TEST REPORT

Test Report No.: 6365F

Applicant	:	TLV CO., LTD.
EUT	:	Ultrasonic Leak Detector
Model No.	:	SonicMan / S02
Serial No.	:	CRF001 (Radiated Emission Test)
		CRF002 (Conducted RF Test via Antenna Terminal)
FCC ID	:	H3R00SO2001
Issue Date	:	19 June 2007
Date of Test	:	12 June 2007 (Radiated Emission Test)
		14 June 2007 (Conducted RF Test via Antenna Terminal)
Applied Standard	:	FCC Part 15 Subpart C Section 15.207, 15.247
		(10-1-05 Edition)
Procedure	:	ANSI C63.4-2003 PUBLIC NOTICE DA 00-705
Test Results	:	PASS

Approved By: 2007.6.19
Manager / Kenzo Furuta

NVLAP LAB CODE 200607-0

Reviewed By: 2007.6.19
Chief Engineer / Takeshi Matsumura

Tested By: 2007.6.19
Engineer / Yukihito Minegishi

: 2007.6.19
Engineer / Kentaro Fukuda

Table of Contents

Revised Record

Revised Record				
Number of Revised Time	Date	Person in Charge	Detail of Revision	Approved By
Initial	19 June 2007	K. Fukuda	-	-

1 Test Report

(1) This report summarizes the result of a single investigation and test result relate only to tested sample.
(2) The report shall not be reproduced except in full without the written approval of the TAIYO YUDEN Co., Ltd.
(3) This test report must not be used by the client to claim product endorsement by any government agency.
(4) 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).
(5) The test results in this report are traceable to international standards.

2 General Information

2.1 Applicant Information

Company Name	TLV CO., LTD.
Address	881 Nagasuna, Noguchi-machi, Kakogawa-shi, Hyogo, 675-8511, Japan

2.2 Product Description

EUT	Ultrasonic Leak Detector
Model No.	SonicMan / S02
Serial No	CRF001 (Radiated Emission Test) CRF002 (Conducted RF Test via Antenna Terminal)
FCC ID	H3R00SO2001
Production Stage	Production
Type of Wide Band Modulation	FHSS with AFH
Type of Modulation	GFSK
ITU Code	F1D
Power Supply	DC 2.4V from Battery (M/N: SO2-101EX)
Operating Voltage Range	DC 2.0V Min. DC 3.2V Max.
Operating Temperature	0℃ Min. 40℃Max.
Weight	550g
Dimensions of EUT	W175.0mm×D85.0mm×H185.0mm
Antenna Type	Inverted F
Max Antenna Gain	2.044dBi
Operating Clocks	3.686MHz, 32.768kHz
Receipt Date of Tested Sample	11 June 2007

Estimates air, gas or steam leaks by detecting ultrasonic. Within 2.4GHz Bluetooth Module. Within laser pointer.
This 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.

EUT operates in the unlicensed 2.4 GHz ISM (Industrial Scientific Medical) band. A frequency hop transceiver is applied to combat interference and fading.

2.3 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	Conducted Emission Test	N/A	N/A	N/A
2	Carrier Frequency Separation	ANSI C63.4: 2003 Public Notice DA00-705	FCC 15.247 (a)(1)	Conducted RF Test via Antenna Terminal	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(d)		N/A	-	Pass
7	Spurious RF Conducted Emission		FCC 15.247(d)		N/A	-	Pass
8	Radiated Emission		FCC 15.247(d)	Radiated Emission Test	N/A	17.0dB Transmitting Mode: 2402MHz Frequency: 4804.000MHz Axial Direction: XY-Plane Antenna Polarization: Vertical	Pass
9	E.I.R.P.		FCC 15.247 (b)(5)	Conducted Calculated	N/A	-	Pass

2.4 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.

2.5 Test Facility

TAIYO YUDEN CO., LTD. EMC Center.
5607-2, Nakamuroda-machi, Takasaki-shi, Gunma, 370-3347, Japan.

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-machi, Takasaki-shi, 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 17025:2005 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).

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).

