

TEST REPORT

Report number: Z071C-07560

Issue Date: April 14, 2008

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. 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
FCC ID	: C4ZAB000002
IC Certification Number	: 4445A-AB000002
Model Number	: DPU-S445 (Type Number: DPU-S445-01A-E)
Serial Number	: PP020, PP112
EUT Condition	: Pre-production

Test procedure	: ANSI C63.4-2003
Date of test	: March 21, 24, 25, 27, 31, 2008 April 14, 2008
Test place	: 3m Semi-anechoic chamber, Shielded room, Site 2
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:

Hiroaki Suzuki
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Authorized by:

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Manager of Quality Control Division



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1. Summary of Test

1.1 Purpose of test

It is the original test in order to verify conformance to FCC Part 15 Subpart C.

1.2 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]:	Limit		
15.247(a)(1) RSS-210 A8.1(a)	Occupied Bandwidth (20dB Bandwidth)	None	Conducted	Pass
RSS-Gen 4.6.1	99% Occupied bandwidth	No limit	Conducted	Pass
15.247(a)(1) RSS-210 A8.1(b)	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.	Conducted	Pass
15.247(a)(1)(iii) RSS-210 A8.1(d)	Number of Hopping Frequencies	Shall have more than 15 channels.	Conducted	Pass
15.247(a)(1)(iii) RSS-210 A8.1(d)	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.	Conducted	Pass
15.247(b)(1) 15.31(e) RSS-210 A8.4(2)	Maximum Peak Output Power - Conducted -	Shall not exceed 0.125 W.	Conducted	Pass
15.247(d) RSS-210 A8.5	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.	Conducted	Pass
15.247(d) RSS-210 A8.5 RSS-Gen 4.9, 4.10	Spurious 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.	Conducted Radiated	Pass
15.247(d) 15.205 15.209 RSS-210 2.2	Restricted Bands of Operation	Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).	Radiated	Pass
15.247(e) RSS-210 A8.2(b)	Transmitter power spectral Density	Shall not be greater than 8 dBm in any 3KHz band.	Conducted	Pass
15.207 RSS-Gen 7.2.2	AC Power Line Conducted Emissions 150kHz – 30MHz	MHz	QP[dBuV]	AV[dBuV]
		0.15 - 0.50	66 - 56	56 - 46
		0.50 - 5	56	46
		5 - 30	60	50

1.3 Modification to the EUT by laboratory

None

2. Equipment description

2.1 EUT information

No.	EUT	Company	Model No.	Serial No.	FCC ID/DoC	Comment
1	Thermal Printer	Seiko Instruments	DPU-S445-01A-E	PP020, PP112*	C4ZAB000002	EUT
2	AC adapter for EUT	Seiko Instruments	PW-0904-W1-E	080131-1, 080131-3*	N/A	Option
3	Battery Pack	Seiko Instruments	BP-L0720-A1-E	77B	N/A	Option
		TWS JAPAN	RB-B2001A	Sample No.3*	N/A	Option

*: Used for Conducted Emission only.

Oscillator(s)/Crystal(s) : 12MHz
 Operating frequency
 Power ratings : DC 7.4V(dry battery)
 AC 100-240V 50/60Hz
 [Power supply for EUT in testing was “Full charge” for dry battery, and AC 102V/120V/138V 60Hz for AC adapter.]
 Port(s) : Serial
 IrDA
 USB
 Bluetooth
 DC IN
 Size : (W) 145 x (D) 135 x (H) 58 mm
 Type of equipment : Stand-alone
 Environment : Indoor use
 Thermal limitation : 0°C to 50°C
 Operating mode : Test mode
 Variation of model(s) : Not applicable

[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 : Gauss Ian Frequency Shift Keying (GFSK)
 Nominal Bit Rates : 1600hops/s
 Symbol rate on channel : 1Mbps
 Channel Separation : 1MHz
 Output power : 1.1015mW
 Antenna (Rx and Tx) : Chip antenna
 Antenna gain : 2.0dBi
 RF type : Transceiver
 Intended use : Data transmission
 RF emission type designator : 836KF1D

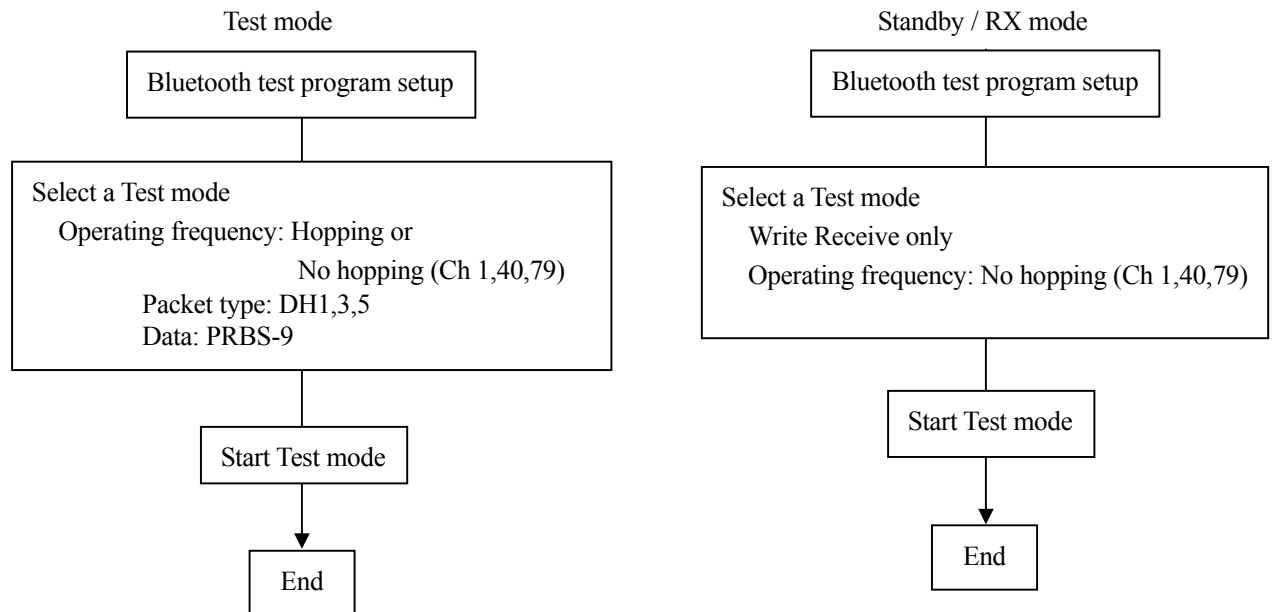
2.2 Operating channels and frequencies

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		

2.3 Operating flow

2.3.1 Test mode

Following programs were performed continuously.



3. Configuration information

3.1 Peripheral(s) used

No.	Equipment	Company	Model No.	Serial No.	FCC ID/DoC	Comment
4	Personal Computer	IBM	Type 2644	97-775G8	DoC	*1
5	AC adapter for PC	IBM	02K6808	011018-00	-	*1
6	Personal Computer	DELL	DHM	1VBB51X	DoC	*2, *3
7	Display	DELL	2001FP	CN-0C0649-46633-495-09CL	DoC	*2, *3
8	AC adapter for Display	DELL	ADP-90FB	CN-0R0423-48661-48P-5POS	-	*2, *3
9	PS/2 Mouse	HP	M-SBJ96	N/A	DoC	*2, *3
10	PS/2 Keyboard	DELL	SK-8000	N/A	DoC	*2, *3

*1: RF Conducted test.

*2: RF Radiated test.

*3: AC power line Conducted emissions test.

3.2 Cable(s) information

No.	Cable	Length [m]	Shield	Connector	From	To	Comment
a	DC cable for EUT AC adapter	1.8	Shielded	Metal	AC adapter	EUT	-
b	AC Power cord for EUT AC adapter	2.0	Unshielded	Plastic	AC adapter	AC outlet	Option
c	Serial cable	1.8	Shielded	Metal	EUT	PC	*4
d	DC cable for PC AC adapter	1.8	Unshielded	Metal	AC adapter	PC	*1
e	AC Power cord for PC AC adapter	0.9	Unshielded	Plastic	AC adapter	AC outlet	*1
f	RGB cable	1.8	Shielded	Metal	PC	Display	*2, *3
g	DC cable for Display AC adapter	1.8	Unshielded	Metal	AC adapter	Display	*2, *3
h	AC Power cord for Display AC adapter	1.7	Unshielded	Plastic	AC adapter	AC outlet	*2, *3
i	Mouse cable	1.8	Unshielded	Metal	Mouse	PC	*2, *3
j	Keyboard cable	1.8	Unshielded	Metal	Keyboard	PC	*2, *3
k	AC Power cord for PC	1.8	Unshielded	Plastic	PC	AC outlet	*2, *3

*1: RF Conducted test.

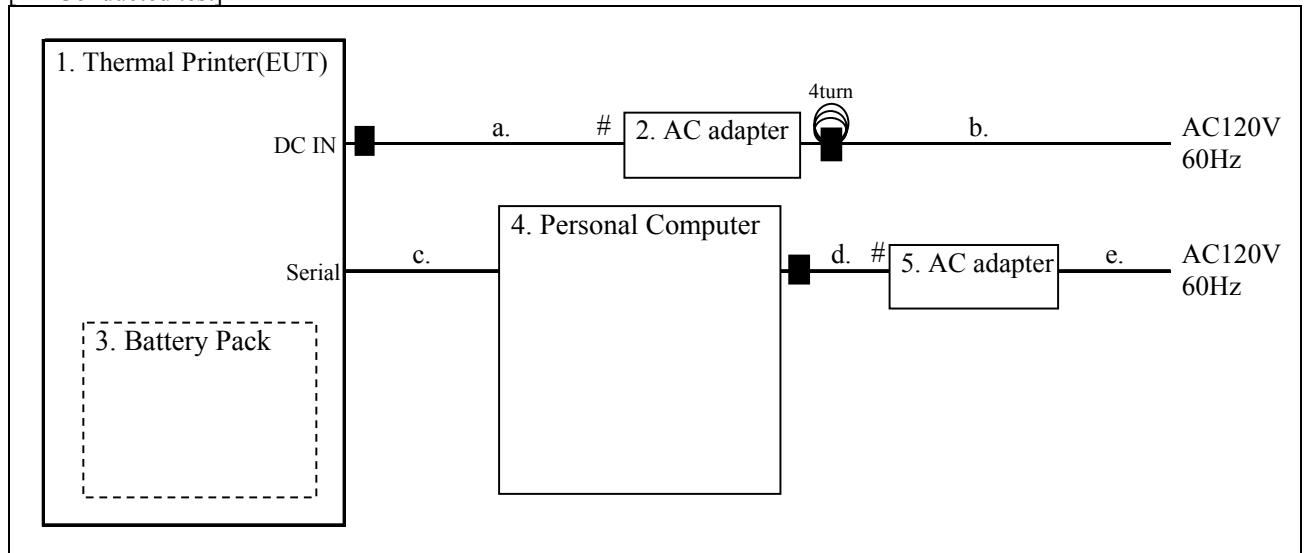
*2: RF Radiated test.

*3: AC power line Conducted emissions test.

*4: Used all tests.

3.3 System configuration

[RF Conducted test]



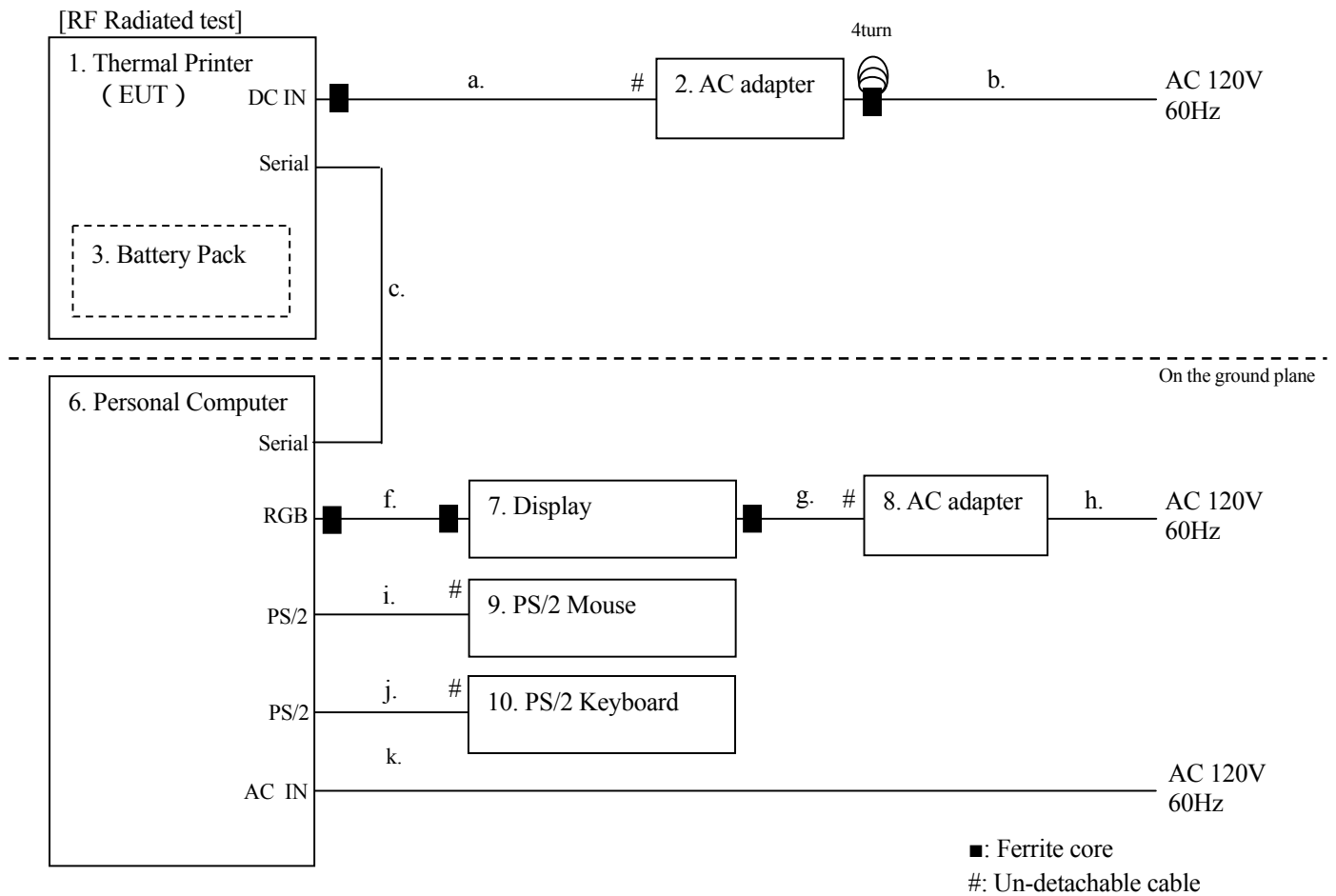
■: Ferrite core
#: Un-detachable cable

Note 1: Numbers assigned to equipment or cables on this diagram are corresponded to the list in “2.1 EUT information”, “3.1 Peripheral(s) used and “3.2 Cable(s) information”.

