

TEST REPORT

Report number: Z071C-09231

Issue Date: October 8, 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	: Seiko Instruments Inc.
Equipment under test (EUT)	: Thermal Printer
FCC ID	: C4ZAB000004
IC Certification Number	: 4445A-AB000004
Model Number	: MPU-L465
Serial Number	: 02C0011683, 02C0011687
EUT Condition	: Pre-production

Test procedure	: ANSI C63.4-2003
Date of test	: September 30, 2009 October 5, 6, 2009
Test place	: 10m Semi-anechoic chamber 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:



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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
15.207 RSS-Gen 7.2.2	AC Power Line Conducted Emissions 150kHz – 30MHz	Conducted	Pass

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 Thermal Printer.

2.2 EUT information

Applicant	: Seiko Instruments Inc. 8, Nakase 1-chome, Mihama-ku, Chiba-shi, Chiba, 261-8507 Japan Phone: + 81-43-211-7683 Fax: + 81-43-211-8055
Equipment under test (EUT)	: Thermal Printer
Trade name	: SII
Model number	: MPU-L465
Serial number	: 02C0011683, 02C0011687
EUT condition	: Pre-production
Max. frequency	: 22.118MHz
Power ratings	: DC 7.4V (Li-ion battery) AC 100-240V 50/60Hz 4.0A [Power supply for EUT in testing was AC 120V 60Hz for AC adapter.]
Size	: (W) 168 x (D) 155 x (H) 87 mm
Type of equipment	: Stand-alone
Environment	: Indoor and Outdoor use
Thermal limitation	: -10°C to 50°C
Operating mode	: Tx mode / Rx mode
Variation of the family model(s)	: MPU-L465-E
[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	: 0.885mW
Antenna (Rx and Tx)	: Chip antenna
Antenna gain	: 2.00dBi
RF type	: Transceiver
Intended use	: Data transmission
RF emission type designator	: 865KF1D (GFSK), 1M16G1D (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)
- iii) Start test mode

【H print Bluetooth I/F】

- i) “H” characters data are sent to EUT from Pocket PC.
- ii) Print “H” characters.
- iii) i) and ii) is repeated.

3. Configuration information

3.1 EUT and Peripheral(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID/DoC	Comment
1	Thermal Printer	Seiko Instruments Inc.	MPU-L465	02C0011683 02C0011687	C4ZAB000004	EUT
2	AC adapter for EUT	Seiko Instruments Inc.	NU60-C090400-13	090413 No.3	-	Option
3	Battery Pack	Seiko Instruments Inc.	BP-L0720-A1-E	92D	-	Option
4	Personal Computer (PC)	HP	Compaq nx6320	CNU71908FX	DoC	*1
		IBM	Think Pad R30 Type 2656	AA-GFX2V 02/04	DoC	*2
5	AC adapter for PC	HP	PA-1650-02HC	5978A0ALLGLQJ	-	*1
		IBM	AA21131 B	11S02K6746Z1Z2 UF23T4L2	-	*2
6	Pocket PC	Toshiba	CET0101A	1728	DoC	*3
7	Cradle	Toshiba	CEX0108A	012124523A1	-	*3
8	Bluetooth card	Toshiba	SD-BT00U	3200021470	CJ6SD00UBT	*3
9	AC adapter for Pocket PC	Toshiba	CEX0107A	0052628	-	*3

*1: Used for RF Radiated test only.

*2: Used for RF Conducted test only.

*3: Used for AC power line Conducted emissions test only.

3.2 Cable(s) information

No.	Cable	Length [m]	Shield	Connector	Comment
a	DC cable for EUT AC adapter	1.5	No	Metal	Option
b	AC Power cord for EUT AC adapter	1.5	No	Plastic	Option
c	Serial cable	1.2	Yes	Metal	Option
d	DC cable for PC AC adapter	1.8	No	Metal	-
e	AC Power cord for PC AC adapter	1.8	No	Plastic	*1
		1.0	No	Plastic	*2
f	USB cable	1.2	Yes	Metal	*3
g	DC cable for Pocket PC	1.5	No	Metal	*3
h	AC Power cord for Pocket PC AC adapter	0.5	No	Plastic	*3

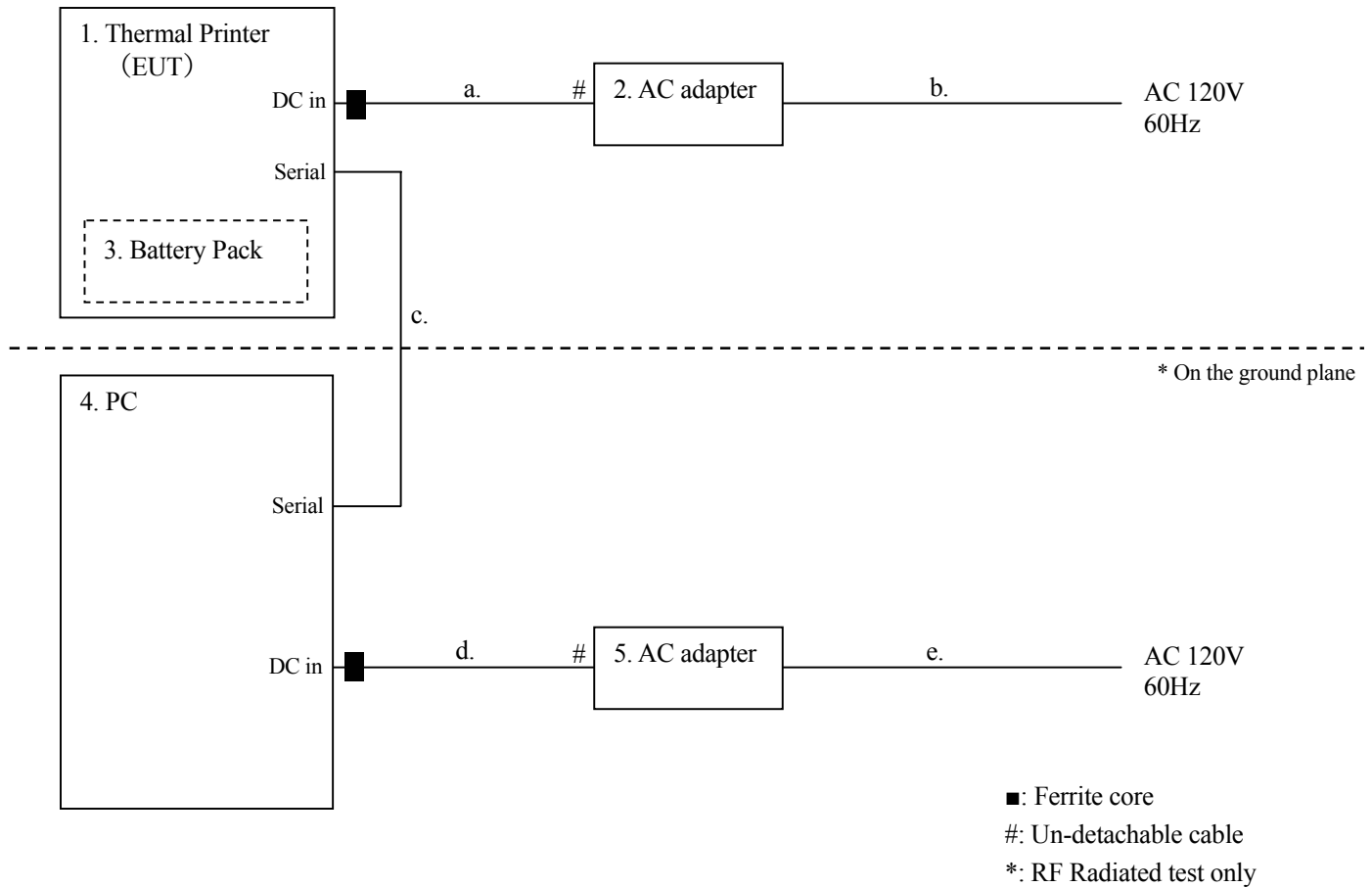
*1: Used for RF Radiated test only.

*2: Used for RF Conducted test only.

*3: Used for AC power line Conducted emissions test only.

3.3 System configuration

[RF Conducted test / RF Radiated test]

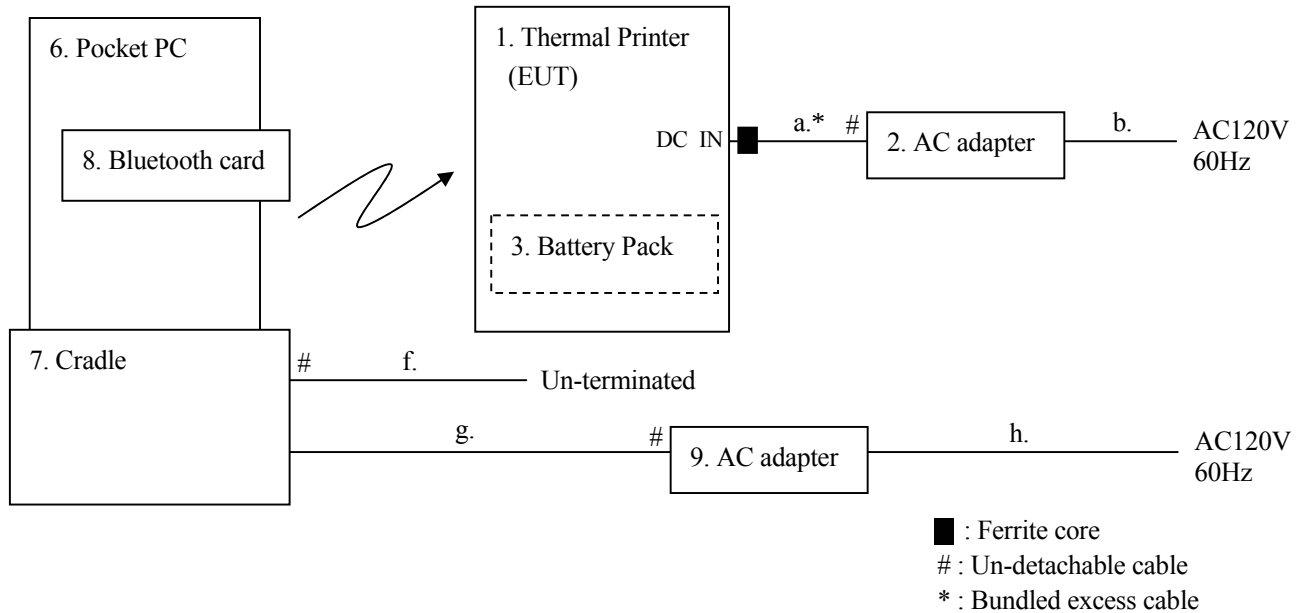


Note1: Numbers assigned to equipment or cables on this diagram are corresponded to the list in “3.1 EUT and Peripheral(s) used”, “3.2 Cable(s) information”.

Note2: DC cable (No.a) with one ferrite core is accessory for AC adapter (No.2).

Note3: DC cable (No.d) with one ferrite core is accessory for AC adapter (No.5).

[Conducted emission test]



Note1: Numbers assigned to equipment or cables on this diagram are corresponded to the list in “3.1 EUT and Peripheral(s) used”, “3.2 Cable(s) information”.

Note2: DC cable (No.a) with one ferrite core is accessory for AC adapter (No.2).

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

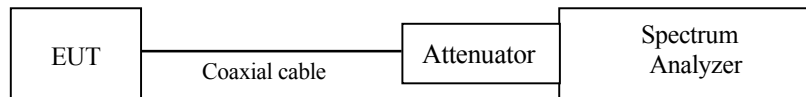
The EUT was set to operate with following conditions.

- 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	0.938	0.865
		3-DH5	1.275	1.155
40	2441.00	DH5	0.940	0.864
		3-DH5	1.275	1.155
79	2480.00	DH5	0.940	0.864
		3-DH5	1.258	1.151

4.1.5 Trace Data

Test Personnel:

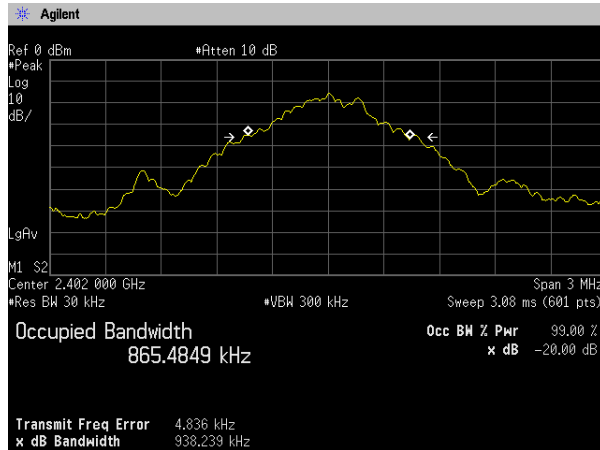
Tested by: Taiki Watanabe

Date : Sep. 30, 2009
 Temperature : 23.0 [°C]
 Humidity : 60.0 [%]
 Test place : Shielded room

