TEST REPORT

Report No. :	6024F-B
Date :	24th April 2006
Applicant :	Topcon America Corporation
	37 West Century Road, Praramus New Jersey, 07652 U.S.A
EUT :	Geodetic Mapping System
FCC ID :	LCB-841201
Model No. :	GMS-2
Serial No. :	0043 (Radiated Test, AC Powerline Conducted Test)
	0025 (Conducted Test)
Receipt date of tested sample :	22nd March 2005
Date of measurement :	22nd, 27th, 28th, 29th March 2006 (Radiated Test)
	30th, 31st March 2006 (Conducted Test)
	4th, 5th April 2006 (AC Powerline Conducted Test)
Test location :	TAIYO YUDEN CO.,LTD. EMC Center
	5607-2, Nakamuroda,Haruna-machi,
	Gunma-Gun, Gunma , 370-3347,Japan.
Applied standard :	FCC 47 CFR Part 15 Subpart C Section15.247 (10-1-05 Edition)
Procedure :	ANSI C63.4-2003
Test results:	PASS

NVLAP®
NVLAP LAB CODE 200607-0

Approved by : Manager / Kenzo Furuta

Reviewed by : Chief Engineer / Takeshi Matsumura

Tested by : Engineer / Shin Itakura

Assistant / Yasuko Hirata

Table of Contents

Revised Record

Revised Record				
Number of Revised time	Date	Person in Charge	Detail of Revision	Approved by
Initial	17th April 2006	S.Itakura	-	-

1 Test report

(1) The measurements covered by this document have been performed in accordance with NVLAP requirements which include the requirements of ISO/IEC 17025 and are traceable to national or international standards of measurement.
(2) This report summarizes the result of a single investigation and test result relate only to tested sample.
(3) The report shall not be reproduced except in full without the written approval of the Taiyo Yuden Co.,Ltd.
(4) This test report must not be used by the client to claim product endorsement by any government agency.(NVLAP or agency of the U.S. Government.)
(5) We hereby certify that no party to the applications authorized hereunder is subject to a denial of benefits, including FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 853(a).

2 General Information

2.1 Product Description

EUT	: Geodetic Mapping System
Model No.	: GMS-2
Serial No.	: 0043, 0025
FCC ID	: LCB-841201
Production stage	: Prototype
Summary of EUT	: The equipment for getting the information of the location and surveying by receiving the GPS signals. The data such as the surveying result can be transmitted and received between this equipment and the other equipment such as PC through USB, RS-232C, Bluetooth.
Modulation	: GFSK
Power supply	: (i) AC 100 – 240V, 60Hz (ii) Rated Voltage DC 7.4V (Lithium Battery) allowed Range DC 6.0 – 18.4V
Weight	: 680g
Dimensions of EUT	: W90mm × D199mm × H63mm
Max antenna gain	: -3.7dBi
The clock frequencies used in this EUT:	1.57GHz, 1.6GHz, 20MHz, 520MHz, 13MHz, 12.288MHz

EUT is operated within the bands 2400 – 2483.5MHz frequency hopping intentional radiators that comply with FCC15.247. It provides 79 channels. And it adopts an AFH function to prevent interference with other wireless applications. Refer to APPENDIX 1.

2.2 Summary of Test and Inspection Result

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
1	AC Powerline Conducted Emission	ANSI C63.4:2003	FCC 15.207	-	N/A	11.4dB Transmittingmode at 2441MHz 0.165MHz VB (QP)	Pass
2	Carrier Frequency Separation	ANSI C63.4:2003 Public Notice DA00-705	FCC 15.247(a)(1)	Conducted	N/A	-	Pass
3	Number of Hopping Frequency		FCC 15.247(a)(1)(iii)		N/A	-	Pass
4	Dwell time		FCC 15.247(a)(1)(iii)		N/A	-	Pass
5	Maximum peak Output Power		FCC 15.247(b)(1)		N/A	-	Pass
6	Band Edge Compliance		FCC 15.247(c)		N/A	-	Pass
7	Spurious RF Conducted Emission		FCC 15.247(c)		N/A	-	Pass
8	Radiated Emission		FCC 15.247(c)	Radiated	N/A	7.3dB Tansmitting mode at 2402MHz Direction:YZ Horizontal (AC Power Supply) 700.003MHz	Pass

2.3 Test Methodology

Interference measurements were made in accordance with ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

2.4 Test Facility

1. FCC 47CFR, Part 15, Section 15.247 regulation test were performed on the shielded room, and radiated interference field strength test was performed on the 10 meter semi-anechoic chamber located at Taiyo Yuden Co.,Ltd. EMC Center, 5607-2 Nakamuroda Haruna-Machi Gunma-Gun Gunma, 370-3347 Japan.
2. This Laboratory is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) by United States Department of Commerce, National Institute of Standard and Technology (NIST) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations.
3. These criteria encompass the requirements of ISO/IEC 17025:1999 and the relevant requirements of ISO 9002:1994 as suppliers of calibration or test results. Accreditation awarded for specific services, listed on the Scope of Accreditation for: ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS FCC. (NVLAP LAB CODE: 200607-0). Refer the certificate of the accreditation to Appendix 2.
4. This laboratory is listed by Federal Communications Commission, Equipment Authorization Division (Registration Number: 606514) and listed by Industry Canada.(No.4389-1)

3 System Test Configuration

3.1 Justification

1. Emission tests were performed with no deviation from the ANSI C63.4-2003 and FCC 47CFR, Part 15, Section 15.247 regulation tests were performed with no deviation from the FCC Public Notice DA00-705 released March 30, 2000.
2. The system was configured for testing a typical fashion. (as a customer would normally use it.)
3. Radiate testing in the range of 1 GHz to 25 GHz was investigated with the spectrum (peak detector function) under the FCC regulation section 15.209 (e) and 15.35 (b). The test performed at an antenna to EUT distance of 1 meter. The level of any unwanted emissions from EUT did not exceed the level of the fundamental emission (Compliance with 15.209 (c)). And test result found to be compliance with FCC regulation section 15.209 (a) Radiated emission limits (500 micro-volts/meter). Data is presented for the “worst case” measurements, that E.U.T was normal operated.
4. Radiate testing in the range of 30 MHz to 1000 MHz was performed at an antenna to EUT distance of 3 meters under the 15.209 (e) and 15.31(f)(1).

3.2 Operating modes

As is explained in Section 2.1, EUT has USB, RS232C, GPS and Bluetooth functions. Because the RF characteristics of Bluetooth wireless functions are target in this test, operations except Bluetooth were not functioned during the test.
About Power Supply to EUT, there are two power supply paths to EUT, that is DC12V supply from AC/DC adapter and DC7.4V supply from Battery.

3.2.1 Operating modes of Bluetooth

Bluesuite v1.20 software supplied by CSR Company was used to set up the Bluetooth operating mode. Description of Bluetooth operating mode is as follows.

Mode	Explanation of the mode
Transmitting mode	**Signal pattern : PRBS9** **Signal packet type : DH1,DH3,DH5(for Dwell time test)** **DH5 (for other test)**

Explanation of Signal pattern

PRBS9 is a periodic Pseudo Random Bit Sequence. 2^9 -1

Explanation of Signal packet type

A Data High rate, ACL type packet. Supports a data payload with CRC, no FEC, and fully transmits within one consecutive 625 microsecond transmission slots.
* number of slot --- 1(DH1), 3(DH3), 5(DH5) data size of payload --- 27bytes(DH1), 183bytes(DH3), 339bytes(DH5)

* All tests were performed with the representative channel operation as follows.

a. Lowest frequency channel : CH0 2402MHz
b. Middle frequency channel : CH39 2441MHz
c. Highest frequency channel : CH78 2480MHz

3.2.2 Operating modes of GPS

Operation of GPS function was not performed during this test.

* GPS receiving mode is neither automatically worked only if EUT is booted, nor co-worked when the other function is operated.

3.2.3 Operating modes of USB

Operation of USB function was not performed during this test.

* USB telecommunication mode is neither automatically worked only if EUT is booted, nor co-worked when the other function is operated. Connection with the other device by USB cable may boot the USB function, however, such operation was not executed in this test.

3.2.4 Operating modes of RS232C

Operation of RS232C function was not performed during this test.

* RS232C telecommunication mode is neither automatically worked only if EUT is booted, nor co-worked when the other function is operated. Connection with the other device by RS232C cable may boot the RS232C function, however, such operation was not executed in this test.

3.2.5 Power Supply

There are two methods to supply power to EUT as described in Section 2.1, and the path of the supplied power to EUT is different from each other. Therefore, there are two operating modes for EUT about how the power is supplied to EUT, that is, AC Power Supply mode and Battery Power Supply mode.

* All tests were performed with 120V AC Power Supply. In addition to that, it was confirmed as the following method that the results did not change when the AC Power Supply was varied within manufacturer's specification(100 – 240V).

AC Powerline Conducted Test

The AC Power line conducted Tests were done with 100V, 120V and 240V AC Power Supply.

Radiated Test

Only the scanning from 30MHz to 25GHz was performed in transmitting and receiving test mode with 100V and 240V AC Power Supply in each case, and the obtained results were confirmed to be same as tested with 120V AC Power Supply.

Conducted Test

DC output level from the AC/DC Adapter was confirmed to be same when the AC Power Supply was set 100V, 120V and 240V.

3.3 List of accessories

	Product name	M/N	S/N	Manufacturer	Notes	FCC ID / DoC
a	AC/DC adapter	A20A1-1ZMP	A043014301	AK-Ⅱ Technology	-	N/A

3.4 Interface cables

	Cable Type	M/N	Connection	Ferrite core	Shielded	Material of connector	Length	Treatment for the extra length
1	AC cable	-	a⇔AC (Radiated, Conducted) a⇔LISN (AC Powerline Conducted Emission)	No	No	Plastic	1.00m	-
2	DC cable	-	a⇔EUT	No	No	Metal	1.82m	-

3.5 Special Test Condition

Nothing

3.6 Equipment Modifications

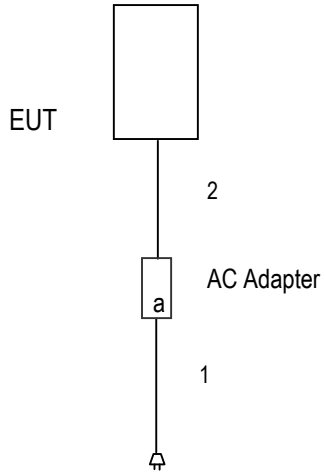
No modification has been carried out by the test laboratory.

3.7 Configuration of Tested System

Radiated Test

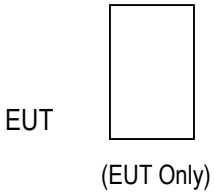
These numbers and the marks in the picture are corresponding to the numbers and the marks in Tables shown at the Section 3.3 and 3.4.

AC Power Supply



AC120V 60Hz

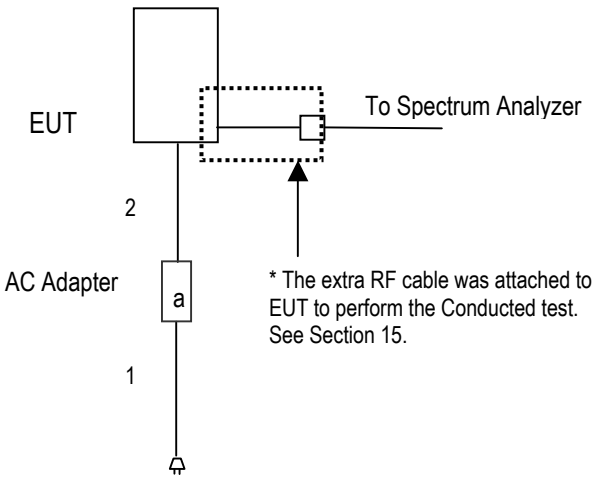
Battery Power Supply



Conducted Test

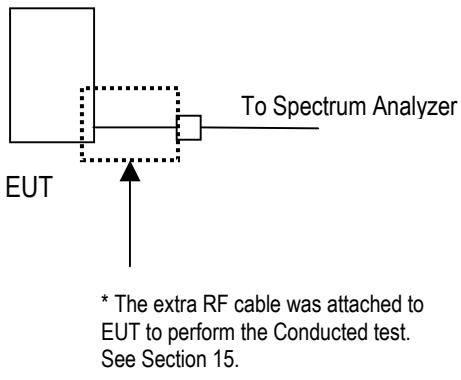
These numbers and the marks in the picture are corresponding to the numbers and the marks in Tables shown at the Section 3.3 and 3.4.

