# RADIO TEST REPORT

## Test Report No. : 10020306H-B-R1

| | | |
|---|---|---|
| **Applicant** | : | **Panasonic Corporation of North America** |
| **Type of Equipment** | : | **Wireless Speaker System** |
| **Model No.** | : | **SC-NA10** |
| **FCC ID** | : | **ACJ-SC-NA10** |
| **Test regulation** | : | **FCC Part 15 Subpart C: 2013** |
| **Test Result** | : | **Complied** |

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 10020306H-B. 10020306H-B is replaced with this report.

**Date of test:** July 4 to 9, 2013

**Representative test engineer:**
Hiroshi Kukita
Engineer of WiSE Japan,
UL Verification Service

**Approved by:**
Takahiro Hatakeda
Leader of WiSE Japan,
UL Verification Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*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

## Original Test Report No.: 10020306H-B

| Revision | Test report No. | Date | Page revised | Contents |
|---|---|---|---|---|
| - (Original) | 10020306H-B | July 26, 2013 | - | - |
| 1 | 10020306H-B-R1 | December 5, 2013 | P.5 | Update of FCC15 version |
| 1 | 10020306H-B-R1 | December 5, 2013 | P.8 | Addition of explanatory note for 2DH5 mode in Details of Operating Mode table |
| 1 | 10020306H-B-R1 | December 5, 2013 | P.25 | Addition of test data (2DH5 mode) |

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# SECTION 1: Customer information

| | | |
|---|---|---|
| Company Name | : | Panasonic Corporation * |
| Address | : | 1-15 Matsuo cho, Kadoma city, Osaka 571-8504 Japan |
| Telephone Number | : | +81-50-3687-9371 |
| Facsimile Number | : | +81-6-6906-8800 |
| Contact Person | : | Tatsumi Tsukuda |

*Panasonic Corporation is on behalf of the applicant: Panasonic Corporation of North America.

# SECTION 2: Equipment under test (E.U.T.)

## 2.1 Identification of E.U.T.

| | | |
|---|---|---|
| Type of Equipment | : | Wireless Speaker System |
| Model No. | : | SC-NA10 |
| Serial No. | : | Refer to Section 4, Clause 4.2 |
| Rating | : | AC100-240V |
| Receipt Date of Sample | : | June 26, 2013 |
| Country of Mass-production | : | Malaysia |
| Condition of EUT | : | Engineering prototype<br>(Not for Sale: This sample is equivalent to mass-produced items.) |
| Modification of EUT | : | No Modification by the test lab |

## 2.2 Product Description

Model No: SC-NA10, (referred to as the EUT in this report), is the Wireless Speaker System.

**General Specification**

| | | |
|---|---|---|
| Clock frequency(ies) in the system | : | Main 4MHz<br>DSP/DAMP 24.576MHz<br>Bluetooth 26MHz |

**Radio Specification**

**[Bluetooth]**

| | | |
|---|---|---|
| Radio Type | : | Transceiver |
| Frequency of Operation | : | 2402-2480MHz |
| Modulation | : | FHSS |
| Power Supply (radio part input) | : | DC3.3V |
| Antenna type | : | PCB Pattern Antenna |
| Antenna Gain | : | 2.0dBi |

**[NFC]**

| | | |
|---|---|---|
| Radio Type | : | Receiver |
| Receiving Frequency | : | 13.56MHz |
| Power Supply (radio part input) | : | DC3.3V |
| Antenna type | : | PCB Pattern Antenna |

# SECTION 3: Test specification, procedures & results

## 3.1 Test Specification

| | | |
|---|---|---|
| Test Specification | : | FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013 |
| Title | : | FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators<br>Section 15.207 Conducted limits<br>Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz |

* The revision on September 30, 2013 does not affect the test specification applied to the EUT.
* The EUT complies with FCC Part 15 Subpart B: 2013, final revised on June 11, 2013 and effective July 11, 2013.

## 3.2 Procedures and results

| Item | Test Procedure | Specification | Worst Margin | Results | Remarks |
|---|---|---|---|---|---|
| Conducted Emission | **FCC:** ANSI C63.4:2003 7. AC powerline conducted emission measurements<br>**IC:** RSS-Gen 7.2.4 | **FCC:** Section 15.207<br>**IC:** RSS-Gen 7.2.4 | **QP**<br>20.7dB, 0.15000MHz, L<br>**AV**<br>19.6dB, 16.14400MHz, N | Complied | - |
| Carrier Frequency Separation | **FCC:** FCC Public Notice DA 00-705<br>**IC:** - | **FCC:** Section15.247(a)(1)<br>**IC:** RSS-210 A8.1 (b) | See data. | Complied | Conducted |
| 20dB Bandwidth | **FCC:** FCC Public Notice DA 00-705<br>**IC:** - | **FCC:** Section15.247(a)(1)<br>**IC:** RSS-210 A8.1 (a) | | Complied | Conducted |
| Number of Hopping Frequency | **FCC:** FCC Public Notice DA 00-705<br>**IC:** - | **FCC:** Section15.247(a)(1)(iii)<br>**IC:** RSS-210 A8.1 (d) | | Complied | Conducted |
| Dwell time | **FCC:** FCC Public Notice DA 00-705<br>**IC:** - | **FCC:** Section15.247(a)(1)(iii)<br>**IC:** RSS-210 A8.1 (d) | | Complied | Conducted |
| Maximum Peak Output Power | **FCC:** FCC Public Notice DA 00-705<br>**IC:** RSS-Gen 4.8 | **FCC:** Section15.247(a)(b)(1)<br>**IC:** RSS-210 A8.4 (2) | | Complied | Conducted |
| Spurious Emission & Band Edge Compliance | **FCC:** FCC Public Notice DA 00-705<br>**IC:** RSS-Gen 4.9 | **FCC:** Section15.247(d)<br>**IC:** RSS-210 A8.5<br>RSS-Gen 6 and 7.2.3 | 5.2dB<br>351.996MHz, QP, Horizontal | Complied | Conducted/ Radiated |
| Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. | | | | | |

* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

**FCC 15.31 (e)**
This EUT provides stable voltage (DC3.3V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

**FCC Part 15.203 Antenna requirement**
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

## 3.3 Addition to standard

| Item | Test Procedure | Specification | Worst margin | Results | Remarks |
|---|---|---|---|---|---|
| 99% Occupied Bandwidth | **IC:** RSS-Gen 4.6.1 | **IC:** RSS-Gen 4.6.1 | N/A | - | Conducted |

Other than above, no addition, exclusion nor deviation has been made from the standard.

## 3.4 Uncertainty

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

| **Test room** (semi-anechoic chamber) | **Conducted emission (±dB)** |
|---|---|
| | 150kHz-30MHz |
| No.1 | 3.5dB |
| No.2 | 3.6dB |
| No.3 | 3.6dB |
| No.4 | 3.6dB |

| **Test room** (semi-anechoic chamber) | **Radiated emission** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **(3m*)(±dB)** | | | | **(1m*)(±dB)** | | **(0.5m*)(±dB)** |
| | 9kHz -30MHz | 30MHz -300MHz | 300MHz -1GHz | 1GHz -10GHz | 10GHz -18GHz | 18GHz -26.5GHz | 26.5GHz -40GHz |
| No.1 | 4.3dB | 5.0dB | 5.1dB | 4.9dB | 5.8dB | 4.4dB | 4.3dB |
| No.2 | 4.3dB | 5.2dB | 5.1dB | 5.0dB | 5.7dB | 4.3dB | 4.2dB |
| No.3 | 4.6dB | 5.0dB | 5.1dB | 5.0dB | 5.7dB | 4.5dB | 4.2dB |
| No.4 | 4.8dB | 5.2dB | 5.0dB | 5.0dB | 5.7dB | 5.2dB | 4.2dB |

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

| **Power meter (±dB)** | |
|---|---|
| Below 1GHz | Above 1GHz |
| 0.7dB | 1.5dB |

| **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 | |
| 1.5dB | 1.7dB | 2.8dB | 2.8dB | 2.9dB | 2.6dB |

Conducted Emission test
The data listed in this test report has enough margin, more than the site margin.

Radiated emission test(3m)
The data listed in this test report has enough margin, more than the site margin.

### 3.5 Test Location

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| | FCC Registration Number | IC Registration Number | Width x Depth x Height (m) | Size of reference ground plane (m) / horizontal conducting plane | Other rooms |
|---|---|---|---|---|---|
| No.1 semi-anechoic chamber | 313583 | 2973C-1 | 19.2 x 11.2 x 7.7m | 7.0 x 6.0m | No.1 Power source room |
| No.2 semi-anechoic chamber | 655103 | 2973C-2 | 7.5 x 5.8 x 5.2m | 4.0 x 4.0m | - |
| No.3 semi-anechoic chamber | 148738 | 2973C-3 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.3 Preparation room |
| No.3 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.4 semi-anechoic chamber | 134570 | 2973C-4 | 12.0 x 8.5 x 5.9m | 6.8 x 5.75m | No.4 Preparation room |
| No.4 shielded room | - | - | 4.0 x 6.0 x 2.7m | N/A | - |
| No.5 semi-anechoic chamber | - | - | 6.0 x 6.0 x 3.9m | 6.0 x 6.0m | - |
| No.6 shielded room | - | - | 4.0 x 4.5 x 2.7m | 4.75 x 5.4 m | - |
| No.6 measurement room | - | - | 4.75 x 5.4 x 3.0m | 4.75 x 4.15 m | - |
| No.7 shielded room | - | - | 4.7 x 7.5 x 2.7m | 4.7 x 7.5m | - |
| No.8 measurement room | - | - | 3.1 x 5.0 x 2.7m | N/A | - |
| No.9 measurement room | - | - | 8.8 x 4.6 x 2.8m | 2.4 x 2.4m | - |
| No.11 measurement room | - | - | 3.1 x 3.4 x 3.0m | 2.4 x 3.4m | - |

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

# SECTION 4: Operation of E.U.T. during testing

## 4.1 Operating Mode(s)

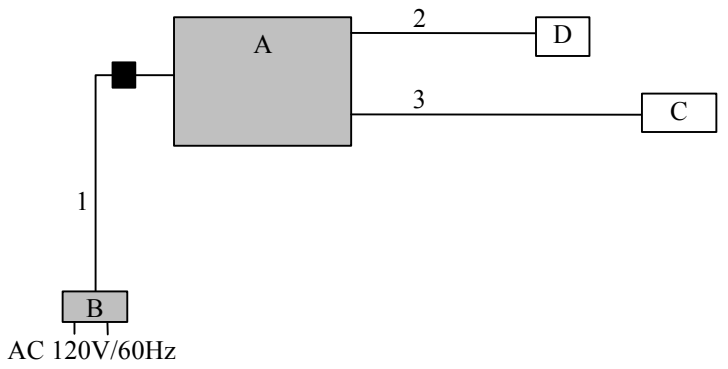
Bluetooth (BT): Transmitting (Tx), Payload: PRBS9
*Inquiry mode was not able to function on test tool.

Details of Operating Mode(s)

| Test Item | Mode | Tested frequency |
|---|---|---|
| Conducted Emission,<br>20dB Bandwidth,<br>Spurious Emission (Conducted/Radiated) | Tx (Hopping off) DH5, 3DH5 | 2402MHz<br>2441MHz<br>2480MHz |
| Maximum Peak Output Power | Tx (Hopping off) DH5, 2DH5, 3DH5 | 2402MHz<br>2441MHz<br>2480MHz |
| Carrier Frequency Separation | Tx (Hopping on) DH5, 3DH5 | 2402MHz<br>2441MHz<br>2480MHz |
| Number of Hopping Frequency | Tx (Hopping on) DH5, 3DH5 | - |
| Dwell time | Tx (Hopping on),<br>-DH1, DH3, DH5<br>-3DH1, 3DH3, 3DH5 | - |
| Band Edge Compliance<br>(Conducted) | Tx DH5, 3DH5<br>-Hopping on<br>-Hopping off | 2402MHz<br>2480MHz |
| 99% Occupied Bandwidth | Tx DH5, 3DH5<br>-Hopping on<br>-Hopping off | 2402MHz<br>2441MHz<br>2480MHz |

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test)
*Antenna terminal conducted tests were performed only with model No.SC-NA30, because model No. SC-NA10 and model No. SC-NA30 had the same module.
*We removed 2DH mode (2 Mb/s EDR: pi/4DQPSK) except power measurement by using 3DH mode (3 Mb/s EDR:8DPSK) as a representative.
*EUT has the power settings by the software as follows;
Power settings: BDR: 46
EDR: 48
Software: Blue test 3
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

## 4.2 Configuration and peripherals




*Cabling and setup were taken into consideration and test data was taken under worse case conditions.

**Description of EUT and Support equipment**

| No. | Item | Model number | Serial number | Manufacturer | Remark |
|---|---|---|---|---|---|
| A | Wireless Speaker System | SC-NA10 | 001 | Panasonic Corporation | EUT |
| B | AC Adaptor | RFEA228C-AG | 1206-004804 | Panasonic Corporation | EUT |
| C | iPhone | MD297ZA | F2NJV61RDTWD | Apple Inc. | - |
| D | iPod 3 | MC525J | DCYG9426DCMN | Apple Inc. | - |

**List of cables used**

| No. | Name | Length (m) | Shield | | Remark |
|---|---|---|---|---|---|
| | | | Cable | Connector | |
| 1 | DC Cable | 1.5 | Unshielded | Unshielded | - |
| 2 | USB Cable | 1.0 | Shielded | Shielded | - |
| 3 | Audio Cable | 1.5 | Unshielded | Unshielded | - |

## SECTION 5: Conducted Emission

**Test Procedure and conditions**

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber. The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

| | |
|---|---|
| **Detector** | **: QP and AV** |
| **Measurement range** | **: 0.15-30MHz** |
| **Test data** | **: APPENDIX** |
| **Test result** | **: Pass** |

## SECTION 6: Radiated Spurious Emission

**Test Procedure**
EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.
The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

**Test Antennas are used as below;**

| Frequency | 30MHz to 300MHz | 300MHz to 1GHz | Above 1GHz |
|---|---|---|---|
| Antenna Type | Biconical | Logperiodic | Horn |

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

**20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5 (IC) and outside the restricted band of FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).**

| Frequency | Below 1GHz | Above 1GHz | | 20dBc |
|---|---|---|---|---|
| Instrument used | Test Receiver | Spectrum Analyzer | | Spectrum Analyzer |
| Detector | QP | PK | AV | PK |
| IF Bandwidth | BW 120kHz(T/R) | RBW: 1MHz<br>VBW: 3MHz | RBW: 1MHz<br>VBW: 10Hz *1) | RBW: 100kHz<br>VBW: 300kHz (S/A) |
| Test Distance | 3m | 3m (below 10GHz),<br>1m *2) (above 10GHz) | | 3m (below 10GHz),<br>1m *2) (above 10GHz) |

*1) Although 00-705 accepts VBW=10Hz for AV measurements, it was confirmed that superfluous smoothing was not performed."
*2) Distance Factor: 20 x log (3.0m/1.0m) = 9.5dB

The carrier level and noise levels were confirmed at each position of X, Y, Z axes, with cover and without cover of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.
After the comparison between EUT with cover and without cover at the position of maximum noise, EUT without cover had the worst data.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

**Measurement range : 30M-25GHz**
**Test data : APPENDIX**
**Test result : Pass**

# SECTION 7: Antenna Terminal Conducted Tests

**Test Procedure**

The tests were made with below setting connected to the antenna port.

| Test | Span | RBW | VBW | Sweep time | Detector | Trace | Instrument used |
|---|---|---|---|---|---|---|---|
| 20dB Bandwidth | 3MHz | 30kHz | 100kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| 99% Occupied Bandwidth | Enough width to display 20dB Bandwidth | 1 to 3% of Span | Three times of RBW | Auto | Peak | Max Hold *1) | Spectrum Analyzer |
| Maximum Peak Output Power | - | - | - | Auto | Peak | - | Power Meter (Sensor: 50MHz BW) |
| Carrier Frequency Separation | 3MHz | 30kHz | 100kHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| Number of Hopping Frequency | 30MHz | 300kHz | 1MHz | Auto | Peak | Max Hold | Spectrum Analyzer |
| Dwell Time | Zero Span | 100kHz, 1MHz | 300kHz, 3MHz | As necessary capture the entire dwell time per hopping channel | Peak | Max Hold | Spectrum Analyzer |
| Conducted Spurious Emission *2) | 9kHz to 150kHz | 200Hz | 620Hz | Auto | Peak | Max Hold | Spectrum Analyzer |
| | 150kHz to 30MHz | 9.1kHz | 27kHz | | | | |
| | 30MHz to 25GHz (Less or equal to 5GHz) | 100kHz | 300kHz | | | | |
| Conducted Spurious Emission Band Edge compliance | 10MHz | 100kHz | 300kHz | Auto | Peak | Max Hold | Spectrum Analyzer |

*1) The measurement was performed with Max Hold since the duty cycle was not 100%.
*2) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents. Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=9.1kHz)

The test results and limit are rounded off to two decimals place, so some differences might be observed.

**Test data : APPENDIX**
**Test result : Pass**

# APPENDIX 1: Data of EMI test

## Conducted Emission

### DATA OF CONDUCTED EMISSION TEST

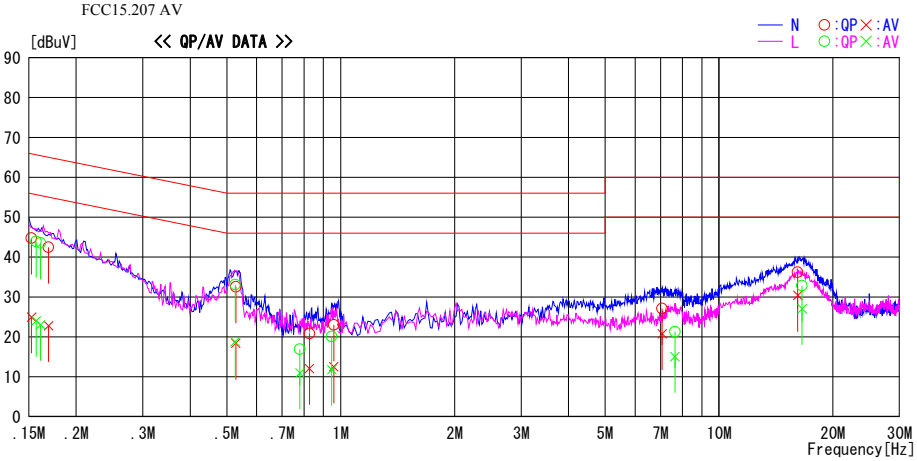
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
07/09/2013

Report No. : 10020306H

Temp./Humi. : 23deg. C / 62% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx DH5 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



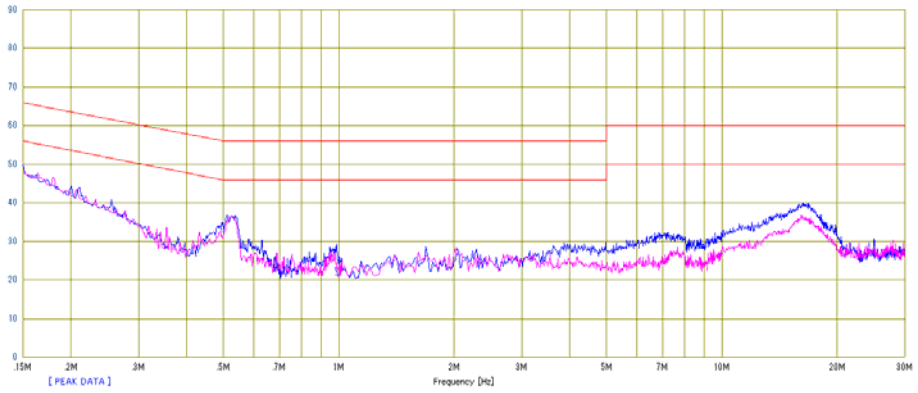

| Frequency | Reading Level | | Corr. | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QP | AV | Factor | QP | AV | QP | AV | QP | AV | | |
| [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 0.15230 | 31.4 | 11.7 | 13.3 | 44.7 | 25.0 | 65.9 | 55.9 | 21.2 | 30.9 | N | |
| 0.16900 | 29.2 | 9.5 | 13.3 | 42.5 | 22.8 | 65.0 | 55.0 | 22.5 | 32.2 | N | |
| 0.52820 | 19.3 | 5.1 | 13.3 | 32.6 | 18.4 | 56.0 | 46.0 | 23.4 | 27.6 | N | |
| 0.82700 | 7.4 | -1.3 | 13.4 | 20.8 | 12.1 | 56.0 | 46.0 | 35.2 | 33.9 | N | |
| 0.95880 | 9.6 | -0.9 | 13.4 | 23.0 | 12.5 | 56.0 | 46.0 | 33.0 | 33.5 | N | |
| 7.07200 | 12.3 | 6.0 | 14.8 | 27.1 | 20.8 | 60.0 | 50.0 | 32.9 | 29.2 | N | |
| 16.14400 | 19.7 | 13.9 | 16.5 | 36.2 | 30.4 | 60.0 | 50.0 | 23.8 | 19.6 | N | |
| 0.15682 | 30.6 | 10.8 | 13.3 | 43.9 | 24.1 | 65.6 | 55.6 | 21.7 | 31.5 | L | |
| 0.16100 | 30.3 | 9.8 | 13.3 | 43.6 | 23.1 | 65.4 | 55.4 | 21.8 | 32.3 | L | |
| 0.52600 | 19.8 | 5.5 | 13.3 | 33.1 | 18.8 | 56.0 | 46.0 | 22.9 | 27.2 | L | |
| 0.78017 | 3.5 | -2.4 | 13.4 | 16.9 | 11.0 | 56.0 | 46.0 | 39.1 | 35.0 | L | |
| 0.94703 | 6.7 | -1.6 | 13.4 | 20.1 | 11.8 | 56.0 | 46.0 | 35.9 | 34.2 | L | |
| 7.64908 | 6.5 | 0.3 | 14.8 | 21.3 | 15.1 | 60.0 | 50.0 | 38.7 | 34.9 | L | |
| 16.57973 | 16.3 | 10.6 | 16.5 | 32.8 | 27.1 | 60.0 | 50.0 | 27.2 | 22.9 | L | |