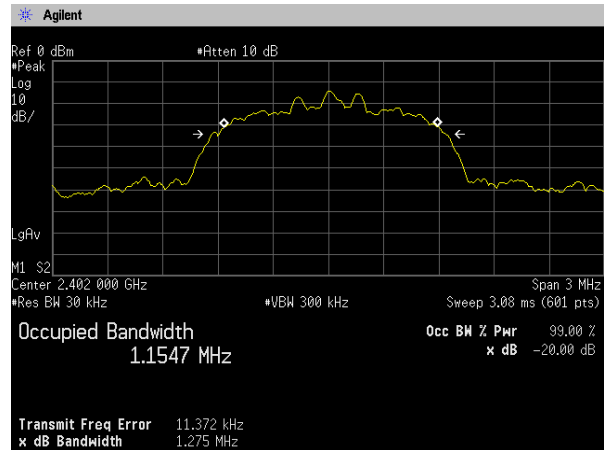
20dB Bandwidth/Occupied Bandwidth

Channel 1: 2402.0MHz

DH5

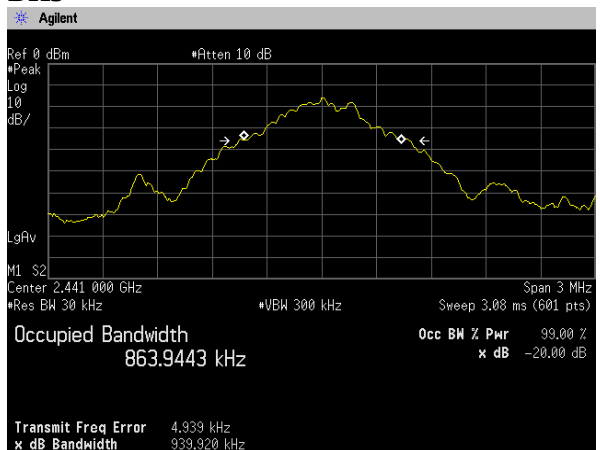


3-DH5

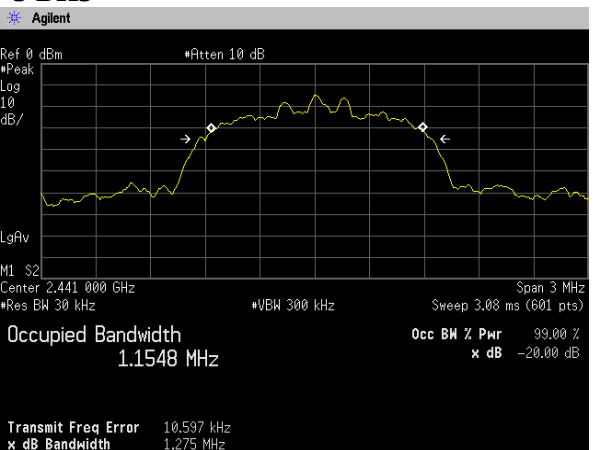


Channel 40: 2441.0MHz

DH5

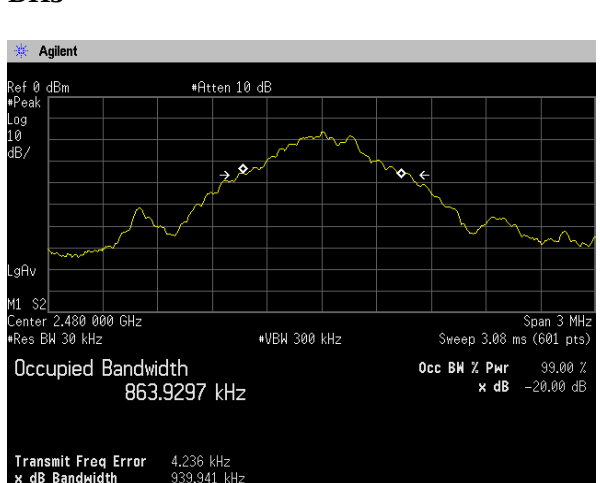


3-DH5

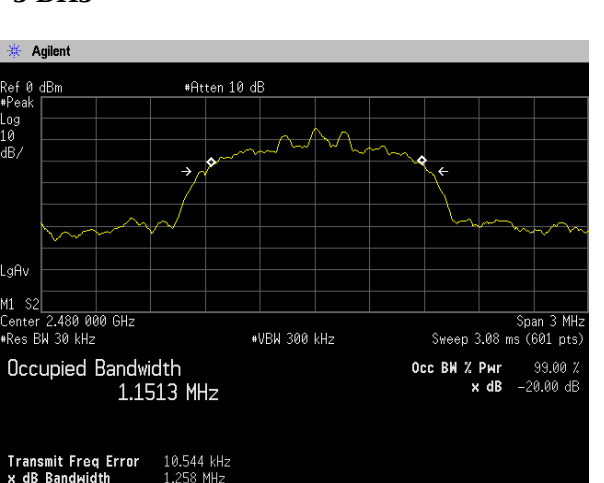


Channel 79: 2480.0MHz

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

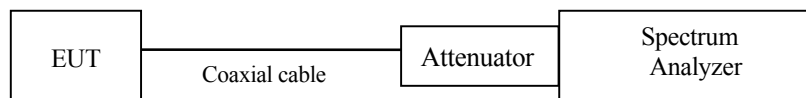
The EUT was set to operate with following conditions.

- 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	1.020	>two-thirds of the 20dB Bandwidth =626.67kHz	PASS
3-DH5	1.025	>two-thirds of the 20dB Bandwidth =850kHz	PASS

4.2.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

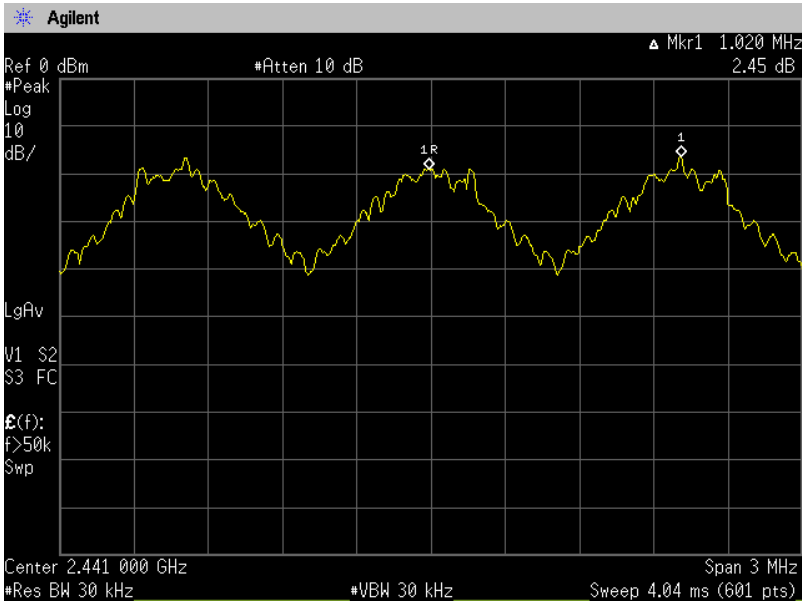
Date : Sep. 30, 2009

Temperature : 23.0 [°C]

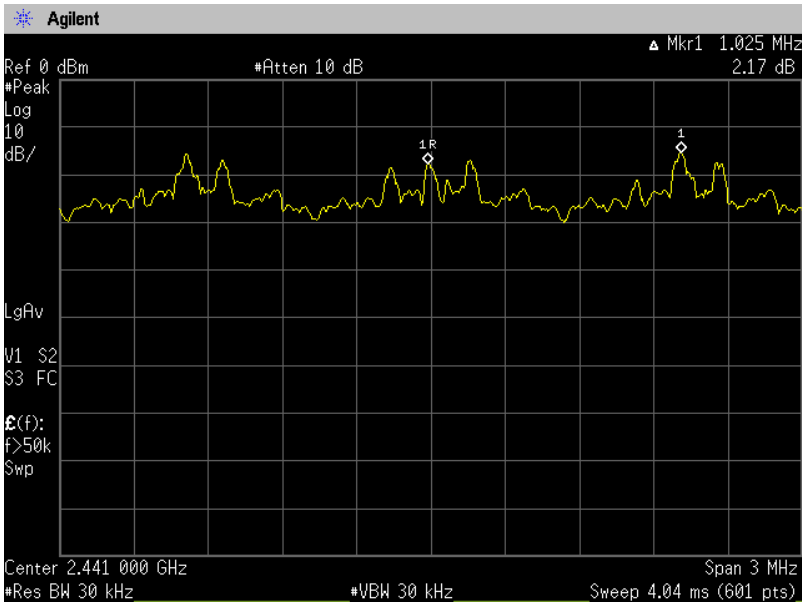
Humidity : 60.0 [%]

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

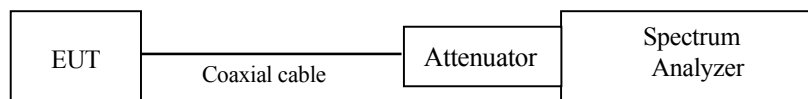
The EUT was set to operate with following conditions.

- 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

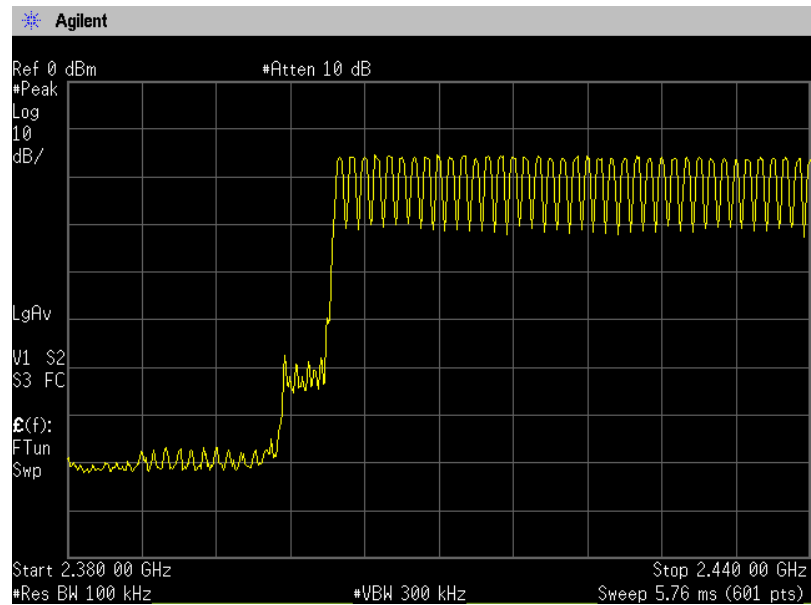
Test Personnel:

Tested by: Taiki Watanabe

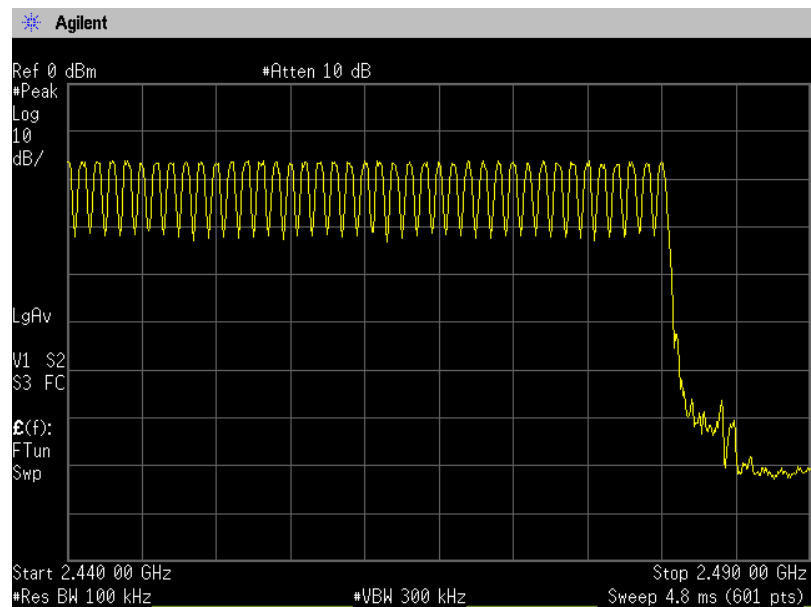
Date : Sep. 30, 2009
Temperature : 23.0 [°C]
Humidity : 60.0 [%]
Test place : Shielded room

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

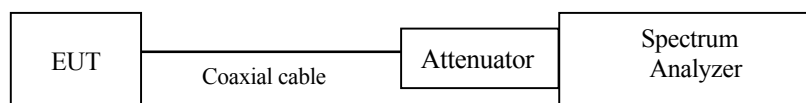
The EUT was set to operate with following conditions.

