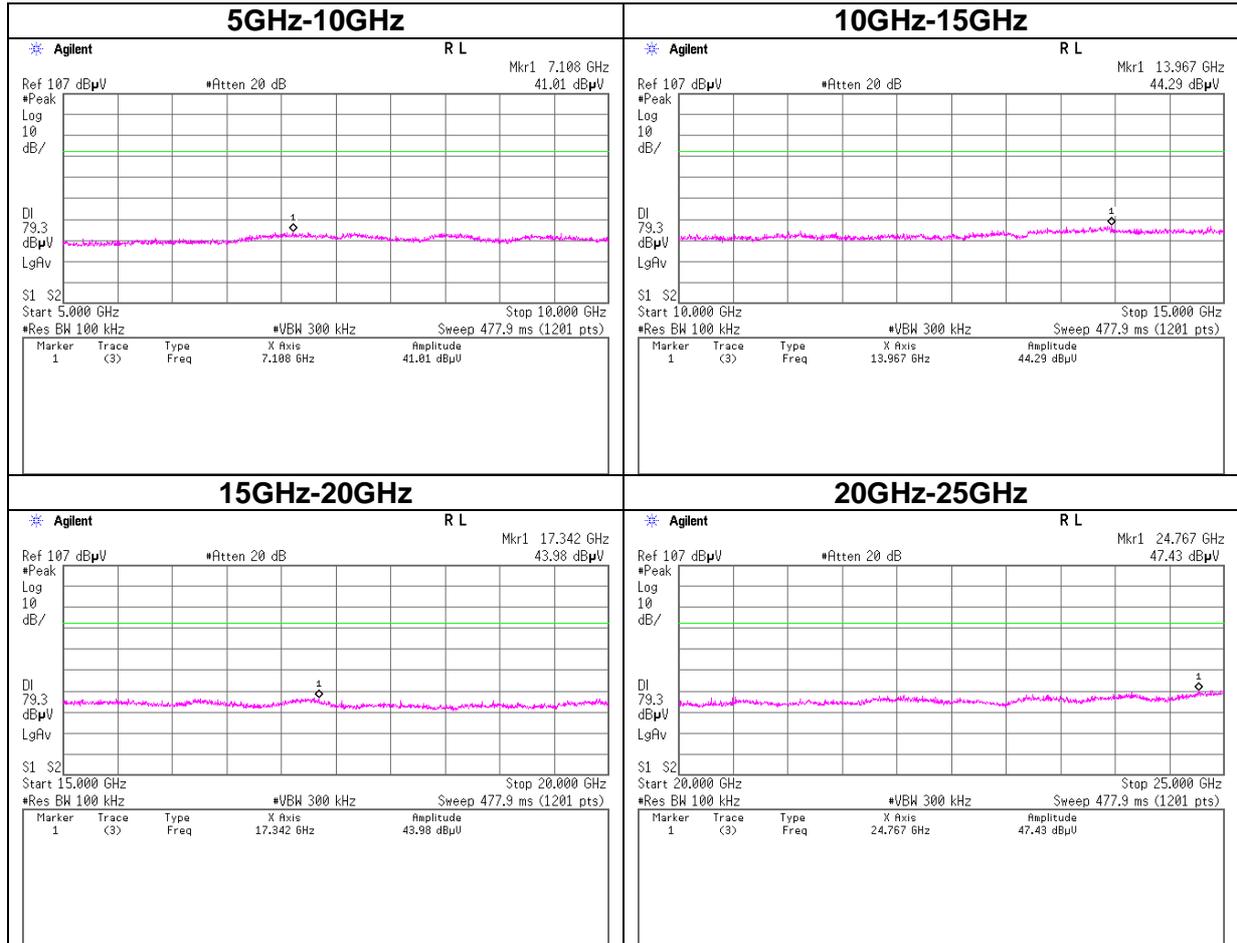
**SPURIOUS EMISSIONS, LOW CHANNEL**



**Tx DH5 2402MHz**