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

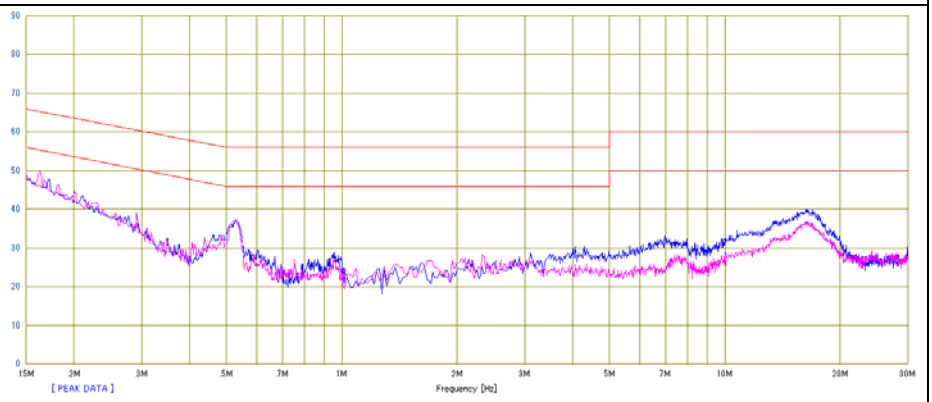
# Conducted Emission

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 10020306H |
| Date | 07/09/2013 |
| Temperature/ Humidity | 23deg. C / 62% RH |
| Engineer | Hiroshi Kukita |
| Mode | Tx DH5 |

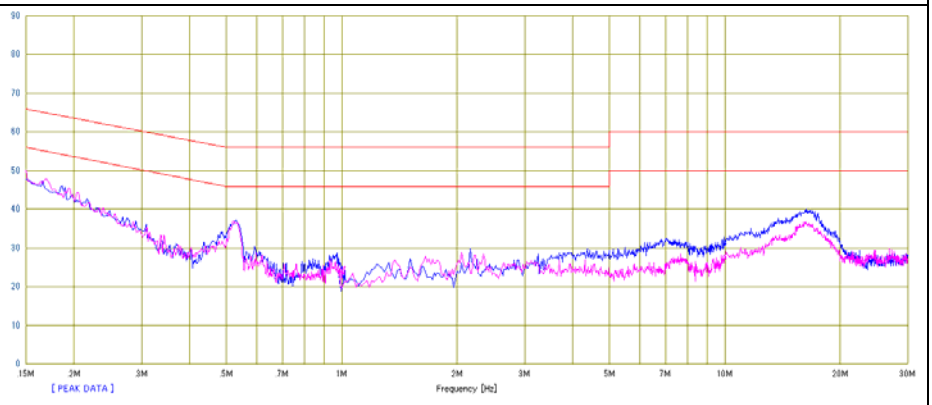
**2402MHz**




**2441MHz**




**2480MHz**




Y scale [dBuV] Chart — N — L

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Telephone : +81 596 24 8999
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# Conducted Emission

## DATA OF CONDUCTED EMISSION TEST

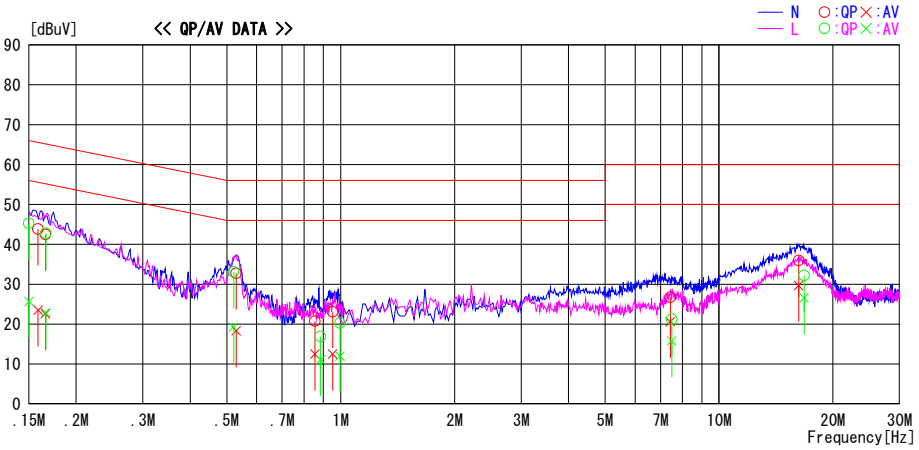
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
07/09/2013

Report No. : 10020306H

Temp./Humi. : 23deg. C / 62% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 3DH5 2402MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



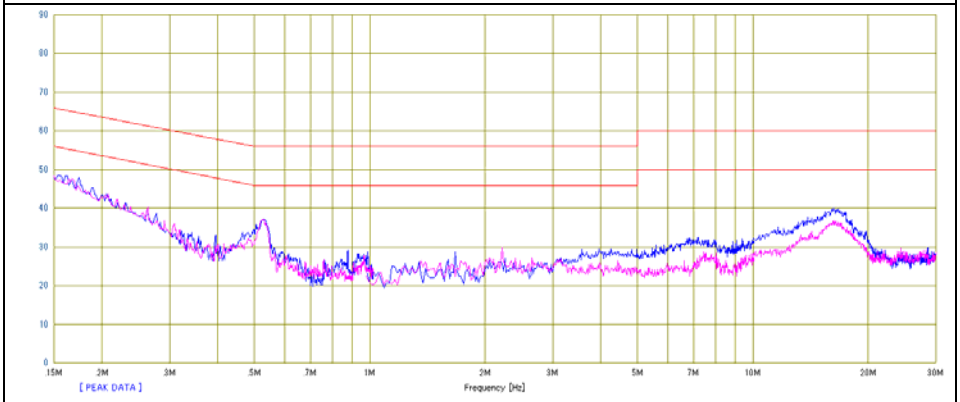

| Frequency | Reading Level | | Corr. | Results | | Limit | | Margin | | Phase | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | QP | AV | Factor | QP | AV | QP | AV | QP | AV | | |
| [MHz] | [dBuV] | [dBuV] | [dB] | [dBuV] | [dBuV] | [dBuV] | [dBuV] | [dB] | [dB] | | |
| 0.15852 | 30.5 | 10.2 | 13.3 | 43.8 | 23.5 | 65.5 | 55.5 | 21.7 | 32.0 | N | |
| 0.16586 | 29.2 | 9.3 | 13.3 | 42.5 | 22.6 | 65.2 | 55.2 | 22.7 | 32.6 | N | |
| 0.52941 | 19.4 | 5.0 | 13.3 | 32.7 | 18.3 | 56.0 | 46.0 | 23.3 | 27.7 | N | |
| 0.85480 | 7.3 | -0.9 | 13.4 | 20.7 | 12.5 | 56.0 | 46.0 | 35.3 | 33.5 | N | |
| 0.95270 | 9.7 | -0.9 | 13.4 | 23.1 | 12.5 | 56.0 | 46.0 | 32.9 | 33.5 | N | |
| 7.43464 | 11.9 | 5.8 | 14.8 | 26.7 | 20.6 | 60.0 | 50.0 | 33.3 | 29.4 | N | |
| 16.23440 | 19.4 | 13.2 | 16.5 | 35.9 | 29.7 | 60.0 | 50.0 | 24.1 | 20.3 | N | |
| 0.15000 | 32.0 | 12.4 | 13.3 | 45.3 | 25.7 | 66.0 | 56.0 | 20.7 | 30.3 | L | |
| 0.16634 | 29.4 | 9.6 | 13.3 | 42.7 | 22.9 | 65.1 | 55.1 | 22.4 | 32.2 | L | |
| 0.52130 | 19.8 | 6.0 | 13.3 | 33.1 | 19.3 | 56.0 | 46.0 | 22.9 | 26.7 | L | |
| 0.88412 | 3.5 | -2.3 | 13.4 | 16.9 | 11.1 | 56.0 | 46.0 | 39.1 | 34.9 | L | |
| 0.99541 | 6.9 | -1.4 | 13.4 | 20.3 | 12.0 | 56.0 | 46.0 | 35.7 | 34.0 | L | |
| 7.49810 | 6.4 | 1.0 | 14.8 | 21.2 | 15.8 | 60.0 | 50.0 | 38.8 | 34.2 | L | |
| 16.78520 | 15.6 | 10.0 | 16.6 | 32.2 | 26.6 | 60.0 | 50.0 | 27.8 | 23.4 | L | |

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

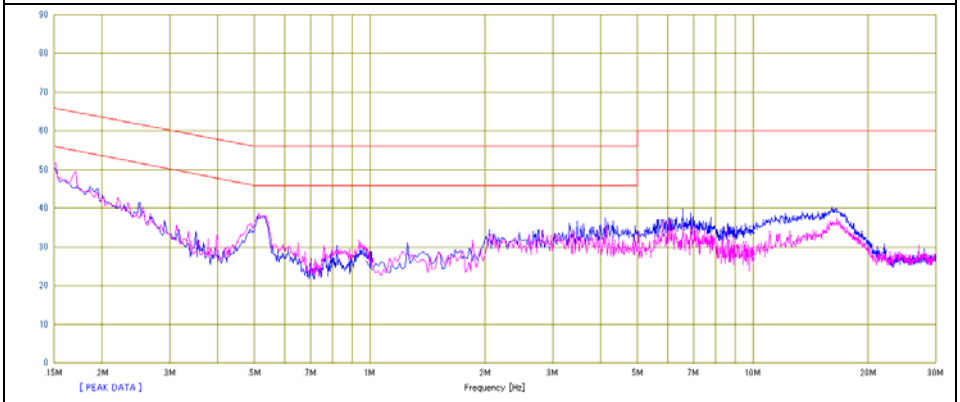
# Conducted Emission

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 10020306H |
| Date | 07/09/2013 |
| Temperature/ Humidity | 23deg. C / 62% RH |
| Engineer | Hiroshi Kukita |
| Mode | Tx 3DH5 |

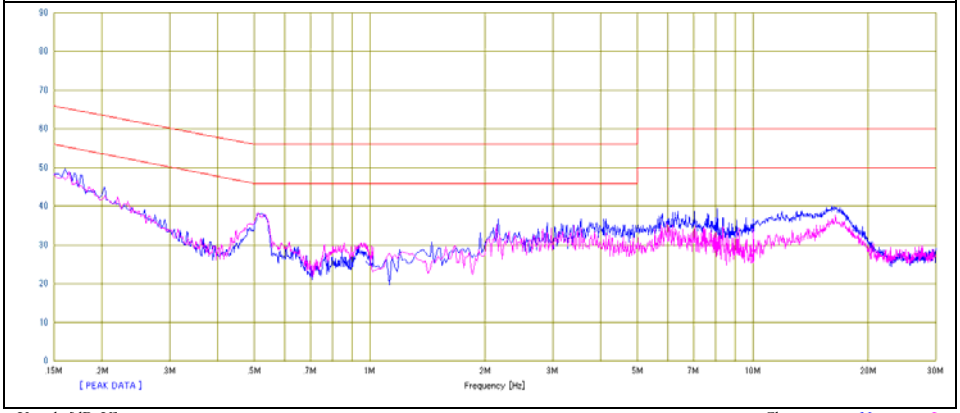
**2402MHz**




**2441MHz**




**2480MHz**




Y scale [dBuV] Chart — N — L

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Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

# 20dB Bandwidth and Carrier Frequency Separation

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Measurement Room |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 23 deg. C / 55% RH |
| Engineer | Satofumi Matsuyama |
| Mode | Tx (Hopping off/on) DH5/3DH5 |

| Mode | Freq. [MHz] | 20dB Bandwidth [MHz] | Carrier Frequency Separation [MHz] | Limit for Carrier Frequency separation [MHz] |
|---|---|---|---|---|
| DH5 | 2402.0 | 0.928 | 1.000 | >= 0.618 |
| DH5 | 2441.0 | 0.928 | 1.000 | >= 0.619 |
| DH5 | 2480.0 | 0.925 | 1.000 | >= 0.617 |
| 3DH5 | 2402.0 | 1.268 | 1.000 | >= 0.845 |
| 3DH5 | 2441.0 | 1.262 | 1.000 | >= 0.841 |
| 3DH5 | 2480.0 | 1.256 | 1.000 | >= 0.837 |

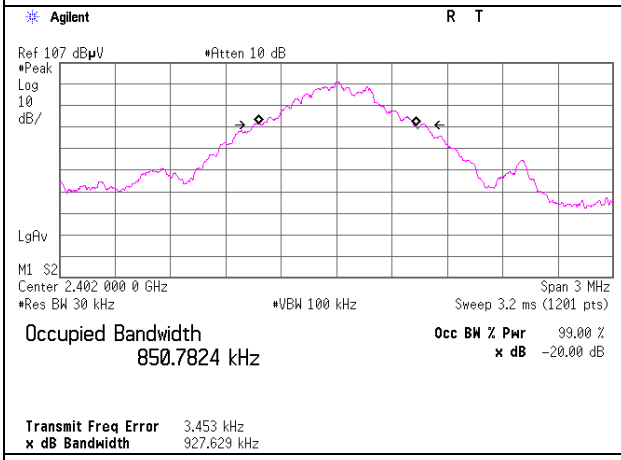
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

# 20dB Bandwidth and Carrier Frequency Separation

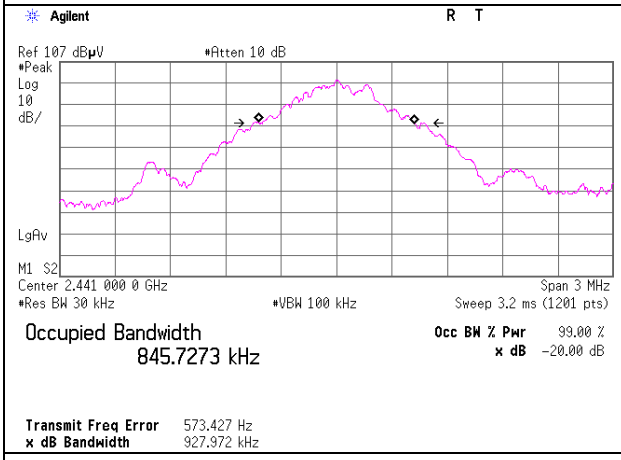
## Tx DH5

### 20dB Bandwidth

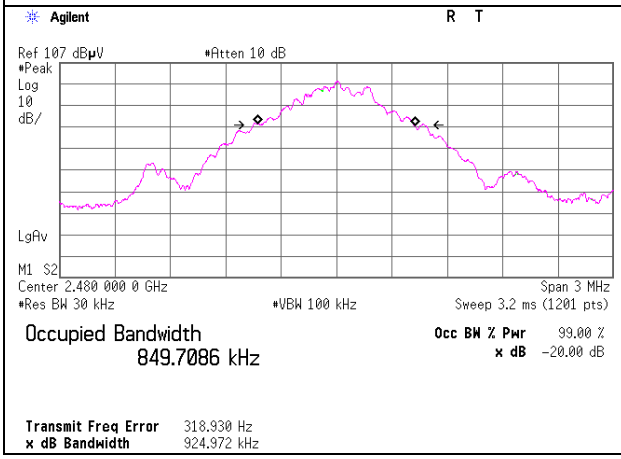
#### 2402MHz




#### 2441MHz

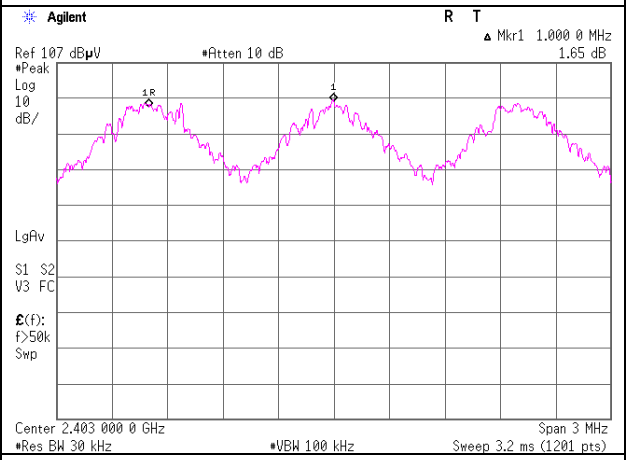



#### 2480MHz

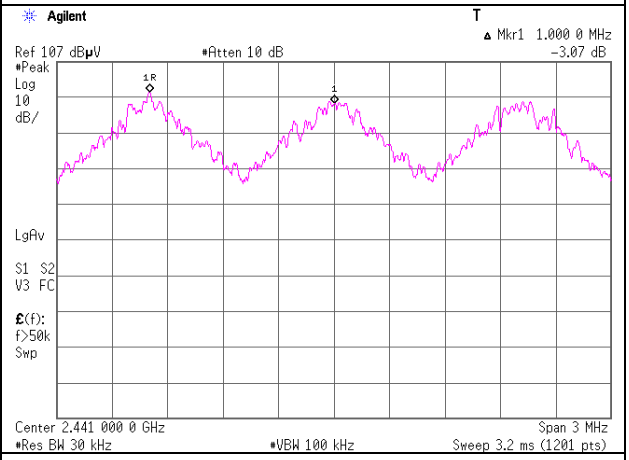



### Carrier Frequency Separation

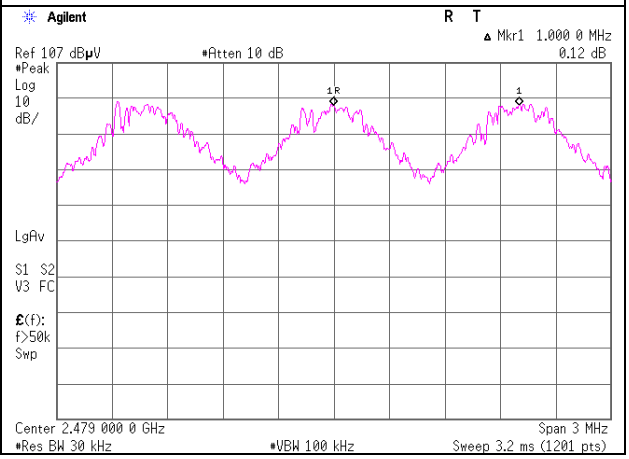
#### 2402MHz




#### 2441MHz




#### 2480MHz

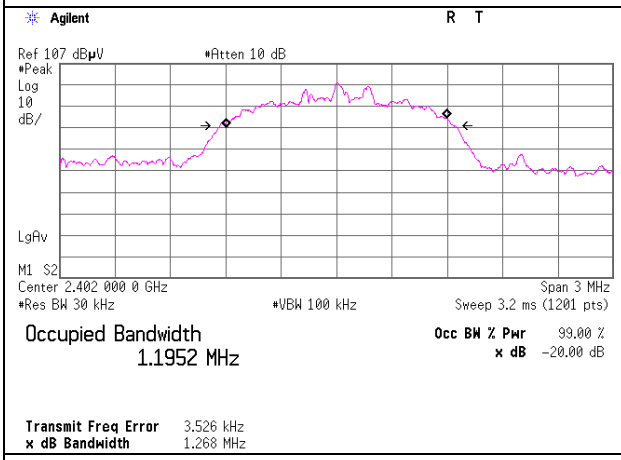


# 20dB Bandwidth and Carrier Frequency Separation

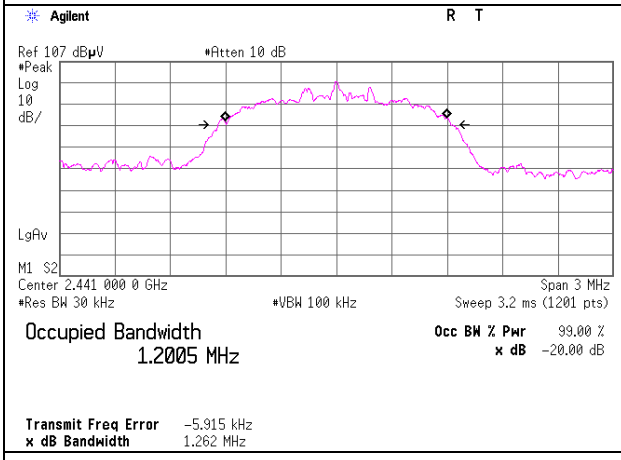
## Tx 3DH5

### 20dB Bandwidth

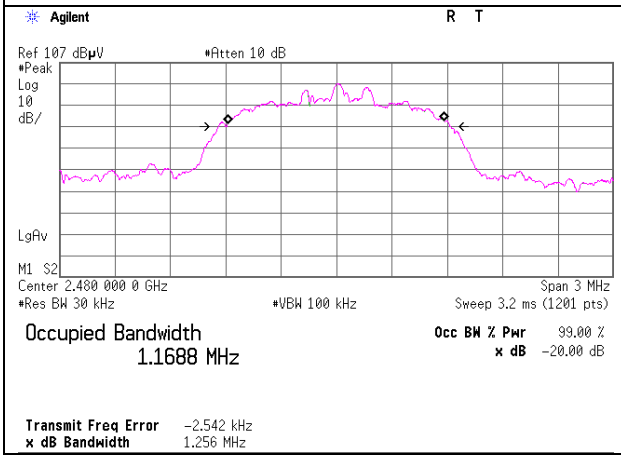
#### 2402MHz




#### 2441MHz

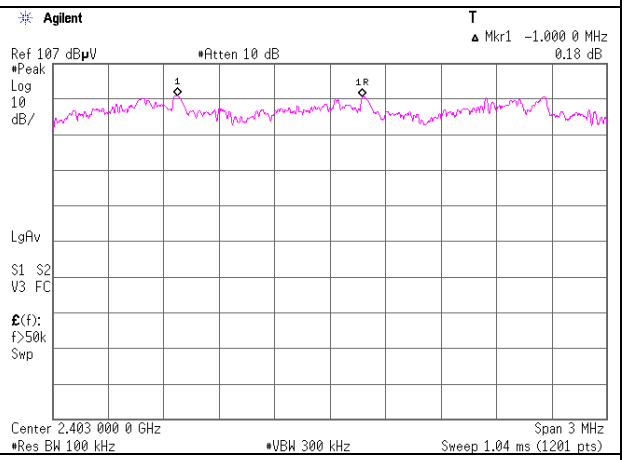



#### 2480MHz

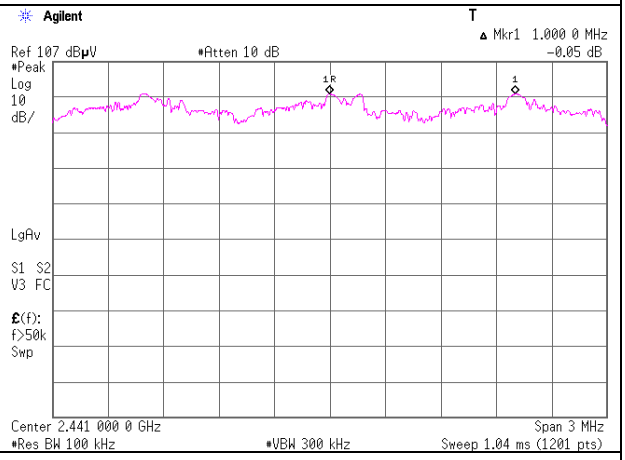



### Carrier Frequency Separation

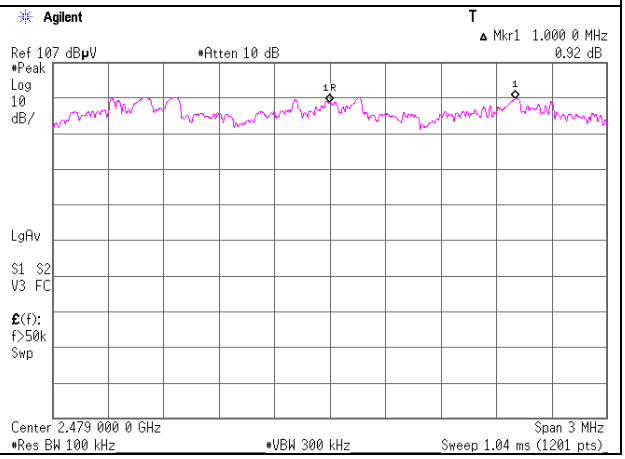
#### 2402MHz




#### 2441MHz




#### 2480MHz



# Number of Hopping Frequency

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Measurement Room |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 23 deg. C / 55% RH |
| Engineer | Satofumi Matsuyama |
| Mode | Tx (Hopping on) DH5/3DH5 |