- 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	2.917	0.311	<0.4s	PASS
79	2480.00	DH5	2.900	0.309	<0.4s	PASS
		3-DH5	2.917	0.311	<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. 0, DH5 = 2.900 ms x 1600 / 6 / 79 x 31.6 = 309.33ms

4.4.5 Trace Data

Test Personnel:

Tested by: Taiki Watanabe

Date : Sep. 30, 2009

Temperature : 23.0 [°C]

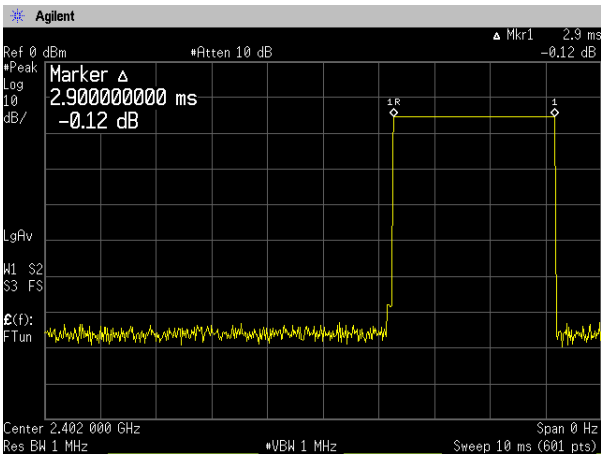
Humidity : 60.0 [%]

Test place : Shielded room

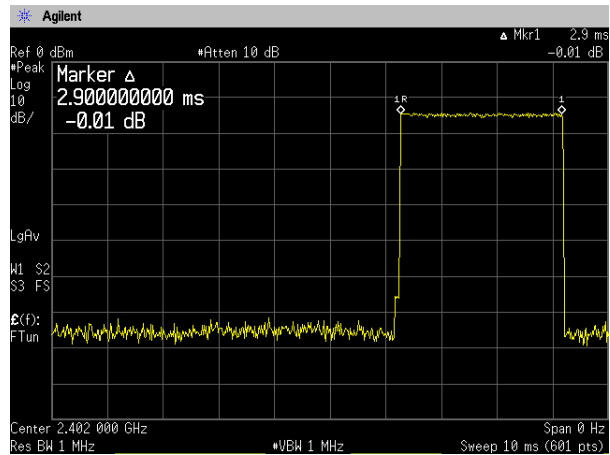
Dwell Time

Channel 1: 2402.0MHz

DH5

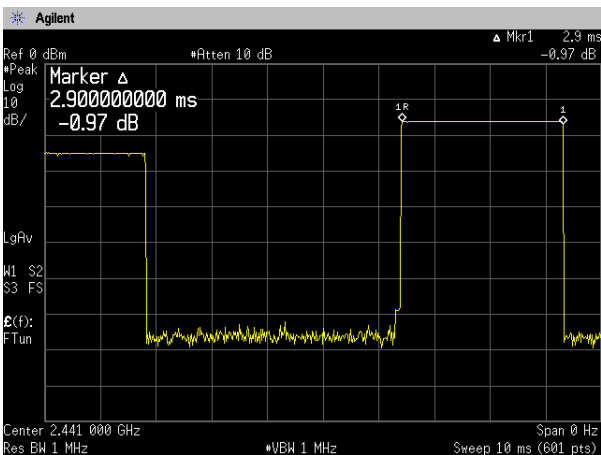


3-DH5

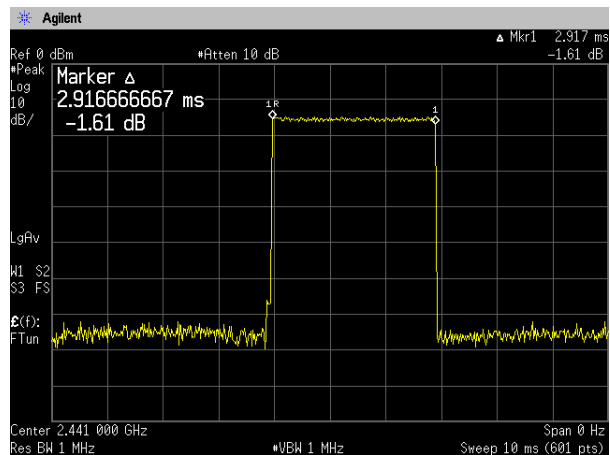


Channel 40: 2441.0MHz

DH5

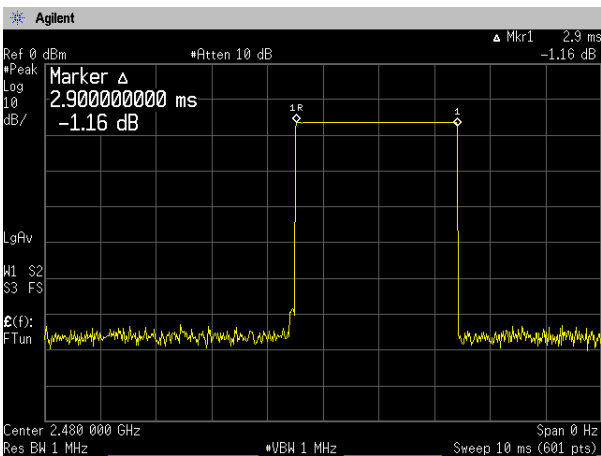


3-DH5

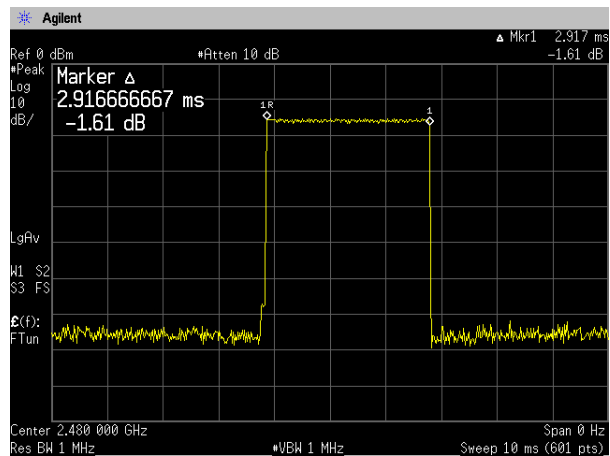


Channel 79: 2480.0MHz

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

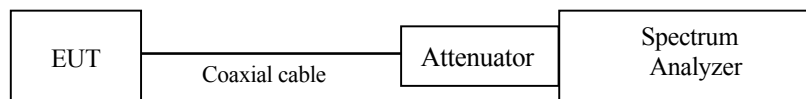
The EUT was set to operate with following conditions.

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

The test mode of EUT is as follows.

- Tx mode in Battery operation. (Full charge) DC 7.4V
- Tx mode in AC power operation. (AC 102V)
- Tx mode in AC power operation. (AC 120V)
- Tx mode in AC power operation. (AC 138V)

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 in Battery operation. (Full charge) DC 7.4V]

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	-15.33	10.66	2.00	-2.67	0.541	≤ 125	PASS
		3-DH5	-13.25	10.66	2.00	-0.59	0.873	≤ 125	PASS
40	2441.00	DH5	-15.88	10.66	2.00	-3.22	0.476	≤ 125	PASS
		3-DH5	-14.09	10.66	2.00	-1.43	0.719	≤ 125	PASS
79	2480.00	DH5	-16.19	10.66	2.00	-3.53	0.444	≤ 125	PASS
		3-DH5	-14.38	10.66	2.00	-1.72	0.673	≤ 125	PASS

[Tx mode in AC power operation. (AC 102V)]

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	-15.23	10.66	2.00	-2.57	0.553	≤ 125	PASS
		3-DH5	-13.28	10.66	2.00	-0.62	0.867	≤ 125	PASS
40	2441.00	DH5	-15.91	10.66	2.00	-3.25	0.473	≤ 125	PASS
		3-DH5	-14.04	10.66	2.00	-1.38	0.728	≤ 125	PASS
79	2480.00	DH5	-16.18	10.66	2.00	-3.52	0.445	≤ 125	PASS
		3-DH5	-14.39	10.66	2.00	-1.73	0.671	≤ 125	PASS

[Tx mode in AC power operation. (AC 120V)]

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	-15.22	10.66	2.00	-2.56	0.555	≤ 125	PASS
		3-DH5	-13.31	10.66	2.00	-0.65	0.861	≤ 125	PASS
40	2441.00	DH5	-15.91	10.66	2.00	-3.25	0.473	≤ 125	PASS
		3-DH5	-14.05	10.66	2.00	-1.39	0.726	≤ 125	PASS
79	2480.00	DH5	-16.18	10.66	2.00	-3.52	0.445	≤ 125	PASS
		3-DH5	-14.39	10.66	2.00	-1.73	0.671	≤ 125	PASS

[Tx mode in AC power operation. (AC 138V)]

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	-15.20	10.66	2.00	-2.54	0.557	≤ 125	PASS
		3-DH5	-13.19	10.66	2.00	-0.53	0.885	≤ 125	PASS
40	2441.00	DH5	-15.90	10.66	2.00	-3.24	0.474	≤ 125	PASS
		3-DH5	-13.97	10.66	2.00	-1.31	0.740	≤ 125	PASS
79	2480.00	DH5	-16.17	10.66	2.00	-3.51	0.446	≤ 125	PASS
		3-DH5	-14.16	10.66	2.00	-1.50	0.708	≤ 125	PASS

Calculation:

Reading (dBm) + Factor (dB) + Antenna Gain of EUT (dBi) = Level (dBm)

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

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

4.5.5 Trace Data

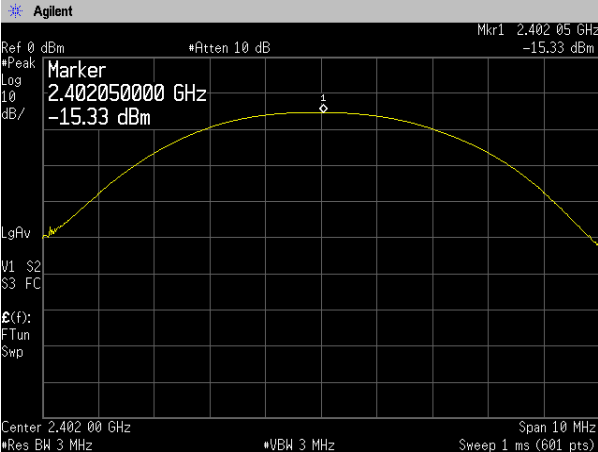
Test Personnel:

Tested by: Taiki Watanabe

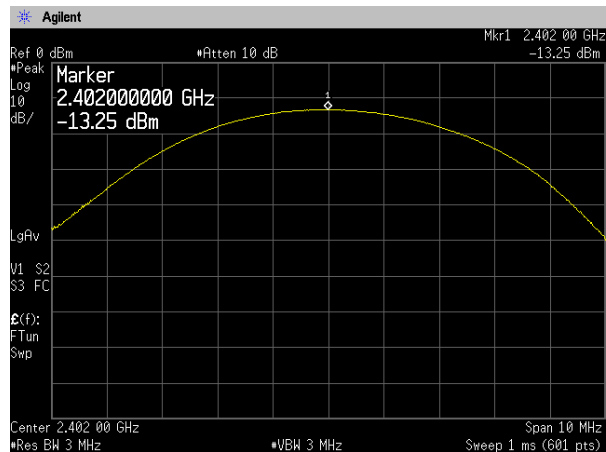
Date : Sep. 30, 2009
Temperature : 23.0 [°C]
Humidity : 60.0 [%]
Test place : Shielded room

Maximum Peak Output Power - Conducted - [Full charge DC 7.4V]

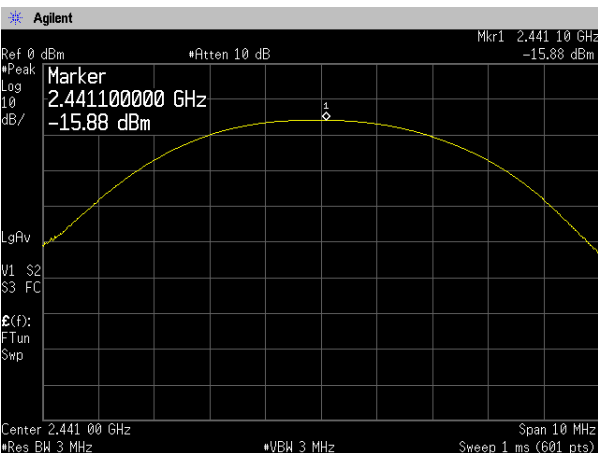
Channel 1: 2402.0MHz
DH5



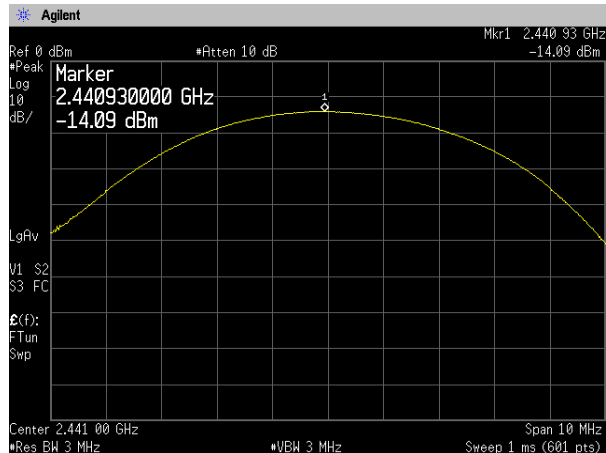
3-DH5



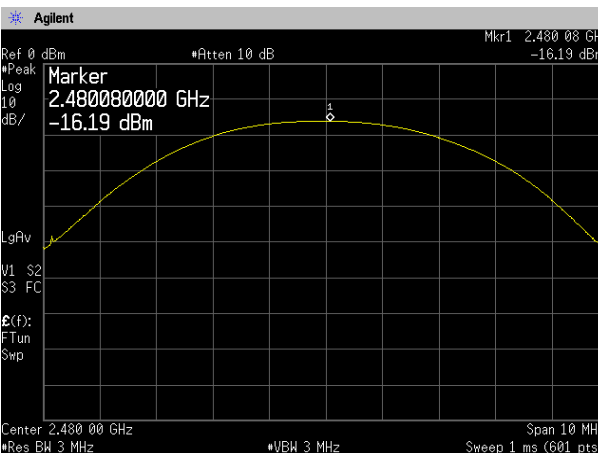
Channel 40: 2441.0MHz
DH5



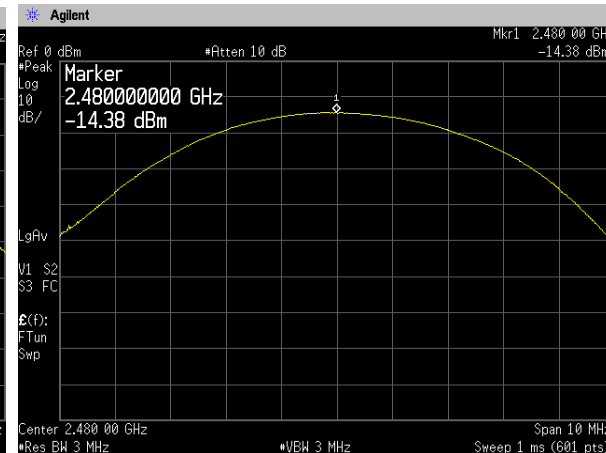
3-DH5



Channel 79: 2480.0MHz
DH5

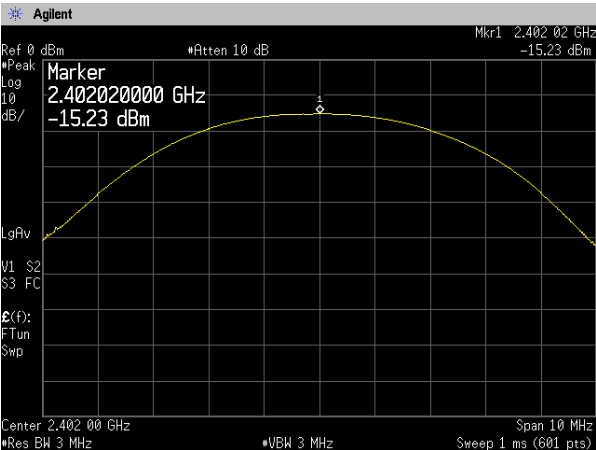


3-DH5

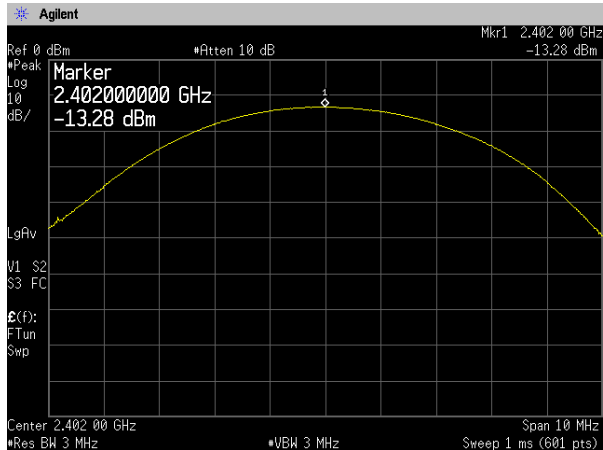


Maximum Peak Output Power - Conducted - [AC 102V]