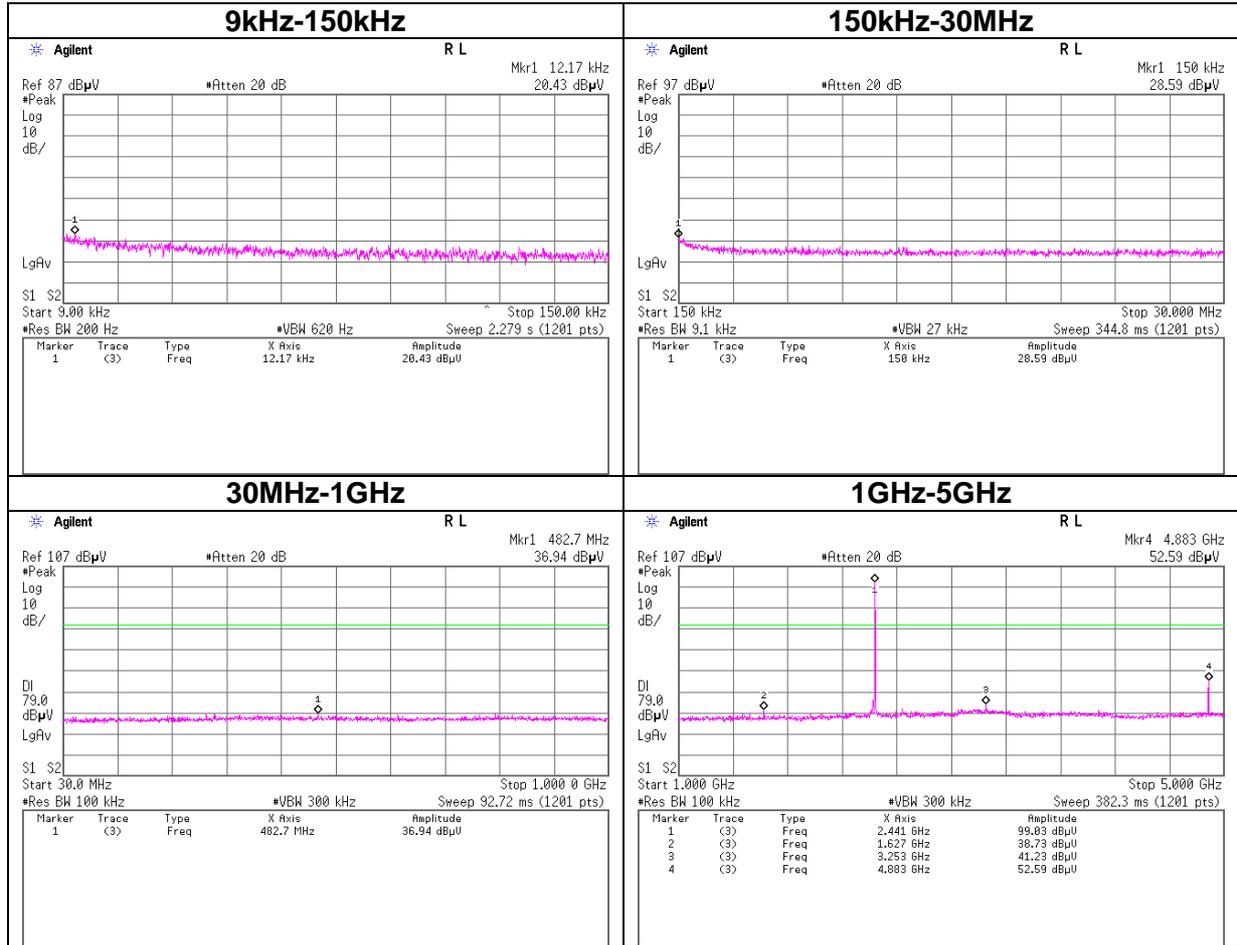


**Tx DH5 2402MHz**

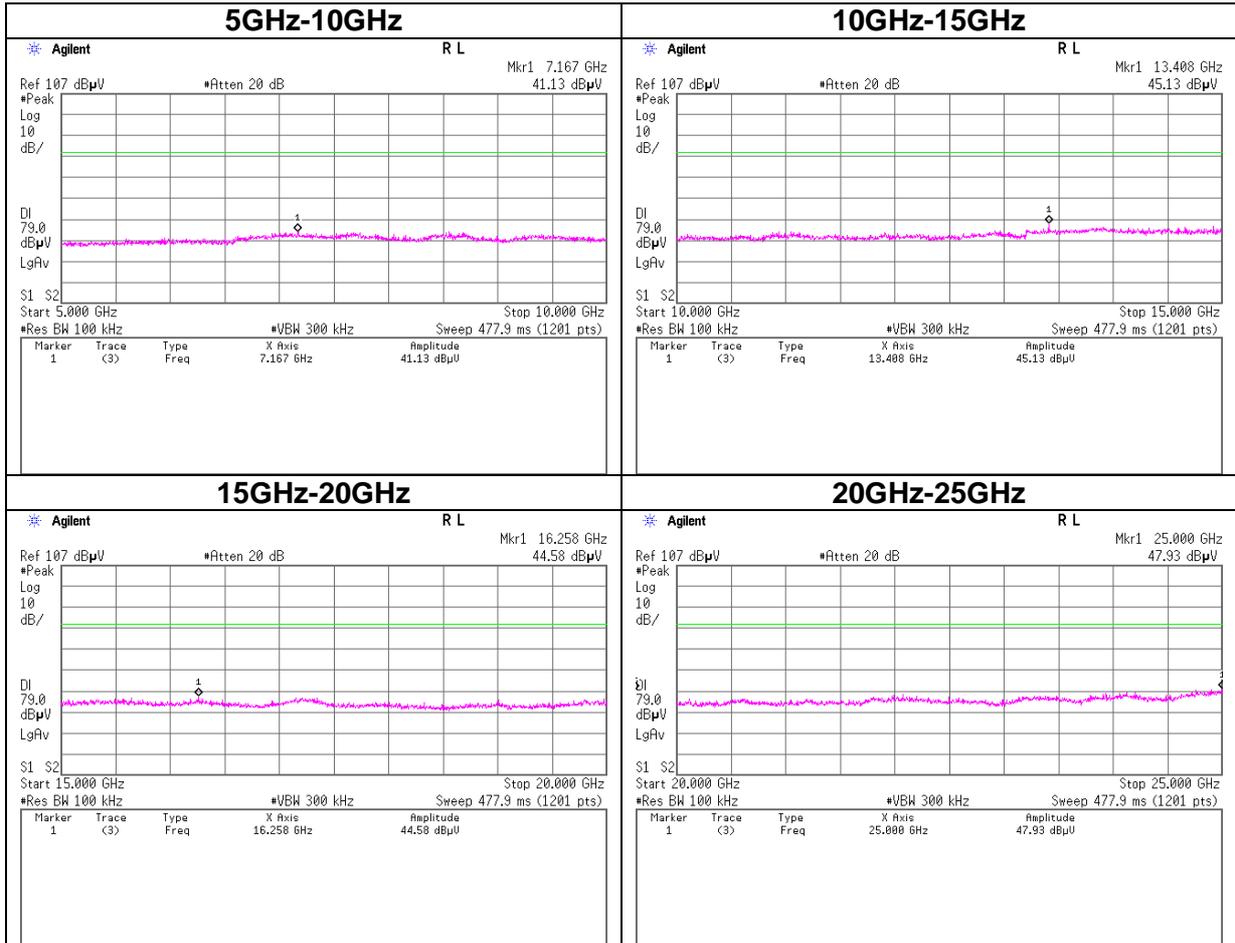