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

Note 3: The ferrite core (4turn) is an accessory for AC power cord (No. b).

Note 4: DC cable (No. d) with one ferrite core is an accessory for PC AC adapter (No. 4).



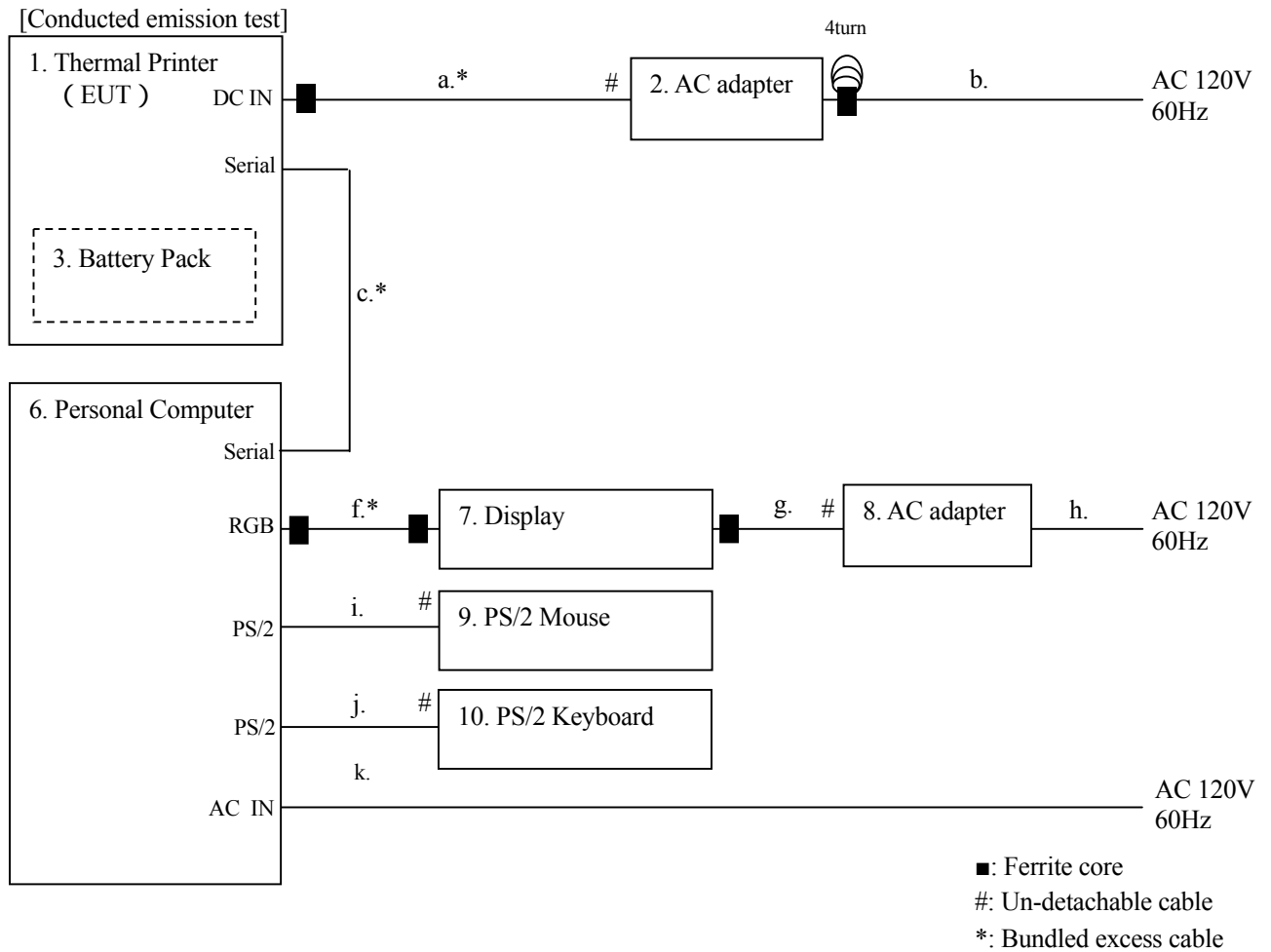
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Note 2: DC cable (No. a) with one ferrite core is an accessory for EUT AC adapter (No. 2).

Note 3: The ferrite core (4turn) is an accessory for AC power cord (No. b).

Note 4: RGB cable (No. f) with two ferrite cores is an accessory for Display (No. 7).

Note 5: DC cable (No. g) with one ferrite core is an accessory for Display AC adapter (No. 8).



Note 1: Numbers assigned to equipment or cables on this diagram are corresponded to the list in “2.1 EUT information”, “3.1 Peripheral(s) used and “3.2 Cable(s) information”.

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

Note 3: The ferrite core (4turn) is an accessory for AC power cord (No. b).

Note 4: RGB cable (No. f) with two ferrite cores is an accessory for Display (No. 7).

Note 5: DC cable (No. g) with one ferrite core is an accessory for Display AC adapter (No. 8).

4. Test Instruments

List of Measuring Instruments

Equipment	Company	Model No.	Serial No.	Cal. due	Cal. date
Spectrum Analyzer (9kHz-3GHz)	Agilent Technologies	E4403B	MY44212805	Oct. 2008	Oct. 3, 2007
Spectrum Analyzer (3Hz – 42.98GHz)	Agilent Technologies	E4447A	MY46180188	Feb. 2009	Feb. 12, 2008
Spectrum Analyzer	Agilent Technologies	8568B	2732A03847	Jul. 2008	Jul. 17, 2007
		85662A	3026A19352		
Preamplifier (100kHz-1.2GHz)	ANRITSU	MH648A	M96057	Jun. 2008	Jun. 25, 2007
Preamplifier (1GHz-26.5GHz)	Agilent Technologies	8449B	3008A01008	Dec. 2009	Dec. 11, 2007
EMI Receiver	ROHDE&SCHWARZ	ESCI	100451	May. 2008	May. 10, 2007
Test Receiver	ROHDE&SCHWARZ	ESHS10	836495/010	Apr. 2008	Apr. 25, 2007
Line impedance stabilization network for EUT	Kyoritsu Electrical Works, Ltd.	KNW-407	8-693-20	Mar. 2009	Mar. 13, 2008
Line impedance stabilization network for peripheral	Kyoritsu Electrical Works, Ltd.	KNW-242C	8-1094-5	Mar. 2009	Mar. 13, 2008
Loop antenna	ROHDE&SCHWARZ	HFH2-Z2	892246/010	Feb.2009	Feb. 12, 2008
Coaxial cable	N/A	RG213	N/A	Feb. 2009	Feb. 14, 2008
Biconical Antenna	Schwarzbeck	VHA9103/BBA9106	1627	Jun. 2008	Jun. 16, 2007
Attenuator(6dB)	TDC	TAT-43B-06	N/A	Jun. 2008	Jun. 22, 2007
Log periodic antenna	Schwarzbeck	UHALP9108A	0437	Jun. 2008	Jun. 16, 2007
Attenuator(3dB)	TDC	TAT-43B-03	N/A	Aug. 2008	Aug. 8, 2007
Double Ridged Guide Antenna	EMCO	3115	5205	Oct. 2008	Oct. 11, 2006
Microwave cable	Suhner	SUCOFLEX 104/15m SUCOFLEX 104/1m	108014/4 108015/4	Jan. 2010	Jan. 25, 2008
Coaxial cable	Fujikura	5D-2W/10m	#AEC3R-001	Feb. 2009	Feb. 14, 2008
		5D-2W/1.5m	#AEC3RC-001	Feb. 2009	Feb. 14, 2008
		5D-2W/1m	#AEC3RC-002	Feb. 2009	Feb. 14, 2008
		5D-2W/1m	#AEC3RC-003	Feb. 2009	Feb. 14, 2008
		8D-2W/15m	YTCRFC#2C	Jun. 2008	Jun. 23, 2007
		5D-2W/1m	YTCRFC#2R,2C-001	Jun. 2008	Jun. 23, 2007
Coaxial cable	N/A	N/A	N/A	Feb. 2009	Feb. 14, 2008
Coaxial Switch	ANRITSU	MP59B	6200611581	Feb. 2009	Feb. 14, 2008
			6200331882	Jun. 2008	Jun. 23, 2007
DC block	ANRITSU	K261	0701001	Jan. 2009	Jan. 18, 2007
PC	DELL	DIMENSION E521	85465BX	N/A	N/A
PC	IBM	6892-44J	97-42089	N/A	N/A
Software	TOYO Corporation	EP5/RE-AJ	0611193/V3.4	N/A	N/A
Software	ZACTA Technology	EMI Data Sheet	Ver.2.81	N/A	N/A
Site attenuation	ZACTA Technology	Site 2	N/A	May. 2008	May. 12, 2007

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

5. Test Type and Results

5.1 20dB Bandwidth / Occupied Bandwidth

5.1.1 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

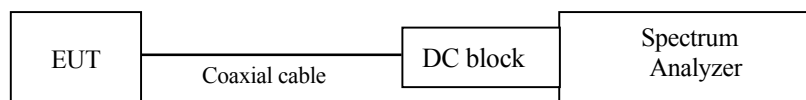
The EUT was set to operate with following conditions.

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

The test mode of EUT is as follows.

- Test mode

5.1.2 Measurement Setup



5.1.3 Limit of Bandwidth at 20 dB below

None

5.1.4 Measurement Result

Channel	Center Frequency [MHz]	20dB Bandwidth [MHz]	Occupied Bandwidth [MHz]
1	2402.0	0.859	0.835
40	2441.0	0.864	0.835
79	2480.0	0.861	0.836

5.1.5 Trace Data

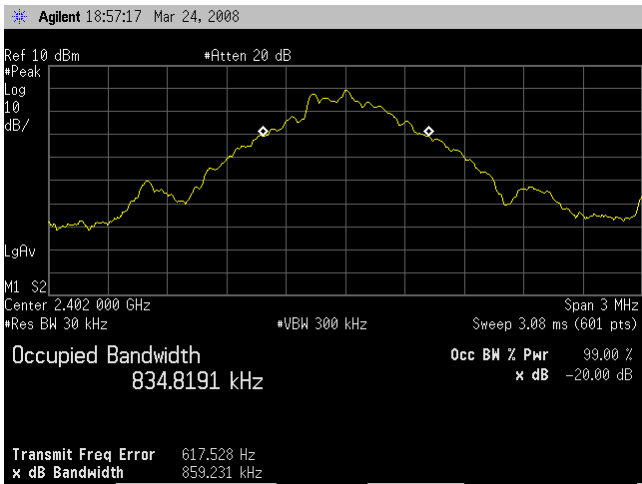
Test Personnel:

Tested by: Hiroaki Suzuki

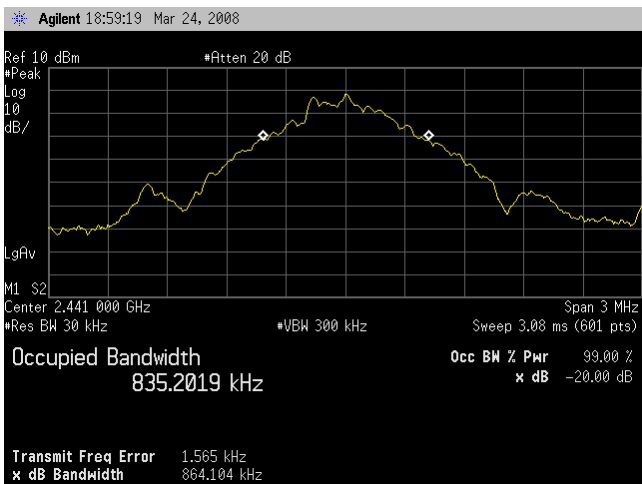
Date : Mar. 24, 2008
Temperature : 22.8 [°C]
Humidity : 37.8 [%]
Test place : Shielded room

20dB Bandwidth/Occupied Bandwidth

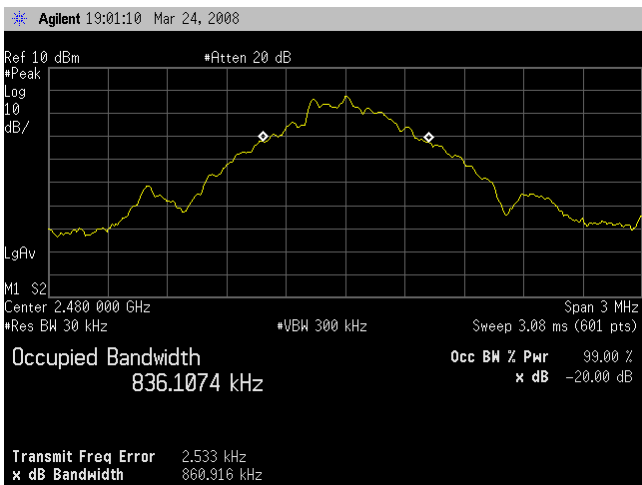
Channel Low: 2402.0MHz [Channel 1]



Channel Middle: 2441.0MHz [Channel 40]



Channel High: 2480.0MHz [Channel 79]



5.2 Carrier Frequency Separation

5.2.1 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

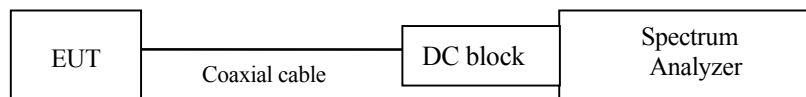
The EUT was set to operate with following conditions.

