



RADIO TEST REPORT

Test Report No. : 32KE0213-HO-03-A

Applicant : Yamaha Corporation
Type of Equipment : Wireless Module
Model No. : BTCARD
FCC ID : A6RBTCARDA
Test regulation : FCC Part 15 Subpart C: 2012
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.

Date of test: August 2 to 4, 2012

Representative test engineer: T. Shimada
Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by: M. Nishiyama
Masanori Nishiyama
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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13-EM-F0429

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SECTION 1: Customer information

Company Name : Yamaha Coropration
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Telephone Number : +81-53-460-3320
Facsimile Number : +81-53-460-2878
Contact Person : Takanori Shimizu

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless Module
Model No. : BTCARD
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0V
Receipt Date of Sample : July 24, 2012
Country of Mass-production : China, Malaysia
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

Radio Specification

[Bluetooth (2.1 + EDR)]

Radio Type : Transceiver
Frequency of Operation : 2402-2480MHz
Modulation : FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)
Power Supply (radio part input) : DC 3.3V
Antenna type : Chip Antenna
Antenna Gain : -2.7dBi

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2012, final revised on July 23, 2012 and effective August 22, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

* The revision on July 23, 2012 does not affect the test specification applied to the EUT.

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 IC: RSS-Gen 7.2.4 | FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4 | QP 30.2dB, 0.15000MHz Tx DH5 2441MHz, N / Tx 3DH5 2441MHz, L1 AV 34.9dB, 0.15000MHz, N | Complied | - |
| Carrier Frequency Separation | FCC: FCC Public Notice DA 00-705 IC: - | FCC: Section15.247(a)(1) ----- IC: RSS-210 A8.1 (b) | See data. | Complied | Conducted |
| 20dB Bandwidth | FCC: FCC Public Notice DA 00-705 IC: - | FCC: Section15.247(a)(1) ----- IC: RSS-210 A8.1 (a) | | - | Conducted |
| Number of Hopping Frequency | FCC: FCC Public Notice DA 00-705 IC: - | FCC: Section15.247(a)(1)(iii) ----- IC: RSS-210 A8.1 (d) | | Complied | Conducted |
| Dwell time | FCC: FCC Public Notice DA 00-705 IC: - | FCC: Section15.247(a)(1)(iii) ----- IC: RSS-210 A8.1 (d) | | Complied | Conducted |
| Maximum Peak Output Power | FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.8 | FCC: Section15.247(a)(b)(1) ----- IC: RSS-210 A8.4 (2) | | Complied | Conducted |
| Spurious Emission & Band Edge Compliance | FCC: FCC Public Notice DA 00-705 IC: RSS-Gen 4.9 | FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 6 and 7.2.3 | | 0.3dB 215.999MHz, QP, Horizontal Tx, 3DH5 2402MHz / Tx, 3DH5 2441MHz | Complied |
| 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)

The power supply voltage is stabilized by internal LDO with BTCARD regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/15.212 Antenna requirement

The antenna is not removable from the EUT as it is a chip antenna. Therefore, the equipment complies with the antenna requirement of Section 15.203/15.212.

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 |
| 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 |

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 report meets the limits unless the uncertainty is taken into consideration.

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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 | - | - | 8.0 x 4.5 x 2.8m | 2.0 x 2.0m | - |
| No.10 measurement room | - | - | 2.6 x 2.8 x 2.5m | 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
Paging

Details of Operating Mode(s)

| Test Item | Mode | Tested frequency |
|---|---|-------------------------------|
| Conducted Emission, Spurious Emission (Conducted/Radiated) | Tx (Hopping off) DH5, 3DH5 | 2402MHz 2441MHz 2480MHz |
| Carrier Frequency Separation | Tx (Hopping on) DH5, 3DH5 | 2402MHz 2441MHz 2480MHz |
| | Paging | 2433MHz |
| 20dB Bandwidth | Tx (Hopping off) DH5, 3DH5 | 2402MHz 2441MHz 2480MHz |
| | Paging | 2433MHz |
| Number of Hopping Frequency | Tx (Hopping on) DH5, 3DH5 Paging | - |
| Dwell time | Tx (Hopping on), -DH1, DH3, DH5 -3DH1, 3DH3, 3DH5 Paging | 2441MHz |
| | Paging | 2433MHz |
| Maximum Peak Output Power Average Output Power | Tx (Hopping off) DH5, 3DH5 | 2402MHz 2441MHz 2480MHz |
| Band Edge Compliance (Conducted) | Tx DH5, 3DH5 -Hopping on -Hopping off | 2402MHz 2480MHz |
| | 99% Occupied Bandwidth | Tx DH5, 3DH5 -Hopping off |
| Tx DH5, 3DH5 -Hopping on Paging | | - |
| <p>*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) *EUT has the power settings by the software as follows; Power settings: BDR: Ext.=0, Int.=50 EDR: Ext.=0, Int.=105 Software: CSR BlueTest3 Version: Release Build</p> <p>*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.</p> | | |

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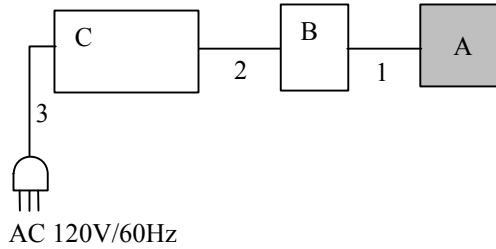
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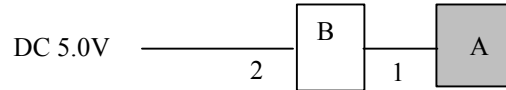
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4.2 Configuration and peripherals

[Conducted emission]



[Radiated emission and
Antenna terminal conducted test]



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

Description of EUT

| No. | Item | Model number | Serial number | Manufacturer | Remarks |
|-----|-----------------|--------------|----------------------|--------------------|---------|
| A | Wireless module | BTCARD | MWD1 *1) MWL1 *2) | Yamaha Corporation | EUT |
| B | Jig | - | - | - | - |
| C | DC Power Supply | PMC35-2A | 13090501 | KIKUSUI | - |

*1) Used for Antenna terminal conducted test

*2) Used for Conducted emission and Radiated Emission test

List of cables used

| No. | Name | Length (m) | Shield | | Remarks |
|-----|--------------|------------|------------|------------|---------|
| | | | Cable | Connector | |
| 1 | Signal Cable | 0.3 | Unshielded | Unshielded | - |
| 2 | DC Cable | 1.5 | Unshielded | Unshielded | - |
| 3 | AC Cable | 2.0 | Unshielded | Unshielded | - |

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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.

1) 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 |

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SECTION 6: Radiated Spurious Emission

Test Procedure

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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.

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 VBW: 3MHz | RBW: 1MHz VBW: 10Hz *1) | RBW: 100kHz VBW: 300kHz (S/A) |
| Test Distance | 3m | 3m (below 10GHz), 1m*2) (above 10GHz) | | 3m (below 10GHz), 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: $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

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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 (Hopping) 100ms | Peak (Hopping) or Sample | Max Hold Clear Write | Spectrum Analyzer |
| Maximum Peak Output Power | - | - | - | Auto | Peak | - | Power Meter (Sensor: 50MHz BW) |
| Average Output Power | - | - | - | Auto | Average | - | Power Meter (Sensor: 50MHz BW) |
| Carrier Frequency Separation | 5MHz(Paging) or 3MHz | 100kHz or 30kHz | 300kHz or 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 *1) | 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 | 20MHz | 100kHz | 300kHz | Auto | Peak | Max Hold | Spectrum Analyzer |

*1) 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

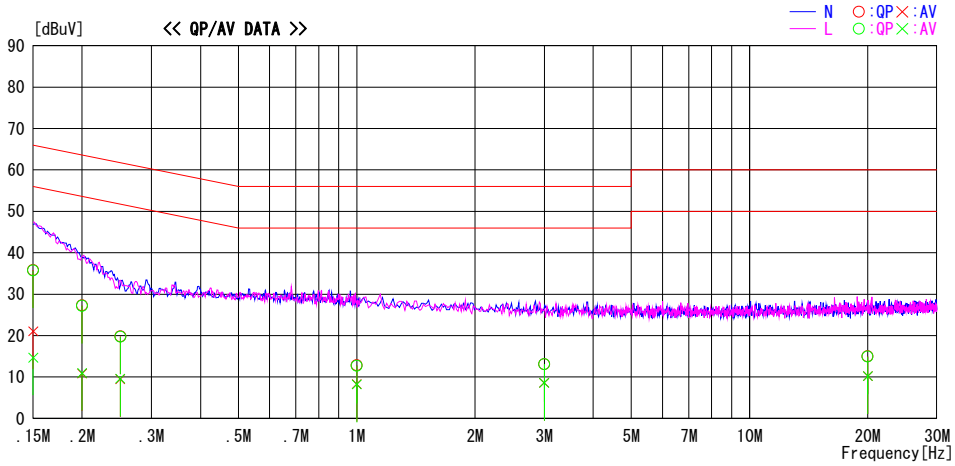
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/08/04

Report No. : 32KE0213-HO-03
Temp./Humi. : 20deg. C / 68% RH
Engineer : Takumi Shimada

Mode / Remarks : Tx DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV

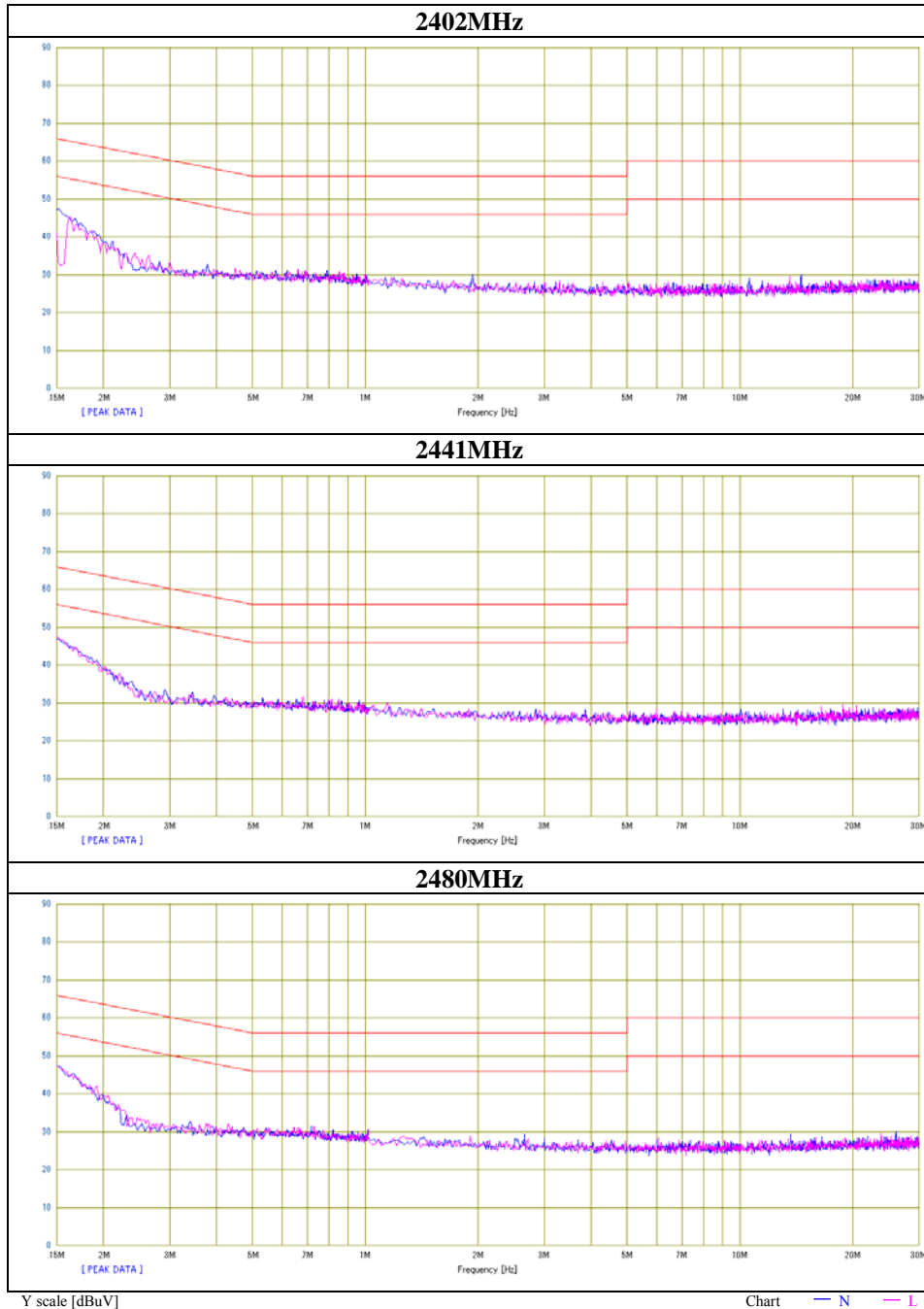


| Frequency [MHz] | Reading Level | | Corr. Factor | Results | | Limit | | Margin | | Phase | Comment |
|--------------------|---------------|--------------|-----------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 0.15000 | 22.6 | 7.9 | 13.2 | 35.8 | 21.1 | 66.0 | 56.0 | 30.2 | 34.9 | N | |
| 0.20000 | 14.1 | -2.3 | 13.2 | 27.3 | 10.9 | 63.6 | 53.6 | 36.3 | 42.7 | N | |
| 0.25000 | 6.6 | -3.7 | 13.2 | 19.8 | 9.5 | 61.8 | 51.8 | 42.0 | 42.3 | N | |
| 1.00000 | -0.5 | -5.0 | 13.3 | 12.8 | 8.3 | 56.0 | 46.0 | 43.2 | 37.7 | N | |
| 3.00000 | -0.5 | -5.0 | 13.6 | 13.1 | 8.6 | 56.0 | 46.0 | 42.9 | 37.4 | N | |
| 20.00000 | -0.2 | -5.0 | 15.2 | 15.0 | 10.2 | 60.0 | 50.0 | 45.0 | 39.8 | N | |
| 0.15000 | 22.5 | 1.5 | 13.2 | 35.7 | 14.7 | 66.0 | 56.0 | 30.3 | 41.3 | L | |
| 0.20000 | 14.0 | -2.2 | 13.2 | 27.2 | 11.0 | 63.6 | 53.6 | 36.4 | 42.6 | L | |
| 0.25000 | 6.5 | -3.6 | 13.2 | 19.7 | 9.6 | 61.8 | 51.8 | 42.1 | 42.2 | L | |
| 1.00000 | -0.6 | -5.1 | 13.3 | 12.7 | 8.2 | 56.0 | 46.0 | 43.3 | 37.8 | L | |
| 3.00000 | -0.5 | -5.0 | 13.6 | 13.1 | 8.6 | 56.0 | 46.0 | 42.9 | 37.4 | L | |
| 20.00000 | -0.3 | -5.0 | 15.2 | 14.9 | 10.2 | 60.0 | 50.0 | 45.1 | 39.8 | L | |

CHART:WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F.(LISN LOSS + CABLE LOSS + ATTN. LOSS)
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. | 32KE0213-HO-03 |
| Date | 08/04/2012 |
| Temperature/ Humidity | 20 deg. C / 68% RH |
| Engineer | Takumi Shimada |
| Mode | Tx DH5 |



Conducted Emission

DATA OF CONDUCTED EMISSION TEST

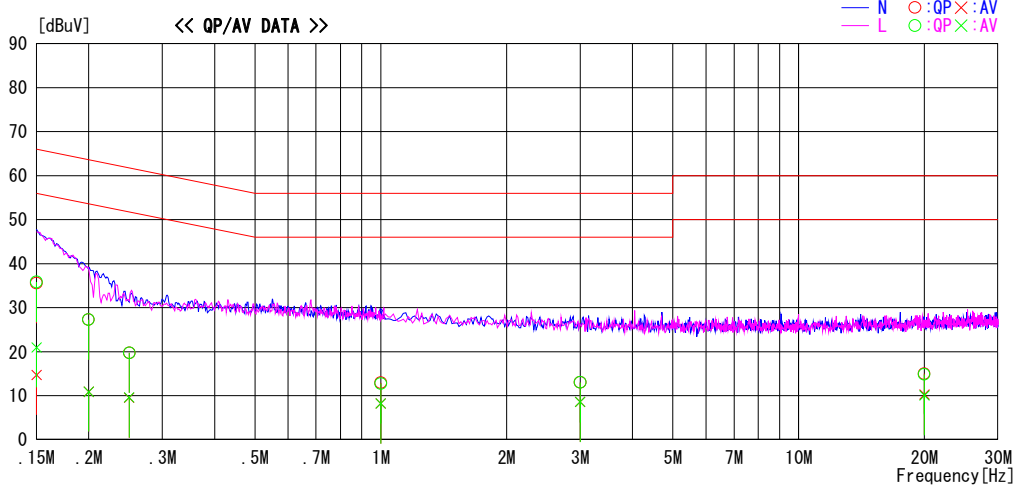
UL Japan, Inc. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2012/08/04