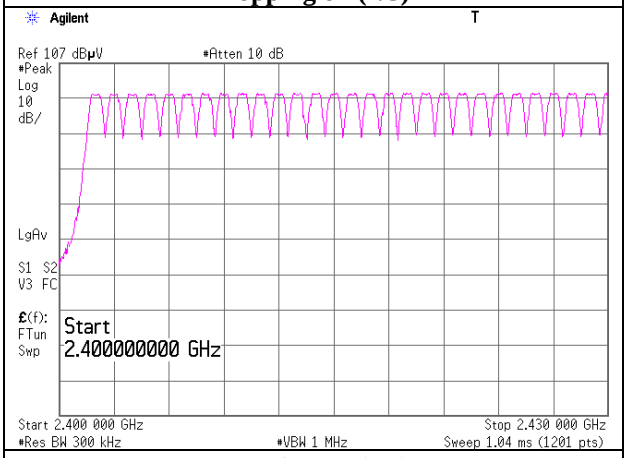
| Mode | Number of channel [times] | Limit [times] |
|---|---|---|
| DH5 | 79 | >= 15 |
| 3DH5 | 79 | >= 15 |

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.

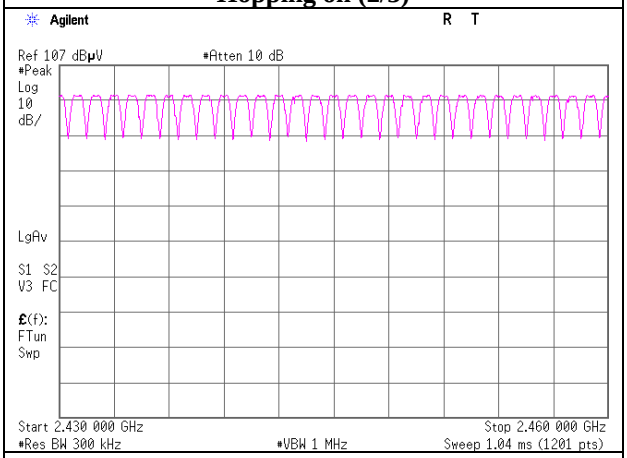
# Number of Hopping Frequency

## Tx DH5

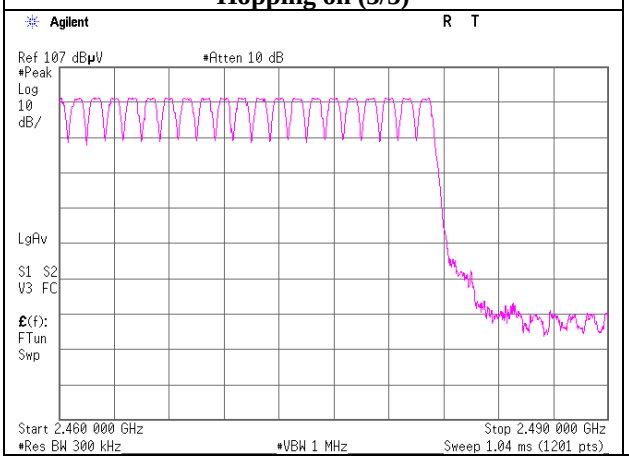
### Hopping on (1/3)




### Hopping on (2/3)

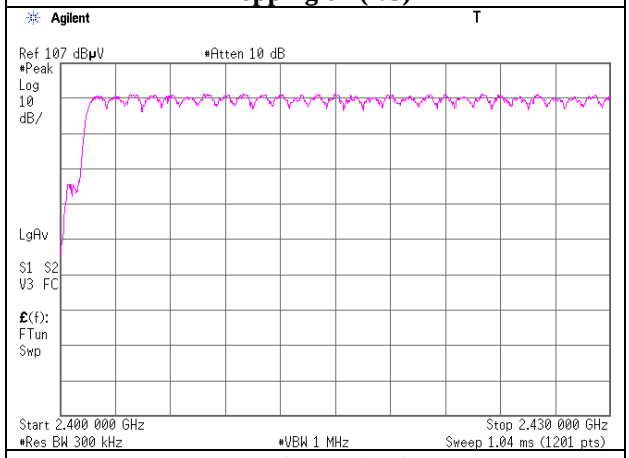



### Hopping on (3/3)

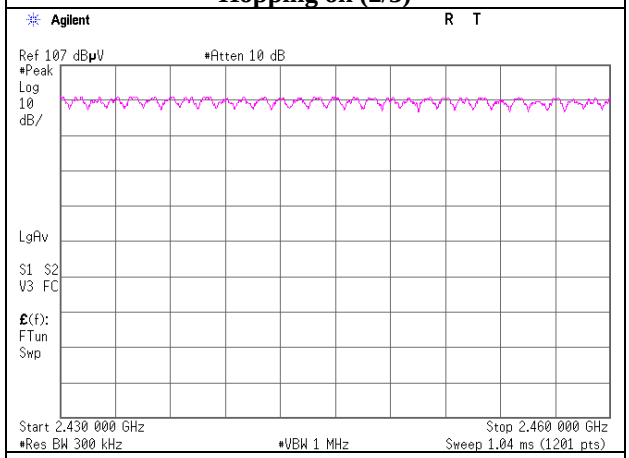



## Tx 3DH5

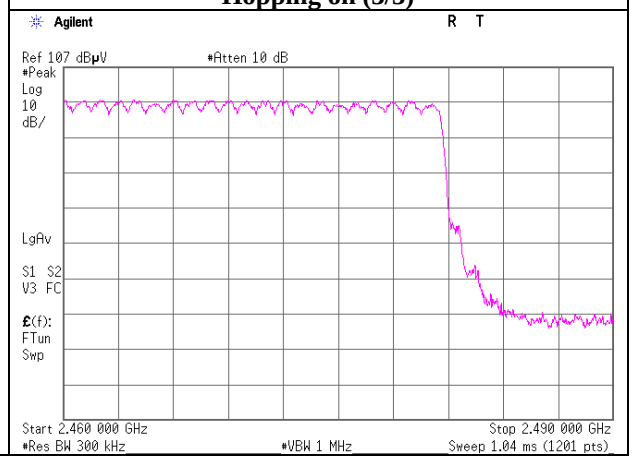
### Hopping on (1/3)




### Hopping on (2/3)




### Hopping on (3/3)



# Dwell time

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Measurement Room |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 23 deg. C / 55% RH |
| Engineer | Satofumi Matsuyama |
| Mode | Tx (Hopping on) DH5/3DH5 |

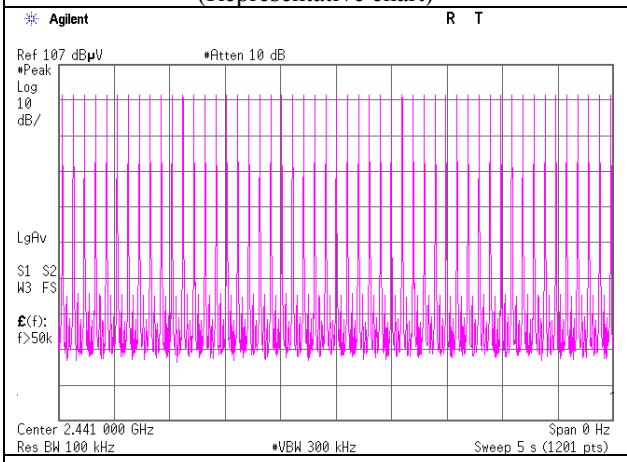
| Mode | Number of transmission in a 31.6(79 Hopping x 0.4) / 12.8(32 Hopping x 0.4)second period | | | | Length of transmission time [msec] | Result [msec] | Limit [msec] |
|---|---|---|---|---|---|---|---|
| DH1 | 51.0 times / | 5 sec. x | 31.6 sec. = | 323 times | 0.518 | 167 | 400 |
| DH3 | 25.0 times / | 5 sec. x | 31.6 sec. = | 158 times | 1.776 | 281 | 400 |
| DH5 | 17.0 times / | 5 sec. x | 31.6 sec. = | 108 times | 3.032 | 327 | 400 |
| 3DH1 | 51.0 times / | 5 sec. x | 31.6 sec. = | 323 times | 0.532 | 172 | 400 |
| 3DH3 | 26.0 times / | 5 sec. x | 31.6 sec. = | 165 times | 1.784 | 294 | 400 |
| 3DH5 | 17.0 times / | 5 sec. x | 31.6 sec. = | 108 times | 3.036 | 328 | 400 |

Sample Calculation
Result = Number of transmission x Length of transmition time

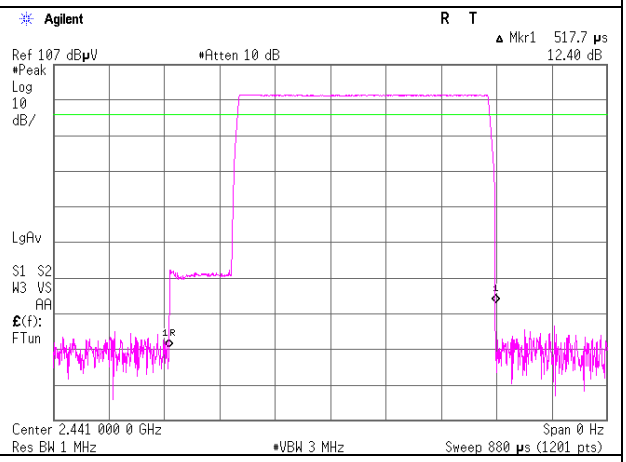
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless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

# Dwell time

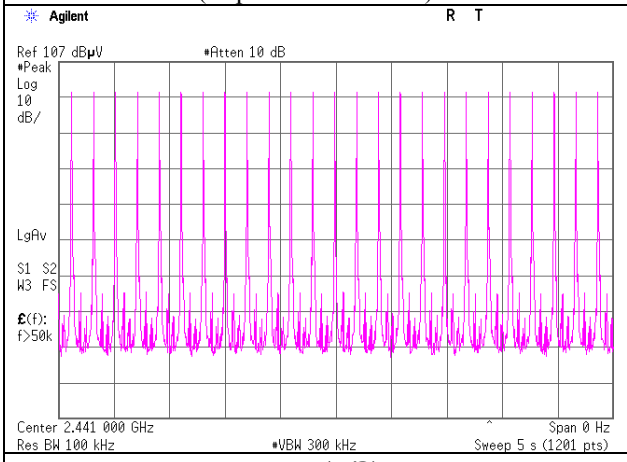
## DH1 (1/2)
(Representative chart)



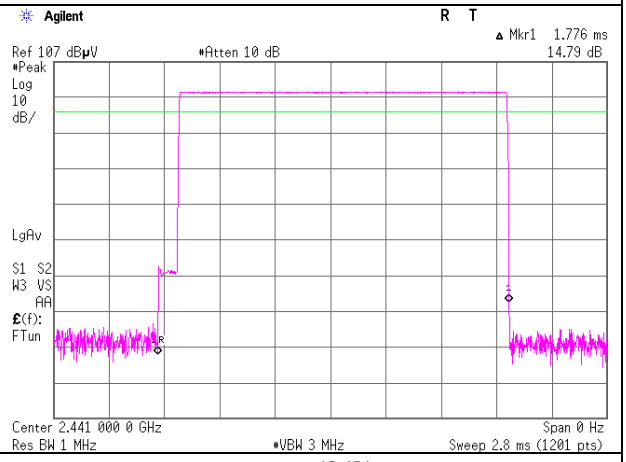

## DH1 (2/2)



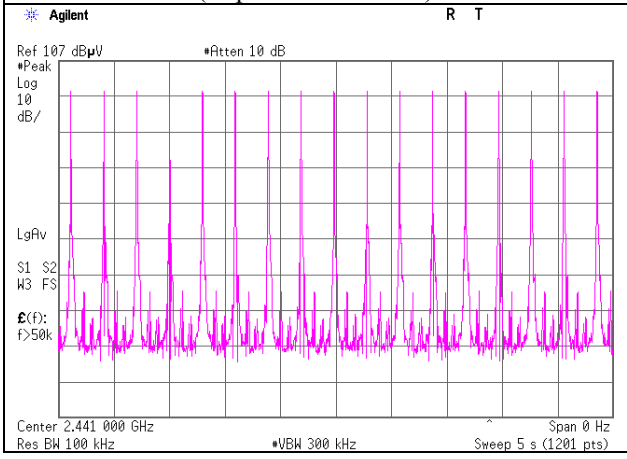

## DH3 (1/2)
(Representative chart)



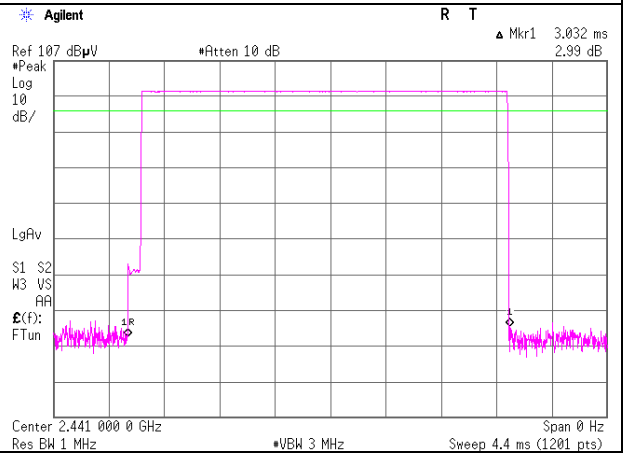

## DH3 (2/2)




## DH5 (1/2)
(Representative chart)

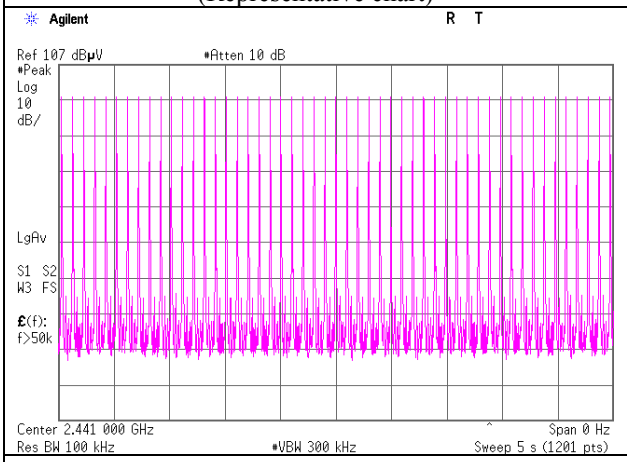



## DH5 (2/2)

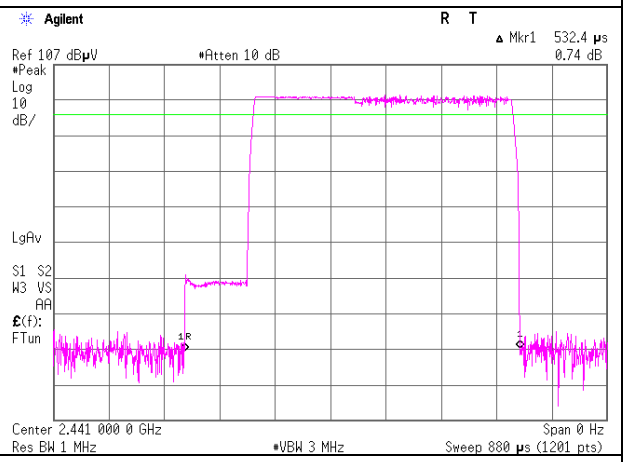


# Dwell time

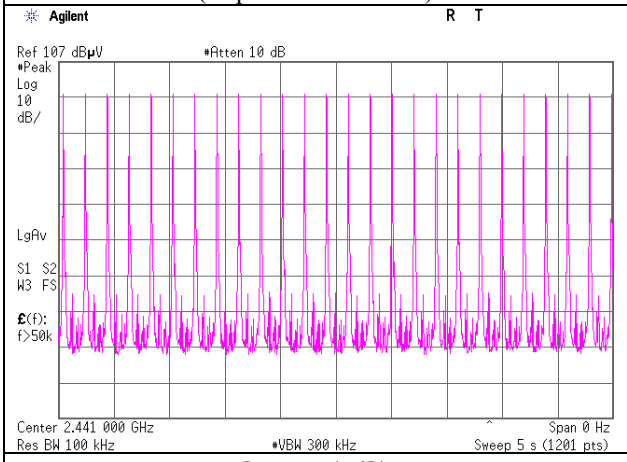
## 3DH1 (1/2)
(Representative chart)



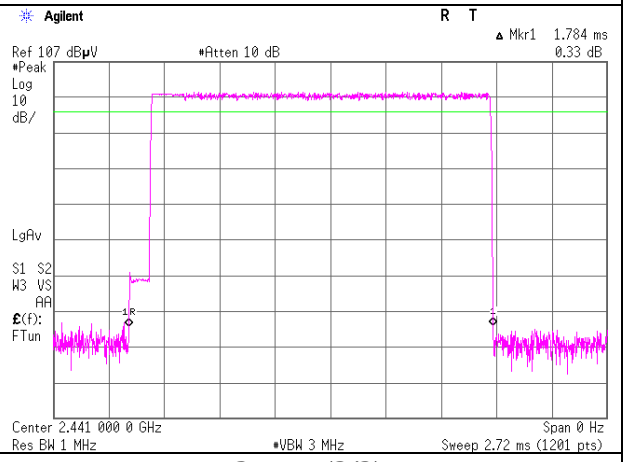

## 3DH1 (2/2)



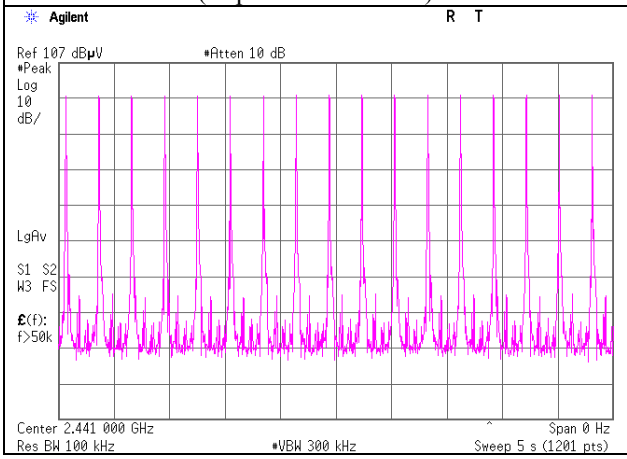

## 3DH3 (1/2)
(Representative chart)



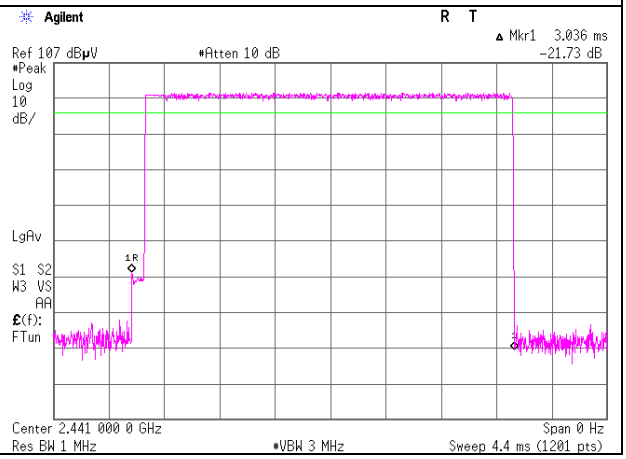

## 3DH3 (2/2)




## 3DH5 (1/2)
(Representative chart)




## 3DH5 (2/2)



# Maximum Peak Output Power

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Measurement Room |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 23 deg. C / 55% RH |
| Engineer | Satofumi Matsuyama |
| Mode | Tx (Hopping off) DH5/2DH5/3DH5 |

| Mode | Freq. | Reading | Cable Loss | Atten. | Result | | Limit | | Margin |
|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | [dBm] | [dB] | [dB] | [dBm] | [mW] | [dBm] | [mW] | [dB] |
| DH5 | 2402.0 | -8.73 | 0.50 | 10.01 | 1.78 | 1.51 | 20.96 | 125 | 19.18 |
| DH5 | 2441.0 | -8.51 | 0.50 | 10.01 | 2.00 | 1.58 | 20.96 | 125 | 18.96 |
| DH5 | 2480.0 | -8.77 | 0.50 | 10.01 | 1.74 | 1.49 | 20.96 | 125 | 19.22 |
| 2DH5 | 2402.0 | -9.82 | 0.50 | 10.01 | 0.69 | 1.17 | 20.96 | 125 | 20.27 |
| 2DH5 | 2441.0 | -10.18 | 0.50 | 10.01 | 0.33 | 1.08 | 20.96 | 125 | 20.63 |
| 2DH5 | 2480.0 | -10.98 | 0.50 | 10.01 | -0.47 | 0.90 | 20.96 | 125 | 21.43 |
| 3DH5 | 2402.0 | -9.75 | 0.50 | 10.01 | 0.76 | 1.19 | 20.96 | 125 | 20.20 |
| 3DH5 | 2441.0 | -10.15 | 0.50 | 10.01 | 0.36 | 1.09 | 20.96 | 125 | 20.60 |
| 3DH5 | 2480.0 | -10.81 | 0.50 | 10.01 | -0.30 | 0.93 | 20.96 | 125 | 21.26 |

