

TEST REPORT

Report number: Z071C-09302

Issue Date: December 10, 2009

The device, as described herewith, was tested pursuant to applicable test procedure indicated below and complies with the requirements of;

FCC Part15 Subpart C / IC RSS-210

The test results are traceable to the international or national standards.

| | | |
|----------------------------|---|-----------------|
| Applicant | : | Wacom Co., Ltd. |
| Equipment under test (EUT) | : | Pen Tablet |
| FCC ID | : | HV4PTKW |
| IC Certification Number | : | 6888A-PTKW |
| Model Number | : | PTK-540WL |
| Serial Number | : | 9KDTS00001 |
| EUT Condition | : | Pre-production |

| | | |
|----------------|---|---|
| Test procedure | : | ANSI C63.4-2003 |
| Date of test | : | November 30, 2009 December 4, 5, 7, 2009 |
| Test place | : | 3m Semi-anechoic chamber, Shielded room |
| Test results | : | Complied |

Zacta Technology Corporation certifies that no party to the application is subject to a denial of federal benefits that include FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

The results in this report are applicable only to the samples tested.

This report shall not be re-produced except in full without the written approval of ZACTA Technology Corporation.

This test report must not be used by client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

Tested by:

Taiki Watanabe

Taiki Watanabe

Authorized by:

Jun Shimanuki

Jun Shimanuki

General Manager of Technical Division



NVLAP LAB CODE 200306-0

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1. Summary of Test

1.1 Purpose of test

It is the original test in order to verify conformance to standards listed in section 1.2.

1.2 Standards

CFR47 FCC Part 15 Subpart C, RSS-210

1.3 Summary of test results

Table-A presents the list of the measurement items for Spread Spectrum, Frequency hopping devices under FCC Part 15 Subpart C and Industry Canada RSS-210 Issue 7.

Table-A: List of the measurements

| Test Items Section | Test Items | Condition | Result |
|--|--|-----------------------|-------------|
| | Transmit mode [Tx]: | | |
| 15.247(a)(1) RSS-210 A8.1(a) | Occupied Bandwidth (20dB Bandwidth) | Conducted | Pass |
| RSS-Gen 4.6.1 | 99% Occupied bandwidth | Conducted | Pass |
| 15.247(a)(1) RSS-210 A8.1(b) | Carrier Frequency Separation | Conducted | Pass |
| 15.247(a)(1)(iii) RSS-210 A8.1(d) | Number of Hopping Frequencies | Conducted | Pass |
| 15.247(a)(1)(iii) RSS-210 A8.1(d) | Time of Occupancy (Dwell Time) | Conducted | Pass |
| 15.247(b)(1) 15.31(e) RSS-210 A8.4(2) | Maximum Peak Output Power - Conducted - | Conducted | Pass |
| 15.247(d) RSS-210 A8.5 | Band Edge Compliance of RF Conducted Emissions | Conducted | Pass |
| 15.247(d) RSS-210 A8.5 RSS-Gen 4.9, 4.10 | Spurious Emissions | Conducted Radiated | Pass |
| 15.247(d) 15.205 15.209 RSS-210 2.2 | Restricted Bands of Operation | Radiated | Pass |

Note: Conducted Emissions measurement is not applicable because the EUT is powered by Li-ion battery.

1.4 Deviation from the standard

None

1.5 Modification to the EUT by laboratory

None

2. Equipment description

2.1 General Description of equipment

EUT is the Pen Tablet.

2.2 EUT information

Applicant : Wacom Co., Ltd.
2-510-1, Toyonodai, Otone-machi, Kitasaitame-gun, Saitama, 349-1148 Japan
Phone: + 81-480-78-1211 Fax: + 81-480-78-1404

Equipment under test (EUT) : Pen Tablet

Trade name : Wacom

Model number : PTK-540WL

Serial number : 9KDTS00001

EUT condition : Pre-production

Max. frequency : 48MHz

Power ratings : DC 3.7V (Li-ion Battery)

Size : (W) 363.2 x (D) 253 x (H) 15 mm

Environment : Indoor use

Thermal limitation : 5°C to 40°C

Operating mode : Tx mode / Rx mode

Variation of the family model(s) : N/A

[RF Specification]

Protocol : Bluetooth

Spread method : Frequency hopping spread spectrum (FHSS)

Communication method : TDD

Frequency Range : 2402MHz - 2480MHz

Number of FR Channels : 79 Channels

Modulation Method/Data rate : GFSK (1Mbps), $\pi/4$ -DQPSK (2Mbps), 8-DPSK (3Mbps)

Nominal Bit Rates : 1600hops/s

Channel Separation : 1MHz

Output power : 2.065mW

Antenna (Rx and Tx) : Printed antenna

Antenna gain : -0.13dBi

RF type : Transceiver

Intended use : Data transmission

RF emission type designator : 880KF1D (GFSK), 1M17G1D (8-DPSK)

2.3 Operating channels and frequencies

| Channel | Frequency [MHz] | Channel | Frequency [MHz] | Channel | Frequency [MHz] |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 1 | 2402 | 28 | 2429 | 55 | 2456 |
| 2 | 2403 | 29 | 2430 | 56 | 2457 |
| 3 | 2404 | 30 | 2431 | 57 | 2458 |
| 4 | 2405 | 31 | 2432 | 58 | 2459 |
| 5 | 2406 | 32 | 2433 | 59 | 2460 |
| 6 | 2407 | 33 | 2434 | 60 | 2461 |
| 7 | 2408 | 34 | 2435 | 61 | 2462 |
| 8 | 2409 | 35 | 2436 | 62 | 2463 |
| 9 | 2410 | 36 | 2437 | 63 | 2464 |
| 10 | 2411 | 37 | 2438 | 64 | 2465 |
| 11 | 2412 | 38 | 2439 | 65 | 2466 |
| 12 | 2413 | 39 | 2440 | 66 | 2467 |
| 13 | 2414 | 40 | 2441 | 67 | 2468 |
| 14 | 2415 | 41 | 2442 | 68 | 2469 |
| 15 | 2416 | 42 | 2443 | 69 | 2470 |
| 16 | 2417 | 43 | 2444 | 70 | 2471 |
| 17 | 2418 | 44 | 2445 | 71 | 2472 |
| 18 | 2419 | 45 | 2446 | 72 | 2473 |
| 19 | 2420 | 46 | 2447 | 73 | 2474 |
| 20 | 2421 | 47 | 2448 | 74 | 2475 |
| 21 | 2422 | 48 | 2449 | 75 | 2476 |
| 22 | 2423 | 49 | 2450 | 76 | 2477 |
| 23 | 2424 | 50 | 2451 | 77 | 2478 |
| 24 | 2425 | 51 | 2452 | 78 | 2479 |
| 25 | 2426 | 52 | 2453 | 79 | 2480 |
| 26 | 2427 | 53 | 2454 | | |
| 27 | 2428 | 54 | 2455 | | |

2.4 Operating mode

【Tx mode】

- i) Bluetooth test program set up
- ii) Select a test mode
 - Operating mode: Tx mode
 - Operating frequency: No hopping (CH.1, 40, 79), Hopping
 - Packet type: DH5, 3-DH5
- iii) Start test mode

Note: Tests were performed in DH5 and 3-DH5 which have the maximum bandwidth.

【Rx mode】

- i) Bluetooth test program set up
- ii) Select a test mode
 - Operating mode: Rx mode
 - Operating frequency: No hopping (CH.1, 40, 79), Hopping
- iii) Start test mode

3. Configuration information

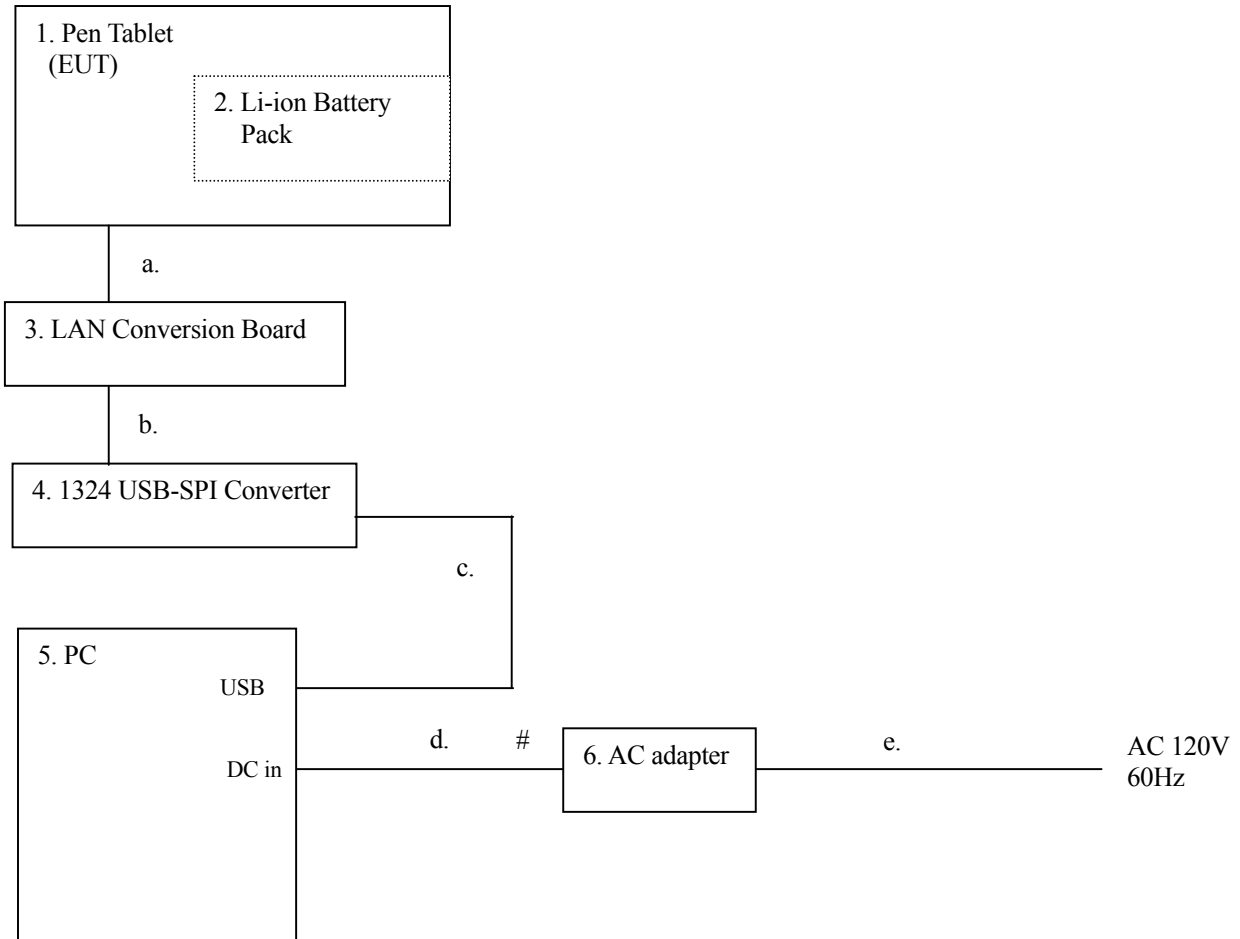
3.1 EUT and Peripheral(s) used

| No. | Equipment | Company | Model No. | Serial No. | FCC ID/DoC | Comment |
|-----|------------------------|---------|-----------------------|------------|-----------------------------------|---------|
| 1 | Pen Tablet | Wacom | PTK-540WL | 9KDTS00001 | FCC ID: HV4PTKW IC: 6888A-PTKW | EUT |
| 2 | Li-ion Battery Pack | Wacom | 1UF103450P-WC M-03 | N/A | - | - |
| 3 | LAN Conversion Board | CSR | M1616U2 | N/A | - | - |
| 4 | 1324 USB-SPI Converter | CSR | USB-SPI | 222698 | - | - |
| 5 | PC | HP | Compaq nx6320 | CNU7071H4D | DoC | - |
| 6 | AC adapter | HP | PA-1650-02HC | 7108054501 | - | - |

3.2 Cable(s) information

| No. | Cable | Length [m] | Shield | Connector | Comment |
|-----|------------------------------------|------------|--------|-----------|---------|
| a | I/O cable | 0.29 | No | Plastic | - |
| b | LAN cable | 1.0 | Yes | Metal | - |
| c | USB cable | 2.0 | Yes | Metal | - |
| d | DC cable for PC AC adapter | 1.8 | No | Plastic | - |
| e | AC Power cord for PC AC adapter | 1.7 | No | Plastic | - |

3.3 System configuration



: Un-detachable cable

Note: Numbers assigned to equipment or cables on this diagram are corresponded to the list in “3.1 EUT and Peripheral(s) used” and “3.2 Cable(s) information”.

4. Test Type and Results

4.1 20dB Bandwidth / Occupied Bandwidth

4.1.1 Test Procedure [FCC 15.247(a)(1), IC RSS-210 A8.1(a)]

The bandwidth at 20 dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=30kHz, VBW=300kHz, Span=3MHz, Sweep=auto

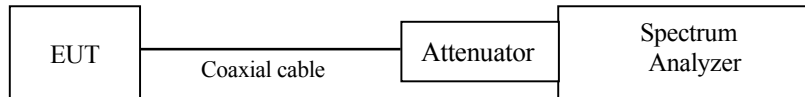
The EUT was set to operate with following conditions.

- No hopping [ch 1 (low), ch 40 (mid) and ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode

4.1.2 Measurement Setup



4.1.3 Limit of Bandwidth at 20 dB below

None

4.1.4 Measurement Result

| Channel | Center Frequency (MHz) | Packet type | 20dB Bandwidth (MHz) | Occupied Bandwidth (MHz) |
|---------|------------------------|-------------|----------------------|--------------------------|
| 1 | 2402.00 | DH5 | 0.945 | 0.878 |
| | | 3-DH5 | 1.267 | 1.172 |
| 40 | 2441.00 | DH5 | 0.948 | 0.880 |
| | | 3-DH5 | 1.267 | 1.169 |
| 79 | 2480.00 | DH5 | 0.951 | 0.879 |
| | | 3-DH5 | 1.264 | 1.167 |

4.1.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 30, 2009
Temperature : 21.0 [°C]
Humidity : 53.0 [%]
Test place : Shielded room

Test Personnel:

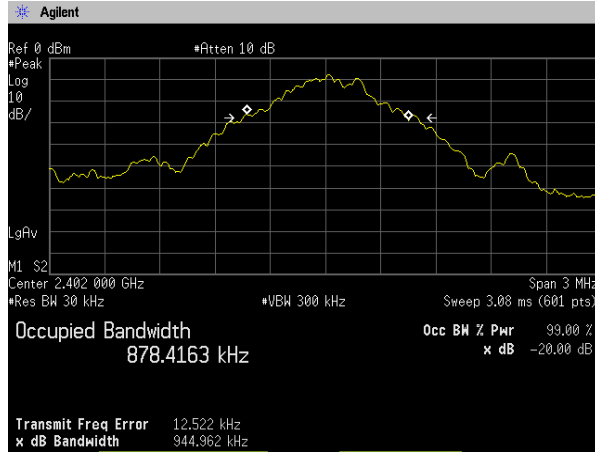
Tested by: Taiki Watanabe

Date : Dec. 4, 2009
Temperature : 22.0 [°C]
Humidity : 40.0 [%]
Test place : Shielded room