Report No. : 32KE0213-HO-03

Temp./Humi. : 20deg. C / 68% RH
Engineer : Takumi Shimada

Mode / Remarks : Tx 3DH5 2441MHz

LIMIT : FCC15.207 QP
FCC15.207 AV

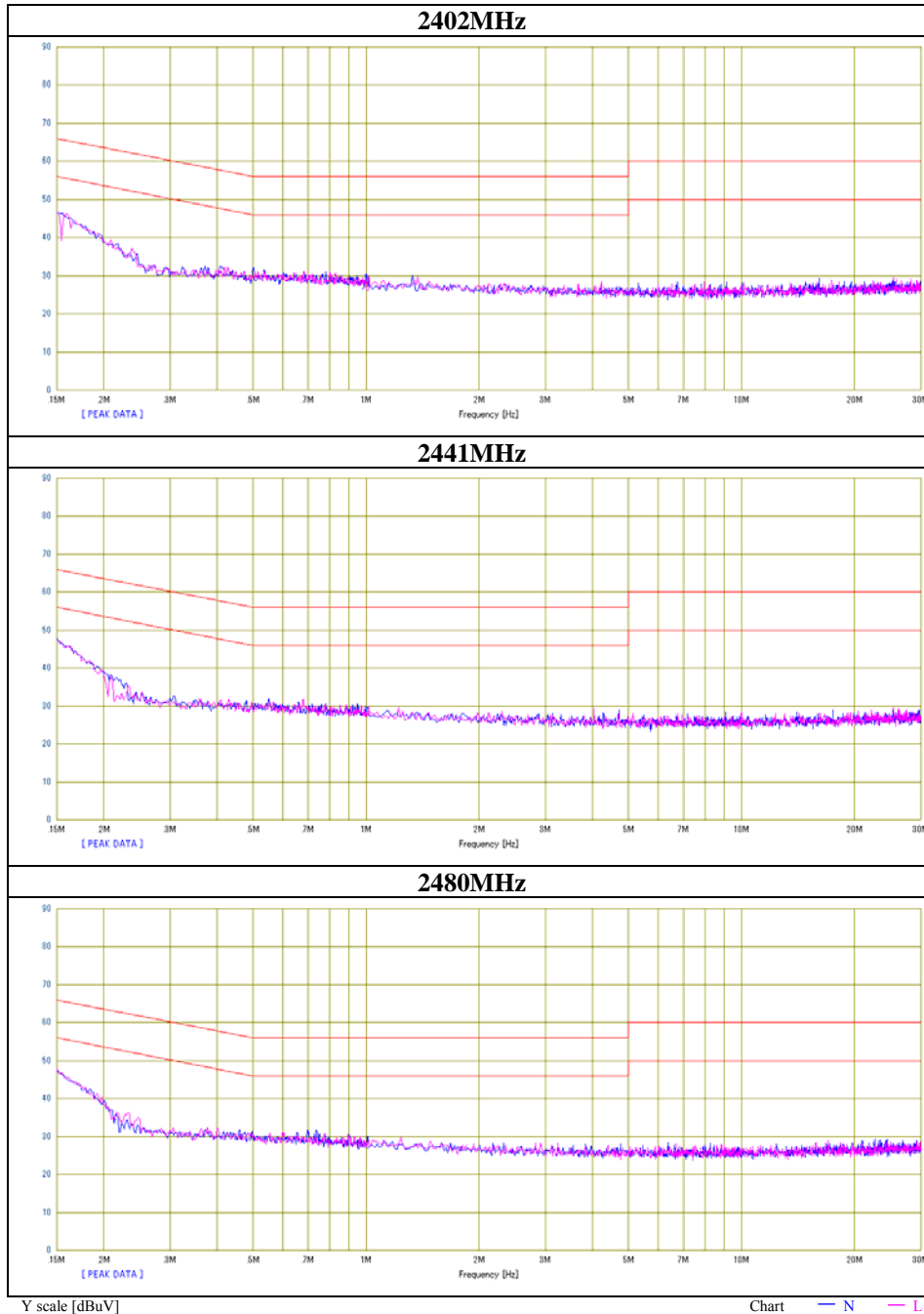


| Frequency [MHz] | Reading Level | | Corr. Factor [dB] | Results | | Limit | | Margin | | Phase | Comment |
|--------------------|---------------|--------------|-------------------------|--------------|--------------|--------------|--------------|------------|------------|-------|---------|
| | QP [dBuV] | AV [dBuV] | | QP [dBuV] | AV [dBuV] | QP [dBuV] | AV [dBuV] | QP [dB] | AV [dB] | | |
| 0.15000 | 22.4 | 1.5 | 13.2 | 35.6 | 14.7 | 66.0 | 56.0 | 30.4 | 41.3 | N | |
| 0.20000 | 14.1 | -2.3 | 13.2 | 27.3 | 10.9 | 63.6 | 53.6 | 36.3 | 42.7 | N | |
| 0.25000 | 6.5 | -3.7 | 13.2 | 19.7 | 9.5 | 61.8 | 51.8 | 42.1 | 42.3 | N | |
| 1.00000 | -0.4 | -5.1 | 13.3 | 12.9 | 8.2 | 56.0 | 46.0 | 43.1 | 37.8 | N | |
| 3.00000 | -0.6 | -5.0 | 13.6 | 13.0 | 8.6 | 56.0 | 46.0 | 43.0 | 37.4 | N | |
| 20.00000 | -0.2 | -5.0 | 15.2 | 15.0 | 10.2 | 60.0 | 50.0 | 45.0 | 39.8 | N | |
| 0.15000 | 22.6 | 7.8 | 13.2 | 35.8 | 21.0 | 66.0 | 56.0 | 30.2 | 35.0 | L | |
| 0.20000 | 14.1 | -2.3 | 13.2 | 27.3 | 10.9 | 63.6 | 53.6 | 36.3 | 42.7 | L | |
| 0.25000 | 6.5 | -3.6 | 13.2 | 19.7 | 9.6 | 61.8 | 51.8 | 42.1 | 42.2 | L | |
| 1.00000 | -0.6 | -5.1 | 13.3 | 12.7 | 8.2 | 56.0 | 46.0 | 43.3 | 37.8 | L | |
| 3.00000 | -0.6 | -5.0 | 13.6 | 13.0 | 8.6 | 56.0 | 46.0 | 43.0 | 37.4 | L | |
| 20.00000 | -0.4 | -5.1 | 15.2 | 14.8 | 10.1 | 60.0 | 50.0 | 45.2 | 39.9 | L | |

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT=READING+C.F(LISN LOSS + CABLE LOSS + ATTEN. LOSS)
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. | 32KE0213-HO-03 |
| Date | 08/04/2012 |
| Temperature/ Humidity | 20 deg. C / 68% RH |
| Engineer | Takumi Shimada |
| Mode | Tx 3DH5 |

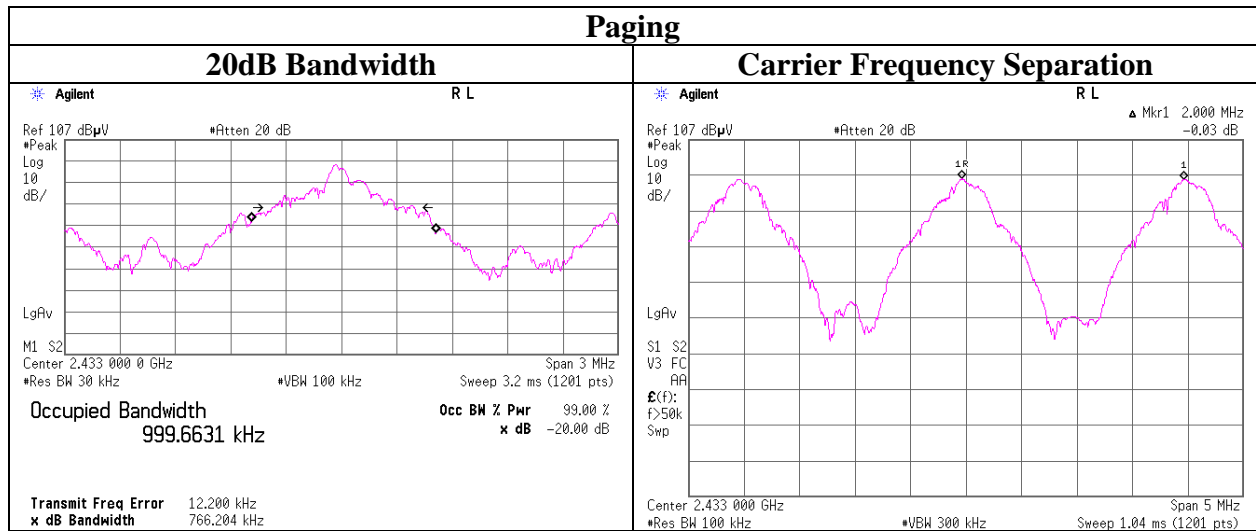


20dB Bandwidth and Carrier Frequency Separation

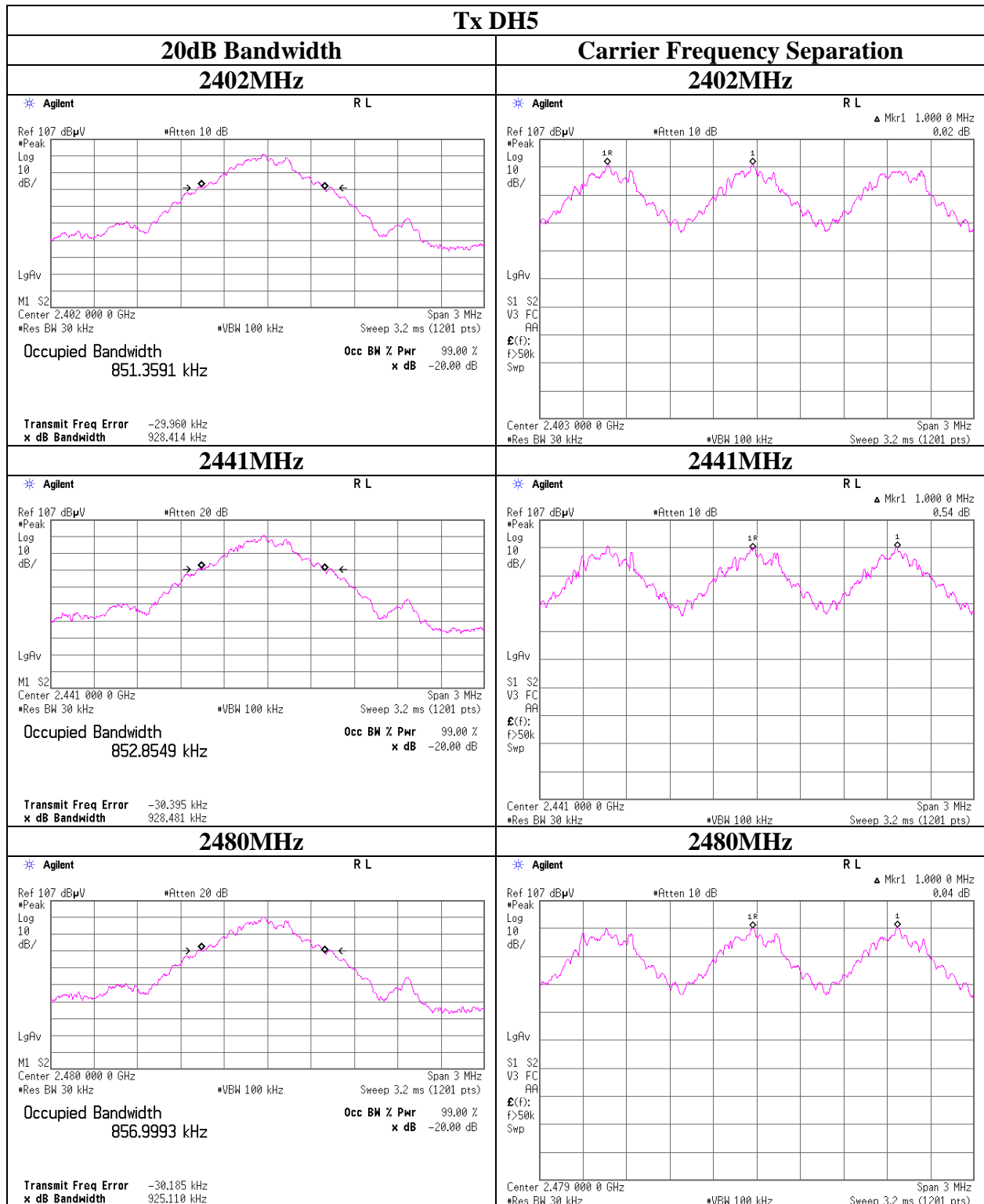
| | |
|-----------------------|--|
| Test place | Head Office EMC Lab. No.6 Measurement Room |
| Report No. | 32KE0213-HO-03 |
| Date | 08/02/2012 |
| Temperature/ Humidity | 25deg. C / 68% RH |
| Engineer | Yutaka Yoshida |
| Mode | Tx (Hopping on) DH5/3DH5/Paging |

| Mode | Freq. [MHz] | 20dB Bandwidth [MHz] | Carrier Frequency Separation [MHz] | Limit for Carrier Frequency separation [MHz] |
|--------|----------------|-------------------------|--|--|
| DH5 | 2402.0 | 0.928 | 1.000 | ≥ 0.619 |
| DH5 | 2441.0 | 0.928 | 1.000 | ≥ 0.619 |
| DH5 | 2480.0 | 0.925 | 1.000 | ≥ 0.617 |
| 3DH5 | 2402.0 | 1.257 | 1.000 | ≥ 0.838 |
| 3DH5 | 2441.0 | 1.262 | 1.000 | ≥ 0.841 |
| 3DH5 | 2480.0 | 1.275 | 1.000 | ≥ 0.850 |
| Paging | 2433.0 | 0.766 | 2.000 | ≥ 0.511 |

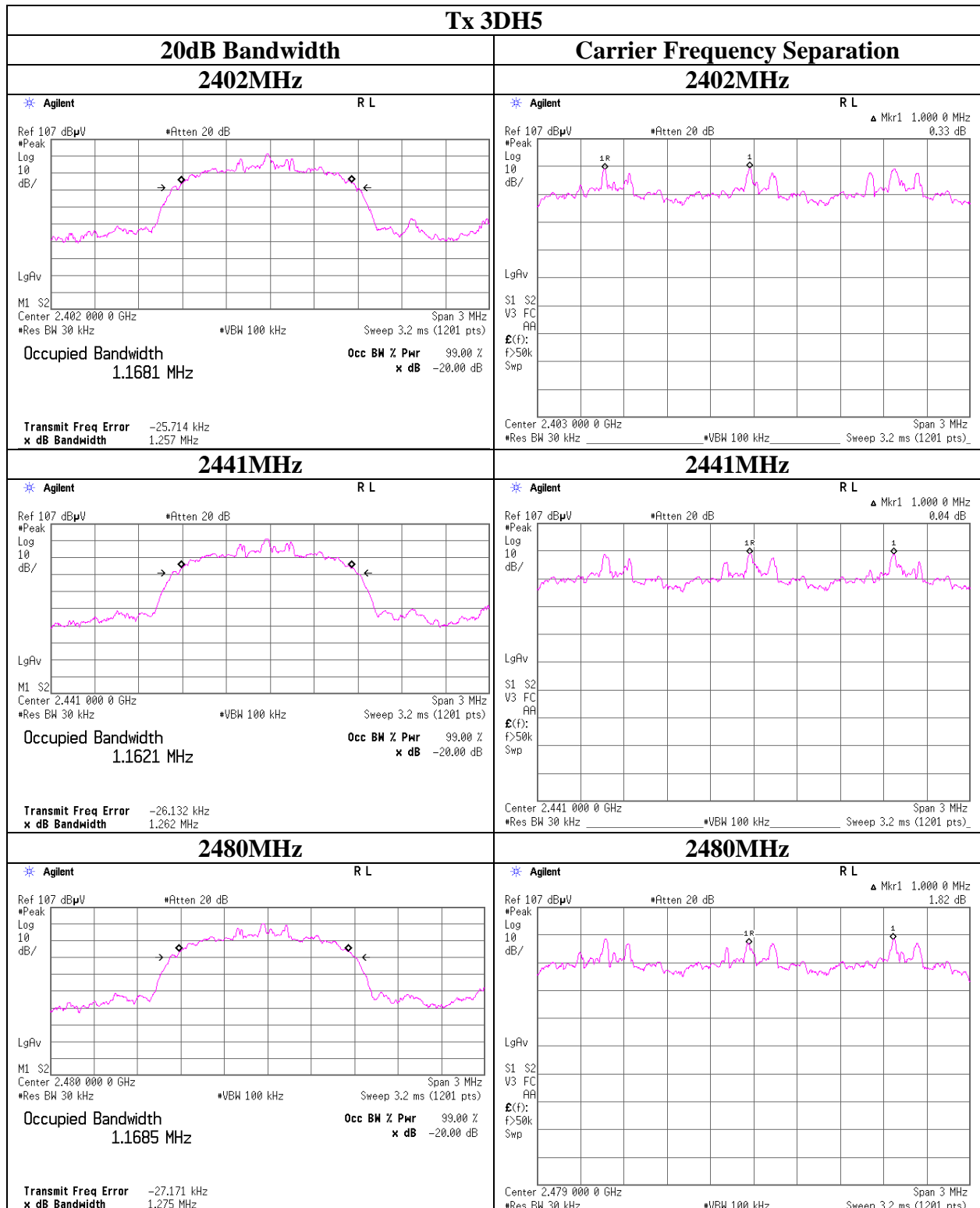
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.