AC Power Supply



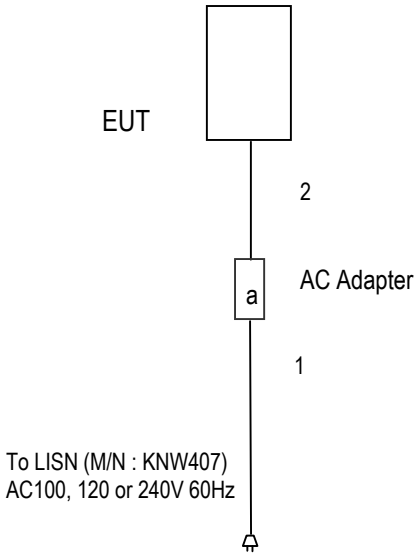
AC120V 60Hz

Battery Power Supply



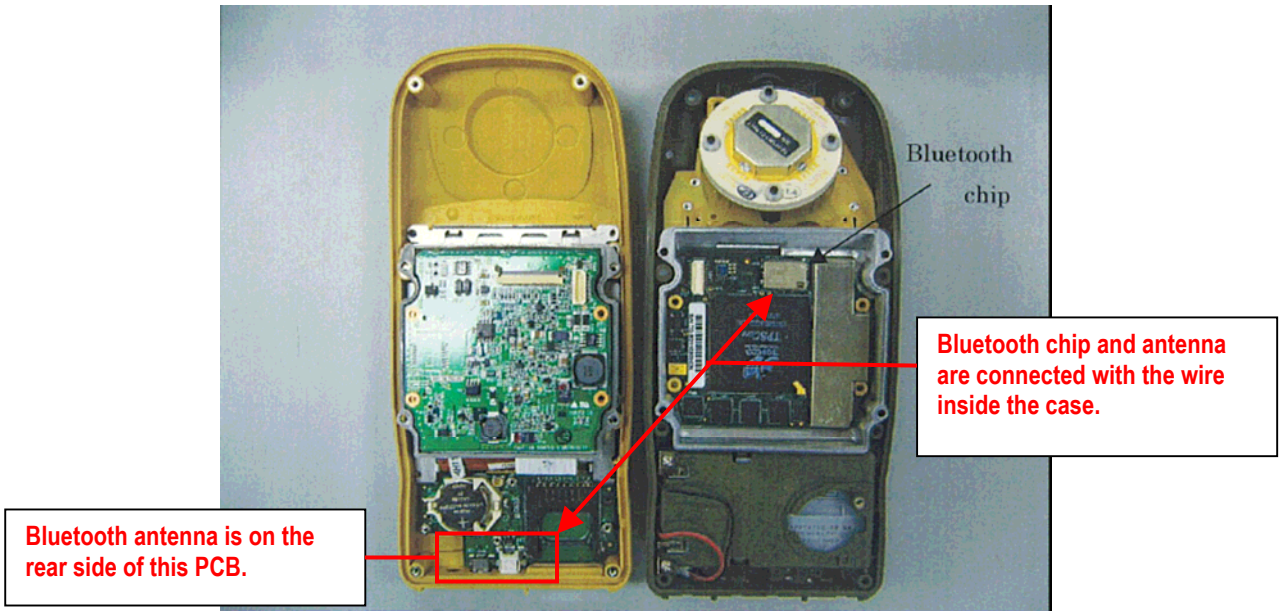
AC Power line Conducted Test

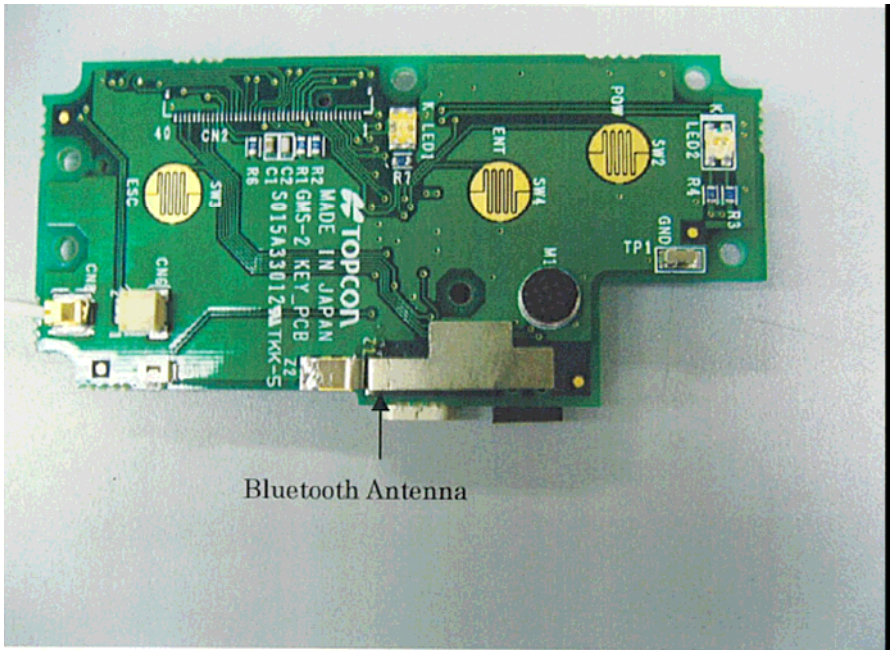
These numbers and the marks in the picture are corresponding to the numbers and the marks in Tables shown at the Section 3.3 and 3.4.



4 Antenna Requirement

The Bluetooth chip and antenna are on the different printed circuit board each other, and they are connected with the wire inside the case. In addition, the antenna is fixed on the internal printed circuit board of EUT. Therefore, the users cannot replace the antenna with the other one. (See photographs below) Therefore, it found to be compliance with FCC regulation section 15.203 .





5 AC Powerline Conducted Test

5.1 Test Setup

Conducted emission measurements were performed from 150kHz to 30 MHz.
The test setup was made according to ANSI STD C63.4-2003 clause 7 in the Shielded room.
The rear of non-conductive wooden table top was placed 0.4 m from a vertical metal reference plane that one of the wall.
Rears of the peripherals were all aligned and flush with rear of non-conductive wooden tabletop.
The height of this table was 0.8 m and 1.5 m wide x 1.0 m deep size.
The spacing between the each equipment was 10 cm.
Connection of the Handy printer connected EUT to the artificial mains network (LISN) was required.
The distance between the closet surface of the EUT and the closet surface of the artificial mains network (LISN) was 0.8 m.
Connection of the all other equipment to the second artificial mains network (LISN) was required. The distance between the peripherals and the closest surface of the second artificial mains network (LISN) was minimum 0.8 m. The second artificial mains network is terminated with 50 ohm terminator. The excess cable was folded back and forth as far as possible to 0.8 m so as to from a bundle not exceeding 0.4 m in length. Interconnecting cables of table top equipment that hang closer than 0.4 m to the floor ground plane were folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
The measurement has been conducted with both neutral (VA) and line (VB) power supply polarization.
The highest voltage emission has been recorded.
For further description of the configuration refer to the photographs of this report.

Detector Mode: Quasi-Peak and Average Bandwidth: 10kHz

5.2 Test Instrumentation

Facility/ Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Next Calibration Due	Note
Shielded room	TDK Co.,Ltd	DA-06912	-	-	-	-
EMI Test Receiver	R&S	ESHS 10	100005	10th.8.2005.	9th.8.2006.	-
LISN	KYORITSU ELECTRICAL WORK	KNW-407	8-680-1	13th.3.2006.	12th.3.2008.	for EUT
		KNW-242	8-818-8	13th.3.2006.	12th.3.2008.	for peripherals
Cable	SUHNER	RG223	CE-1	27th.4.2005	26th.4.2006.	-
		RG223	CE-2	27th.4.2005	26th.4.2006.	-
		RG2214	CE-3	27th.4.2005	26th.4.2006.	-
Attenuator	KYORITSU	KPD-602	5K325	27th.4.2005	26th.4.2006.	-
Pulse Limiter	Agilent Technologies	11867A	1387	27th.4.2005	26th.4.2006.	-
RF Selector	TOYO Corporation	NS4900	0302-009	27th.4.2005	26th.4.2006.	-
50Ω terminator	Agilent Technologies	HP11593A	No.1	13th.3.2006.	12th.3.2008.	-
Software	TOYO Corporation	EP5/CE Ver.2.0	0208085	N/A	N/A	-
Thermo-Hygrometer	AS ONE Corporation	BA-9116	No.2	28th.2.2006.	27th.2.2007.	-

5.3 Conducted Emission Calculation

The basic equation with a sample calculation is as follows:

c.f.= CF + AL
CE = RA + c.f.

Where c.f. = Correction Factor (dB)
CE = Conducted Emission (Emission Level - Result) (dBuV)
RA = Receiver Amplitude (Reading Level) (dBuV)
CF = Cable Attenuation Loss (dB)
AL = Attenuator Loss (dB)

Assume a receiver reading of 37.5 dBuV is obtained. The Factor of 3.5dB is added, giving a terminal voltage of 41.0 dBuV. The 41.0 dBuV value was mathematically converted to its corresponding level in uV.

CE = 37.5 + 3.5 = 41.0 dBuV

Level in uV = Common Antilogarithm : 10^(41.0/20) = 112.2 uV

5.4 Test Results

(1) AC Power Supply (120VAC, 60Hz)

(i) Transmitting mode at 2402MHz

Test Date : 4th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 47 %

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.154	37.9	4.7	3.4	41.3	8.1	65.8	55.8	24.5	47.7
0.180	33.7	3.3	3.4	37.1	6.7	64.5	54.5	27.4	47.8
0.192	32.7	4.4	3.4	36.1	7.8	64.0	54.0	27.9	46.2
0.201	32.0	4.9	3.3	35.3	8.2	63.6	53.6	28.3	45.4
0.248	46.4	34.6	3.3	49.7	37.9	61.8	51.8	12.1	13.9
4.256	33.0	15.1	3.5	36.5	18.6	56.0	46.0	19.5	27.4

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.152	38.1	5.0	3.4	41.5	8.4	65.9	55.9	24.4	47.5
0.162	36.7	3.3	3.4	40.1	6.7	65.4	55.4	25.3	48.7
0.190	32.7	4.2	3.4	36.1	7.6	64.1	54.1	28.0	46.5
0.196	31.5	3.7	3.4	34.9	7.1	63.8	53.8	28.9	46.7
0.201	31.1	4.3	3.3	34.4	7.6	63.6	53.6	29.2	46.0
4.255	34.0	15.0	3.4	37.4	18.4	56.0	46.0	18.6	27.6

(ii) Transmitting mode at 2441MHz

Test Date : 5th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 36%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.151	38.5	10.3	3.4	41.9	13.7	65.9	55.9	24.0	42.2
0.156	37.6	7.5	3.4	41.0	10.9	65.7	55.7	24.7	44.8
0.168	35.3	4.5	3.4	38.7	7.9	65.1	55.1	26.4	47.2
0.180	33.8	3.5	3.4	37.2	6.9	64.5	54.5	27.3	47.6
0.252	42.7	32.8	3.3	46.0	36.1	61.7	51.7	15.7	15.6
4.150	30.0	18.7	3.5	33.5	22.2	56.0	46.0	22.5	23.8

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.151	38.3	10.3	3.4	41.7	13.7	65.9	55.9	24.2	42.2
0.156	37.6	8.7	3.4	41.0	12.1	65.7	55.7	24.7	43.6
0.167	36.1	5.3	3.4	39.5	8.7	65.1	55.1	25.6	46.4
0.203	31.9	4.9	3.3	35.2	8.2	63.5	53.5	28.3	45.3
0.256	43.0	27.6	3.3	46.3	30.9	61.6	51.6	15.3	20.7
4.147	31.3	20.4	3.4	34.7	23.8	56.0	46.0	21.3	22.2

(iii) Transmitting mode at 2480MHz

Test Date : 5th April 2006
Serial No. : 0043
Mode : Transmitting mode at 2480MHz
Temperature : 21℃
Humidity : 36%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.152	37.8	7.8	3.4	41.2	11.2	65.8	55.8	24.6	44.6
0.161	36.1	4.9	3.4	39.5	8.3	65.4	55.4	25.9	47.1
0.164	36.4	4.7	3.4	39.8	8.1	65.2	55.2	25.4	47.1
0.178	34.6	2.0	3.4	38.0	5.4	64.6	54.6	26.6	49.2
0.212	30.8	3.4	3.3	34.1	6.7	63.1	53.1	29.0	46.4
0.247	41.3	32.1	3.3	44.6	35.4	61.8	51.8	17.2	16.4
4.279	29.4	18.4	3.5	32.9	21.9	56.0	46.0	23.1	24.1

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.159	36.3	4.7	3.4	39.7	8.1	65.5	55.5	25.8	47.4
0.167	35.6	3.4	3.4	39.0	6.8	65.1	55.1	26.1	48.3
0.171	35.1	3.1	3.4	38.5	6.5	64.9	54.9	26.4	48.4
0.216	30.0	4.2	3.3	33.3	7.5	63.0	53.0	29.7	45.5
0.249	40.5	23.1	3.3	43.8	26.4	61.8	51.8	18.0	25.4
4.273	32.5	21.1	3.4	35.9	24.5	56.0	46.0	20.1	21.5

(2) AC Power Supply (100VAC, 60Hz)

(i) Transmitting mode at 2402MHz

Test Date : 4th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 47%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.163	36.2	4.7	3.4	39.6	8.1	65.3	55.3	25.7	47.2
0.175	41.8	24.0	3.4	45.2	27.4	64.7	54.7	19.5	27.3
0.182	35.0	7.0	3.4	38.4	10.4	64.4	54.4	26.0	44.0
0.189	39.2	20.4	3.4	42.6	23.8	64.1	54.1	21.5	30.3
0.194	46.1	36.3	3.4	49.5	39.7	63.8	53.8	14.3	14.1
4.309	26.0	9.4	3.5	29.5	12.9	56.0	46.0	26.5	33.1

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.174	36.0	8.6	3.4	39.4	12.0	64.8	54.8	25.4	42.8
0.209	31.0	2.0	3.3	34.3	5.7	63.8	53.3	29.5	47.6
0.226	29.0	3.2	3.3	32.3	6.5	62.6	52.6	30.3	46.1
0.256	26.0	4.5	3.3	29.3	7.8	61.6	51.6	32.3	43.8
4.356	34.6	24.4	3.4	38.0	27.8	56.0	46.0	18.0	18.2

(ii) Transmitting mode at 2441MHz

Test Date : 5th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 36%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.156	38.5	6.2	3.4	41.9	9.6	65.7	55.7	23.8	46.1
0.179	34.9	4.1	3.4	38.3	7.5	64.6	54.6	26.3	47.1
0.200	44.9	32.1	3.3	48.2	35.4	63.6	53.6	15.4	18.2
4.210	28.0	17.6	3.5	31.5	21.1	56.0	46.0	24.5	24.9

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.151	38.8	7.6	3.4	42.2	11.0	65.9	55.9	23.7	44.9
0.182	34.3	4.7	3.4	37.7	8.1	64.4	54.4	26.7	46.3
0.199	33.4	6.2	3.4	36.8	9.6	63.6	53.6	26.8	44.0
0.210	33.3	8.1	3.3	36.6	11.4	63.2	53.2	26.6	41.8
0.213	35.7	9.7	3.3	39.0	13.0	63.1	53.1	24.1	40.1
4.209	30.0	20.0	3.4	33.4	23.4	56.0	46.0	22.6	22.6

(iii) Transmitting mode at 2480MHz

Test Date : 5th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 36%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.153	38.3	9.7	3.4	41.7	13.1	65.8	55.8	24.1	42.7
0.160	37.0	7.3	3.4	40.4	10.7	65.5	55.5	25.1	44.8
0.164	37.1	5.4	3.4	40.5	8.8	65.3	55.3	24.8	46.5
0.168	35.7	5.0	3.4	39.1	8.4	65.0	55.0	25.9	46.6
0.245	28.3	1.9	3.3	31.6	5.2	61.9	51.9	30.3	46.7
4.196	30.7	19.1	3.5	34.2	22.6	56.0	46.0	21.8	23.4

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.154	38.3	6.6	3.4	41.7	10.0	65.8	55.8	24.1	45.8
0.202	32.4	1.5	3.3	35.7	4.8	63.5	53.5	27.8	48.7
0.212	30.6	1.5	3.3	33.9	4.8	63.1	53.1	29.2	48.3
0.249	40.3	22.1	3.3	43.6	25.4	61.8	51.8	18.2	26.4
4.198	30.1	19.7	3.4	33.5	23.1	56.0	46.0	22.5	22.9

(3) AC Power Supply (240VAC, 60Hz)

(i) Transmitting mode at 2402MHz

Test Date : 4th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 47%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.186	42.5	12.3	3.4	45.9	15.7	64.2	54.2	18.3	38.5
0.193	41.7	11.4	3.4	45.1	14.8	63.9	53.9	18.8	39.1
0.201	41.1	10.1	3.3	44.4	13.4	63.6	53.6	19.2	40.2
0.329	32.4	27.0	3.3	35.7	30.3	59.5	49.5	23.8	19.2

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.170	48.2	35.3	3.4	51.6	38.7	65.0	55.0	13.4	16.3
0.188	41.8	11.7	3.4	45.2	15.1	64.1	54.1	18.9	39.0
0.224	38.5	7.5	3.3	41.8	10.8	62.7	52.7	20.9	41.9
0.252	36.0	5.7	3.3	39.3	9.0	61.7	51.7	22.4	42.7
0.332	39.4	29.3	3.3	42.7	32.6	59.4	49.4	16.7	16.8
3.856	39.4	26.3	3.4	42.8	29.7	56.0	46.0	13.2	16.3
4.492	33.8	16.5	3.4	37.2	19.9	56.0	46.0	18.8	26.1