- Hopping [ch 40 (mid)]

The test mode of EUT is as follows.

- Test mode

5.2.2 Measurement Setup



5.2.3 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.

5.2.4 Measurement Result

Channel Separation [MHz]	Limit [MHz]	PASS / FAIL
1.005	>two-thirds of the 20dB Bandwidth =576kHz	PASS

5.2.5 Trace Data

Test Personnel:

Tested by: Hiroaki Suzuki

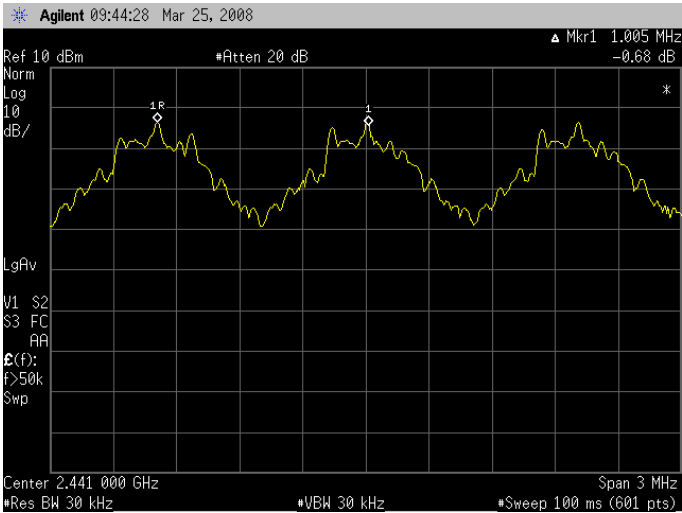
Date : Mar. 25, 2008

Temperature : 20.6 [°C]

Humidity : 46.9 [%]

Test place : Shielded room

Carrier Frequency Separation
Channel Middle: 2441.0MHz [Channel 40]



5.3 Number of Hopping Frequencies

5.3.1 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

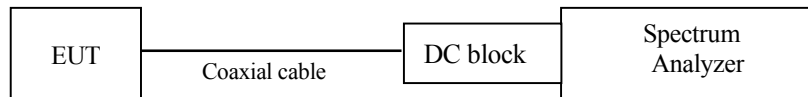
The EUT was set to operate with following conditions.

- Hopping

The test mode of EUT is as follows.

- Test mode

5.3.2 Measurement Setup



5.3.3 Limit of Number of Hopping Frequencies

Shall have more than 15 channels.

5.3.4 Measurement Result

Number of channels	Limit	PASS / FAIL
79	15 channel	PASS

5.3.5 Trace Data

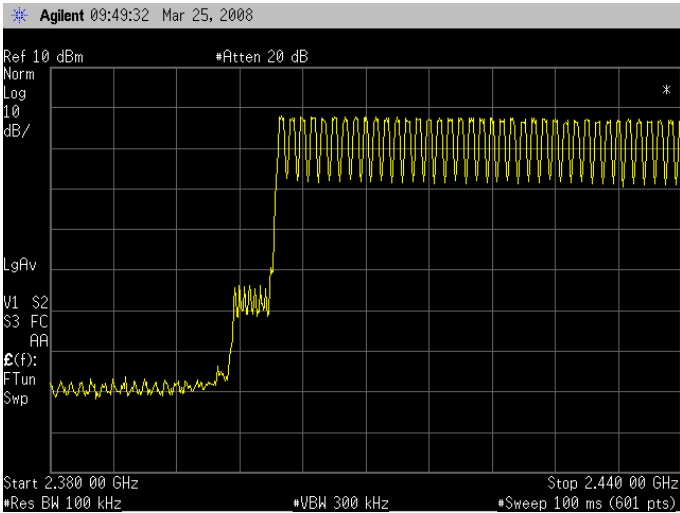
Test Personnel:

Tested by: Hiroaki Suzuki

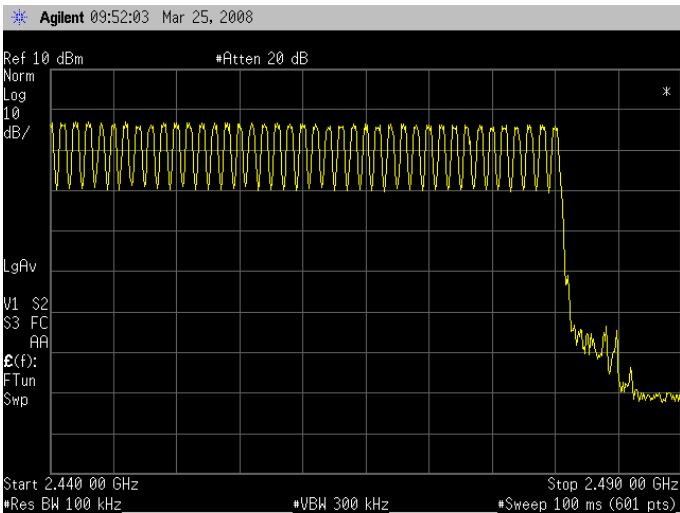
Date : Mar. 25, 2008
Temperature : 20.6 [°C]
Humidity : 46.9 [%]
Test place : Shielded room

Number of Hopping Frequencies

Low



High



5.4 Time of Occupancy (Dwell Time)

5.4.1 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=5ms

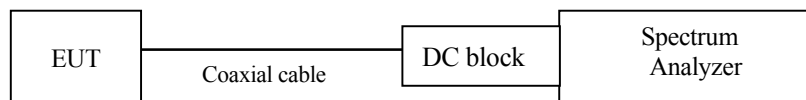
The EUT was set to operate with following conditions.

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

The test mode of EUT is as follows.

- Test mode

5.4.2 Measurement Setup



5.4.3 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.

5.4.4 Measurement Result

Channel	Frequency [MHz]	Packet type	Dwell Time [ms]	Occupancy time of 31.6 seconds [s]	Limit	PASS / FAIL
1	2402.0	DH1	0.400	0.128	< 0.4 s	PASS
		DH3	1.650	0.264		PASS
		DH5	2.900	0.309		PASS
40	2441.0	DH1	0.400	0.128		PASS
		DH3	1.658	0.265		PASS
		DH5	2.900	0.309		PASS
79	2480.0	DH1	0.392	0.125		PASS
		DH3	1.650	0.264		PASS
		DH5	2.900	0.309		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, DH1 = 0.400 ms x 1600 / 2 / 79 x 31.6 = 128.0 ms

5.4.5 Trace Data

Test Personnel:

Tested by: Hiroaki Suzuki

Date : Mar. 25, 2008
Temperature : 20.6 [°C]
Humidity : 46.9 [%]
Test place : Shielded room

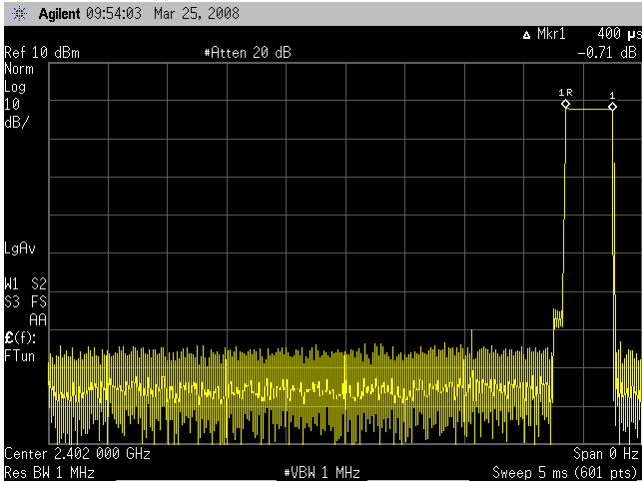
Test Personnel:

Tested by: Hiroaki Suzuki

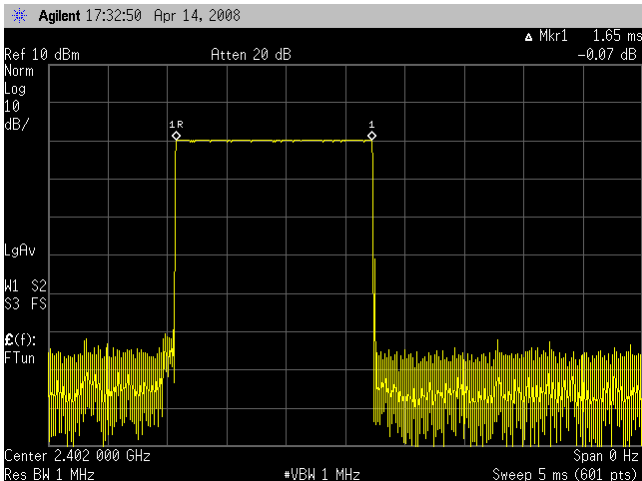
Date : Apr. 14, 2008
Temperature : 22.0 [°C]
Humidity : 39.8 [%]
Test place : Shielded room

Dwell Time

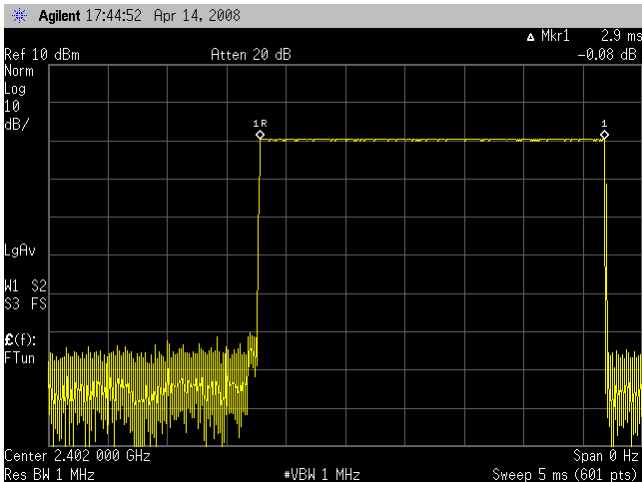
Channel Low: 2402.0MHz [Channel 1] DH1



Channel Low: 2402.0MHz [Channel 1] DH3

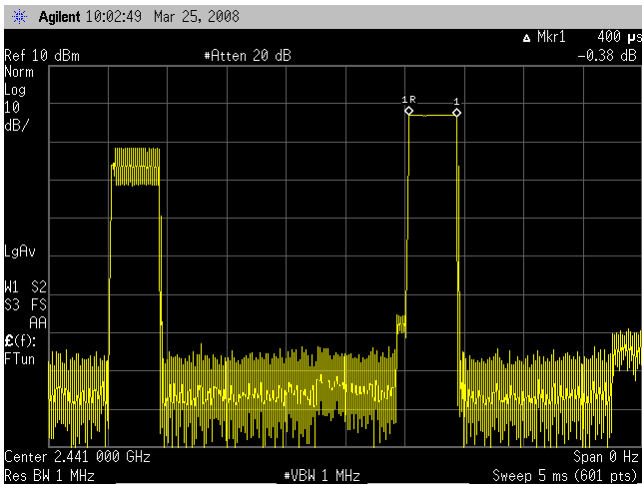


Channel Low: 2402.0MHz [Channel 1] DH5

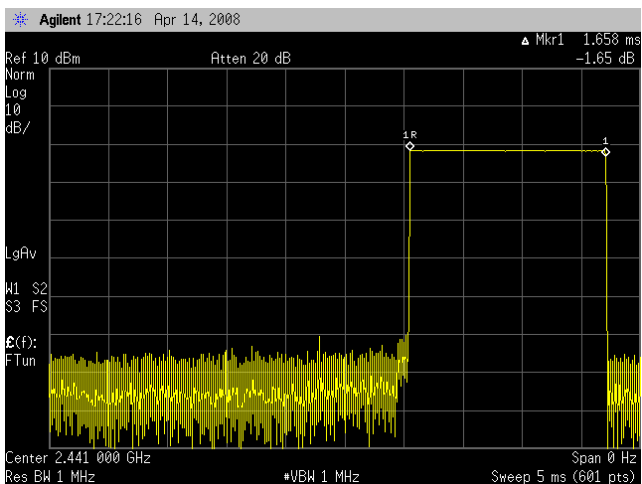


Dwell Time

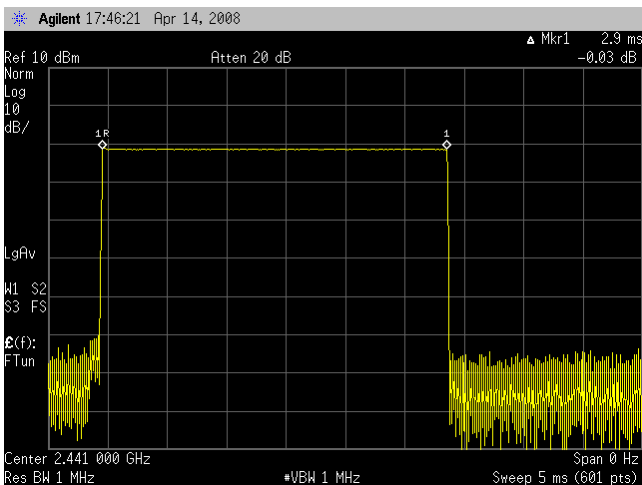
Channel Middle: 2441.0MHz [Channel 40] DH1