**SPURIOUS EMISSIONS, MID CHANNEL**

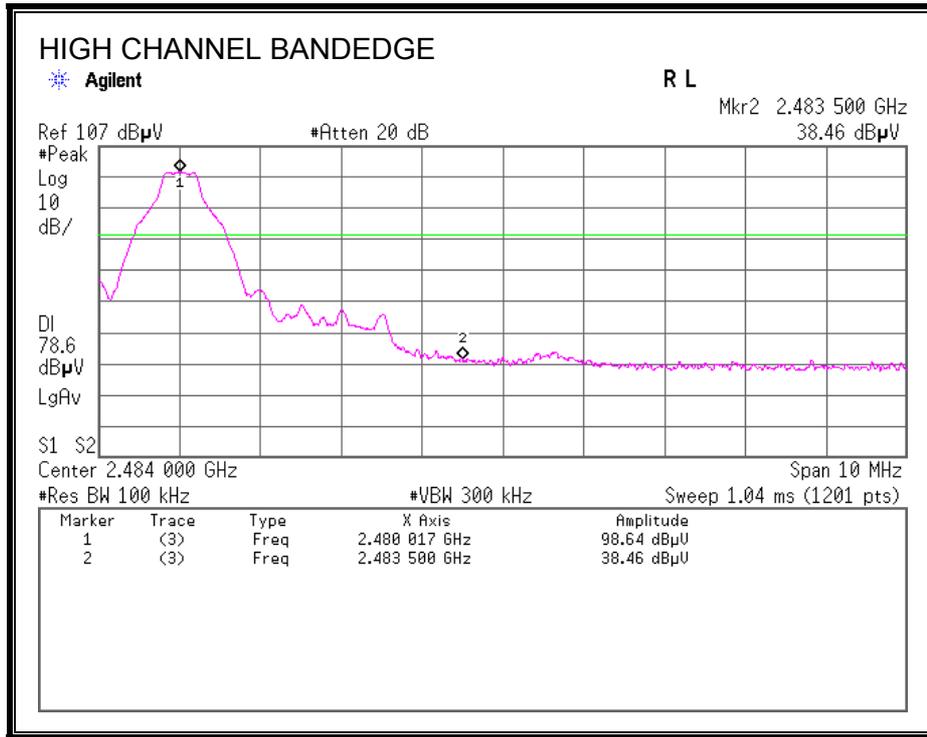
**Tx DH5 2441MHz**



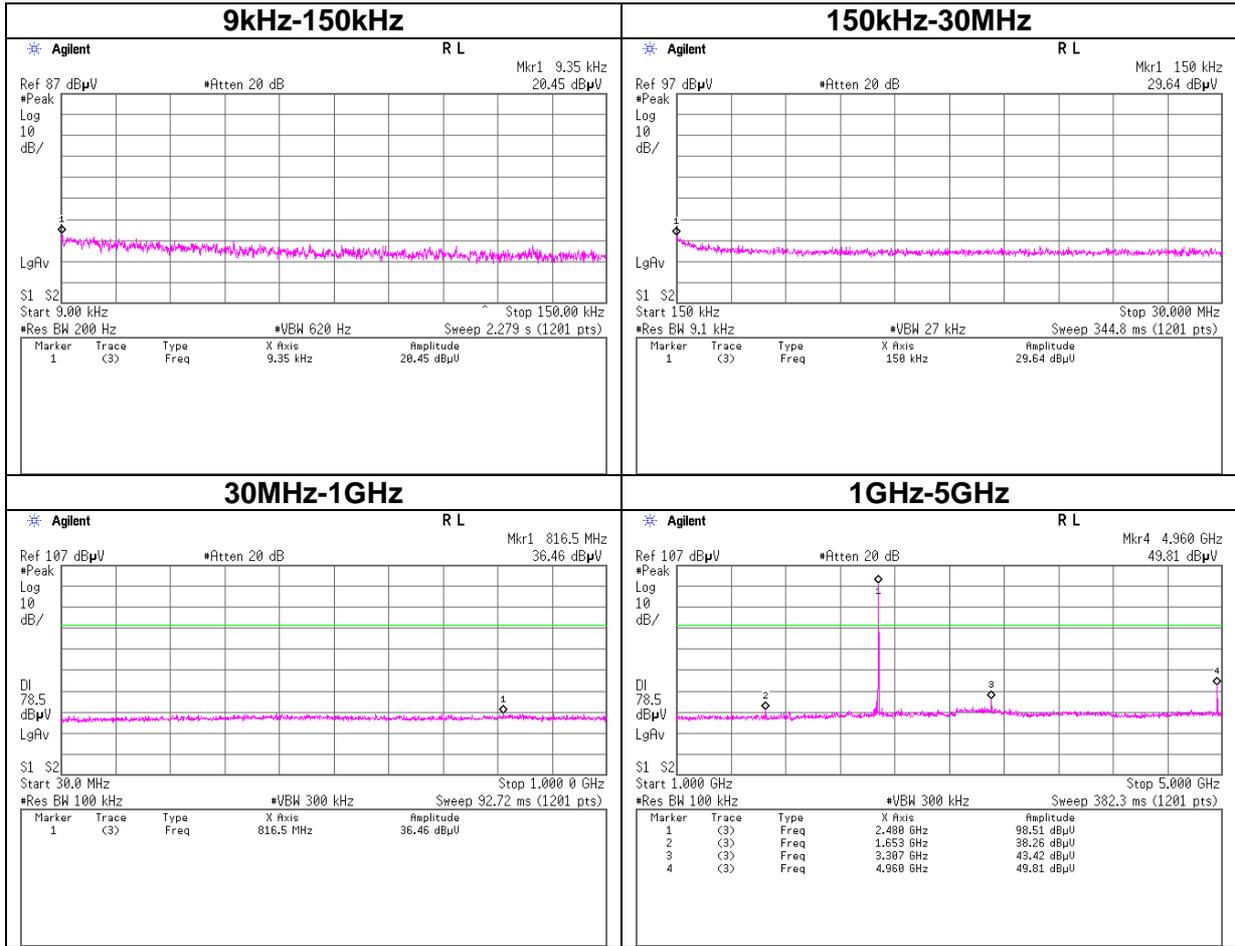