5. 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 Operating Modes

Transmitting Mode

Modulation		GFSK
Signal Pattern		PRBS9
Signal Packet Type	GFSK	DH5
Representative Channel		CH0 2402MHz (Lowest Frequency Channel)
		CH39 2441MHz (Middle Frequency Channel)
		CH78 2480MHz (Highest Frequency Channel)

Remarks:

Signal Pattern PRBS9: Periodic Pseudo Random Bit Sequence. $2^9 - 1$

Signal Packet Type:

DH1, 3, 5: Data high rate, ACL type packet
Data payload with CRC, without FEC
Fully transmission within one consecutive 625-microsecond transmission slots
Number of slot = 5(DH5)
Data size of payload = 339bytes (DH5)

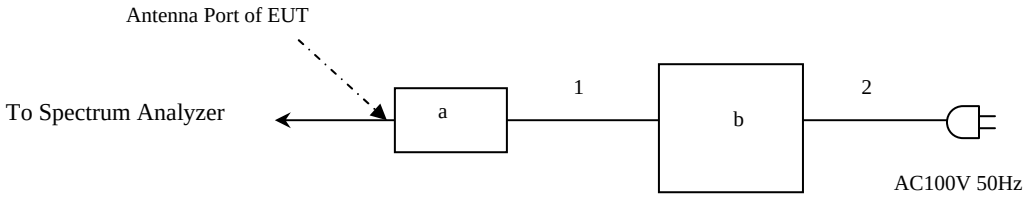
Software (Controller): The software used to set up the Bluetooth operating mode was installed in EUT by TLV.

3.3 Configuration of Tested System

(1) Conducted RF Test via Antenna Terminal

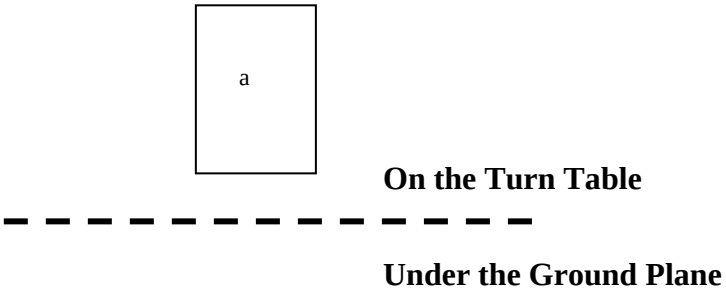
These numbers and the marks in the picture are corresponding to the numbers and the marks in Tables shown at the Section 3.4 and 3.5.

Test Setting for Normal Frequency Hopping, Non Frequency Hopping and AFH Mode



(2) Radiated Emission Test

These numbers and the marks in the picture are corresponding to the numbers and the marks in Tables shown at the Section 3.4 and 3.5.



3.4 List of Accessories and EUT

	Product Name	M/N	S/N	Manufacturer	EUT / Accessory	FCC ID / DoC	Notes
a	Ultrasonic Leak Detector	SonicMan / SO2	CRF001 (Radiated Emission Test) CRF002 (Conducted RF Test Via Antenna Terminal)	TLV. CO., LTD	EUT	H3R00SO2001	
b	Regulated DC Power Supply	PA18-3A	6110066	KENWOOD	Accessory	N/A	-

3.5 Interface Cables

	Cable Type	M/N	Shielded	Ferrite Core	Material of Connector	Length	Treatment for the Extra Length
1	DC Cable	-	No	No	Metal	1.07m	-
2	AC Cable	-	No	Yes	Metal	2.00m	-

3.6 Test Instruments

About test instruments for all tests, please refer to appendix 3.

3.7 Special Test Condition

Nothing

3.8 Equipment Modifications

No modification has been carried out by TAIYO YUDEN CO., LTD. EMC Center.

4 Antenna Requirement

The EUT provides a permanently attached antenna and it was found to be compliant with FCC regulation section 15.203.

Antenna Type	Inverted F
Antenna Gain	2.044dBi

5 AC Powerline Conducted Emission

N/A

This EUT is operated only for battery. So this measurement is not applied to this EUT.

6 20dB Bandwidth

6.1 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

6.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode, Non Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %

Operation Mode: Transmitting Mode (GFSK Modulation)

CH	Frequency [MHz]	20dB Bandwidth [MHz]
0ch(Lowest)	2402.0	0.870
39ch(Middle)	2441.0	0.870
78ch(Highest)	2480.0	0.870

7 Carrier Frequency Separation

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	100kHz
VBW	300kHz
Span	3MHz
Sweep Time	Auto

7.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode, Frequency Hopping Transmitting Mode, Adoptive Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %
Regulation	:	FCC Part15 C §15.247 (a)(1)

Operating Mode: Transmitting Mode (GFSK Modulation)

Transmitting Mode, Frequency Hopping (79ch)