Channel 1: 2402.0MHz
DH5



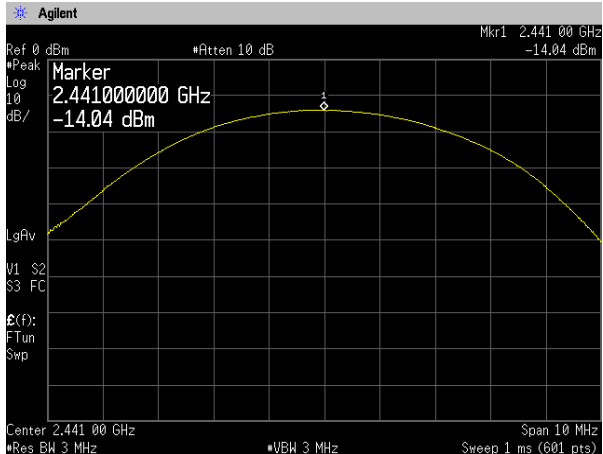
3-DH5



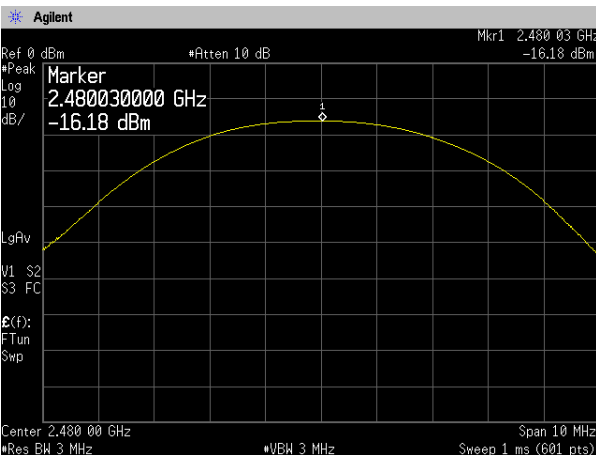
Channel 40: 2441.0MHz
DH5



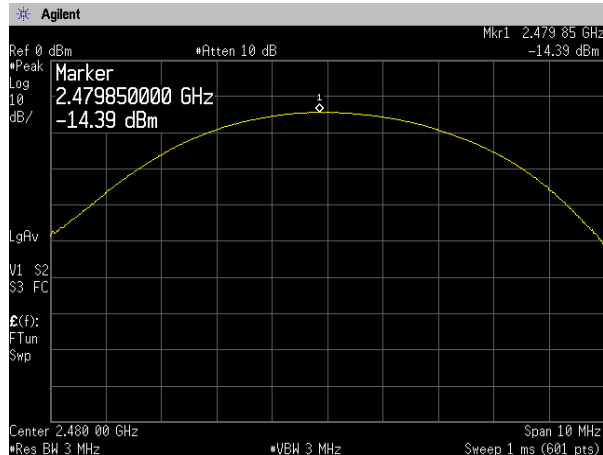
3-DH5



Channel 79: 2480.0MHz
DH5

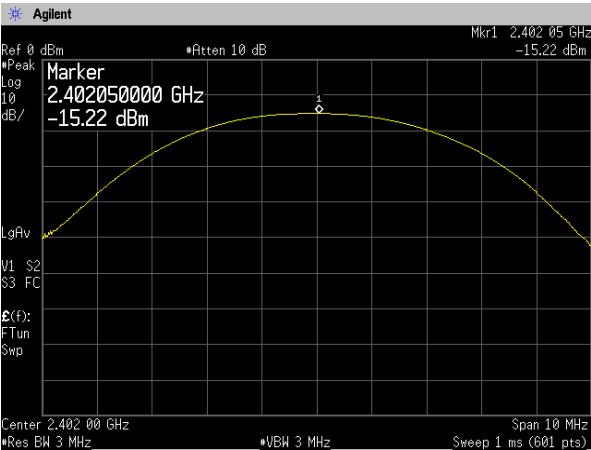


3-DH5

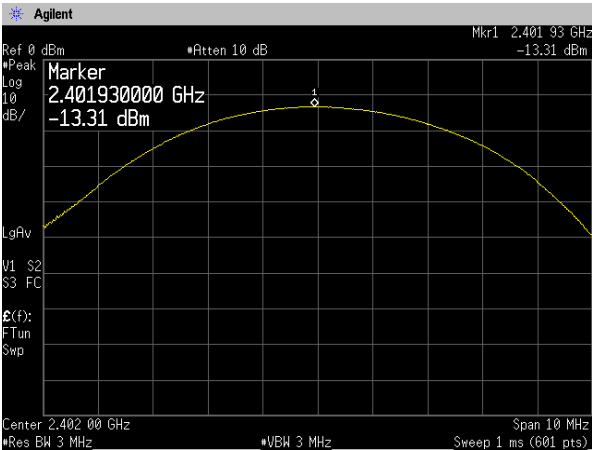


Maximum Peak Output Power - Conducted - [AC 120V]

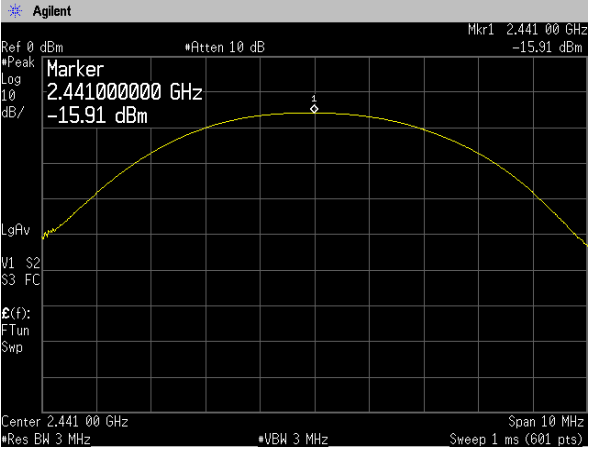
Channel 1: 2402.0MHz
DH5



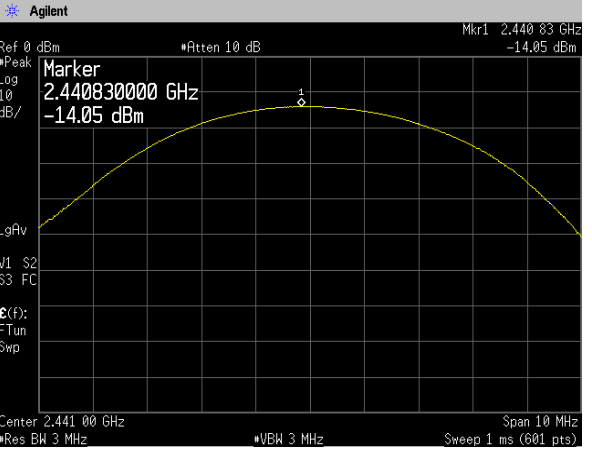
3-DH5



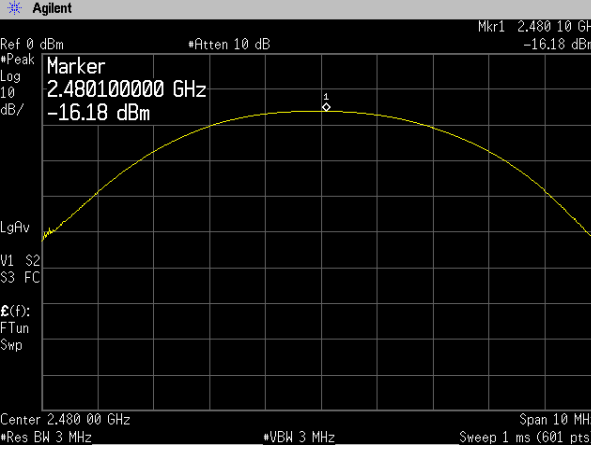
Channel 40: 2441.0MHz
DH5



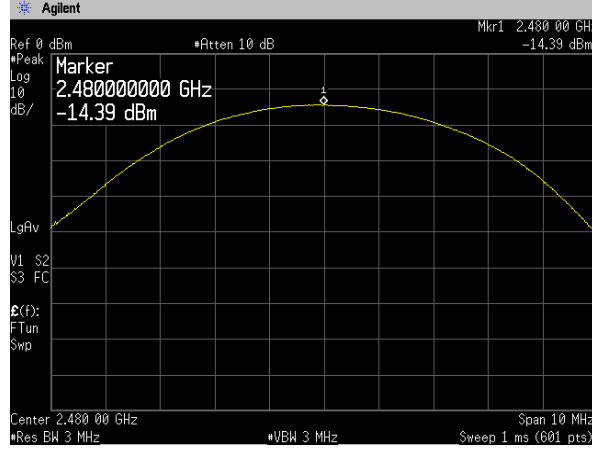
3-DH5



Channel 79: 2480.0MHz
DH5

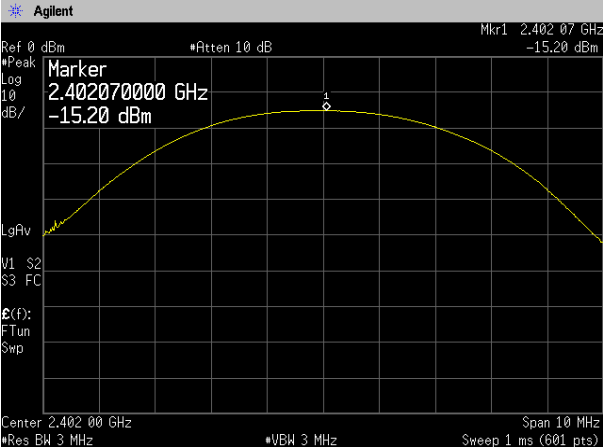


3-DH5

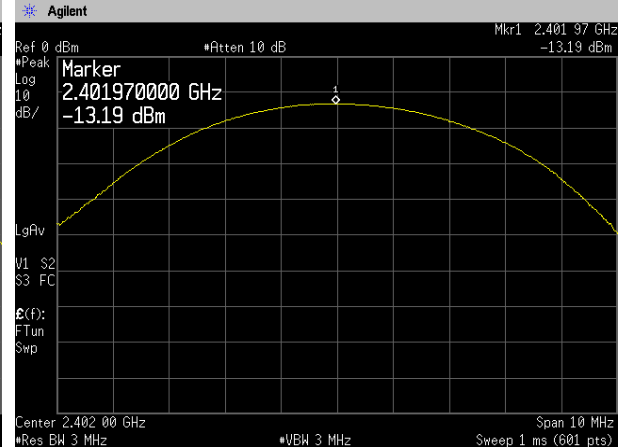


Maximum Peak Output Power - Conducted - [AC 138V]