**Tx DH5 2441MHz**



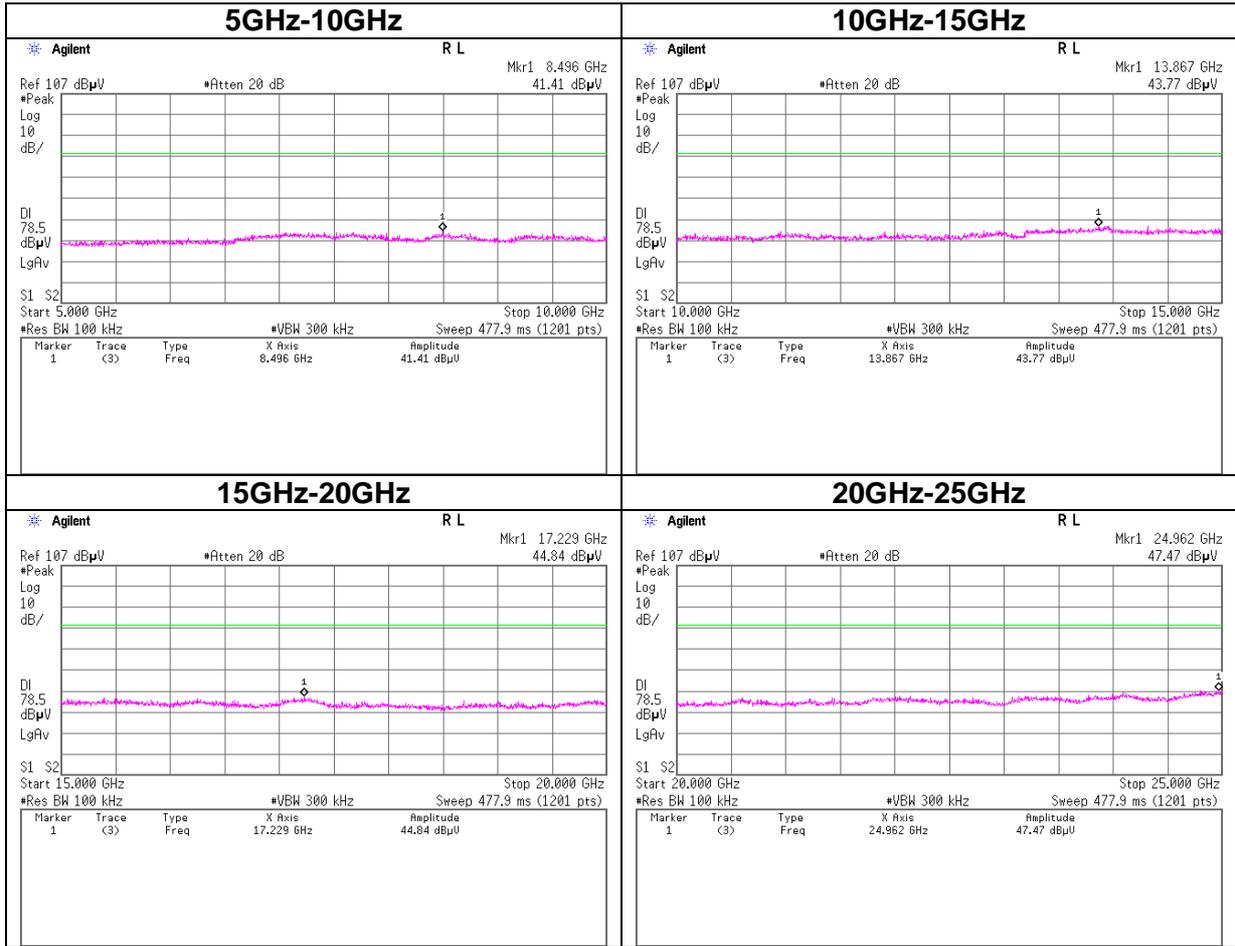
**SPURIOUS EMISSIONS, HIGH