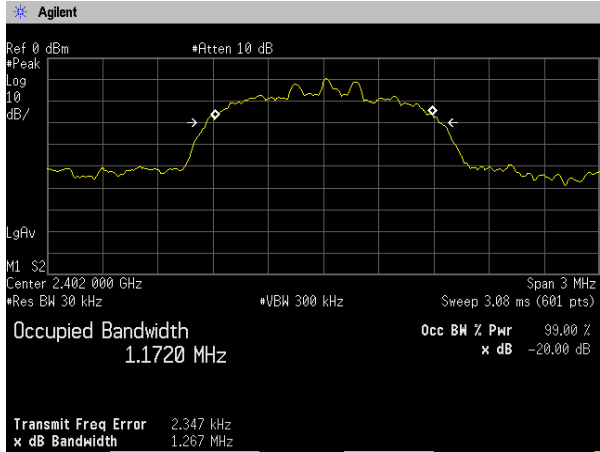
20dB Bandwidth/Occupied Bandwidth

Channel 1: 2402.0MHz

DH5

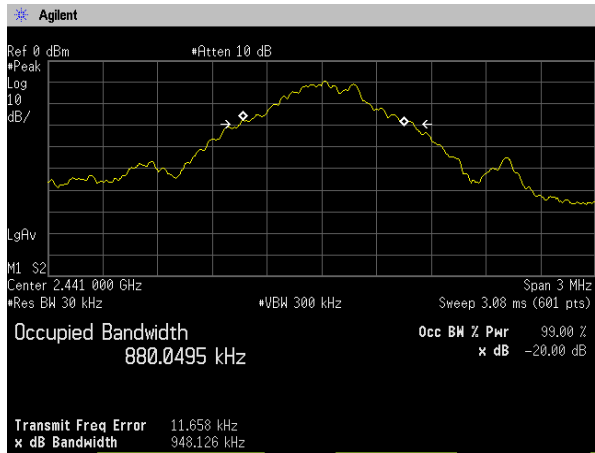


3-DH5

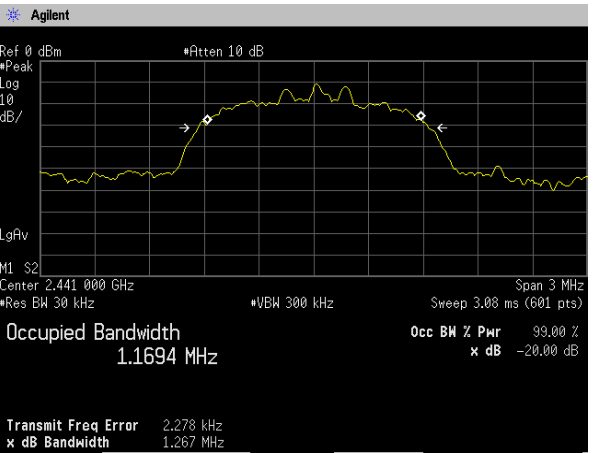


Channel 40: 2441.0MHz

DH5

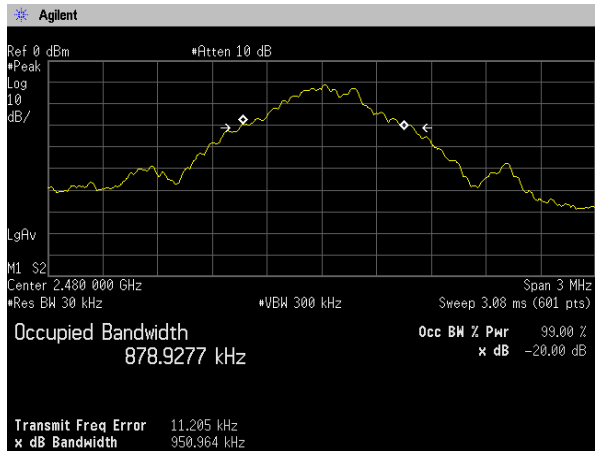


3-DH5

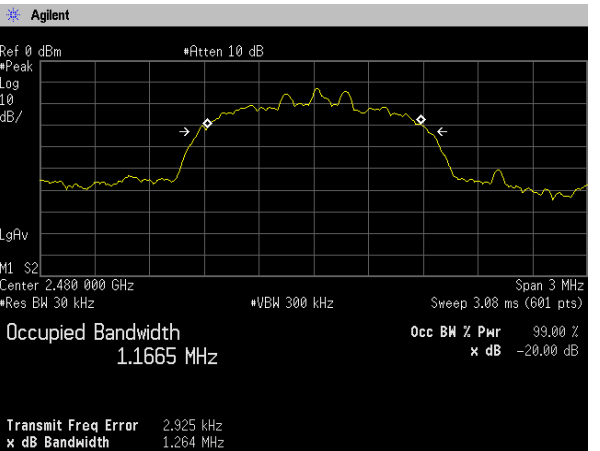


Channel 79: 2480.0MHz

DH5



3-DH5



4.2 Carrier Frequency Separation

4.2.1 Test Procedure [FCC 15.247(a)(1), IC RSS-210 A8.1(b)]

The adjacent channel interval is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=30kHz, VBW=30kHz, Span=3MHz, Sweep=auto

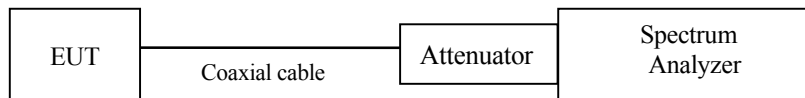
The EUT was set to operate with following conditions.

- Hopping [ch 40 (mid)]

The test mode of EUT is as follows.

- Tx mode

4.2.2 Measurement Setup



4.2.3 Limit of Carrier Frequency Separation

Systems shall have hopping channel carrier frequencies separated by a minimum of; 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

4.2.4 Measurement Result

| Packet type | Channel separation (MHz) | Limit (MHz) | Result |
|-------------|--------------------------|---|--------|
| DH5 | 1.005 | >two-thirds of the 20dB Bandwidth =634kHz | PASS |
| 3-DH5 | 1.005 | >two-thirds of the 20dB Bandwidth =845kHz | PASS |

4.2.5 Trace Data

Test Personnel:

Tested by:

Taiki Watanabe

Date : Nov. 30, 2009

Temperature : 21.0 [°C]

Humidity : 53.0 [%]

Test place : Shielded room

Test Personnel:

Tested by:

Taiki Watanabe

Date : Dec. 4, 2009

Temperature : 22.0 [°C]

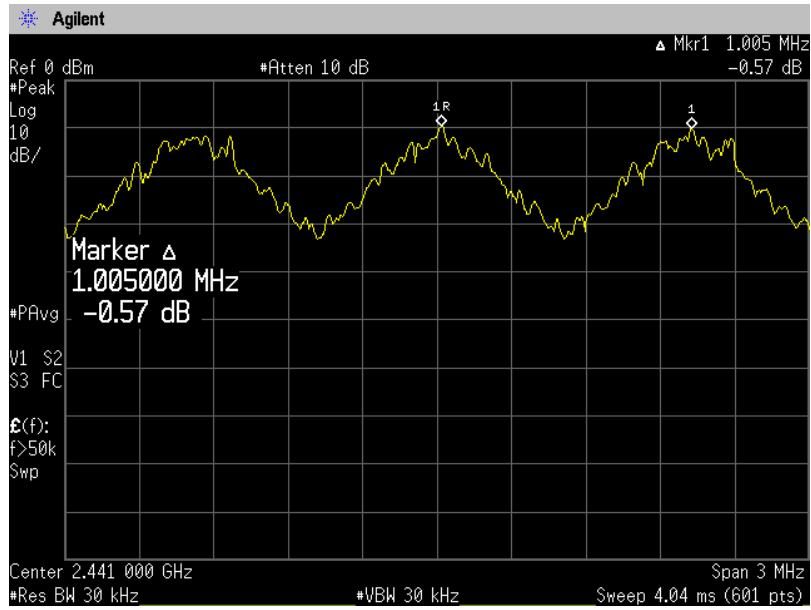
Humidity : 40.0 [%]

Test place : Shielded room

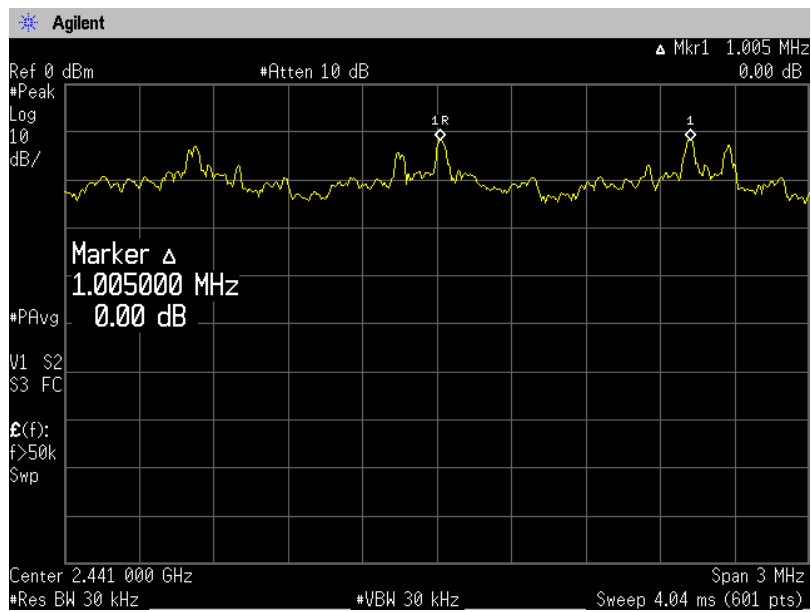
Carrier Frequency Separation

Channel 40: 2441.0MHz

DH5



3-DH5



4.3 Number of Hopping Frequencies

4.3.1 Test Procedure [FCC 15.247(a)(1)(iii), IC RSS-210 A8.1(d)]

The number of hopping channels is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=100kHz, VBW=300kHz, Span=Arbitrary setting, Sweep=auto

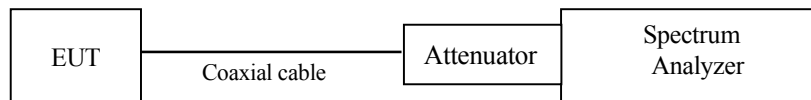
The EUT was set to operate with following conditions.

- Hopping

The test mode of EUT is as follows.

- Tx mode

4.3.2 Measurement Setup



4.3.3 Limit of Number of Hopping Frequencies

Shall have more than 15 channels.

4.3.4 Measurement Result

| Number of channels | Limit | Result |
|--------------------|-------------|--------|
| 79 | ≥15 channel | PASS |

4.3.5 Trace Data

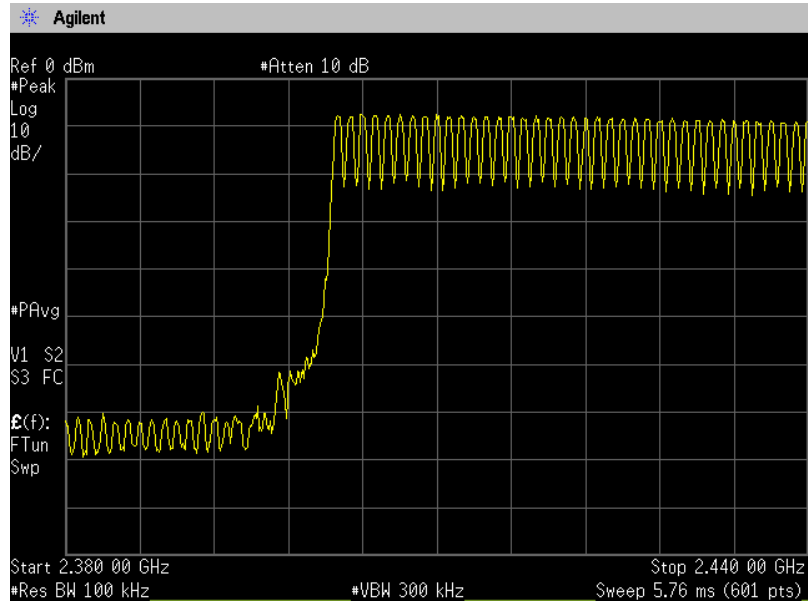
Test Personnel:

Tested by: Taiki Watanabe

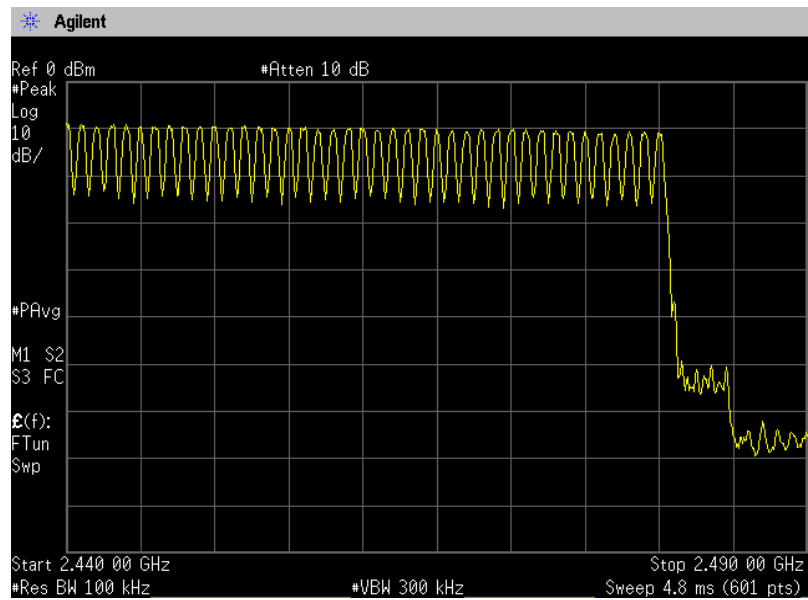
Date : Nov. 30, 2009
 Temperature : 21.0 [°C]
 Humidity : 53.0 [%]
 Test place : Shielded room

Number of Hopping Frequencies

Low



High



4.4 Time of Occupancy (Dwell Time)

4.4.1 Test Procedure [FCC 15.247(a)(1)(iii), IC RSS-210 A8.1(d)]

The time occupancy of hopping channel is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=1MHz, VBW=1MHz, Span=0MHz, Sweep=10ms

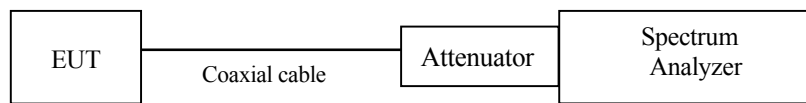
The EUT was set to operate with following conditions.

- Hopping [ch 1 (low), ch 40 (mid) and ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode

4.4.2 Measurement Setup



4.4.3 Limit of Time of Occupancy (Dwell Time)

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

4.4.4 Measurement Result

| Channel | Frequency (MHz) | Packet type | Dwell time (ms) | Occupancy time of 31.6 seconds (s) | Limit | Result |
|---------|-----------------|-------------|-----------------|------------------------------------|-------|--------|
| 1 | 2402.00 | DH5 | 2.900 | 0.309 | <0.4s | PASS |
| | | 3-DH5 | 2.900 | 0.309 | <0.4s | PASS |
| 40 | 2441.00 | DH5 | 2.900 | 0.309 | <0.4s | PASS |
| | | 3-DH5 | 2.900 | 0.309 | <0.4s | PASS |
| 79 | 2480.00 | DH5 | 2.900 | 0.309 | <0.4s | PASS |
| | | 3-DH5 | 2.900 | 0.309 | <0.4s | PASS |

The hopping rates of Bluetooth devices change with different types of payload. The longer the payload is, the slower the hopping rate. The hopping rate scenario is defined in Bluetooth core specification.