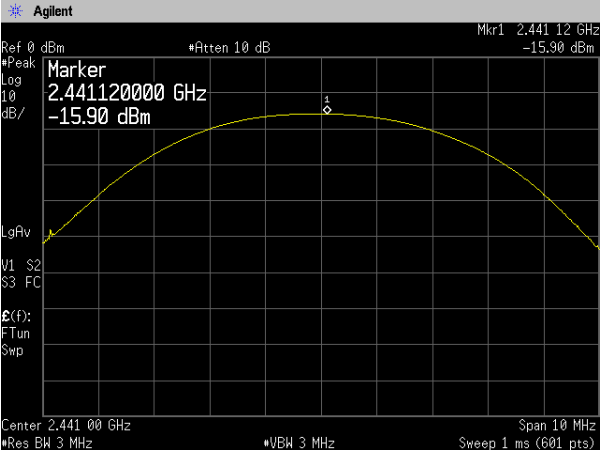
Channel 1: 2402.0MHz
DH5



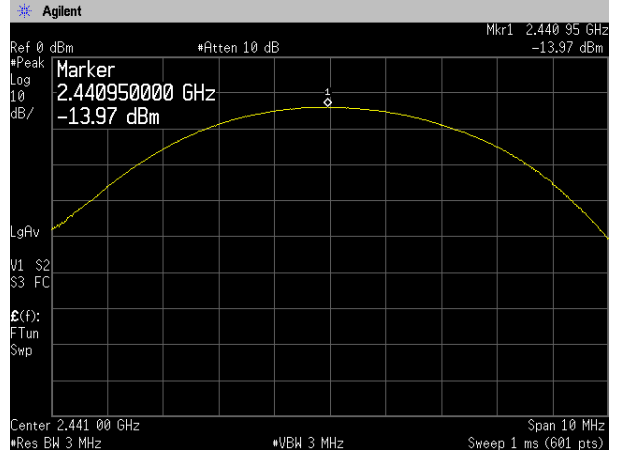
3-DH5



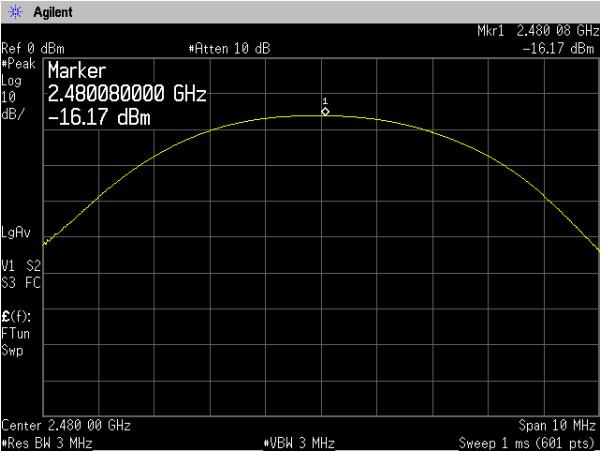
Channel 40: 2441.0MHz
DH5



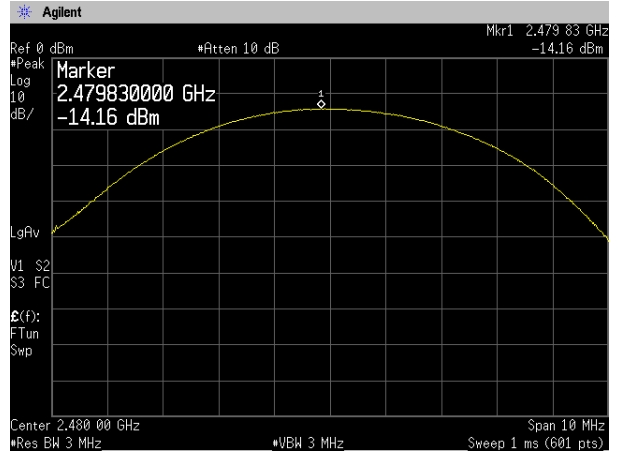
3-DH5



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

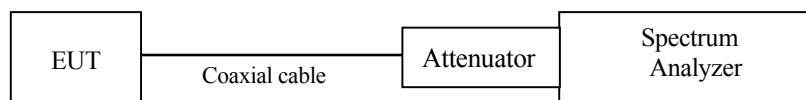
The EUT was set to operate with following conditions.

- 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	-15.14	2398.02	-56.26	41.12	At least 20dB below from peak of RF	PASS
		3-DH5	-13.80	2400.48	-53.14	39.34	At least 20dB below from peak of RF	PASS
79	2480.00	DH5	-16.28	2482.00	-65.07	48.79	At least 20dB below from peak of RF	PASS
		3-DH5	-14.90	2481.98	-59.33	44.43	At least 20dB below from peak of RF	PASS

4.6.5 Trace Data

Test Personnel:

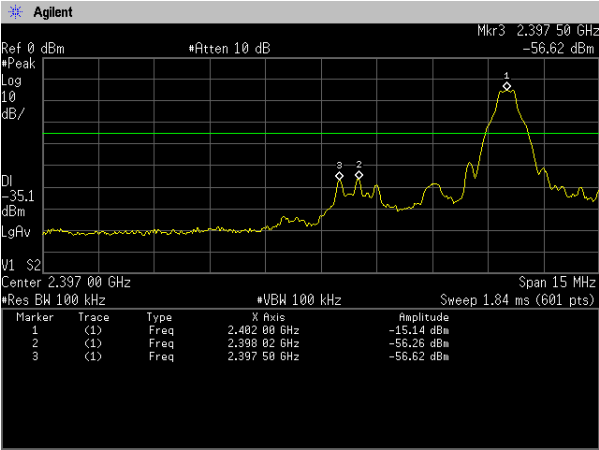
Tested by: Taiki Watanabe

Date : Sep. 30, 2009
 Temperature : 23.0 [°C]
 Humidity : 60.0 [%]
 Test place : Shielded room

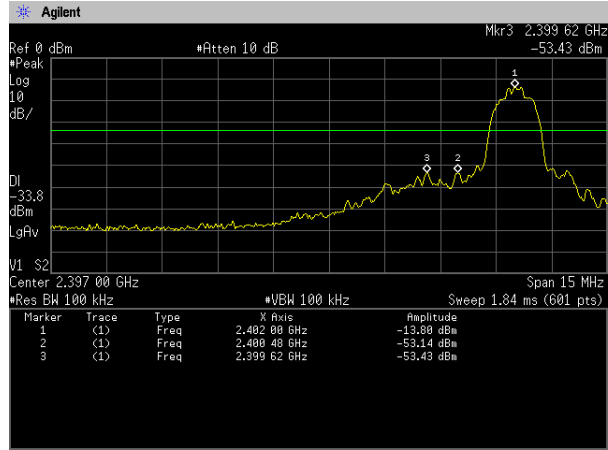
Band Edge Compliance of RF Conducted Emissions

Channel 1: 2402.0MHz

DH5

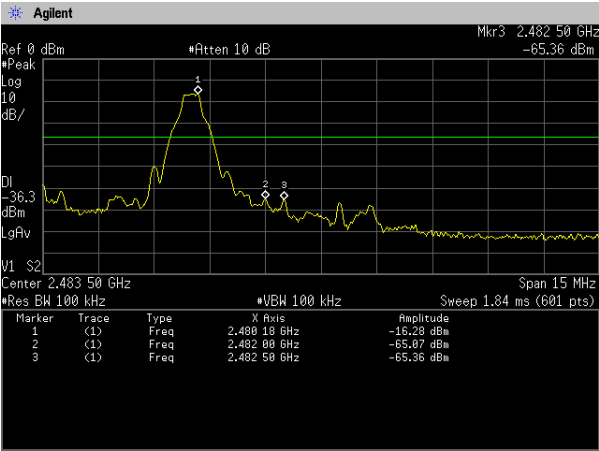


3-DH5

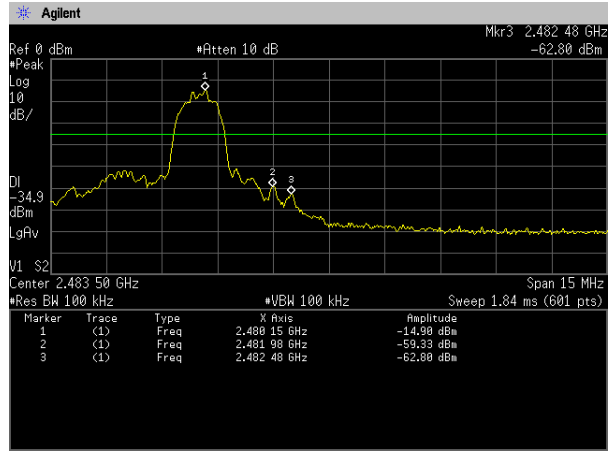


Channel 79: 2480.0MHz

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

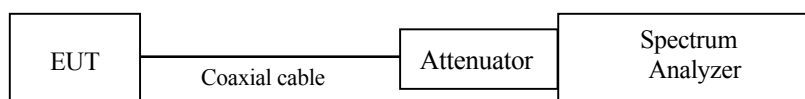
The EUT was set to operate with following conditions.

- 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

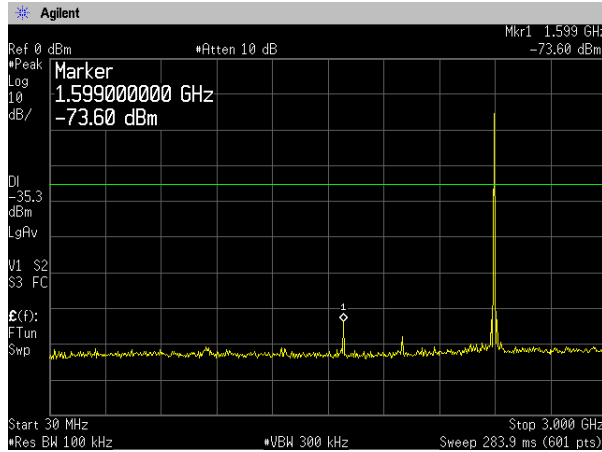
Date : Sep. 30, 2009
 Temperature : 23.0 [°C]
 Humidity : 60.0 [%]
 Test place : Shielded room