(ii) Transmitting mode at 2441MHz

Test Date : 5th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 36%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.168	48.4	37.5	3.4	51.8	40.9	65.1	55.1	13.3	14.2
0.191	41.8	11.3	3.4	45.2	14.7	64.0	54.0	18.8	39.3
0.213	39.5	8.6	3.3	42.8	11.9	63.1	53.1	20.3	41.2
0.335	37.6	31.4	3.3	40.9	34.7	59.3	49.3	18.4	14.6

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.165	50.4	37.1	3.4	53.8	40.5	65.2	55.2	11.4	14.7
0.189	41.2	11.2	3.4	44.6	14.6	64.1	54.1	19.5	39.5
0.214	39.3	8.1	3.3	42.6	11.4	63.0	53.0	20.4	41.6
0.334	38.5	29.6	3.3	41.8	32.9	59.3	49.3	17.5	16.4
3.386	32.5	15.7	3.4	35.9	19.1	56.0	46.0	20.1	26.9
4.000	30.4	11.6	3.4	33.8	15.0	56.0	46.0	22.2	31.0
4.481	30.0	5.4	3.4	33.4	8.8	56.0	46.0	22.6	37.2
4.656	28.9	4.4	3.4	32.3	7.8	56.0	46.0	23.7	38.2

(iii) Transmitting mode at 2480MHz

Test Date : 5th April 2006
Serial No. : 0043
Temperature : 21℃
Humidity : 36%

VA

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
3.291	23.4	10.6	3.4	26.8	14.0	56.0	46.0	29.2	32.0
4.253	26.2	14.7	3.5	29.7	18.2	56.0	46.0	26.3	27.8

VB

Frequency [MHz]	Meter Reading [dB(uV)]		Factor [dB]	Conducted Emission [dB(uV)]		Limits [dB(uV)]		Margin [dB]	
	QP	AV		QP	AV	QP	AV	QP	AV
0.154	46.1	16.8	3.4	49.5	20.2	65.8	55.8	16.3	35.6
0.173	43.4	15.1	3.4	46.8	18.5	64.8	54.8	18.0	36.3
0.195	41.1	15.4	3.4	44.5	18.8	63.8	53.8	19.3	35.0
0.214	41.0	27.2	3.3	44.3	30.5	63.0	53.0	18.7	22.5
0.300	37.7	16.1	3.3	41.0	19.4	60.2	50.2	19.2	30.8
0.407	30.5	13.7	3.3	33.8	17.0	57.7	47.7	23.9	30.7
4.322	29.3	18.5	3.4	32.7	21.9	56.0	46.0	23.3	24.1
4.355	30.8	20.7	3.4	34.2	24.1	56.0	46.0	21.8	21.9

6 Radiated Test

6.1 Test Setup

The test setup was made according to ANSI STD C63.4-2003 clause 8 on the 10 meter semi-anechoic chamber, which allows a 3 or 1 m distance measurement.
EUT was placed on non-conductive table (foam polystyrene). The height of this table was 0.8 m.
The measurement has been conducted with both horizontal and vertical antenna polarization.
The turntable has been fully rotated. The highest radiation of the equipment has been recorded.
For further description of the configuration refer to the pictures of this report.

Distance between equipment and antenna : 3m (30MHz to 18GHz)
: 1m (18GHz to 25GHz)

Spectrum Analyzer Setting

30～1000MHz	Detector : Quasi-Peak Bandwidth : 120kHz
1～25GHz	Detector : Peak and Average Bandwidth : 1MHz

Axial Direction

6.2 Test Instrumentation

Facility/ Equipment	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Date	Next Calibration Due
10m anechoic chamber	TDK Co.,Ltd	DA-06912	-	-	13th-17th.3.2006.	12th.3.2007.
EMI Test Receiver	R&S	ESCS 30	100148	30-1000MHz	11th.8.2005.	10th.8.2006.
Spectrum Analyzer	Agilent Technologies	8563E	3416A02230	30-1000MHz	5th.4.2005.	4th.4.2006.
		E4446A	US42070181	1-40GHz	14th.11.2005.	13th.11.2006.
Amplifier		8449B	3008A00571	1-26.5GHz	6th.3.2006.	5th.3.2007.
		8447D	2944A06812	30-1000MHz	5th.4.2005.	5th.4.2006.
RF Selector	TOYO Corporation	NS4900	0302-010	-	6th.4.2005.	5th.4.2006.
RF Cable	SUHNER	RG214	RG 1	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 3	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 8	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 5	30-1000MHz	6th.4.2005.	5th.4.2006.
		RG214	RG 6	30-1000MHz	6th.4.2005.	5th.4.2006.
		SUCOFLEX 106	SU1	1-18GHz	6th.3.2006.	5th.3.2007.
		SUCOFLEX 104	SU4	1-18GHz	6th.3.2006.	5th.3.2007.
	HP	85381C	No.3	18-25GHz	28th.6.2005.	27th.6.2006.
		85381C	No.5	18-25GHz	28th.6.2005.	27th.6.2006.
Attenuator	KYORITSU	KPD-602	220142	30-1000MHz	6th.4.2005.	5th.4.2006.
Antenna	Schwarzbeck	BBA9106	No.4	30-300MHz	25nd.2.2006.	24th.2.2007.
		UHALP9108-A	160	300-1000MHz	25nd.2.2006.	24th.2.2007.
	EMCO	3115	9403-4232	1-18GHz	1st.4.2005.	31st.3.2007.
		3116	9311-2227	18-40GHz	1st.4.2005.	31st.3.2007.
Software	TOYO Corporation	EP5/RE Ver.2.0	0208086	-	N/A	N/A
Multimeter	Advantest	R6451	67840312	-	30th.5.2005.	29th.5.2006.
Thermo-Hygrometer	AS ONE Corporation	BA-9116	No.1	-	28th.2.2006.	27th.2.2007.

6.3 Radiated Emission Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

c.f.= AF + CF +AL – AG - DF
RE = RA + c.f.

Where c.f. = Correction Factor (dB/m)
RE = Radiated Emission (Emission Level - Result) (dBuV/m)
RA = Receiver Amplitude (Reading Level) (dBuV)
AF = Antenna Factor (dB/m)
CF = Cable Attenuation Loss (dB)
AG = Amplifier Gain (dB)
AL = Attenuator Loss (dB)
DF = Distance Factor
Distance between equipment and antenna:3m = 0(dB)
Distance between equipment and antenna:1m = 9.5(dB)

Assume a receiver reading of 41.3 dBuV is obtained. The Correction Factor of –1.1 dB/m is added, giving a Radiated Emission of 40.2 dBuV/m. The 40.2 dBuV/m value was mathematically converted to its corresponding level in uV/m.

RE = 41.3 + (-1.1) = 40.2 dBuV/m

Level in uV/m = Common Antilogarithm : 10^(40.2/20)= 102.3uV/m

6.4 Test Results

6.4.1 The variation of the field strength of the fundamental emissions

Section 15.31.(e) : For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

The operating channel and the axial direction of EUT where the maximum career level was obtained, were the highest channel and the XY direction. In that channel and direction, the field strength of the fundamental emissions was each observed when the AC input level was 102V(85% of 120V), 120V and 138V(115% of 120V). The result is as follows.

AC input level [V]	Field strength [dBuV/m]
102	95.8
120	96.1
138	95.7

From this result, the variation of the field strength is within 0.4dB when the AC input level is varied from 102V to 138V.

6.4.2 Spurious Emission

6.4.2.1 Battery Power Supply

(1) Transmitting mode at 2402MHz

Test Conditions (S/N of EUT : 0043)

Test Date		22nd March 2006	27th March 2006		29th March 2006
			1st battery*2	2nd battery*2	
Power*1	before test	DC 8.010V	DC8.219V	DC7.907V	DC8.319V
	after test	DC 7.550V	DC7.294V	DC7.521V	DC8.212V
Temperature		21℃	17℃	17℃	22℃
Humidity		32 %	37 %	37 %	31 %

*1 The charged battery more than typical battery voltage DC7.4V was used for the test.
*2 The first battery run out during the test on March 27th March 2006, and the battery was exchanged with the second one. Therefore, the voltage of the first battery and the second battery was recorded before and after test.

(i) Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.005	Horizontal	36.6	0.6	37.2	46.0	8.8
900.010	Horizontal	31.6	5.1	36.7	46.0	9.3

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.012	Horizontal	-	59.1	-13.2	-	45.9	-	74.0	-	28.1
		55.0	-		41.8	-	54.0	-	12.2	-
1143.880	Horizontal	-	59.3	-12.9	-	46.4	-	74.0	-	27.6
		47.1	-		34.2	-	54.0	-	19.8	-
4804.000	Horizontal	-	<44.3	-0.5	-	<43.8	-	74.0	-	>30.2
		<32.8	-		<32.3	-	54.0	-	>21.7	-
7206.005	Horizontal	-	<44.2	3.5	-	<47.7	-	74.0	-	>26.3
		<32.3	-		<35.8	-	54.0	-	>18.2	-

The Mark "<", ">" in the table each means floor noise data and the data is below or over the shown value.

(ii) Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		QP			QP					
700.004	Horizontal	36.7		0.6	37.3		46.0		8.7	
900.014	Vertical	30.8		5.1	35.9		46.0		10.1	
Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.985	Horizontal		57.7	-13.2	-	44.5	-	74.0	-	29.5
		54.1			40.9	-	54.0	-	13.1	-
1100.050	Vertical		54.7	-13.2		41.5	-	74.0	-	32.5
		48.9			35.7		54.0	-	18.3	-
4804.000	Horizontal	-	<44.3	-0.5	-	<43.8	-	74.0	-	>30.2
		<32.8	-		<32.3	-	54.0	-	>21.7	-
7206.005	Horizontal	-	<44.2	3.5	-	<47.7	-	74.0	-	>26.3
		<32.3	-		<35.8	-	54.0	-	>18.2	-
9608.005	Horizontal	-	<44.4	5.7	-	<50.1	-	74.0	-	>23.9
		<33.2	-		<38.9	-	54.0	-	>15.1	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(iii) Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
650.018	Vertical	36.8	-0.4	36.4	46.0	9.6
900.004	Horizontal	32.2	5.1	37.3	46.0	8.7

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Emission Level [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.130	Horizontal	-	57.7	-13.2	-	44.5	-	74.0	-	29.5
		53.0	-		39.8	-	54.0	-	14.2	-
1100.120	Vertical	-	55.6	-13.2	-	42.4	-	74.0	-	31.6
		50.1	-		36.9	-	54.0	-	17.1	-
4804.000	Horizontal	-	<44.3	-0.5	-	<43.8	-	74.0	-	>30.2
		<32.8	-		<32.3	-	54.0	-	>21.7	-
7206.005	Horizontal	-	<44.2	3.5	-	<47.7	-	74.0	-	>26.3
		<32.3	-		<35.8	-	54.0	-	>18.2	-
9608.005	Horizontal	-	<44.4	5.7	-	<50.1	-	74.0	-	>23.9
		<33.2	-		<38.9	-	54.0	-	>15.1	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(2) Transmitting mode at 2441MHz

Test Conditions (S/N of EUT : 0043)

Test Date		22nd March 2006	27th March 2006		29th March 2006
			1st battery*2	2nd battery*2	
Power*1	before test	DC 8.010V	DC8.219V	DC7.907V	DC8.319V
	after test	DC 7.550V	DC7.294V	DC7.521V	DC8.212V
Temperature		21℃	17℃	17℃	22℃
Humidity		32 %	37 %	37 %	31 %

*1 The charged battery more than typical battery voltage DC7.4V was used for the test.
*2 The first battery run out during the test on March 27th March 2006, and the battery was exchanged with the second one. Therefore, the voltage of the first battery and the second battery was recorded before and after test.

(i) Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
700.006	Horizontal	36.5	0.6	37.1	46.0	8.9
900.007	Horizontal	31.4	5.1	36.5	46.0	9.5

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.960	Horizontal	-	58.4	-13.2	-	45.2	-	74.0	-	28.8
		54.6	-		41.4	-	54.0	-	12.6	-
1100.210	Vertical	-	55.3	-13.2	-	42.1	-	74.0	-	31.9
		48.7	-		35.5	-	54.0	-	18.5	-
1144.050	Horizontal	-	60.1	-12.9	-	47.2	-	74.0	-	26.8
		47.6	-		34.7	-	54.0	-	19.3	-
4882.095	Horizontal	-	<44.5	-0.4	-	<44.1	-	74.0	-	>29.9
		<32.4	-		<32.0	-	54.0	-	>22.0	-
7323.007	Horizontal	-	<43.7	3.6	-	<47.3	-	74.0	-	>26.7
		<32.3	-		<35.9	-	54.0	-	>18.1	-

The Mark "<", ">" in the table each means floor noise data and the data is below or over the shown value.

(ii) Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.006	Horizontal	36.5	0.6	37.1	46.0	8.9
900.007	Horizontal	31.4	5.1	36.5	46.0	9.5

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.042	Horizontal	-	57.9	-13.2	-	44.7	-	74.0	-	29.3
		54.0	-		40.8	-	54.0	-	13.2	-
1100.100	Vertical	-	54.7	-13.2	-	41.5	-	74.0	-	32.5
		47.0	-		33.8	-	54.0	-	20.2	-
4882.095	Horizontal	-	<44.5	-0.4	-	<44.1	-	74.0	-	>29.9
		<32.4	-		<32.0	-	54.0	-	>22.0	-
7323.007	Horizontal	-	<43.7	3.6	-	<47.3	-	74.0	-	>26.7
		<32.3	-		<35.9	-	54.0	-	>18.1	-
9764.007	Horizontal	-	<44.1	5.8	-	<49.9	-	74.0	-	>24.1
		<32.9	-		<38.7	-	54.0	-	>15.3	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(iii) Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
650.010	Vertical	36.6	-0.4	36.2	46.0	9.8
900.021	Horizontal	31.6	5.1	36.7	46.0	9.3

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.825	Vertical	-	55.2	-13.2	-	42.0	-	74.0	-	32.0
		49.8	-		36.6	-	54.0	-	17.4	-
1099.992	Horizontal	-	57.6	-13.2	-	44.4	-	74.0	-	29.6
		52.8	-		39.6	-	54.0	-	14.4	-
4882.095	Horizontal	-	<44.5	-0.4	-	<44.1	-	74.0	-	>29.9
		<32.4	-		<32.0	-	54.0	-	>22.0	-
7323.007	Horizontal	-	<43.7	3.6	-	<47.3	-	74.0	-	>26.7
		<32.3	-		<35.9	-	54.0	-	>18.1	-
9764.007	Horizontal	-	<44.1	5.8	-	<49.9	-	74.0	-	>24.1
		<32.9	-		<38.7	-	54.0	-	>15.3	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(3) Transmitting mode at 2480MHz

Test Conditions (S/N of EUT : 0043)

Test Date		22nd March 2006	27th March 2006		29th March 2006
			1st battery*2	2nd battery*2	
Power*1	before test	DC 8.010V	DC8.219V	DC7.907V	DC8.319V
	after test	DC 7.550V	DC7.294V	DC7.521V	DC8.212V
Temperature		21℃	17℃	17℃	22℃
Humidity		32 %	37 %	37 %	31 %

*1 The charged battery more than typical battery voltage DC7.4V was used for the test.
*2 The first battery run out during the test on March 27th March 2006, and the battery was exchanged with the second one. Therefore, the voltage of the first battery and the second battery was recorded before and after test.