Channel	Channel Separation [MHz]	Limit *1 [MHz]
Low Frequency (0ch-1ch)	1.004	> 0.580
Middle Frequency (38ch-39ch)	1.004	> 0.580
High Frequency (77ch-78ch)	0.986	> 0.580

Transmitting Mode, Adoptive Frequency Hopping (20ch)

Channel	Channel Separation [MHz]	Limit *1 [MHz]
Low Frequency (0ch-1ch)	1.010	> 0.580
Middle Frequency (38ch-39ch)	0.992	> 0.580
High Frequency (77ch-78ch)	1.004	> 0.580

*1: Limit value of Carrier Frequency Separation is 2/3 of 20dB Bandwidth.
Refer the result of 20dB Bandwidth to Section 5.

8 Number of Hopping Frequency

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	300kHz
VBW	300kHz
Sweep Time	Auto

8.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode, Frequency Hopping Transmitting Mode, Adoptive Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %
Regulation	:	FCC Part15 C §15.247 (a)(1)(iii)

Operating Mode: Transmitting Mode (GFSK Modulation)

Mode	Number of Channel [time]	Limit [time]
Transmitting Mode Frequency Hopping (79ch)	79	>=15
Transmitting Mode Adoptive Frequency Hopping (20ch)	20 *A	>=15

AFH: Intelligent hopping techniques to avoid interference to other transmission.
*A: None of them is overlapped each other

9 Dwell Time

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	1MHz
VBW	1MHz
Span	0Hz
Sweep Time	Auto

9.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode (DH5), Frequency Hopping Transmitting Mode (DH5), Adoptive Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %
Regulation	:	FCC Part15 C §15.247 (a)(1)(iii)

(1) Operating Mode: Transmitting Mode, Frequency Hopping (79ch)

GFSK Modulation		
Packet	Dwell Time [ms]	Limit [ms]
DH5	313.17	400

(2) Operating Mode: Transmitting Mode, Adaptive Frequency Hopping (20ch)

GFSK Modulation		
Packet	Dwell Time [ms]	Limit [ms]
DH5	313.17	400

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

Time of Occupancy (Dwell Time) for Packet Type DH5

The frequency-hopping 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]

Transmitting time is 2.936 ms.
Then, dwell time is 106.49 x 2.936ms = 313.17ms per 31.6 seconds.

Data of Dwell Time (Frequency Hopping (20ch))

Time of Occupancy (Dwell Time) for Packet Type DH5

The frequency-hopping 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 20.
The number of times that appears in 1 channel per 1 second is as follows.
266.67/20=13.34 [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 20 = 8.0 seconds
The number of times that appears in 1 channel per 8.0 seconds is as follows.
13.34 x 8.0 = 106.72 [times]

Transmitting time is 2.936 ms.
Then, dwell time is 106.72 x 2.936ms = 313.17ms per 8.0 seconds.

10 Maximum Peak Output Power

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	5MHz
Sweep Time	Auto

10.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode, Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %
Regulation	:	FCC Part15 C §15.247 (b)(1)

Operating Mode: Transmitting Mode (GFSK Modulation)

CH	Frequency [MHz]	Reading [dBm]	Cable Loss1 [dB]	Cable Loss2 [dB]	Result		Limit	
					[dBm]	[mW]	[dBm]	[mW]
0ch(Lowest)	2402	-4.30	0.60	0.20	-3.50	0.447	30.0	1000
39ch(Middle)	2441	-4.03	0.61	0.20	-3.22	0.476	30.0	1000
78ch(Highest)	2480	-3.68	0.54	0.20	-2.94	0.508	30.0	1000

Result = Reading + Cable Loss1 + Cable Loss2

Note: Cable Loss1: RF2

Cable Loss2: Conversion cable used for connecting to SMA type

11 Band Edge Compliance

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	100kHz
VBW	100kHz
Span	10MHz
Sweep Time	Auto