Spurious Emissions - Conducted -

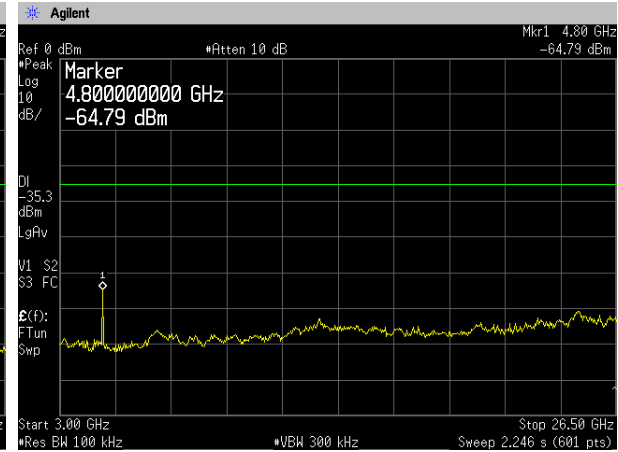
DH5

Channel 1: 2402.0MHz

30MHz-3GHz

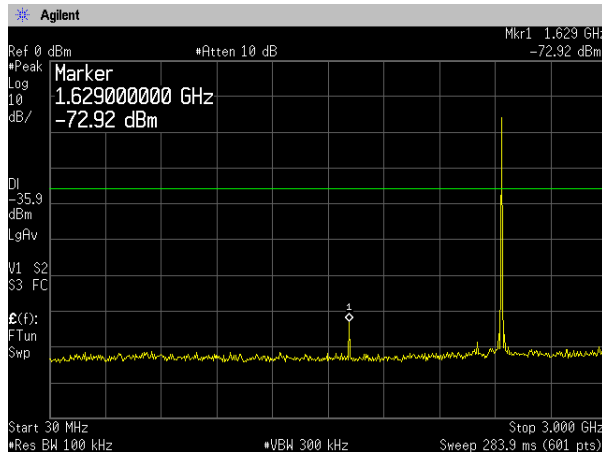


3GHz-26.5GHz

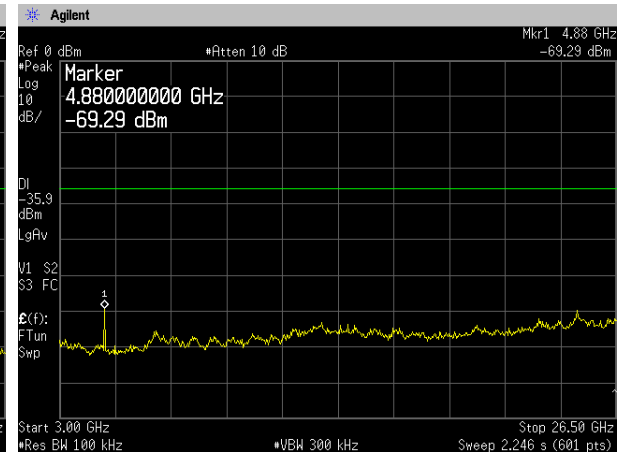


Channel 40: 2441.0MHz

30MHz-3GHz

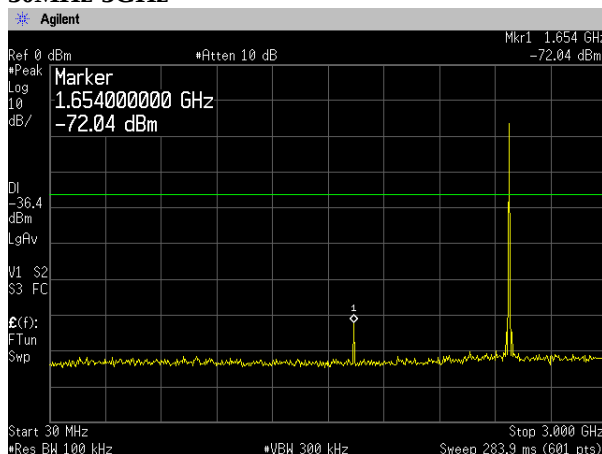


3GHz-26.5GHz

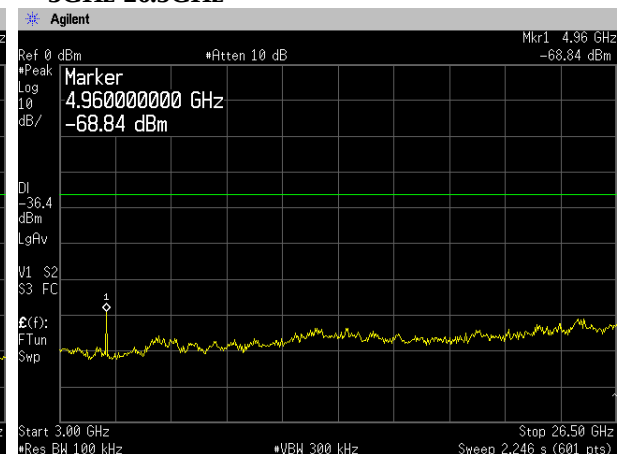


Channel 79: 2480.0MHz

30MHz-3GHz



3GHz-26.5GHz

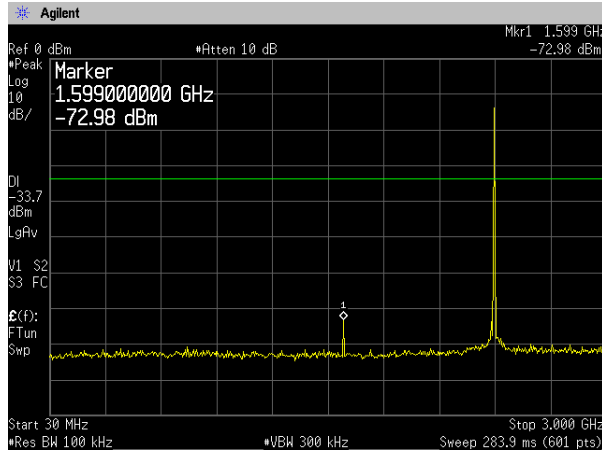


Spurious Emissions - Conducted -

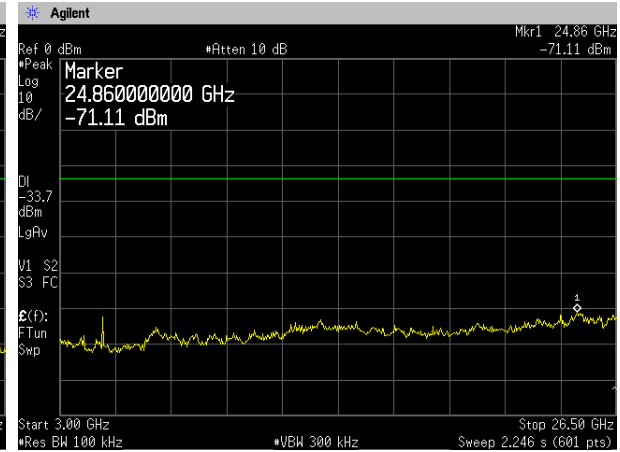
3-DH5

Channel 1: 2402.0MHz

30MHz-3GHz

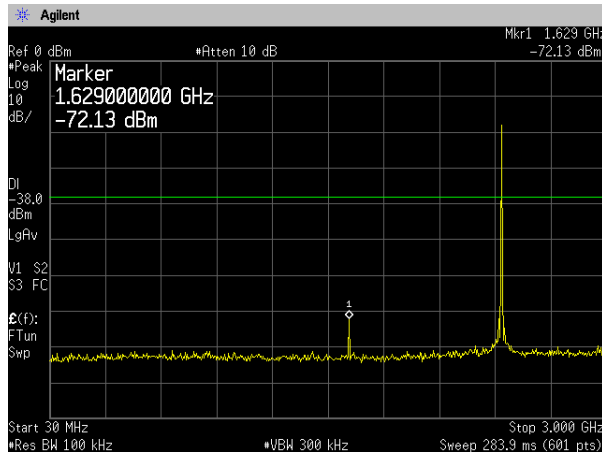


3GHz-26.5GHz

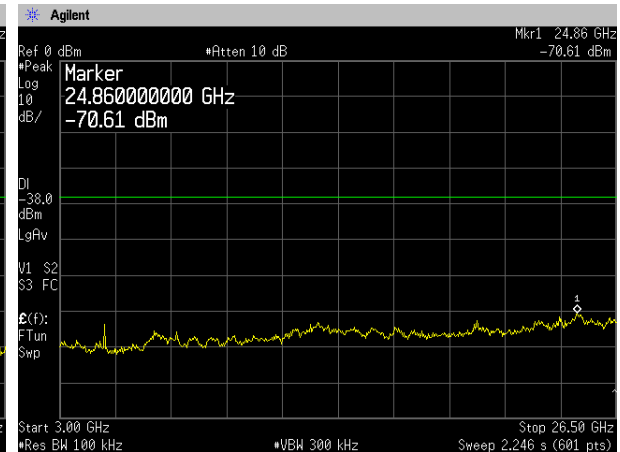


Channel 40: 2441.0MHz

30MHz-3GHz

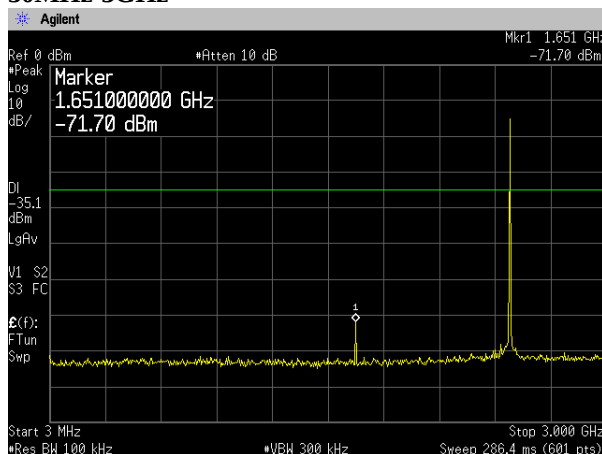


3GHz-26.5GHz

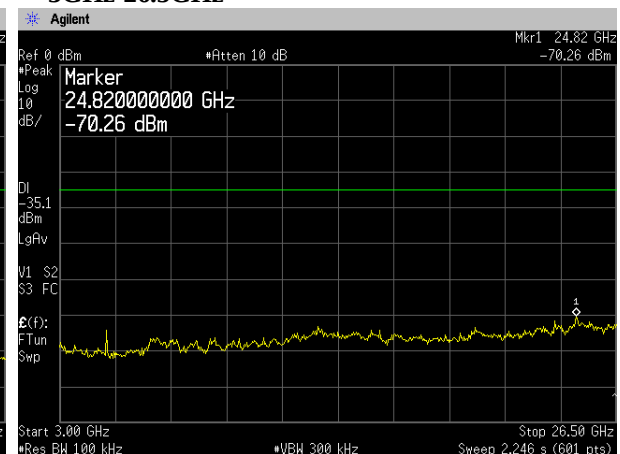


Channel 79: 2480.0MHz

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.

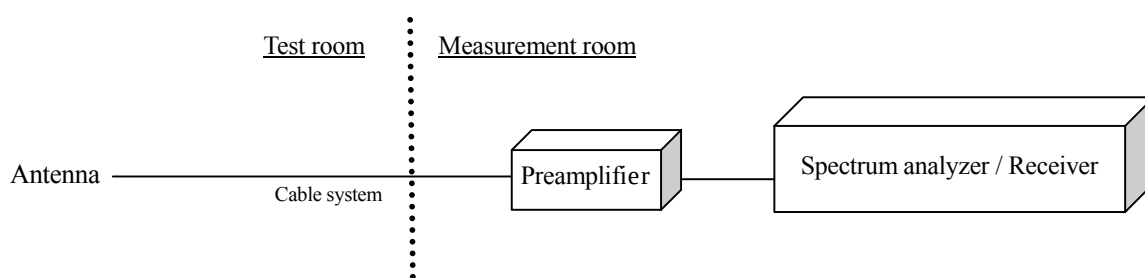
- No hopping [ch 1 (low), ch 40 (mid), ch 79 (high)]

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 : Oct. 5, 2009
Temperature : 20.1 [°C]
Humidity : 63.4 [%]
Test place : 3m Semi-anechoic chamber

Test Personnel:

Tested by: Taiki Watanabe

Date : Oct. 6, 2009
Temperature : 20.1 [°C]
Humidity : 61.5 [%]
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	44.415	V	36.1	-9.7	26.4	40.0	13.6	100.0	333.0
2	96.011	H	38.7	-13.9	24.8	43.5	18.7	200.0	260.0
3	357.962	V	42.6	-6.3	36.3	46.0	9.7	100.0	154.0
4	443.883	H	41.4	-4.3	37.1	46.0	8.9	100.0	154.0
5	799.769	V	35.2	2.3	37.5	46.0	8.5	100.0	134.0
6	799.795	H	31.9	2.3	34.2	46.0	11.8	187.0	236.0
7	869.718	V	25.1	3.5	28.6	46.0	17.4	100.0	127.0

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	1600.583	H	—	50.5	-8.0	—	42.5	74.0	—	31.5	100.0	335.0
2	1600.583	H	47.1	—	-8.0	39.1	—	54.0	14.9	—	100.0	335.0
3	4804.000	H	—	45.9	3.0	—	48.9	74.0	—	25.1	100.0	151.0
4	4804.000	H	40.2	—	3.0	43.2	—	54.0	10.8	—	100.0	151.0
5	4804.000	V	—	50.7	3.0	—	53.7	74.0	—	20.3	100.0	272.0
6	4804.000	V	44.5	—	3.0	47.5	—	54.0	6.5	—	100.0	272.0

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	44.415	V	35.7	-9.7	26.0	40.0	14.0	100.0	3.0
2	96.127	H	38.9	-13.9	25.0	43.5	18.5	319.0	250.0
3	357.956	V	42.0	-6.3	35.7	46.0	10.3	100.0	161.0
4	443.873	H	39.9	-4.3	35.6	46.0	10.4	100.0	155.0
5	799.803	V	35.3	2.3	37.6	46.0	8.4	100.0	128.0
6	799.825	H	33.2	2.3	35.5	46.0	10.5	100.0	51.0
7	862.922	V	25.9	3.4	29.3	46.0	16.7	100.0	142.0

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	4882.000	H	—	46.3	3.2	—	49.5	74.0	—	24.5	100.0	345.0
2	4882.000	H	38.1	—	3.2	41.3	—	54.0	12.7	—	100.0	345.0
3	4882.000	V	—	52.2	3.2	—	55.4	74.0	—	18.6	100.0	101.0
4	4882.000	V	43.6	—	3.2	46.8	—	54.0	7.2	—	100.0	101.0

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	44.415	V	35.8	-9.7	26.1	40.0	13.9	100.0	327.0
2	96.127	H	39.0	-13.9	25.1	43.5	18.4	257.0	246.0
3	357.956	V	43.4	-6.3	37.1	46.0	8.9	100.0	156.0
4	443.873	H	40.1	-4.3	35.8	46.0	10.2	263.0	6.0
5	799.803	V	35.5	2.3	37.8	46.0	8.2	100.0	132.0
6	799.825	H	31.3	2.3	33.6	46.0	12.4	100.0	88.0
7	862.922	V	25.6	3.4	29.0	46.0	17.0	100.0	132.0

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	4960.000	H		45.2	3.5		48.7	74.0		25.3	100.0	344.0
2	4960.000	H	35.6		3.5	39.1		54.0	14.9		100.0	344.0
3	4960.000	V		51.9	3.5		55.4	74.0		18.6	100.0	92.0
4	4960.000	V	41.9		3.5	45.4		54.0	8.6		100.0	92.0

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	44.413	V	35.6	-9.7	25.9	40.0	14.1	100.0	324.0
2	96.133	H	39.8	-13.9	25.9	43.5	17.6	301.0	268.0
3	357.963	V	42.1	-6.3	35.8	46.0	10.2	100.0	154.0
4	443.880	H	41.2	-4.3	36.9	46.0	9.1	100.0	155.0
5	472.510	H	39.1	-3.8	35.3	46.0	10.7	197.0	271.0
6	799.797	V	35.3	2.3	37.6	46.0	8.4	100.0	137.0

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	4804.000	H		53.1	3.0		56.1	74.0		17.9	100.0	345.0
2	4804.000	H	34.6		3.0	37.6		54.0	16.4		100.0	345.0
3	4804.000	V		51.1	3.0		54.1	74.0		19.9	100.0	267.0
4	4804.000	V	34.4		3.0	37.4		54.0	16.6		100.0	267.0

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	44.411	V	35.8	-9.7	26.1	40.0	13.9	100.0	343.0
2	96.145	H	39.0	-13.9	25.1	43.5	18.4	265.0	280.0
3	357.961	V	42.7	-6.3	36.4	46.0	9.6	100.0	152.0
4	443.872	H	39.5	-4.3	35.2	46.0	10.8	100.0	27.0
5	472.508	H	38.0	-3.8	34.2	46.0	11.8	100.0	15.0
6	799.822	V	35.5	2.3	37.8	46.0	8.2	100.0	125.0

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	4882.000	H		47.5	3.2		50.7	74.0		23.3	100.0	152.0
2	4882.000	H	33.8		3.2	37.0		54.0	17.0		100.0	152.0
3	4882.000	V		52.2	3.2		55.4	74.0		18.6	100.0	272.0
4	4882.000	V	33.2		3.2	36.4		54.0	17.6		100.0	272.0

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	44.411	V	35.7	-9.7	26.0	40.0	14.0	100.0	19.0
2	96.136	H	40.1	-13.9	26.2	43.5	17.3	236.0	281.0
3	357.958	V	43.1	-6.3	36.8	46.0	9.2	100.0	153.0
4	443.874	H	39.7	-4.3	35.4	46.0	10.6	100.0	160.0
5	472.508	H	38.5	-3.8	34.7	46.0	11.3	100.0	9.0
6	799.815	V	34.9	2.3	37.2	46.0	8.8	100.0	125.0

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	4960.000	H		47.6	3.5		51.1	74.0		22.9	100.0	99.0
2	4960.000	H	31.6		3.5	35.1		54.0	18.9		100.0	99.0
3	4960.000	V		53.4	3.5		56.9	74.0		17.1	100.0	273.0
4	4960.000	V	34.7		3.5	38.2		54.0	15.8		100.0	273.0

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	44.399	V	35.3	-9.7	25.6	40.0	14.4	100.0	322.0
2	96.015	H	39.3	-13.9	25.4	43.5	18.1	200.0	262.0
3	233.110	V	39.5	-10.1	29.4	46.0	16.6	100.0	111.0
4	329.323	V	43.6	-7.2	36.4	46.0	9.6	100.0	162.0
5	357.970	V	42.5	-6.3	36.2	46.0	9.8	100.0	158.0
6	799.850	V	35.4	2.3	37.7	46.0	8.3	100.0	140.0