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied)+ Attenuator

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. As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

# Radiated Spurious Emission

| | | |
|---|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber | |
| Report No. | 10020306H | |
| Date | 07/04/2013 | 07/05/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH | 20 deg. C / 74% RH |
| Engineer | Hiroshi Kukita | Keisuke Kawamura |
| | (1-10GHz) | (Above 10GHz/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 | 88.850 | QP | 35.4 | 8.0 | 7.4 | 28.4 | 22.4 | 43.5 | 21.1 | |
| Hori | 122.680 | QP | 32.3 | 13.1 | 7.6 | 28.2 | 24.8 | 43.5 | 18.7 | |
| Hori | 147.150 | QP | 32.0 | 14.8 | 7.8 | 28.2 | 26.4 | 43.5 | 17.1 | |
| Hori | 258.200 | QP | 27.4 | 17.6 | 8.5 | 27.5 | 26.0 | 46.0 | 20.0 | |
| Hori | 352.000 | QP | 37.7 | 15.9 | 9.1 | 28.0 | 34.7 | 46.0 | 11.3 | |
| Hori | 436.220 | QP | 41.2 | 17.6 | 9.4 | 28.6 | 39.6 | 46.0 | 6.4 | |
| Hori | 608.260 | QP | 38.6 | 19.3 | 10.2 | 28.8 | 39.3 | 46.0 | 6.7 | |
| Hori | 1602.023 | PK | 54.0 | 25.4 | 1.9 | 36.0 | 45.3 | 73.9 | 28.6 | |
| Hori | 2390.000 | PK | 49.1 | 26.8 | 2.4 | 35.7 | 42.6 | 73.9 | 31.3 | |
| Hori | 3203.995 | PK | 49.9 | 27.8 | 2.8 | 35.0 | 45.5 | 73.9 | 28.4 | |
| Hori | 4804.000 | PK | 57.9 | 30.6 | 4.1 | 34.9 | 57.7 | 73.9 | 16.2 | |
| Hori | 7206.000 | PK | 43.4 | 35.5 | 5.0 | 34.9 | 49.0 | 73.9 | 24.9 | |
| Hori | 9608.000 | PK | 45.9 | 38.2 | 5.8 | 35.4 | 54.5 | 73.9 | 19.4 | |
| Hori | 1602.023 | AV | 51.3 | 25.4 | 1.9 | 36.0 | 42.6 | 53.9 | 11.3 | |
| Hori | 2390.000 | AV | 35.6 | 26.8 | 2.4 | 35.7 | 29.1 | 53.9 | 24.8 | |
| Hori | 3203.995 | AV | 43.6 | 27.8 | 2.8 | 35.0 | 39.2 | 53.9 | 14.7 | |
| Vert | 88.920 | QP | 34.0 | 8.0 | 7.4 | 28.4 | 21.0 | 43.5 | 22.5 | |
| Vert | 122.750 | QP | 38.6 | 13.1 | 7.6 | 28.2 | 31.1 | 43.5 | 12.4 | |
| Vert | 233.470 | QP | 33.8 | 17.0 | 8.4 | 27.6 | 31.6 | 46.0 | 14.4 | |
| Vert | 351.984 | QP | 36.3 | 15.9 | 9.1 | 28.0 | 33.3 | 46.0 | 12.7 | |
| Vert | 436.210 | QP | 38.5 | 17.6 | 9.4 | 28.6 | 36.9 | 46.0 | 9.1 | |
| Vert | 608.240 | QP | 34.6 | 19.3 | 10.2 | 28.8 | 35.3 | 46.0 | 10.7 | |
| Vert | 1604.330 | PK | 53.0 | 25.4 | 1.9 | 36.0 | 44.3 | 73.9 | 29.6 | |
| Vert | 2390.000 | PK | 46.8 | 26.8 | 2.4 | 35.7 | 40.3 | 73.9 | 33.6 | |
| Vert | 3201.509 | PK | 48.0 | 27.8 | 2.8 | 35.0 | 43.6 | 73.9 | 30.3 | |
| Vert | 4804.000 | PK | 53.0 | 30.6 | 4.1 | 34.9 | 52.8 | 73.9 | 21.1 | |
| Vert | 7206.000 | PK | 43.6 | 35.5 | 5.0 | 34.9 | 49.2 | 73.9 | 24.7 | |
| Vert | 9608.000 | PK | 46.0 | 38.2 | 5.8 | 35.4 | 54.6 | 73.9 | 19.3 | |
| Vert | 1604.330 | AV | 49.2 | 25.4 | 1.9 | 36.0 | 40.5 | 53.9 | 13.4 | |
| Vert | 2390.000 | AV | 33.9 | 26.8 | 2.4 | 35.7 | 27.4 | 53.9 | 26.5 | |
| Vert | 3201.509 | AV | 40.3 | 27.8 | 2.8 | 35.0 | 35.9 | 53.9 | 18.0 | |

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 | 104.6 | 26.8 | 2.4 | 35.7 | 98.1 | - | - | Carrier |
| Hori | 2400.000 | PK | 64.4 | 26.8 | 2.4 | 35.7 | 57.9 | 78.1 | 20.2 | |
| Vert | 2402.000 | PK | 102.0 | 26.8 | 2.4 | 35.7 | 95.5 | - | - | Carrier |
| Vert | 2400.000 | PK | 61.0 | 26.8 | 2.4 | 35.7 | 54.5 | 75.5 | 21.0 | |

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

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# Radiated Spurious Emission
# (Dwell time factor relaxation)

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH |
| Engineer | Hiroshi Kukita |
| | (1-10GHz) |
| Mode | Tx, DH5 2402MHz |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 4804.000 | AV | 52.6 | 30.6 | 4.1 | 34.9 | -22.7 | 29.7 | 53.9 | 24.2 | |
| Hori | 7206.000 | AV | 32.2 | 35.5 | 5.0 | 34.9 | -22.7 | 15.1 | 53.9 | 38.8 | |
| Hori | 9608.000 | AV | 33.2 | 38.2 | 5.8 | 35.4 | -22.7 | 19.1 | 53.9 | 34.8 | |
| Vert | 4804.000 | AV | 47.0 | 30.6 | 4.1 | 34.9 | -22.7 | 24.1 | 53.9 | 29.8 | |
| Vert | 7206.000 | AV | 32.3 | 35.5 | 5.0 | 34.9 | -22.7 | 15.2 | 53.9 | 38.7 | |
| Vert | 9608.000 | AV | 33.3 | 38.2 | 5.8 | 35.4 | -22.7 | 19.2 | 53.9 | 34.7 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))
- Gain(Amprifier) + Dwell time factor (Refer to dwell time data sheet)

*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

# Radiated Spurious Emission

| | | |
|---|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber | |
| Report No. | 10020306H | |
| Date | 07/04/2013 | 07/05/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH | 20 deg. C / 74% RH |
| Engineer | Hiroshi Kukita | Keisuke Kawamura |
| | (1-10GHz) | (Above 10GHz/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 | 88.900 | QP | 38.1 | 8.0 | 7.4 | 28.4 | 25.1 | 43.5 | 18.4 | |
| Hori | 122.900 | QP | 35.6 | 13.2 | 7.6 | 28.2 | 28.2 | 43.5 | 15.3 | |
| Hori | 147.350 | QP | 30.1 | 14.8 | 7.8 | 28.2 | 24.5 | 43.5 | 19.0 | |
| Hori | 258.050 | QP | 35.5 | 17.6 | 8.5 | 27.5 | 34.1 | 46.0 | 11.9 | |
| Hori | 351.960 | QP | 37.0 | 15.9 | 9.1 | 28.0 | 34.0 | 46.0 | 12.0 | |
| Hori | 436.256 | QP | 39.9 | 17.6 | 9.4 | 28.6 | 38.3 | 46.0 | 7.7 | |
| Hori | 608.268 | QP | 38.3 | 19.3 | 10.2 | 28.8 | 39.0 | 46.0 | 7.0 | |
| Hori | 1626.672 | PK | 55.0 | 25.5 | 2.0 | 36.0 | 46.5 | 73.9 | 27.4 | |
| Hori | 3250.843 | PK | 49.5 | 27.9 | 2.8 | 35.0 | 45.2 | 73.9 | 28.7 | |
| Hori | 4882.000 | PK | 48.4 | 30.9 | 4.2 | 34.9 | 48.6 | 73.9 | 25.3 | |
| Hori | 7323.000 | PK | 42.8 | 35.7 | 5.0 | 34.9 | 48.6 | 73.9 | 25.3 | |
| Hori | 9764.000 | PK | 46.2 | 38.4 | 5.8 | 35.4 | 55.0 | 73.9 | 18.9 | |
| Hori | 1626.672 | AV | 51.9 | 25.5 | 2.0 | 36.0 | 43.4 | 53.9 | 10.5 | |
| Hori | 3250.843 | AV | 43.3 | 27.9 | 2.8 | 35.0 | 39.0 | 53.9 | 14.9 | |
| Vert | 89.400 | QP | 31.3 | 8.0 | 7.4 | 28.4 | 18.3 | 43.5 | 25.2 | |
| Vert | 123.030 | QP | 30.8 | 13.2 | 7.6 | 28.2 | 23.4 | 43.5 | 20.1 | |
| Vert | 233.450 | QP | 32.8 | 17.0 | 8.4 | 27.6 | 30.6 | 46.0 | 15.4 | |
| Vert | 352.040 | QP | 36.2 | 15.9 | 9.1 | 28.0 | 33.2 | 46.0 | 12.8 | |
| Vert | 436.210 | QP | 38.8 | 17.6 | 9.4 | 28.6 | 37.2 | 46.0 | 8.8 | |
| Vert | 608.268 | QP | 34.5 | 19.3 | 10.2 | 28.8 | 35.2 | 46.0 | 10.8 | |
| Vert | 1626.647 | PK | 54.5 | 25.5 | 2.0 | 36.0 | 46.0 | 73.9 | 27.9 | |
| Vert | 3253.337 | PK | 50.5 | 27.9 | 2.8 | 35.0 | 46.2 | 73.9 | 27.7 | |
| Vert | 4882.000 | PK | 51.0 | 30.9 | 4.2 | 34.9 | 51.2 | 73.9 | 22.7 | |
| Vert | 7323.000 | PK | 43.0 | 35.7 | 5.0 | 34.9 | 48.8 | 73.9 | 25.1 | |
| Vert | 9764.000 | PK | 46.6 | 38.4 | 5.8 | 35.4 | 55.4 | 73.9 | 18.5 | |
| Vert | 1626.647 | AV | 51.5 | 25.5 | 2.0 | 36.0 | 43.0 | 53.9 | 10.9 | |
| Vert | 3253.337 | AV | 44.8 | 27.9 | 2.8 | 35.0 | 40.5 | 53.9 | 13.4 | |

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

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## Radiated Spurious Emission
## (Dwell time factor relaxation)

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH |
| Engineer | Hiroshi Kukita |
| | (1-10GHz) |
| Mode | Tx, DH5 2441MHz |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 4882.000 | AV | 40.9 | 30.9 | 4.2 | 34.9 | -22.7 | 18.4 | 53.9 | 35.5 | |
| Hori | 7323.000 | AV | 31.3 | 35.7 | 5.0 | 34.9 | -22.7 | 14.4 | 53.9 | 39.5 | |
| Hori | 9764.000 | AV | 33.8 | 38.4 | 5.8 | 35.4 | -22.7 | 19.9 | 53.9 | 34.0 | |
| Vert | 4882.000 | AV | 44.8 | 30.9 | 4.2 | 34.9 | -22.7 | 22.3 | 53.9 | 31.6 | |
| Vert | 7323.000 | AV | 31.2 | 35.7 | 5.0 | 34.9 | -22.7 | 14.3 | 53.9 | 39.6 | |
| Vert | 9764.000 | AV | 33.9 | 38.4 | 5.8 | 35.4 | -22.7 | 20.0 | 53.9 | 33.9 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))
- Gain(Amprifier) + Dwell time factor (Refer to dwell time data sheet)

*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

# Radiated Spurious Emission

| | | |
|---|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber | |
| Report No. | 10020306H | |
| Date | 07/04/2013 | 07/05/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH | 20 deg. C / 74% RH |
| Engineer | Hiroshi Kukita | Keisuke Kawamura |
| | (1-10GHz) | (Above 10GHz/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 | 88.900 | QP | 38.0 | 8.0 | 7.4 | 28.4 | 25.0 | 43.5 | 18.5 | |
| Hori | 122.960 | QP | 30.6 | 13.2 | 7.6 | 28.2 | 23.2 | 43.5 | 20.3 | |
| Hori | 147.360 | QP | 29.9 | 14.8 | 7.8 | 28.2 | 24.3 | 43.5 | 19.2 | |
| Hori | 258.030 | QP | 34.9 | 17.6 | 8.5 | 27.5 | 33.5 | 46.0 | 12.5 | |
| Hori | 351.924 | QP | 34.9 | 15.9 | 9.1 | 28.0 | 31.9 | 46.0 | 14.1 | |
| Hori | 436.222 | QP | 41.3 | 17.6 | 9.4 | 28.6 | 39.7 | 46.0 | 6.3 | |
| Hori | 608.260 | QP | 38.8 | 19.3 | 10.2 | 28.8 | 39.5 | 46.0 | 6.5 | |
| Hori | 1652.775 | PK | 55.9 | 25.7 | 2.0 | 36.0 | 47.6 | 73.9 | 26.3 | |
| Hori | 2483.500 | PK | 57.0 | 26.7 | 2.4 | 35.7 | 50.4 | 73.9 | 23.5 | |
| Hori | 3306.343 | PK | 49.8 | 27.9 | 2.8 | 35.0 | 45.5 | 73.9 | 28.4 | |
| Hori | 4960.000 | PK | 50.0 | 31.1 | 4.2 | 34.9 | 50.4 | 73.9 | 23.5 | |
| Hori | 7440.000 | PK | 43.0 | 35.9 | 5.1 | 34.9 | 49.1 | 73.9 | 24.8 | |
| Hori | 9920.000 | PK | 46.2 | 38.7 | 5.9 | 35.4 | 55.4 | 73.9 | 18.5 | |
| Hori | 1652.775 | AV | 53.0 | 25.7 | 2.0 | 36.0 | 44.7 | 53.9 | 9.2 | |
| Hori | 3306.343 | AV | 43.6 | 27.9 | 2.8 | 35.0 | 39.3 | 53.9 | 14.6 | |
| Vert | 89.120 | QP | 30.8 | 8.0 | 7.4 | 28.4 | 17.8 | 43.5 | 25.7 | |
| Vert | 122.880 | QP | 37.6 | 13.2 | 7.6 | 28.2 | 30.2 | 43.5 | 13.3 | |
| Vert | 233.490 | QP | 32.7 | 17.0 | 8.4 | 27.6 | 30.5 | 46.0 | 15.5 | |
| Vert | 351.960 | QP | 36.2 | 15.9 | 9.1 | 28.0 | 33.2 | 46.0 | 12.8 | |
| Vert | 436.208 | QP | 38.3 | 17.6 | 9.4 | 28.6 | 36.7 | 46.0 | 9.3 | |
| Vert | 608.308 | QP | 31.3 | 19.3 | 10.2 | 28.8 | 32.0 | 46.0 | 14.0 | |
| Vert | 1653.730 | PK | 58.2 | 25.7 | 2.0 | 36.0 | 49.9 | 73.9 | 24.0 | |
| Vert | 2483.500 | PK | 51.0 | 26.7 | 2.4 | 35.7 | 44.4 | 73.9 | 29.5 | |
| Vert | 3306.343 | PK | 53.1 | 27.9 | 2.8 | 35.0 | 48.8 | 73.9 | 25.1 | |
| Vert | 4960.000 | PK | 49.8 | 31.1 | 4.2 | 34.9 | 50.2 | 73.9 | 23.7 | |
| Vert | 7440.000 | PK | 43.2 | 35.9 | 5.1 | 34.9 | 49.3 | 73.9 | 24.6 | |
| Vert | 9920.000 | PK | 45.9 | 38.7 | 5.9 | 35.4 | 55.1 | 73.9 | 18.8 | |
| Vert | 1653.730 | AV | 55.2 | 25.7 | 2.0 | 36.0 | 46.9 | 53.9 | 7.0 | |
| Vert | 3306.343 | AV | 49.0 | 27.9 | 2.8 | 35.0 | 44.7 | 53.9 | 9.2 | |

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).

*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

# Radiated Spurious Emission
# (Dwell time factor relaxation)

| | |
|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber |
| Report No. | 10020306H |
| Date | 07/04/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH |
| Engineer | Hiroshi Kukita |
| | (1-10GHz) |
| Mode | Tx, DH5 2480MHz |

| Polarity | Frequency [MHz] | Detector | Reading [dBuV] | Ant Factor [dB/m] | Loss [dB] | Gain [dB] | Dwell Factor [dB] | Result [dBuV/m] | Limit [dBuV/m] | Margin [dB] | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hori | 2483.500 | AV | 42.8 | 26.7 | 2.4 | 35.7 | -22.7 | 13.5 | 53.9 | 40.4 | |
| Hori | 4960.000 | AV | 43.8 | 31.1 | 4.2 | 34.9 | -22.7 | 21.5 | 53.9 | 32.4 | |
| Hori | 7440.000 | AV | 31.2 | 35.9 | 5.1 | 34.9 | -22.7 | 14.6 | 53.9 | 39.3 | |
| Hori | 9920.000 | AV | 33.6 | 38.7 | 5.9 | 35.4 | -22.7 | 20.1 | 53.9 | 33.8 | |
| Vert | 2483.500 | AV | 39.0 | 26.7 | 2.4 | 35.7 | -22.7 | 9.7 | 53.9 | 44.2 | |
| Vert | 3306.343 | AV | 49.0 | 27.9 | 2.8 | 35.0 | -22.7 | 22.0 | 53.9 | 31.9 | |
| Vert | 4960.000 | AV | 43.9 | 31.1 | 4.2 | 34.9 | -22.7 | 21.6 | 53.9 | 32.3 | |
| Vert | 7440.000 | AV | 31.1 | 35.9 | 5.1 | 34.9 | -22.7 | 14.5 | 53.9 | 39.4 | |
| Vert | 9920.000 | AV | 33.5 | 38.7 | 5.9 | 35.4 | -22.7 | 20.0 | 53.9 | 33.9 | |

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz))
- Gain(Amprifier) + Dwell time factor (Refer to dwell time data sheet)

*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

# Radiated Spurious Emission

| | | | |
|---|---|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber | | |
| Report No. | 10020306H | | |
| Date | 07/04/2013 | 07/05/2013 | 07/08/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH | 20 deg. C / 74% RH | 20 deg. C / 54% RH |
| Engineer | Hiroshi Kukita (1-10GHz) | Keisuke Kawamura (Above 10GHz) | Hiroshi Kukita (30-1000MHz) |
| Mode | Tx, 3DH5 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 | 89.560 | QP | 37.3 | 8.1 | 7.4 | 28.4 | 24.4 | 43.5 | 19.1 | |
| Hori | 122.880 | QP | 37.3 | 13.2 | 7.6 | 28.2 | 29.9 | 43.5 | 13.6 | |
| Hori | 146.480 | QP | 38.0 | 14.8 | 7.8 | 28.2 | 32.4 | 43.5 | 11.1 | |
| Hori | 255.990 | QP | 33.4 | 17.5 | 8.5 | 27.5 | 31.9 | 46.0 | 14.1 | |
| Hori | 351.966 | QP | 43.1 | 15.9 | 9.1 | 28.0 | 40.1 | 46.0 | 5.9 | |
| Hori | 436.226 | QP | 39.0 | 17.6 | 9.4 | 28.6 | 37.4 | 46.0 | 8.6 | |
| Hori | 608.256 | QP | 39.1 | 19.3 | 10.2 | 28.8 | 39.8 | 46.0 | 6.2 | |
| Hori | 1602.023 | PK | 56.5 | 25.4 | 1.9 | 36.0 | 47.8 | 73.9 | 26.1 | |
| Hori | 2390.000 | PK | 48.5 | 26.8 | 2.4 | 35.7 | 42.0 | 73.9 | 31.9 | |
| Hori | 3203.946 | PK | 50.0 | 27.8 | 2.8 | 35.0 | 45.6 | 73.9 | 28.3 | |
| Hori | 4804.000 | PK | 50.0 | 30.6 | 4.1 | 34.9 | 49.8 | 73.9 | 24.1 | |
| Hori | 7206.000 | PK | 43.6 | 35.5 | 5.0 | 34.9 | 49.2 | 73.9 | 24.7 | |
| Hori | 9608.000 | PK | 45.9 | 38.2 | 5.8 | 35.4 | 54.5 | 73.9 | 19.4 | |
| Hori | 1602.023 | AV | 53.3 | 25.4 | 1.9 | 36.0 | 44.6 | 53.9 | 9.3 | |
| Hori | 2390.000 | AV | 36.6 | 26.8 | 2.4 | 35.7 | 30.1 | 53.9 | 23.8 | |
| Hori | 3203.946 | AV | 44.0 | 27.8 | 2.8 | 35.0 | 39.6 | 53.9 | 14.3 | |
| Hori | 4804.000 | AV | 41.0 | 30.6 | 4.1 | 34.9 | 40.8 | 53.9 | 13.1 | |
| Hori | 7206.000 | AV | 32.3 | 35.5 | 5.0 | 34.9 | 37.9 | 53.9 | 16.0 | |
| Hori | 9608.000 | AV | 33.3 | 38.2 | 5.8 | 35.4 | 41.9 | 53.9 | 12.0 | |
| Vert | 85.520 | QP | 40.5 | 7.4 | 7.3 | 28.4 | 26.8 | 40.0 | 13.2 | |
| Vert | 126.500 | QP | 38.5 | 13.5 | 7.7 | 28.2 | 31.5 | 43.5 | 12.0 | |
| Vert | 240.000 | QP | 31.9 | 17.1 | 8.4 | 27.6 | 29.8 | 46.0 | 16.2 | |
| Vert | 351.998 | QP | 39.2 | 15.9 | 9.1 | 28.0 | 36.2 | 46.0 | 9.8 | |
| Vert | 436.220 | QP | 33.4 | 17.6 | 9.4 | 28.6 | 31.8 | 46.0 | 14.2 | |
| Vert | 608.256 | QP | 30.9 | 19.3 | 10.2 | 28.8 | 31.6 | 46.0 | 14.4 | |
| Vert | 1604.330 | PK | 53.5 | 25.4 | 1.9 | 36.0 | 44.8 | 73.9 | 29.1 | |
| Vert | 2390.000 | PK | 46.8 | 26.8 | 2.4 | 35.7 | 40.3 | 73.9 | 33.6 | |
| Vert | 3201.509 | PK | 48.0 | 27.8 | 2.8 | 35.0 | 43.6 | 73.9 | 30.3 | |
| Vert | 4804.000 | PK | 48.3 | 30.6 | 4.1 | 34.9 | 48.1 | 73.9 | 25.8 | |
| Vert | 7206.000 | PK | 43.5 | 35.5 | 5.0 | 34.9 | 49.1 | 73.9 | 24.8 | |
| Vert | 9608.000 | PK | 46.1 | 38.2 | 5.8 | 35.4 | 54.7 | 73.9 | 19.2 | |
| Vert | 1604.330 | AV | 51.2 | 25.4 | 1.9 | 36.0 | 42.5 | 53.9 | 11.4 | |
| Vert | 2390.000 | AV | 34.0 | 26.8 | 2.4 | 35.7 | 27.5 | 53.9 | 26.4 | |
| Vert | 3201.509 | AV | 37.8 | 27.8 | 2.8 | 35.0 | 33.4 | 53.9 | 20.5 | |
| Vert | 4804.000 | AV | 38.0 | 30.6 | 4.1 | 34.9 | 37.8 | 53.9 | 16.1 | |
| Vert | 7206.000 | AV | 32.3 | 35.5 | 5.0 | 34.9 | 37.9 | 53.9 | 16.0 | |
| Vert | 9608.000 | AV | 33.1 | 38.2 | 5.8 | 35.4 | 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).