(i) Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
650.013	Vertical	31.8	-0.4	31.4	46.0	14.6
700.006	Horizontal	36.5	0.6	37.1	46.0	8.9
900.010	Horizontal	31.7	5.1	36.8	46.0	9.2

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.150	Horizontal	-	58.5	-13.2	-	45.3	-	74.0	-	28.7
		54.8	-		41.6	-	54.0	-	12.4	-
1100.100	Vertical	-	55.1	-13.2	-	41.9	-	74.0	-	32.1
		49.0	-		35.8	-	54.0	-	18.2	-
4959.998	Horizontal	-	<43.6	-0.4	-	<43.2	-	74.0	-	>30.8
		<32.5	-		<32.1	-	54.0	-	>21.9	-
7439.998	Horizontal	-	<44.9	3.6	-	<48.5	-	74.0	-	>25.5
		<33.0	-		<36.6	-	54.0	-	>17.4	-
9919.003	Horizontal	-	<46.8	6.1	-	<52.9	-	74.0	-	>21.1
		<33.4	-		<39.5	-	54.0		>14.5	-

The Mark "<", ">" in the table each means floor noise data and the data is below or over the shown value.

(ii) Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.006	Horizontal	36.5	0.6	37.1	46.0	8.9
900.005	Vertical	31.0	5.1	36.1	46.0	9.9
900.007	Horizontal	29.5	5.1	34.6	46.0	11.4

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.230	Horizontal	-	58.3	-13.2	-	45.1	-	74.0	-	28.9
		54.2	-		41.0	-	54.0	-	13.0	-
1100.440	Vertical	-	54.1	-13.2	-	40.9	-	74.0	-	33.1
		48.2	-		35.0	-	54.0	-	19.0	-
4959.998	Horizontal	-	<43.6	-0.4	-	<43.2	-	74.0	-	>30.8
		<32.5	-		<32.1	-	54.0	-	>21.9	-
7439.998	Horizontal	-	<44.9	3.6	-	<48.5	-	74.0	-	>25.5
		<33.0	-		<36.6	-	54.0	-	>17.4	-
9919.003	Horizontal	-	<46.8	6.1	-	<52.9	-	74.0	-	>21.1
		<33.4	-		<39.5	-	54.0	-	>14.5	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(iii) Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
650.008	Vertical	37.1	-0.4	36.7	46.0	9.3
700.007	Vertical	33.9	0.6	34.5	46.0	11.5
900.011	Horizontal	33.0	5.1	38.1	46.0	7.9

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1050.350	Horizontal	-	54.3	-13.8	-	40.5	-	74.0	-	33.5
		46.1	-		32.3	-	54.0	-	21.7	-
1050.100	Vertical	-	51.8	-13.8	-	38.0	-	74.0	-	36.0
		41.2	-		27.4	-	54.0	-	26.6	-
1099.090	Horizontal	-	57.1	-13.3	-	43.8	-	74.0	-	30.2
		53.2	-		39.9	-	54.0	-	14.1	-
1099.690	Vertical	-	55.2	-13.2	-	42.0	-	74.0	-	32.0
		49.9	-		36.7	-	54.0	-	17.3	-
1150.050	Horizontal	-	53.9	-12.8	-	41.1	-	74.0	-	32.9
		47.9	-		35.1	-	54.0	-	18.9	-

6.4.2.2 AC Power Supply

(1) Transmitting mode at 2402MHz

Test Conditions (S/N of EUT : 0043)

Test Date	28th March 2006	29th March 2006
Temperature	22℃	22℃
Humidity	33 %	31 %

(i) Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		QP			QP					
700.009	Horizontal	37.7		0.6	38.3		46.0		7.7	
Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.950	Vertical	-	57.9	-13.2	-	44,7	-	74.0	-	29.3
		53.3	-		40.1	-	54.0	-	13.9	-
2860.220	Horizontal	-	53.7	-6.5	-	47.2	-	74.0	-	26.8
		48.4	-		41.9	-	54.0	-	12.1	-
4804.000	Horizontal	-	<44.3	-0.5	-	<43.8	-	74.0	-	>30.2
		<32.8	-		<32.3	-	54.0	-	>21.7*3	-
7206.005	Horizontal	-	<44.2	3.5	-	<47.7	-	74.0	-	>26.3
		<32.3	-		<35.8	-	54.0	-	>18.2*3	-
9608.005	Horizontal	-	<44.4	5.7	-	<50.1	-	74.0	-	>23.9
		<33.2	-		<38.9	-	54.0	-	>15.1*3	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(ii) Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.003	Horizontal	38.1	0.6	38.7	46.0	7.3

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.930	Vertical	-	57.7	-13.2	-	44.5	-	74.0	-	29.5
		53.1	-		39.9	-	54.0	-	14.1	-
2860.030	Horizontal		52.8	-6.5		46.3	-	74.0	-	27.7
		47.6			41.1		54.0	-	12.9	-
4804.000	Horizontal	-	<44.3	-0.5	-	<43.8	-	74.0	-	>30.2
		<32.8	-		<32.3	-	54.0	-	>21.7	-
7206.005	Horizontal	-	<44.2	3.5	-	<47.7	-	74.0	-	>26.3
		<32.3	-		<35.8	-	54.0	-	>18.2	-
9608.005	Horizontal	-	<44.4	5.7	-	<50.1	-	74.0	-	>23.9
		<33.2	-		<38.9	-	54.0	-	>15.1	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(iii) Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.013	Horizontal	35.8	0.6	36.4	46.0	9.6

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.850	Horizontal	-	57.0	-13.2	-	43.8	-	74.0	-	30.2
		52.8	-		39.6	-	54.0	-	14.4	-
1100.000	Vertical	-	56.6	-13.2	-	43.4	-	74.0	-	30.6
		51.5	-		38.3	-	54.0	-	15.7	-
2859.900	Horizontal	-	51.8	-6.5	-	45.3	-	74.0	-	28.7
		45.4	-		38.9	-	54.0	-	15.1	-
2860.150	Vertical	-	49.7	-6.5	-	43.2	-	74.0	-	30.8
		40.6	-		34.1	-	54.0	-	19.9	-
4804.000	Horizontal	-	<44.3	-0.5	-	<43.8	-	74.0	-	>30.2
		<32.8	-		<32.3	-	54.0	-	>21.7	-
7206.005	Horizontal	-	<44.2	3.5	-	<47.7	-	74.0	-	>26.3
		<32.3	-		<35.8	-	54.0	-	>18.2	-
9608.005	Horizontal	-	<44.4	5.7	-	<50	-	74.0	-	>23.9
		<33.2	-		<38.9	-	54.0	-	>15.1	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(2) Transmitting mode at 2441MHz

Test Conditions (S/N of EUT : 0043)

Test Date	28th March 2006	29th March 2006
Temperature	22℃	22℃
Humidity	33 %	31 %

(i) Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
700.004	Horizontal	37.8	0.6	38.4	46.0	7.6

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.830	Vertical	-	57.8	-13.2	-	44.6	-	74.0	-	29.4
		53.4	-		40.2	-	54.0	-	13.8	-
2859.870	Horizontal	-	52.1	-6.5	-	45.6	-	74.0	-	28.4
		45.3	-		38.8	-	54.0	-	15.2	-
4882.095	Horizontal	-	<44.5	-0.4	-	<44.1	-	74.0	-	>29.9
		<32.4	-		<32.0	-	54.0	-	>22.0	-
7323.007	Horizontal	-	<43.7	3.6	-	<47.3	-	74.0	-	>26.7
		<32.3	-		<35.9	-	54.0	-	>18.1	-
9764.007	Horizontal	-	<44.1	5.8	-	<49.9	-	74.0	-	>24.1
		<32.9	-		<38.7	-	54.0	-	>15.3	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(ii) Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.004	Horizontal	37.7	0.6	38.3	46.0	7.7

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.020	Horizontal	-	59.1	-13.2	-	45.9	-	74.0	-	28.1
		55.7	-		42.5	-	54.0	-	11.5	-
2860.120	Horizontal		52.9	-6.5	-	46.4	-	74.0	-	27.6
		47.9	-		41.4	-	54.0	-	12.6	-
4882.095	Horizontal	-	<44.5	-0.4	-	<44.1	-	74.0	-	>29.9
		<32.4	-		<32.0	-	54.0	-	>22.0	-
7323.007	Horizontal	-	<43.7	3.6	-	<47.3	-	74.0	-	>26.7
		<32.3	-		<35.9	-	54.0	-	>18.1	-
9764.007	Horizontal	-	<44.1	5.8	-	<49.9	-	74.0	-	>24.1
		<32.9	-		<38.7	-	54.0	-	>15.3*	-

The Mark "<", ">" in the table each means floor noise data and the data is below or over the shown value.

(iii) Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.003	Vertical	35.3	0.6	35.9	46.0	10.1

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.920	Horizontal	-	55.7	-13.2	-	42.5	-	74.0	-	31.5
		50.6	-		37.4	-	54.0	-	16.6	-
1099.920	Vertical	-	57.6	-13.2	-	44.4	-	74.0	-	29.6
		53.0	-		39.8	-	54.0	-	14.2	
2860.050	Horizontal	-	51.0	-6.5	-	44.5	-	74.0	-	29.5
		44.8	-		38.3	-	54.0	-	15.7	-
2859.920	Vertical	-	51.9	-6.5	-	45.4	-	74.0	-	28.6
		46.5			40.0	-	54.0	-	14.0	-
4882.095	Horizontal	-	<44.5	-0.4	-	<44.1	-	74.0	-	>29.9
		<32.4	-		<32.0	-	54.0	-	>22.0	-
7323.007	Horizontal	-	<43.7	3.6	-	<47.3	-	74.0	-	>26.7
		<32.3	-		<35.9	-	54.0	-	>18.1	-
9764.007	Horizontal	-	<44.1	5.8	-	<49.9	-	74.0	-	>24.1
		<32.9	-		<38.7	-	54.0	-	>15.3	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(3) Transmitting mode at 2480MHz

Test Conditions (S/N of EUT : 0043)

Test Date	28th March 2006	29th March 2006
Temperature	22℃	22℃
Humidity	33 %	31 %

(i) Axial Direction : XY-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)] QP	Factor [dB/m]	Emission Level [dB(uV/m)] QP	Limits [dB(uV/m)]	Margin [dB]
450.003	Horizontal	39.9	-3.1	36.8	46.0	9.2
700.016	Horizontal	37.4	0.6	38.0	46.0	8.0
900.010	Horizontal	30.7	5.1	35.8	46.0	10.2

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.940	Horizontal	-	57.3	-13.2	-	44.1	-	74.0	-	29.9
		53.0	-		39.8	-	54.0	-	14.2	-
1100.020	Vertical	-	59.1	-13.2	-	45.9	-	74.0	-	28.1
		55.3	-		42.1	-	54.0	-	11.9	-
2799.840	Horizontal	-	52.3	-6.8	-	45.5	-	74.0	-	28.5
		46.2	-		39.4	-	54.0	-	14.6	-
2859.330	Horizontal	-	53.2	-6.5	-	46.7	-	74.0	-	27.3
		48.5	-		42.0	-	54.0	-	12.0	-

(ii) Axial Direction : YZ-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.004	Horizontal	37.6	0.6	38.2	46.0	7.8

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1100.010	Horizontal	-	57.6	-13.2	-	44.4	-	74.0	-	29.6
		53.1	-		39.9	-	54.0	-	14.1	-
1100.050	Vertical	-	57.3	-13.2	-	44.1	-	74.0	-	29.9
		52.5	-		39.3	-	54.0	-	14.7	-
2859.950	Horizontal	-	52.8	-6.5	-	46.3	-	74.0	-	27.7
		47.6	-		41.1	-	54.0	-	12.9	-
2860.070	Vertical	-	50.7	-6.5	-	44.2	-	74.0	-	29.8
		42.5	-		36.0	-	54.0	-	18.0	-
4959.998	Horizontal	-	<43.6	-0.4	-	<43.2	-	74.0	-	>30.8
		<32.5	-		<32.1		54.0	-	>21.9	-
7439.998	Horizontal	-	<44.9	3.6	-	<48.5	-	74.0	-	>25.5
		<33.0	-		<36.6	-	54.0	-	>17.4	-
9919.993	Horizontal	-	46.8	6.1	-	<52.9	-	74.0	-	>21.1
		<33.4	-		<39.5	-	54.0	-	>14.5	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

(iii) Axial Direction : ZX-Plane

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]	Factor [dB/m]	Emission Level [dB(uV/m)]	Limits [dB(uV/m)]	Margin [dB]
		QP		QP		
700.007	Vertical	36.2	0.6	36.8	46.0	9.2
900.011	Horizontal	29.6	5.1	34.7	46.0	11.3

Frequency [MHz]	Antenna Polarization	Meter Reading [dB(uV)]		Factor [dB/m]	Emission Level [dB(uV/m)]		Limits [dB(uV/m)]		Margin [dB]	
		Average	Peak		Average	Peak	Average	Peak	Average	Peak
1099.880	Horizontal	-	56.6	-13.2	-	43.4	-	74.0	-	30.6
		52.0	-		38.8	-	54.0	-	15.2	-
1100.120	Vertical	-	56.6	-13.2	-	43.4	-	74.0	-	30.6
		51.4	-		38.2	-	54.0	-	15.8	-
2859.880	Horizontal	-	52.7	-6.5	-	46.2	-	74.0	-	27.8
		47.7	-		41.2	-	54.0	-	12.8	-
2860.020	Vertical	-	50.9	-6.5	-	44.4	-	74.0	-	29.6
		45.3	-		38.8	-	54.0	-	15.2	-
4959.998	Horizontal	-	<43.6	-0.4	-	<43.2	-	74.0	-	>30.8
		<32.5	-		<32.1	-	54.0	-	>21.9	-
7439.998	Horizontal	-	<44.9	3.6	-	<48.5	-	74.0	-	>25.5
		<33.0	-		<36.6	-	54.0	-	>17.4	-

The Mark “<”, “>” in the table each means floor noise data and the data is below or over the shown value.

7 20dB Bandwidth

7.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum analyzer setting : -
DETECTOR MODE : PEAK
RBW : 30kHz
VBW : 30kHz
SPAN : 2MHz
SWEEP TIME : AUTO

7.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

7.3 Test Results

(1) Battery Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date		30th March 2006
Power*1	before test	DC 8.328V
	after test	DC 7.499V
Mode		Transmitting mode, Non Frequency Hopping
Temperature		22℃
Humidity		51 %

*1: The charged battery more than typical battery voltage DC7.4V was used for the test.

Operation mode: Transmitting mode

CH	Freqency [MHz]	20dB Bandwidth [MHz]
0ch(Lowest)	2402.0	0.866
39ch(Middle)	2441.0	0.862
78ch(Highest)	2480.0	0.866

(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date		30th March 2006
Power*1	before test	DC 8.328V
	after test	DC 7.499V
Mode		Transmitting mode, Non Frequency Hopping
Temperature		22℃
Humidity		51 %

Operation mode: Transmitting mode

CH	Freqency [MHz]	20dB Bandwidth [MHz]
0ch(Lowest)	2402.0	0.930
39ch(Middle)	2441.0	0.866
78ch(Highest)	2480.0	0.926

8 Carrier Frequency Separation

8.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum Analyzer setting : -
DETECTOR MODE :PEAK
RBW : 100kHz
VBW : 300kHz
SPAN : 3MHz
SWEEP TIME : AUTO

8.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

8.3 Test Results

(1) Battery Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date		30th March 2006	31st March 2006
Power*1	before test	DC 8.328V	DC 8.325V
	after test	DC 7.499V	DC 7.534V
Mode		Transmitting mode, Frequency Hopping (79ch)	Transmitting mode, Adoptive Frequency Hopping (20ch)
Temperature		22℃	21℃
Humidity		51 %	50 %

*1: The charged battery more than typical battery voltage DC7.4V was used for the test.