Channel Middle: 2441.0MHz [Channel 40] DH3

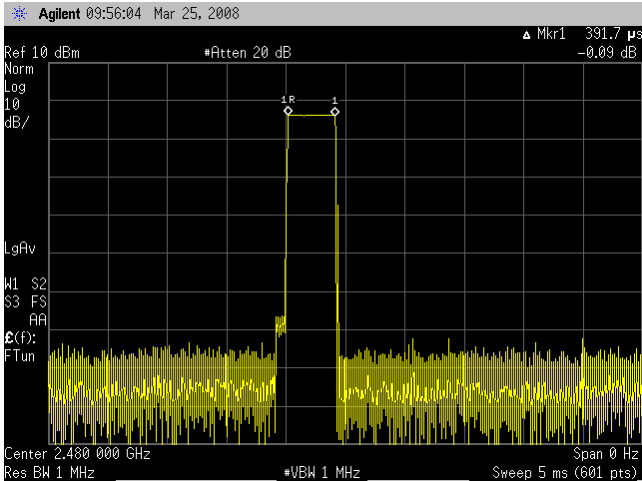


Channel Middle: 2441.0MHz [Channel 40] DH5

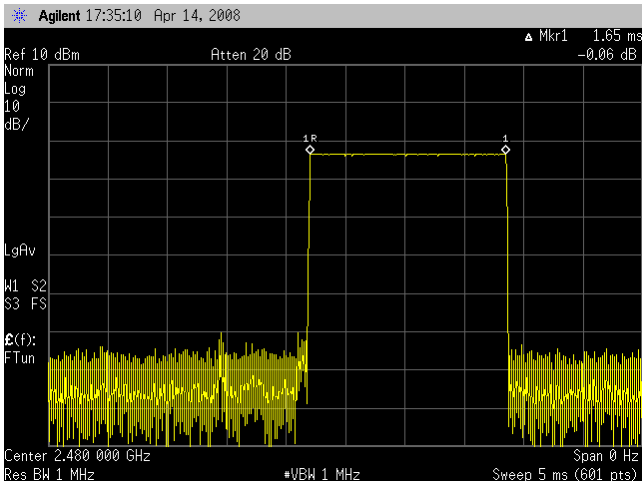


Dwell Time

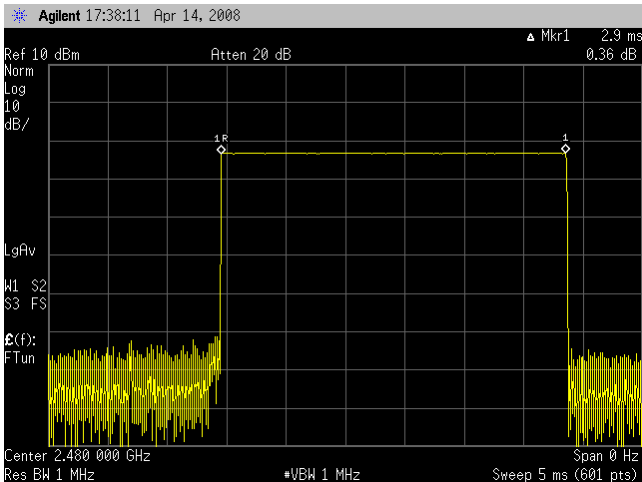
Channel High: 2480.0MHz [Channel 79] DH1



Channel High: 2480.0MHz [Channel 79] DH3



Channel High: 2480.0MHz [Channel 79] DH5



5.5 Maximum Peak Output Power - Conducted -

5.5.1 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

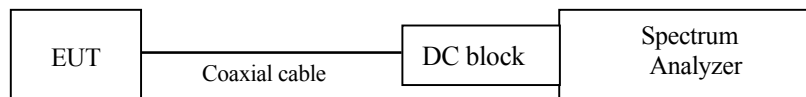
The EUT was set to operate with following conditions.

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

The test mode of EUT is as follows.

- Test mode in Battery operation. (Full charge)
- Test mode in AC power operation. (AC102V, AC120V, and AC138V)

5.5.2 Test Instruments and Measurement Setup



5.5.3 Limit of Maximum Peak Output Power

0.125 watt or less.

5.5.4 Measurement Result

[Test mode in Battery operation (Full charge) DC 7.4V]

Voltage	channel	Center Frequency [MHz]	Factor [dB]	Reading [dBm]	Antenna Gain of EUT [dBi]	Level [dBm]	Peak Output Power [mW]	Limit [mW]	PASS /FAIL
7.4V	1	2402.0	0.1	-1.87	2.0	0.23	1.0544	125	PASS
	40	2441.0	0.1	-1.73	2.0	0.37	1.0889	125	PASS
	79	2480.0	0.1	-2.50	2.0	-0.40	0.9120	125	PASS

Calculation:

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

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

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

[Test mode in AC power operation]

Voltage	channel	Center Frequency [MHz]	Factor [dB]	Reading [dBm]	Antenna Gain of EUT [dBi]	Level [dBm]	Peak Output Power [mW]	Limit [mW]	PASS /FAIL
102V	1	2402.0	0.1	-1.77	2.0	0.33	1.0789	125	PASS
	40	2441.0	0.1	-2.68	2.0	-0.58	0.8750	125	PASS
	79	2480.0	0.1	-3.49	2.0	-1.39	0.7261	125	PASS
120V	1	2402.0	0.1	-1.73	2.0	0.37	1.0889	125	PASS
	40	2441.0	0.1	-2.64	2.0	-0.54	0.8831	125	PASS
	79	2480.0	0.1	-3.43	2.0	-1.33	0.7362	125	PASS
138V	1	2402.0	0.1	-1.68	2.0	0.42	1.1015	125	PASS
	40	2441.0	0.1	-2.65	2.0	-0.55	0.8810	125	PASS
	79	2480.0	0.1	-3.48	2.0	-1.38	0.7278	125	PASS

Calculation :

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

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

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

5.5.5 Trace Data

Test Personnel:

Tested by: Hiroaki Suzuki

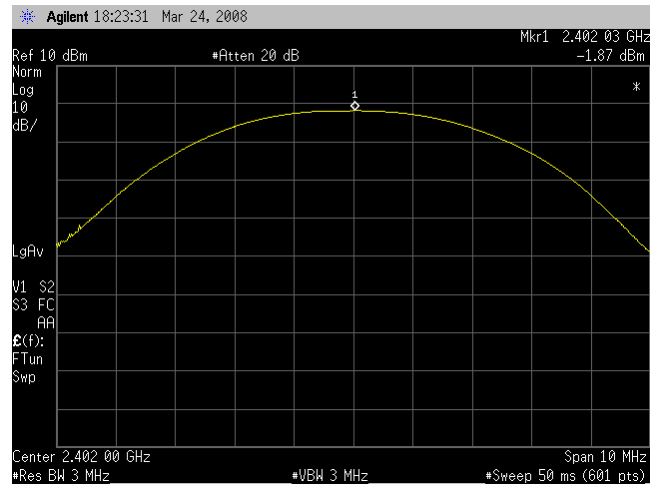
Date : Mar. 24, 2008
Temperature : 22.8 [°C]
Humidity : 37.8 [%]
Test place : Shielded room

Test Personnel:

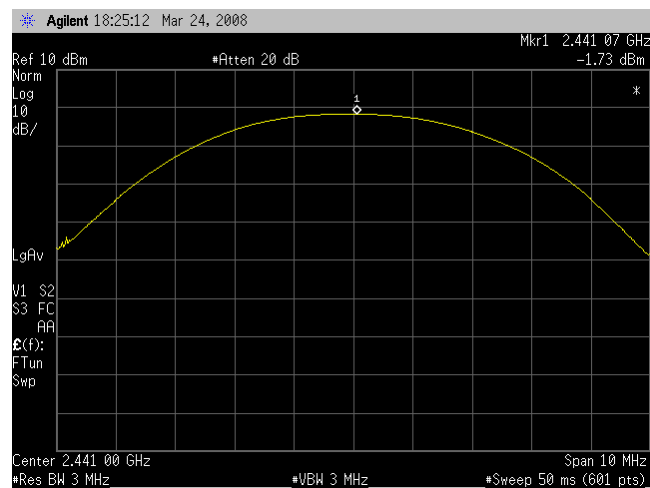
Tested by: Hiroaki Suzuki

Date : Mar. 25, 2008
Temperature : 20.6 [°C]
Humidity : 46.9 [%]
Test place : Shielded room

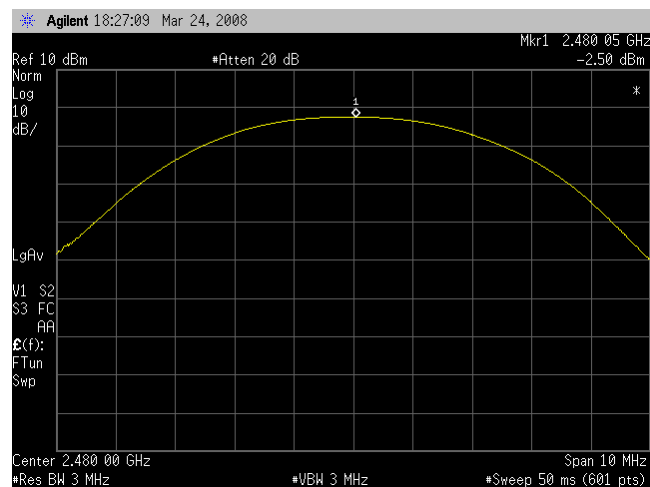
Maximum Peak Output Power - Conducted - [Full charge]
Channel Low: 2402.0MHz [Channel 1]



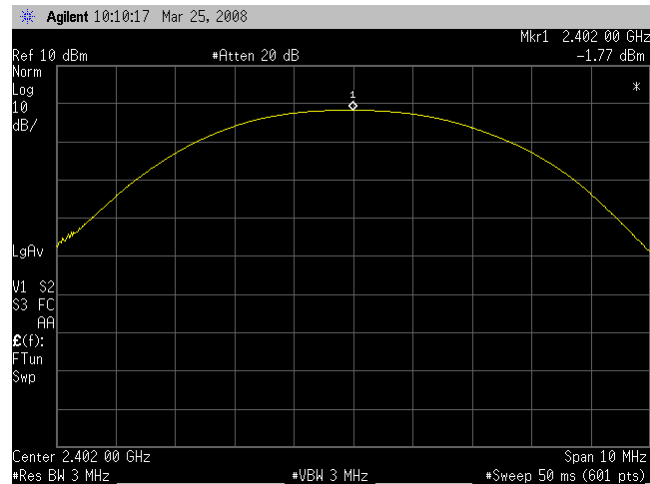
Channel Middle: 2441.0MHz [Channel 40]



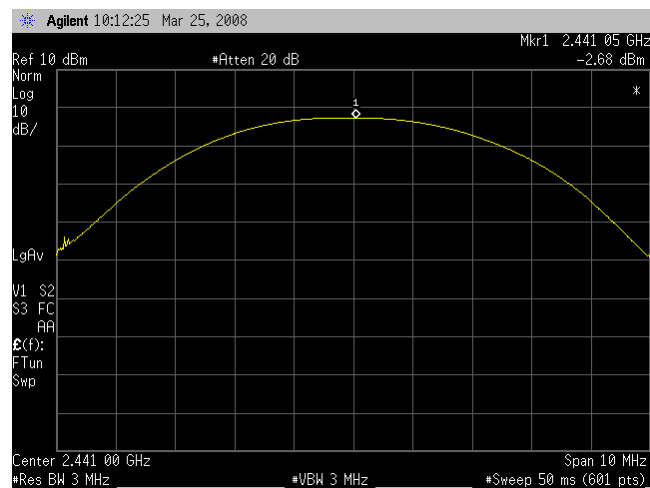
Channel High: 2480.0MHz [Channel 79]