20dB Bandwidth and Carrier Frequency Separation



20dB Bandwidth and Carrier Frequency Separation

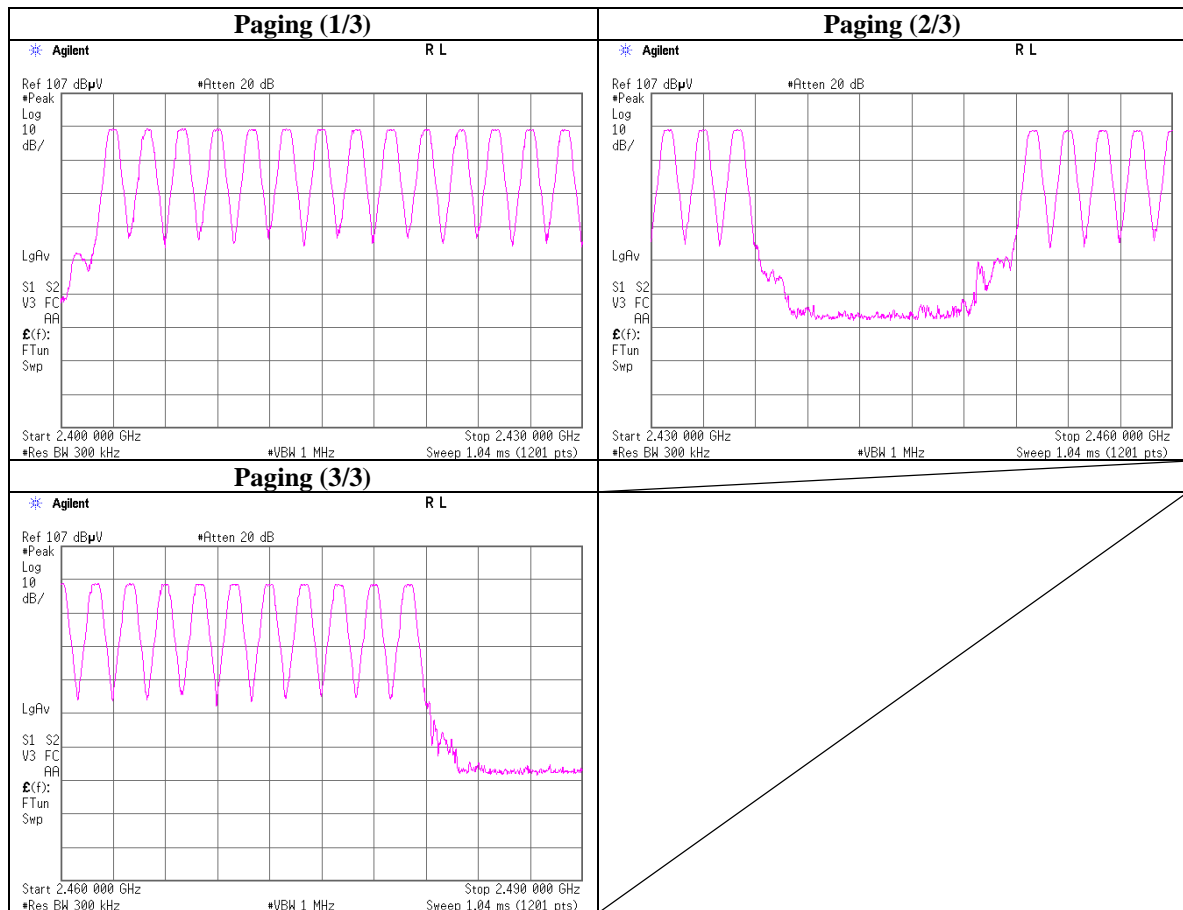


Number of Hopping Frequency

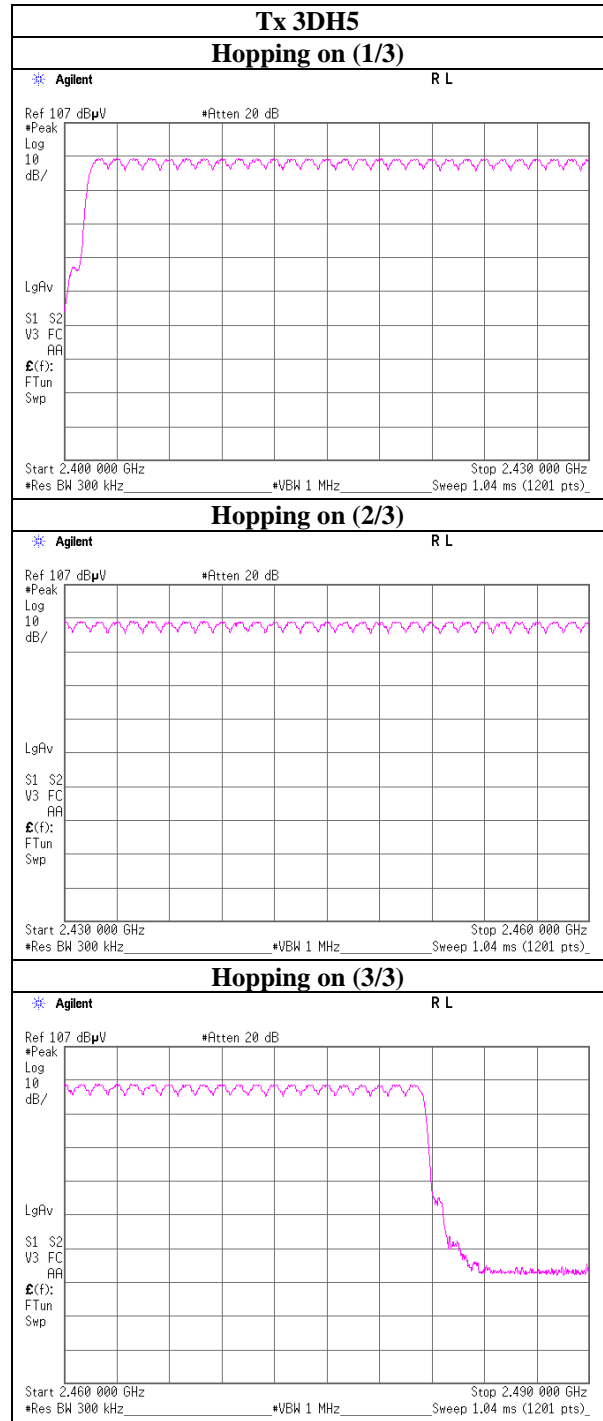
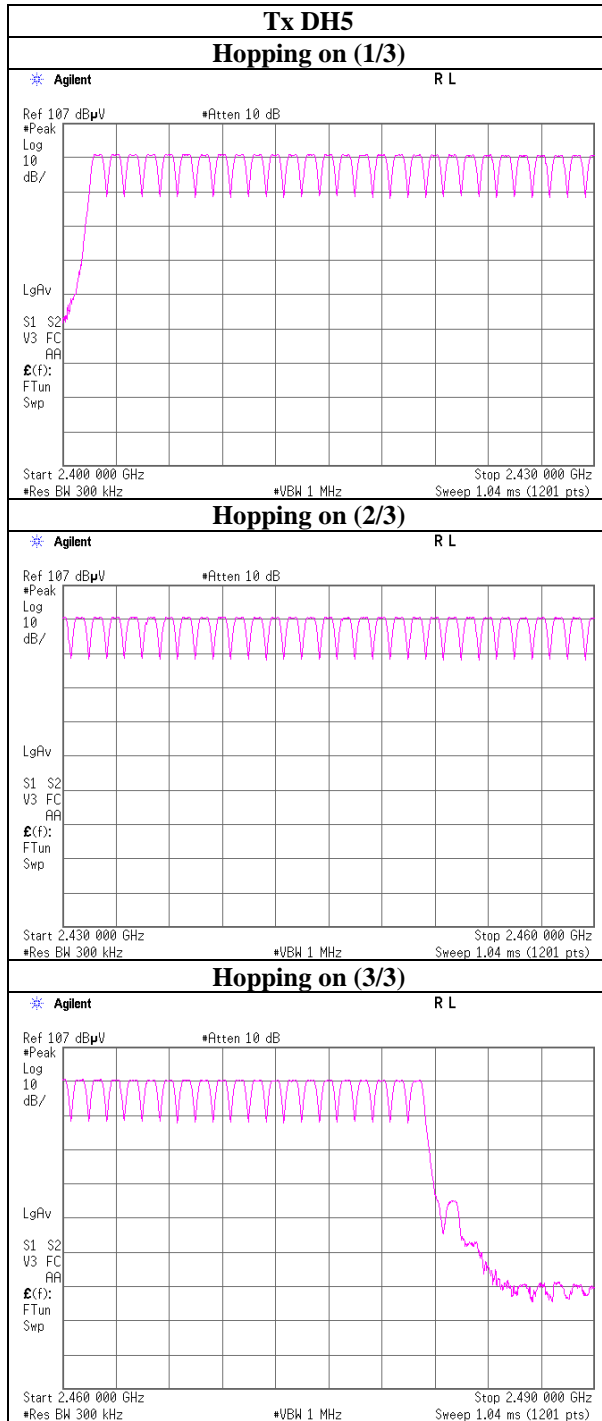
| | |
|-----------------------|--|
| Test place | Head Office EMC Lab. No.6 Measurement Room |
| Report No. | 32KE0213-HO-03 |
| Date | 08/02/2012 |
| Temperature/ Humidity | 25deg. C / 68% RH |
| Engineer | Yutaka Yoshida |
| Mode | Tx (Hopping on) DH5/3DH5/Paging |

| Mode | Number of channel [times] | Limit [times] |
|--------|---------------------------|---------------|
| DH5 | 79 | >= 15 |
| 3DH5 | 79 | >= 15 |
| Paging | 32 | >= 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



Dwell time

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 32KE0213-HO-03
Date 08/02/2012
Temperature/ Humidity 25deg. C / 68% RH
Engineer Yutaka Yoshida
Mode Tx (Hopping on) DH5/3DH5/Paging

| 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 | 50.6 times / 5 sec. x | 31.6 sec. = | 320 times | 166 | 400 |
| DH3 | 25.6 times / 5 sec. x | 31.6 sec. = | 162 times | 289 | 400 |
| DH5 | 17.6 times / 5 sec. x | 31.6 sec. = | 112 times | 339 | 400 |
| 3DH1 | 50.2 times / 5 sec. x | 31.6 sec. = | 318 times | 170 | 400 |
| 3DH3 | 25.6 times / 5 sec. x | 31.6 sec. = | 162 times | 289 | 400 |
| 3DH5 | 17.2 times / 5 sec. x | 31.6 sec. = | 109 times | 332 | 400 |
| Inquiry | 100.0 times / 1 sec. x | 12.8 sec. = | 1280 times | 156 | 400 |

Sample Calculation

Result = Number of transmission x Length of transmission time

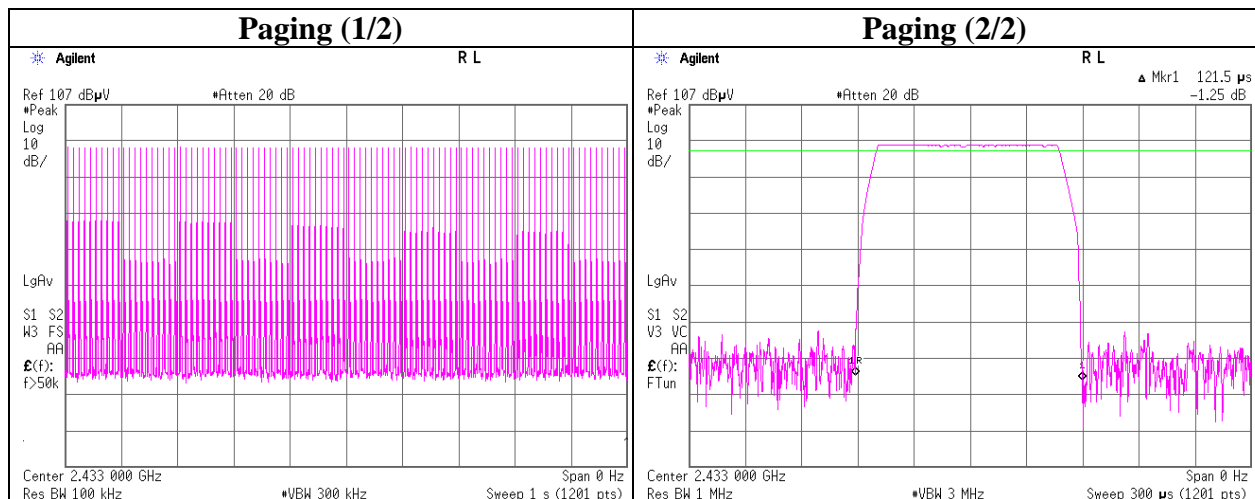
*Average data of 5 tests.(except Inquiry)

| Mode | Sampling [times] | | | | | Average [times] |
|------|------------------|----|----|----|----|--------------------|
| | 1 | 2 | 3 | 4 | 5 | |
| DH1 | 51 | 50 | 51 | 50 | 51 | 50.6 |
| DH3 | 26 | 25 | 26 | 25 | 26 | 25.6 |
| DH5 | 17 | 18 | 18 | 18 | 17 | 17.6 |
| 3DH1 | 50 | 50 | 51 | 50 | 50 | 50.2 |
| 3DH3 | 25 | 25 | 26 | 26 | 26 | 25.6 |
| 3DH5 | 18 | 17 | 17 | 17 | 17 | 17.2 |

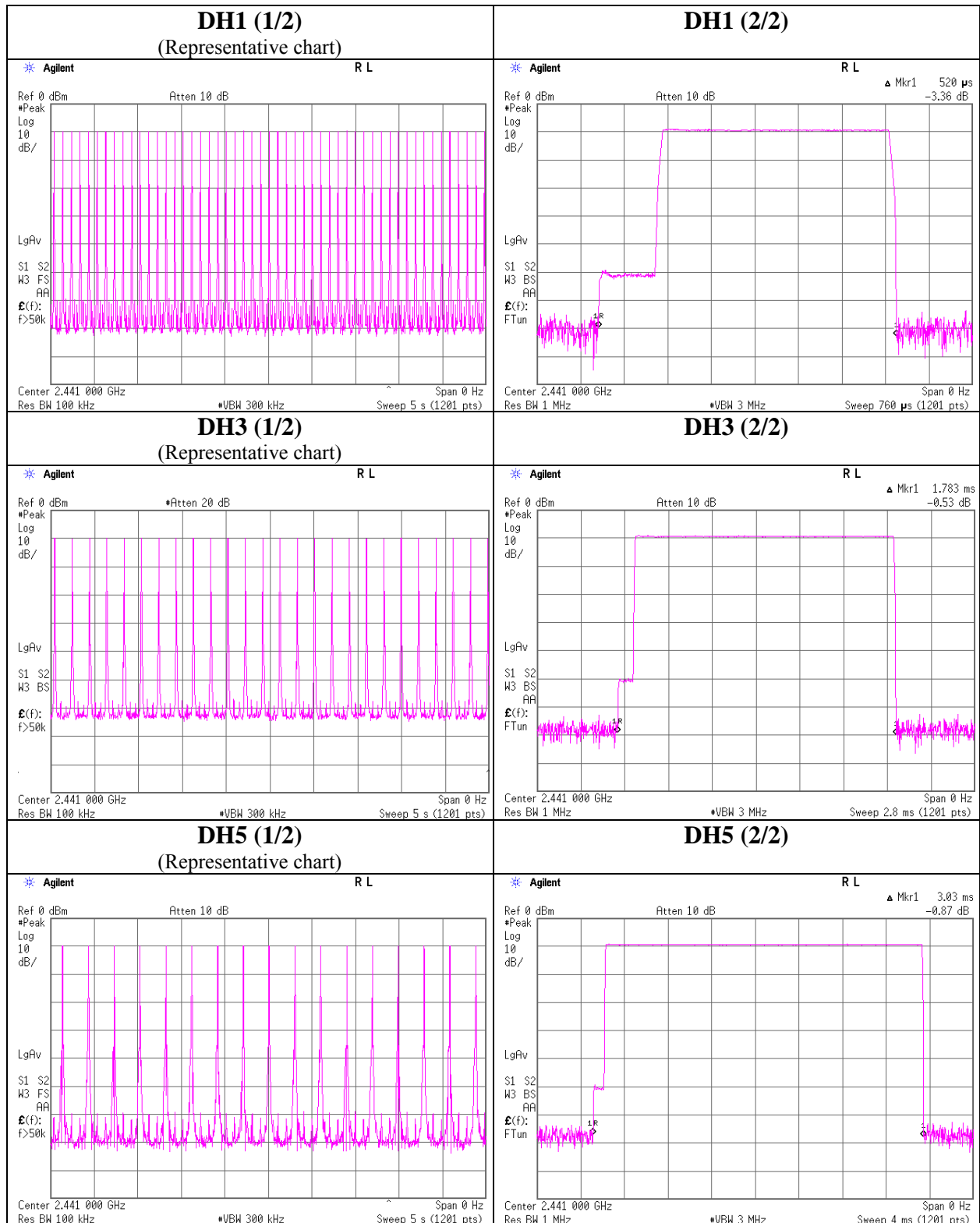
Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