Operation mode: Transmitting mode , Frequency Hopping (79ch)

Channel	Channel Separation [MHz]	Limit *2 [MHz]
Low frequency (0ch-1ch)	1.010	> 0.577
Middle frequency (38ch-39ch)	1.010	> 0.574
High frequency (77ch-78ch)	1.058	> 0.577

Operation mode: Transmitting mode , Adoptive Frequency Hopping (20ch)

Channel	Channel Separation [MHz]	Limit *2 [MHz]
Low frequency (0ch-1ch)	1.016	> 0.577
Middle frequency (38ch-39ch)	1.004	> 0.574
High frequency (77ch-78ch)	1.010	> 0.577

*2: Limit value of Carrier Frequency Separation is 2/3 of 20dB Bandwidth. Refer the result of 20dB Bandwidth to Section 7.

(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date	31st March 2006
Power	AC 120V
Mode	Transmitting mode, Frequency Hopping (79ch) Adoptive Frequency Hopping (20ch)
Temperature	21℃
Humidity	50 %

Operation mode: Transmitting mode , Frequency Hopping (79ch)

Channel	Channel Separation [MHz]	Limit *3 [MHz]
Low frequency (0ch-1ch)	0.944	> 0.620
Middle frequency (38ch-39ch)	0.980	> 0.577
High frequency (77ch-78ch)	0.986	> 0.617

Operation mode: Transmitting mode , Adoptive Frequency Hopping (20ch)

Channel	Channel Separation [MHz]	Limit *3 [MHz]
Low frequency (0ch-1ch)	1.010	> 0.620
Middle frequency (38ch-39ch)	1.004	> 0.577
High frequency (77ch-78ch)	0.998	> 0.617

*3: Limit value of Carrier Frequency Separation is 2/3 of 20dB Bandwidth. Refer the result of 20dB Bandwidth to Section 7.

9 Number of Hopping Frequency

9.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum analyzer setting : -
DETECTOR MODE : PEAK
RBW : 300kHz
VBW : 300kHz
SWEEP TIME : AUTO

9.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

9.3 Test Results

(1) Battery Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date		30th March 2006	31st March 2006
Power*1	before test	DC 8.328V	DC 8.325V
	after test	DC 7.499V	DC 7.534V
Mode		Transmitting mode, Frequency Hopping (20ch)	Transmitting mode, Adoptive Frequency Hopping (20ch)
Temperature		22℃	21℃
Humidity		51 %	50 %

*1: The charged battery more than typical battery voltage DC7.4V was used for the test.

Operation mode: Transmitting mode

	Mode	Number of channel [time]	Limit [time]
(i)	Transmitting mode Frequency Hopping (79ch)	79	≥ 15
(ii)	Transmitting mode Adoptive Frequency Hopping (20ch)	20 *2	≥ 15

AFH: Intelligent hopping techniques to avoid interference to other transmission.

*2: None of them is overlapped each other.

(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date	31st March 2006
Power	AC 120V
Mode	Transmitting mode, Frequency Hopping (79ch) Adoptive Frequency Hopping (20ch)
Temperature	21℃
Humidity	50 %

Operation mode: Transmitting mode

Mode	Number of channel [time]	Limit [time]
Transmitting mode Frequency Hopping (79ch)	79	≥ 15
Transmitting mode Adoptive Frequency Hopping (20ch)	20 *3	≥ 15

AFH: Intelligent hopping techniques to avoid interference to other transmission.

*3: None of them is overlapped each other.

10 Dwell Time

10.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum analyzer setting : -
DETECTOR MODE : PEAK
RBW : 1MHz
VBW : 1MHz
SPAN : 0Hz
SWEEP TIME : AUTO

10.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

10.3 Test Results

(1) Battery Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date		30th March 2006
Power*1	before test	DC 8.328V
	after test	DC 7.499V
Mode		Transmitting mode (DH1, DH3, DH5), Frequency Hopping (79ch)
Temperature		22℃
Humidity		51 %

*1: The charged battery more than typical battery voltage DC7.4V was used for the test.

Operation mode: Transmitting mode, Frequency Hopping (79ch)

Channel	Packet	Transmitting time [ms]	Dwell time [ms]	Limit [ms]
Low frequency (0ch)	DH1	0.421	134.72	400
	DH3	1.683	271.29	400
	DH5	2.926	311.57	400
Middle frequency (39ch)	DH1	0.421	134.72	400
	DH3	1.683	271.29	400
	DH5	2.946	313.71	400
High frequency (78ch)	DH1	0.421	134.72	400
	DH3	1.673	269.68	400
	DH5	2.927	311.72	400

(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date	31st March 2006
Power	AC 120V
Mode	Transmitting mode (DH1, DH3, DH5), Frequency Hopping (79ch)
Temperature	22℃
Humidity	51 %

Operation mode: Transmitting mode, Frequency Hopping (79ch)

Channel	Packet	Transmitting time [ms]	Dwell time [ms]	Limit [ms]
Low frequency (0ch)	DH1	0.417	133.43	400
	DH3	1.683	271.29	400
	DH5	2.916	310.51	400
Middle frequency (39ch)	DH1	0.421	134.72	400
	DH3	1.673	269.68	400
	DH5	2.926	311.57	400
High frequency (78ch)	DH1	0.421	134.72	400
	DH3	1.683	271.29	400
	DH5	2.926	311.57	400

Data of Dwell Time (Frequency Hopping (79ch))

Time of occupancy (Dwell Time) for packet type DH1.

FH hop rate of Bluetooth system is 1600hops per 1 second.
A DH1 packet needs 1 time slot for transmitting and 1 time slot for receiving.

In a DH1 packet, it hops 800 times for transmitting per 1 second.
The number of hopping channel is 79.
The number of times that appears in 1 channel per 1 second is as follows.
800/79=10.13 (times)

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed 0.4 x 79 = 31.6 seconds
The number of times that appears in 1 channel per 31.6 seconds is as follows.
10.13 x 31.6 = 320.11 (times)

If Transmitting time is 0.421ms,
Then, dwell time is 320.11 x 0.421ms = 134.72ms per 31.6 seconds.

Time of occupancy (Dwell Time) for packet type DH3.

FH hop rate of Bluetooth system is 1600hops per 1 second.
A DH3 packet needs 3 times slot for transmitting and 1 time slot for receiving.

In a DH3 packet, it hops 400 times for transmitting per 1 second.
The number of hopping channel is 79.
The number of times that appears in 1 channel per 1 second is as follows.
400/79=5.1 (times)

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed 0.4 x 79 = 31.6 seconds
The number of times that appears in 1 channel per 31.6 seconds is as follows.
5.1 x 31.6 = 161.16 (times)

If Transmitting time is 1.683ms,
Then, dwell time is 161.16 x 1.683ms = 271.29ms per 31.6 seconds,

Time of occupancy (Dwell Time) for packet type DH5.

FH hop rate of Bluetooth system is 1600hops per 1 second.
A DH5 packet needs 5 times slot for transmitting and 1 time slot for receiving.

In a DH5 packet, it hops 266.67 times for transmitting per 1 second.
The number of hopping channel is 79.
The number of times that appears in 1 channel per 1 second is as follows.
266.67/79=3.37 (times)

The average time of occupancy on any channel shall not be greater than 0.4 seconds (400ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed 0.4 x 79 = 31.6 seconds
The number of times that appears in 1 channel per 31.6 seconds is as follows.
3.37 x 31.6 = 106.49 (times)

If Transmitting time is 2.926ms,
Then, dwell time is 106.49 x 2.926ms = 311.57ms per 31.6 seconds.

11 Maximum Peak Output Power

11.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum analyzer setting : -
DETECTOR MODE : PEAK
RBW : 1MHz
VBW : 1MHz
SWEEP TIME : AUTO

11.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

11.3 Test Results

(1) Battery Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date		31st March 2006
Power*1	before test	DC 8.325V
	after test	DC 7.534V
Mode		Transmitting mode, Non Frequency Hopping
Temperature		21℃
Humidity		50 %

*1: The charged battery more than typical battery voltage DC7.4V was used for the test.

Operation mode: Transmitting mode

CH	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]		Result [dBm]	Limit [dBm]
			RF3	extra RF cable		
0ch(Lowest)	2402.0	-4.30	1.99	1.60	-0.71	30.0
39ch(Middle)	2441.0	-4.41	1.99	1.60	-0.82	30.0
78ch(Highest)	2480.0	-4.67	2.08	1.60	-0.99	30.0

Result = Reading + Cable Loss(RF3) + Cable Loss(extra RF cable)

* The extra cable and its loss were supplied by manufacturer to perform the Conducted Test. See Section 15.

(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date	31st March 2006
Power	AC 120V
Mode	Transmitting mode, Frequency Hopping (79ch)
Temperature	21℃
Humidity	50 %

Operation mode: Transmitting mode

CH	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]		Result [dBm]	Limit [dBm]
			RF3	extra RF cable		
0ch(Lowest)	2402.0	-4.51	1.99	1.60	-0.92	30.0
39ch(Middle)	2441.0	-4.81	1.99	1.60	-1.22	30.0
78ch(Highest)	2480.0	-5.07	2.08	1.60	-1.39	30.0

Result = Reading + Cable Loss(RF3) + Cable Loss(extra RF cable)

* The extra cable and its loss were supplied by manufacturer to perform the Conducted Test. See Section 15.

12 Band Edge Compliance

12.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum analyzer setting : -
DETECTOR MODE : PEAK
RBW : 100kHz
VBW : 100kHz
SWEEP TIME : AUTO

12.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

12.3 Test Results

(1) Battery Power Supply

Test Date : 30th, 31st March 2006
Serial No. : 0025
Regulation : FCC Part15 C §15.247 (a)(1)

Test Conditions (S/N of EUT : 0025)

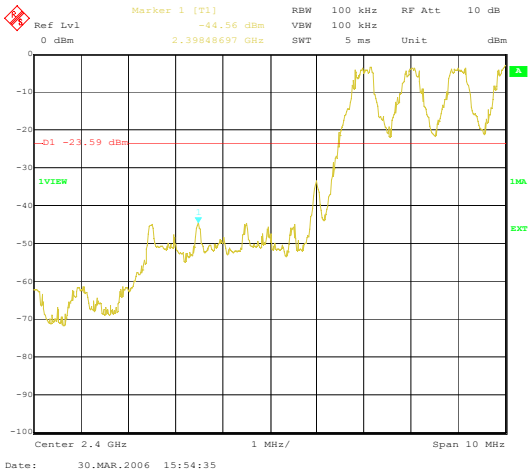
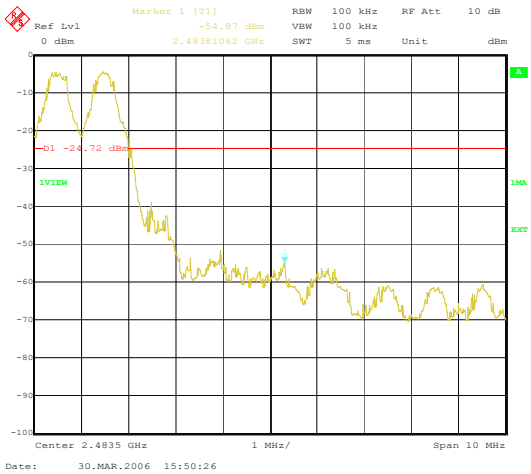
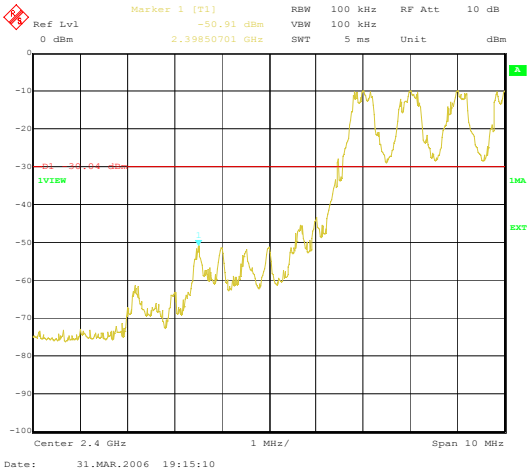
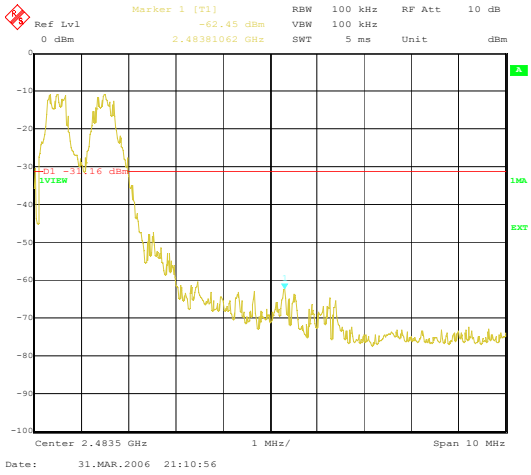
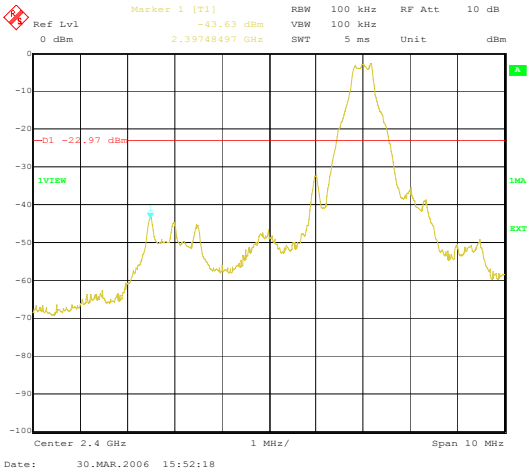
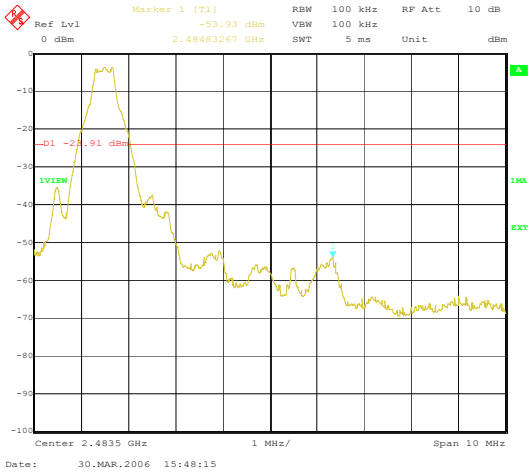
Test Date		30th March 2006	31st March 2006
Power*1	before test	DC 8.328V	DC 8.325V
	after test	DC 7.499V	DC 7.534V
Mode		Transmitting mode, Non Frequency Hopping Frequency Hopping (79ch)	Transmitting mode, Adoptive Frequency Hopping (20ch)
Temperature		22℃	21℃
Humidity		51 %	50 %

*

*1: The charged battery more than typical battery voltage DC7.4V was used for the test.