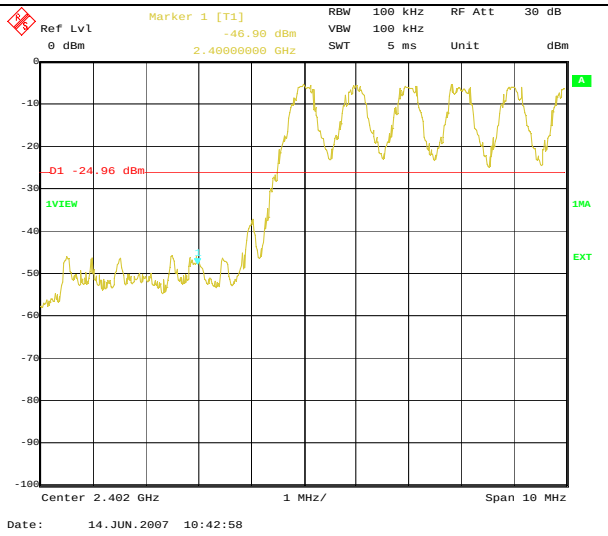
11.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode, Frequency Hopping (79ch) Transmitting Mode, Adoptive Frequency Hopping (20ch) Transmitting Mode, Non Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %
Regulation	:	FCC Part15 C §15.247 (d)

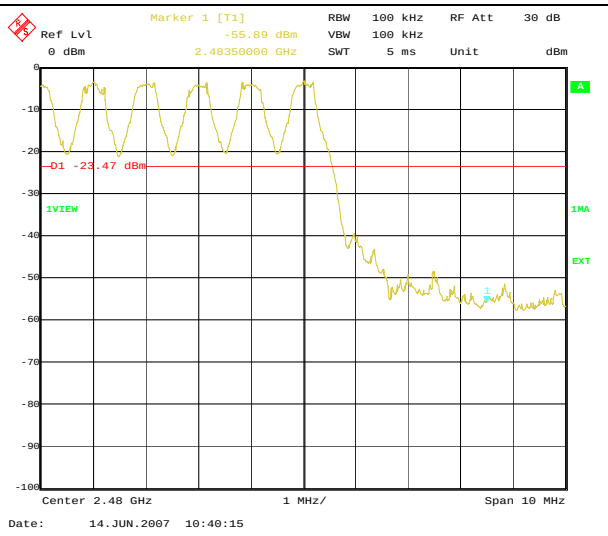
The spectrum data are attached next page. Display line indicates the 20dB offset below highest level. It shows compliance with the requirement in part 15.247(d).

Operating Mode: Transmitting Mode (GFSK Modulation)

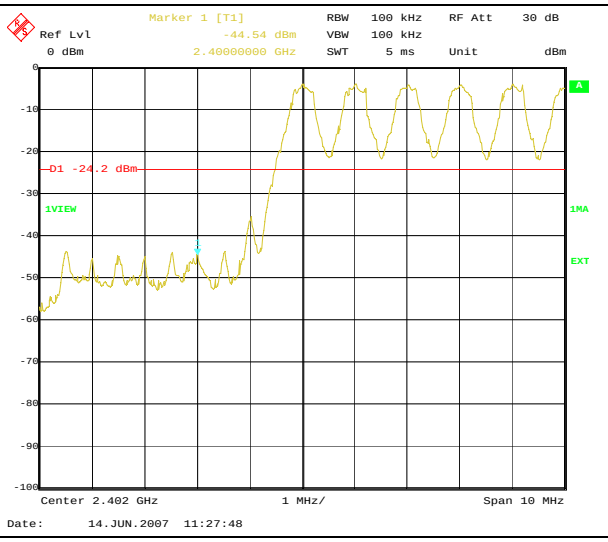
Frequency Hopping 79ch (2402MHz)



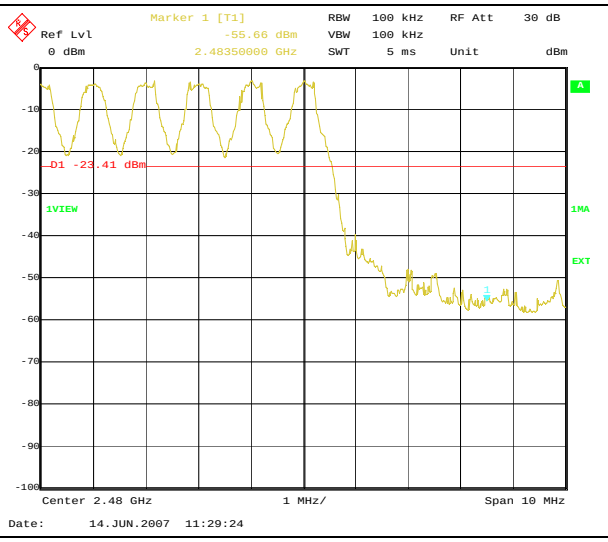
Frequency Hopping 79ch (2480MHz)