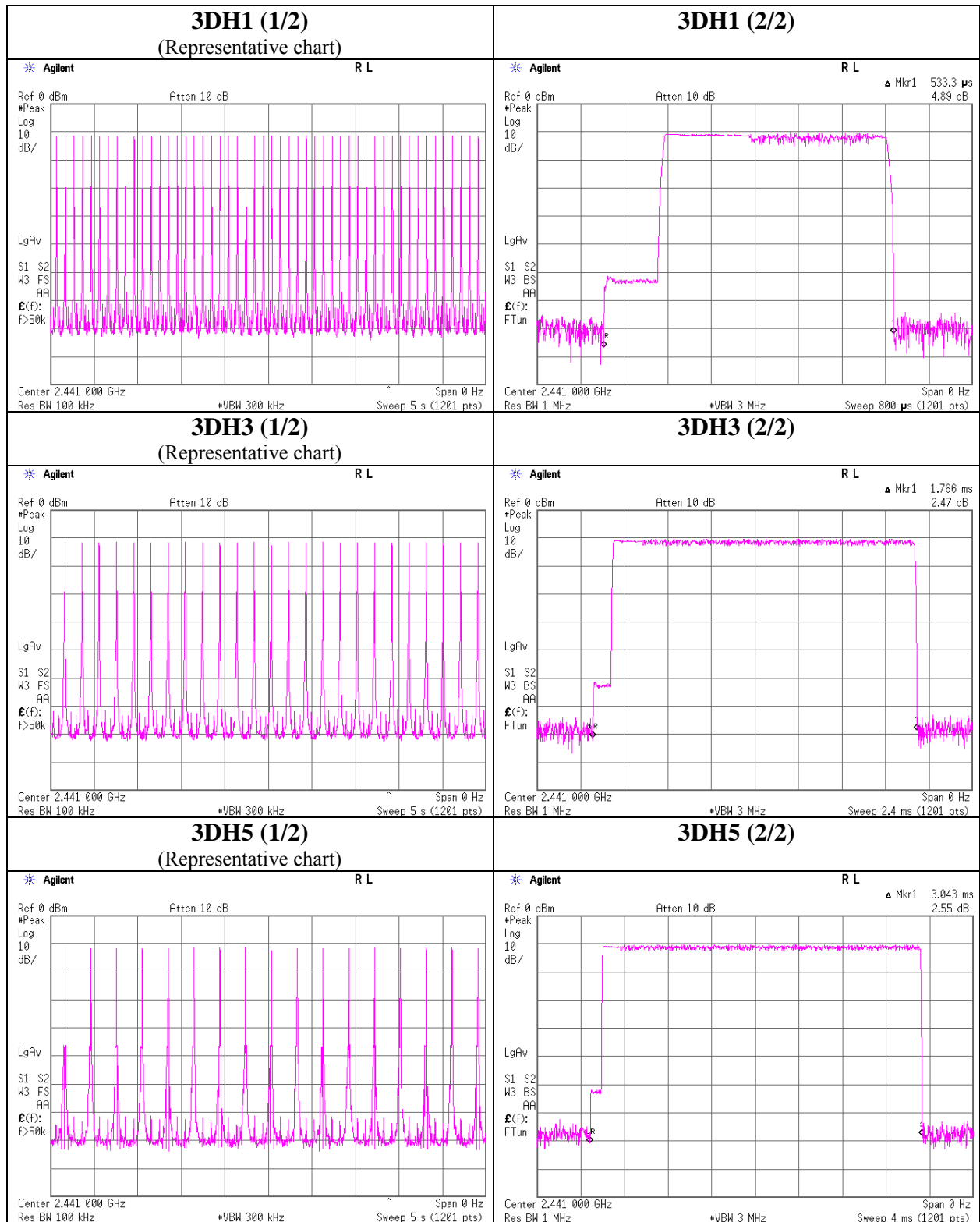
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than $0.4s$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



Dwell time



Dwell time



Maximum Peak Output Power

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 32KE0213-HO-03
Date 08/02/2012
Temperature/ Humidity 25deg. C / 68% RH
Engineer Yutaka Yoshida
Mode Tx (Hopping off) DH5/3DH5

| Mode | Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|------|----------------|------------------|-----------------------|----------------|--------|------|-------|------|----------------|
| | | | | | [dBm] | [mW] | [dBm] | [mW] | |
| DH5 | 2402.0 | -8.65 | 1.99 | 10.08 | 3.42 | 2.20 | 20.96 | 125 | 17.54 |
| DH5 | 2441.0 | -9.09 | 2.01 | 10.08 | 3.00 | 2.00 | 20.96 | 125 | 17.96 |
| DH5 | 2480.0 | -9.48 | 2.02 | 10.09 | 2.63 | 1.83 | 20.96 | 125 | 18.33 |
| 3DH5 | 2402.0 | -7.02 | 1.99 | 10.08 | 5.05 | 3.20 | 20.96 | 125 | 15.91 |
| 3DH5 | 2441.0 | -7.29 | 2.01 | 10.08 | 4.80 | 3.02 | 20.96 | 125 | 16.16 |
| 3DH5 | 2480.0 | -7.46 | 2.02 | 10.09 | 4.65 | 2.92 | 20.96 | 125 | 16.31 |

Sample Calculation:

Result = Reading + Cable Loss + 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.

Average Output Power

(for reporting purpose only)

Test place Head Office EMC Lab. No.6 Measurement Room
Report No. 32KE0213-HO-03
Date 08/02/2012
Temperature/ Humidity 25deg. C / 68% RH
Engineer Yutaka Yoshida
Mode Tx (Hopping off) DH5/3DH5

| Mode | Freq. [MHz] | Reading [dBm] | Cable Loss [dB] | Atten. [dB] | Result | | Limit | | Margin [dB] |
|------|----------------|------------------|-----------------------|----------------|--------|------|-------|------|----------------|
| | | | | | [dBm] | [mW] | [dBm] | [mW] | |
| DH5 | 2402.0 | -10.04 | 1.99 | 10.08 | 2.03 | 1.60 | 20.96 | 125 | 18.93 |
| DH5 | 2441.0 | -10.49 | 2.01 | 10.08 | 1.60 | 1.45 | 20.96 | 125 | 19.36 |
| DH5 | 2480.0 | -10.84 | 2.02 | 10.09 | 1.27 | 1.34 | 20.96 | 125 | 19.69 |
| 3DH5 | 2402.0 | -11.04 | 1.99 | 10.08 | 1.03 | 1.27 | 20.96 | 125 | 19.93 |
| 3DH5 | 2441.0 | -11.37 | 2.01 | 10.08 | 0.72 | 1.18 | 20.96 | 125 | 20.24 |
| 3DH5 | 2480.0 | -11.48 | 2.02 | 10.09 | 0.63 | 1.16 | 20.96 | 125 | 20.33 |

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 32KE0213-HO
Date 08/03/2012 08/03/2012
Temperature/ Humidity 21 deg. C / 75% RH 21 deg. C / 75% RH
Engineer Hironobu Ohnishi Takumi Shimada
(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 | 215.999 | QP | 37.0 | 16.6 | 8.3 | 27.9 | 34.0 | 43.5 | 9.5 | |
| Hori | 224.001 | QP | 42.6 | 16.8 | 8.4 | 27.8 | 40.0 | 46.0 | 6.0 | |
| Hori | 266.666 | QP | 39.6 | 17.9 | 8.6 | 27.6 | 38.5 | 46.0 | 7.5 | |
| Hori | 288.002 | QP | 41.1 | 18.6 | 8.8 | 27.6 | 40.9 | 46.0 | 5.1 | |
| Hori | 352.000 | QP | 33.1 | 16.0 | 9.2 | 28.0 | 30.3 | 46.0 | 15.7 | |
| Hori | 1601.977 | PK | 48.5 | 26.5 | 1.8 | 35.3 | 41.5 | 73.9 | 32.4 | |
| Hori | 2390.000 | PK | 47.1 | 27.4 | 2.2 | 34.8 | 41.9 | 73.9 | 32.0 | |
| Hori | 4804.000 | PK | 46.2 | 31.2 | 4.0 | 34.0 | 47.4 | 73.9 | 26.5 | |
| Hori | 7206.000 | PK | 44.3 | 35.9 | 4.6 | 34.2 | 50.6 | 73.9 | 23.3 | No signal |
| Hori | 9608.000 | PK | 46.1 | 38.8 | 5.3 | 34.7 | 55.5 | 73.9 | 18.4 | No signal |
| Hori | 24020.000 | PK | 46.4 | 40.5 | -1.7 | 31.7 | 53.5 | 73.9 | 20.4 | No signal |
| Hori | 1601.977 | AV | 39.3 | 26.5 | 1.8 | 35.3 | 32.3 | 53.9 | 21.6 | |
| Hori | 2390.000 | AV | 34.1 | 27.4 | 2.2 | 34.8 | 28.9 | 53.9 | 25.0 | |
| Hori | 4804.000 | AV | 37.6 | 31.2 | 4.0 | 34.0 | 38.8 | 53.9 | 15.1 | |
| Hori | 7206.000 | AV | 31.5 | 35.9 | 4.6 | 34.2 | 37.8 | 53.9 | 16.1 | No signal |
| Hori | 9608.000 | AV | 33.1 | 38.8 | 5.3 | 34.7 | 42.5 | 53.9 | 11.4 | No signal |
| Hori | 24020.000 | AV | 33.5 | 40.5 | -1.7 | 31.7 | 40.6 | 53.9 | 13.3 | No signal |
| Vert | 215.999 | QP | 32.1 | 16.6 | 8.3 | 27.9 | 29.1 | 43.5 | 14.4 | |
| Vert | 224.001 | QP | 38.9 | 16.8 | 8.4 | 27.8 | 36.3 | 46.0 | 9.7 | |
| Vert | 266.666 | QP | 38.9 | 17.9 | 8.6 | 27.6 | 37.8 | 46.0 | 8.2 | |
| Vert | 288.002 | QP | 38.8 | 18.6 | 8.8 | 27.6 | 38.6 | 46.0 | 7.4 | |
| Vert | 352.000 | QP | 31.1 | 16.0 | 9.2 | 28.0 | 28.3 | 46.0 | 17.7 | |
| Vert | 1601.977 | PK | 48.9 | 26.5 | 1.8 | 35.3 | 41.9 | 73.9 | 32.0 | |
| Vert | 2390.000 | PK | 45.6 | 27.4 | 2.2 | 34.8 | 40.4 | 73.9 | 33.5 | |
| Vert | 4804.000 | PK | 45.5 | 31.2 | 4.0 | 34.0 | 46.7 | 73.9 | 27.2 | |
| Vert | 7206.000 | PK | 44.5 | 35.9 | 4.6 | 34.2 | 50.8 | 73.9 | 23.1 | No signal |
| Vert | 9608.000 | PK | 46.6 | 38.8 | 5.3 | 34.7 | 56.0 | 73.9 | 17.9 | No signal |
| Vert | 24020.000 | PK | 46.0 | 40.5 | -1.7 | 31.7 | 53.1 | 73.9 | 20.8 | No signal |
| Vert | 1601.977 | AV | 42.0 | 26.5 | 1.8 | 35.3 | 35.0 | 53.9 | 18.9 | |
| Vert | 2390.000 | AV | 33.2 | 27.4 | 2.2 | 34.8 | 28.0 | 53.9 | 25.9 | |
| Vert | 4804.000 | AV | 37.1 | 31.2 | 4.0 | 34.0 | 38.3 | 53.9 | 15.6 | |
| Vert | 7206.000 | AV | 31.5 | 35.9 | 4.6 | 34.2 | 37.8 | 53.9 | 16.1 | No signal |
| Vert | 9608.000 | AV | 33.0 | 38.8 | 5.3 | 34.7 | 42.4 | 53.9 | 11.5 | No signal |
| Vert | 24020.000 | AV | 33.4 | 40.5 | -1.7 | 31.7 | 40.5 | 53.9 | 13.4 | No signal |

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
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 32KE0213-HO
Date 08/03/2012 08/03/2012
Temperature/ Humidity 21 deg. C / 75% RH 21 deg. C / 75% RH
Engineer Hironobu Ohnishi Takumi Shimada
(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 | 215.999 | QP | 36.8 | 16.6 | 8.3 | 27.9 | 33.8 | 43.5 | 9.7 | |
| Hori | 224.007 | QP | 42.4 | 16.8 | 8.4 | 27.8 | 39.8 | 46.0 | 6.2 | |
| Hori | 266.666 | QP | 39.4 | 17.9 | 8.6 | 27.6 | 38.3 | 46.0 | 7.7 | |
| Hori | 288.003 | QP | 41.2 | 18.6 | 8.8 | 27.6 | 41.0 | 46.0 | 5.0 | |
| Hori | 352.001 | QP | 33.3 | 16.0 | 9.2 | 28.0 | 30.5 | 46.0 | 15.5 | |
| Hori | 1626.644 | PK | 48.0 | 26.6 | 1.8 | 35.3 | 41.1 | 73.9 | 32.8 | |
| Hori | 4882.000 | PK | 48.7 | 31.4 | 3.9 | 34.0 | 50.0 | 73.9 | 23.9 | |
| Hori | 7323.000 | PK | 42.9 | 36.0 | 4.7 | 34.2 | 49.4 | 73.9 | 24.5 | No signal |
| Hori | 9764.000 | PK | 45.0 | 39.0 | 5.3 | 34.7 | 54.6 | 73.9 | 19.3 | No signal |
| Hori | 24410.000 | PK | 47.1 | 40.5 | -1.7 | 32.2 | 53.7 | 73.9 | 20.2 | No signal |
| Hori | 1626.644 | AV | 39.9 | 26.6 | 1.8 | 35.3 | 33.0 | 53.9 | 20.9 | |
| Hori | 4882.000 | AV | 41.5 | 31.4 | 3.9 | 34.0 | 42.8 | 53.9 | 11.1 | |
| Hori | 7323.000 | AV | 31.0 | 36.0 | 4.7 | 34.2 | 37.5 | 53.9 | 16.4 | No signal |
| Hori | 9764.000 | AV | 33.0 | 39.0 | 5.3 | 34.7 | 42.6 | 53.9 | 11.3 | No signal |
| Hori | 24410.000 | AV | 34.4 | 40.5 | -1.7 | 32.2 | 41.0 | 53.9 | 12.9 | No signal |
| Vert | 215.999 | QP | 32.3 | 16.6 | 8.3 | 27.9 | 29.3 | 43.5 | 14.2 | |
| Vert | 224.007 | QP | 39.0 | 16.8 | 8.4 | 27.8 | 36.4 | 46.0 | 9.6 | |
| Vert | 266.666 | QP | 38.6 | 17.9 | 8.6 | 27.6 | 37.5 | 46.0 | 8.5 | |
| Vert | 288.003 | QP | 38.9 | 18.6 | 8.8 | 27.6 | 38.7 | 46.0 | 7.3 | |
| Vert | 352.001 | QP | 31.0 | 16.0 | 9.2 | 28.0 | 28.2 | 46.0 | 17.8 | |
| Vert | 1626.644 | PK | 48.8 | 26.6 | 1.8 | 35.3 | 41.9 | 73.9 | 32.0 | |
| Vert | 4882.000 | PK | 47.0 | 31.4 | 3.9 | 34.0 | 48.3 | 73.9 | 25.6 | |
| Vert | 7323.000 | PK | 43.3 | 36.0 | 4.7 | 34.2 | 49.8 | 73.9 | 24.1 | No signal |
| Vert | 9764.000 | PK | 45.2 | 39.0 | 5.3 | 34.7 | 54.8 | 73.9 | 19.1 | No signal |
| Vert | 24410.000 | PK | 47.0 | 40.5 | -1.7 | 32.2 | 53.6 | 73.9 | 20.3 | No signal |
| Vert | 1626.644 | AV | 42.1 | 26.6 | 1.8 | 35.3 | 35.2 | 53.9 | 18.7 | |
| Vert | 4882.000 | AV | 39.6 | 31.4 | 3.9 | 34.0 | 40.9 | 53.9 | 13.0 | |
| Vert | 7323.000 | AV | 31.1 | 36.0 | 4.7 | 34.2 | 37.6 | 53.9 | 16.3 | No signal |
| Vert | 9764.000 | AV | 32.8 | 39.0 | 5.3 | 34.7 | 42.4 | 53.9 | 11.5 | No signal |
| Vert | 24410.000 | AV | 34.4 | 40.5 | -1.7 | 32.2 | 41.0 | 53.9 | 12.9 | No signal |

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 $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$
26.5GHz-40GHz $20\log(3.0\text{m}/0.5\text{m})=15.6\text{dB}$

Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 32KE0213-HO
Date 08/03/2012 08/03/2012
Temperature/ Humidity 21 deg. C / 75% RH 21 deg. C / 75% RH
Engineer Hironobu Ohnishi Takumi Shimada
(Above 1GHz) (Below 1GHz)
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 | 215.999 | QP | 46.1 | 16.6 | 8.3 | 27.9 | 43.1 | 43.5 | 0.4 | |
| Hori | 224.007 | QP | 46.2 | 16.8 | 8.4 | 27.8 | 43.6 | 46.0 | 2.4 | |
| Hori | 256.008 | QP | 44.6 | 17.6 | 8.6 | 27.6 | 43.2 | 46.0 | 2.8 | |
| Hori | 288.002 | QP | 45.5 | 18.6 | 8.8 | 27.6 | 45.3 | 46.0 | 0.7 | |
| Hori | 352.009 | QP | 37.8 | 16.0 | 9.2 | 28.0 | 35.0 | 46.0 | 11.0 | |
| Hori | 1652.642 | PK | 49.2 | 26.6 | 1.8 | 35.3 | 42.3 | 73.9 | 31.6 | |
| Hori | 2483.500 | PK | 60.2 | 27.5 | 2.3 | 34.8 | 55.2 | 73.9 | 18.7 | |
| Hori | 3305.284 | PK | 46.0 | 29.1 | 2.7 | 34.3 | 43.5 | 73.9 | 30.4 | |
| Hori | 4960.000 | PK | 43.7 | 31.6 | 4.0 | 34.0 | 45.3 | 73.9 | 28.6 | |
| Hori | 7440.000 | PK | 42.7 | 36.2 | 4.7 | 34.3 | 49.3 | 73.9 | 24.6 | No signal |
| Hori | 9920.000 | PK | 45.0 | 39.1 | 5.4 | 34.7 | 54.8 | 73.9 | 19.1 | No signal |
| Hori | 24800.000 | PK | 48.7 | 40.6 | -1.6 | 32.7 | 55.0 | 73.9 | 18.9 | No signal |
| Hori | 1652.642 | AV | 41.2 | 26.6 | 1.8 | 35.3 | 34.3 | 53.9 | 19.6 | |
| Hori | 2483.500 | AV | 46.2 | 27.5 | 2.3 | 34.8 | 41.2 | 53.9 | 12.7 | |
| Hori | 3305.284 | AV | 36.5 | 29.1 | 2.7 | 34.3 | 34.0 | 53.9 | 19.9 | |
| Hori | 4960.000 | AV | 31.7 | 31.6 | 4.0 | 34.0 | 33.3 | 53.9 | 20.6 | |
| Hori | 7440.000 | AV | 30.8 | 36.2 | 4.7 | 34.3 | 37.4 | 53.9 | 16.5 | No signal |
| Hori | 9920.000 | AV | 32.6 | 39.1 | 5.4 | 34.7 | 42.4 | 53.9 | 11.5 | No signal |
| Hori | 24800.000 | AV | 35.7 | 40.6 | -1.6 | 32.7 | 42.0 | 53.9 | 11.9 | No signal |
| Vert | 215.999 | QP | 43.3 | 16.6 | 8.3 | 27.9 | 40.3 | 43.5 | 3.2 | |
| Vert | 224.007 | QP | 43.5 | 16.8 | 8.4 | 27.8 | 40.9 | 46.0 | 5.1 | |
| Vert | 256.008 | QP | 45.1 | 17.6 | 8.6 | 27.6 | 43.7 | 46.0 | 2.3 | |
| Vert | 288.002 | QP | 43.2 | 18.6 | 8.8 | 27.6 | 43.0 | 46.0 | 3.0 | |
| Vert | 352.009 | QP | 36.0 | 16.0 | 9.2 | 28.0 | 33.2 | 46.0 | 12.8 | |
| Vert | 1652.642 | PK | 49.4 | 26.6 | 1.8 | 35.3 | 42.5 | 73.9 | 31.4 | |
| Vert | 2483.500 | PK | 58.1 | 27.5 | 2.3 | 34.8 | 53.1 | 73.9 | 20.8 | |
| Vert | 3305.284 | PK | 46.7 | 29.1 | 2.7 | 34.3 | 44.2 | 73.9 | 29.7 | |
| Vert | 4960.000 | PK | 44.4 | 31.6 | 4.0 | 34.0 | 46.0 | 73.9 | 27.9 | |
| Vert | 7440.000 | PK | 43.3 | 36.2 | 4.7 | 34.3 | 49.9 | 73.9 | 24.0 | No signal |
| Vert | 9920.000 | PK | 44.7 | 39.1 | 5.4 | 34.7 | 54.5 | 73.9 | 19.4 | No signal |
| Vert | 24800.000 | PK | 48.2 | 40.6 | -1.6 | 32.7 | 54.5 | 73.9 | 19.4 | No signal |
| Vert | 1652.642 | AV | 42.4 | 26.6 | 1.8 | 35.3 | 35.5 | 53.9 | 18.4 | |
| Vert | 2483.500 | AV | 44.2 | 27.5 | 2.3 | 34.8 | 39.2 | 53.9 | 14.7 | |
| Vert | 3305.284 | AV | 35.8 | 29.1 | 2.7 | 34.3 | 33.3 | 53.9 | 20.6 | |
| Vert | 4960.000 | AV | 31.6 | 31.6 | 4.0 | 34.0 | 33.2 | 53.9 | 20.7 | |
| Vert | 7440.000 | AV | 30.8 | 36.2 | 4.7 | 34.3 | 37.4 | 53.9 | 16.5 | No signal |
| Vert | 9920.000 | AV | 32.6 | 39.1 | 5.4 | 34.7 | 42.4 | 53.9 | 11.5 | No signal |
| Vert | 24800.000 | AV | 35.7 | 40.6 | -1.6 | 32.7 | 42.0 | 53.9 | 11.9 | No signal |

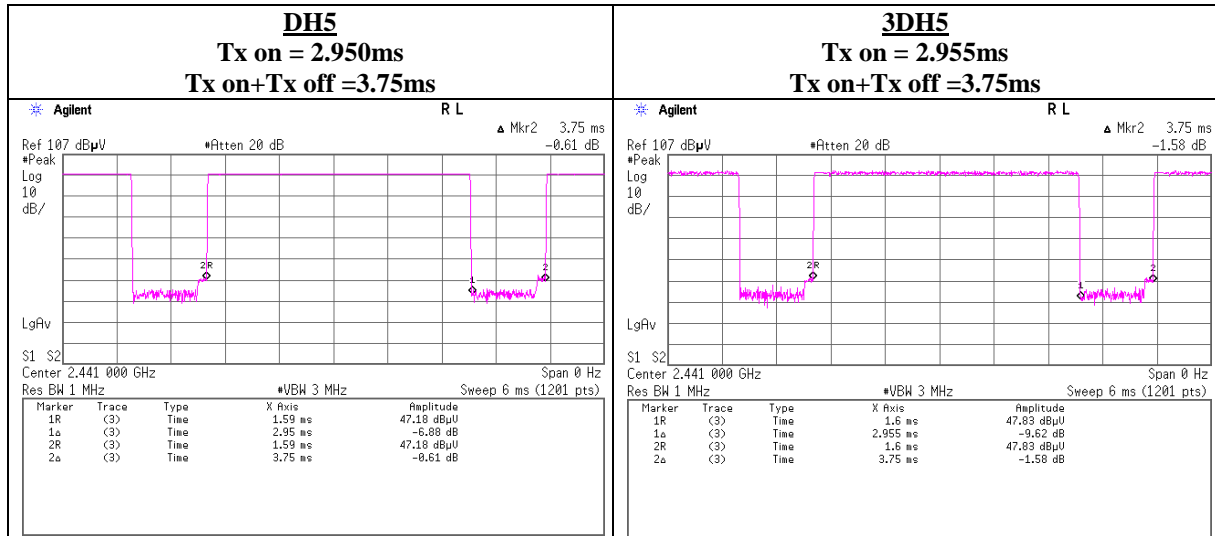
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

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

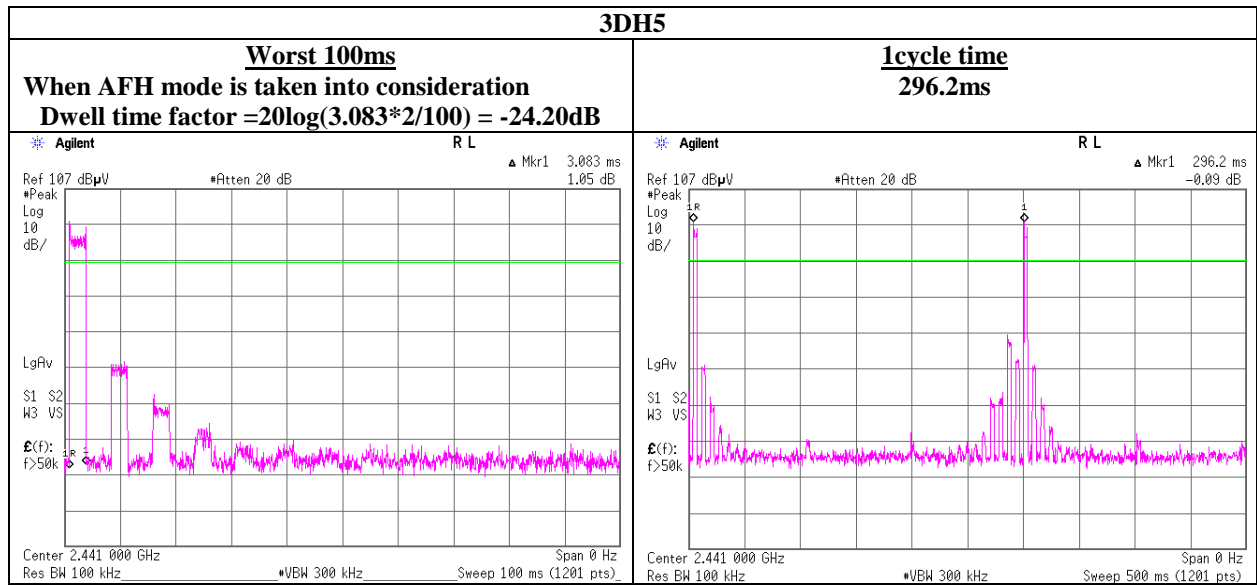
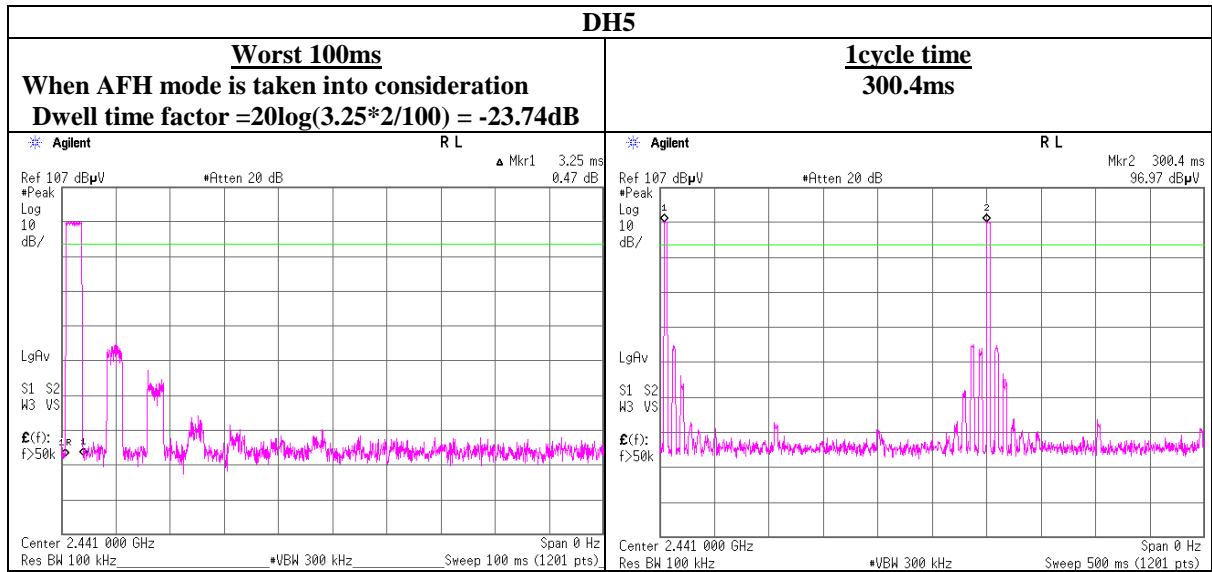
*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Duty Cycle