Calculation:

Occupancy time of 31.6 seconds * = time domain slot length x hop rate / number of hopper channel / 79 x 31.6

EX.) For Ch. 1, DH5 = 2.967 ms x 1600 / 6 / 79 x 31.6 = 316ms

4.4.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 30, 2009
 Temperature : 21.0 [°C]
 Humidity : 53.0 [%]
 Test place : Shielded room

Test Personnel:

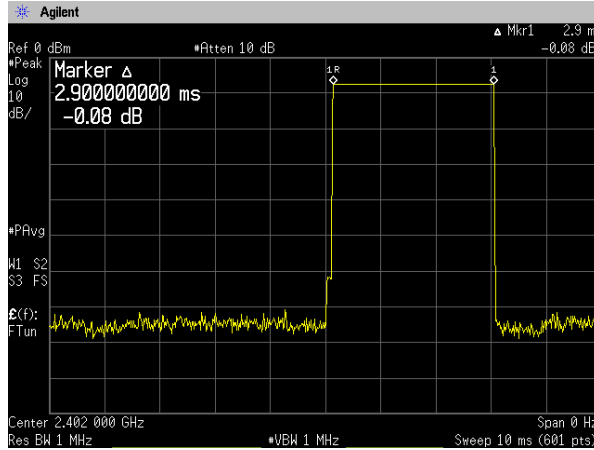
Tested by: Taiki Watanabe

Date : Dec. 4, 2009
 Temperature : 22.0 [°C]
 Humidity : 40.0 [%]
 Test place : Shielded room

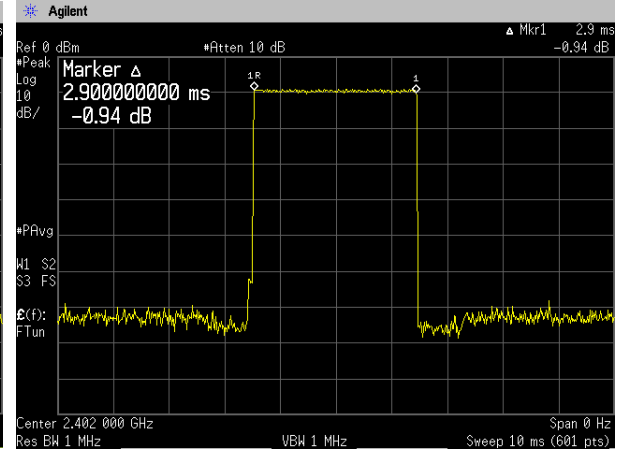
Dwell Time

Channel 1: 2402.0MHz

DH5

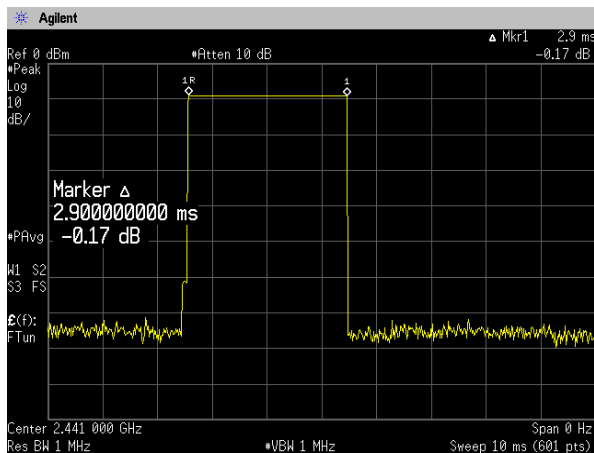


3-DH5

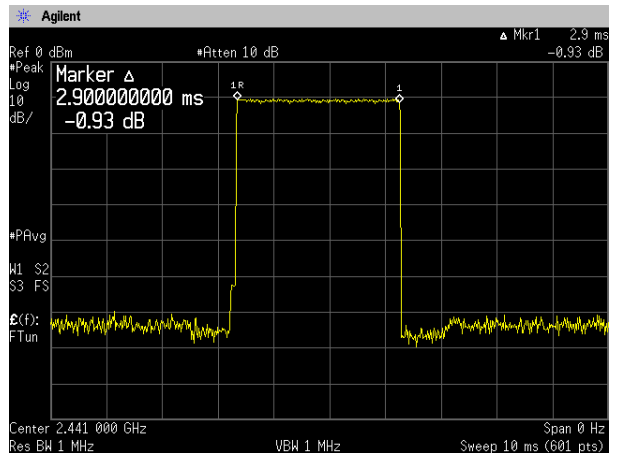


Channel 40: 2441.0MHz

DH5

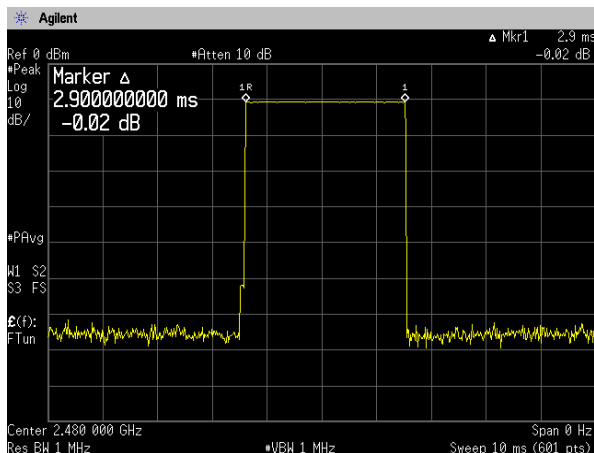


3-DH5

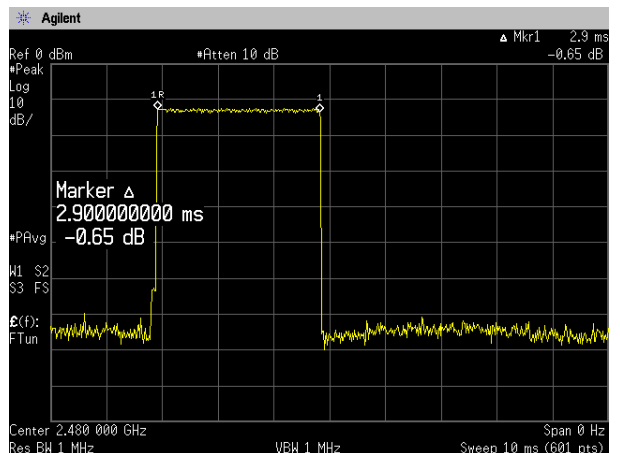


Channel 79: 2480.0MHz

DH5



3-DH5



4.5 Maximum Peak Output Power - Conducted -

4.5.1 Test Procedure [FCC 15.247(b)(1), 15.31(e), IC RSS-210 A8.4(2)]

The peak power is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=3MHz, VBW=3MHz, Span=10MHz, Sweep=auto

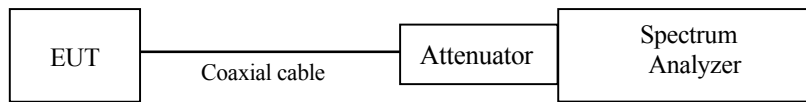
The EUT was set to operate with following conditions.

- No hopping [ch 1 (low), ch 40 (mid) and ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode

4.5.2 Test Instruments and Measurement Setup



4.5.3 Limit of Maximum Peak Output Power

0.125 watt or less.

4.5.4 Measurement Result

[Tx mode]

| Channel | Center Frequency (MHz) | Packet type | Reading (dBm) | Factor (dB) | Antenna Gain (dBi) | Level (dBm) | Peak Output Power (mW) | Limit (mW) | Result |
|---------|------------------------|-------------|---------------|-------------|--------------------|-------------|------------------------|------------|--------|
| 1 | 2402.00 | DH5 | -7.32 | 10.60 | -0.13 | 3.15 | 2.065 | ≤125 | PASS |
| | | 3-DH5 | -8.26 | 10.60 | -0.13 | 2.21 | 1.663 | ≤125 | PASS |
| 40 | 2441.00 | DH5 | -8.70 | 10.60 | -0.13 | 1.77 | 1.503 | ≤125 | PASS |
| | | 3-DH5 | -9.70 | 10.60 | -0.13 | 0.77 | 1.194 | ≤125 | PASS |
| 79 | 2480.00 | DH5 | -10.48 | 10.60 | -0.13 | -0.01 | 0.998 | ≤125 | PASS |
| | | 3-DH5 | -11.77 | 10.60 | -0.13 | -1.30 | 0.741 | ≤125 | PASS |

Calculation:

$$\text{Reading (dBm)} + \text{Factor (dB)} + \text{Antenna Gain of EUT (dBi)} = \text{Level (dBm)}$$

$$10\log P = \text{Level (dBm)}$$

$$P = 10^{(\text{Maximum Peak Output Power (dBm)} / 10)} \text{ (mW)}$$

4.5.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 30, 2009
 Temperature : 21.0 [°C]
 Humidity : 53.0 [%]
 Test place : Shielded room

Test Personnel:

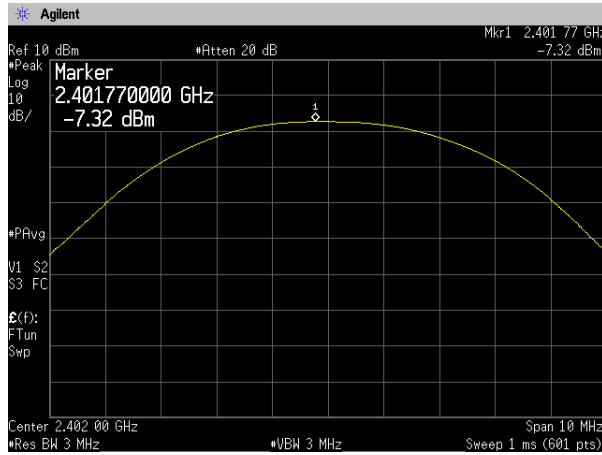
Tested by: Taiki Watanabe

Date : Dec. 4, 2009
 Temperature : 22.0 [°C]
 Humidity : 40.0 [%]
 Test place : Shielded room

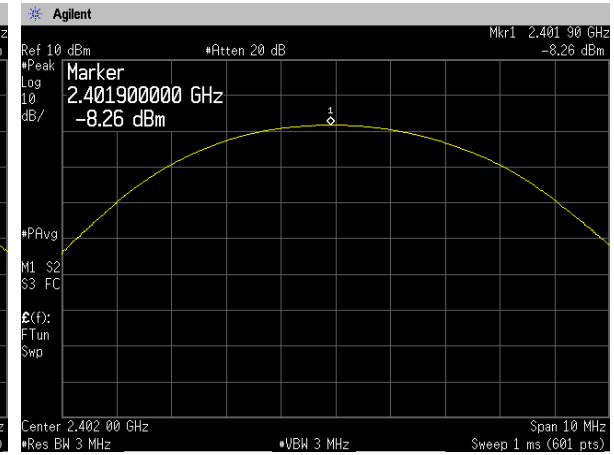
Maximum Peak Output Power - Conducted -

Channel 1: 2402.0MHz

DH5

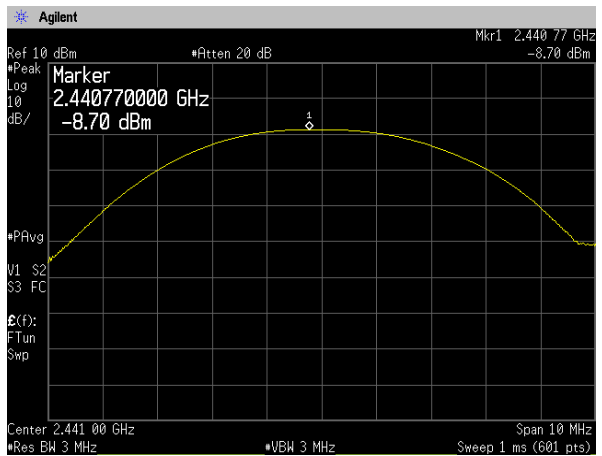


3-DH5

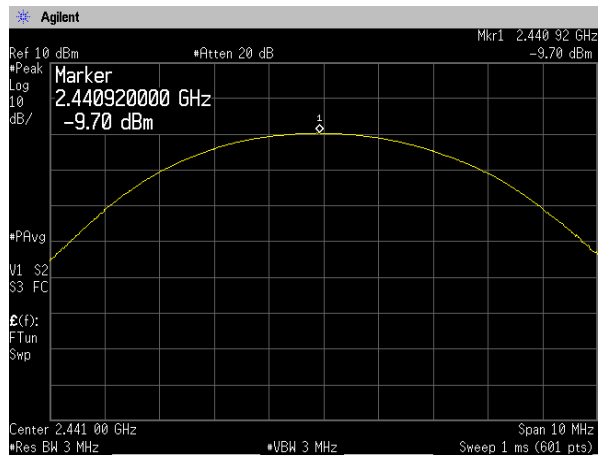


Channel 40: 2441.0MHz

DH5

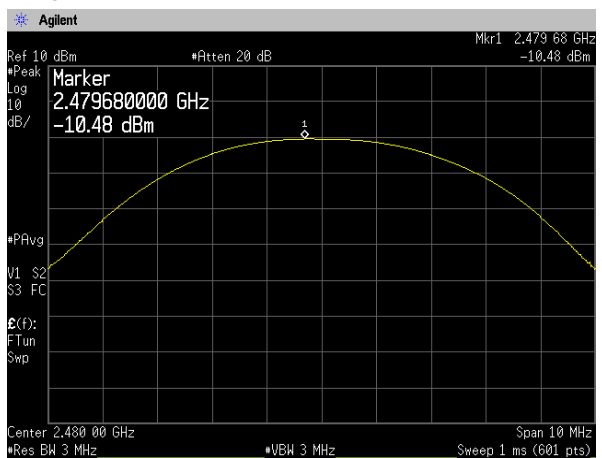


3-DH5

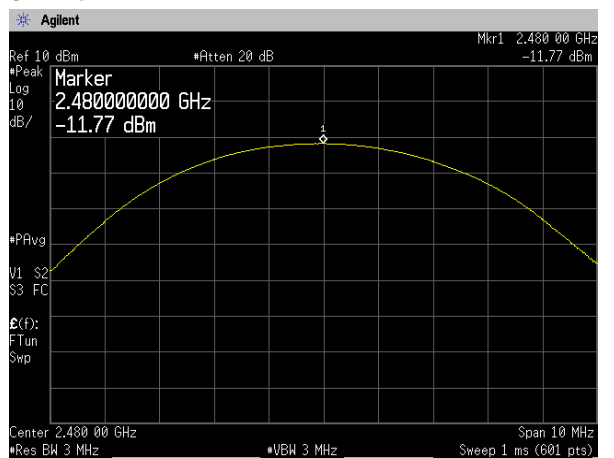


Channel 79: 2480.0MHz

DH5



3-DH5



4.6 Band Edge Compliance of RF Conducted Emissions

4.6.1 Test Procedure [FCC 15.247 (d), IC RSS-210 A8.5]

The Band Edge is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to :

- RBW=100kHz, VBW=100kHz, Span=15MHz, Sweep=Auto

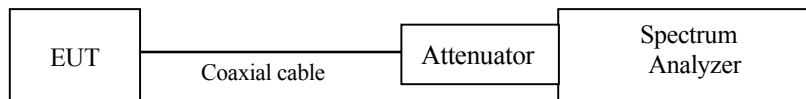
The EUT was set to operate with following conditions.

- No hopping [ch 1 (low) and ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode

4.6.2 Test Instruments and Measurement Setup



4.6.3 Limit of Band-edge Compliance of RF Conducted Emissions

In any 100KHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power.