*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 | 104.6 | 26.8 | 2.4 | 35.7 | 98.1 | - | - | Carrier |
| Hori | 2400.000 | PK | 60.0 | 26.8 | 2.4 | 35.7 | 53.5 | 78.1 | 24.6 | |
| Vert | 2402.000 | PK | 102.0 | 26.8 | 2.4 | 35.7 | 95.5 | - | - | Carrier |
| Vert | 2400.000 | PK | 55.5 | 26.8 | 2.4 | 35.7 | 49.0 | 75.5 | 26.5 | |

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

# Radiated Spurious Emission

| | | | |
|---|---|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber | | |
| Report No. | 10020306H | | |
| Date | 07/04/2013 | 07/05/2013 | 07/08/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH | 20 deg. C / 74% RH | 20 deg. C / 54% RH |
| Engineer | Hiroshi Kukita (1-10GHz) | Keisuke Kawamura (Above 10GHz) | Hiroshi Kukita (30-1000MHz) |
| Mode | Tx, 3DH5 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 | 88.032 | QP | 35.8 | 7.8 | 7.3 | 28.4 | 22.5 | 43.5 | 21.0 | |
| Hori | 122.872 | QP | 37.4 | 13.2 | 7.6 | 28.2 | 30.0 | 43.5 | 13.5 | |
| Hori | 146.488 | QP | 37.3 | 14.8 | 7.8 | 28.2 | 31.7 | 43.5 | 11.8 | |
| Hori | 255.976 | QP | 33.1 | 17.5 | 8.5 | 27.5 | 31.6 | 46.0 | 14.4 | |
| Hori | 351.992 | QP | 43.7 | 15.9 | 9.1 | 28.0 | 40.7 | 46.0 | 5.3 | |
| Hori | 436.228 | QP | 39.1 | 17.6 | 9.4 | 28.6 | 37.5 | 46.0 | 8.5 | |
| Hori | 608.266 | QP | 38.9 | 19.3 | 10.2 | 28.8 | 39.6 | 46.0 | 6.4 | |
| Hori | 1626.672 | PK | 54.0 | 25.5 | 2.0 | 36.0 | 45.5 | 73.9 | 28.4 | |
| Hori | 3250.843 | PK | 51.1 | 27.9 | 2.8 | 35.0 | 46.8 | 73.9 | 27.1 | |
| Hori | 4882.000 | PK | 47.8 | 30.9 | 4.2 | 34.9 | 48.0 | 73.9 | 25.9 | |
| Hori | 7323.000 | PK | 43.2 | 35.7 | 5.0 | 34.9 | 49.0 | 73.9 | 24.9 | |
| Hori | 9764.000 | PK | 46.0 | 38.4 | 5.8 | 35.4 | 54.8 | 73.9 | 19.1 | |
| Hori | 1626.672 | AV | 50.8 | 25.5 | 2.0 | 36.0 | 42.3 | 53.9 | 11.6 | |
| Hori | 3250.843 | AV | 46.0 | 27.9 | 2.8 | 35.0 | 41.7 | 53.9 | 12.2 | |
| Hori | 4882.000 | AV | 36.2 | 30.9 | 4.2 | 34.9 | 36.4 | 53.9 | 17.5 | |
| Hori | 7323.000 | AV | 31.5 | 35.7 | 5.0 | 34.9 | 37.3 | 53.9 | 16.6 | |
| Hori | 9764.000 | AV | 33.7 | 38.4 | 5.8 | 35.4 | 42.5 | 53.9 | 11.4 | |
| Vert | 85.520 | QP | 40.8 | 7.4 | 7.3 | 28.4 | 27.1 | 40.0 | 12.9 | |
| Vert | 126.500 | QP | 38.4 | 13.5 | 7.7 | 28.2 | 31.4 | 43.5 | 12.1 | |
| Vert | 240.006 | QP | 31.7 | 17.1 | 8.4 | 27.6 | 29.6 | 46.0 | 16.4 | |
| Vert | 351.996 | QP | 39.1 | 15.9 | 9.1 | 28.0 | 36.1 | 46.0 | 9.9 | |
| Vert | 436.236 | QP | 33.7 | 17.6 | 9.4 | 28.6 | 32.1 | 46.0 | 13.9 | |
| Vert | 608.262 | QP | 30.7 | 19.3 | 10.2 | 28.8 | 31.4 | 46.0 | 14.6 | |
| Vert | 1626.647 | PK | 56.2 | 25.5 | 2.0 | 36.0 | 47.7 | 73.9 | 26.2 | |
| Vert | 3253.341 | PK | 51.0 | 27.9 | 2.8 | 35.0 | 46.7 | 73.9 | 27.2 | |
| Vert | 4882.000 | PK | 46.4 | 30.9 | 4.2 | 34.9 | 46.6 | 73.9 | 27.3 | |
| Vert | 7323.000 | PK | 43.8 | 35.7 | 5.0 | 34.9 | 49.6 | 73.9 | 24.3 | |
| Vert | 9764.000 | PK | 46.1 | 38.4 | 5.8 | 35.4 | 54.9 | 73.9 | 19.0 | |
| Vert | 1626.647 | AV | 53.0 | 25.5 | 2.0 | 36.0 | 44.5 | 53.9 | 9.4 | |
| Vert | 3253.341 | AV | 46.0 | 27.9 | 2.8 | 35.0 | 41.7 | 53.9 | 12.2 | |
| Vert | 4882.000 | AV | 35.4 | 30.9 | 4.2 | 34.9 | 35.6 | 53.9 | 18.3 | |
| Vert | 7323.000 | AV | 31.3 | 35.7 | 5.0 | 34.9 | 37.1 | 53.9 | 16.8 | |
| Vert | 9764.000 | AV | 33.6 | 38.4 | 5.8 | 35.4 | 42.4 | 53.9 | 11.5 | |

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

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Facsimile : +81 596 24 8124

# Radiated Spurious Emission

| | | | |
|---|---|---|---|
| Test place | Head Office EMC Lab. No.2 Semi Anechoic Chamber | | |
| Report No. | 10020306H | | |
| Date | 07/04/2013 | 07/05/2013 | 07/08/2013 |
| Temperature/ Humidity | 22 deg. C / 65% RH | 20 deg. C / 74% RH | 20 deg. C / 54% RH |
| Engineer | Hiroshi Kukita (1-10GHz) | Keisuke Kawamura (Above 10GHz) | Hiroshi Kukita (30-1000MHz) |
| Mode | Tx, 3DH5 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 | 88.032 | QP | 34.7 | 7.8 | 7.3 | 28.4 | 21.4 | 43.5 | 22.1 | |
| Hori | 122.860 | QP | 37.4 | 13.2 | 7.6 | 28.2 | 30.0 | 43.5 | 13.5 | |
| Hori | 146.464 | QP | 37.5 | 14.8 | 7.8 | 28.2 | 31.9 | 43.5 | 11.6 | |
| Hori | 255.992 | QP | 33.7 | 17.5 | 8.5 | 27.5 | 32.2 | 46.0 | 13.8 | |
| Hori | 351.996 | QP | 43.8 | 15.9 | 9.1 | 28.0 | 40.8 | 46.0 | 5.2 | |
| Hori | 436.222 | QP | 39.2 | 17.6 | 9.4 | 28.6 | 37.6 | 46.0 | 8.4 | |
| Hori | 608.268 | QP | 39.0 | 19.3 | 10.2 | 28.8 | 39.7 | 46.0 | 6.3 | |
| Hori | 1652.658 | PK | 55.8 | 25.7 | 2.0 | 36.0 | 47.5 | 73.9 | 26.4 | |
| Hori | 2483.500 | PK | 55.8 | 26.7 | 2.4 | 35.7 | 49.2 | 73.9 | 24.7 | |
| Hori | 3305.385 | PK | 50.9 | 27.9 | 2.8 | 35.0 | 46.6 | 73.9 | 27.3 | |
| Hori | 4960.000 | PK | 47.0 | 31.1 | 4.2 | 34.9 | 47.4 | 73.9 | 26.5 | |
| Hori | 7440.000 | PK | 43.2 | 35.9 | 5.1 | 34.9 | 49.3 | 73.9 | 24.6 | |
| Hori | 9920.000 | PK | 46.1 | 38.7 | 5.9 | 35.4 | 55.3 | 73.9 | 18.6 | |
| Hori | 1652.658 | AV | 53.2 | 25.7 | 2.0 | 36.0 | 44.9 | 53.9 | 9.0 | |
| Hori | 2483.500 | AV | 41.9 | 26.7 | 2.4 | 35.7 | 35.3 | 53.9 | 18.6 | |
| Hori | 3305.385 | AV | 45.0 | 27.9 | 2.8 | 35.0 | 40.7 | 53.9 | 13.2 | |
| Hori | 4960.000 | AV | 35.0 | 31.1 | 4.2 | 34.9 | 35.4 | 53.9 | 18.5 | |
| Hori | 7440.000 | AV | 31.3 | 35.9 | 5.1 | 34.9 | 37.4 | 53.9 | 16.5 | |
| Hori | 9920.000 | AV | 33.5 | 38.7 | 5.9 | 35.4 | 42.7 | 53.9 | 11.2 | |
| Vert | 85.770 | QP | 41.3 | 7.4 | 7.3 | 28.4 | 27.6 | 40.0 | 12.4 | |
| Vert | 126.500 | QP | 38.6 | 13.5 | 7.7 | 28.2 | 31.6 | 43.5 | 11.9 | |
| Vert | 239.952 | QP | 31.2 | 17.1 | 8.4 | 27.6 | 29.1 | 46.0 | 16.9 | |
| Vert | 351.996 | QP | 39.0 | 15.9 | 9.1 | 28.0 | 36.0 | 46.0 | 10.0 | |
| Vert | 436.238 | QP | 33.5 | 17.6 | 9.4 | 28.6 | 31.9 | 46.0 | 14.1 | |
| Vert | 608.266 | QP | 30.5 | 19.3 | 10.2 | 28.8 | 31.2 | 46.0 | 14.8 | |
| Vert | 1653.730 | PK | 55.8 | 25.7 | 2.0 | 36.0 | 47.5 | 73.9 | 26.4 | |
| Vert | 2483.500 | PK | 56.0 | 26.7 | 2.4 | 35.7 | 49.4 | 73.9 | 24.5 | |
| Vert | 3305.313 | PK | 53.5 | 27.9 | 2.8 | 35.0 | 49.2 | 73.9 | 24.7 | |
| Vert | 4960.000 | PK | 49.0 | 31.1 | 4.2 | 34.9 | 49.4 | 73.9 | 24.5 | |
| Vert | 7440.000 | PK | 43.4 | 35.9 | 5.1 | 34.9 | 49.5 | 73.9 | 24.4 | |
| Vert | 9920.000 | PK | 45.8 | 38.7 | 5.9 | 35.4 | 55.0 | 73.9 | 18.9 | |
| Vert | 1653.730 | AV | 53.0 | 25.7 | 2.0 | 36.0 | 44.7 | 53.9 | 9.2 | |
| Vert | 2483.500 | AV | 41.9 | 26.7 | 2.4 | 35.7 | 35.3 | 53.9 | 18.6 | |
| Vert | 3305.313 | AV | 48.0 | 27.9 | 2.8 | 35.0 | 43.7 | 53.9 | 10.2 | |
| Vert | 4960.000 | AV | 38.3 | 31.1 | 4.2 | 34.9 | 38.7 | 53.9 | 15.2 | |
| Vert | 7440.000 | AV | 31.3 | 35.9 | 5.1 | 34.9 | 37.4 | 53.9 | 16.5 | |
| Vert | 9920.000 | AV | 33.5 | 38.7 | 5.9 | 35.4 | 42.7 | 53.9 | 11.2 | |

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).

*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

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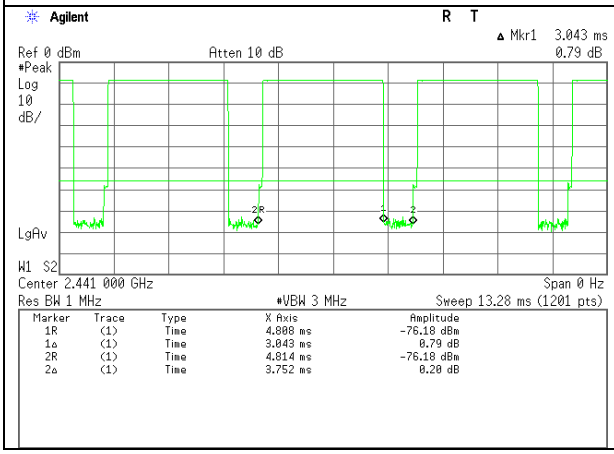
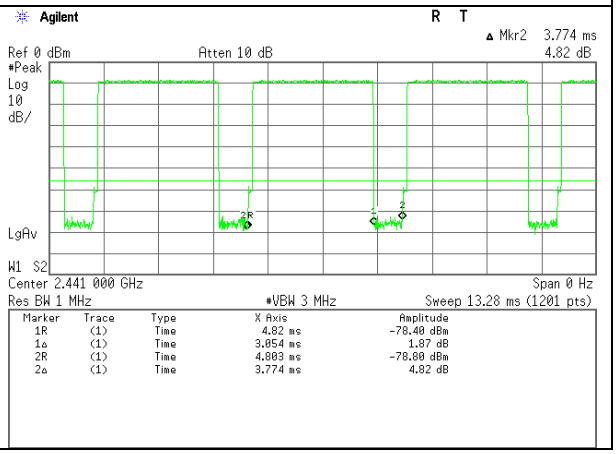
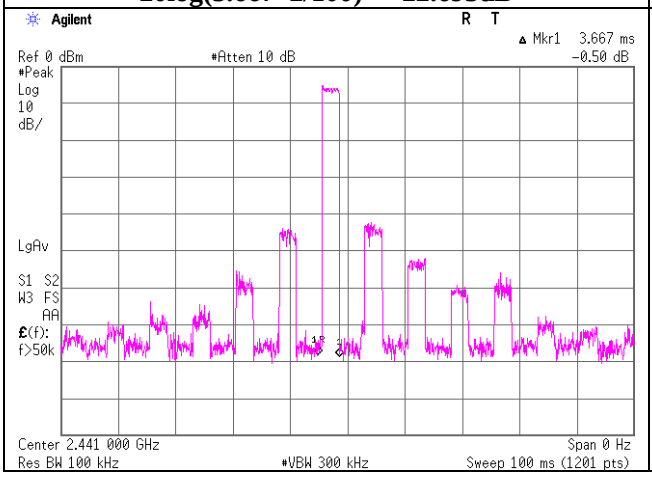
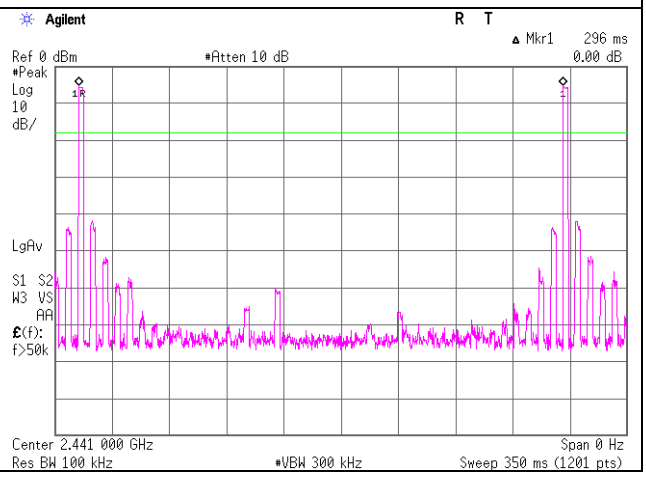
# Duty Cycle confirmation

| DH5 | 3DH5 |
|---|---|
| **Duty cycle = 81.1%**<br>**Tx on = 3.043ms**<br>**Tx on+Tx off =3.752ms** | **Duty cycle = 80.9%**<br>**Tx on = 3.054ms**<br>**Tx on+Tx off =3.774ms** |
|  |  |

# Dwell time factor

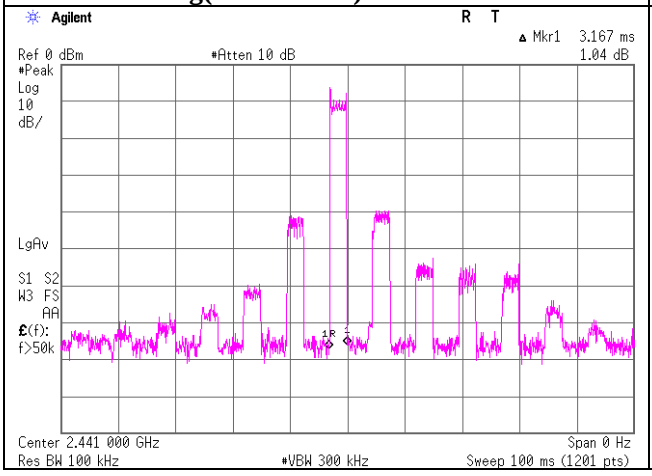
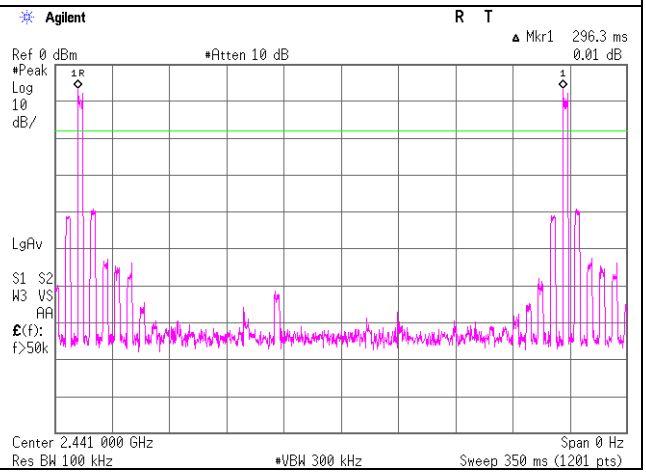
**DH5**

| **Worst 100ms**<br>**Dwell time factor =**<br>**20log(3.667*2/100) = -22.693dB** | **1cycle time**<br>**296ms** |
|---|---|
|  |  |





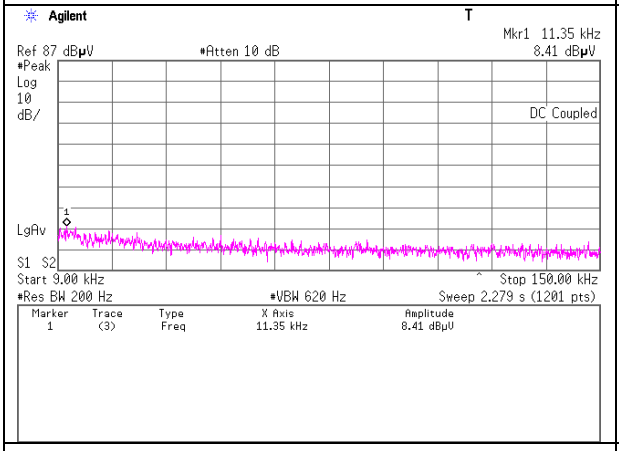
**3DH5**

| **Worst 100ms**<br>**Dwell time factor =**<br>**20log(3.167*2/100) = -23.966dB** | **1cycle time**<br>**296.3ms** |
|---|---|
|  |  |