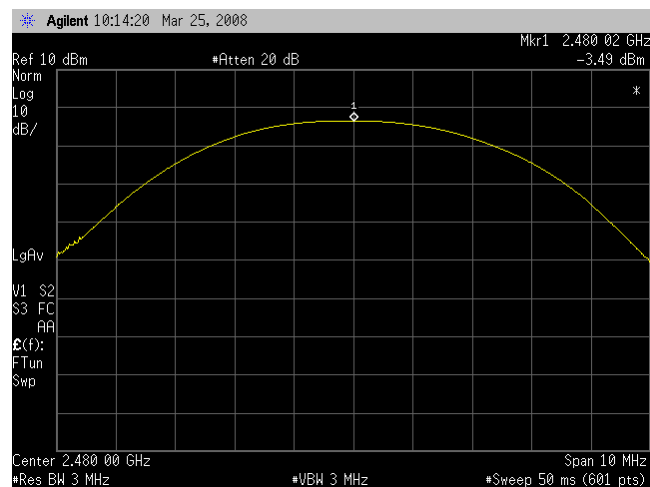
Maximum Peak Output Power - Conducted - [AC 102V]
Channel Low: 2402.0MHz [Channel 1]



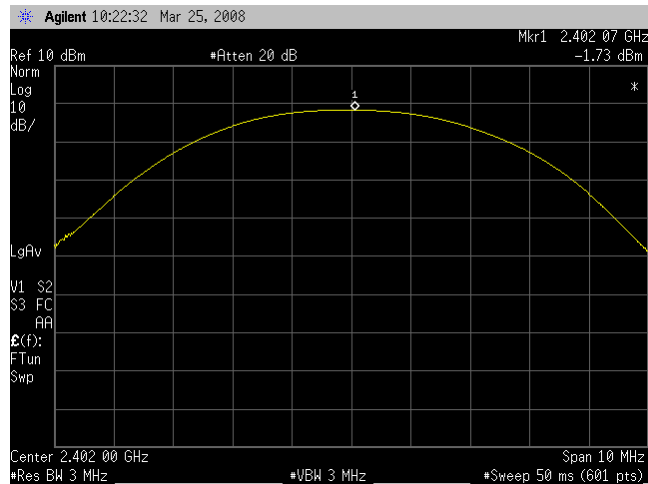
Channel Middle: 2441.0MHz [Channel 40]



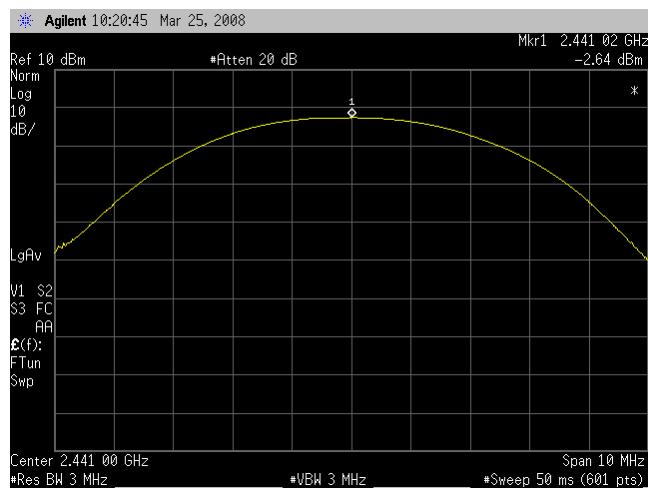
Channel High: 2480.0MHz [Channel 79]



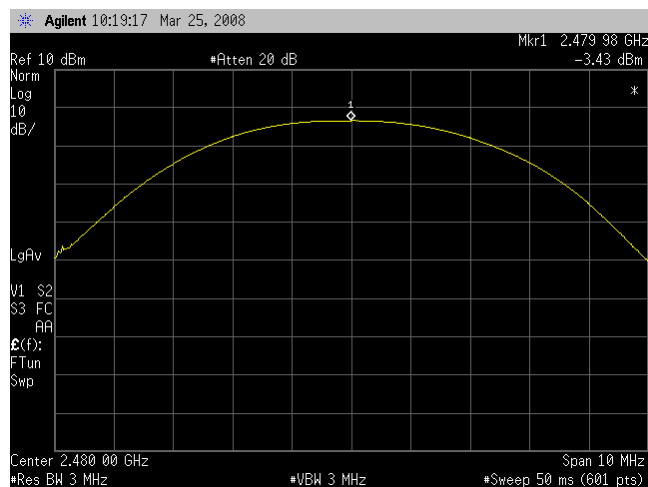
Maximum Peak Output Power - Conducted - [AC 120V]
Channel Low: 2402.0MHz [Channel 1]



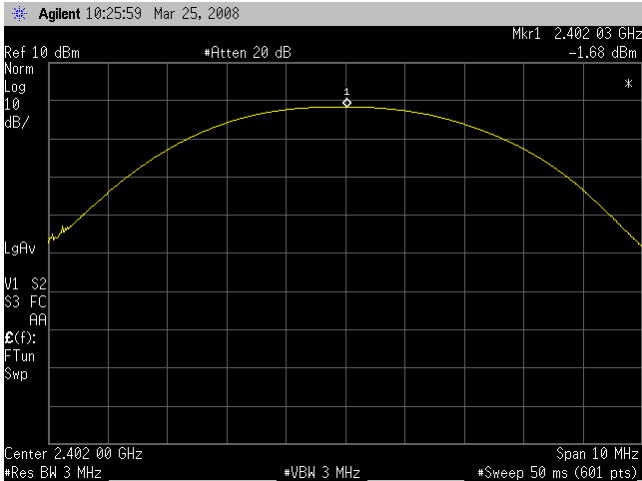
Channel Middle: 2441.0MHz [Channel 40]



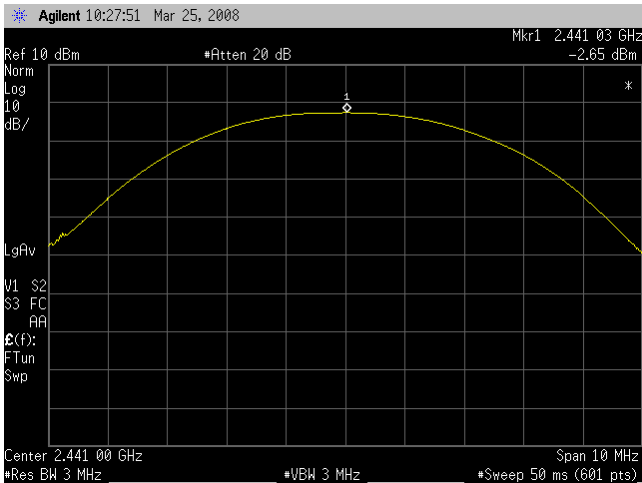
Channel High: 2480.0MHz [Channel 79]



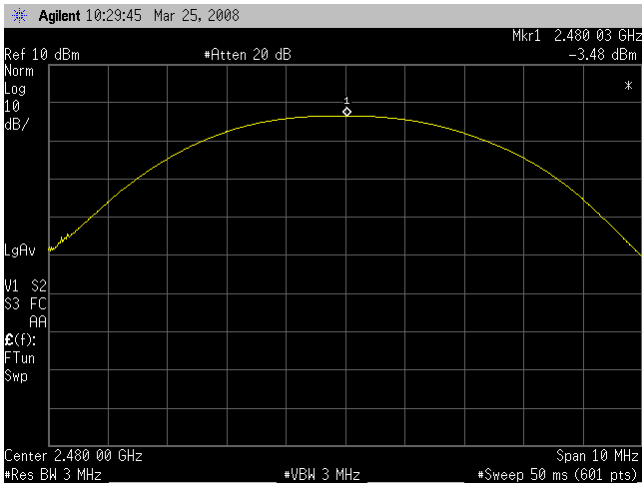
Maximum Peak Output Power - Conducted - [AC 138V]
Channel Low: 2402.0MHz [Channel 1]



Channel Middle: 2441.0MHz [Channel 40]



Channel High: 2480.0MHz [Channel 79]



5.6 Band Edge Compliance of RF Conducted Emissions

5.6.1 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=Arbitrary setting, Sweep=Auto

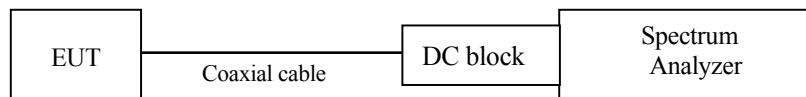
The EUT was set to operate with following conditions.

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

The test mode of EUT is as follows.

- Test mode

5.6.2 Test Instruments and Measurement Setup



5.6.3 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.

5.6.4 Measurement Results of Band-edge

Channel	Frequency [MHz]	RF power Level [dBm]	Band-edge Frequency [MHz]	Band-edge Level [dBm]	Difference Level [dBm]	Limit [dBm]	PASS / FAIL
1	2402.0	-1.01	2398.00	-42.86	41.85	At least 20dB below from peak of RF.	PASS
79	2480.0	-2.62	2484.00	-52.64	50.02	At least 20dB below from peak of RF.	PASS

5.6.5 Trace Data

Test Personnel:

Tested by: Hiroaki Suzuki

Date : Mar. 24, 2008

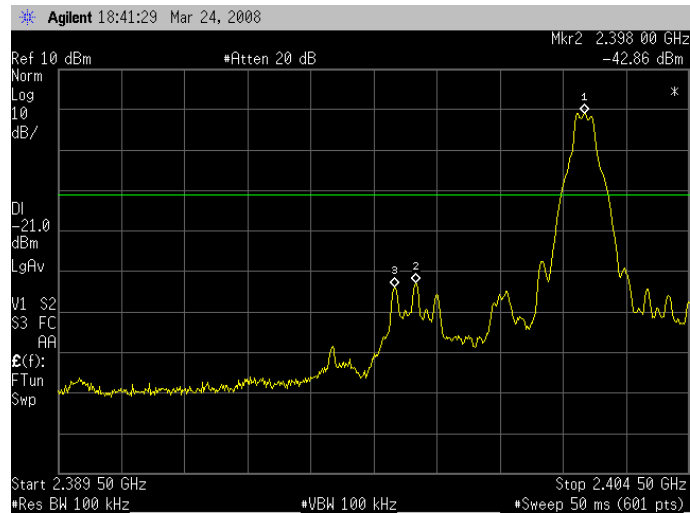
Temperature : 22.8 [°C]

Humidity : 37.8 [%]

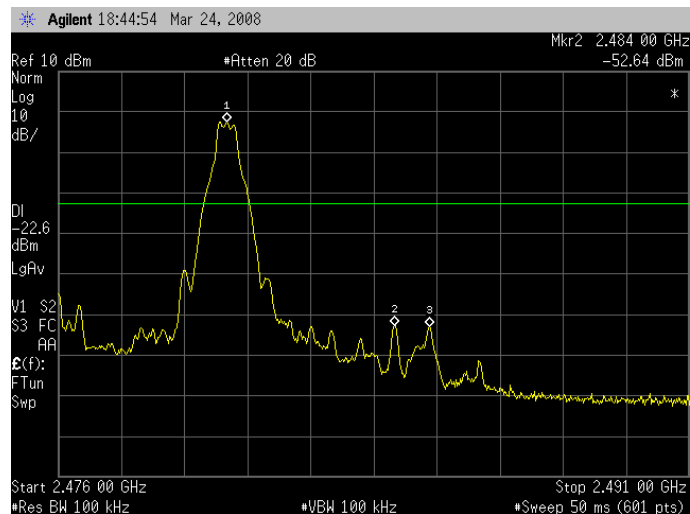
Test place : Shielded room

Band Edge Compliance of RF Conducted Emissions

Channel Low: 2402.0MHz [Channel 1]



Channel High: 2480.0MHz [Channel 79]



5.7 Spurious Emissions - Conducted -

5.7.1 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

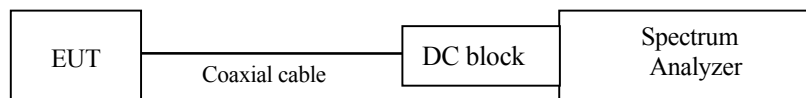
The EUT was set to operate with following conditions.

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

The test mode of EUT is as follows.

- Test mode

5.7.2 Measurement Setup



5.7.3 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.