4.6.4 Measurement Results of Band-edge

| Channel | Frequency (MHz) | Packet type | RF Power Level (dBm) | Band-edge Frequency (MHz) | Band-edge Level (dBm) | Difference Level (dBm) | Limit (dBm) | Result |
|---------|-----------------|-------------|----------------------|---------------------------|-----------------------|------------------------|-------------------------------------|--------|
| 1 | 2402.00 | DH5 | -7.49 | 2400.02 | -50.81 | 43.32 | At least 20dB below from peak of RF | PASS |
| | | 3-DH5 | -9.11 | 2400.52 | -43.42 | 34.31 | | PASS |
| 79 | 2480.00 | DH5 | -10.77 | 2484.50 | -58.89 | 48.12 | | PASS |
| | | 3-DH5 | -12.78 | 2481.50 | -49.98 | 37.20 | | PASS |

4.6.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 30, 2009
Temperature : 21.0 [°C]
Humidity : 53.0 [%]
Test place : Shielded room

Test Personnel:

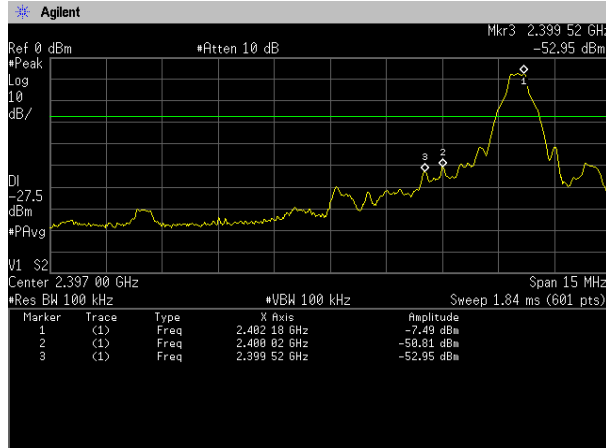
Tested by: Taiki Watanabe

Date : Dec. 4, 2009
Temperature : 22.0 [°C]
Humidity : 40.0 [%]
Test place : Shielded room

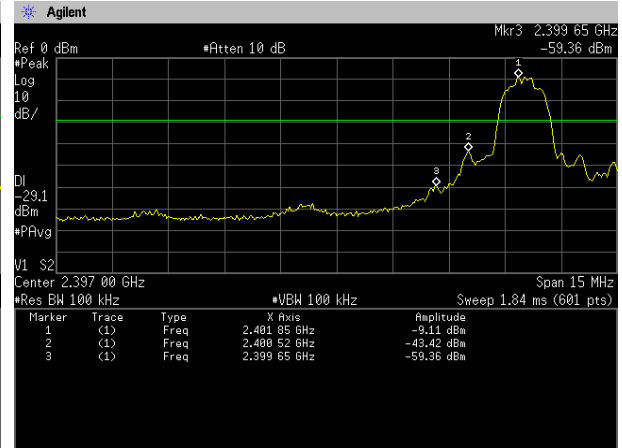
Band Edge Compliance of RF Conducted Emissions

Channel 1: 2402.0MHz

DH5

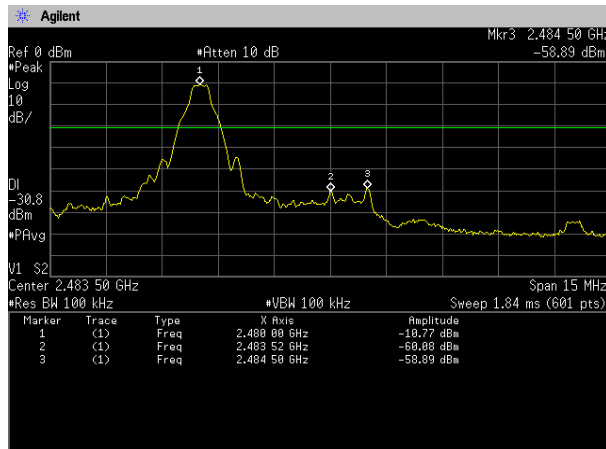


3-DH5

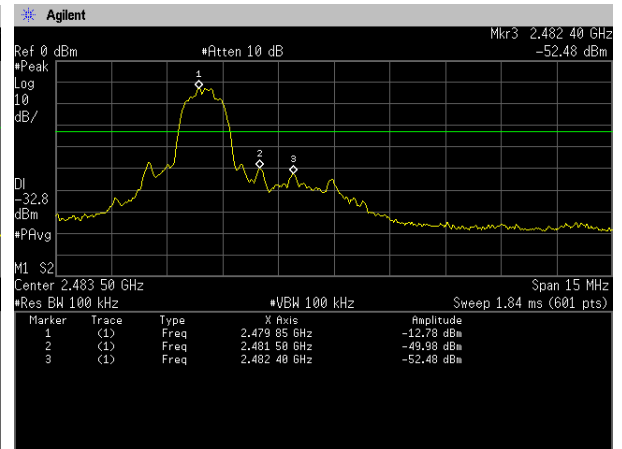


Channel 79: 2480.0MHz

DH5



3-DH5



4.7 Spurious Emissions - Conducted -

4.7.1 Test Procedure [FCC 15.247(d), IC RSS-210 A8.5, RSS-Gen 4.9&4.10]

The spurious emissions (Conducted) are measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- RBW=100kHz, VBW=300kHz, Span=Arbitrary setting, Sweep=Auto

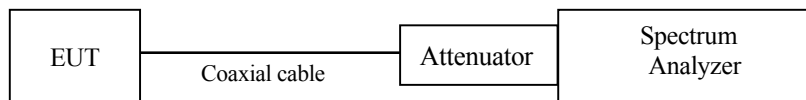
The EUT was set to operate with following conditions.

- No hopping [ch 1 (low), ch 40 (mid) and ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode

4.7.2 Measurement Setup



4.7.3 Limit of Spurious Emissions - Conducted -

In any 100KHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power.

4.7.4 Measurement Results of Spurious Emissions - Conducted -

| Channel | Frequency [MHz] | Limit [dBm] | Results Chart | PASS / FAIL |
|---------|-----------------|--------------------------------------|--------------------|-------------|
| 1 | 2402.0 | At least 20dB below from peak of RF. | See the Trace Data | PASS |
| 40 | 2441.0 | At least 20dB below from peak of RF. | See the Trace Data | PASS |
| 79 | 2480.0 | At least 20dB below from peak of RF. | See the Trace Data | PASS |

4.7.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 30, 2009
 Temperature : 21.0 [°C]
 Humidity : 53.0 [%]
 Test place : Shielded room

Test Personnel:

Tested by: Taiki Watanabe

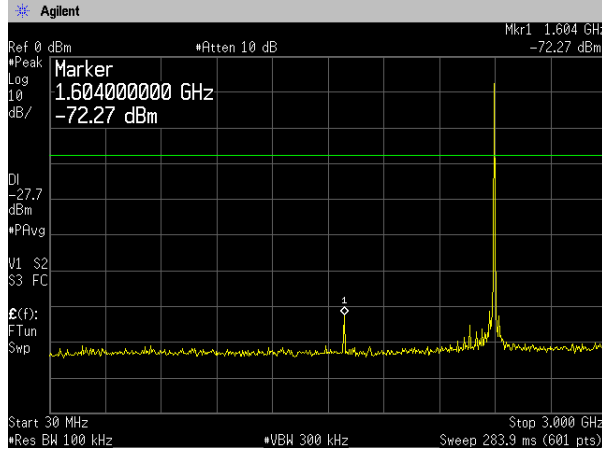
Date : Dec. 4, 2009
 Temperature : 22.0 [°C]
 Humidity : 40.0 [%]
 Test place : Shielded room

Spurious Emissions - Conducted -

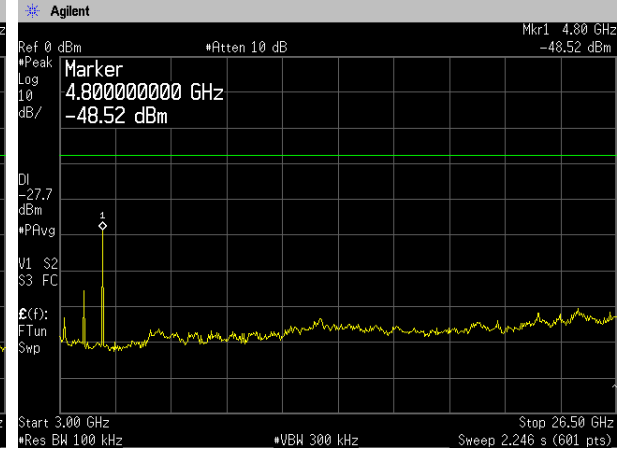
DH5

Channel 1: 2402.0MHz

30MHz-3GHz

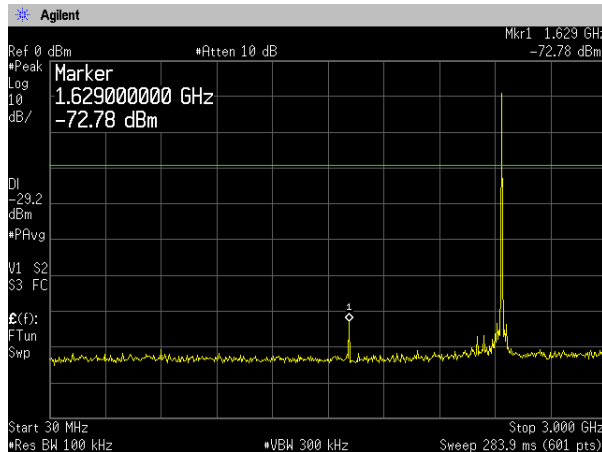


3GHz-26.5GHz

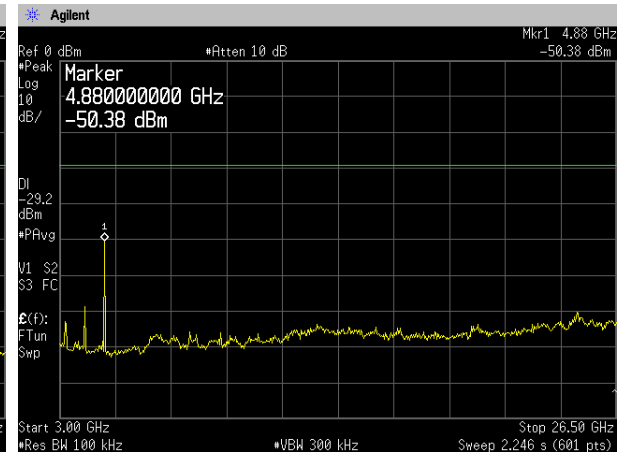


Channel 40: 2441.0MHz

30MHz-3GHz

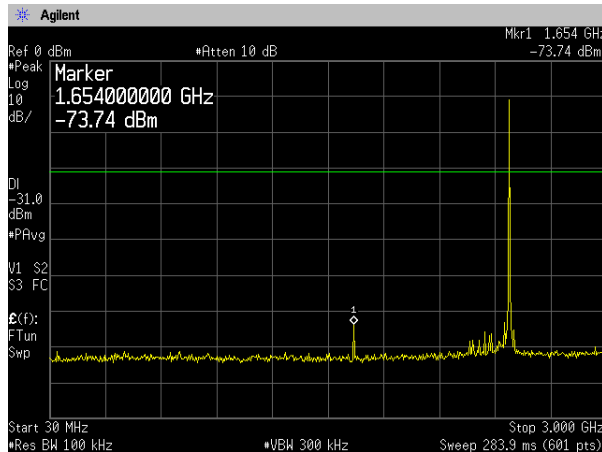


3GHz-26.5GHz

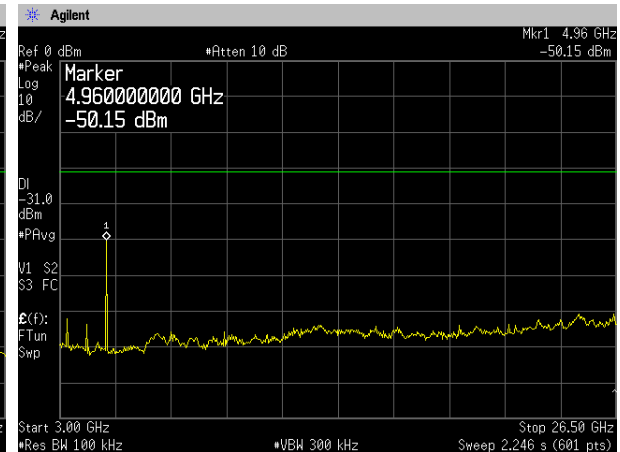


Channel 79: 2480.0MHz

30MHz-3GHz



3GHz-26.5GHz

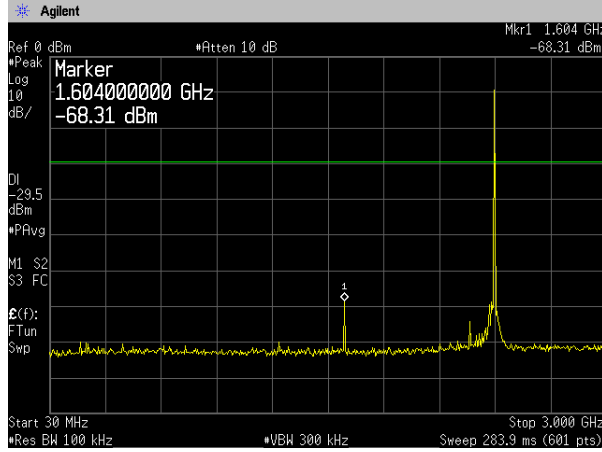


Spurious Emissions - Conducted -

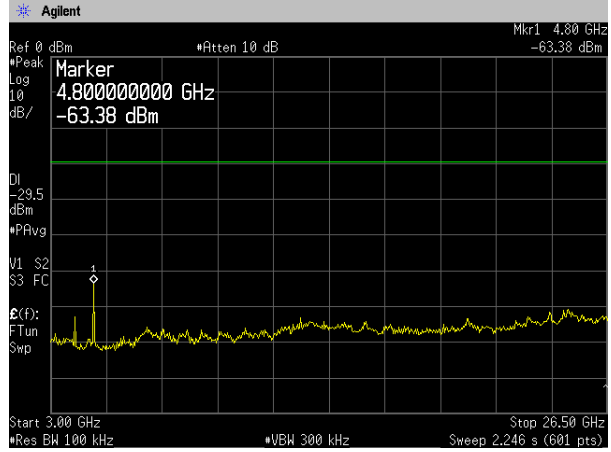
3-DH5

Channel 1: 2402.0MHz

30MHz-3GHz

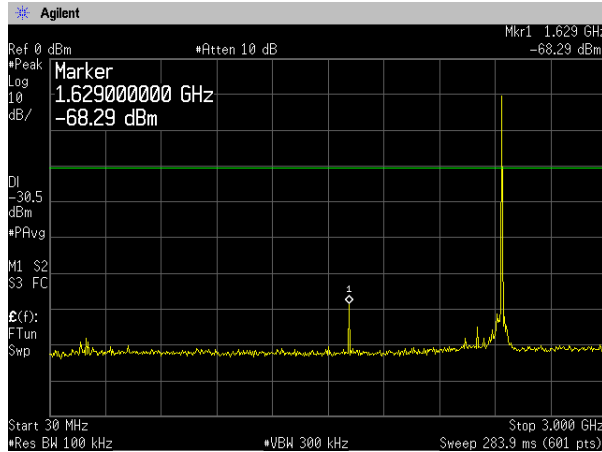


3GHz-26.5GHz

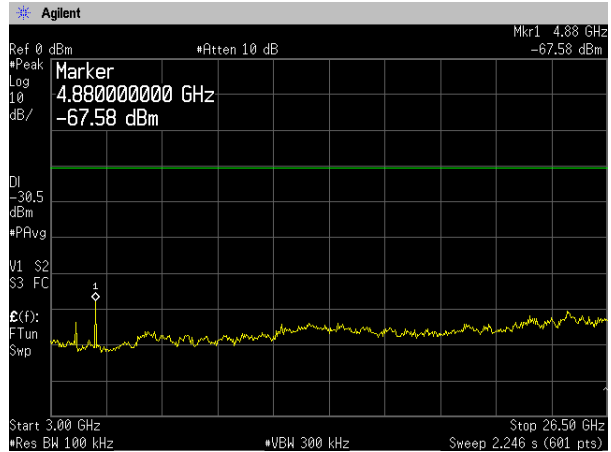


Channel 40: 2441.0MHz

30MHz-3GHz

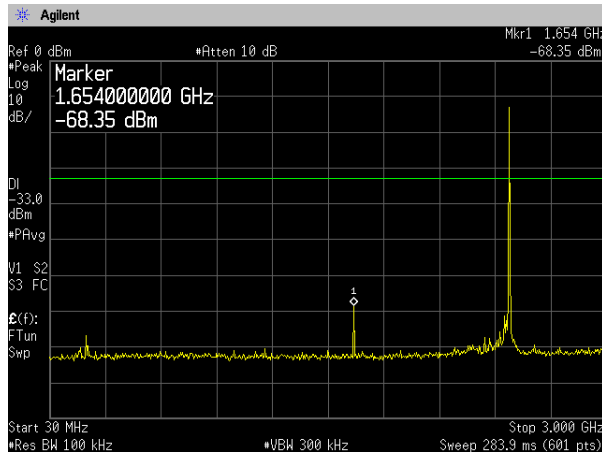


3GHz-26.5GHz

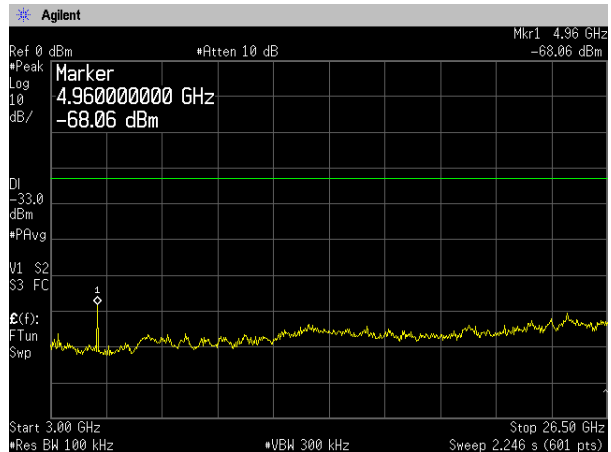


Channel 79: 2480.0MHz

30MHz-3GHz



3GHz-26.5GHz



4.8 Spurious Emissions - Radiated - (9kHz - 25GHz)

4.8.1 Test Procedure [FCC 15.205/209/247(d), IC RSS-210 A8.5, RSS-Gen 4.9&4.10]

Radiated emission measurements are performed at 3m distance with the broadband antenna (Loop antenna, TRILOG antenna, and double-ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1 to 4 meters and stopped at height producing the maximum emission. As for the Loop antenna, it is positioned with its plane vertical, and the center of the Loop is 1.0meter above the ground plane. Frequency Range: 9kHz –1GHz is scanned and investigated with the test receiver, and above 1GHz, with the spectrum analyzer. The detector function of the test receiver is set to CISPR Quasi-peak mode and the bandwidth is set to 120kHz. Peak and average detectors are used for measurements above 1GHz. The bandwidth of the spectrum analyzer is set to 1MHz.