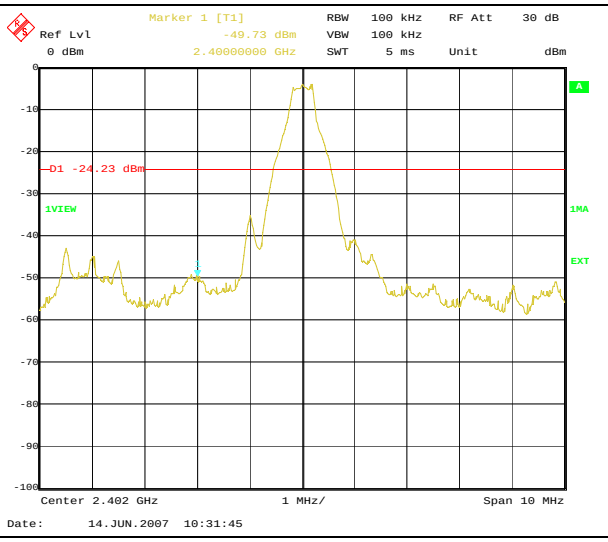
Adoptive Frequency Hopping 20ch (2402MHz)



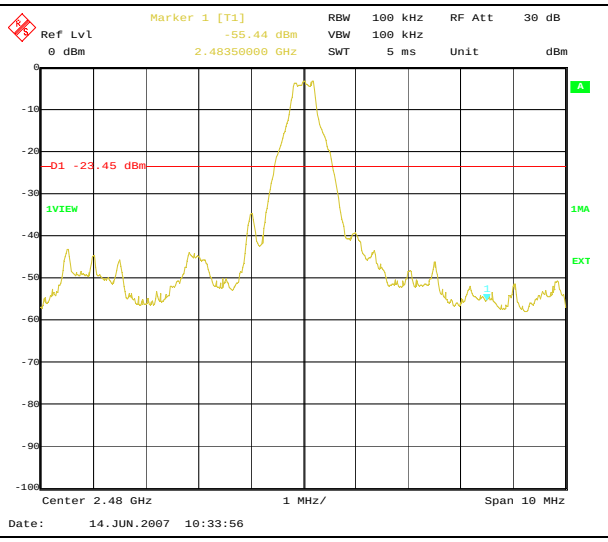
Adoptive Frequency Hopping 20ch (2480MHz)



Non Frequency Hopping (0ch(Lowest) 2402MHz)



Non Frequency Hopping (78ch(Highest) 2480MHz)