Dwell time factor



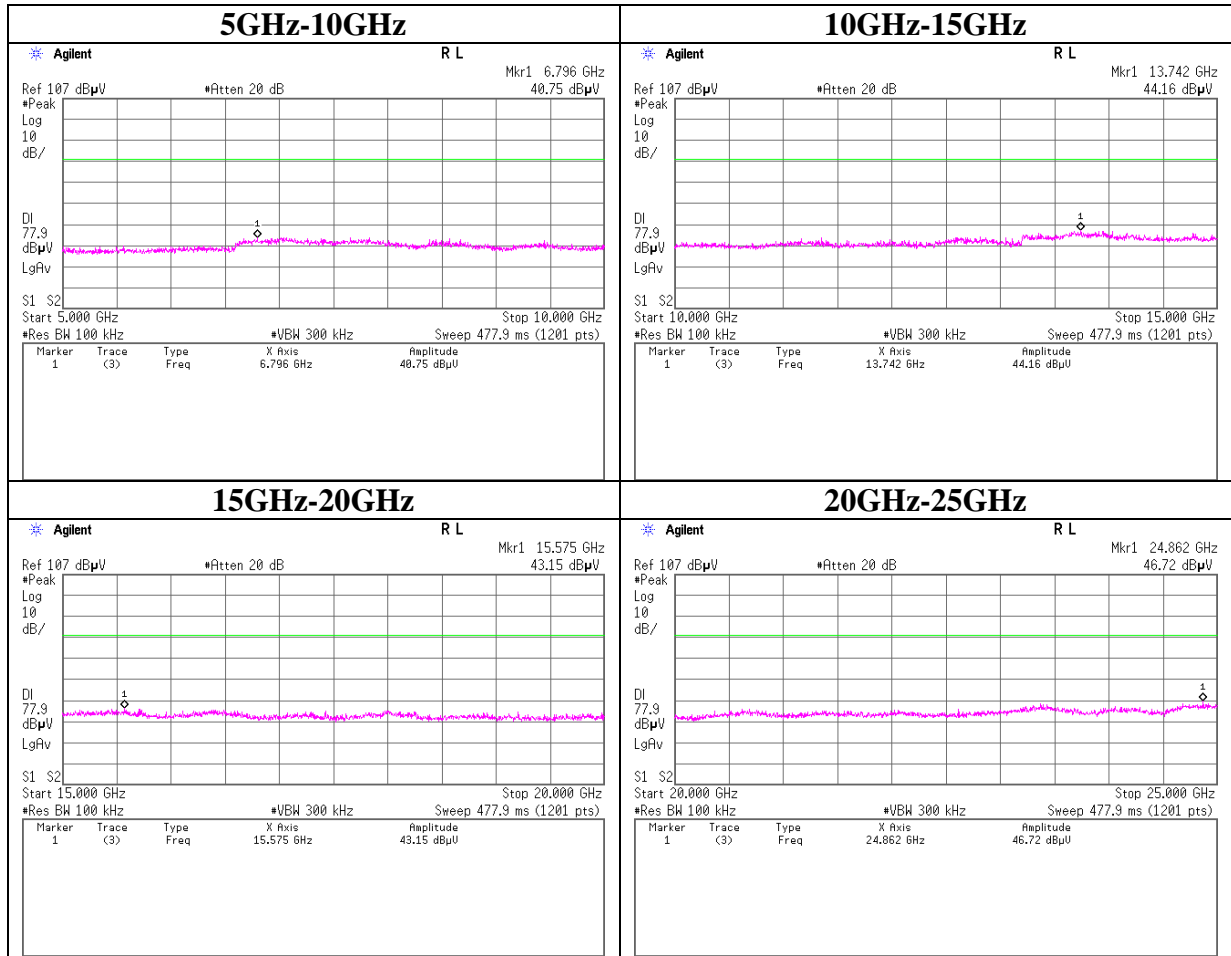
Conducted Spurious Emission

Tx DH5 2402MHz



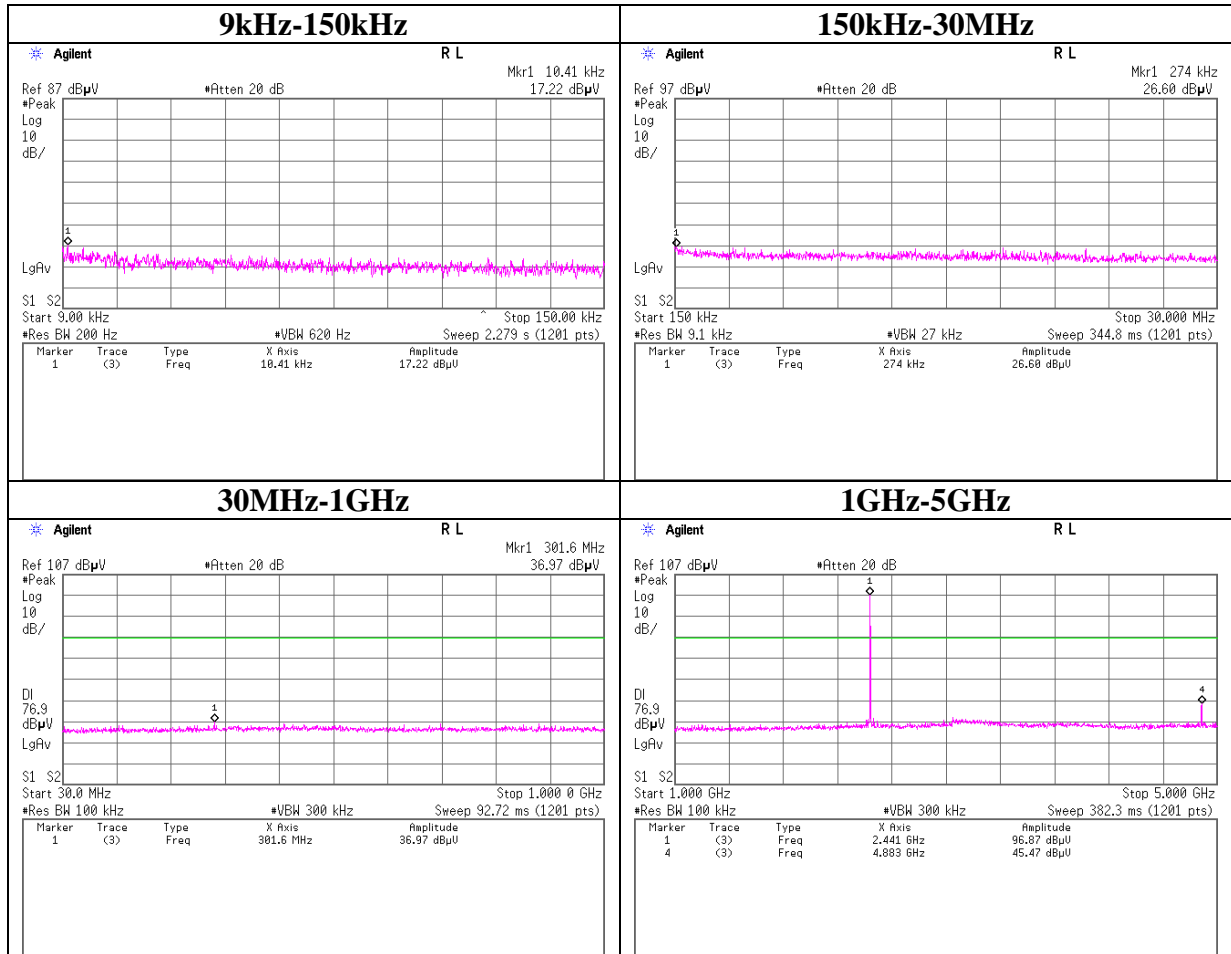
Conducted Spurious Emission

Tx DH5 2402MHz



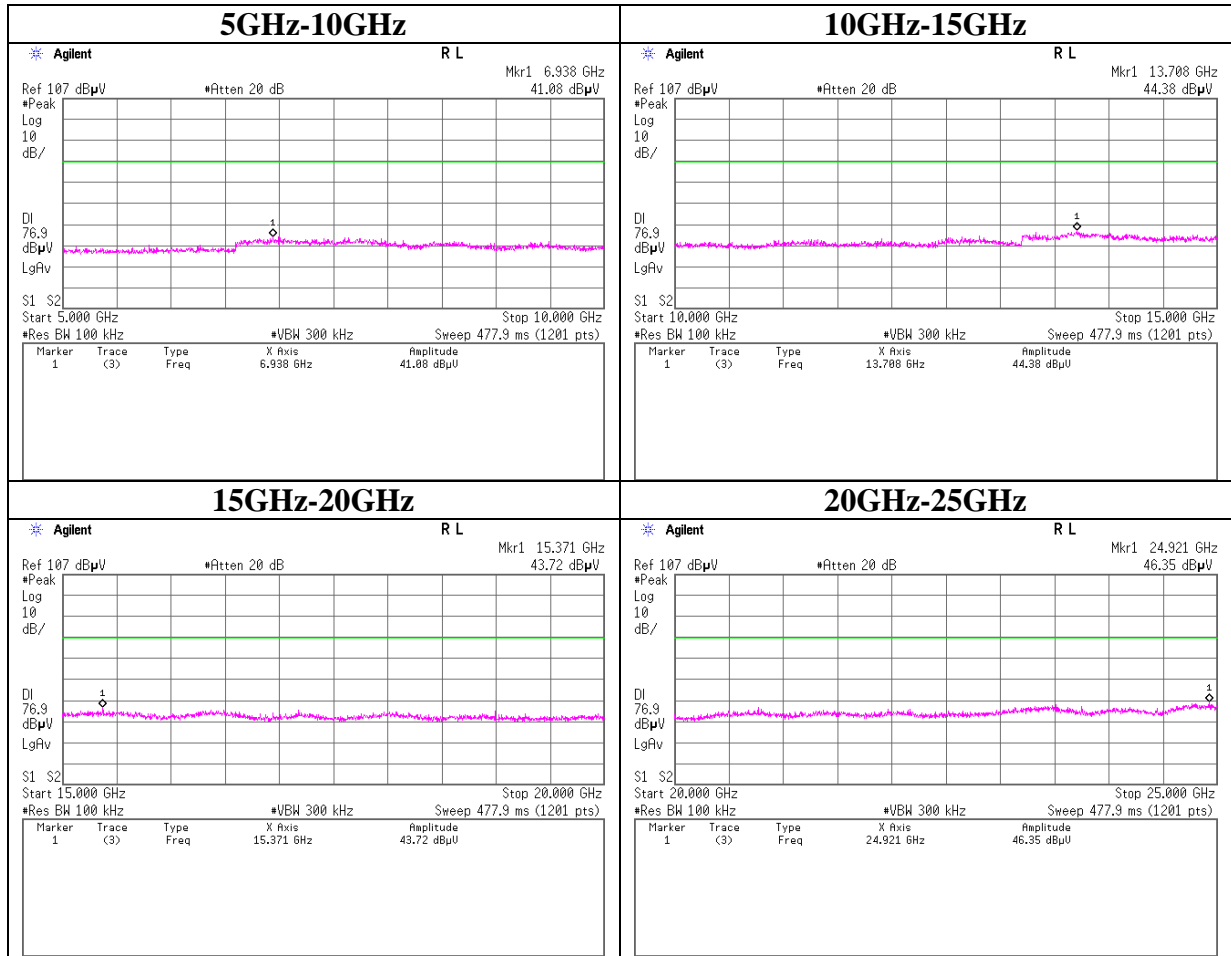
Conducted Spurious Emission

Tx DH5 2441MHz



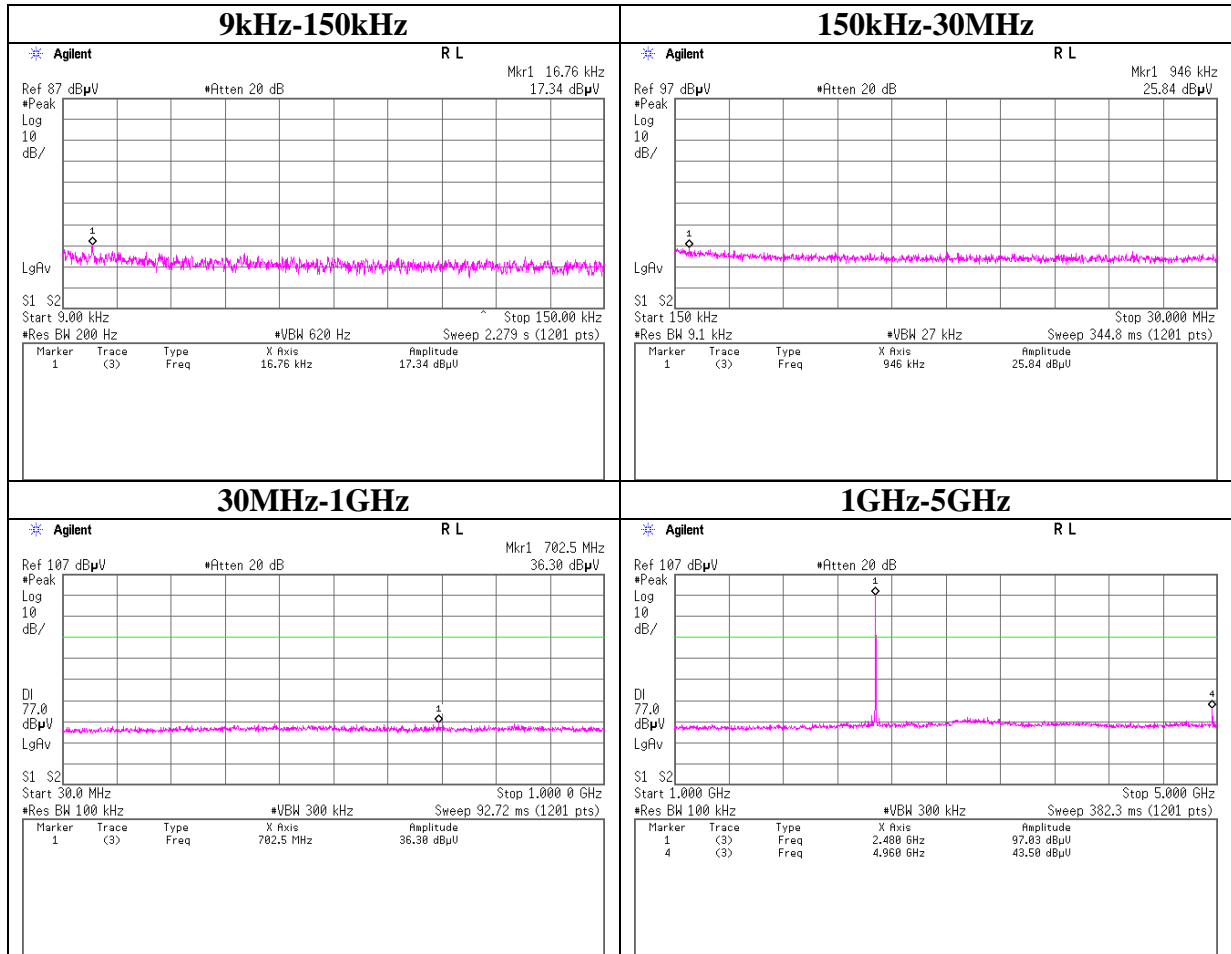
Conducted Spurious Emission

Tx DH5 2441MHz



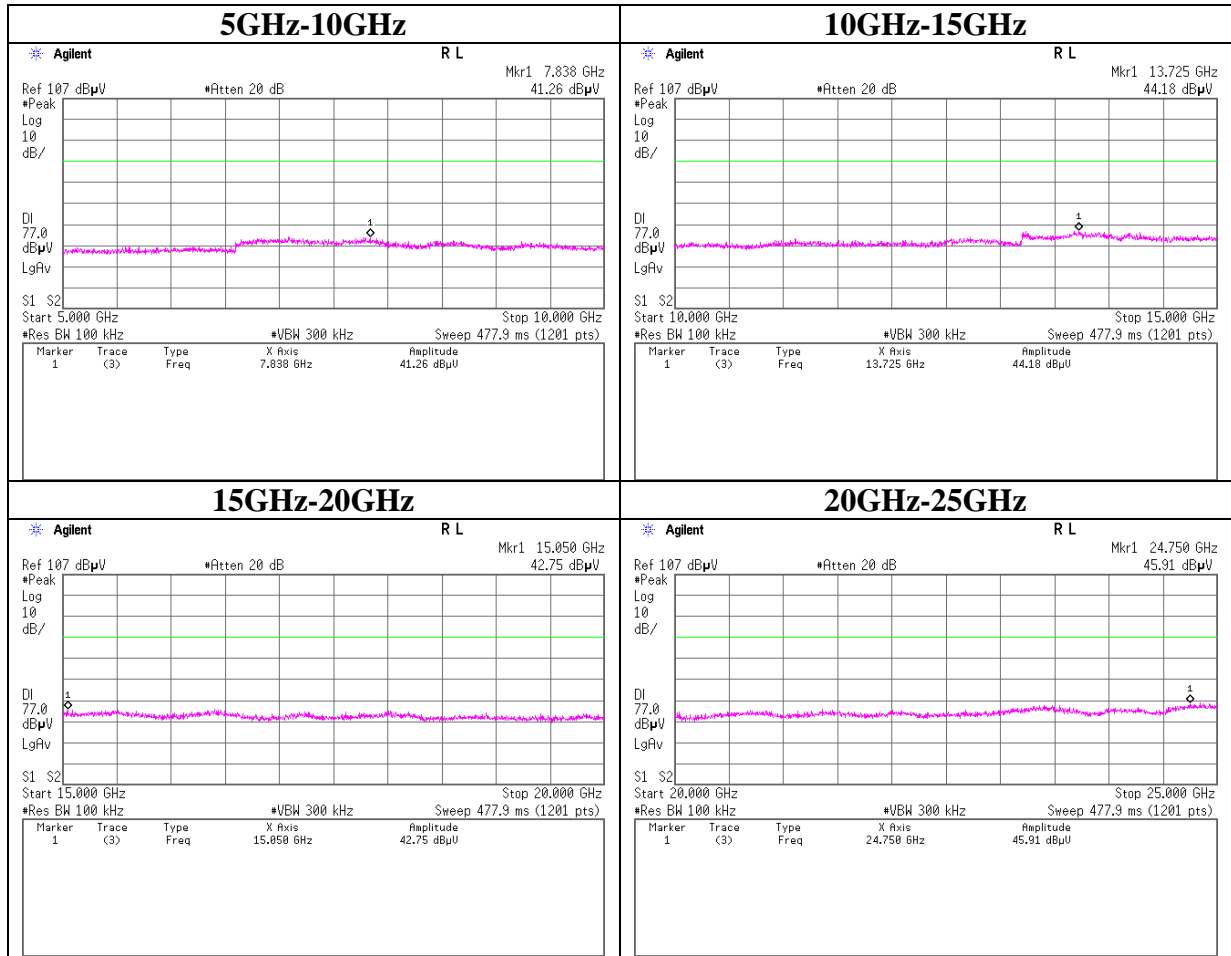
Conducted Spurious Emission

Tx DH5 2480MHz



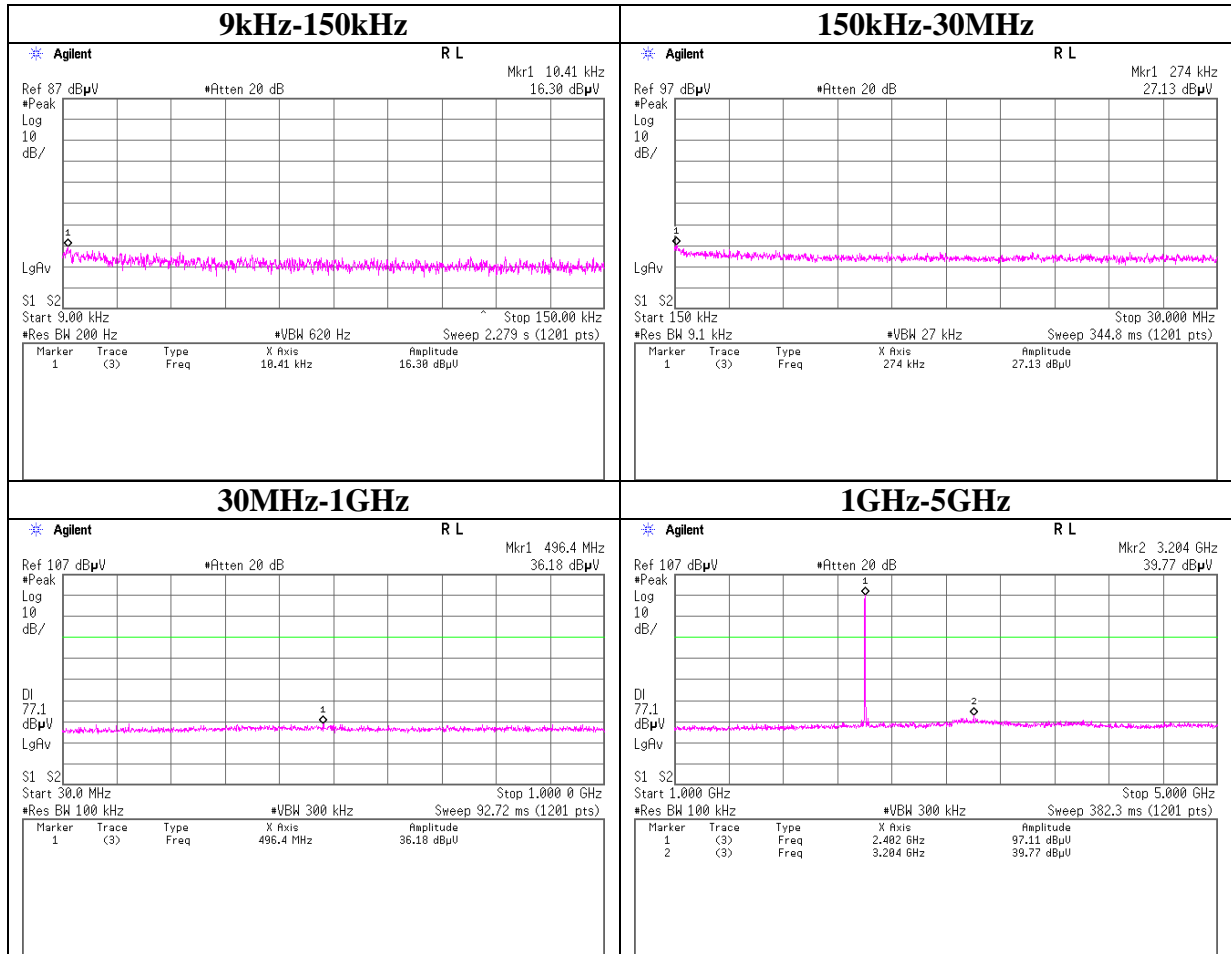
Conducted Spurious Emission

Tx DH5 2480MHz



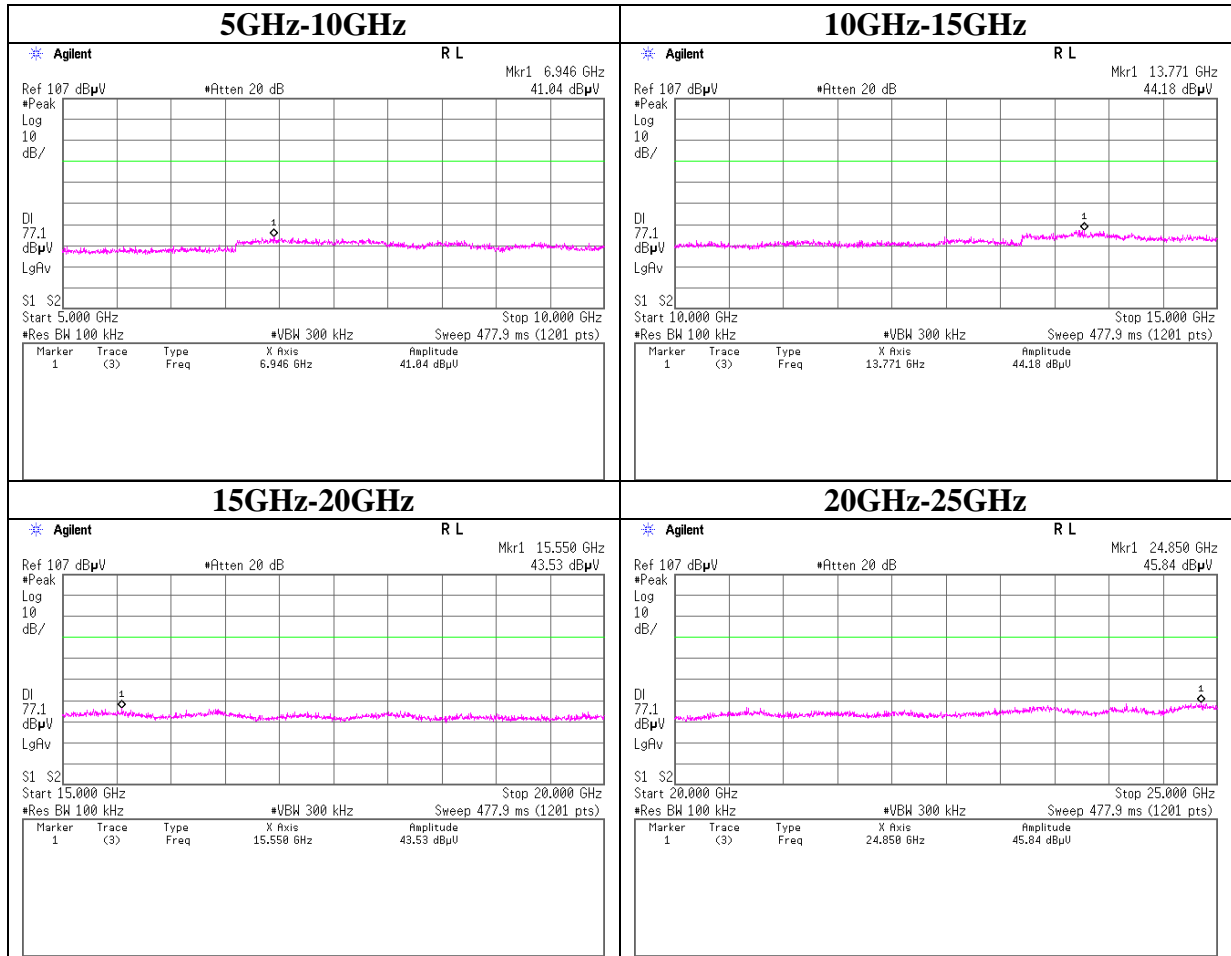
Conducted Spurious Emission

Tx 3DH5 2402MHz



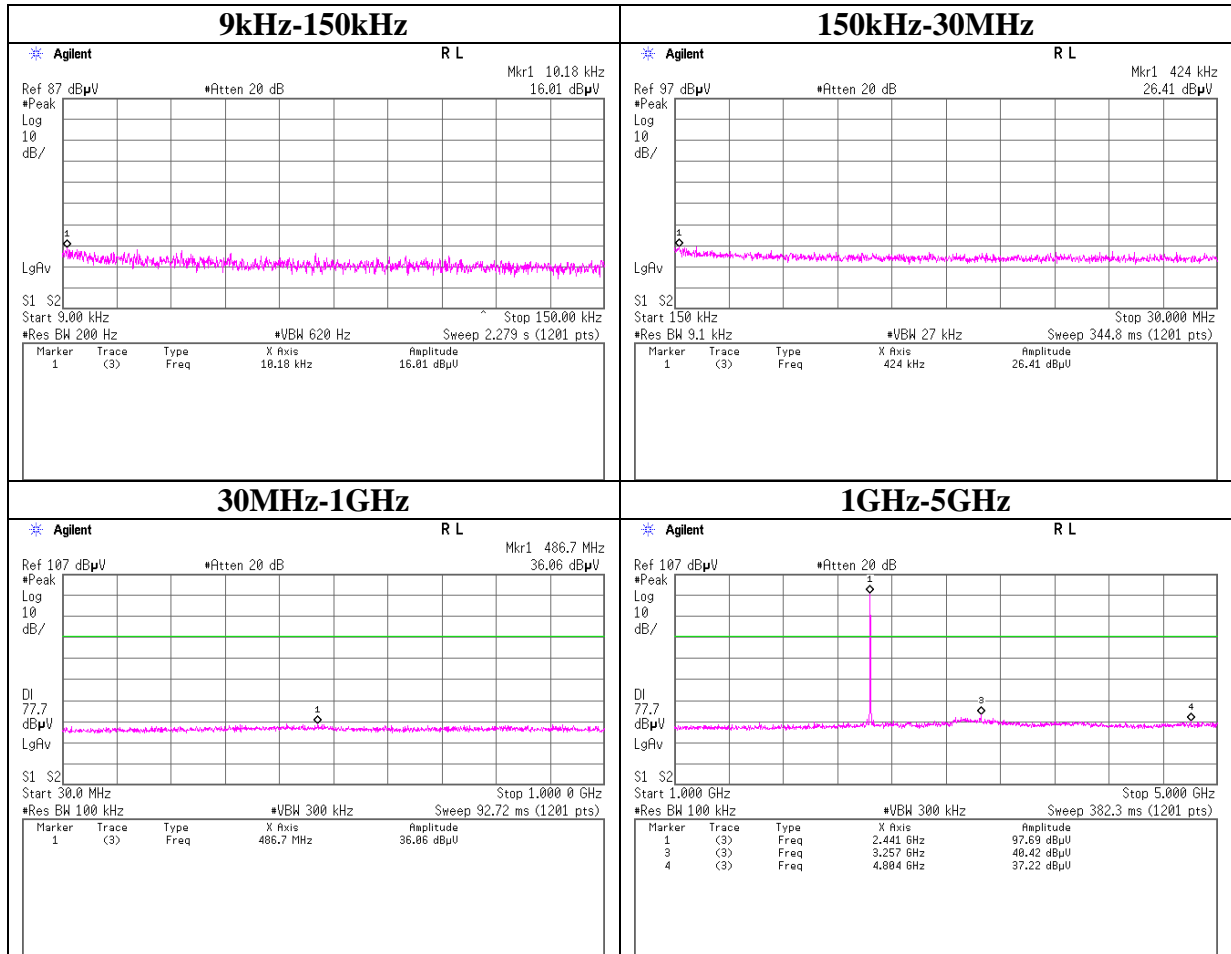
Conducted Spurious Emission

Tx 3DH5 2402MHz



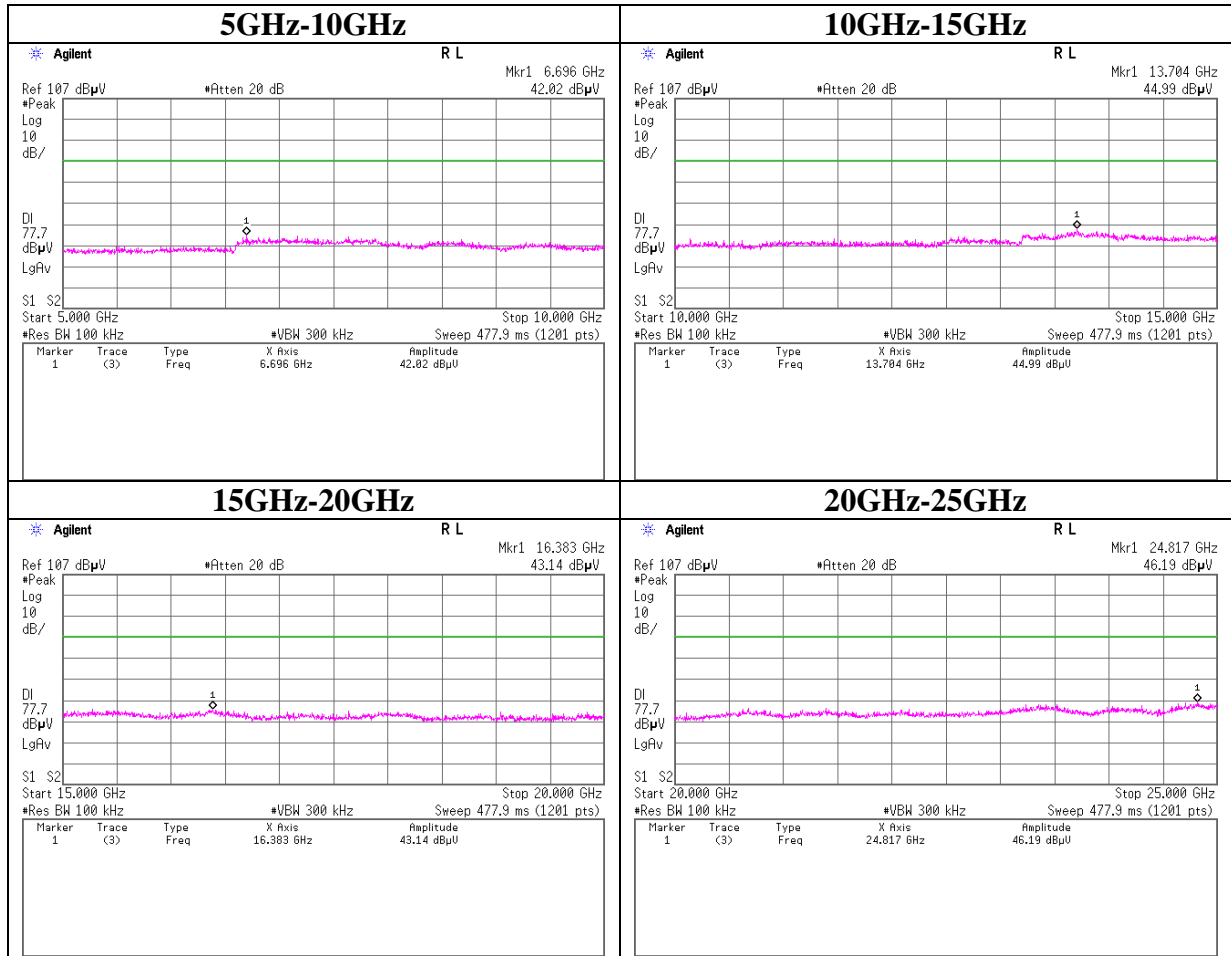
Conducted Spurious Emission

Tx 3DH5 2441MHz



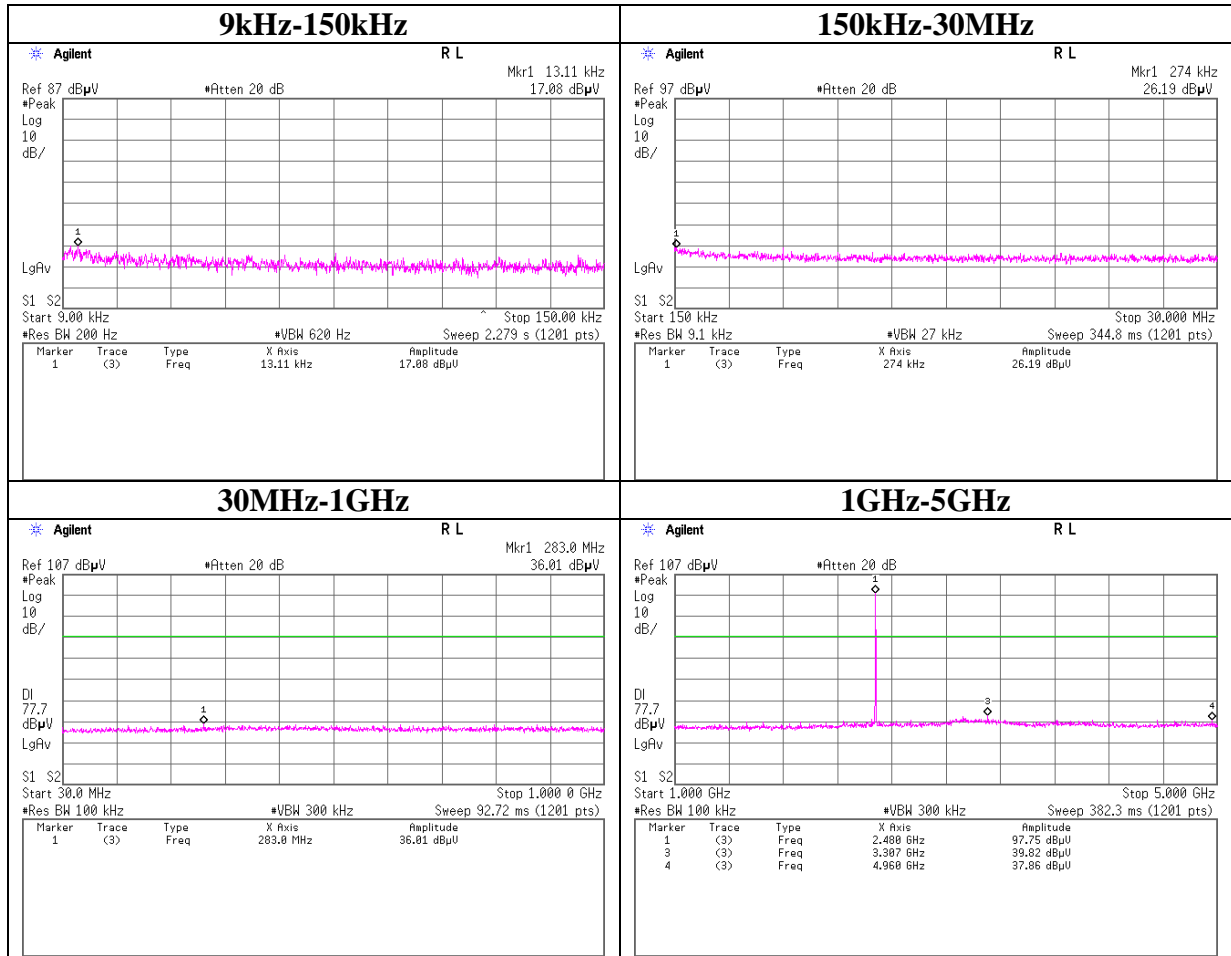
Conducted Spurious Emission

Tx 3DH5 2441MHz



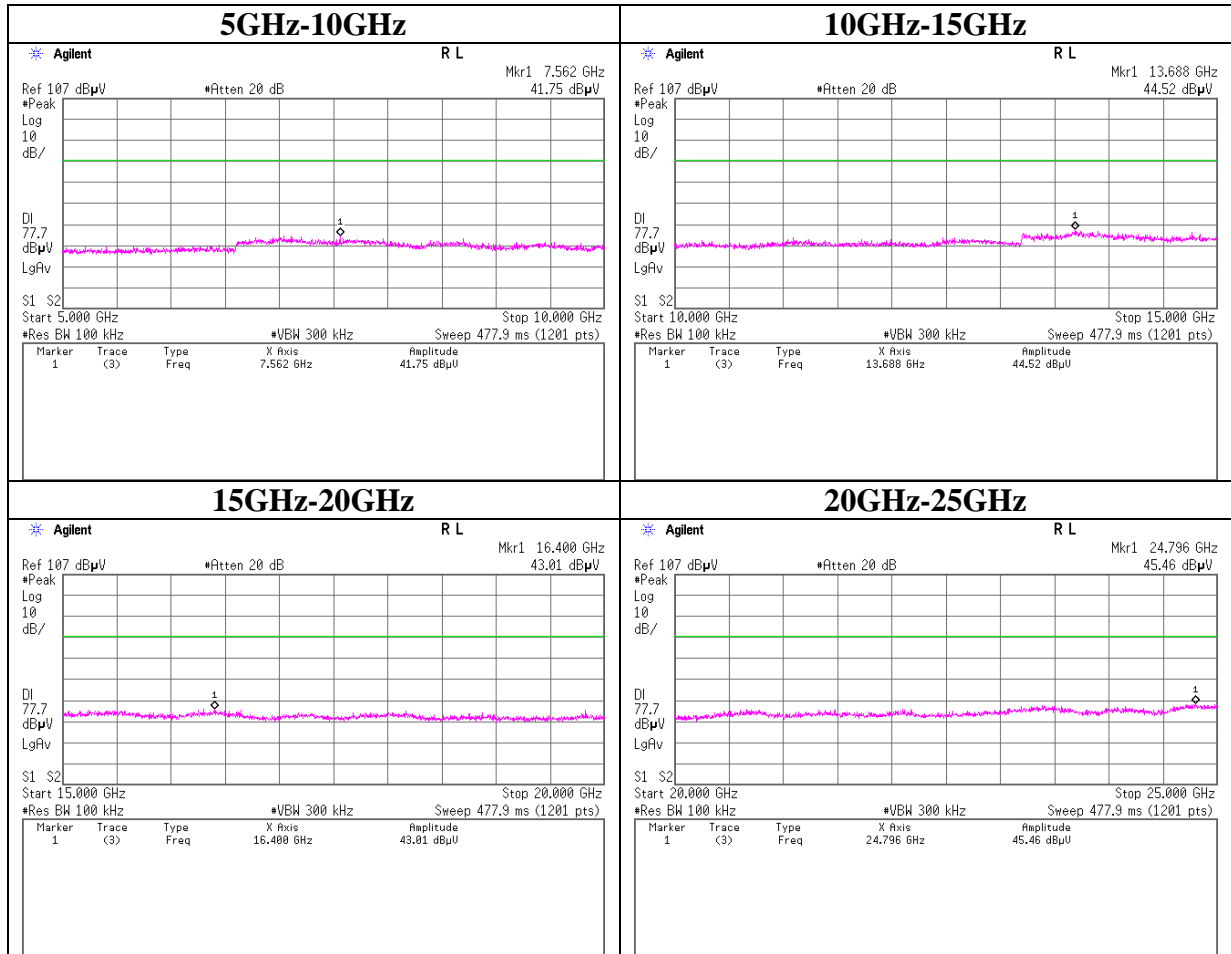
Conducted Spurious Emission

Tx 3DH5 2480MHz



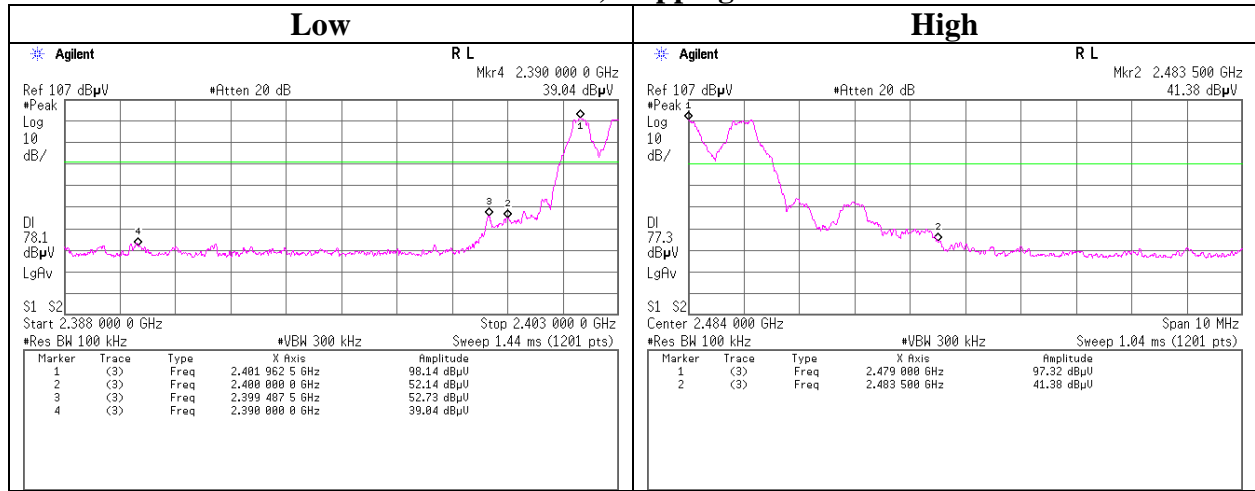
Conducted Spurious Emission

Tx 3DH5 2480MHz

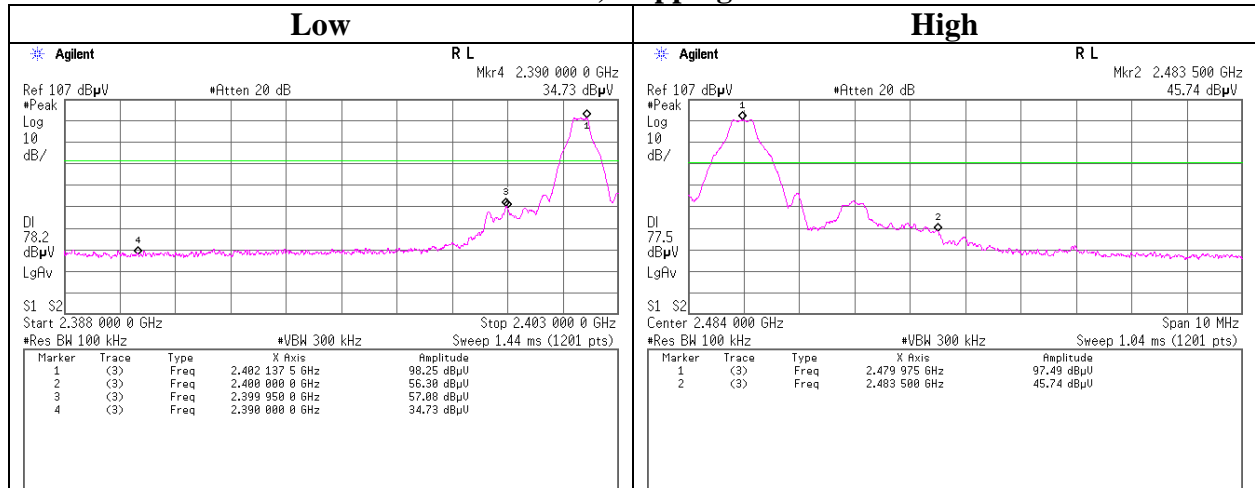


Conducted Emission Band Edge compliance

Tx DH5, Hopping on

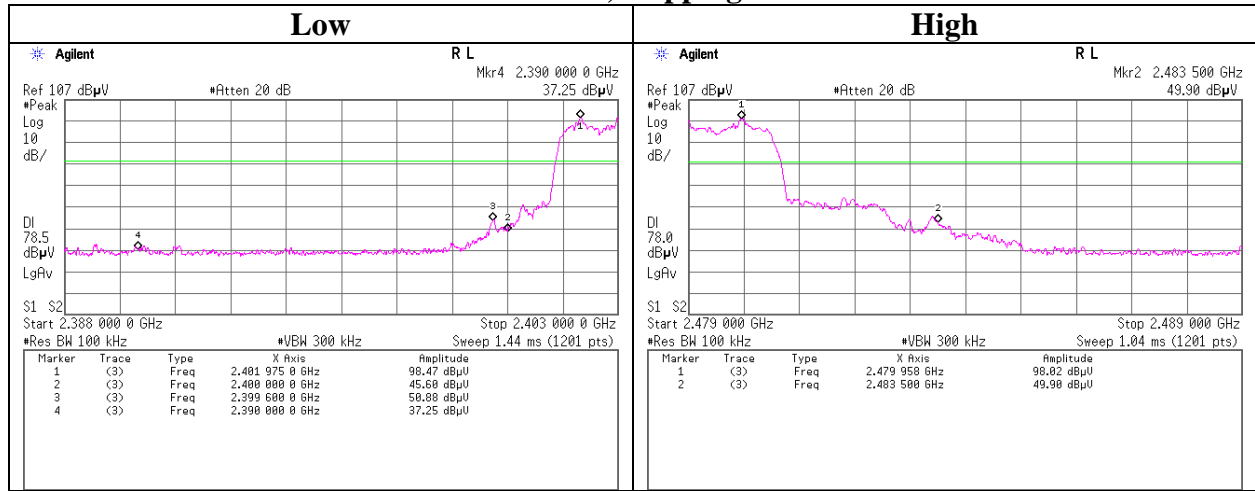


Tx DH5, Hopping off

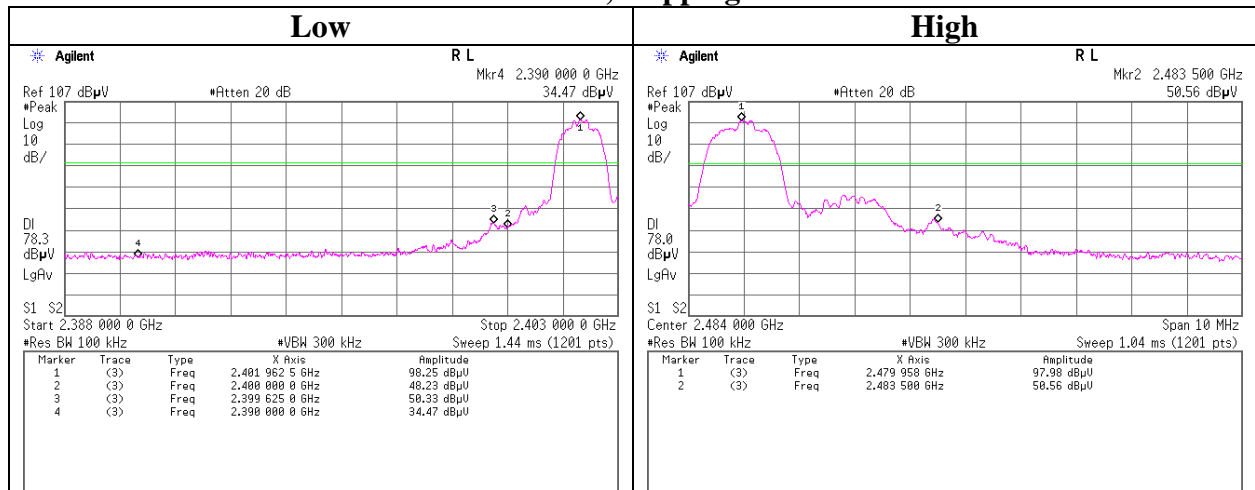


Conducted Emission Band Edge compliance