The EUT and support equipment are placed on a 1meter x 2meter surface, 0.8meter height FRP table. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission.

Interconnecting cables, which hanging closer than 40cm to the horizontal metal ground plane are bundled its excess in center. The highest fundamental frequency generated in the EUT is 2402-2480MHz, therefore the frequency was investigated up to 25GHz, as specified in CFR section 15.33, and at least six highest emissions are reported. The test results represent the worst-case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation.

Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

The spectrum analyzer is set to:

- Peak: RBW=1MHz, VBW=1MHz, Span=0Hz, Sweep=auto
- Average: RBW=1MHz, VBW=10Hz, Span=0Hz, Sweep=auto

The EUT was set to operate with following conditions.

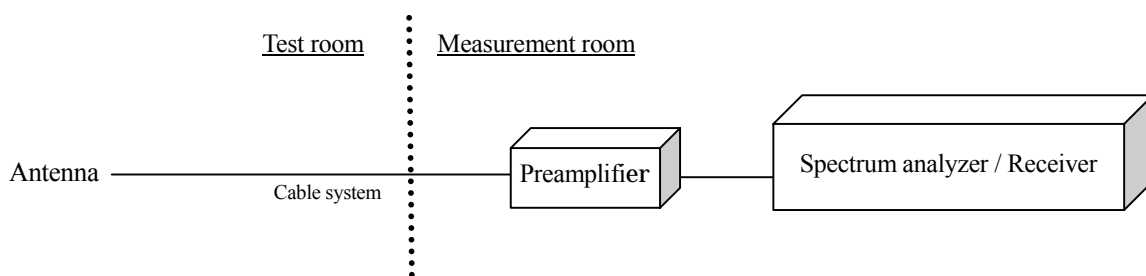
- No hopping [ch 1 (low), ch 40 (mid), ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode, Rx mode

4.8.2 Measurement Setup

Test configuration for Spurious emissions



4.8.3 Limit of Spurious Emission Measurement

| Frequency [MHz] | Field Strength | |
|--------------------|-----------------|---------------|
| | [uV/m] | [dBuV/m] |
| 0.009 – 0.490 | 2400 / F [kHz] | 20logE [uV/m] |
| 0.490 – 1.705 | 24000 / F [kHz] | 20logE [uV/m] |
| 1.705-30 | 30 | 29.5 |
| 30 – 88 | 100 | 40.0 |
| 88 – 216 | 150 | 43.5 |
| 216 – 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20 log Emission [uV/m]
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.8.4 Calculation Method

Emission level = Reading + (Ant. factor + Cable system loss – Amp. Gain)

Margin = Limit – Emission level

4.8.5 Measurement Results

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 5, 2009
 Temperature : 21.4 [°C]
 Humidity : 33.4 [%]
 Test place : 3m Semi-anechoic chamber

Test Personnel:

Tested by: Taiki Watanabe

Date : Nov. 7, 2009
 Temperature : 21.4 [°C]
 Humidity : 33.9 [%]
 Test place : 3m Semi-anechoic chamber

Spurious Emissions - Radiated-

DH5

Tx Channel 1: 2402.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 128.178 | H | 28.9 | -10.0 | 18.9 | 43.5 | 24.6 | 298.0 | 29.0 |
| 2 | 272.000 | H | 43.3 | -8.6 | 34.7 | 46.0 | 11.3 | 120.0 | 341.0 |
| 3 | 287.997 | H | 44.7 | -8.1 | 36.6 | 46.0 | 9.4 | 127.0 | 342.0 |
| 4 | 303.997 | H | 45.2 | -7.7 | 37.5 | 46.0 | 8.5 | 100.0 | 348.0 |
| 5 | 367.996 | H | 43.5 | -6.1 | 37.4 | 46.0 | 8.6 | 100.0 | 319.0 |
| 6 | 400.000 | H | 41.3 | -5.4 | 35.9 | 46.0 | 10.1 | 100.0 | 28.0 |
| 7 | 431.997 | H | 44.3 | -4.6 | 39.7 | 46.0 | 6.3 | 100.0 | 35.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1602.030 | H | 58.7 | 58.7 | -8.1 | 50.6 | 50.6 | 74.0 | 6.4 | 23.4 | 100.0 | 46.0 |
| 2 | 1602.030 | H | 55.7 | 55.7 | -8.1 | 47.6 | 47.6 | 54.0 | 6.4 | 26.1 | 100.0 | 46.0 |
| 3 | 1602.030 | V | 56.0 | 56.0 | -8.1 | 47.9 | 47.9 | 74.0 | 11.4 | 18.7 | 100.0 | 316.0 |
| 4 | 1602.030 | V | 50.7 | 50.7 | -8.1 | 42.6 | 42.6 | 54.0 | 11.4 | 18.7 | 100.0 | 316.0 |
| 5 | 4804.000 | H | 52.2 | 52.2 | 3.1 | 55.3 | 55.3 | 74.0 | 7.9 | 12.7 | 151.0 | 226.0 |
| 6 | 4804.000 | H | 43.0 | 43.0 | 3.1 | 46.1 | 46.1 | 54.0 | 7.9 | 12.7 | 151.0 | 226.0 |
| 7 | 4804.000 | V | 58.2 | 58.2 | 3.1 | 61.3 | 61.3 | 74.0 | 3.0 | 12.7 | 113.0 | 256.0 |
| 8 | 4804.000 | V | 47.9 | 47.9 | 3.1 | 51.0 | 51.0 | 54.0 | 3.0 | 12.7 | 113.0 | 256.0 |

Tx Channel 40: 2441.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 272.006 | H | 43.2 | -8.6 | 34.6 | 46.0 | 11.4 | 122.0 | 337.0 |
| 2 | 287.996 | H | 44.7 | -8.1 | 36.6 | 46.0 | 9.4 | 121.0 | 334.0 |
| 3 | 304.000 | H | 45.0 | -7.7 | 37.3 | 46.0 | 8.7 | 100.0 | 342.0 |
| 4 | 367.989 | H | 43.6 | -6.1 | 37.5 | 46.0 | 8.5 | 100.0 | 322.0 |
| 5 | 399.996 | H | 41.0 | -5.4 | 35.6 | 46.0 | 10.4 | 100.0 | 16.0 |
| 6 | 431.996 | H | 44.1 | -4.6 | 39.5 | 46.0 | 6.5 | 100.0 | 40.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1628.050 | H | 57.9 | 57.9 | -8.0 | 49.9 | 49.9 | 74.0 | 6.2 | 24.1 | 100.0 | 35.0 |
| 2 | 1628.050 | H | 55.8 | 55.8 | -8.0 | 47.8 | 47.8 | 54.0 | 6.2 | 27.9 | 100.0 | 35.0 |
| 3 | 1628.050 | V | 54.1 | 54.1 | -8.0 | 46.1 | 46.1 | 74.0 | 11.0 | 16.8 | 100.0 | 317.0 |
| 4 | 1628.050 | V | 51.0 | 51.0 | -8.0 | 43.0 | 43.0 | 54.0 | 11.0 | 16.8 | 100.0 | 317.0 |
| 5 | 4882.000 | H | 53.7 | 53.7 | 3.5 | 57.2 | 57.2 | 74.0 | 5.7 | 13.0 | 100.0 | 222.0 |
| 6 | 4882.000 | H | 45.2 | 45.2 | 3.5 | 48.7 | 48.7 | 54.0 | 5.7 | 13.0 | 100.0 | 222.0 |
| 7 | 4882.000 | V | 57.5 | 57.5 | 3.5 | 61.0 | 61.0 | 74.0 | 2.5 | 13.0 | 100.0 | 58.0 |
| 8 | 4882.000 | V | 48.0 | 48.0 | 3.5 | 51.5 | 51.5 | 54.0 | 2.5 | 13.0 | 100.0 | 58.0 |

Tx Channel 79: 2480.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|--------------------|-----|---------------------------|-------------------|----------------------------|---------------------|----------------------|----------------|--------------|
| 1 | 272.004 | H | 43.3 | -8.6 | 34.7 | 46.0 | 11.3 | 110.0 | 347.0 |
| 2 | 287.993 | H | 44.7 | -8.1 | 36.6 | 46.0 | 9.4 | 119.0 | 344.0 |
| 3 | 303.997 | H | 45.1 | -7.7 | 37.4 | 46.0 | 8.6 | 100.0 | 341.0 |
| 4 | 367.996 | H | 43.7 | -6.1 | 37.6 | 46.0 | 8.4 | 100.0 | 322.0 |
| 5 | 399.994 | H | 41.4 | -5.4 | 36.0 | 46.0 | 10.0 | 100.0 | 25.0 |
| 6 | 431.996 | H | 43.5 | -4.6 | 38.9 | 46.0 | 7.1 | 100.0 | 21.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|--------------------|-----|---------------------------|---------------------------|-------------------|----------------------------|----------------------------|---------------------|----------------------|----------------------|----------------|--------------|
| 1 | 1654.050 | V | | 53.9 | -7.7 | | 46.2 | 74.0 | | 27.8 | 100.0 | 84.0 |
| 2 | 1654.050 | V | 49.8 | | -7.7 | 42.1 | | 54.0 | 11.9 | | 100.0 | 84.0 |
| 3 | 1654.050 | H | | 59.1 | -7.7 | | 51.4 | 74.0 | | 22.6 | 100.0 | 35.0 |
| 4 | 1654.050 | H | 57.1 | | -7.7 | 49.4 | | 54.0 | 4.6 | | 100.0 | 35.0 |
| 5 | 4960.000 | V | | 55.7 | 3.6 | | 59.3 | 74.0 | | 14.7 | 100.0 | 265.0 |
| 6 | 4960.000 | V | 48.3 | | 3.6 | 51.9 | | 54.0 | 2.1 | | 100.0 | 265.0 |
| 7 | 4960.000 | H | | 49.0 | 3.6 | | 52.6 | 74.0 | | 21.4 | 100.0 | 32.0 |
| 8 | 4960.000 | H | 44.4 | | 3.6 | 48.0 | | 54.0 | 6.0 | | 100.0 | 32.0 |

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable - Amp)]
2. No emissions were detected in frequency range 9kHz to 30MHz at the 3 meters distance.

Spurious Emissions - Radiated -

3-DH5

Tx Channel 1: 2402.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 272.009 | H | 43.2 | -8.6 | 34.6 | 46.0 | 11.4 | 119.0 | 349.0 |
| 2 | 287.993 | H | 45.0 | -8.1 | 36.9 | 46.0 | 9.1 | 116.0 | 345.0 |
| 3 | 303.997 | H | 45.1 | -7.7 | 37.4 | 46.0 | 8.6 | 100.0 | 345.0 |
| 4 | 367.989 | H | 43.7 | -6.1 | 37.6 | 46.0 | 8.4 | 100.0 | 322.0 |
| 5 | 399.994 | H | 41.3 | -5.4 | 35.9 | 46.0 | 10.1 | 100.0 | 26.0 |
| 6 | 431.998 | H | 43.9 | -4.6 | 39.3 | 46.0 | 6.7 | 100.0 | 29.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1602.050 | V | 51.6 | 54.7 | -8.1 | 43.5 | 46.6 | 74.0 | 10.5 | 27.4 | 142.0 | 331.0 |
| 2 | 1602.050 | V | 51.6 | 54.7 | -8.1 | 43.5 | 46.6 | 54.0 | 10.5 | 27.4 | 142.0 | 331.0 |
| 3 | 1602.050 | H | 56.2 | 58.7 | -8.1 | 48.1 | 50.6 | 74.0 | 5.9 | 23.4 | 100.0 | 41.0 |
| 4 | 1602.050 | H | 56.2 | 58.7 | -8.1 | 48.1 | 50.6 | 54.0 | 5.9 | 23.4 | 100.0 | 41.0 |
| 5 | 4804.000 | V | 40.3 | 53.2 | 3.1 | 43.4 | 56.3 | 74.0 | 10.6 | 17.7 | 100.0 | 274.0 |
| 6 | 4804.000 | V | 40.3 | 53.2 | 3.1 | 43.4 | 56.3 | 54.0 | 10.6 | 17.7 | 100.0 | 274.0 |
| 7 | 4804.000 | H | 39.7 | 48.3 | 3.1 | 42.8 | 51.4 | 74.0 | 11.2 | 22.6 | 100.0 | 112.0 |
| 8 | 4804.000 | H | 39.7 | 48.3 | 3.1 | 42.8 | 51.4 | 54.0 | 11.2 | 22.6 | 100.0 | 112.0 |

Tx Channel 40: 2441.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 272.009 | H | 43.2 | -8.6 | 34.6 | 46.0 | 11.4 | 121.0 | 348.0 |
| 2 | 287.992 | H | 45.0 | -8.1 | 36.9 | 46.0 | 9.1 | 116.0 | 336.0 |
| 3 | 303.986 | H | 44.9 | -7.7 | 37.2 | 46.0 | 8.8 | 100.0 | 336.0 |
| 4 | 367.997 | H | 43.6 | -6.1 | 37.5 | 46.0 | 8.5 | 100.0 | 324.0 |
| 5 | 399.998 | H | 41.2 | -5.4 | 35.8 | 46.0 | 10.2 | 100.0 | 21.0 |
| 6 | 431.997 | H | 43.9 | -4.6 | 39.3 | 46.0 | 6.7 | 100.0 | 36.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1628.050 | H | 56.8 | 59.2 | -8.0 | 48.8 | 51.2 | 74.0 | 5.2 | 22.8 | 104.0 | 12.0 |
| 2 | 1628.050 | H | 56.8 | 59.2 | -8.0 | 48.8 | 51.2 | 54.0 | 5.2 | 22.8 | 104.0 | 12.0 |
| 3 | 1628.050 | V | 50.9 | 53.8 | -8.0 | 42.9 | 45.8 | 74.0 | 11.1 | 28.2 | 100.0 | 316.0 |
| 4 | 1628.050 | V | 50.9 | 53.8 | -8.0 | 42.9 | 45.8 | 54.0 | 11.1 | 28.2 | 100.0 | 316.0 |
| 5 | 4882.000 | H | 39.7 | 49.5 | 3.5 | 43.2 | 53.0 | 74.0 | 10.8 | 21.0 | 100.0 | 221.0 |
| 6 | 4882.000 | H | 39.7 | 49.5 | 3.5 | 43.2 | 53.0 | 54.0 | 10.8 | 21.0 | 100.0 | 221.0 |
| 7 | 4882.000 | V | 40.0 | 52.1 | 3.5 | 43.5 | 55.6 | 74.0 | 10.5 | 18.4 | 100.0 | 59.0 |
| 8 | 4882.000 | V | 40.0 | 52.1 | 3.5 | 43.5 | 55.6 | 54.0 | 10.5 | 18.4 | 100.0 | 59.0 |