The spectrum data are attached below. Display line indicates the 20dB offset below highest level. It shows compliance with the requirement in part 15.247(c)

Operation mode: Transmitting mode

Frequency Hopping 79ch (2402MHz)	Frequency Hopping 79ch (2480MHz)
	
Adoptive Frequency Hopping 20ch (2402MHz)	Adoptive Frequency Hopping 20ch (2480MHz)
	
Non Frequency Hopping (0ch(Lowest) 2402MHz)	Non Frequency Hopping (79ch(Highest) 2480MHz)
	

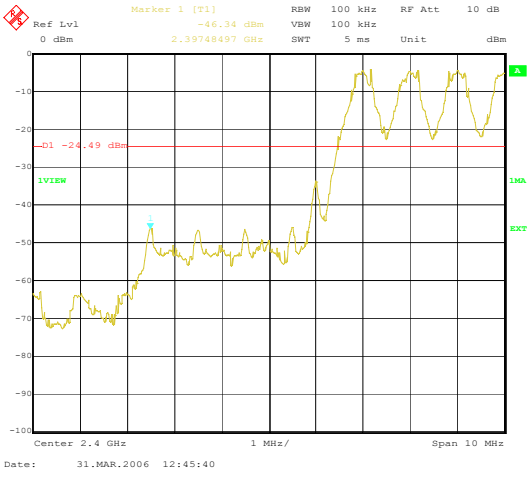
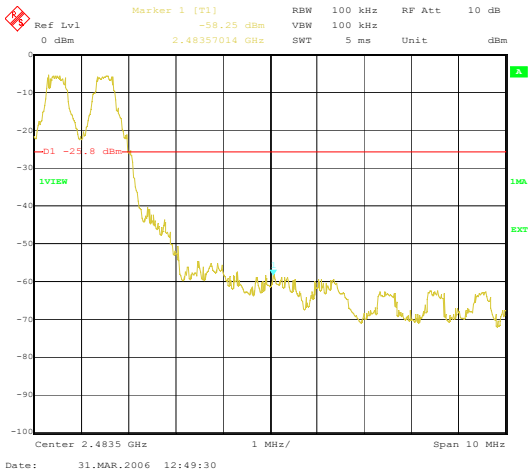
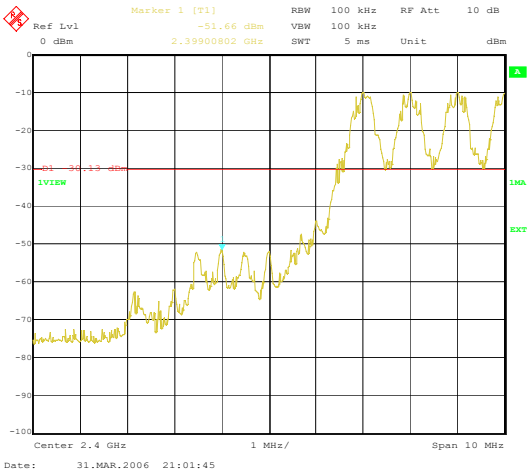
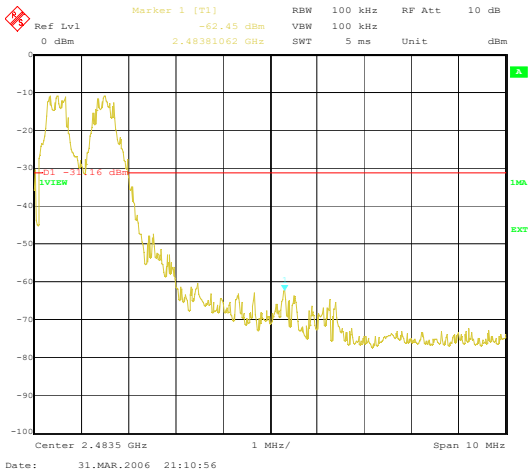
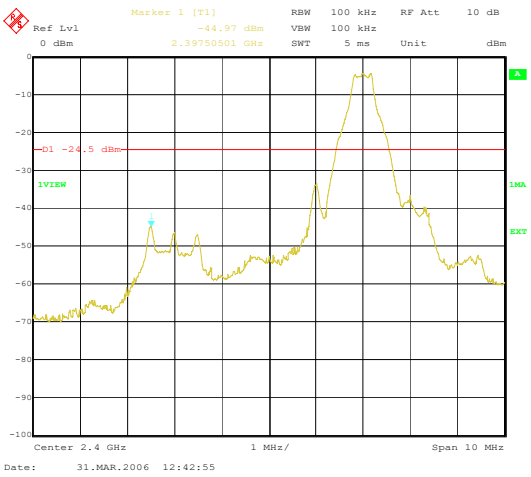
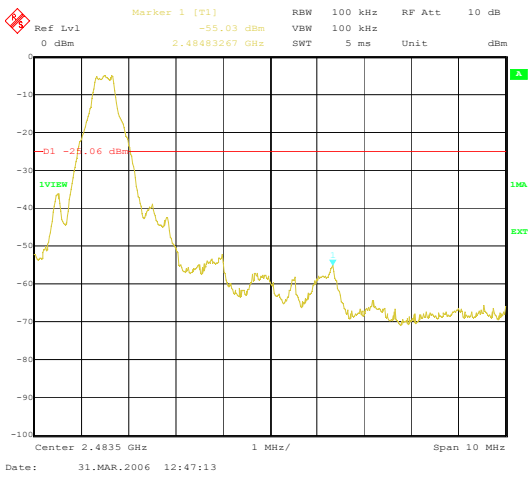
(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date	31st March 2006
Power	AC 120V
Mode	Transmitting mode, Non Frequency Hopping Frequency Hopping (79ch) Adoptive Frequency Hopping (20ch)
Temperature	21℃
Humidity	50 %

The spectrum data are attached below. Display line indicates the 20dB offset below highest level. It shows compliance with the requirement in part 15.247(c)

Operation mode: Transmitting mode

Frequency Hopping 79ch (2402MHz)	Frequency Hopping 79ch (2480MHz)
	
Adoptive Frequency Hopping 20ch (2402MHz)	Adoptive Frequency Hopping 20ch (2480MHz)
	
Non Frequency Hopping (0ch(Lowest) 2402MHz)	Non Frequency Hopping (79ch(Highest) 2480MHz)
	

13 Spurious RF Conducted Emission

13.1 Test Setup

The spectrum analyzer was connected to the transmitter output port through the RF cable.

Spectrum analyzer setting : -
DETECTOR : PEAK
RBW : 100kHz
VBW : 100kHz
SWEEP TIME : AUTO

13.2 Test Instrument

Equipment	Manufacture	Model No.	Serial No.	Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	10th.2.2006.	9th.2.2007.
RF cable	SUHNER	SUCOFLEX 104E	RF3	5th.7.2005.	4th.7.2006.
Multimeter	Advantest	R6451	67840312	30th.5.2005.	29th.5.2006.
HYGRO-THERMOGRAPH	SEKONIC	ST-50	HE01-00511	7th.2.2006.	6th.2.2007.

13.3 Test Results

(1) Battery Power Supply

Test Conditions (S/N of EUT : 0025)

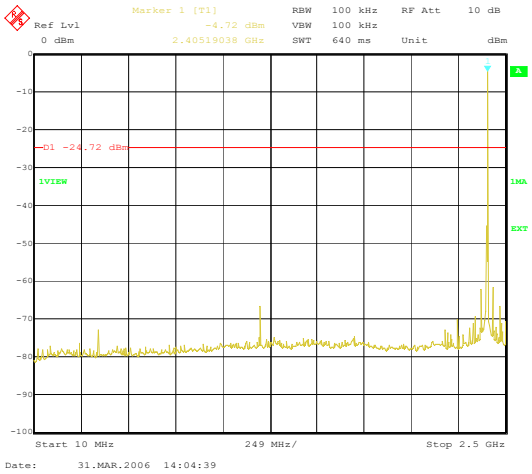
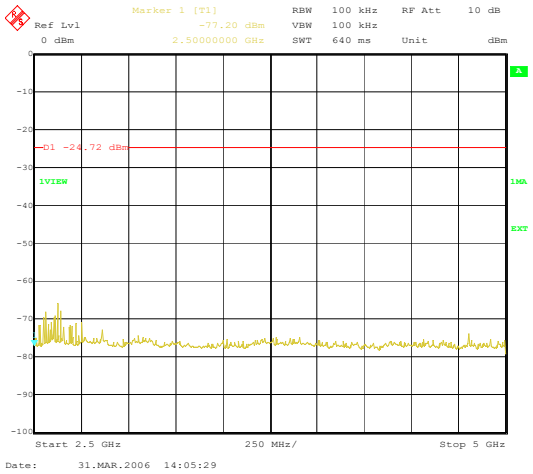
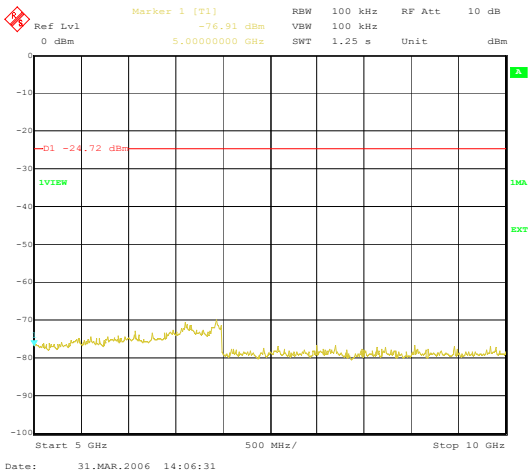
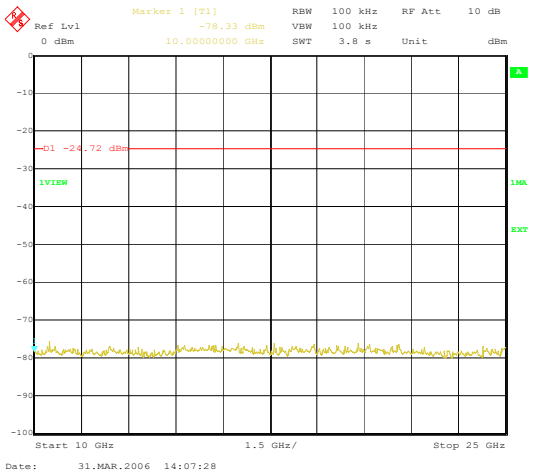
Test Date		31st March 2006
Power*1	before test	DC 8.325V
	after test	DC 7.534V
Mode		Transmitting mode, Non Frequency Hopping
Temperature		21℃
Humidity		50 %

The spectrum data are attached below. Display line indicates the 20dB offset below highest level.
It shows compliance with the requirement in part 15.247(c)

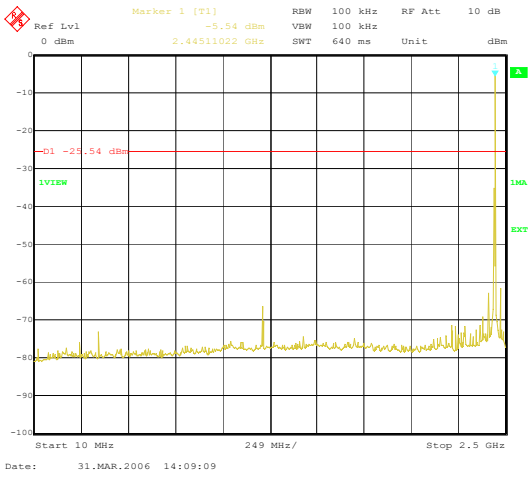
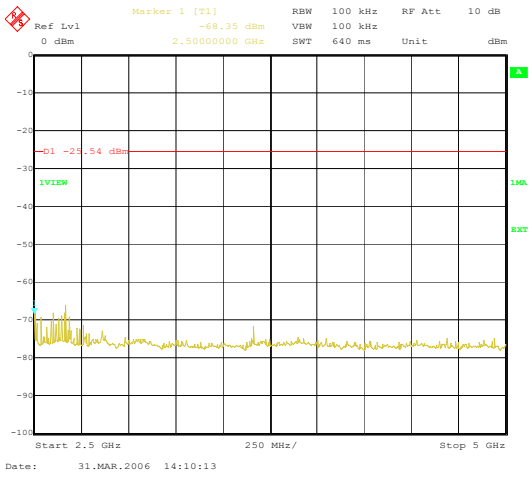
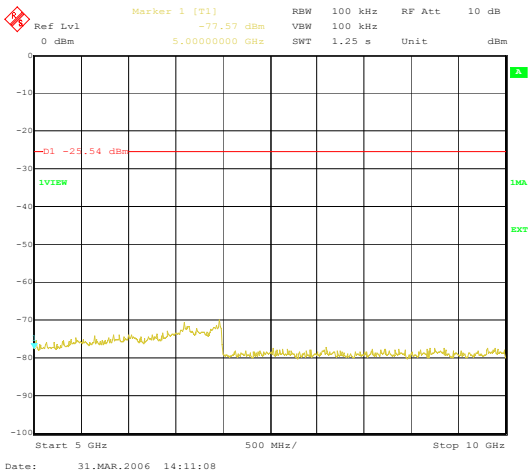
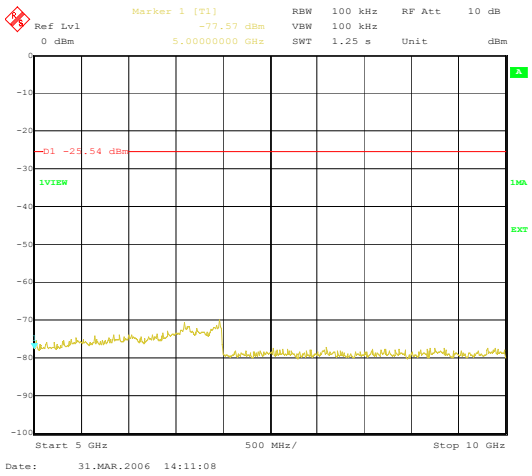
Non Frequency Hopping