Tx 3DH5, Hopping on



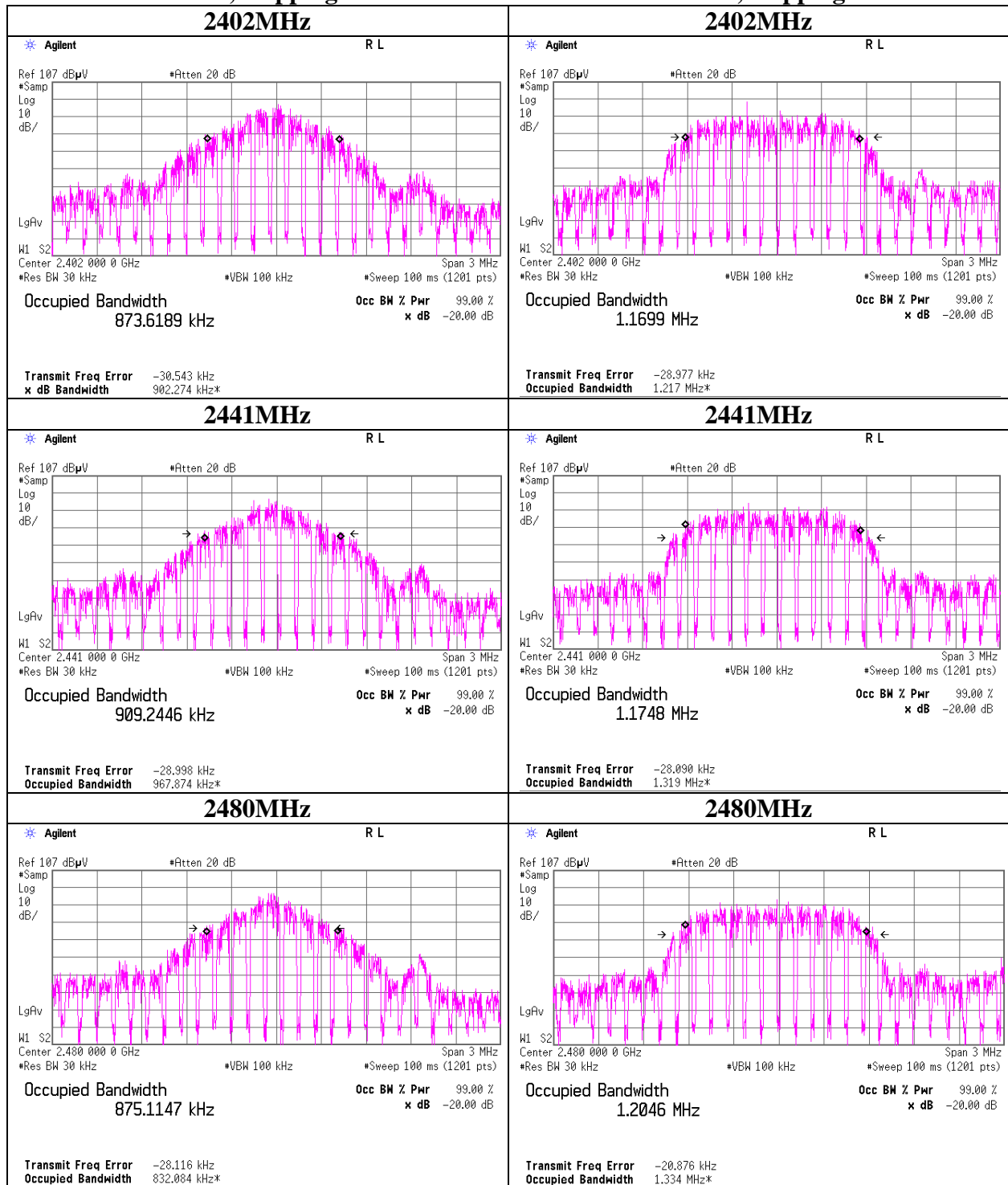
Tx 3DH5, Hopping off



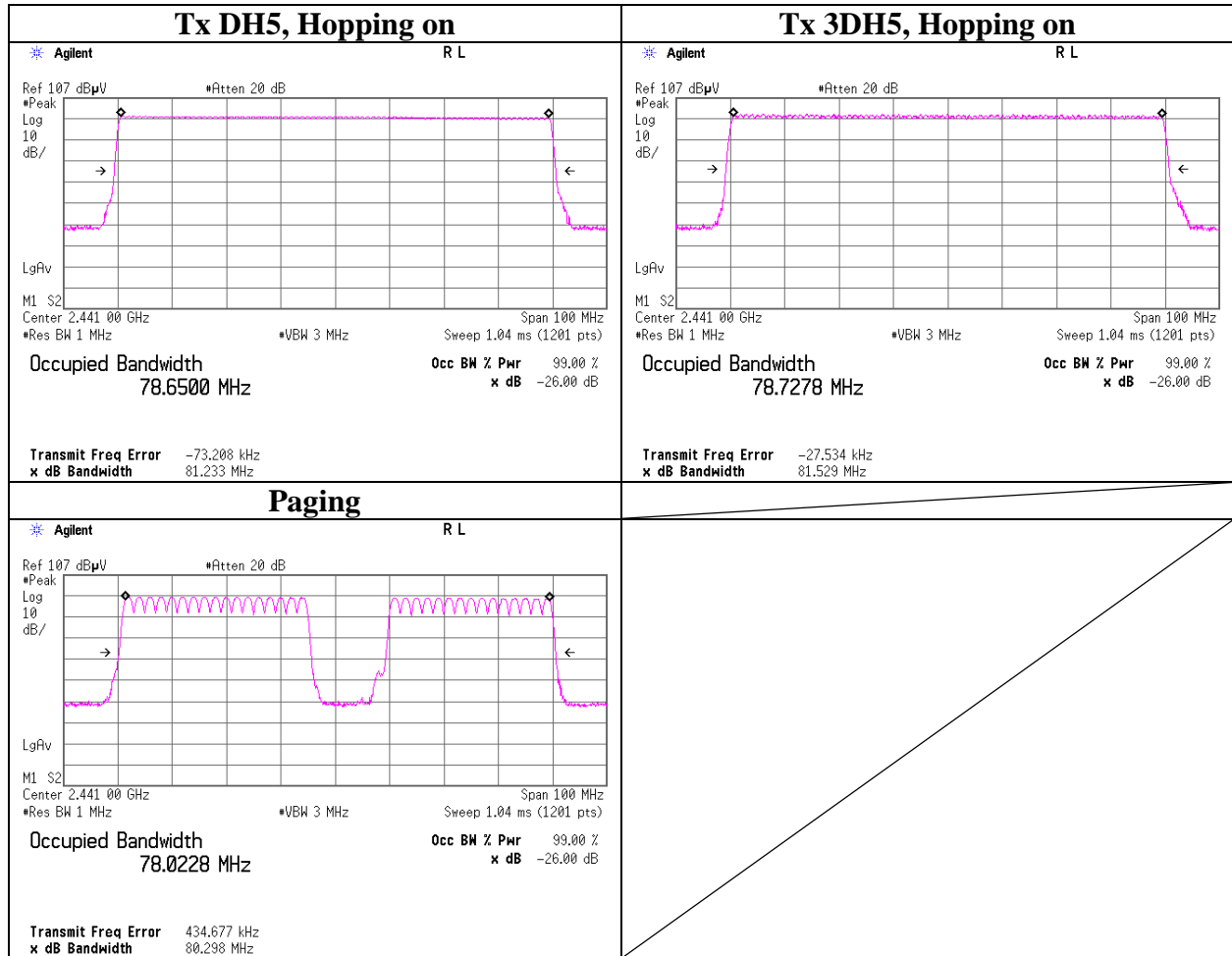
99% Occupied Bandwidth

Tx DH5, Hopping off

Tx 3DH5, Hopping off



99% Occupied Bandwidth



APPENDIX 2: Test instruments

EMI test equipment

| Control No. | Instrument | Manufacturer | Model No | Serial No | Test Item | Calibration Date * Interval(month) |
|--------------------|------------------------------|--------------------------|--|-------------------------|------------------|---|
| MSA-10 | Spectrum Analyzer | Agilent | E4448A | MY46180655 | AT | 2012/02/03 * 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-20 | Attenuator(10dB)(above 1GHz) | HIROSE ELECTRIC CO.,LTD. | AT-110 | - | AT | 2012/01/12 * 12 |
| MCC-66 | Microwave Cable 1G-40GHz | Suhner | SUCOFLEX102 | 28636/2 | AT | 2012/04/25 * 12 |
| MMM-16 | DIGITAL HiTESTER | Hioki | 3805 | 070900532 | AT | 2012/01/13 * 12 |
| MOS-14 | Thermo-Hygrometer | Custom | CTH-201 | - | AT | 2012/02/06 * 12 |
| MAEC-02 | Semi Anechoic Chamber(NSA) | TDK | Semi Anechoic Chamber 3m | DA-06902 | RE/CE | 2012/06/29 * 12 |
| MOS-22 | Thermo-Hygrometer | Custom | CTH-201 | 0003 | RE/CE | 2012/02/06 * 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/CE | 2012/04/06 * 12 |
| MHA-06 | Horn Antenna 1-18GHz | Schwarzbeck | BBHA9120D | 254 | RE | 2012/02/22 * 12 |