Tx Channel 79: 2480.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 272.002 | H | 43.3 | -8.6 | 34.7 | 46.0 | 11.3 | 120.0 | 339.0 |
| 2 | 288.001 | H | 45.0 | -8.1 | 36.9 | 46.0 | 9.1 | 119.0 | 342.0 |
| 3 | 303.995 | H | 45.0 | -7.7 | 37.3 | 46.0 | 8.7 | 100.0 | 342.0 |
| 4 | 367.987 | H | 43.6 | -6.1 | 37.5 | 46.0 | 8.5 | 100.0 | 322.0 |
| 5 | 399.983 | H | 41.0 | -5.4 | 35.6 | 46.0 | 10.4 | 100.0 | 16.0 |
| 6 | 431.995 | H | 43.4 | -4.6 | 38.8 | 46.0 | 7.2 | 100.0 | 28.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1654.050 | V | 51.2 | 54.7 | -7.7 | 43.5 | 47.0 | 74.0 | 10.5 | 27.0 | 100.0 | 255.0 |
| 2 | 1654.050 | V | 51.2 | 54.7 | -7.7 | 43.5 | 47.0 | 74.0 | 10.5 | 27.0 | 100.0 | 255.0 |
| 3 | 1654.050 | H | 57.4 | 59.6 | -7.7 | 49.7 | 51.9 | 74.0 | 4.3 | 22.1 | 100.0 | 37.0 |
| 4 | 1654.050 | H | 57.4 | 59.6 | -7.7 | 49.7 | 51.9 | 74.0 | 4.3 | 22.1 | 100.0 | 37.0 |
| 5 | 4960.000 | V | 39.7 | 50.0 | 3.6 | 43.3 | 53.6 | 74.0 | 10.7 | 20.4 | 100.0 | 265.0 |
| 6 | 4960.000 | V | 39.7 | 50.0 | 3.6 | 43.3 | 53.6 | 74.0 | 10.7 | 20.4 | 100.0 | 265.0 |
| 7 | 4960.000 | H | 39.1 | 46.7 | 3.6 | 42.7 | 50.3 | 74.0 | 11.3 | 23.7 | 100.0 | 249.0 |
| 8 | 4960.000 | H | 39.1 | 46.7 | 3.6 | 42.7 | 50.3 | 74.0 | 11.3 | 23.7 | 100.0 | 249.0 |

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable - Amp)]
2. No emissions were detected in frequency range 9kHz to 30MHz at the 3 meters distance.

Spurious Emissions - Radiated -

Rx Channel 1: 2402.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 272.000 | H | 41.5 | -8.6 | 32.9 | 46.0 | 13.1 | 119.0 | 333.0 |
| 2 | 288.003 | H | 44.8 | -8.1 | 36.7 | 46.0 | 9.3 | 112.0 | 342.0 |
| 3 | 304.003 | H | 44.8 | -7.7 | 37.1 | 46.0 | 8.9 | 100.0 | 345.0 |
| 4 | 367.988 | H | 43.6 | -6.1 | 37.5 | 46.0 | 8.5 | 100.0 | 321.0 |
| 5 | 399.988 | H | 41.1 | -5.4 | 35.7 | 46.0 | 10.3 | 100.0 | 23.0 |
| 6 | 431.986 | H | 43.4 | -4.6 | 38.8 | 46.0 | 7.2 | 100.0 | 38.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1600.300 | H | 55.6 | 61.6 | -8.1 | 47.5 | 53.5 | 74.0 | 6.5 | 20.5 | 100.0 | 48.0 |
| 2 | 1600.300 | H | 55.6 | 61.6 | -8.1 | 47.5 | 53.5 | 54.0 | 6.5 | 20.5 | 100.0 | 48.0 |
| 3 | 1600.300 | V | 50.2 | 57.6 | -8.1 | 42.1 | 49.5 | 74.0 | 11.9 | 24.5 | 100.0 | 320.0 |
| 4 | 1600.300 | V | 50.2 | 57.6 | -8.1 | 42.1 | 49.5 | 54.0 | 11.9 | 24.5 | 100.0 | 320.0 |
| 5 | 2400.500 | H | 53.1 | 56.4 | -4.2 | 48.9 | 52.2 | 74.0 | 5.1 | 21.8 | 100.0 | 132.0 |
| 6 | 2400.500 | H | 53.1 | 56.4 | -4.2 | 48.9 | 52.2 | 54.0 | 5.1 | 21.8 | 100.0 | 132.0 |
| 7 | 2400.500 | V | 47.2 | 52.6 | -4.2 | 43.0 | 48.4 | 74.0 | 11.0 | 25.6 | 100.0 | 323.0 |
| 8 | 2400.500 | V | 47.2 | 52.6 | -4.2 | 43.0 | 48.4 | 54.0 | 11.0 | 25.6 | 100.0 | 323.0 |

Rx Channel 40: 2441.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 271.995 | H | 41.5 | -8.6 | 32.9 | 46.0 | 13.1 | 125.0 | 335.0 |
| 2 | 288.001 | H | 44.8 | -8.1 | 36.7 | 46.0 | 9.3 | 117.0 | 344.0 |
| 3 | 304.001 | H | 44.9 | -7.7 | 37.2 | 46.0 | 8.8 | 100.0 | 347.0 |
| 4 | 367.992 | H | 43.7 | -6.1 | 37.6 | 46.0 | 8.4 | 100.0 | 326.0 |
| 5 | 399.990 | H | 41.1 | -5.4 | 35.7 | 46.0 | 10.3 | 100.0 | 27.0 |
| 6 | 431.995 | H | 43.6 | -4.6 | 39.0 | 46.0 | 7.0 | 100.0 | 34.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1626.370 | H | 54.8 | 57.2 | -8.0 | 46.8 | 49.2 | 74.0 | 7.2 | 24.8 | 100.0 | 13.0 |
| 2 | 1626.370 | H | 54.8 | 57.2 | -8.0 | 46.8 | 49.2 | 54.0 | 7.2 | 24.8 | 100.0 | 13.0 |
| 3 | 1626.370 | V | 50.8 | 53.9 | -8.0 | 42.8 | 45.9 | 74.0 | 11.2 | 28.1 | 100.0 | 317.0 |
| 4 | 1626.370 | V | 50.8 | 53.9 | -8.0 | 42.8 | 45.9 | 54.0 | 11.2 | 28.1 | 100.0 | 317.0 |
| 5 | 2439.540 | H | 49.1 | 52.3 | -4.2 | 44.9 | 48.1 | 74.0 | 9.1 | 25.9 | 100.0 | 273.0 |
| 6 | 2439.540 | H | 49.1 | 52.3 | -4.2 | 44.9 | 48.1 | 54.0 | 9.1 | 25.9 | 100.0 | 273.0 |
| 7 | 2439.540 | V | 48.8 | 52.7 | -4.2 | 44.6 | 48.5 | 74.0 | 9.4 | 25.5 | 148.0 | 283.0 |
| 8 | 2439.540 | V | 48.8 | 52.7 | -4.2 | 44.6 | 48.5 | 54.0 | 9.4 | 25.5 | 148.0 | 283.0 |

Rx Channel 79: 2480.0MHz

| No. | Frequency [MHz] | (P) | Reading QP [dB(μV)] | c. f [dB(1/m)] | Result QP [dB(μV/m)] | Limit [dB(μV/m)] | Margin QP [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|----------------|----------------------|------------------|----------------|-------------|-----------|
| 1 | 271.992 | H | 41.6 | -8.6 | 33.0 | 46.0 | 13.0 | 122.0 | 340.0 |
| 2 | 288.003 | H | 44.9 | -8.1 | 36.8 | 46.0 | 9.2 | 123.0 | 341.0 |
| 3 | 304.000 | H | 44.9 | -7.7 | 37.2 | 46.0 | 8.8 | 100.0 | 345.0 |
| 4 | 367.989 | H | 43.7 | -6.1 | 37.6 | 46.0 | 8.4 | 100.0 | 322.0 |
| 5 | 399.996 | H | 41.1 | -5.4 | 35.7 | 46.0 | 10.3 | 100.0 | 23.0 |
| 6 | 431.993 | H | 44.0 | -4.6 | 39.4 | 46.0 | 6.6 | 100.0 | 35.0 |

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 1652.400 | H | 57.6 | 57.6 | -7.7 | 49.9 | 49.9 | 74.0 | 6.4 | 24.1 | 100.0 | 13.0 |
| 2 | 1652.400 | H | 55.3 | 55.3 | -7.7 | 47.6 | 47.6 | 54.0 | 6.4 | 27.3 | 100.0 | 13.0 |
| 3 | 1652.400 | V | 54.4 | 54.4 | -7.7 | 46.7 | 46.7 | 74.0 | 11.1 | 27.3 | 100.0 | 255.0 |
| 4 | 1652.400 | V | 50.6 | 50.6 | -7.7 | 42.9 | 42.9 | 54.0 | 11.1 | 27.3 | 100.0 | 255.0 |
| 5 | 2478.480 | H | 52.1 | 52.1 | -4.1 | 48.0 | 48.0 | 74.0 | 9.0 | 26.0 | 177.0 | 69.0 |
| 6 | 2478.480 | H | 49.1 | 49.1 | -4.1 | 45.0 | 45.0 | 54.0 | 9.0 | 26.8 | 177.0 | 69.0 |
| 7 | 2478.480 | V | 51.3 | 51.3 | -4.1 | 47.2 | 47.2 | 74.0 | 10.6 | 26.8 | 100.0 | 320.0 |
| 8 | 2478.480 | V | 47.5 | 47.5 | -4.1 | 43.4 | 43.4 | 54.0 | 10.6 | 26.8 | 100.0 | 320.0 |

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable - Amp)]
2. No emissions were detected in frequency range 9kHz to 30MHz at the 3 meters distance.

4.9 Restricted Band of Operation

4.9.1 Test Procedure [FCC 15.205, 15.209, 15.247(d), IC RSS-210 2.2]

The peak power is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to:

- Peak: RBW=1MHz, VBW=1MHz, Span=40MHz, Sweep=auto
- Average: RBW=1MHz, VBW=10Hz, Span=40MHz, Sweep=auto

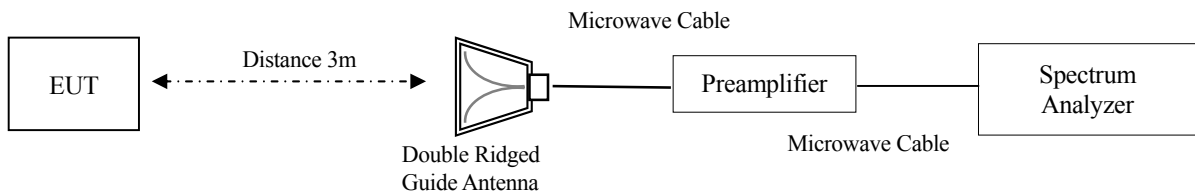
The EUT was set to operate with following conditions.

- No hopping [ch 1(low), ch 79 (high)]

The test mode of EUT is as follows.

- Tx mode

4.9.2 Measurement Setup



4.9.3 Limit of Restricted Band of Operation

Emission at the boundary of the restricted band provided by 15.205 shall be lower than 15.209 limit.

4.9.4 Measurement Result

DH5

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 2390.000 | H | | 48.5 | -4.2 | | 44.3 | 74.0 | | 29.7 | 108.0 | 198.0 |
| 2 | 2390.000 | H | 37.7 | | -4.2 | 33.5 | | 54.0 | 20.5 | | 108.0 | 198.0 |
| 3 | 2390.000 | V | | 49.4 | -4.2 | | 45.2 | 74.0 | | 28.8 | 100.0 | 280.0 |
| 4 | 2390.000 | V | 37.7 | | -4.2 | 33.5 | | 54.0 | 20.5 | | 100.0 | 280.0 |
| 5 | 2483.500 | H | | 60.9 | -4.1 | | 56.8 | 74.0 | | 17.2 | 107.0 | 197.0 |
| 6 | 2483.500 | H | 47.1 | | -4.1 | 43.0 | | 54.0 | 11.0 | | 107.0 | 197.0 |
| 7 | 2483.500 | V | | 56.8 | -4.1 | | 52.7 | 74.0 | | 21.3 | 100.0 | 269.0 |
| 8 | 2483.500 | V | 44.0 | | -4.1 | 39.9 | | 54.0 | 14.1 | | 100.0 | 269.0 |

3-DH5

| No. | Frequency [MHz] | (P) | Reading AV [dB(μV)] | Reading PK [dB(μV)] | c. f [dB(1/m)] | Result AV [dB(μV/m)] | Result PK [dB(μV/m)] | Limit [dB(μV/m)] | Margin AV [dB] | Margin PK [dB] | Height [cm] | Angle [°] |
|-----|-----------------|-----|---------------------|---------------------|----------------|----------------------|----------------------|------------------|----------------|----------------|-------------|-----------|
| 1 | 2390.000 | H | | 50.5 | -4.2 | | 46.3 | 74.0 | | 27.7 | 100.0 | 135.0 |
| 2 | 2390.000 | H | 37.7 | | -4.2 | 33.5 | | 54.0 | 20.5 | | 100.0 | 135.0 |
| 3 | 2390.000 | V | | 50.7 | -4.2 | | 46.5 | 74.0 | | 27.5 | 100.0 | 282.0 |
| 4 | 2390.000 | V | 37.7 | | -4.2 | 33.5 | | 54.0 | 20.5 | | 100.0 | 280.0 |
| 5 | 2483.500 | H | | 64.7 | -4.1 | | 60.6 | 74.0 | | 13.4 | 102.0 | 197.0 |
| 6 | 2483.500 | H | 48.3 | | -4.1 | 44.2 | | 54.0 | 9.8 | | 102.0 | 197.0 |
| 7 | 2483.500 | V | | 61.6 | -4.1 | | 57.5 | 74.0 | | 16.5 | 100.0 | 274.0 |
| 8 | 2483.500 | V | 46.3 | | -4.1 | 42.2 | | 54.0 | 11.8 | | 100.0 | 274.0 |

4.9.5 Trace Data

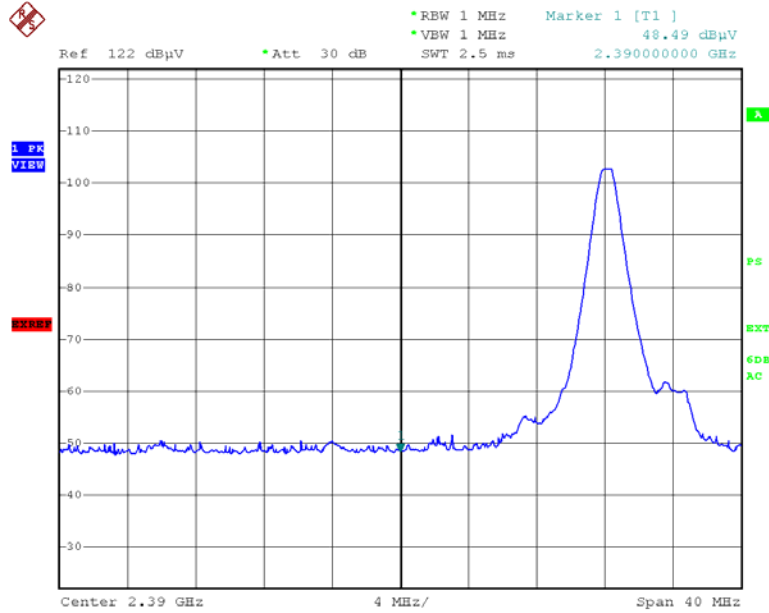
Test Personnel:

Tested by: Taiki Watanabe

Date : Dec. 5, 2009
Temperature : 21.4 [°C]
Humidity : 33.4 [%]
Test place : 3m Semi-anechoic chamber

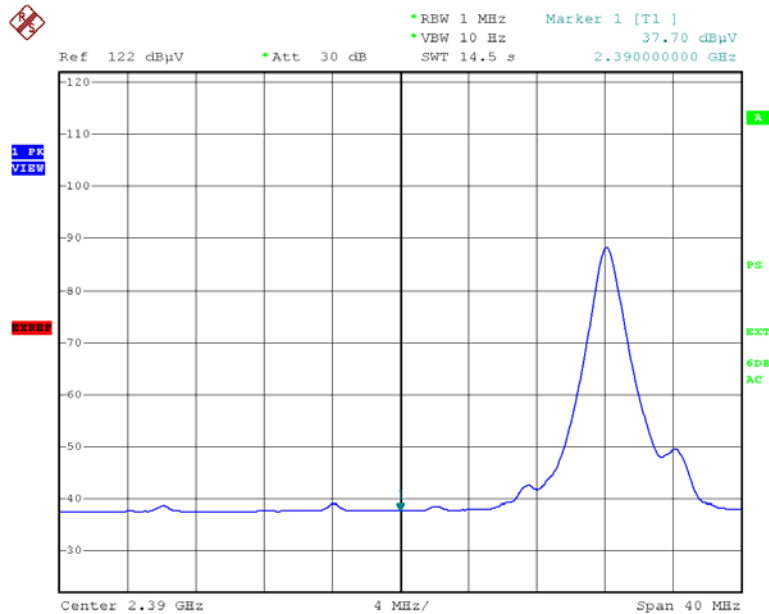
Restricted Band of Operation

**Frequency: 2390.0MHz -Horizontal- [DH5]
Peak**



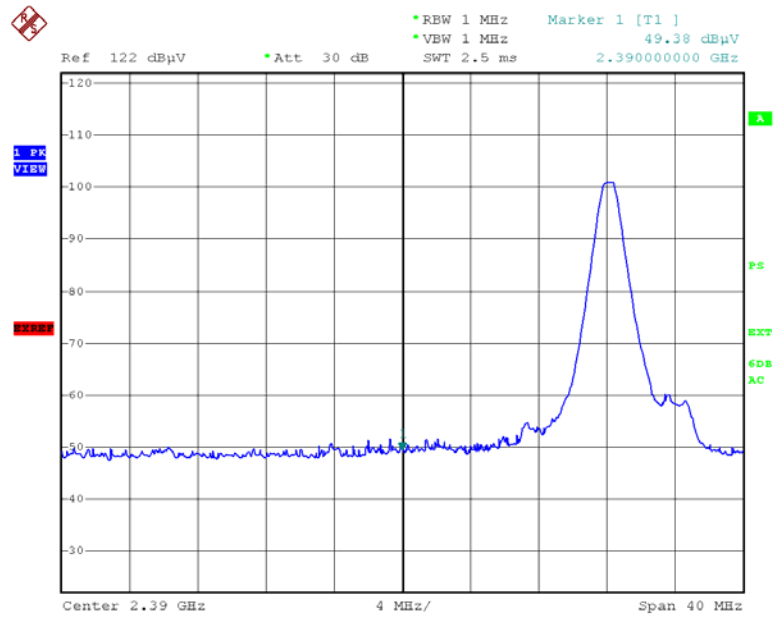
Date: 5.DEC.2009 09:03:54

Average



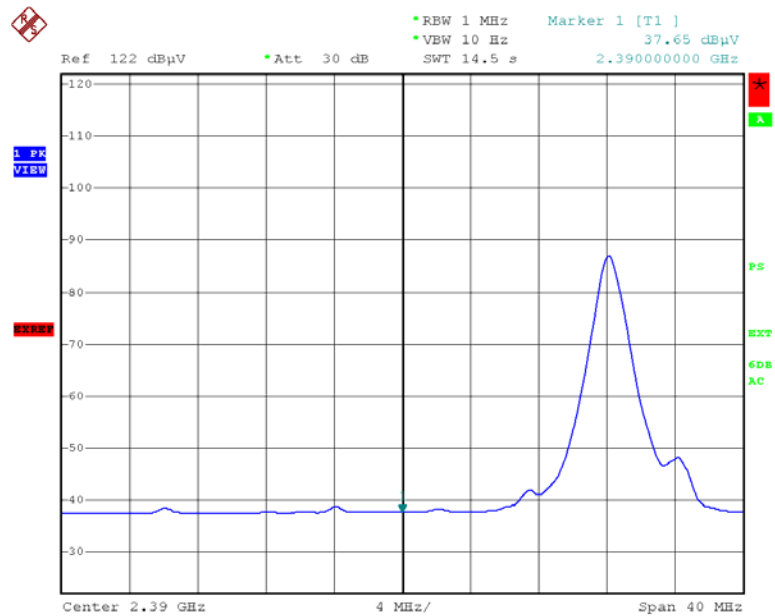
Date: 5.DEC.2009 08:59:50

Frequency: 2390.0MHz -Vertical- [DH5]
Peak



Date: 5.DEC.2009 09:11:55

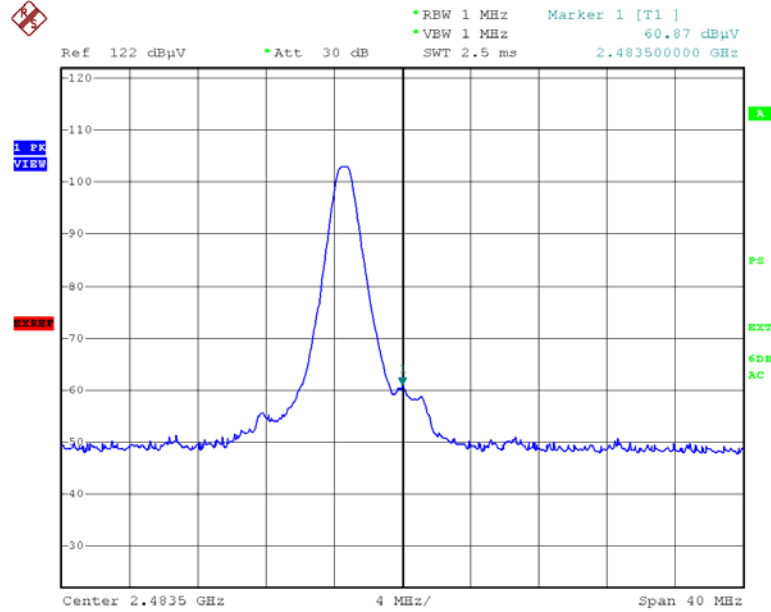
Average



Date: 5.DEC.2009 09:10:19

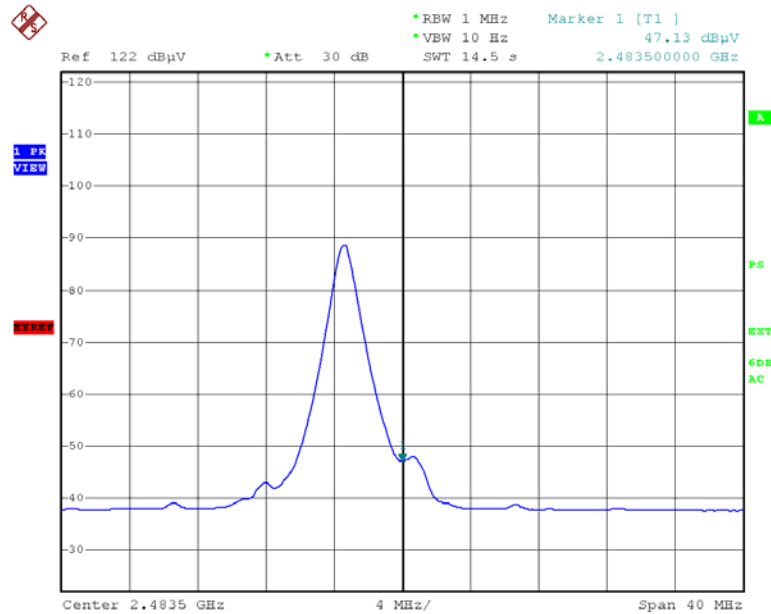
Restricted Band of Operation

**Frequency: 2483.5MHz -Horizontal- [DH5]
Peak**



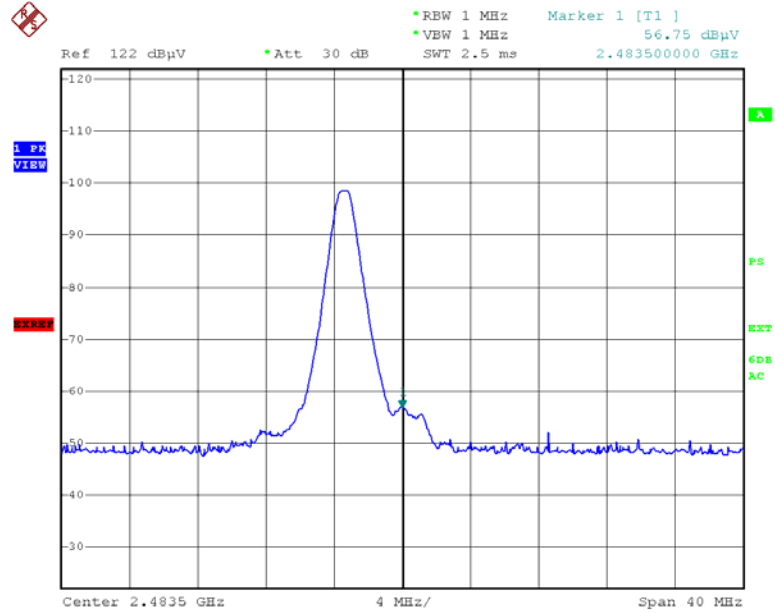
Date: 5.DEC.2009 09:20:03

Average



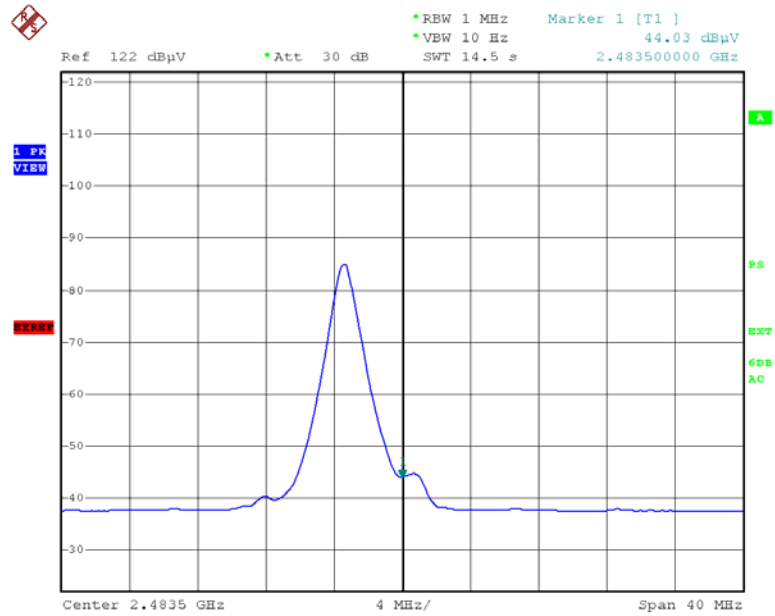
Date: 5.DEC.2009 09:22:22

**Frequency: 2483.5MHz -Vertical- [DH5]
Peak**



Date: 5.DEC.2009 09:27:26

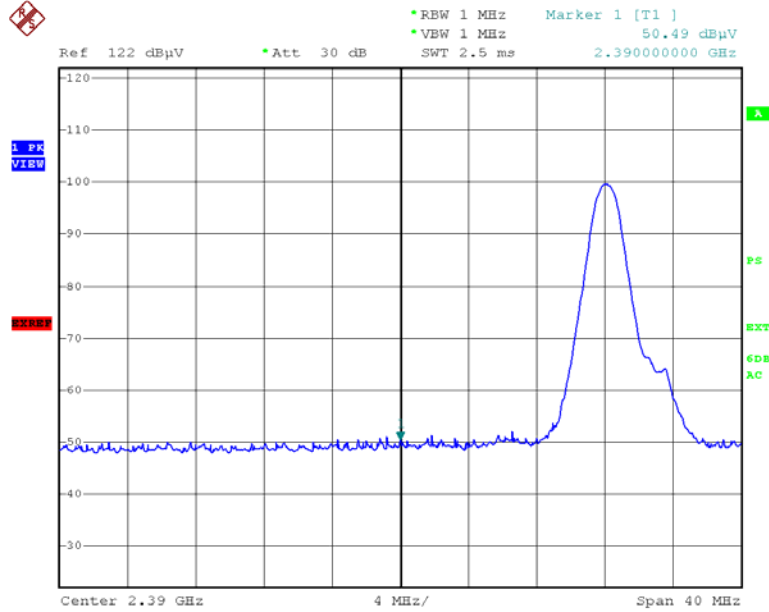
Average



Date: 5.DEC.2009 09:29:18

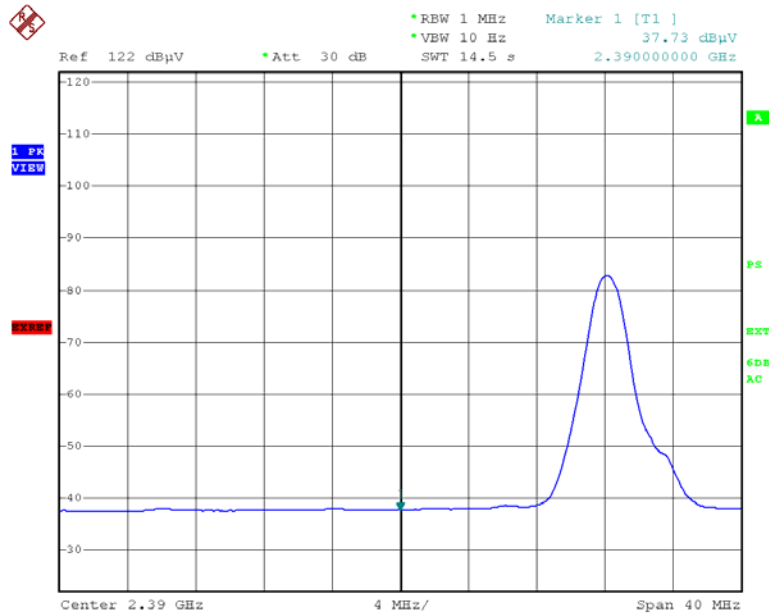
Restricted Band of Operation

**Frequency: 2390.0MHz -Horizontal- [3-DH5]
Peak**



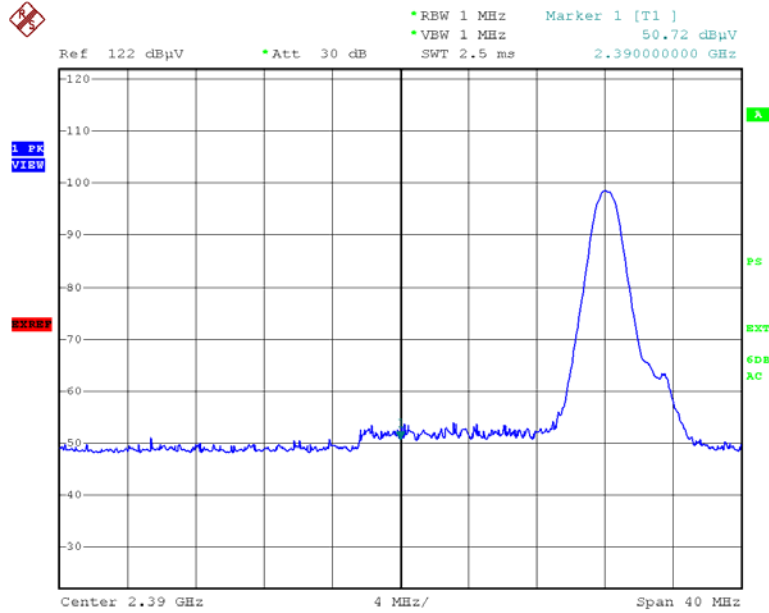
Date: 5.DEC.2009 09:42:46

Average



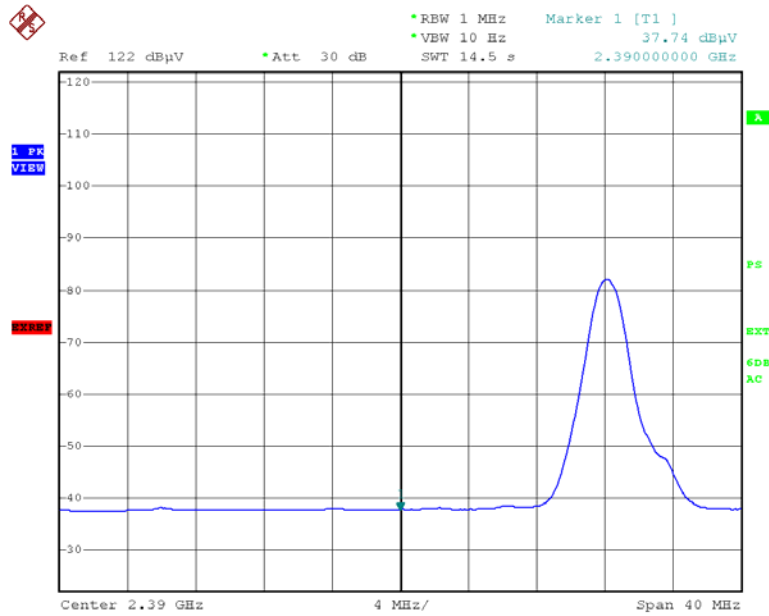
Date: 5.DEC.2009 09:41:12

Frequency: 2390.0MHz -Vertical- [3-DH5]
Peak



Date: 5.DEC.2009 09:48:14

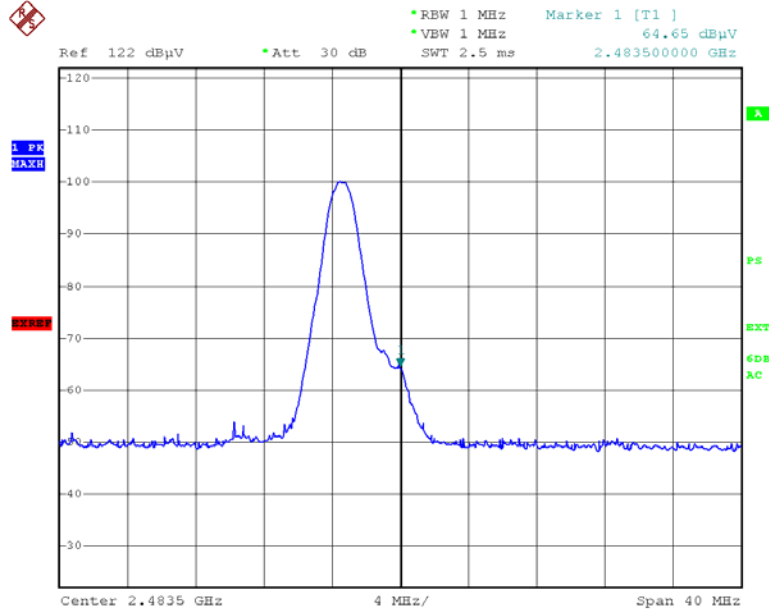
Average



Date: 5.DEC.2009 09:49:43

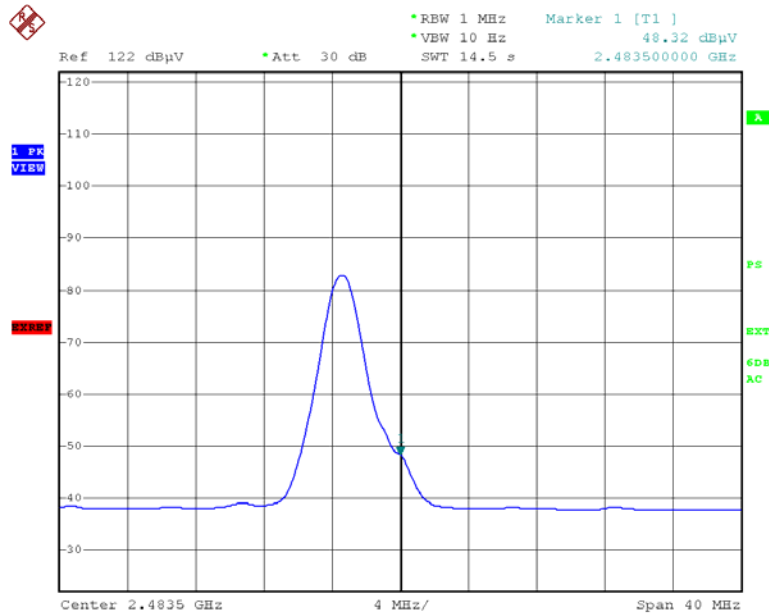
Restricted Band of Operation

**Frequency: 2483.5MHz -Horizontal- [3-DH5]
Peak**



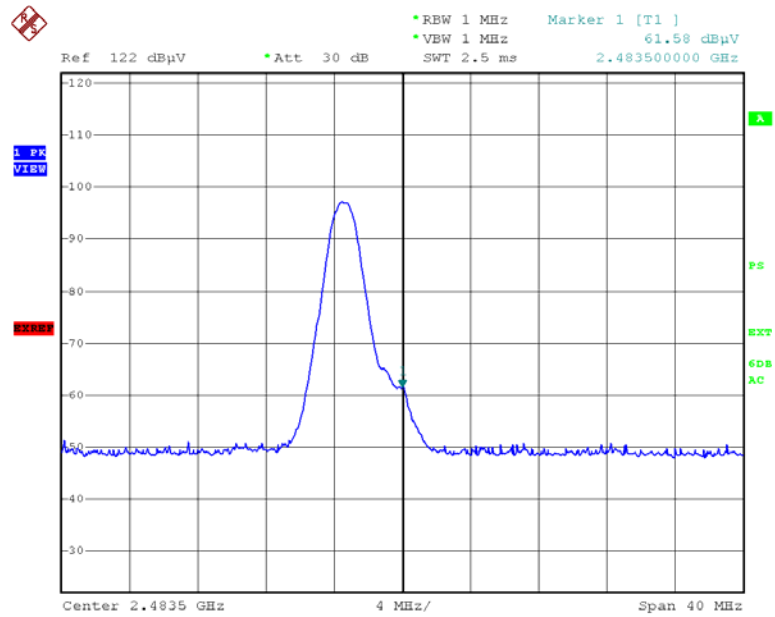
Date: 5.DEC.2009 09:54:44

Average



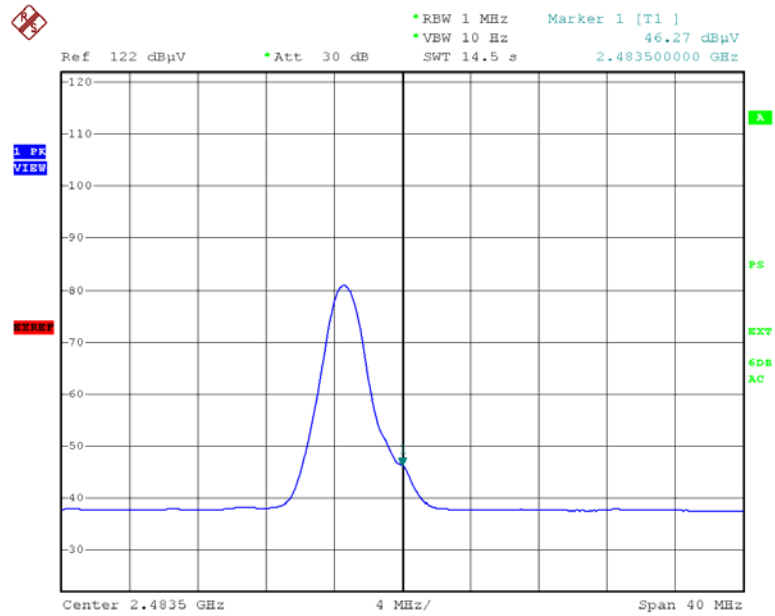
Date: 5.DEC.2009 09:56:15

Frequency: 2483.5MHz -Vertical- [3-DH5]
Peak



Date: 5.DEC.2009 10:01:00

Average



Date: 5.DEC.2009 10:02:34

4.10 Antenna requirement

According to FCC section 15.203., an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

The antenna is a chip antenna mounted inside of the EUT. Therefore, the EUT complies with the antenna requirement of FCC section 15.203.

5. *Uncertainty of measurement*

{ TC } Expanded uncertainties stated were calculated with a coverage Factor $k=2$.

Please note that these results are not taken into account when determining compliance or non-compliance with test result.

| Test item | Measurement uncertainty |
|---|-------------------------|
| Conducted emission at mains port (150kHz - 30MHz) | $\pm 2.9\text{dB}$ |
| Radiated emission (9kHz - 30MHz) | $\pm 4.4\text{dB}$ |
| Radiated emission (30MHz – 1000MHz) | $\pm 5.2\text{dB}$ |
| Radiated emission (1000MHz – 26GHz) | $\pm 3.6\text{dB}$ |

6. Laboratory description

6.1 Location: ZACTA Technology Corporation Yonezawa Testing Center
4149-7 Hachimanpara 5-chome Yonezawa-shi Yamagata 992-1128 Japan
Phone: +81-238-28-2880 Fax: +81-238-28-2888

6.2 Facility filing information:

1) NVLAP accreditation: NVLAP Lab. code: 200306-0

2) FCC filing:

| Site name | Registration Number | Expiry Date |
|---|---------------------|-------------------|
| Site 2, Site3 | 91065 | November 16, 2011 |
| 3m Semi-anechoic chamber 10m Semi-anechoic chamber | 540072 | March 12, 2010 |

3) Industry Canada Oats site filing:

| Site name | Sites on file: Oats 3m/10m | Expiry Date |
|---------------------------|-------------------------------|------------------|
| Site 2 | 4224A-2 | January 24, 2010 |
| Site 3 | 4224A-3 | January 24, 2010 |
| 3m Semi-anechoic chamber | 4224A-4 | January 24, 2010 |
| 10m Semi-anechoic chamber | 4224A-5 | January 24, 2010 |