12 Spurious RF Conducted Emission

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

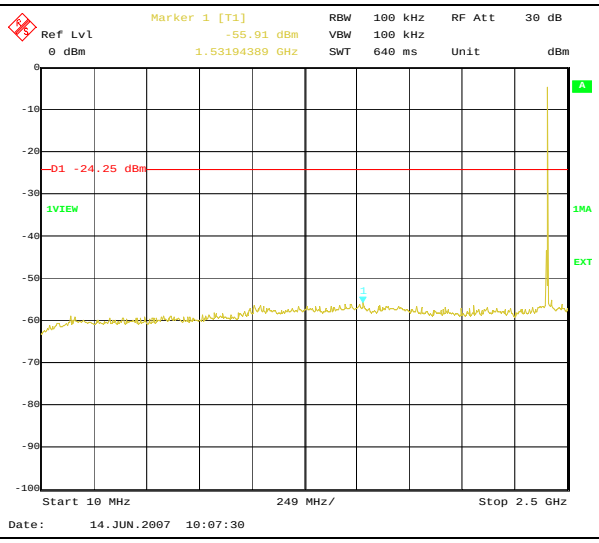
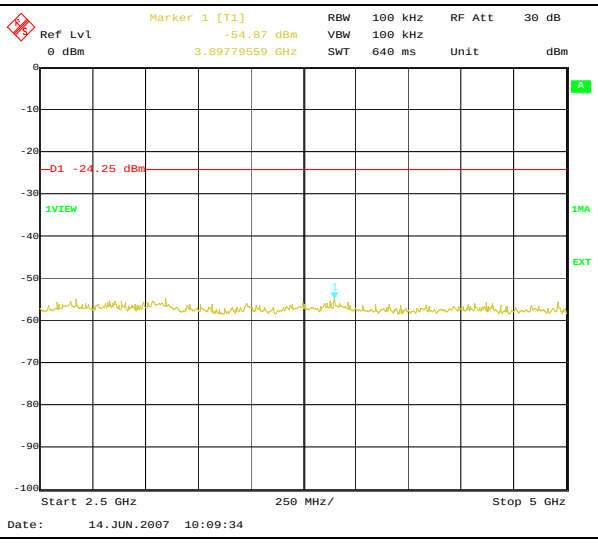
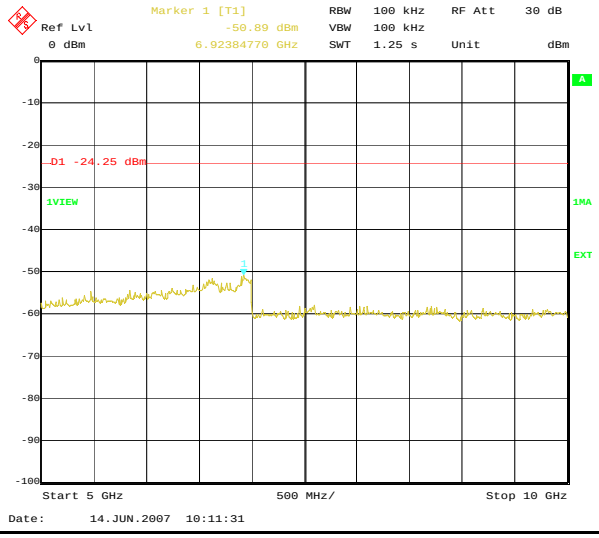
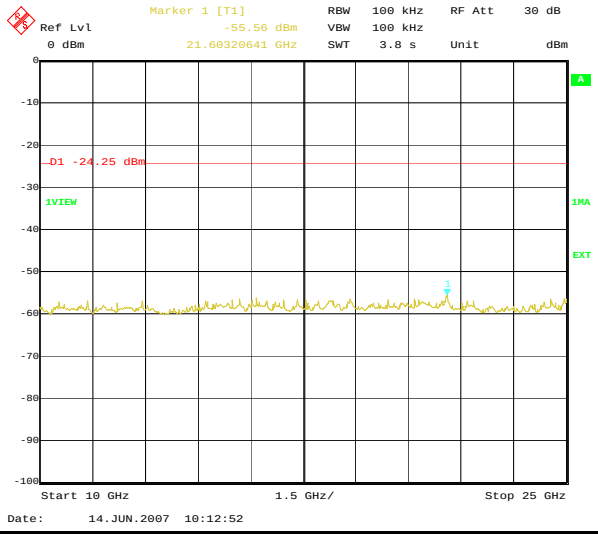
12.2 Test Results

Serial No.	:	CRF002
Power	:	DC 2.4V Supplied by PSU
Mode	:	Transmitting Mode, Non Frequency Hopping
Temperature	:	21.9℃
Humidity	:	61.1 %
Regulation	:	FCC Part15 C §15.247 (d)

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

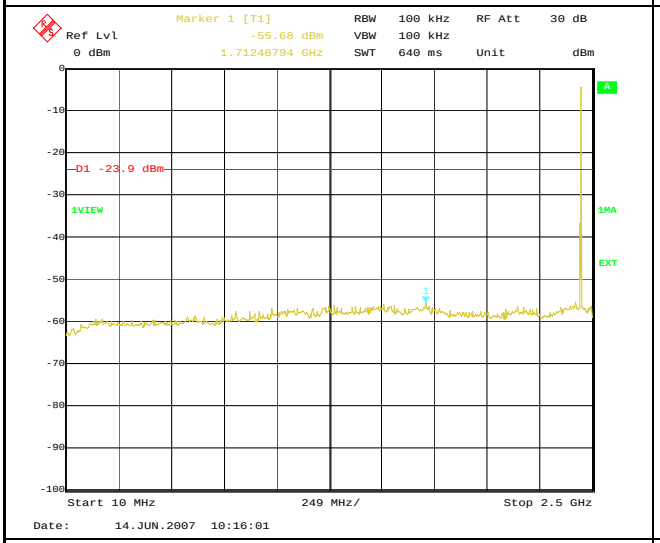
Operating Mode: Transmitting Mode (GFSK Modulation)