5.7.4 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

5.7.5 Trace Data

Test Personnel:

Tested by:

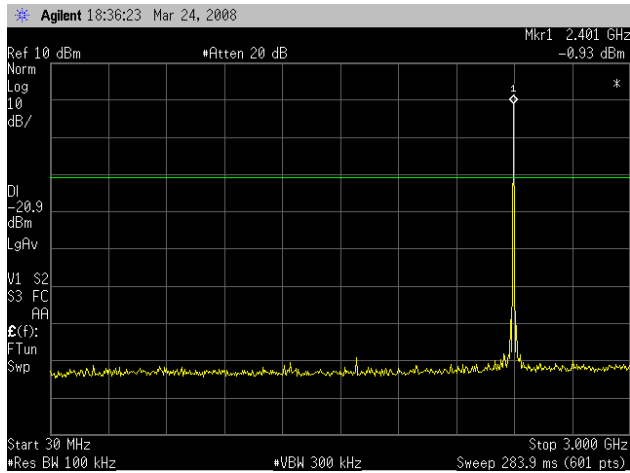
Hiroaki Suzuki

Date : Mar. 24, 2008
Temperature : 22.8 [°C]
Humidity : 37.8 [%]
Test place : Shielded room

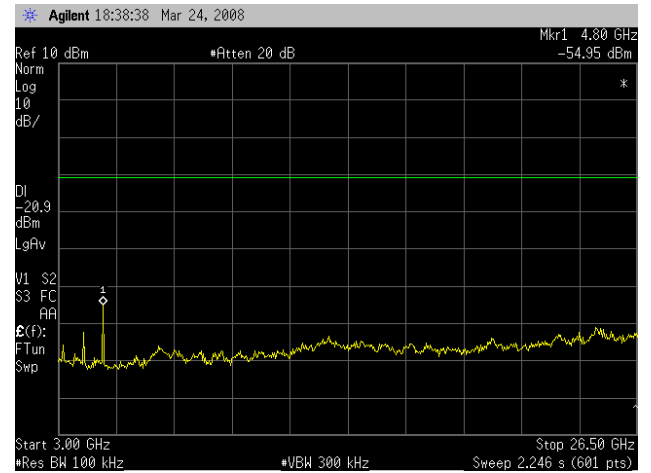
Spurious Emissions - Conducted -

Channel Low: 2402.0MHz [Channel 1]

30MHz-3GHz

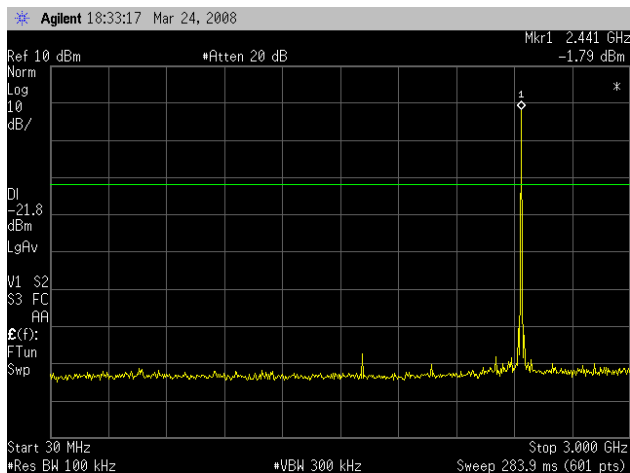


3GHz-26.5GHz

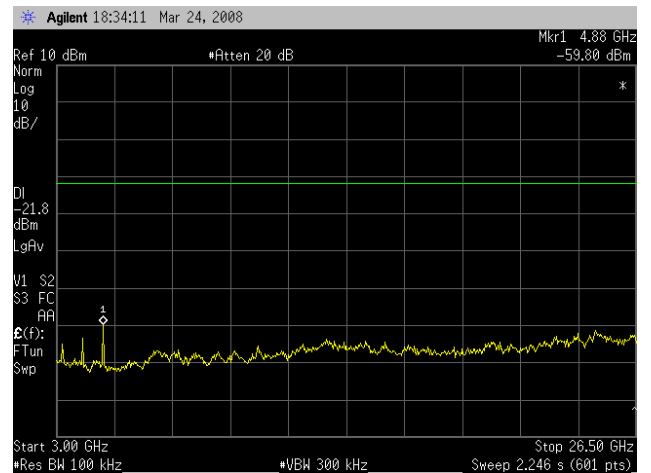


Channel Middle: 2441.0MHz [Channel 40]

30MHz-3GHz

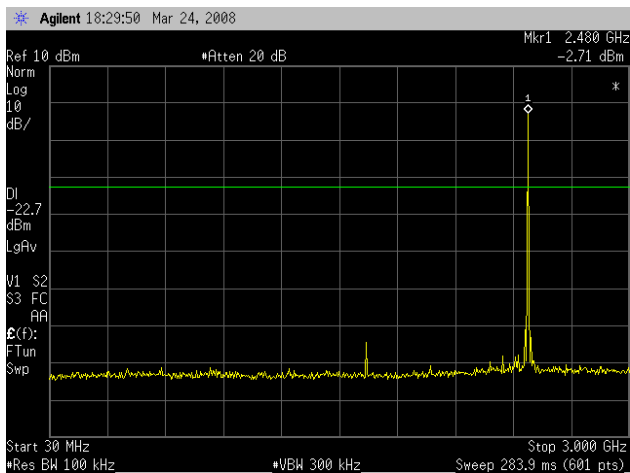


3GHz-26.5GHz

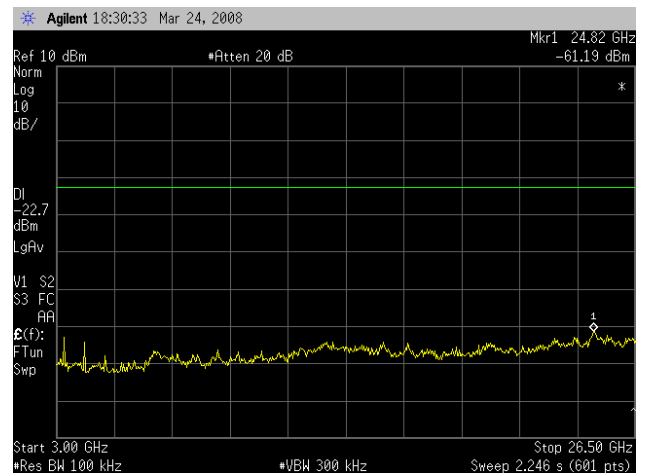


Channel High: 2480.0MHz [Channel 79]

30MHz-3GHz



3GHz-26.5GHz



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

5.8.1 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, Biconical antenna, log-periodic 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.

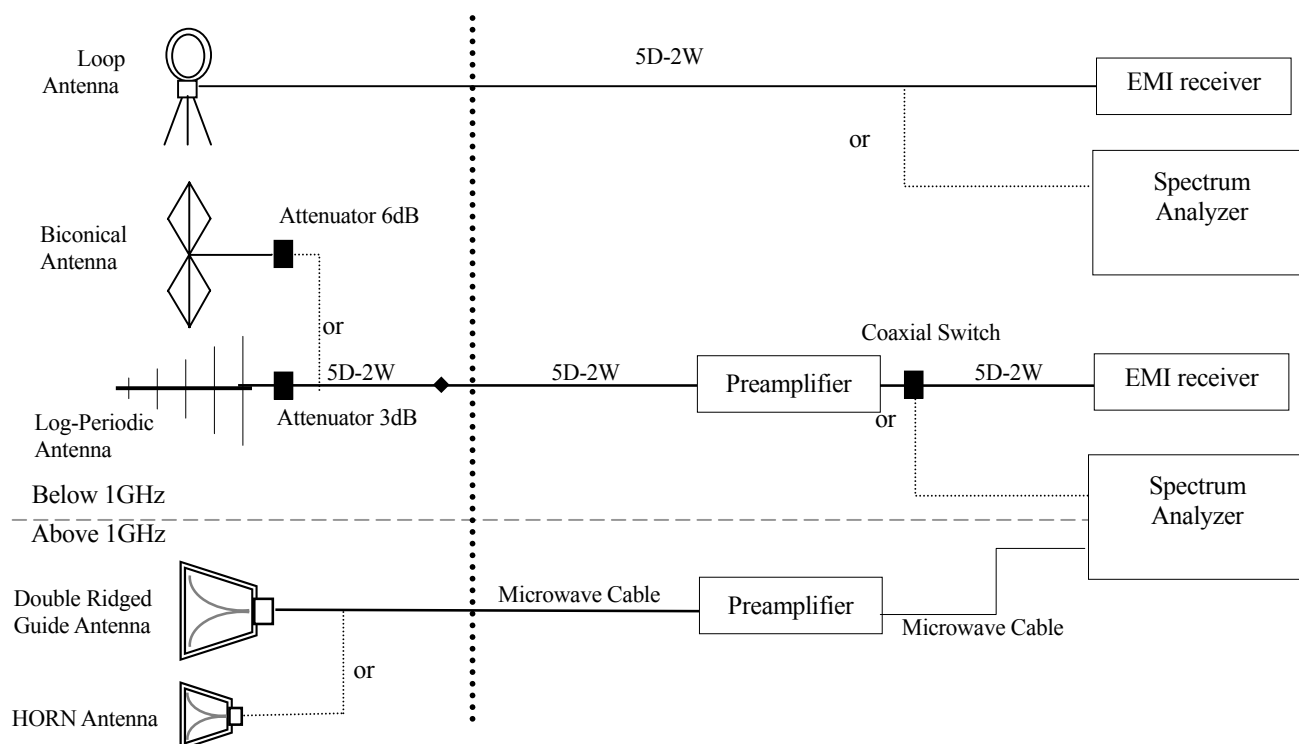
The EUT and support equipment are placed on a 1 meter x 1.5meter surface, 0.8meter height styrene form table. The turntable is rotated by 360 degrees and stopped at azimuth of producing the maximum emission.

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.

5.8.2 Measurement Setup

Test configuration for Spurious emissions



5.8.3 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.

5.8.4 Sample of field strength calculation

Spurious Emission

$$\text{dB}\mu\text{V} / \text{m} = 20\log_{10} (\mu\text{V}/\text{m})$$

Limit @147.6MHz = 150μV/m = 43.5dBμV/m
Reading = 42.8dBμV
Ant. Factor + Cable Loss - Amp. Gain = 14.2 + 3.0 - 30.0 = -12.8dB
Total = 42.8 - 12.8 = 30.0dBμV/m
Margin = 43.5 - 30.0 = <u>13.5dB</u>

5.8.5 Measurement Results

Test Personnel:

Tested by: Hiroaki Suzuki

Date : Mar. 27, 2008
Temperature : 21.4 [°C]
Humidity : 44.5 [%]
Test place : 3m Semi-anechoic chamber

Test Personnel:

Tested by: Hiroaki Suzuki

Date : Apr. 14, 2008
Temperature : 22.6 [°C]
Humidity : 32.4 [%]
Test place : 3m Semi-anechoic chamber

Spurious Emissions - Radiated -

Tx Channel Low: 2402.0MHz [Channel 1]

No.	Frequency [MHz]	Pol. [H/V]	Reading QP [dB(μV)]	Cable Factor dB(1/m)	Result QP [dB(μV)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg.]	Remark
1	31.910	V	37.0	-5.3	31.7	40.0	8.3	100.0	122.0	
2	124.900	V	42.3	-8.7	33.6	43.5	9.9	100.0	90.0	
3	299.860	V	40.4	-1.6	38.8	46.0	7.2	100.0	61.0	
4	333.170	V	50.4	-9.8	40.6	46.0	5.4	100.0	131.0	
5	343.640	V	44.1	-9.4	34.7	46.0	11.3	100.0	41.0	
6	1026.050	V	54.8	-9.6	45.2	74.0	28.8	100.0	183.0	peak
7	1026.050	V	49.7	-9.6	40.1	54.0	13.9	100.0	183.0	average
8	1539.100	V	55.3	-6.3	49.0	74.0	25.0	108.0	5.0	peak
9	1539.100	V	50.4	-6.3	44.1	54.0	9.9	108.0	5.0	average
10	2052.100	V	52.8	-2.6	50.2	74.0	23.8	133.0	113.0	peak
11	2052.100	V	47.4	-2.6	44.8	54.0	9.2	133.0	113.0	average
12	4882.000	V	51.1	7.3	58.4	74.0	15.6	138.0	167.0	peak
13	4882.000	V	36.3	7.3	43.6	54.0	10.4	138.0	167.0	average
14	4882.030	H	48.4	7.3	55.7	74.0	18.3	146.0	97.0	peak
15	4882.030	H	34.7	7.3	42.0	54.0	12.0	146.0	97.0	average

Tx Channel Middle: 2441.0MHz [Channel 40]

No.	Frequency [MHz]	Pol. [H/V]	Reading QP [dB(μV)]	Cable Factor dB(1/m)	Result QP [dB(μV)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg.]	Remark
1	126.990	V	40.0	-8.6	31.4	43.5	12.1	100.0	72.0	
2	299.860	V	40.0	-1.6	38.4	46.0	7.6	100.0	56.0	
3	333.190	V	49.2	-9.8	39.4	46.0	6.6	100.0	50.0	
4	1026.050	V	54.8	-9.6	45.2	74.0	28.8	100.0	183.0	peak
5	1026.050	V	49.7	-9.6	40.1	54.0	13.9	100.0	183.0	average
6	1539.100	V	55.3	-6.3	49.0	74.0	25.0	108.0	5.0	peak
7	1539.100	V	50.4	-6.3	44.1	54.0	9.9	108.0	5.0	average
8	2052.100	V	52.8	-2.6	50.2	74.0	23.8	133.0	113.0	peak
9	2052.100	V	47.4	-2.6	44.8	54.0	9.2	133.0	113.0	average
10	4882.000	V	51.1	7.3	58.4	74.0	15.6	138.0	167.0	peak
11	4882.000	V	36.3	7.3	43.6	54.0	10.4	138.0	167.0	average
12	4882.030	H	48.4	7.3	55.7	74.0	18.3	146.0	97.0	peak
13	4882.030	H	34.7	7.3	42.0	54.0	12.0	146.0	97.0	average

Note:

1. Emission Level (Margin) = Limit – [Reading + Factor (Antenna + Cable - Amp)]
2. The 6 highest emissions relative to the limits are reported.
3. The EUT was found to comply to the limits of FCC Part15 Subpart C and RSS-210 with a margin of 3.0dB.
4. No emissions were detected in frequency range 9KHz to 30MHz at the 3 meters distance.