CHANNEL**



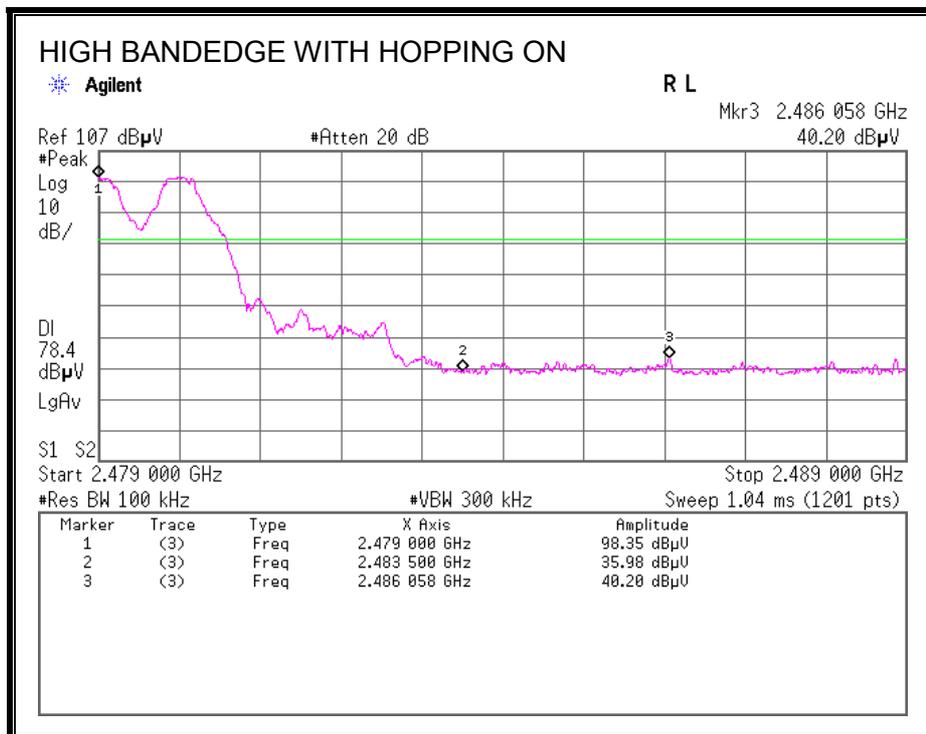
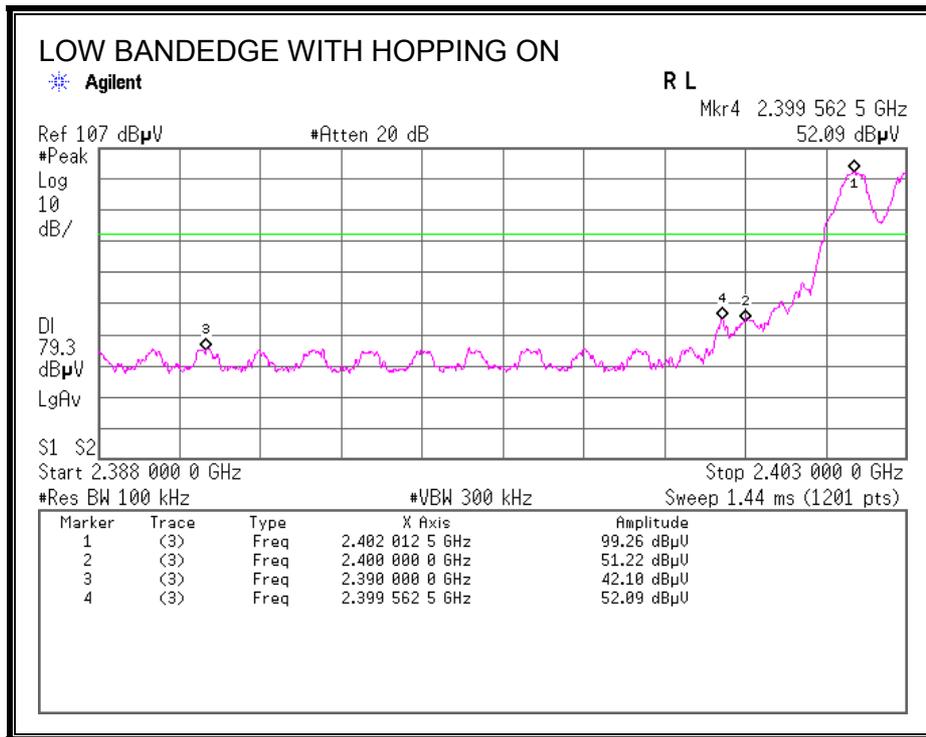
**Tx DH5 2480MHz**