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	2400.493	H	41.2	48.4	-4.1	37.1	44.3	74.0	16.9	29.7	100.0	60.0
2	2400.493	H	41.2	48.4	-4.1	37.1	44.3	74.0	16.9	29.7	100.0	60.0
3	2400.507	V	39.4	49.9	-4.1	35.3	45.8	74.0	18.7	28.2	100.0	97.0
4	2400.507	V	39.4	49.9	-4.1	35.3	45.8	74.0	18.7	28.2	100.0	97.0

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	44.410	V	35.3	-9.7	25.6	40.0	14.4	100.0	26.0
2	96.010	H	39.8	-13.9	25.9	43.5	17.6	197.0	269.0
3	233.292	V	35.6	-10.1	25.5	46.0	20.5	100.0	135.0
4	329.321	V	41.7	-7.2	34.5	46.0	11.5	100.0	153.0
5	357.960	V	41.2	-6.3	34.9	46.0	11.1	100.0	158.0
6	799.848	V	35.1	2.3	37.4	46.0	8.6	100.0	332.0

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	2439.460	H	39.7	47.2	-4.0	35.7	43.2	74.0	18.3	30.8	100.0	342.0
2	2439.460	H	39.7	47.2	-4.0	35.7	43.2	74.0	18.3	30.8	100.0	342.0
3	2439.488	V	41.2	48.1	-4.0	37.2	44.1	74.0	16.8	29.9	100.0	95.0
4	2439.488	V	41.2	48.1	-4.0	37.2	44.1	74.0	16.8	29.9	100.0	95.0

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	44.400	V	35.3	-9.7	25.6	40.0	14.4	100.0	326.0
2	96.138	H	39.4	-13.9	25.5	43.5	18.0	205.0	233.0
3	233.150	V	34.3	-10.1	24.2	46.0	21.8	100.0	82.0
4	329.320	V	42.4	-7.2	35.2	46.0	10.8	100.0	150.0
5	357.955	V	40.9	-6.3	34.6	46.0	11.4	100.0	157.0
6	799.858	V	35.3	2.3	37.6	46.0	8.4	100.0	142.0

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	2478.510	H	39.7	47.1	-3.9	35.8	43.2	74.0	18.2	30.8	100.0	332.0
2	2478.510	H	39.7	47.1	-3.9	35.8	43.2	74.0	18.2	30.8	100.0	332.0
3	2478.500	V	43.0	49.5	-3.9	39.1	45.6	74.0	14.9	28.4	100.0	36.0
4	2478.500	V	43.0	49.5	-3.9	39.1	45.6	74.0	14.9	28.4	100.0	36.0

Note:

1. Emission Level (Margin) = Limit - [Reading + Factor (Antenna + Cable - Amp)]
2. No emissions were detected in frequency range 9kHz to 30MHz, above 1GHz 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

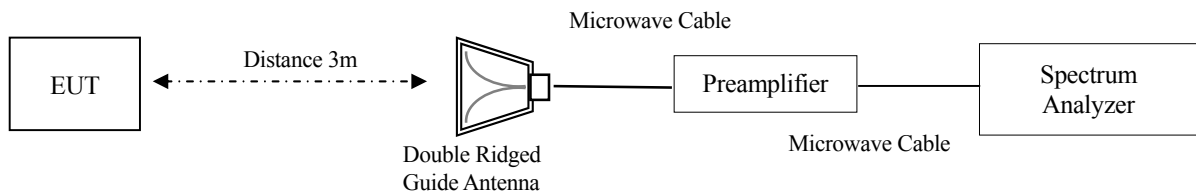
The EUT was set to operate with following conditions.

- 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		48.7	-4.2		44.5	74.0		29.5	100.0	340.0
2	2390.000	H	36.1		-4.2	31.9		54.0	22.1		100.0	340.0
3	2390.000	V		47.8	-4.2		43.6	74.0		30.4	100.0	32.0
4	2390.000	V	34.7		-4.2	30.5		54.0	23.5		100.0	32.0
5	2483.500	H		57.2	-3.9		53.3	74.0		20.7	100.0	342.0
6	2483.500	H	46.3		-3.9	42.4		54.0	11.6		100.0	342.0
7	2483.500	V		51.5	-3.9		47.6	74.0		26.4	100.0	26.0
8	2483.500	V	41.1		-3.9	37.2		54.0	16.8		100.0	26.0

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		50.9	-4.2		46.7	74.0		27.3	100.0	346.0
2	2390.000	H	38.1		-4.2	33.9		54.0	20.1		100.0	346.0
3	2390.000	V		49.1	-4.2		44.9	74.0		29.1	100.0	32.0
4	2390.000	V	35.1		-4.2	30.9		54.0	23.1		100.0	32.0
5	2483.500	H		56.7	-3.9		52.8	74.0		21.2	100.0	341.0
6	2483.500	H	45.4		-3.9	41.5		54.0	12.5		100.0	341.0
7	2483.500	V		51.4	-3.9		47.5	74.0		26.5	100.0	34.0
8	2483.500	V	39.9		-3.9	36.0		54.0	18.0		100.0	34.0

4.9.5 Trace Data

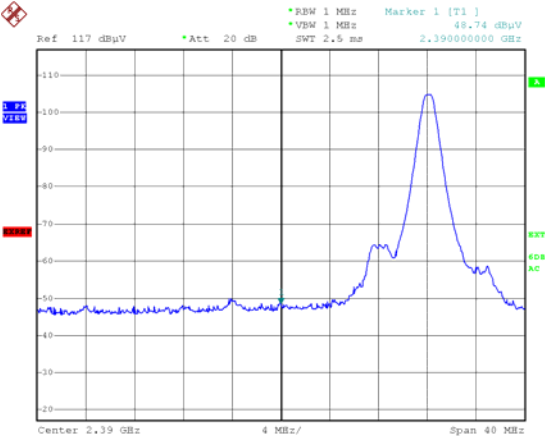
Test Personnel:

Tested by: Taiki Watanabe

Date : Oct. 5, 2009
Temperature : 20.1 [°C]
Humidity : 63.4 [%]
Test place : 3m Semi-anechoic chamber

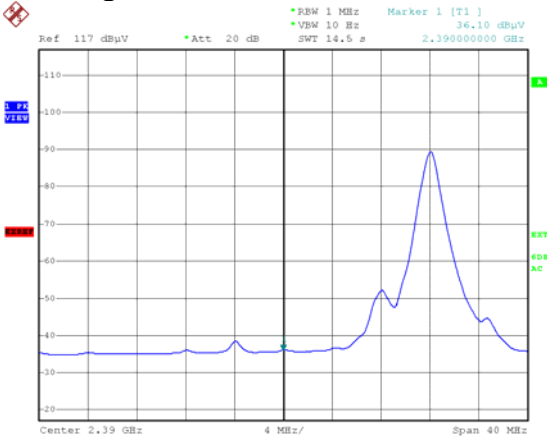
Restricted Band of Operation

Frequency: 2390.0MHz -Horizontal- [DH5]
Peak



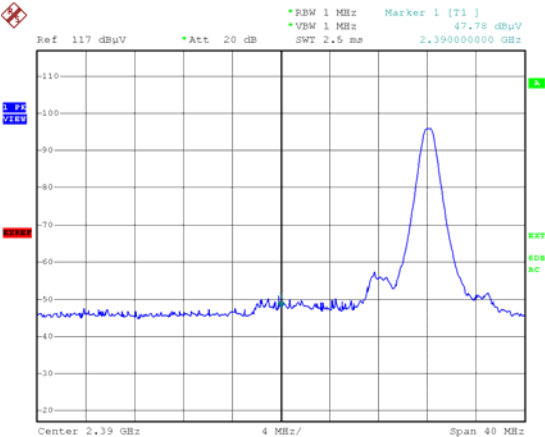
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Average



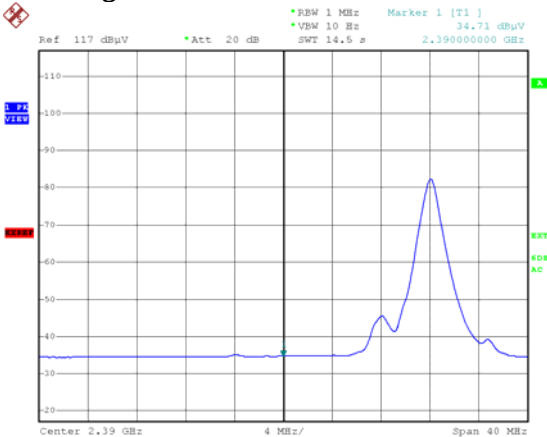
Date: 5.OCT.2009 10:17:24

Frequency: 2390.0MHz -Vertical- [DH5]
Peak



Date: 5.OCT.2009 10:21:42

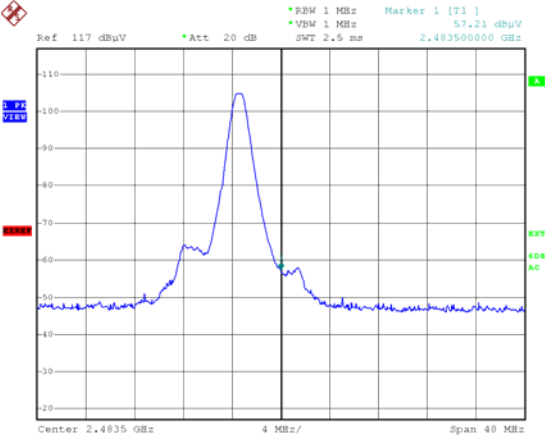
Average



Date: 5.OCT.2009 10:23:42

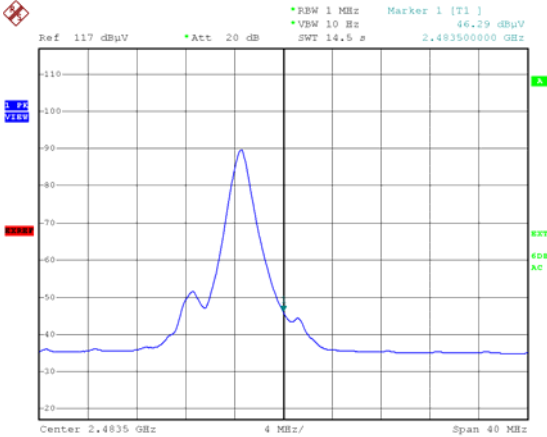
Restricted Band of Operation

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



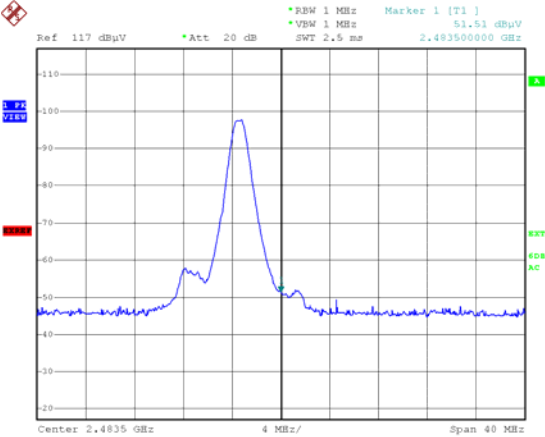
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Average



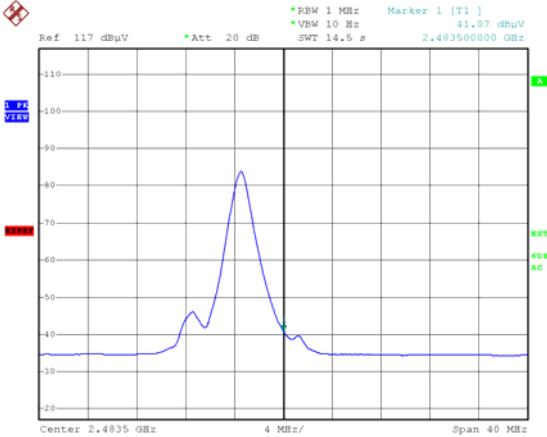
Date: 5.OCT.2009 10:36:59

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



Date: 5.OCT.2009 10:40:59

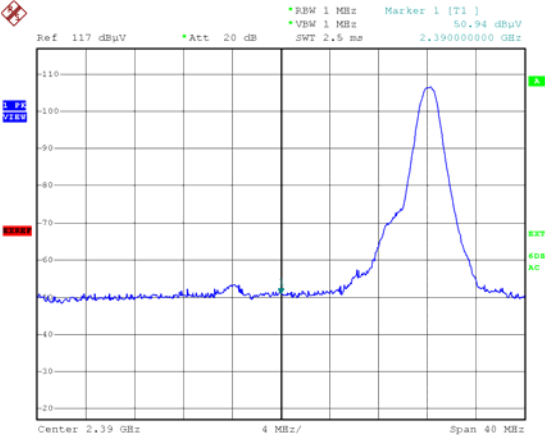
Average



Date: 5.OCT.2009 10:42:53

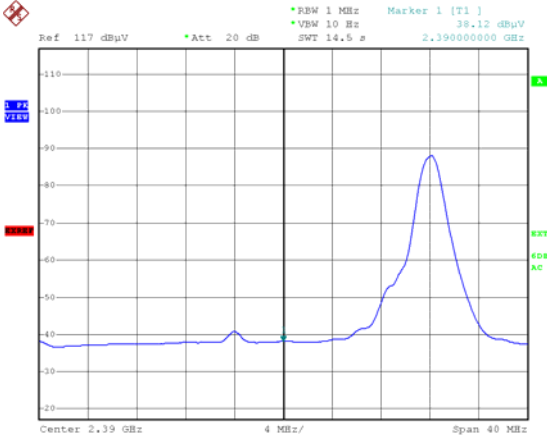
Restricted Band of Operation

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



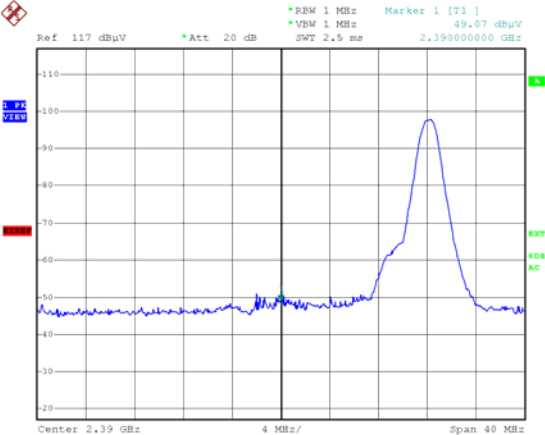
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Average