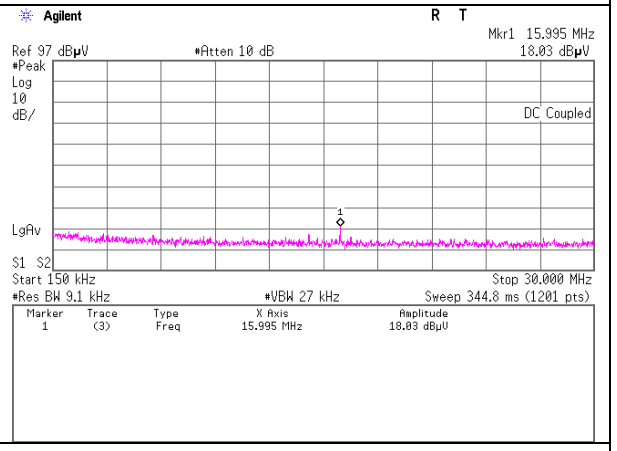
# Conducted Spurious Emission

## Tx DH5 2402MHz

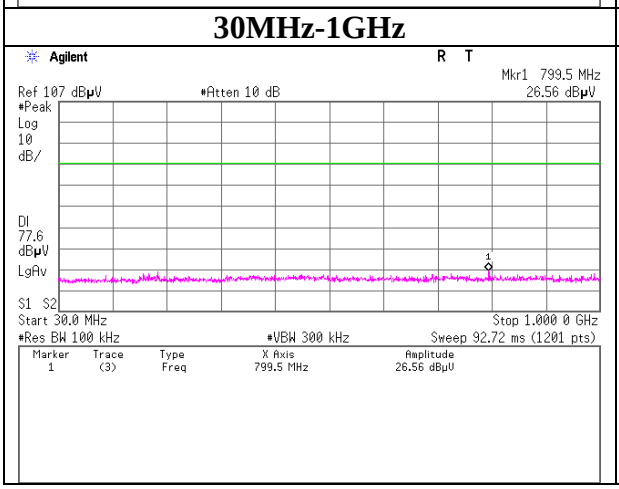
### 9kHz-150kHz



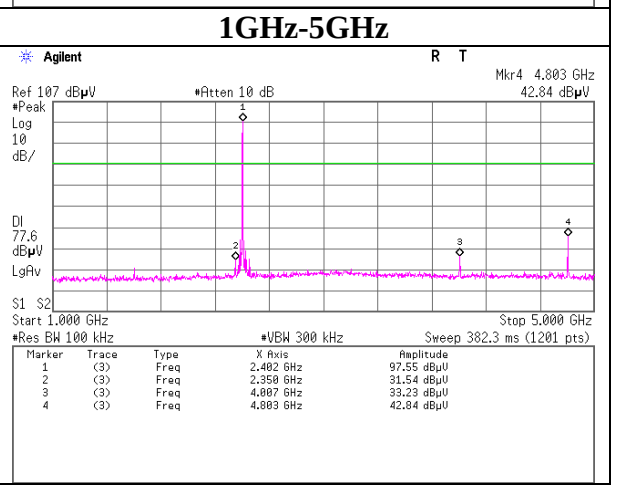

### 150kHz-30MHz




### 30MHz-1GHz




### 1GHz-5GHz





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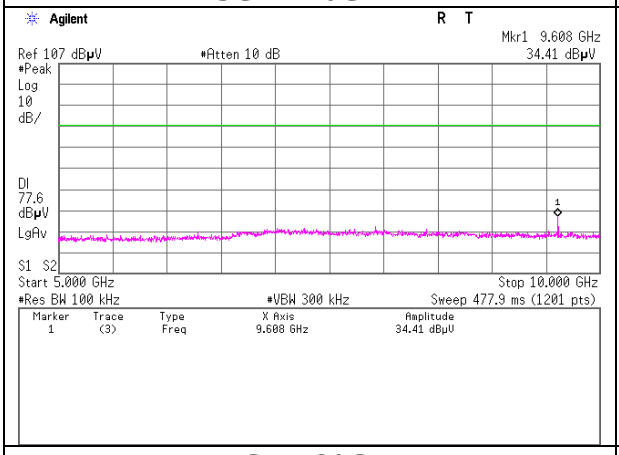
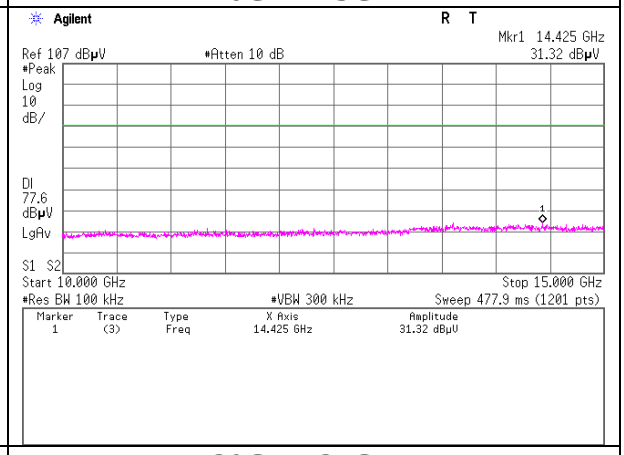
# Conducted Spurious Emission

## Tx DH5 2402MHz

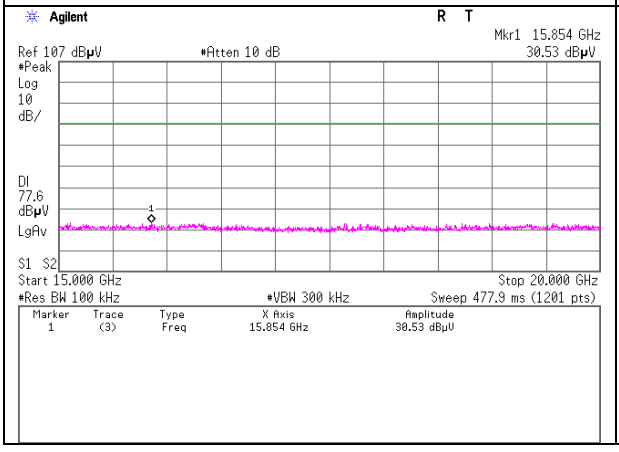
### 5GHz-10GHz



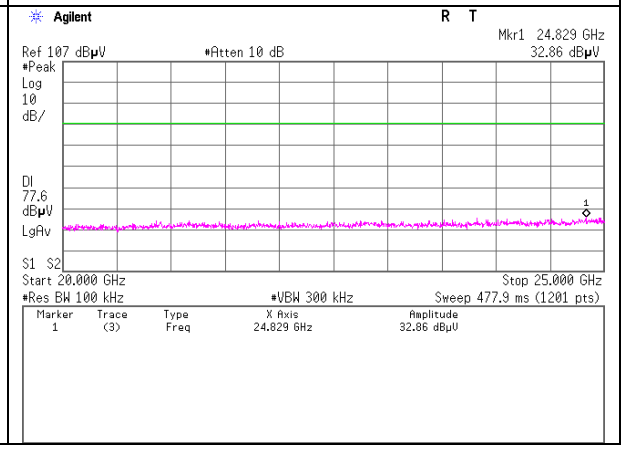

### 10GHz-15GHz




### 15GHz-20GHz



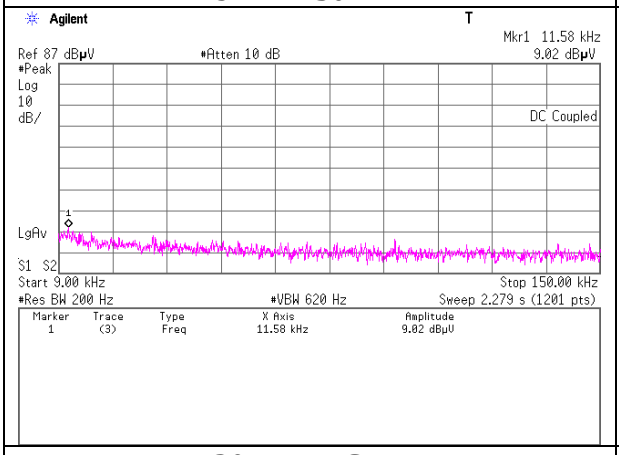

### 20GHz-25GHz



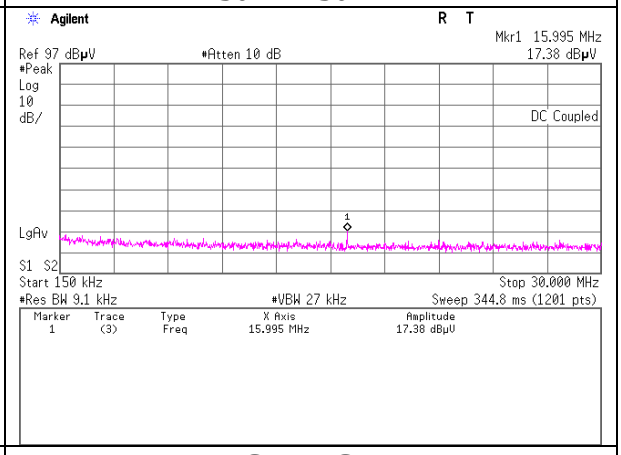
# Conducted Spurious Emission

## Tx DH5 2441MHz

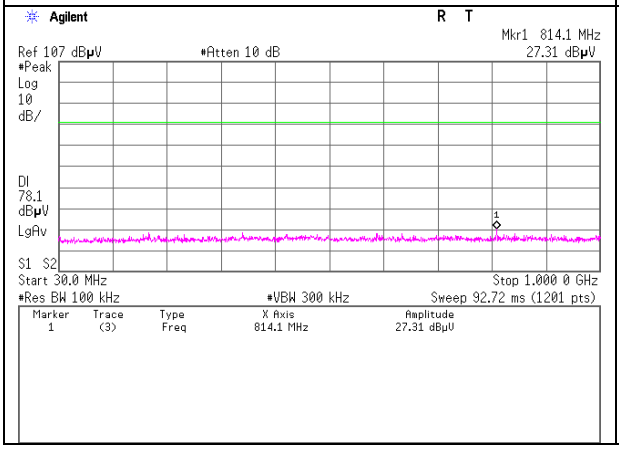
### 9kHz-150kHz



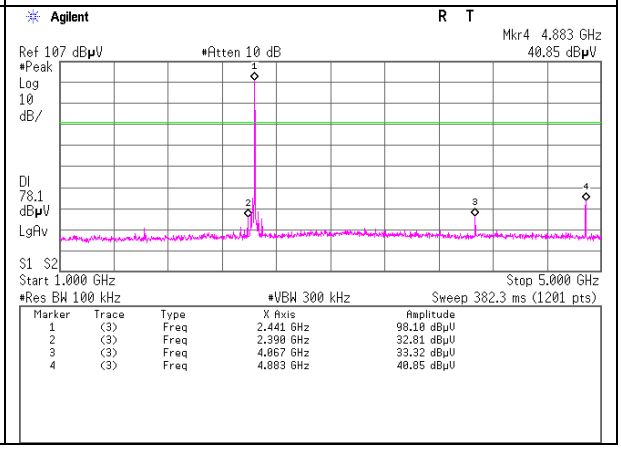

### 150kHz-30MHz




### 30MHz-1GHz




### 1GHz-5GHz





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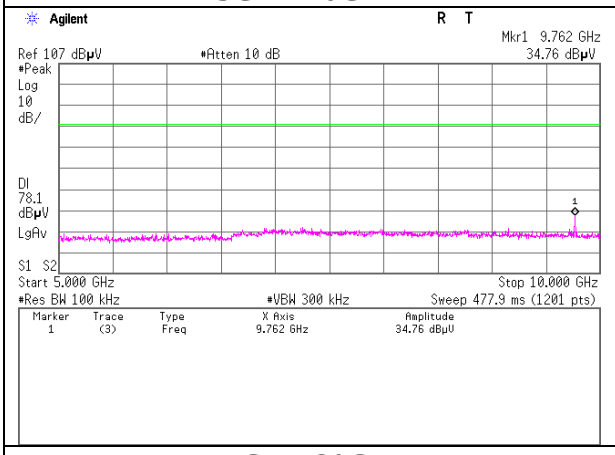
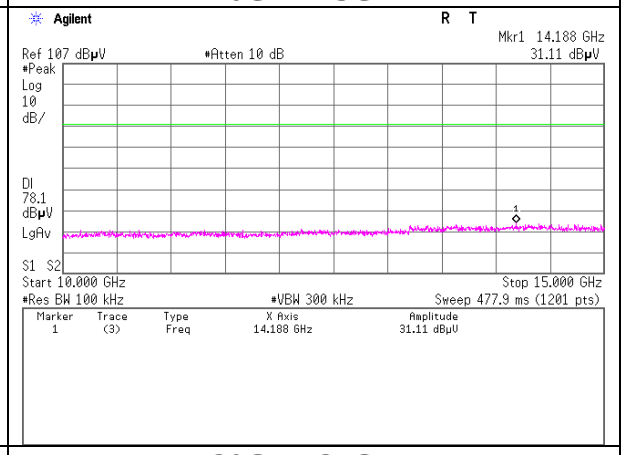
# Conducted Spurious Emission

## Tx DH5 2441MHz

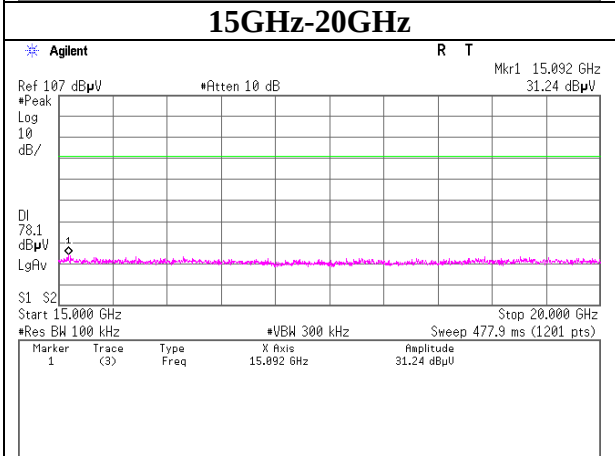
### 5GHz-10GHz



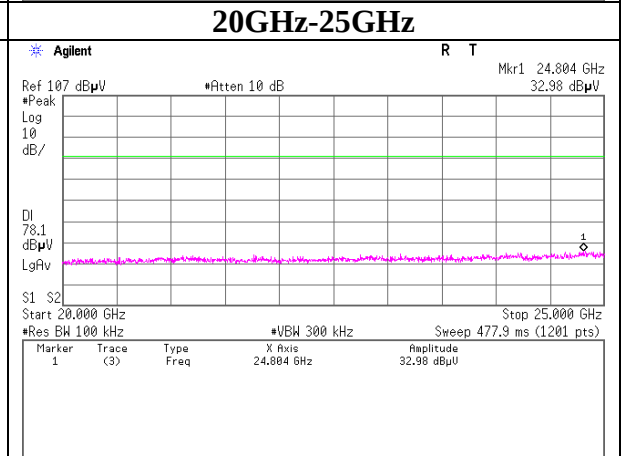

### 10GHz-15GHz




### 15GHz-20GHz



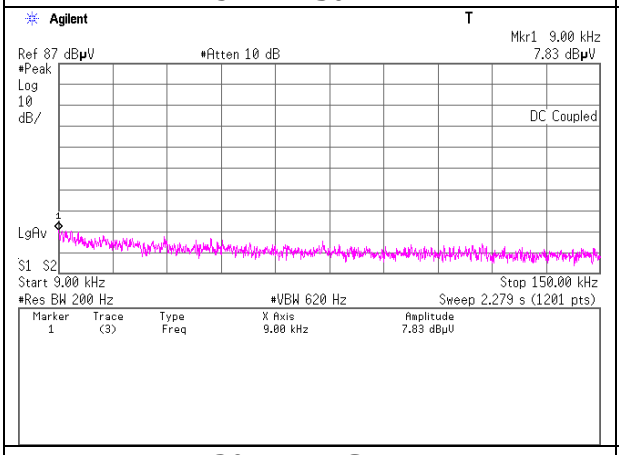

### 20GHz-25GHz



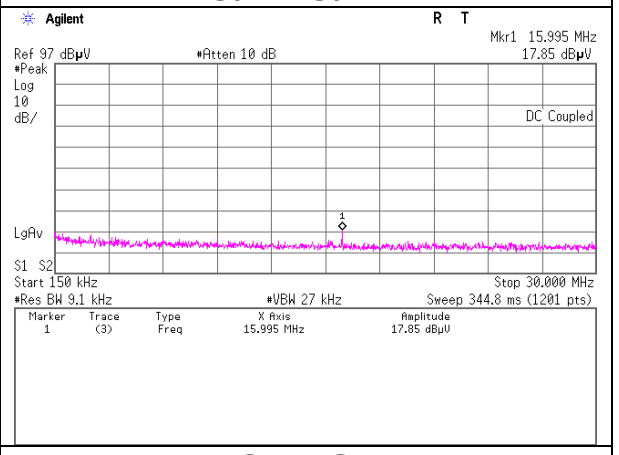
# Conducted Spurious Emission

## Tx DH5 2480MHz

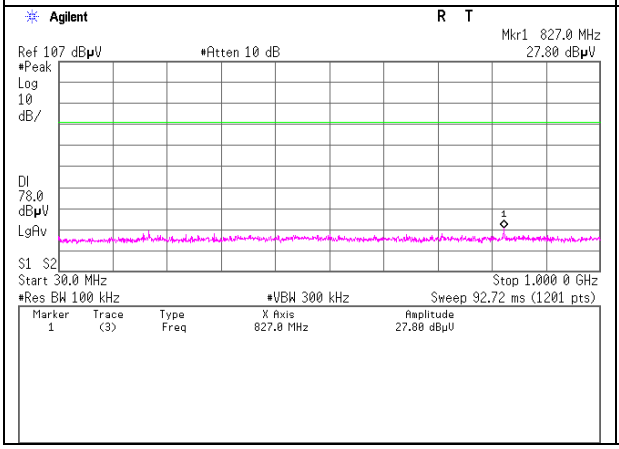
### 9kHz-150kHz



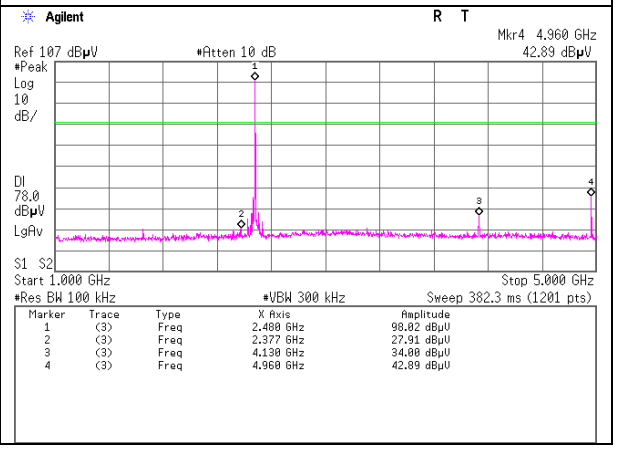

### 150kHz-30MHz




### 30MHz-1GHz




### 1GHz-5GHz

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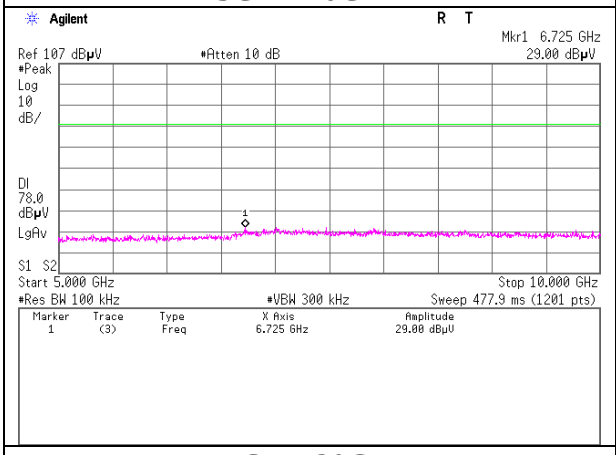
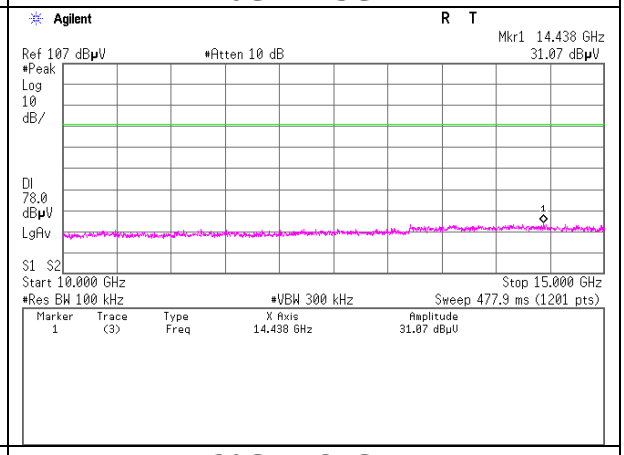
# Conducted Spurious Emission