Operation mode: Transmitting mode

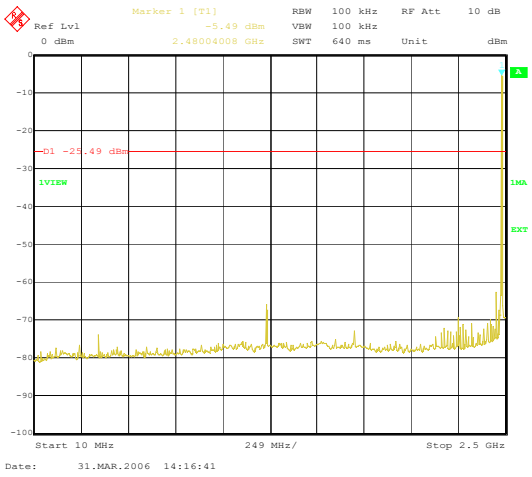
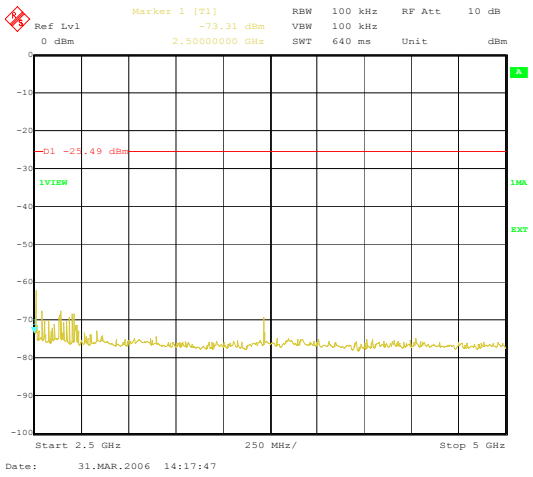
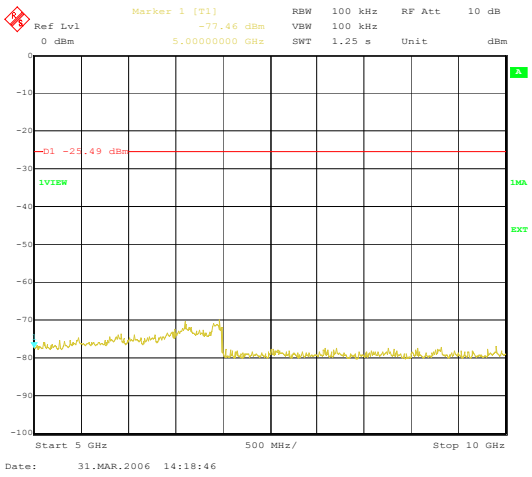
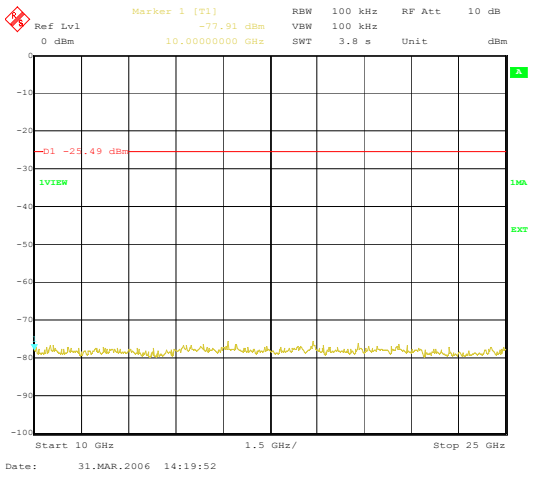
0ch(Lowest) 2402MHz

10MHz～2.5GHz	2.5GHz～5GHz
	
5GHz～10GHz	10GHz～25GHz
	

39ch(Middle) 2441MHz

10MHz～2.5GHz	2.5GHz～5GHz
	
5GHz～10GHz	**10GHz～25GHz**
	

78ch(Highest) 2480MHz

10MHz～2.5GHz	2.5GHz～5GHz
	
5GHz～10GHz	**10GHz～25GHz**
	

(2) AC Power Supply

Test Conditions (S/N of EUT : 0025)

Test Date	31st March 2006
Power	AC 120V
Mode	Transmitting mode, Non Frequency Hopping
Temperature	21℃
Humidity	50 %

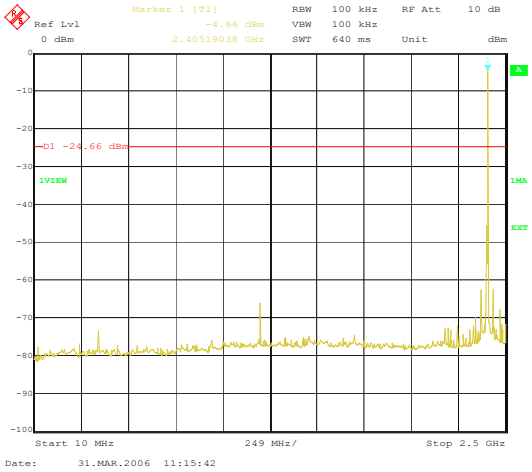
The spectrum data are attached below. Display line indicates the 20dB offset below highest level.
It shows compliance with the requirement in part 15.247(c)

Non Frequency Hopping

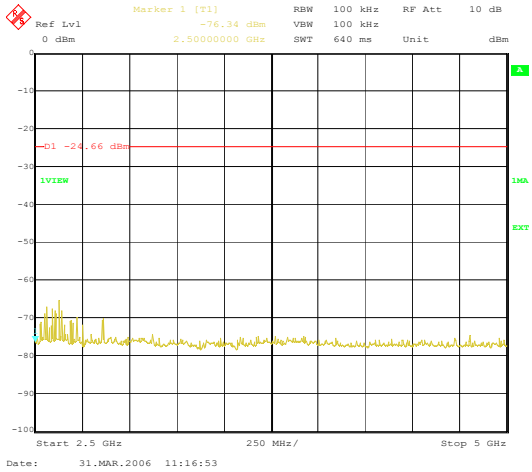
Operation mode: Transmitting mode

0ch(Lowest) 2402MHz

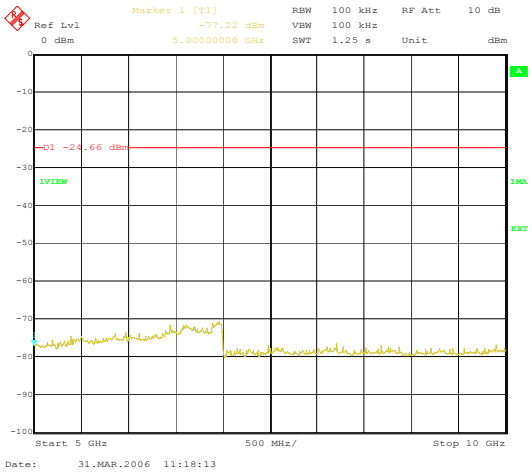
10MHz～2.5GHz



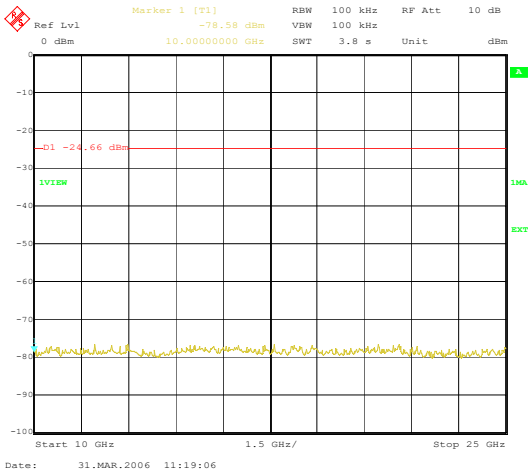
2.5GHz～5GHz



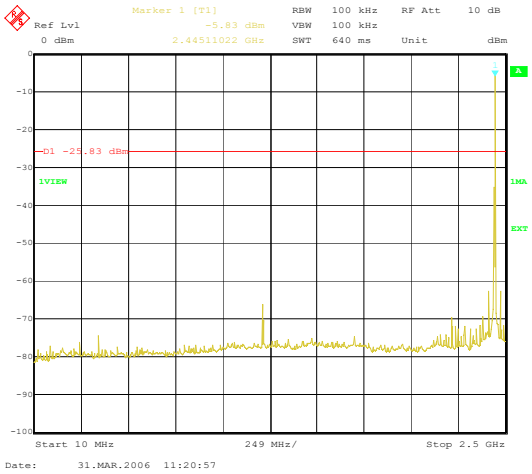
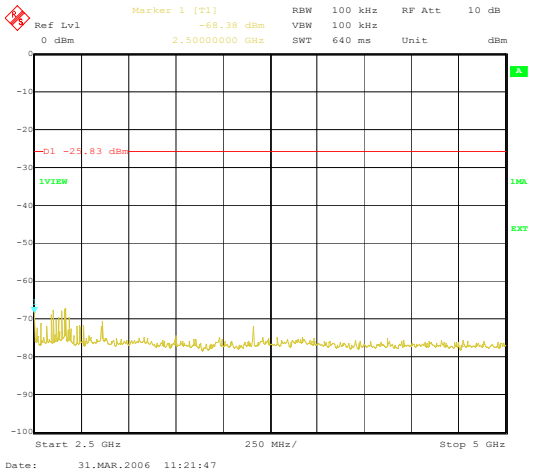
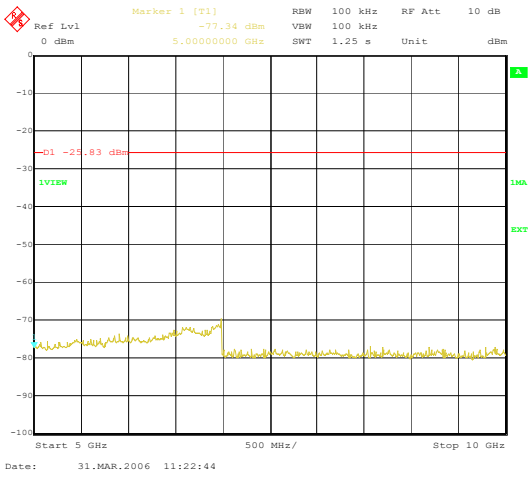
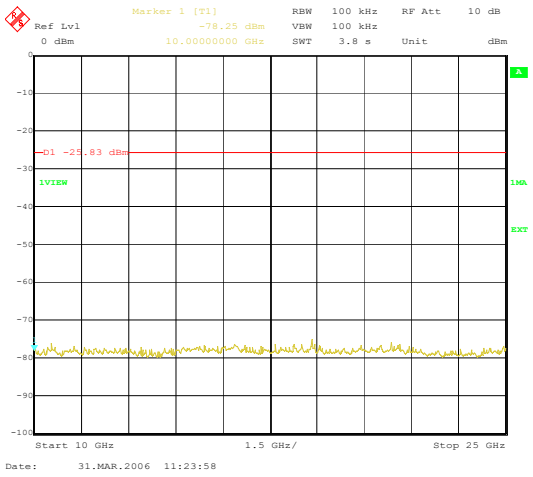
5GHz～10GHz



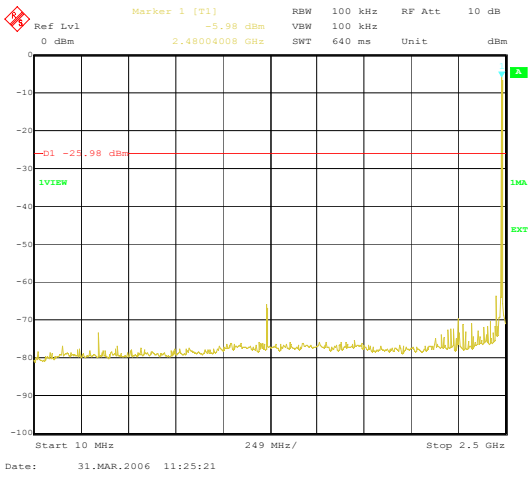
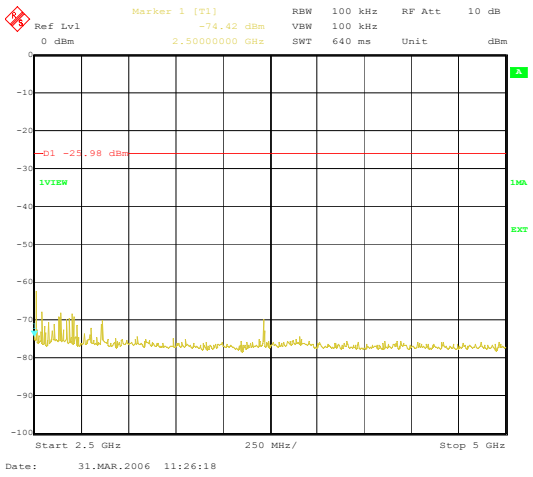
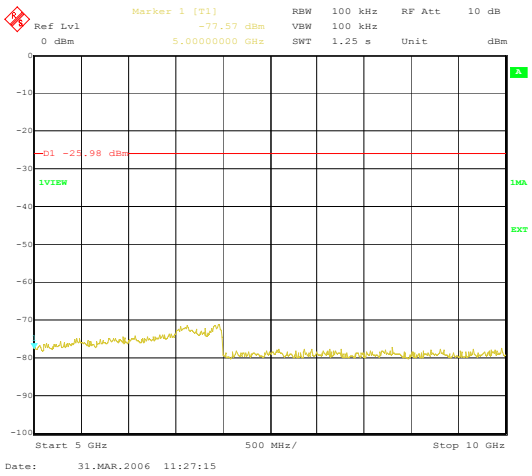
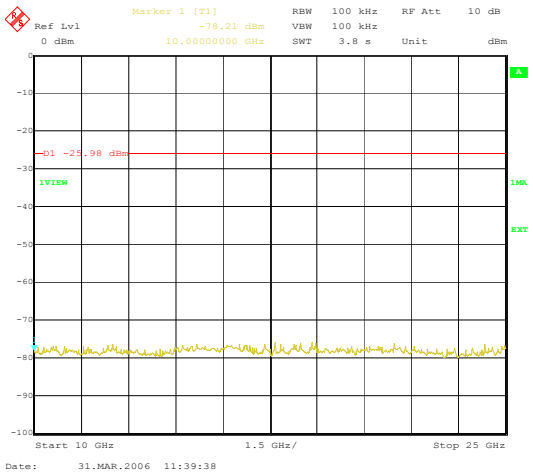
10GHz～25GHz



39ch(Middle) 2441MHz

10MHz～2.5GHz	2.5GHz～5GHz
	
5GHz～10GHz	**10GHz～25GHz**
	

78ch(Highest) 2480MHz

10MHz～2.5GHz	2.5GHz～5GHz
	
5GHz～10GHz	**10GHz～25GHz**
	

14 EIRP Calculation from Peak Power

15.247 (b)(5): Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

EIRP Calculation :

A	B	C
Specified Antenna Gain (dBi)	Max. RF Output Power at Antenna Terminal (dBm)	**Total EIRP (dBm)**
-3.70	-0.71	**-4.41**

Calculation : C = A + B

EIRP = -4.41dBm = 0.36mW

15 PHOTOS OF TESTED EUT

S/N : 0043 (for Radiated Test and AC Powerline Conducted Test)

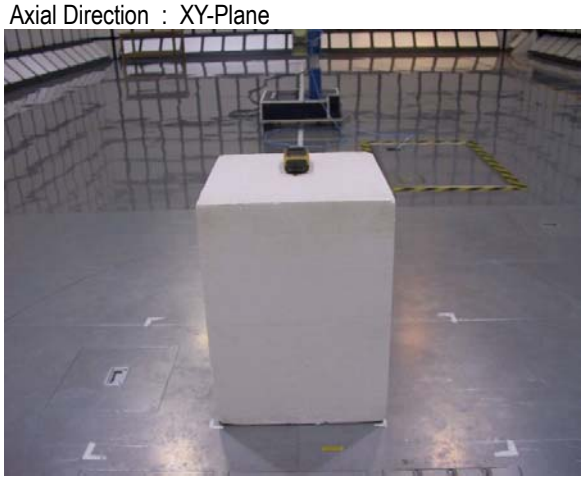
S/N : 0025 (for Conducted Test)