**Tx DH5 2480MHz**



**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**



## 7. RADIATED TEST RESULTS

### 7.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.5

| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
|-----------------------|------------------------------------|--------------------------------------|
| 30 - 88               | 100                                | 40                                   |
| 88 - 216              | 150                                | 43.5                                 |
| 216 - 960             | 200                                | 46                                   |
| Above 960             | 500                                | 54                                   |

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

## 7.2. TRANSMITTER RADIATED TEST RESULT (DH5)

### Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber  
 Report No. 32JE0252-AP-01  
 Date 06/21/2012 06/25/2012  
 Temperature/ Humidity 24 deg.C/ 64% RH 26 deg.C/ 48% RH  
 Engineer Satofumi Matsuyama Satofumi Matsuyama  
 (Above 1GHz) (Below 1GHz)  
 Mode Tx, DH5 2402MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori     | 95.993          | QP       | 22.7           | 9.4             | 8.1       | 32.3      | 7.9             | 43.5           | 35.6        |        |
| Hori     | 250.084         | QP       | 22.8           | 17.4            | 9.6       | 32.1      | 17.7            | 46.0           | 28.3        |        |
| Hori     | 1601.990        | PK       | 49.5           | 25.5            | 2.0       | 33.2      | 43.8            | 73.9           | 30.1        |        |
| Hori     | 2390.000        | PK       | 45.3           | 28.1            | 2.4       | 32.3      | 43.5            | 73.9           | 30.4        |        |
| Hori     | 4804.000        | PK       | 43.5           | 31.2            | 4.3       | 31.5      | 47.5            | 73.9           | 26.4        |        |
| Hori     | 1601.990        | AV       | 45.8           | 25.5            | 2.0       | 33.2      | 40.1            | 53.9           | 13.8        |        |
| Hori     | 2390.000        | AV       | 32.6           | 28.1            | 2.4       | 32.3      | 30.8            | 53.9           | 23.1        |        |
| Hori     | 4804.000        | AV       | 34.5           | 31.2            | 4.3       | 31.5      | 38.5            | 53.9           | 15.4        |        |
| Vert     | 95.997          | QP       | 29.9           | 9.4             | 8.1       | 32.3      | 15.1            | 43.5           | 28.4        |        |
| Vert     | 249.992         | QP       | 25.9           | 17.4            | 9.6       | 32.1      | 20.8            | 46.0           | 25.2        |        |
| Vert     | 1602.067        | PK       | 51.4           | 25.5            | 2.0       | 33.2      | 45.7            | 73.9           | 28.2        |        |
| Vert     | 2390.000        | PK       | 45.0           | 28.1            | 2.4       | 32.3      | 43.2            | 73.9           | 30.7        |        |
| Vert     | 4804.000        | PK       | 44.6           | 31.2            | 4.3       | 31.5      | 48.6            | 73.9           | 25.3        |        |
| Vert     | 1602.067        | AV       | 48.6           | 25.5            | 2.0       | 33.2      | 42.9            | 53.9           | 11.0        |        |
| Vert     | 2390.000        | AV       | 32.2           | 28.1            | 2.4       | 32.3      | 30.4            | 53.9           | 23.5        |        |
| Vert     | 4804.000        | AV       | 35.4           | 31.2            | 4.3       | 31.5      | 39.4            | 53.9           | 14.5        |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

#### 20dBc Data Sheet

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark  |
|----------|-----------------|----------|----------------|-------------------|-----------|-----------|-----------------|----------------|-------------|---------|
| Hori     | 2402.000        | PK       | 104.2          | 28.1              | 2.4       | 32.3      | 102.4           | -              | -           | Carrier |
| Hori     | 2400.000        | PK       | 59.6           | 28.1              | 2.4       | 32.3      | 57.8            | 82.4           | 24.6        |         |
| Vert     | 2402.000        | PK       | 101.7          | 28.1              | 2.4       | 32.3      | 99.9            | -              | -           | Carrier |
| Vert     | 2400.000        | PK       | 58.1           | 28.1              | 2.4       | 32.3      | 56.3            | 79.9           | 23.6        |         |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