## Tx DH5 2480MHz

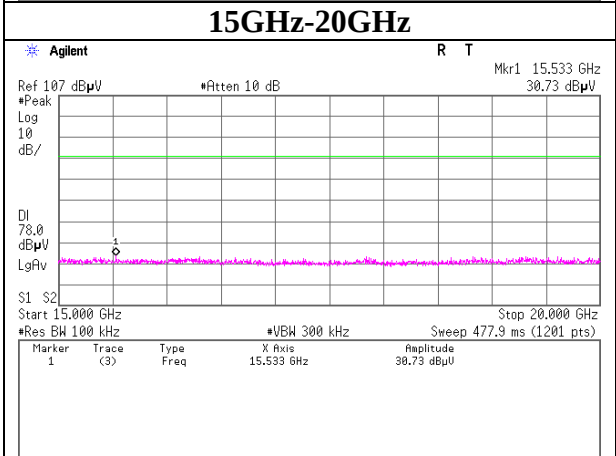
### 5GHz-10GHz



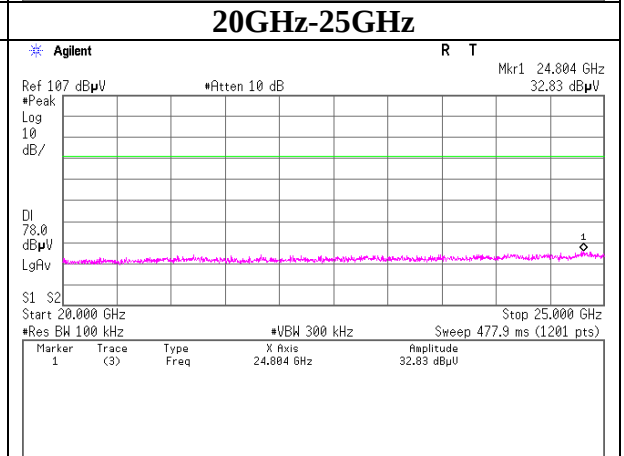

### 10GHz-15GHz




### 15GHz-20GHz



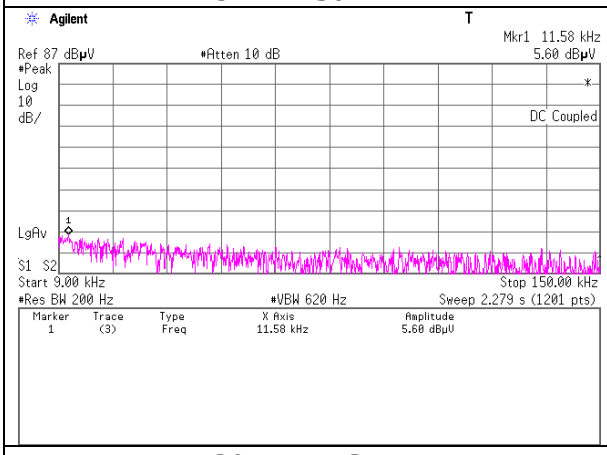

### 20GHz-25GHz



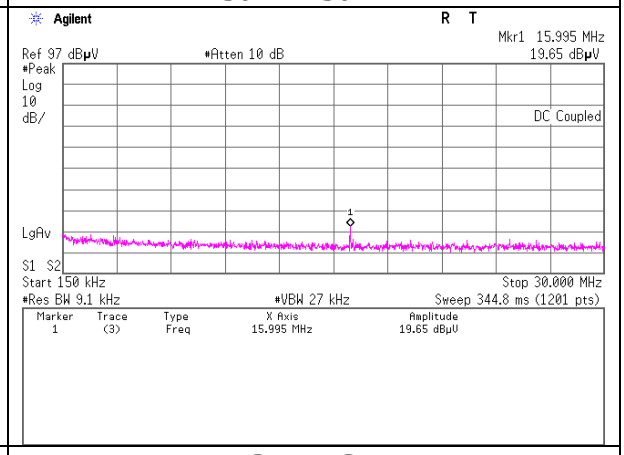
# Conducted Spurious Emission

## Tx 3DH5 2402MHz

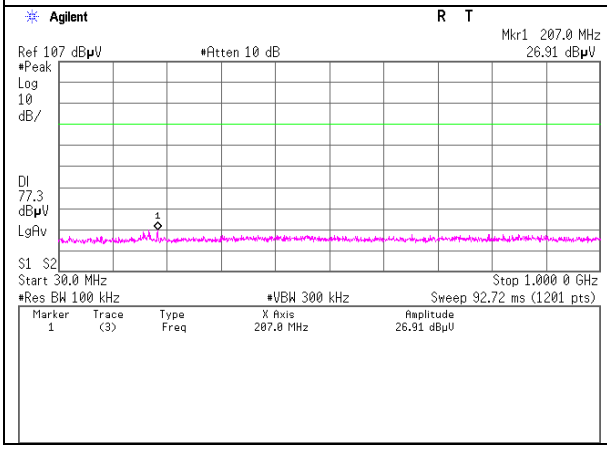
### 9kHz-150kHz



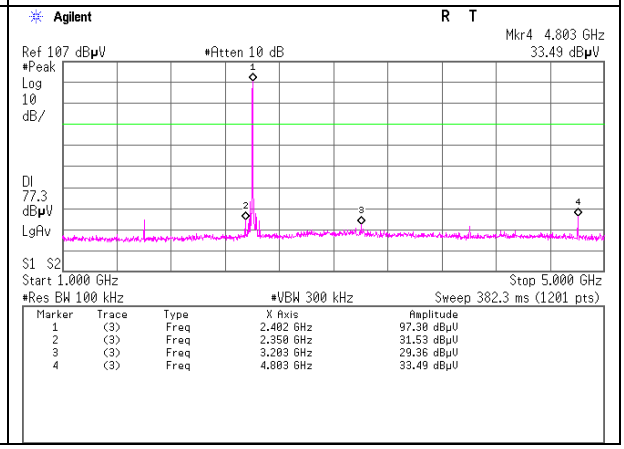

### 150kHz-30MHz




### 30MHz-1GHz




### 1GHz-5GHz





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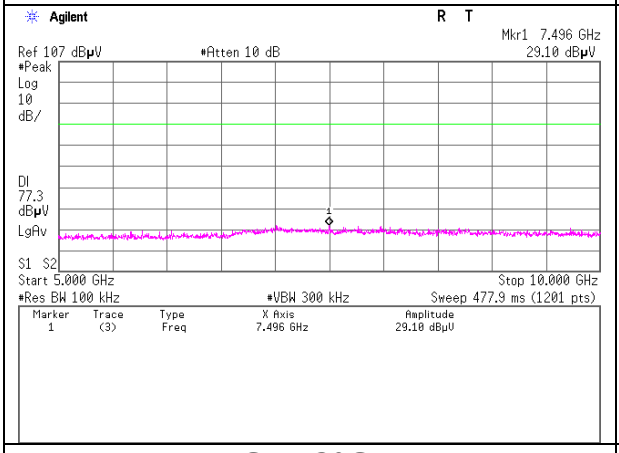
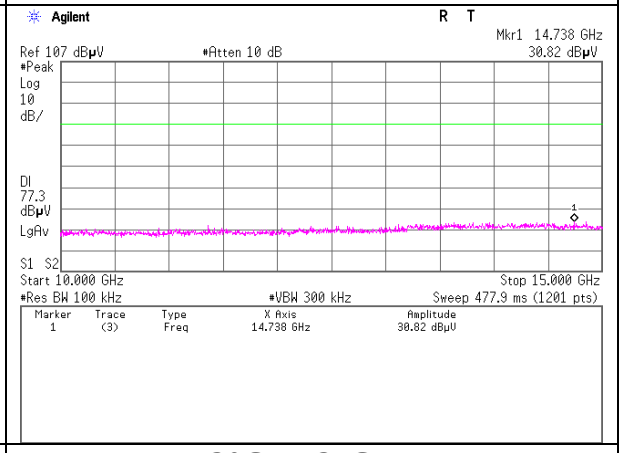
# Conducted Spurious Emission

## Tx 3DH5 2402MHz

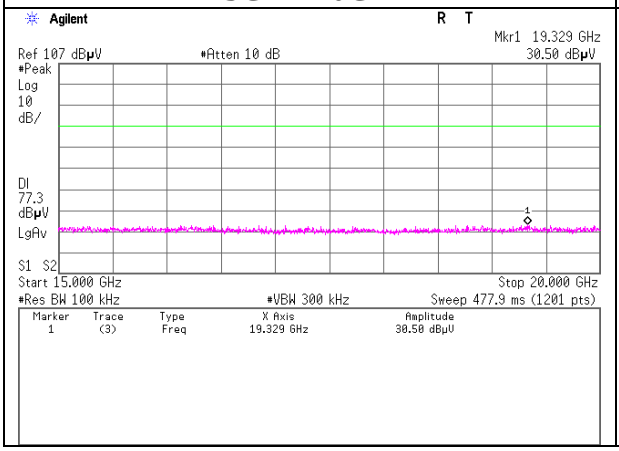
### 5GHz-10GHz



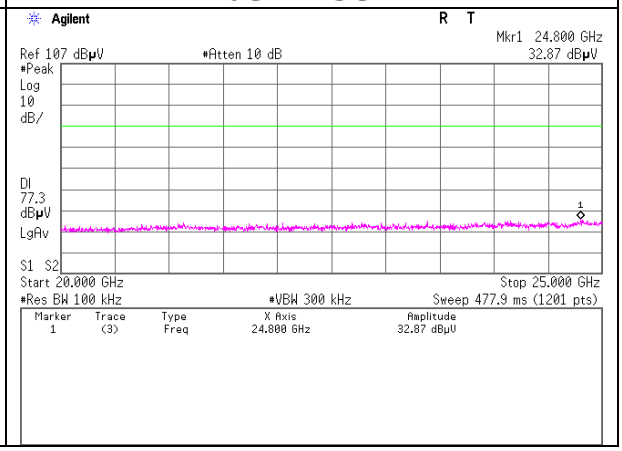

### 10GHz-15GHz




### 15GHz-20GHz



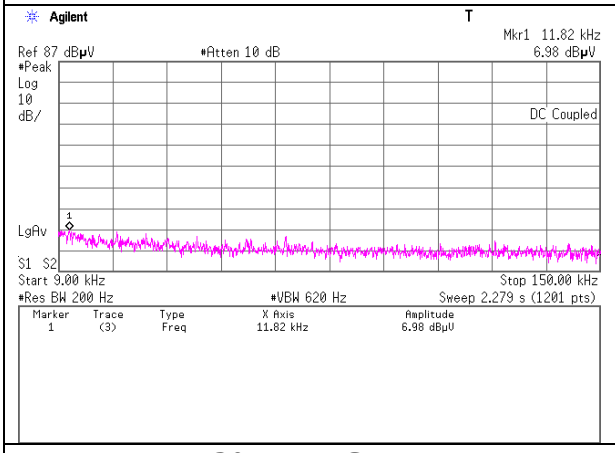

### 20GHz-25GHz



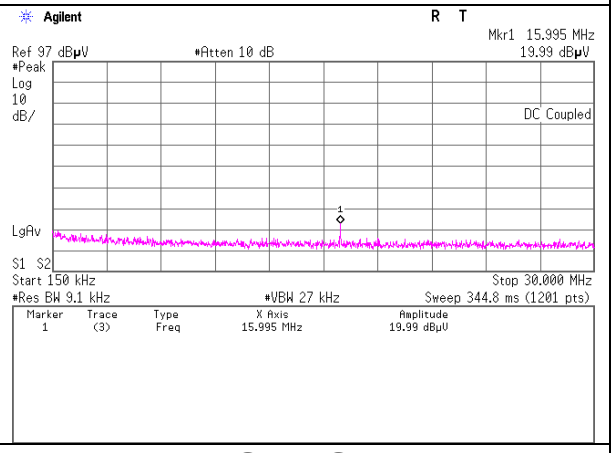
# Conducted Spurious Emission

## Tx 3DH5 2441MHz

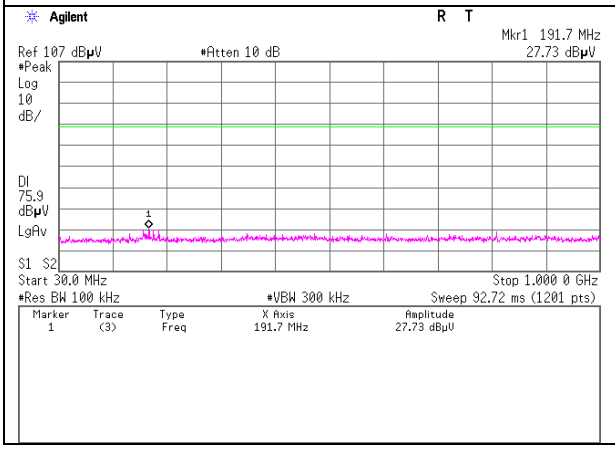
### 9kHz-150kHz



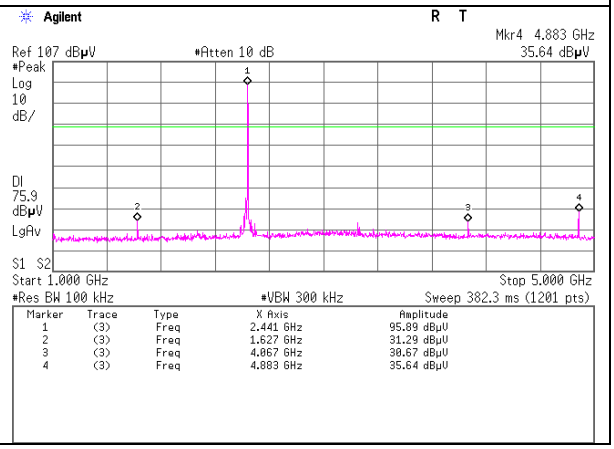

### 150kHz-30MHz




### 30MHz-1GHz




### 1GHz-5GHz





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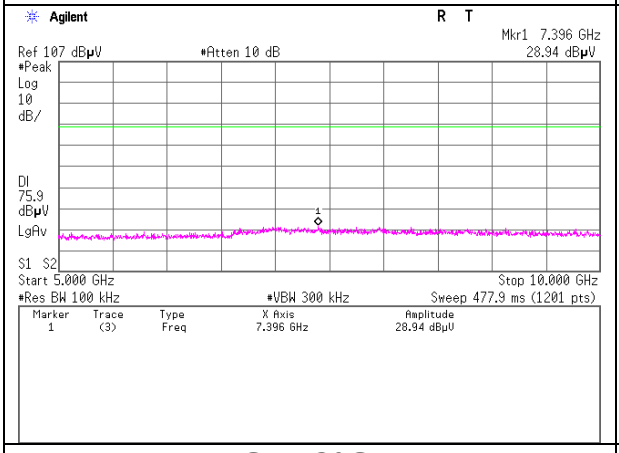
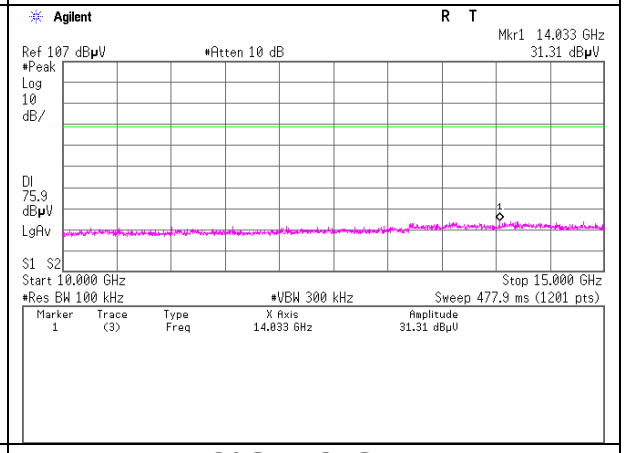
# Conducted Spurious Emission

## Tx 3DH5 2441MHz

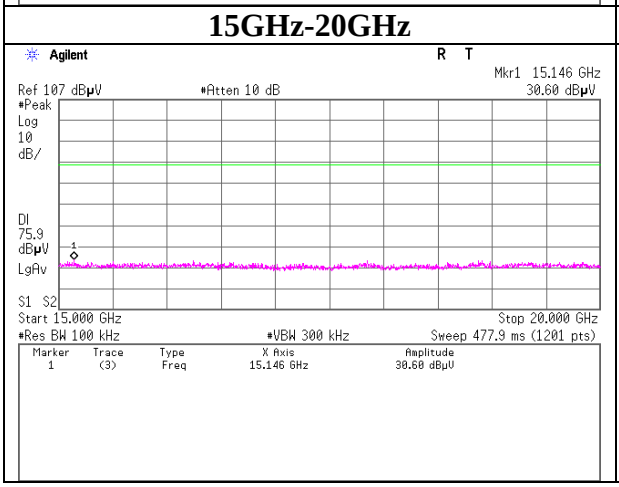
### 5GHz-10GHz



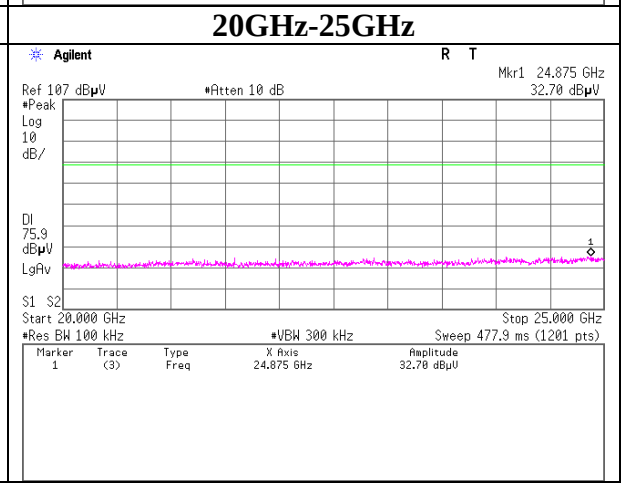

### 10GHz-15GHz




### 15GHz-20GHz



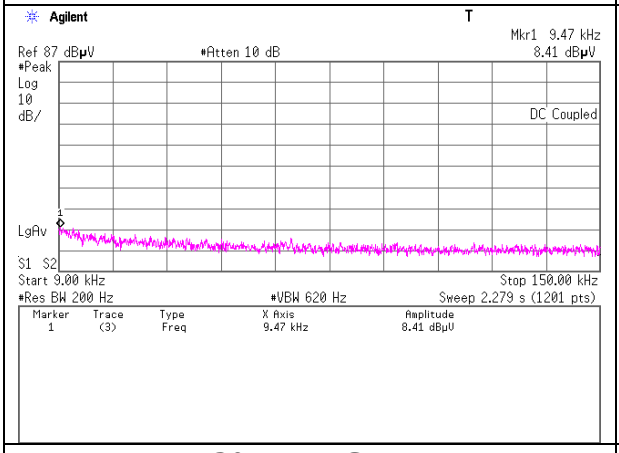

### 20GHz-25GHz



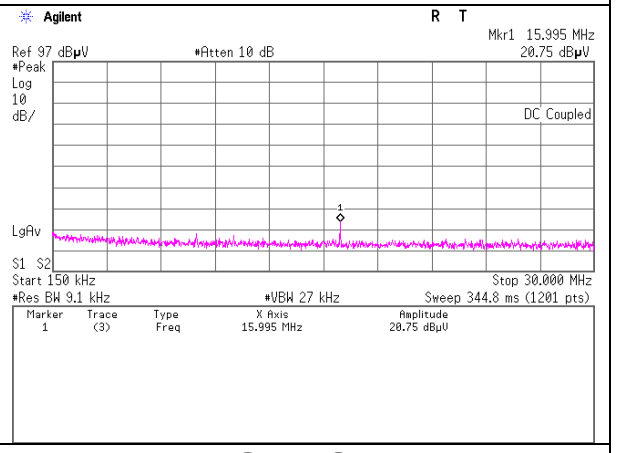
# Conducted Spurious Emission

## Tx 3DH5 2480MHz

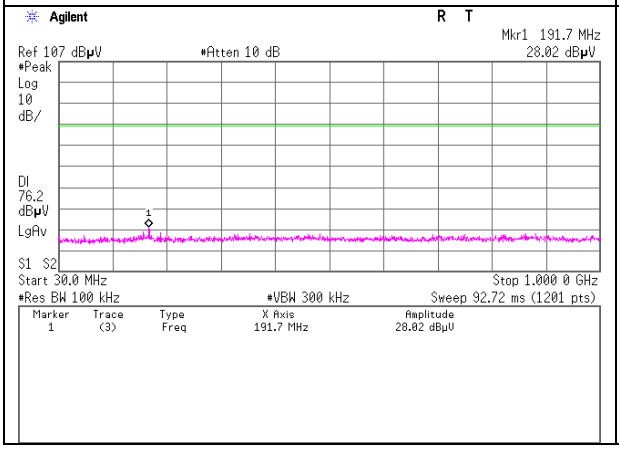
### 9kHz-150kHz



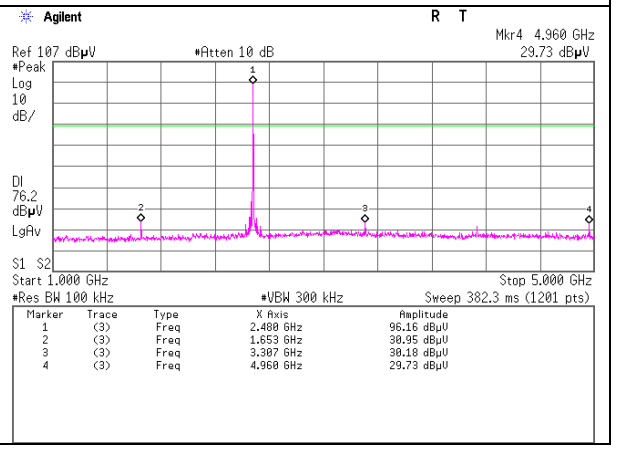

### 150kHz-30MHz




### 30MHz-1GHz




### 1GHz-5GHz





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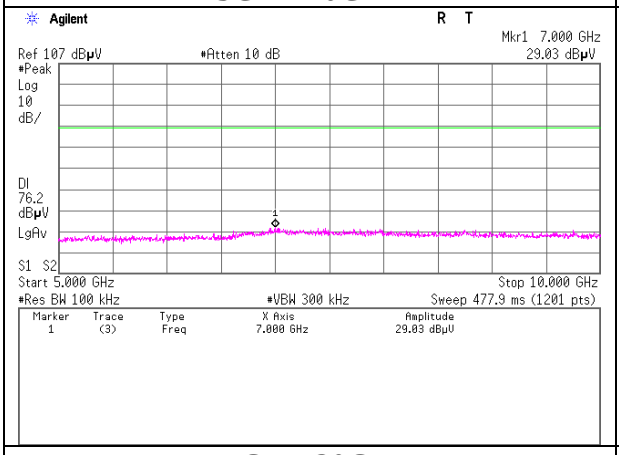
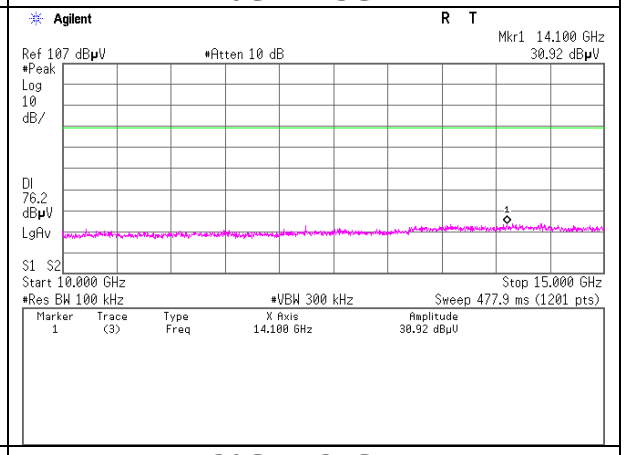
# Conducted Spurious Emission