Spurious Emissions - Radiated -

Tx Channel High: 2480.0MHz [Channel 79]

No.	Frequency [MHz]	Pol. [H/V]	Reading QP [dB(μV)]	Cable Factor dB(1/m)	Result QP [dB(μV)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg.]	Remark
1	124.800	V	42.3	-8.7	33.6	43.5	9.9	100.0	67.0	
2	299.840	V	40.4	-1.6	38.8	46.0	7.2	100.0	42.0	
3	333.150	V	50.0	-9.8	40.2	46.0	5.8	100.0	130.0	
4	1026.050	V	55.7	-9.6	46.1	74.0	27.9	100.0	187.0	peak
5	1026.050	V	50.5	-9.6	40.9	54.0	13.1	100.0	187.0	average
6	1539.020	V	55.3	-6.3	49.0	74.0	25.0	100.0	5.0	peak
7	1539.020	V	50.8	-6.3	44.5	54.0	9.5	100.0	5.0	average
8	2052.070	V	52.5	-2.6	49.9	74.0	24.1	100.0	120.0	peak
9	2052.070	V	46.2	-2.6	43.6	54.0	10.4	100.0	120.0	average
10	4960.000	H	48.0	7.5	55.5	74.0	18.5	131.0	92.0	peak
11	4960.000	H	34.4	7.5	41.9	54.0	12.1	131.0	92.0	average
12	4960.020	V	51.6	7.5	59.1	74.0	14.9	123.0	161.0	peak
13	4960.020	V	36.4	7.5	43.9	54.0	10.1	123.0	161.0	average

Note:

1. Emission Level (Margin) = Limit – [Reading + Factor (Antenna + Cable - Amp)]
2. The 6 highest emissions relative to the limits are reported.
3. The EUT was found to comply to the limits of FCC Part15 Subpart C and RSS-210 with a margin of 3.0dB.
4. No emissions were detected in frequency range 9KHz to 30MHz at the 3 meters distance.

Spurious Emissions - Radiated -

Rx Channel Low: 2402.0MHz [Channel 1]

No.	Frequency [MHz]	Pol. [H/V]	Reading QP [dB(μV)]	Cable Factor dB(1/m)	Result QP [dB(μV)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg.]	Remark
1	117.470	V	39.6	-9.3	30.3	43.5	13.2	100.0	185.0	
2	299.840	V	39.5	-1.6	37.9	46.0	8.1	100.0	272.0	
3	333.140	V	48.3	-9.8	38.5	46.0	7.5	100.0	9.0	
4	343.630	V	41.2	-9.4	31.8	46.0	14.2	100.0	0	
5	1539.050	V	54.9	-6.3	48.6	74.0	25.4	100.0	5.0	peak
6	1539.050	V	49.7	-6.3	43.4	54.0	10.6	100.0	5.0	average
7	2052.080	V	53.4	-2.6	50.8	74.0	23.2	100.0	117.0	peak
8	2052.080	V	48.1	-2.6	45.5	54.0	8.5	100.0	117.0	average

Rx Channel Middle: 2441.0MHz [Channel 40]

No.	Frequency [MHz]	Pol. [H/V]	Reading QP [dB(μV)]	Cable Factor dB(1/m)	Result QP [dB(μV)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg.]	Remark
1	117.250	V	39.9	-9.4	30.5	43.5	13.0	100.0	166.0	
2	299.850	V	39.8	-1.6	38.2	46.0	7.8	100.0	271.0	
3	333.190	V	48.9	-9.8	39.1	46.0	6.9	100.0	0	
4	363.620	V	41.3	-8.9	32.4	46.0	13.6	100.0	0	
5	1539.050	V	54.6	-6.3	48.3	74.0	25.7	100.0	5.0	peak
6	1539.050	V	49.8	-6.3	43.5	54.0	10.5	100.0	5.0	average
7	2052.080	V	52.4	-2.6	49.8	74.0	24.2	100.0	118.0	peak
8	2052.080	V	46.9	-2.6	44.3	54.0	9.7	100.0	118.0	average

Rx Channel High: 2480.0MHz [Channel 79]

No.	Frequency [MHz]	Pol. [H/V]	Reading QP [dB(μV)]	Cable Factor dB(1/m)	Result QP [dB(μV)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg.]	Remark
1	117.280	V	39.7	-9.4	30.3	43.5	13.2	100.0	165.0	
2	299.840	V	40.0	-1.6	38.4	46.0	7.6	100.0	267.0	
3	333.190	V	48.7	-9.8	38.9	46.0	7.1	100.0	2.0	
4	363.620	V	41.3	-8.9	32.4	46.0	13.6	100.0	0	
5	1539.050	V	54.5	-6.3	48.2	74.0	25.8	100.0	5.0	peak
6	1539.050	V	50.0	-6.3	43.7	54.0	10.3	100.0	5.0	average
7	2052.080	V	53.4	-2.6	50.8	74.0	23.2	100.0	118.0	peak
8	2052.080	V	47.1	-2.6	44.5	54.0	9.5	100.0	118.0	average

Note:

1. Emission Level (Margin) = Limit – [Reading + Factor (Antenna + Cable - Amp)]
2. The 6 highest emissions relative to the limits are reported.
3. The EUT was found to comply to the limits of FCC Part15 Subpart C and RSS-210 with a margin of 3.0dB.
4. No emissions were detected in frequency range 9KHz to 30MHz at the 3 meters distance.

5.9 Restricted Band of Operation

5.9.1 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:

- RBW=1MHz, VBW=1MHz, 10Hz, Span=Arbitrary setting, Sweep=auto

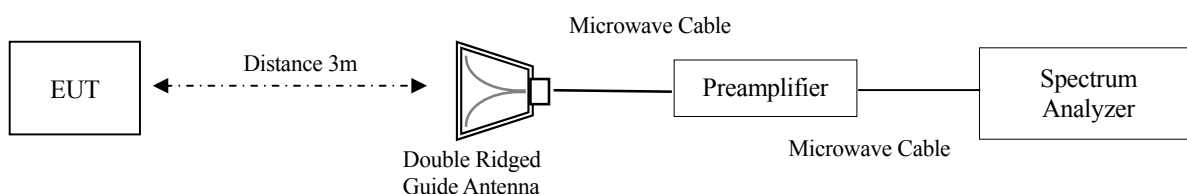
The EUT was set to operate with following conditions.

- Hopping

The test mode of EUT is as follows.

- Test mode

5.9.2 Measurement Setup



5.9.3 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.

5.9.4 Measurement Result

Frequency [MHz]	Pol. [H/V]	Reading [dBuV/m]		Factor [dB]	Emission Level [dBuV/m]		Limit [dBuV/m]		Margin [dB]		PASS /FAIL
		Peak	Ave.		Peak	Ave.	Peak	Ave.	Peak	Ave.	
2390.0	H	46.83	37.85	-2.4	44.43	35.45	74.0	54.0	29.57	18.55	PASS
2390.0	V	46.72	38.11	-2.4	44.32	35.71	74.0	54.0	29.68	18.29	PASS
2483.5	H	47.88	41.57	-2.0	45.88	39.57	74.0	54.0	28.12	14.43	PASS
2483.5	V	47.40	42.48	-2.0	45.40	40.48	74.0	54.0	28.60	13.52	PASS

5.9.5 Trace Data

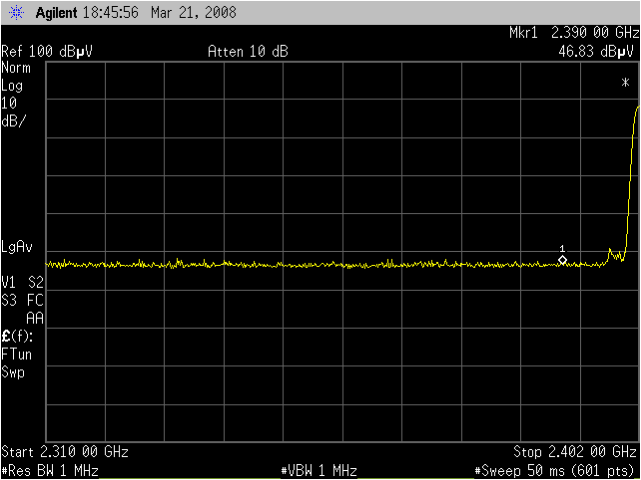
Test Personnel:

Tested by: Hiroaki Suzuki

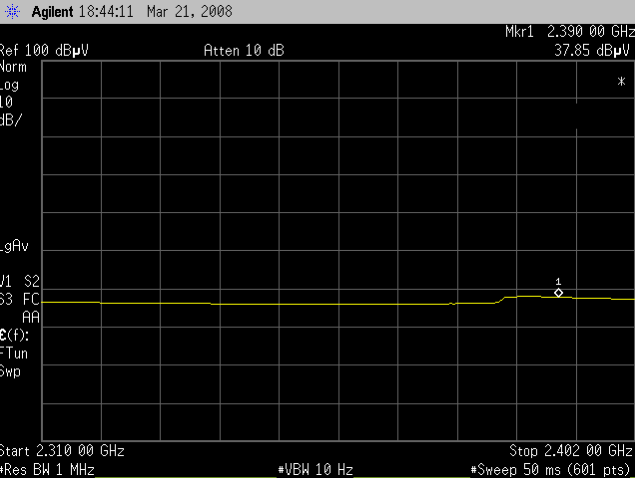
Date : Mar. 21, 2008
 Temperature : 20.3 [°C]
 Humidity : 34.6 [%]
 Test place : 3m Semi-anechoic chamber

Restricted Band of Operation

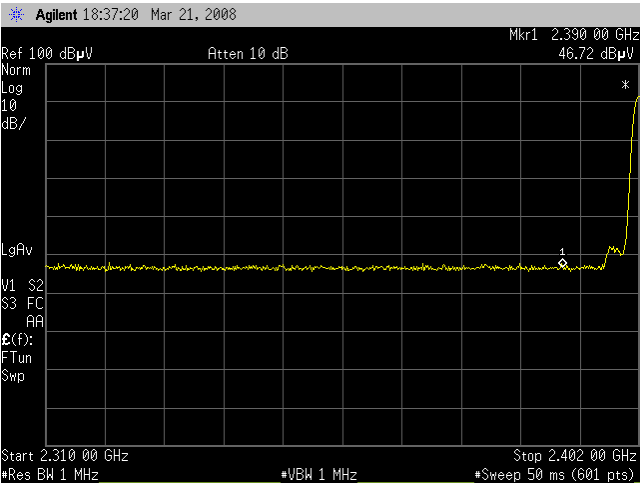
**Frequency: 2390.0MHz -Horizontal-
PEAK**



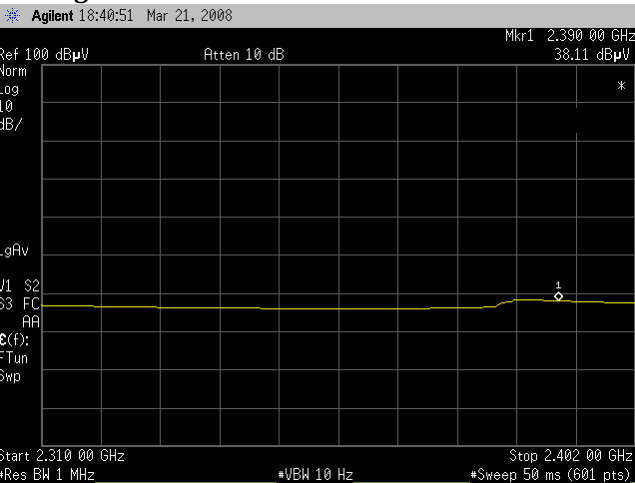
Average



**Frequency: 2390.0MHz -Vertical-
PEAK**

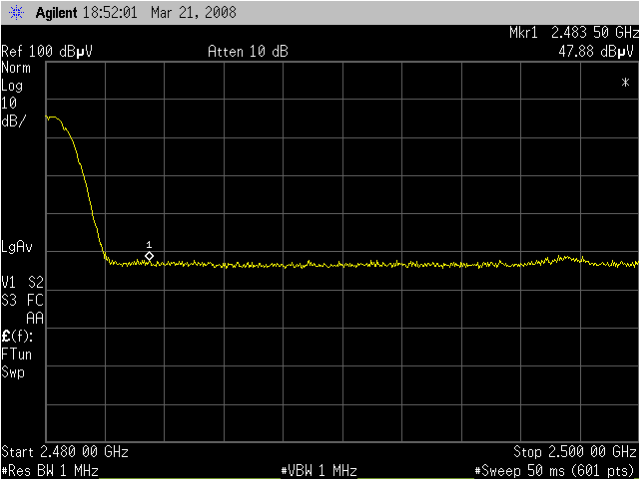


Average

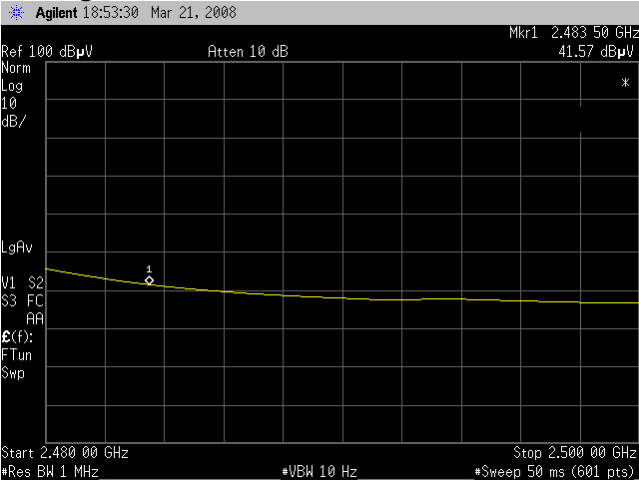


Restricted Band of Operation

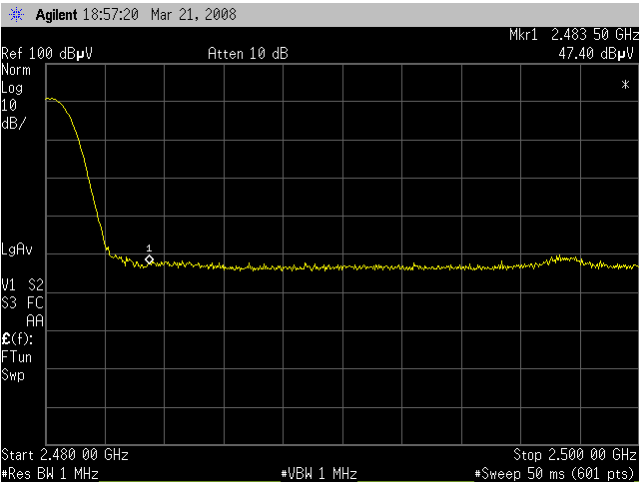
**Frequency: 2483.5MHz -Horizontal-
PEAK**