| MPA-10 | Pre Amplifier | Agilent | 8449B | 3008A02142 | RE | 2012/01/25 * 12 |
| MHA-02 | Horn Antenna 18-26.5GHz | EMCO | 3160-09 | 1265 | RE | 2012/02/22 * 12 |
| MCC-132 | Microwave Cable | HUBER+SUHNER | SUCOFLEX104 | 336161/4(1m)/340639(5m) | RE | 2011/09/06 * 12 |
| MHF-06 | High Pass Filter 3.5-24GHz | TOKIMEC | TF323DCA | 601 | RE | 2012/05/30 * 12 |
| MTR-03 | Test Receiver | Rohde & Schwarz | ESCI | 100300 | RE/CE | 2012/04/03 * 12 |
| MLS-06 | LISN(AMN) | Schwarzbeck | NSLK8127 | 8127363 | CE(EUT) | 2012/02/06 * 12 |
| MCC-13 | Coaxial Cable | Fujikura | 3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m) | - | CE | 2012/02/16 * 12 |
| MAT-65 | Attenuator(13dB) | JFW Industries, Inc. | 50FP-013H2 N | - | CE | 2012/01/28 * 12 |
| MBA-02 | Biconical Antenna | Schwarzbeck | BBA9106 | VHA91032008 | RE | 2011/10/23 * 12 |
| MLA-02 | Logperiodic Antenna | Schwarzbeck | USLP9143 | 201 | RE | 2011/10/23 * 12 |
| MCC-12 | Coaxial Cable | Fujikura/Agilent | - | - | RE | 2012/02/16 * 12 |
| MAT-07 | Attenuator(6dB) | Weinschel Corp | 2 | BK7970 | RE | 2011/11/02 * 12 |
| MPA-09 | Pre Amplifier | Agilent | 8447D | 2944A10845 | RE | 2011/09/26 * 12 |

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

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