**Radiated Spurious Emission**

Test place Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber  
 Report No. 32JE0252-AP-01  
 Date 06/21/2012 06/25/2012  
 Temperature/ Humidity 24 deg.C/ 64% RH 26 deg.C/ 48% RH  
 Engineer Satofumi Matsuyama Satofumi Matsuyama  
 (Above 1GHz) (Below 1GHz)  
 Mode Tx, DH5 2441MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori     | 94.842          | QP       | 22.8           | 9.2             | 8.1       | 32.3      | 7.8             | 43.5           | 35.7        |        |
| Hori     | 250.023         | QP       | 22.9           | 17.4            | 9.6       | 32.1      | 17.8            | 46.0           | 28.2        |        |
| Hori     | 1626.686        | PK       | 50.1           | 25.5            | 2.0       | 33.2      | 44.4            | 73.9           | 29.5        |        |
| Hori     | 4882.000        | PK       | 44.9           | 31.4            | 4.3       | 31.5      | 49.1            | 73.9           | 24.8        |        |
| Hori     | 1626.686        | AV       | 46.4           | 25.5            | 2.0       | 33.2      | 40.7            | 53.9           | 13.2        |        |
| Hori     | 4882.000        | AV       | 35.0           | 31.4            | 4.3       | 31.5      | 39.2            | 53.9           | 14.7        |        |
| Vert     | 95.998          | QP       | 29.8           | 9.4             | 8.1       | 32.3      | 15.0            | 43.5           | 28.5        |        |
| Vert     | 249.991         | QP       | 26.0           | 17.4            | 9.6       | 32.1      | 20.9            | 46.0           | 25.1        |        |
| Vert     | 1626.498        | PK       | 51.2           | 25.5            | 2.0       | 33.2      | 45.5            | 73.9           | 28.4        |        |
| Vert     | 4882.000        | PK       | 46.6           | 31.4            | 4.3       | 31.5      | 50.8            | 73.9           | 23.1        |        |
| Vert     | 1626.498        | AV       | 47.5           | 25.5            | 2.0       | 33.2      | 41.8            | 53.9           | 12.1        |        |
| Vert     | 4882.000        | AV       | 37.5           | 31.4            | 4.3       | 31.5      | 41.7            | 53.9           | 12.2        |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

**Radiated Spurious Emission**

Test place Head Office EMC Lab. No.4 and 3 Semi Anechoic Chamber  
 Report No. 32JE0252-AP-01  
 Date 06/21/2012 06/25/2012  
 Temperature/ Humidity 24 deg.C/ 64% RH 26 deg.C/ 48% RH  
 Engineer Satofumi Matsuyama Satofumi Matsuyama  
 (Above 1GHz) (Below 1GHz)  
 Mode Tx, DH5 2480MHz

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant.Fac. [dB/m] | Loss [dB] | Gain [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|----------|-----------------|----------|----------------|-----------------|-----------|-----------|-----------------|----------------|-------------|--------|
| Hori     | 95.975          | QP       | 22.7           | 9.4             | 8.1       | 32.3      | 7.9             | 43.5           | 35.6        |        |
| Hori     | 250.028         | QP       | 23.0           | 17.4            | 9.6       | 32.1      | 17.9            | 46.0           | 28.1        |        |
| Hori     | 1652.678        | PK       | 49.6           | 25.6            | 2.0       | 33.1      | 44.1            | 73.9           | 29.8        |        |
| Hori     | 2483.500        | PK       | 50.1           | 28.5            | 2.4       | 32.2      | 48.8            | 73.9           | 25.1        |        |
| Hori     | 4960.000        | PK       | 44.0           | 31.6            | 4.3       | 31.5      | 48.4            | 73.9           | 25.5        |        |
| Hori     | 1652.678        | AV       | 45.3           | 25.6            | 2.0       | 33.1      | 39.8            | 53.9           | 14.1        |        |
| Hori     | 2483.500        | AV       | 36.5           | 28.5            | 2.4       | 32.2      | 35.2            | 53.9           | 18.7        |        |
| Hori     | 4960.000        | AV       | 35.6           | 31.6            | 4.3       | 31.5      | 40.0            | 53.9           | 13.9        |        |
| Vert     | 95.999          | QP       | 29.7           | 9.4             | 8.1       | 32.3      | 14.9            | 43.5           | 28.6        |        |
| Vert     | 249.995         | QP       | 25.8           | 17.4            | 9.6       | 32.1      | 20.7            | 46.0           | 25.3        |        |
| Vert     | 1652.710        | PK       | 50.6           | 25.6            | 2.0       | 33.1      | 45.1            | 73.9           | 28.8        |        |
| Vert     | 2483.500        | PK       | 49.2           | 28.5            | 2.4       | 32.2      | 47.9            | 73.9           | 26.0        |        |
| Vert     | 4960.000        | PK       | 47.2           | 31.6            | 4.3       | 31.5      | 51.6            | 73.9           | 22.3        |        |
| Vert     | 1652.710        | AV       | 47.5           | 25.6            | 2.0       | 33.1      | 42.0            | 53.9           | 11.9        |        |
| Vert     | 2483.500        | AV       | 35.7           | 28.5            | 2.4       | 32.2      | 34.4            | 53.9           | 19.5        |        |
| Vert     | 4960.000        | AV       | 37.8           | 31.6            | 4.3       | 31.5      | 42.2            | 53.9           | 11.7        |        |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