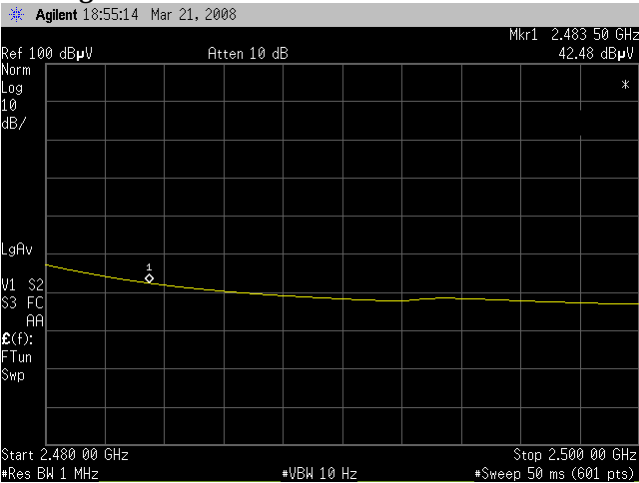
Average



**Frequency: 2483.5MHz -Vertical-
PEAK**



Average



5.10 Transmitter Power Spectral Density

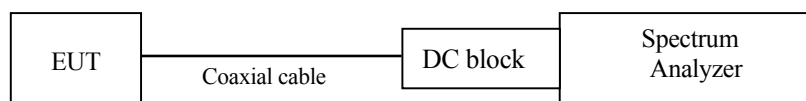
5.10.1 Test Procedure [FCC 15.247(d), IC RSS-210 A8.2(b)]

The peak power 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= 3kHz, VBW=10kHz, Span=300kHz, Sweep = 100 sec.

5.10.2 Measurement Setup



5.10.3 Limit of Transmitter Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band.

5.10.4 Measurement Results

Ch No.	Frequency [MHz]	Reading [dBm]	Factor (Cable loss) [dB]	Level [dBm]	Limit [dBm]	Margin [dB]
1	2402.0	-12.82	0.1	-12.72	8.0	20.72
40	2441.0	-13.69	0.1	-13.59	8.0	21.59
79	2480.0	-14.78	0.1	-14.68	8.0	22.68

Note:

1. Transmitter Power Spectral Density Level (Margin) = Limit – [Reading + Factor (Cable)]

5.10.5 Trace Data

Test Personnel:

Tested by:

Hiroaki Suzuki

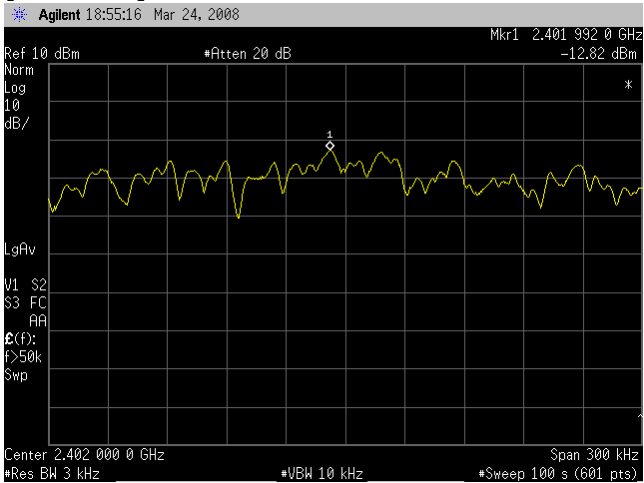
Date : Mar. 24, 2008

Temperature : 22.8 [°C]

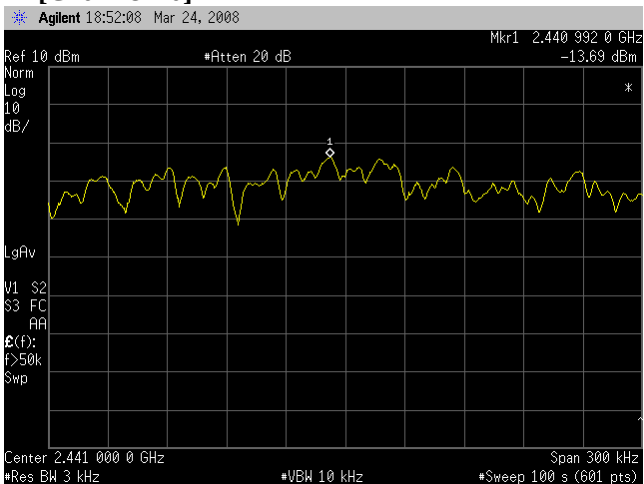
Humidity : 37.8 [%]

Test place : Shielded room

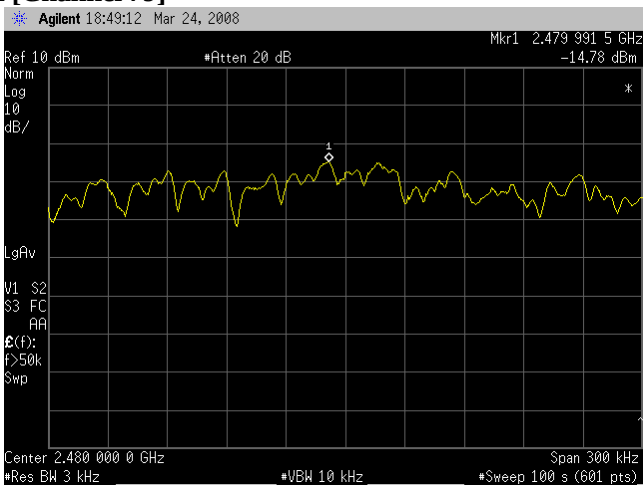
Transmitter Power Spectral Density
Channel Low: 2402.0MHz [Channel 1]



Channel Middle: 2441.0MHz [Channel 40]



Channel High: 2480.0MHz [Channel 79]



5.11 AC power line Conducted Emissions

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

Conducted emissions 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 2.3m(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 2.4m (W) × 2.7m (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:

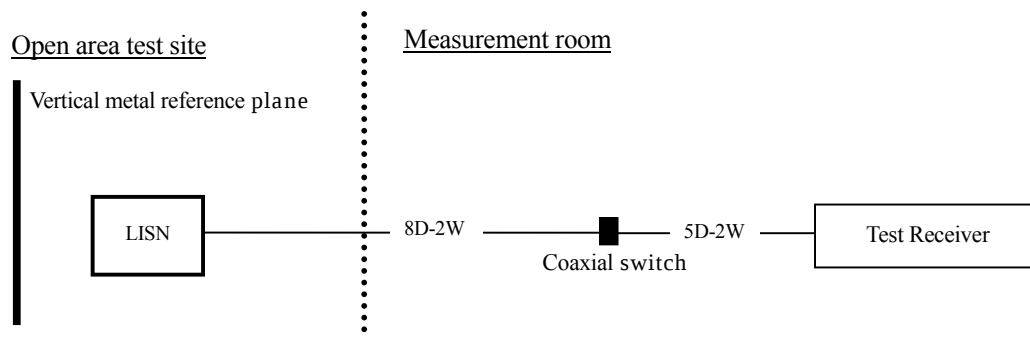
- 0.15MHz to 30MHz

The Test receiver is set to:

- Detector: Quasi-peak, Average
Bandwidth: 9kHz

5.11.2 Measurement Setup

Test configuration for AC power line Conducted Emissions



5.11.3 Limit of AC power line Conducted Emissions Measurement (Sample calculation)

Frequency	Limit		Sample of field strength calculation
	QP(dBμV)	AV(dBμV)	
0.15MHz to 0.5MHz	66 to 56*	56 to 46*	$\text{dB}\mu\text{V} = 20\log_{10}(\mu\text{V})$ Limit @ : 60.0dBμV(Quasi-peak) 6.770MHz : 50.0dBμV(Average)
0.5MHz to 5MHz	56	46	(Quasi peak) Reading = 51.2dBμV Cable loss + AMN factor = 0.3dB Total = 51.2 + 0.3 = 51.5dBμV Margin = 60.0 – 51.5 = 8.5dB
5MHz to 30MHz	60	50	(Average) Reading = 45.0dBμV Cable loss + AMN factor = 0.3dB Total = 45.0 + 0.3 = 45.3dBμV Margin = 50.0 – 45.3 = 4.7dB

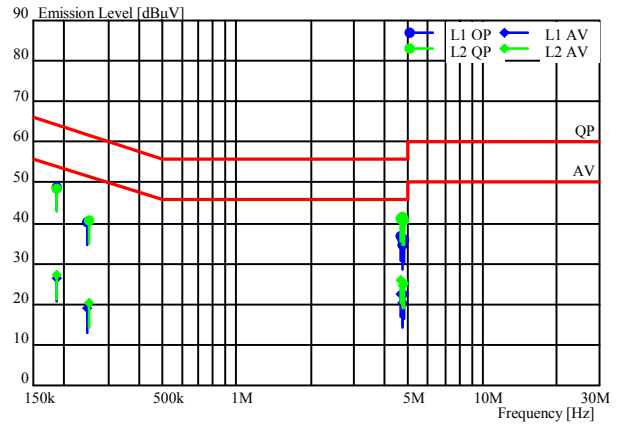
*: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

5.11.4 Measurement Result

***** CONDUCTED EMISSION at MAINS PORT *****

Sheet number : 1

Standard : FCC Part 15 Subpart C
Class : N/A
Terminal : Mains
Date of test : 2008/3/31
Test site : 2
Temperature [] : 16.3
Humidity [%] : 41.6
Operator : T.Seino
Company name : Seiko Instruments Inc.
EUT : Thermal Printer
Model number : DPU-S445-01A-E
Serial number : PP112
Test mode : Test mode
Comment :



Phase	Frequency [MHz]	Reading		Factor	Emission level		Limit		Margin		Comment
		QP [dBUV]	AV [dBUV]		QP [dBUV]	AV [dBUV]	QP [dBUV]	AV [dBUV]	QP [dB]	AV [dB]	
L1	0.186	48.9	26.4	0.2	49.1	26.6	64.2	54.2	15.1	27.6	
L1	0.247	40.2	18.8	0.1	40.3	18.9	61.9	51.9	21.6	33.0	
L1	4.623	36.4	22.3	0.3	36.7	22.6	56.0	46.0	19.3	23.4	
L1	4.686	35.4	19.9	0.3	35.7	20.2	56.0	46.0	20.3	25.8	
L1	4.745	34.1	20.2	0.3	34.4	20.5	56.0	46.0	21.6	25.5	
L1	4.811	35.6	22.1	0.3	35.9	22.4	56.0	46.0	20.1	23.6	
L2	0.186	48.3	26.9	0.2	48.5	27.1	64.2	54.2	15.7	27.1	
L2	0.250	40.6	20.1	0.1	40.7	20.2	61.8	51.8	21.1	31.6	
L2	4.620	40.8	25.6	0.3	41.1	25.9	56.0	46.0	14.9	20.1	
L2	4.685	40.3	25.4	0.3	40.6	25.7	56.0	46.0	15.4	20.3	
L2	4.746	41.2	24.4	0.3	41.5	24.7	56.0	46.0	14.5	21.3	*
L2	4.808	40.2	24.6	0.3	40.5	24.9	56.0	46.0	15.5	21.1	

5.12 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.

6. Uncertainty of measurement

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)	$\pm 3.6\text{dB}$

7. Laboratory description

7.1 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

7.2 Facility filing information:

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

2) FCC filing: Pursuant to Section 2.948 of the FCC rules.

Site name	Registration Number	Expiry Date
Site 1, Site 2, Site3	91065	November 16, 2008
3m Semi-anechoic chamber 10m Semi-anechoic chamber	540072	March 12, 2010

3) Industry Canada Oats site filing: Pursuant to RSS 212, Issue 1(Provisional).

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: Pursuant to V-5/2006.04 VCCI regulations for registration of measurement facilities.

Site name	Radiated emission registration No.	Conducted emission registration No.	Duration of registration
Site 1	R-136	C-132	November 16, 2008
Site 2	R-137	C-133	November 16, 2008
Site 3	R-138	C-134	November 16, 2008
10m Semi-anechoic chamber	R-2480	C-2722	December 19, 2009
3m Semi-anechoic chamber	R-2481	C-2723	December 19, 2009
Shielded room No.1	-	C-2724	December 19, 2009

5) ETL SEMKO authorization:

Authorized as an EMC test laboratory.

6) TUV Rheinland authorization:

Authorized as an EMC test laboratory.

8. Test photographs

System configuration (RF Conducted test)



Transmitter Radiated Spurious Emissions (RF Radiated test)



AC power line Conducted Emissions