## Tx 3DH5 2480MHz

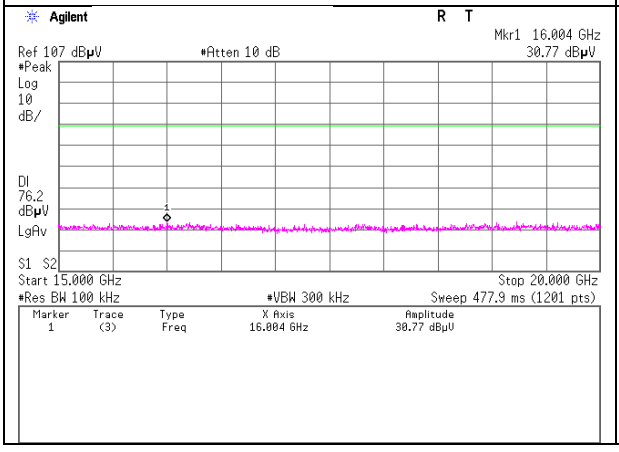
### 5GHz-10GHz



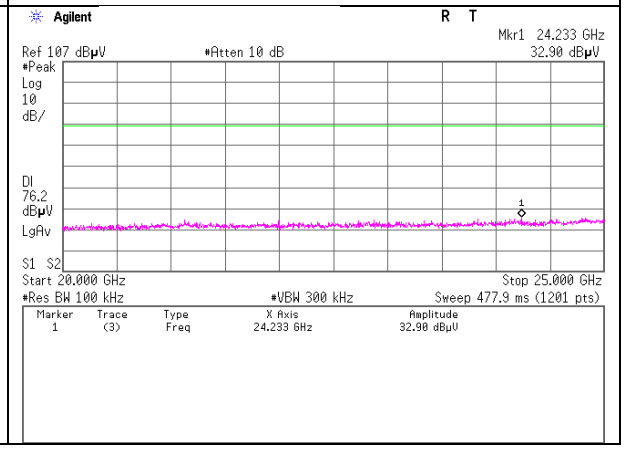

### 10GHz-15GHz




### 15GHz-20GHz



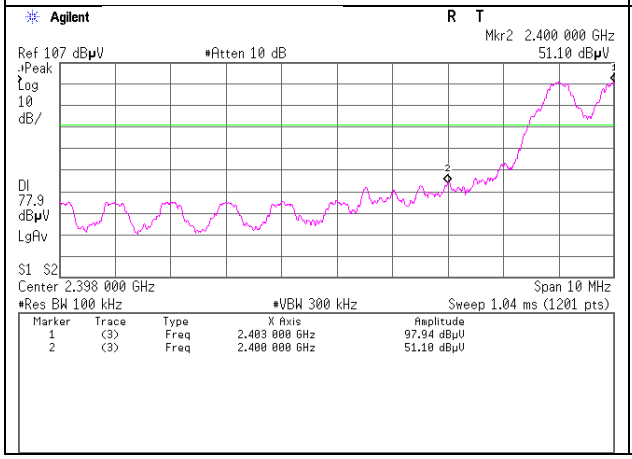

### 20GHz-25GHz



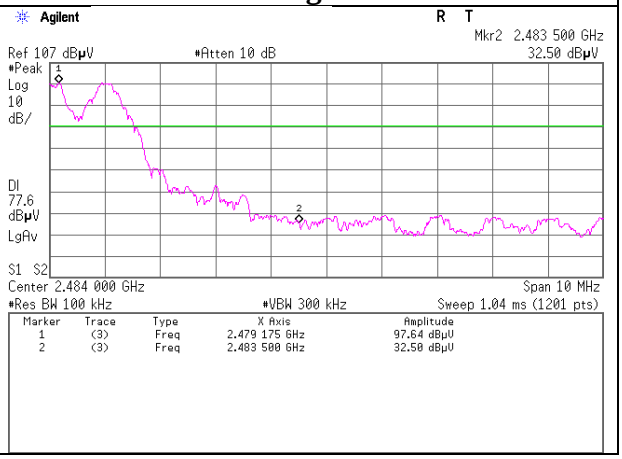
# Conducted Emission Band Edge compliance

## Tx DH5, Hopping on

### Low

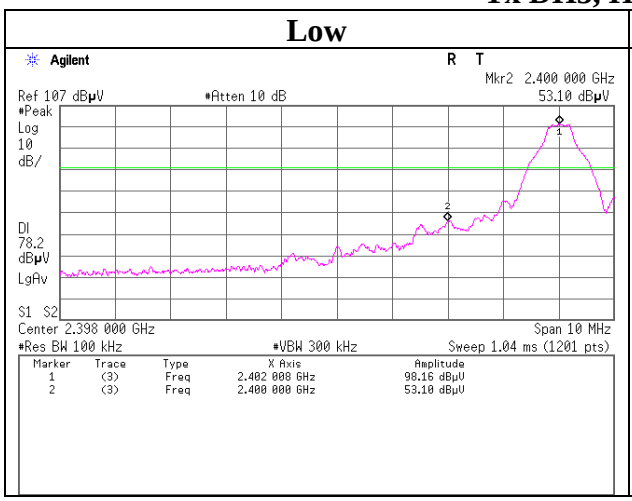



### High

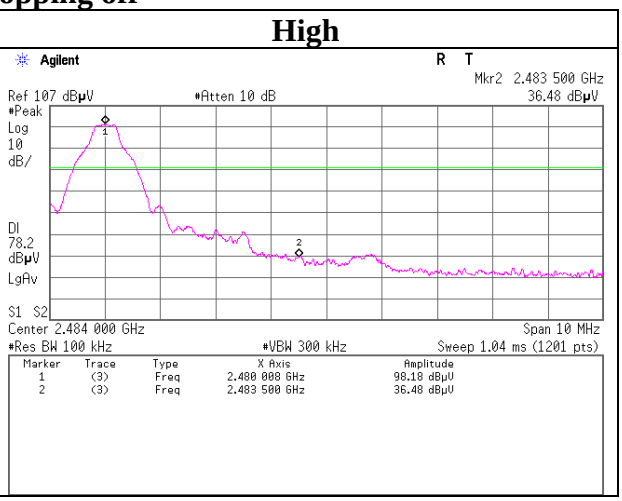



## Tx DH5, Hopping off

### Low



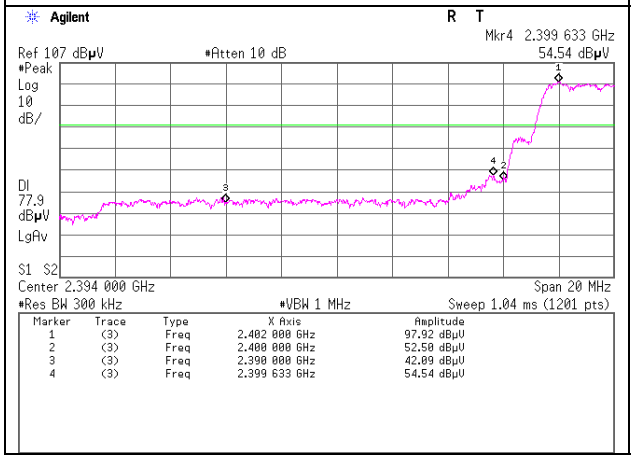

### High



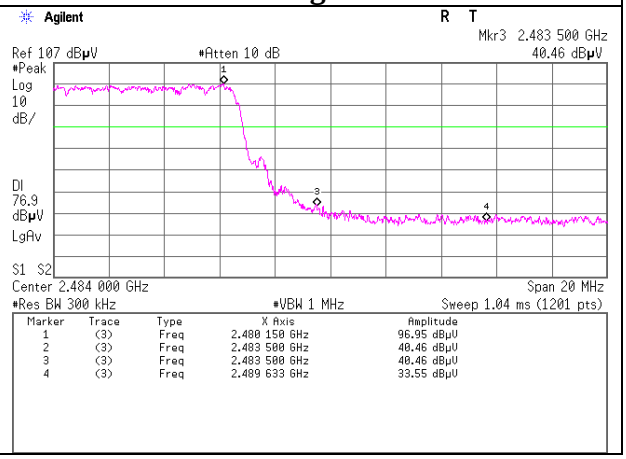
# Conducted Emission Band Edge compliance

## Tx 3DH5, Hopping on

### Low

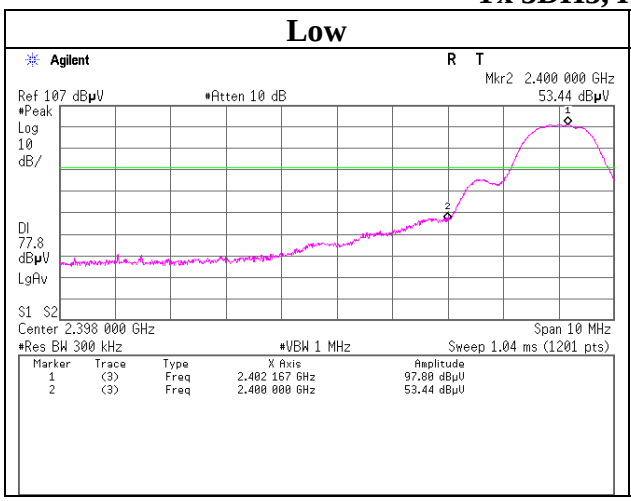



### High

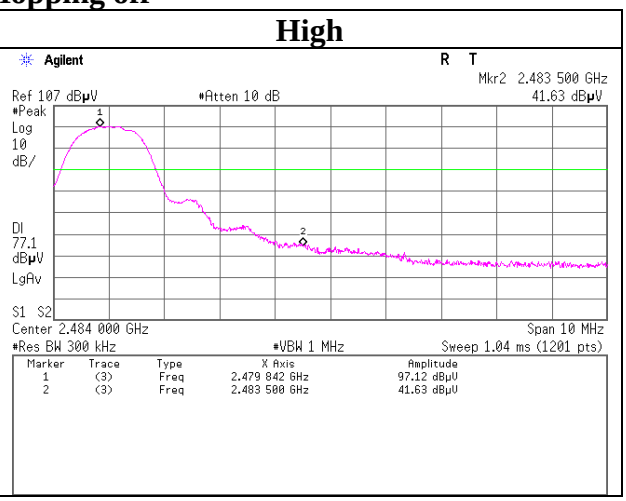



## Tx 3DH5, Hopping off

### Low



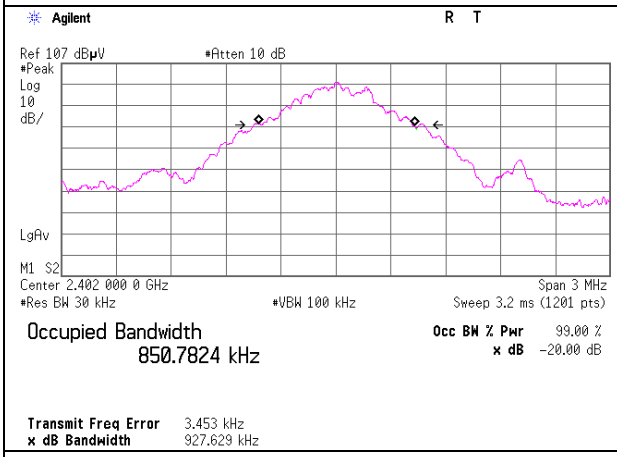

### High



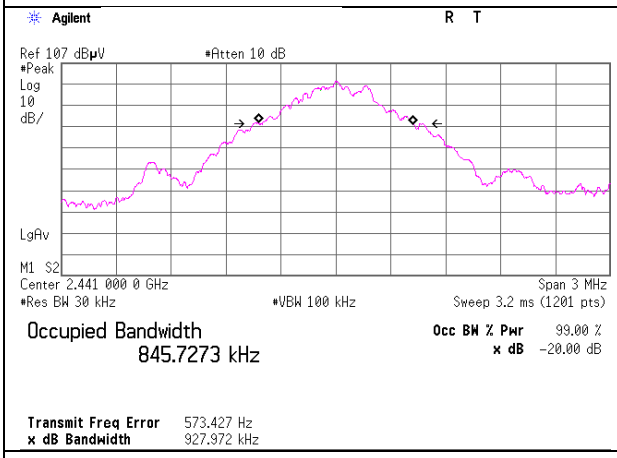
# 99%Occupied Bandwidth

## Tx DH5, Hopping off

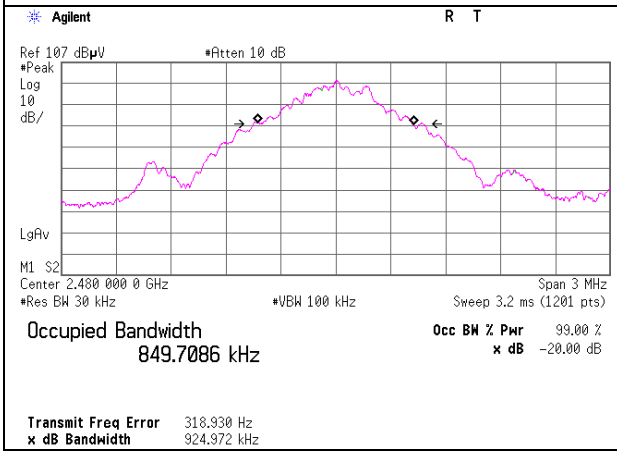
### 2402MHz




### 2441MHz

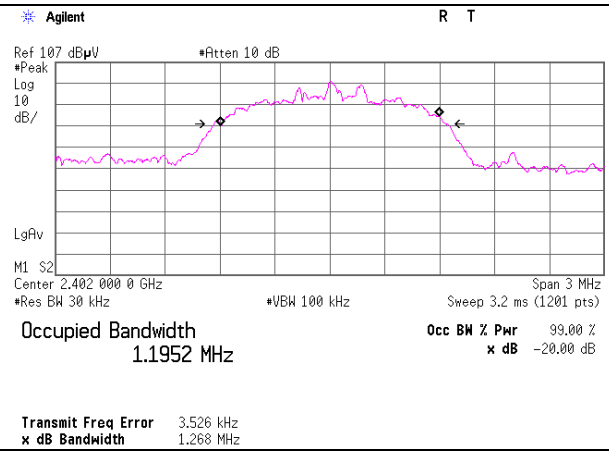



### 2480MHz

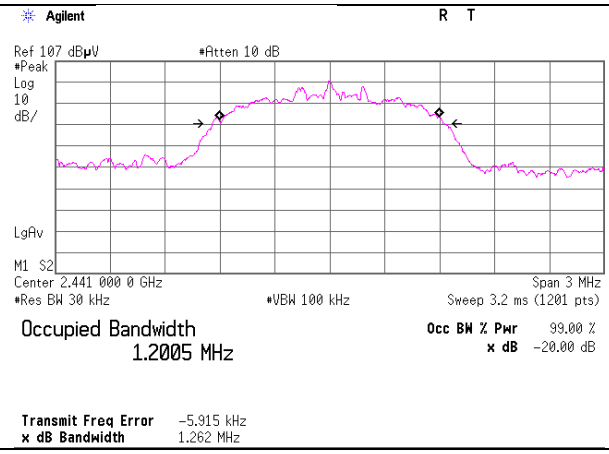



## Tx 3DH5, Hopping off

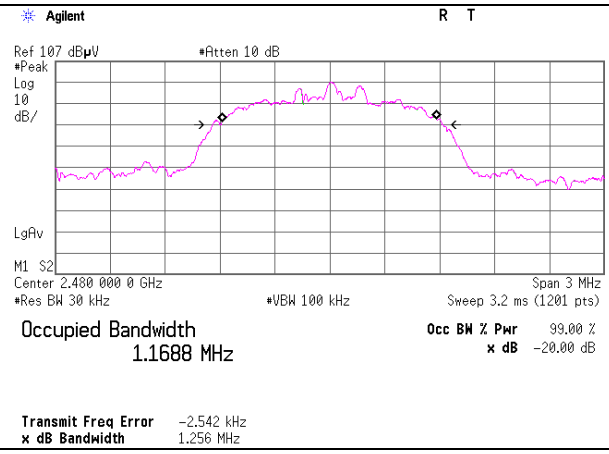
### 2402MHz



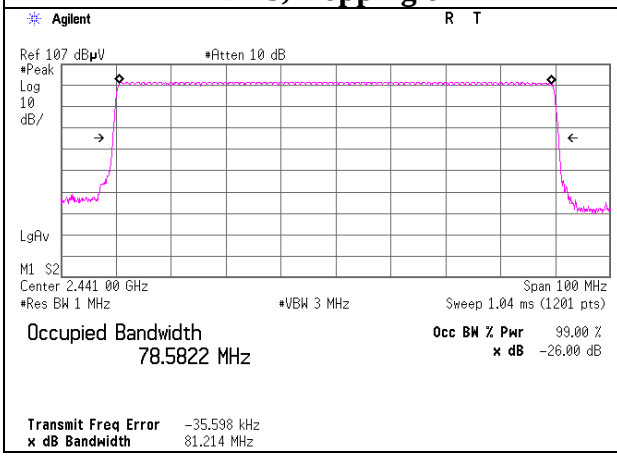
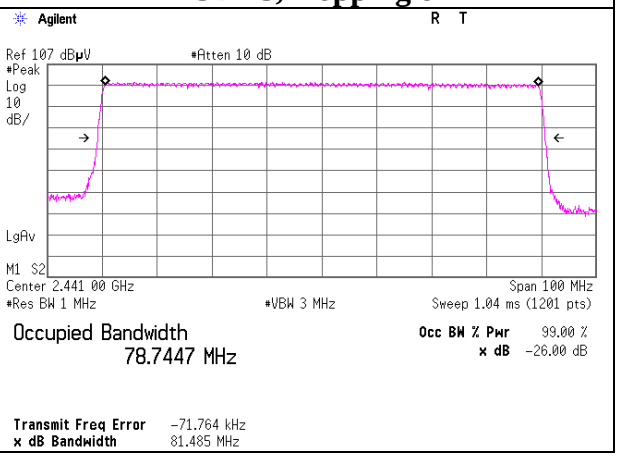

### 2441MHz




### 2480MHz



# 99% Occupied Bandwidth

| Tx DH5, Hopping on | Tx 3DH5, Hopping on |
|---|---|
|  |  |

# APPENDIX 2: Test instruments

**EMI test equipment**

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|---|---|---|---|---|---|---|
| MRENT-95 | Spectrum Analyzer | Agilent | E4440A | MY46185823 | AT | 2013/06/14 * 12 |
| MPM-09 | Power Meter | Anritsu | ML2495A | 6K00003348 | AT | 2012/10/08 * 12 |
| MPSE-12 | Power sensor | Anritsu | MA2411B | 011598 | AT | 2012/10/08 * 12 |
| MCC-67 | Microwave Cable 1G-40GHz | Suhner | SUCOFLEX102 | 28635/2 | AT | 2013/04/16 * 12 |
| MAT-22 | Attenuator(10dB) 1-18GHz | Orient Microwave | BX10-0476-00 | - | AT | 2013/03/21 * 12 |
| MOS-22 | Thermo-Hygrometer | Custom | CTH-201 | 0003 | AT/RE/CE | 2013/02/26 * 12 |
| MAEC-02 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-06902 | RE/CE | 2013/06/30 * 12 |
| MJM-14 | Measure | KOMELON | KMC-36 | - | RE/CE | - |
| COTS-MEMI | EMI measurement program | TSJ | TEPTO-DV | - | RE/CE | - |
| MSA-04 | Spectrum Analyzer | Agilent | E4448A | US44300523 | RE | 2013/04/03 * 12 |
| MHA-06 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 254 | RE | 2013/02/15 * 12 |
| MPA-10 | Pre Amplifier | Agilent | 8449B | 3008A02142 | RE | 2013/01/10 * 12 |
| MCC-132 | Microwave Cable | HUBER+SUHNER | SUCOFLEX104 | 336161/4(1m) / 340639(5m) | RE | 2012/09/05 * 12 |
| MHA-02 | Horn Antenna 18-26.5GHz | EMCO | 3160-09 | 1265 | RE | 2013/02/15 * 12 |
| MTR-03 | Test Receiver | Rohde & Schwarz | ESCI | 100300 | RE/CE | 2013/06/11 * 12 |
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | VHA91032008 | RE | 2012/10/08 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 201 | RE | 2012/10/08 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | - | RE | 2013/02/06 * 12 |
| MAT-07 | Attenuator(6dB) | Weinschel Corp | 2 | BK7970 | RE | 2012/11/06 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | 2944A10845 | RE | 2012/09/11 * 12 |
| MLS-06 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127363 | CE(EUT) | 2013/01/07 * 12 |
| MCC-13 | Coaxial Cable | Fujikura | 3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m) | - | CE | 2013/02/06 * 12 |
| MAT-65 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | CE | 2013/01/09 * 12 |
| MJG-50 | Extension Tap US | UL Japan | | | CE | - |

**The expiration date of the calibration is the end of the expired month.**
**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**
**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

**Test Item: CE: Conducted Emission**
**RE: Radiated Emission**
**AT: Antenna Terminal Conducted test**