## 8. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |                       |
|-----------------------------|------------------------|-----------------------|
|                             | Quasi-peak             | Average               |
| 0.15-0.5                    | 66 to 56 <sup>*</sup>  | 56 to 46 <sup>*</sup> |
| 0.5-5                       | 56                     | 46                    |
| 5-30                        | 60                     | 50                    |

<sup>\*</sup>Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

**RESULTS**

**Conducted Emission**

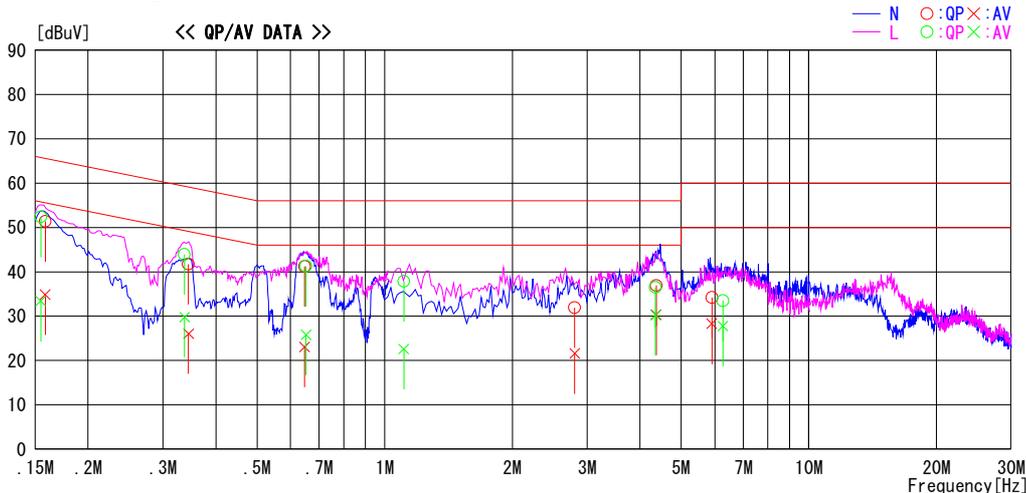
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber  
 Date : 2012/06/28

Report No. : 32JE0252-AP-01  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 24deg. C / 51% RH  
 Engineer : Satofumi Matsuyama

Mode / Remarks : BT Communication Mode

LIMIT : FCC15.207 QP  
 FCC15.207 AV



| Frequency<br>[MHz] | Reading Level |              | Corr.<br>Factor | Results      |              | Limit        |              | Margin     |            | Phase | Comment |
|--------------------|---------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
|                    | QP<br>[dBuV]  | AV<br>[dBuV] |                 | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dB] | AV<br>[dB] |       |         |
| 0.15840            | 38.1          | 21.6         | 13.3            | 51.4         | 34.9         | 65.5         | 55.5         | 14.1       | 20.6       | N     |         |
| 0.34460            | 28.4          | 12.8         | 13.3            | 41.7         | 26.1         | 59.1         | 49.1         | 17.4       | 23.0       | N     |         |
| 0.64720            | 27.9          | 9.8          | 13.3            | 41.2         | 23.1         | 56.0         | 46.0         | 14.8       | 22.9       | N     |         |
| 2.80600            | 18.3          | 8.0          | 13.6            | 31.9         | 21.6         | 56.0         | 46.0         | 24.1       | 24.4       | N     |         |
| 4.36400            | 23.2          | 16.6         | 13.7            | 36.9         | 30.3         | 56.0         | 46.0         | 19.1       | 15.7       | N     |         |
| 5.90800            | 20.4          | 14.5         | 13.8            | 34.2         | 28.3         | 60.0         | 50.0         | 25.8       | 21.7       | N     |         |
| 0.15450            | 39.1          | 20.1         | 13.3            | 52.4         | 33.4         | 65.8         | 55.8         | 13.4       | 22.4       | L     |         |
| 0.33720            | 30.6          | 16.5         | 13.3            | 43.9         | 29.8         | 59.3         | 49.3         | 15.4       | 19.5       | L     |         |
| 0.65220            | 28.0          | 12.5         | 13.3            | 41.3         | 25.8         | 56.0         | 46.0         | 14.7       | 20.2       | L     |         |
| 1.10880            | 24.4          | 9.2          | 13.4            | 37.8         | 22.6         | 56.0         | 46.0         | 18.2       | 23.4       | L     |         |
| 4.35100            | 22.8          | 16.5         | 13.7            | 36.5         | 30.2         | 56.0         | 46.0         | 19.5       | 15.8       | L     |         |
| 6.27000            | 19.7          | 14.0         | 13.8            | 33.5         | 27.8         | 60.0         | 50.0         | 26.5       | 22.2       | L     |         |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F (LISN LOSS+ATT LOSS +CABLE LOSS)  
 Except for the above table : adequate margin data below the limits.