4) VCCI site filing:

| Site name | Radiated emission | Conducted Emission for mains port | Expiry Date | Conducted emission for telecom port | Expiry Date |
|---------------------------|-------------------|-----------------------------------|---------------|-------------------------------------|--------------|
| Site 2 | R-137 | C-133 | Nov. 16, 2011 | T-1477 | Oct. 8, 2011 |
| Site 3 | R-138 | C-134 | Nov. 16, 2011 | T-1478 | Oct. 8, 2011 |
| 10m Semi-anechoic chamber | R-2480 | C-2722 | Dec. 19, 2009 | T-1474 | Oct. 8, 2011 |
| 3m Semi-anechoic chamber | R-2481 | C-2723 | Dec. 19, 2009 | T-1475 | Oct. 8, 2011 |
| Shielded room No.1 | R-137 | C-2724 | Dec. 19, 2009 | T-1476 | Oct. 8, 2011 |

5) ETL SEMKO authorization:

Authorized as an EMC test laboratory.

6) TUV Rheinland authorization:

Authorized as an EMC test laboratory.

7) BUREAU VERITAS certification:

Certified as an EMC test laboratory.

Appendix A: Test equipment

List of Measuring Instruments

| Equipment | Company | Model No. | Serial No. | Cal. due | Cal. date |
|---|---------------------------------|--------------------------|---------------|-----------|---------------|
| Spectrum Analyzer (3Hz – 42.98GHz) | Agilent Technologies | E4447A | MY46180188 | Feb. 2010 | Feb. 27, 2009 |
| Spectrum Analyzer (9kHz – 26.5GHz) | ADVANTEST | R3271 | 35050045 | Jul. 2011 | Jul. 1, 2009 |
| Preamplifier (100kHz-1.2GHz) | ANRITSU | MH648A | M96057 | Jun. 2010 | Jun. 13, 2009 |
| Preamplifier (1GHz-26.5GHz) | Agilent Technologies | 8449B | 3008A01008 | Dec. 2009 | Dec. 11, 2007 |
| EMI Receiver | ROHDE&SCHWARZ | ESCI | 100765 | May. 2010 | May. 27, 2009 |
| Highpass filter | R&S | EZ-25 | 100013 | Jan. 2010 | Jan. 7, 2009 |
| Line impedance stabilization network for EUT | Kyoritsu Electrical Works, Ltd. | KNW-407F | 8-2003-1 | May. 2010 | May. 29, 2009 |
| Line impedance stabilization network for peripheral | Kyoritsu Electrical Works, Ltd. | KNW-242F | 8-1973-1 | May. 2010 | May. 8, 2009 |
| 50Ω terminator | HRS | UG-88/U | N/A | Mar. 2010 | Mar. 4, 2009 |
| Loop antenna | ROHDE&SCHWARZ | HFH2-Z2 | 891847/17 | Feb. 2010 | Feb. 12, 2009 |
| Coaxial cable | N/A | RG213 | N/A | Feb. 2010 | Feb. 12, 2009 |
| TRILOG Antenna | Schwarzbeck | VULB9160 | 9160-3221 | Apr. 2010 | Apr. 13, 2009 |
| Attenuator (6dB) | TDC | TAT-43B-06 | N/A | Jun. 2010 | Jun. 13, 2009 |
| Double Ridged Guide Antenna | EMCO | 3115 | 4328 | Dec. 2010 | Dec. 10, 2008 |
| Broad-Band Horn antenna | Schwarzbeck | BBHA9170 | BBHA9170189 | Mar. 2010 | Mar. 23, 2008 |
| Preamplifier | TSJ | MLA-1840-B03-35 | 1240332 | Mar. 2010 | Mar. 23, 2008 |
| Microwave cable | SUHNER | SUCOFLEX 106 | 60929/6 (15m) | Nov. 2010 | Nov. 5, 2009 |
| | SUHNER | SUCOFLEX 106 | 60959/6 (1m) | Nov. 2010 | Nov. 5, 2009 |
| Coaxial cable | Fujikura | 5D-2W/1.5m | #AEC3R-003 | Feb. 2010 | Feb. 5, 2009 |
| | | 5D-2W/1m | #AEC3R-004 | Feb. 2010 | Feb. 5, 2009 |
| | | 5D-2W/4m | #AEC3C-001 | Feb. 2010 | Feb. 5, 2009 |
| | SUHNER | RG214/U/10m | #AEC3C-002 | Feb. 2010 | Feb. 5, 2009 |
| Microwave cable | SUHNER | SUCOFLEX104 | 199511/4 | Nov. 2010 | Nov. 12, 2009 |
| Attenuator | Weinschel | 56-10 | J4180 | Nov. 2010 | Nov. 12, 2009 |
| PC | DELL | DIMENSION E521 | 85465BX | N/A | N/A |
| Software | TOYO Corporation | EP5/RE-AJ | 0611193/V3.4 | N/A | N/A |
| Site attenuation | ZACTA Technology | 3m Semi-anechoic chamber | 5192Z | May. 2010 | May. 18, 2009 |

*The calibrations of the above equipment are traceable to NIST or equivalent standards of the reference organizations.