16 PHOTOS OF TEST SETUP

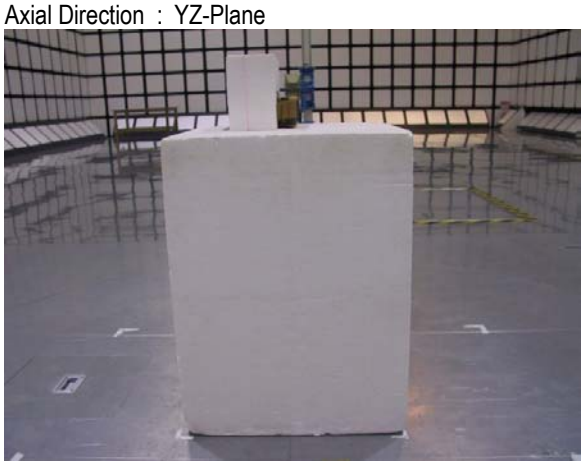
16.1 Photos of Radiated Measurement

Battery Power Supply

Axial Direction : XY-Plane



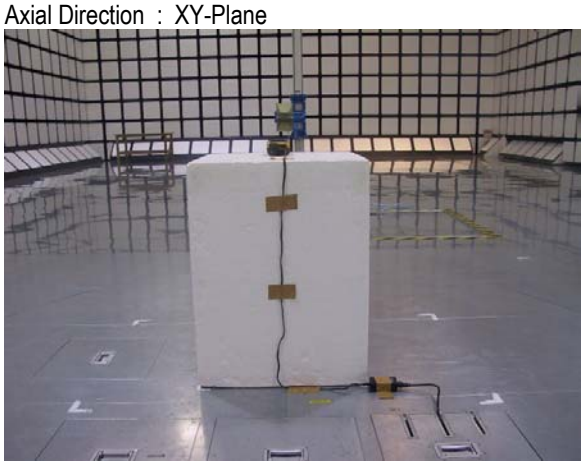
Axial Direction : YZ-Plane



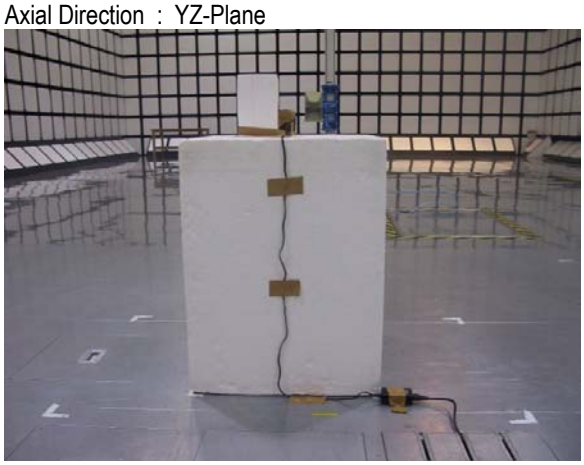
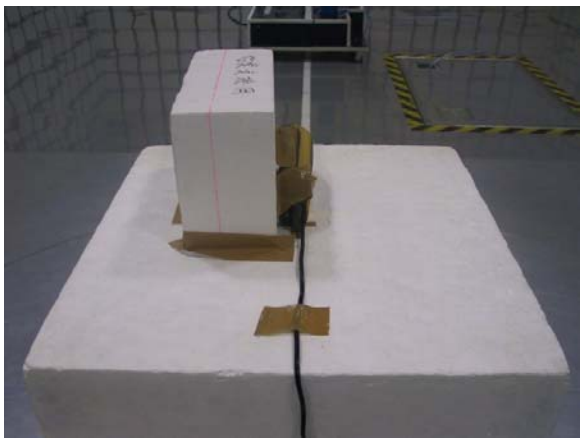
Axial Direction : ZX-Plane

AC Power Supply

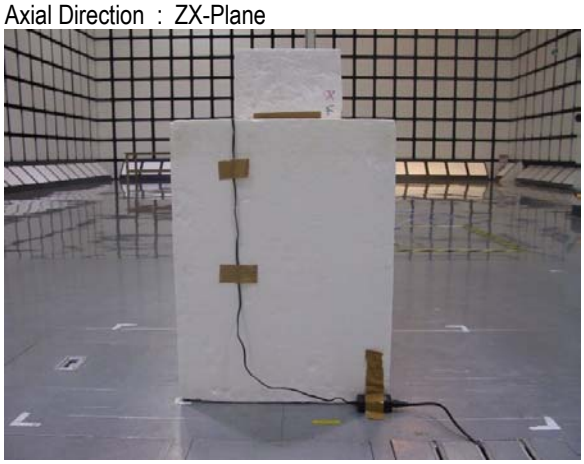
Axial Direction : XY-Plane



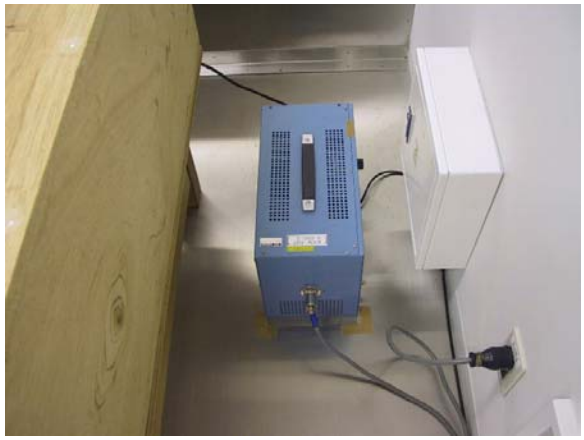

Axial Direction : YZ-Plane

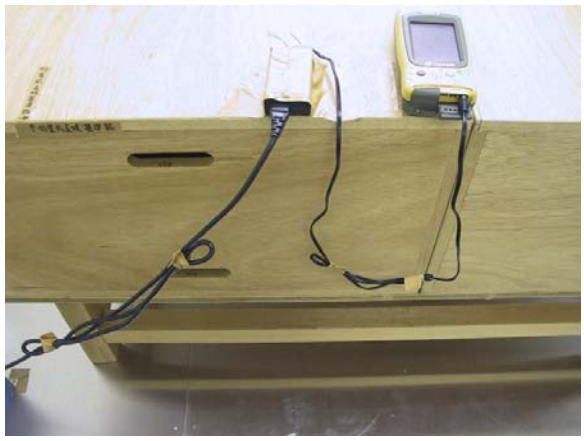



Axial Direction : ZX-Plane



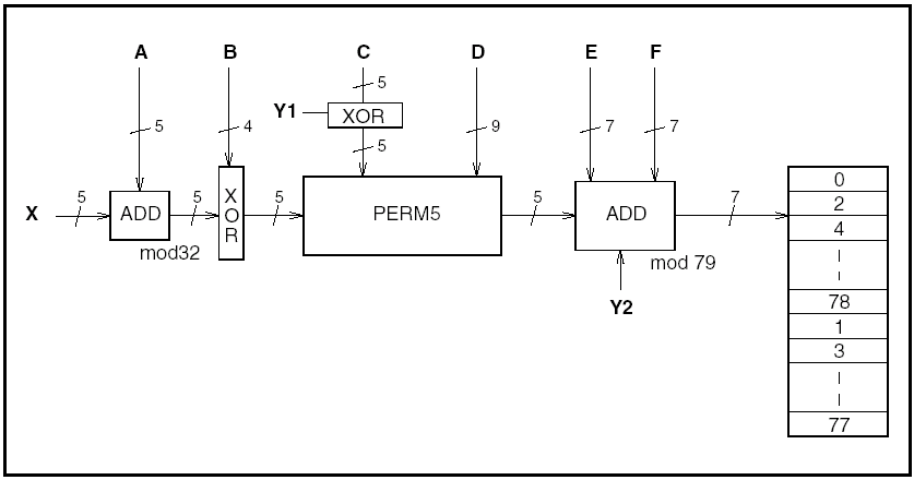

16.2 Photos of Conducted Measurement



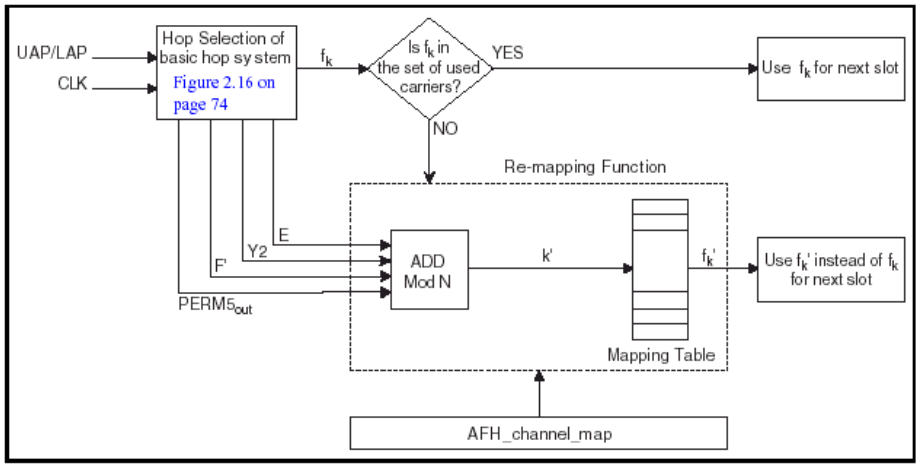
APPENDIX 1
About AFH-Hopping Sequence

AFH-Hopping Sequence is provided for in the Bluetooth Spec 1.2. Here is an outline below.
1.In the case of 79Hopping



Due to the above flow, 32 hops are made into 5 ways. Then, the sign of the sign head 160 is formed. The remainder that is worked out by dividing with 79 is assigned to Hopping Channel.
Each parameter of the above figure uses the value calculated from the Bluetooth clock and the Bluetooth address which are shown in the next page.

2.In the case of AFH-Hopping



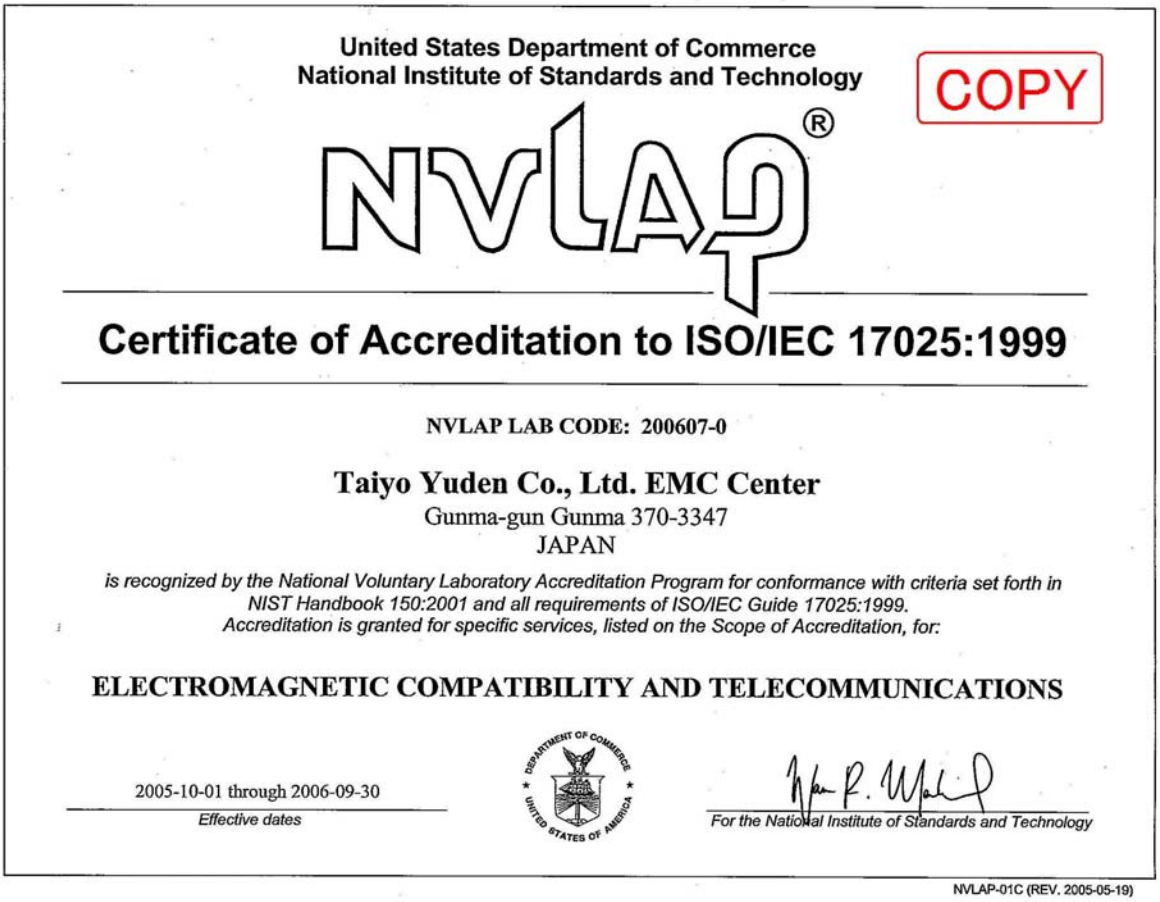
Also in the case of AFH, the fundamental sign adopt the sign head 160 that is the same as the case of 79Hopping. Hopping Pattern uses the value that is worked out by dividing with the number of AFH-Channel's. Then, available Hopping becomes even as well as 79Hopping.
The selection of the communication Channel is done by the communication error rate and the receiving signal strength. Frequency is determined by pairing the channel and the value which is divided by the number of AFH-Channel one-to-one.

It is decided in the specifications that Communication Channel has to have “20Channels” at least. However, if the number of communication Channel is controlled to be under 20 back to 79Channel-Hopping, and select the communication Channel again.

3.The parameter list which decides Hopping-Pattern

	Page scan / Interlaced Page Scan / Inquiry scan / Interlaced Inquiry Scan	Page/Inquiry	Master/Slave page response and Inquiry response	Connection state
X	$CLKN_{16-12}$ / $(CLKN_{16-12}+16) mod 32$ / Xir_{4-0} / $Xir_{4-0}+16) mod 32$	Xp_{4-0} / Xi_{4-0}	$Xprm_{4-0}$ / $Xprs_{4-0}$ / Xir_{4-0}	CLK_{6-2}
Y1	0	$CLKE_1$ / $CLKN_1$	$CLKE_1$ / $CLKN_1$ / 1	CLK_1
Y2	0	$32 \times CLKE_1$ / $32 \times CLKN_1$	$32 \times CLKE_1$ / $32 \times CLKN_1$ / 32×1	$32 \times CLK_1$
A	A_{27-23}	A_{27-23}	A_{27-23}	$A_{27-23} \oplus CLK_{25-21}$
B	A_{22-19}	A_{22-19}	A_{22-19}	A_{22-19}
C	$A_{8,6,4,2,0}$	$A_{8,6,4,2,0}$	$A_{8,6,4,2,0}$	$A_{8,6,4,2,0} \oplus CLK_{20-16}$
D	A_{18-10}	A_{18-10}	A_{18-10}	$A_{18-10} \oplus CLK_{15-7}$
E	$A_{13,11,9,7,5,3,1}$	$A_{13,11,9,7,5,3,1}$	$A_{13,11,9,7,5,3,1}$	$A_{13,11,9,7,5,3,1}$
F	0	0	0	$16 \times CLK_{27-7} \bmod 79$
F'	n/a	n/a	n/a	$16 \times CLK_{27-7} \bmod N$

APPENDIX 2



United States Department of Commerce
National Institute of Standards and Technology

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2005-10-01 through 2006-09-30
Effective dates

For the National Institute of Standards and Technology

NVLAP-01C (REV. 2005-05-19)