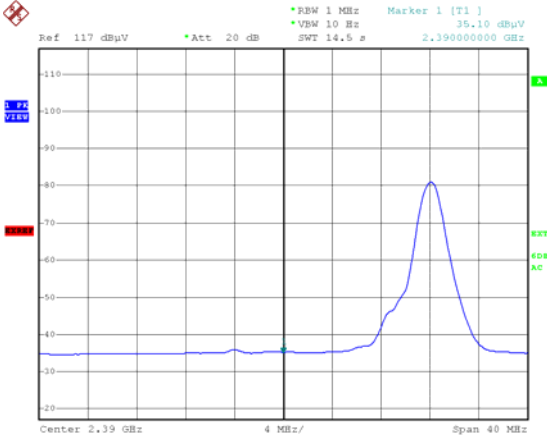
Date: 5.OCT.2009 11:01:54

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



Date: 5.OCT.2009 11:07:14

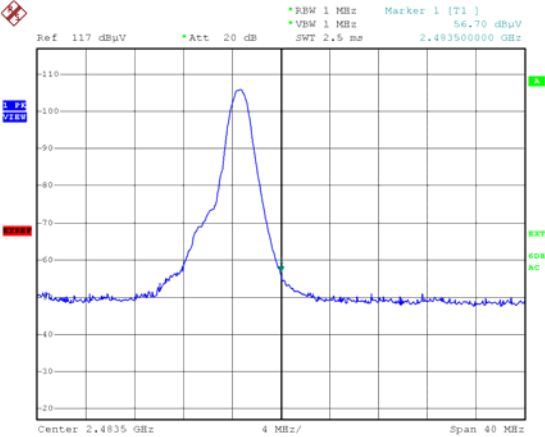
Average



Date: 5.OCT.2009 11:09:07

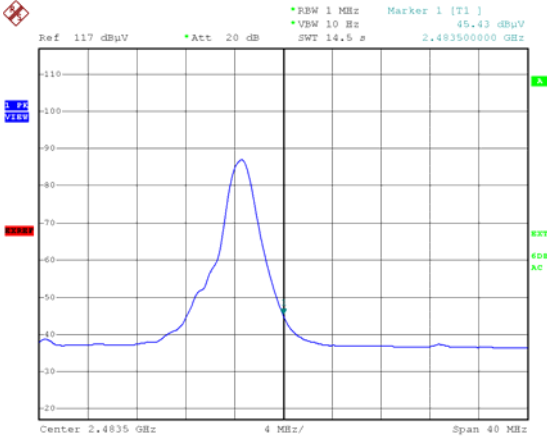
Restricted Band of Operation

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



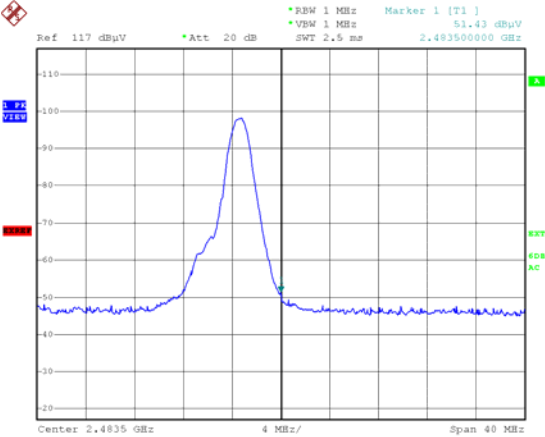
Date: 5.OCT.2009 11:15:06

Average



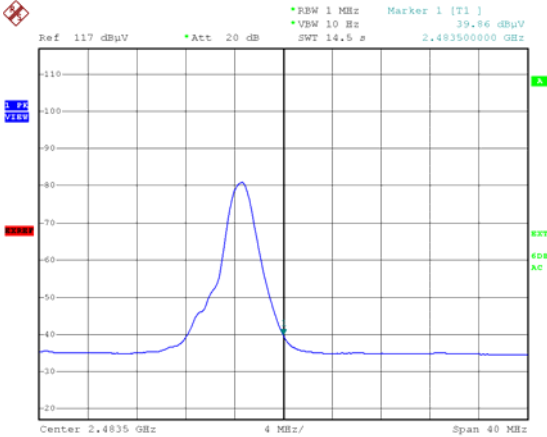
Date: 5.OCT.2009 11:17:30

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



Date: 5.OCT.2009 11:21:04

Average



Date: 5.OCT.2009 11:24:06

4.10 AC power line Conducted Emissions

4.10.1 Test Procedure [FCC 15.207, IC RSS-Gen 7.2.2]

Conducted emission at AC mains port measurements are performed at open area test site according to ANSI C63.4 section 7.

EUT and support equipment are placed on wooden table of 2.0m(W) × 1.0m(D) × 0.8m(H) in size. EUT is connected to 50Ω/50μH Line impedance stabilization network (LISN) which is placed on reference ground plane, and was placed 80cm away from EUT. Excess of AC power cable is bundled in center. Vertical Metal Reference Plane 2.0m (W) × 2.0m (H) in size is placed 0.4m away from EUT. LISN for peripheral is terminated in 50Ω.

EUT operating mode is selected to emit the maximum noise. Overall frequency range is investigated with spectrum analyzer using peak detector. Maximum emission configuration is determined by manipulating the EUT, support equipment, interconnecting cables. Then, emission measurements are performed with test receiver in above setting to each current-carrying conductor of the mains port. Sufficient time for EUT, support equipment and test equipment are provided in order for them to warm up to their normal operating condition.

Frequency range:

- 0.15MHz to 30MHz

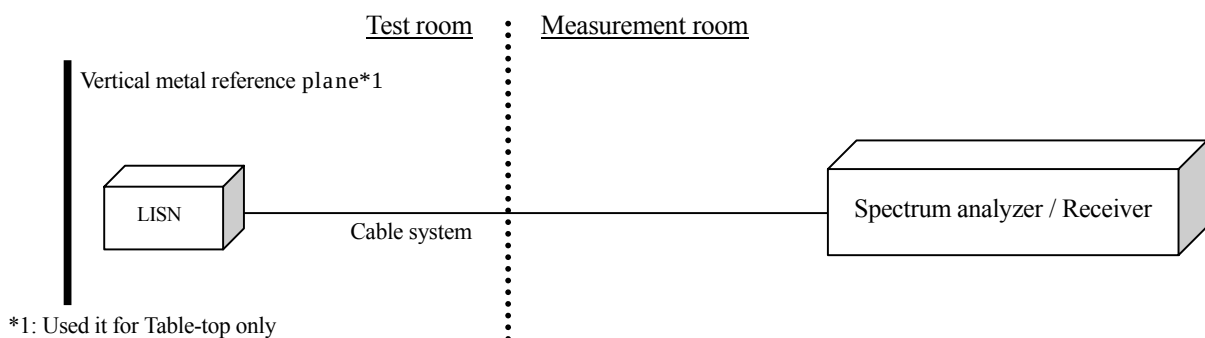
The Test receiver is set to:

Detector: Quasi-peak, Average

Bandwidth: 9kHz

4.10.2 Measurement Setup

Test configuration for AC power line Conducted Emissions



*1: Used it for Table-top only

4.10.3 Limit of AC power line Conducted Emissions Measurement

Frequency	Limit	
	QP(dBμV)	AV(dBμV)
0.15MHz to 0.5MHz	66 to 56*	56 to 46*
0.5MHz to 5MHz	56	46
5MHz to 30MHz	60	50

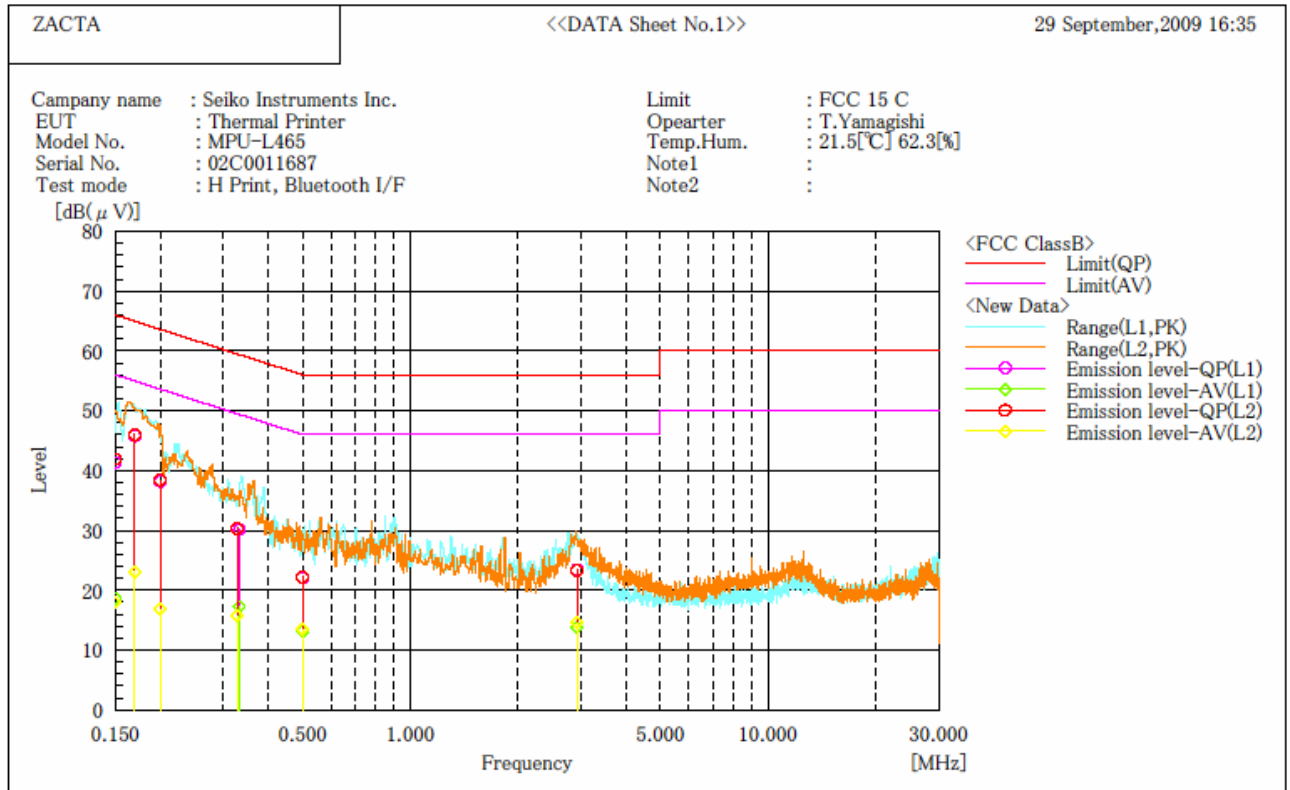
*: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

4.10.4 Calculation method

Emission level = Reading + (LISN. factor + Cable system loss)

Margin = Limit – Emission level

4.10.5 Measurement Result



Final Result

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.150	30.1	7.4	11.2	41.3	18.6	66.0	56.0	24.7	37.4
2	0.170	34.8	12.0	11.0	45.8	23.0	65.0	55.0	19.2	32.0
3	0.200	27.4	6.0	10.8	38.2	16.8	63.6	53.6	25.4	36.8
4	0.333	20.0	7.1	10.1	30.1	17.2	59.4	49.4	29.3	32.2
5	0.500	12.4	3.4	9.7	22.1	13.1	56.0	46.0	33.9	32.9
6	2.922	13.5	3.8	9.9	23.4	13.7	56.0	46.0	32.6	32.3

--- L2 Phase ---

No.	Frequency [MHz]	Reading QP [dB(μV)]	Reading AV [dB(μV)]	c. f [dB]	Result QP [dB(μV)]	Result AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
1	0.150	30.6	6.7	11.3	41.9	18.0	66.0	56.0	24.1	38.0
2	0.170	34.9	11.9	11.1	46.0	23.0	65.0	55.0	19.0	32.0
3	0.200	27.6	6.0	10.8	38.4	16.8	63.6	53.6	25.2	36.8
4	0.328	20.1	5.5	10.2	30.3	15.7	59.5	49.5	29.2	33.8
5	0.500	12.4	3.6	9.8	22.2	13.4	56.0	46.0	33.8	32.6
6	2.922	13.3	4.5	10.0	23.3	14.5	56.0	46.0	32.7	31.5

4.11 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	M08067	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
EMI Receiver	ROHDE&SCHWARZ	ESCI	100451	May. 2010	May. 20, 2009
Highpass filter	R&S	EZ-25	100014	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. 2009	Nov. 12, 2008
	SUHNER	SUCOFLEX 106	60959/6 (1m)	Nov. 2009	Nov. 12, 2008
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
Coaxial cable	Fujikura	5D-2W/0.5m	#AEC10R-005	Feb. 2010	Feb. 5, 2009
		5D-2W/4m	#AEC10C-001	Feb. 2010	Feb. 5, 2009
		5D-2W/1.5m	#AEC10C-002	Feb. 2010	Feb. 5, 2009
	SUHNER	RG214/U/25m	#AEC10C-003	Feb. 2010	Feb. 5, 2009
Microwave cable	SUHNER	SUCOFLEX104	199511/4	Nov. 2009	Nov. 12, 2008
Attenuator	Weinschel	56-10	J4180	Nov. 2009	Nov. 12, 2008
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.