(i) 0ch (Lowest) 2402MHz

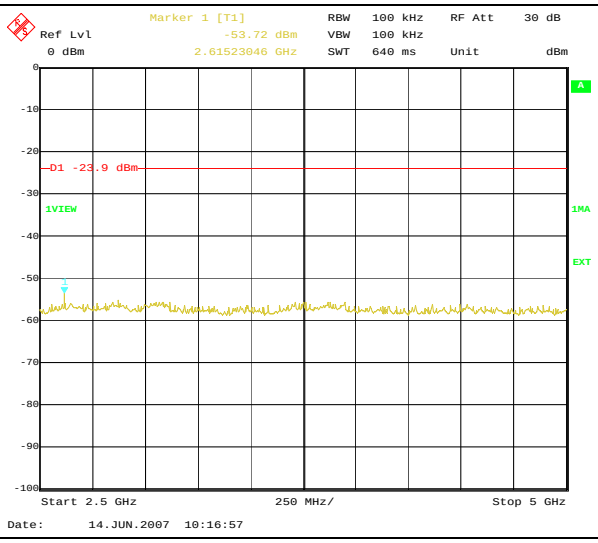
10MHz～2.5GHz	2.5GHz～5GHz
	
5GHz～10GHz	10GHz～25GHz
	

(ii) 39ch (Middle) 2441MHz

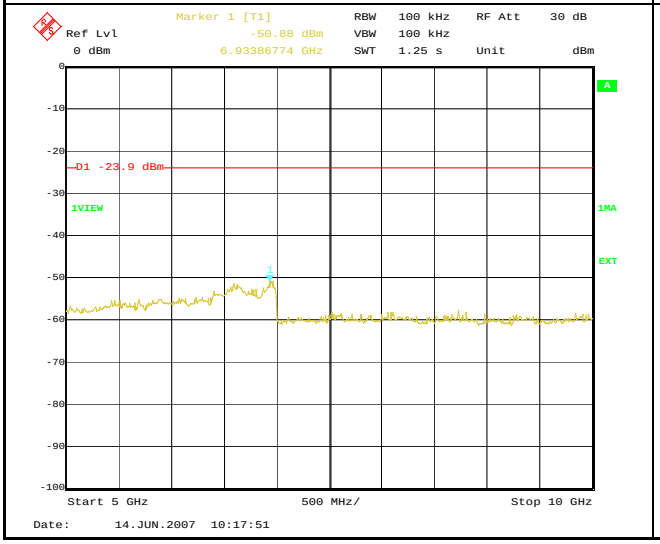
10MHz～2.5GHz



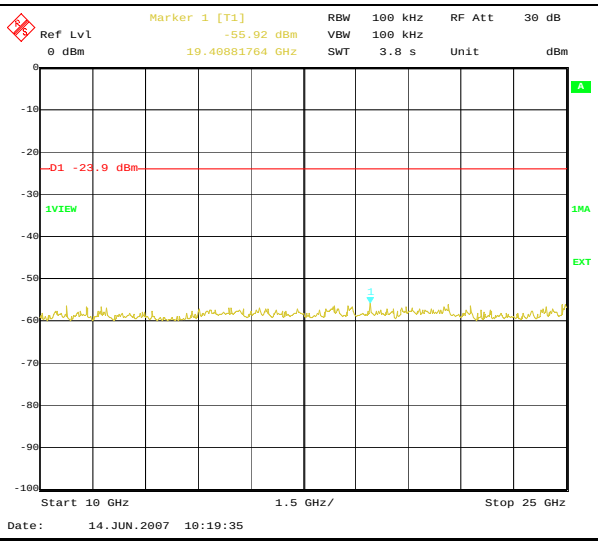
2.5GHz～5GHz



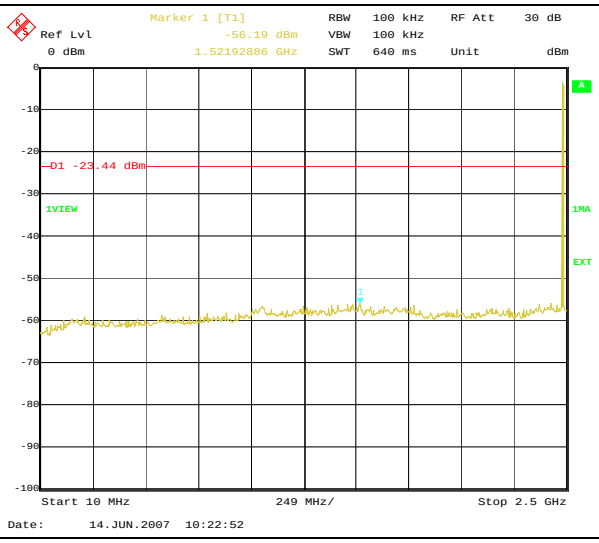
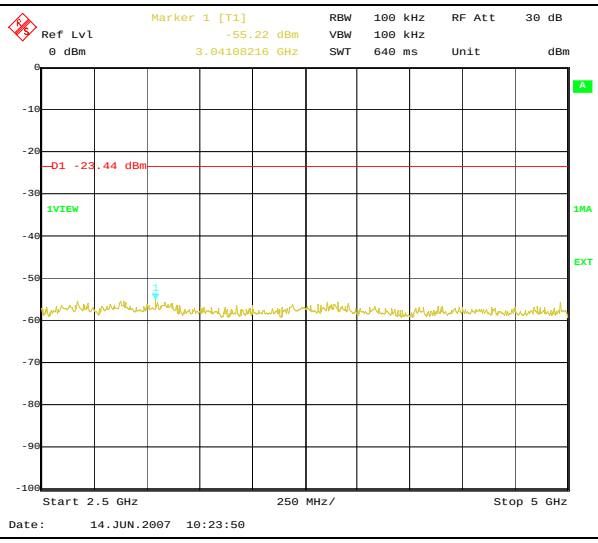
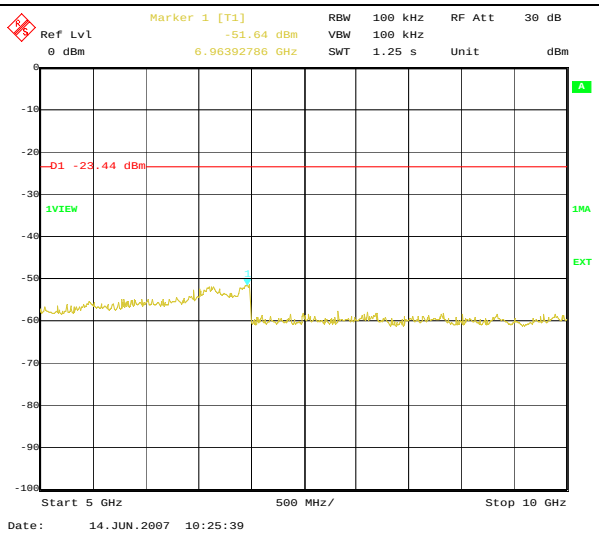
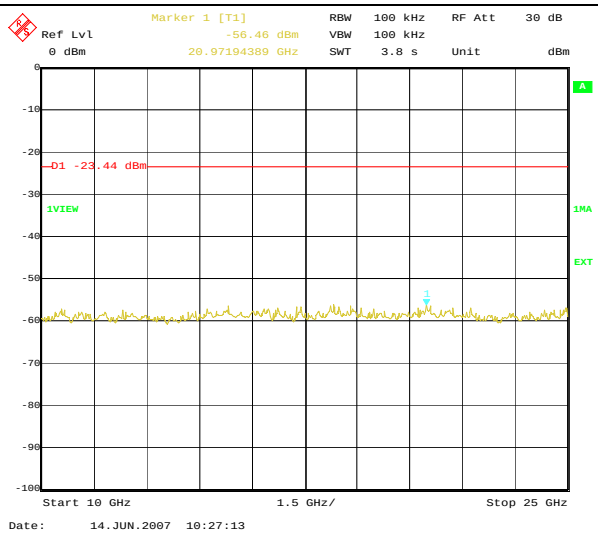
5GHz～10GHz



10GHz～25GHz



(iii) 78ch (Highest) 2480MHz

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

13 Radiated Emission

13.1 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)

Test Receiver Setting:

30~1000MHz:

Detector Mode	Quasi-Peak
Bandwidth	120kHz

Spectrum Analyzer Setting:

1~25GHz:

Detector Mode	Peak and Average
Bandwidth	Peak: RBW: 1MHz, VBW: 1MHz
	Average: RBW: 1MHz, VBW: 10Hz

Axial Direction:

13.2 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(1/m)]
	RE	:	Radiated Emission (Emission Level - Result) [dB(uV/m)]
	RA	:	Receiver Amplitude (Reading Level) [dBuV]
	AF	:	Antenna Factor [dB(1/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 36.5 dBuV is obtained.
The Correction Factor of -2.0 dB/m is added, giving a Radiated Emission of 34.5 dBuV/m.
The 34.5 dBuV/m value was mathematically converted to its corresponding level in uV/m.

RE = 36.5 + (-2.0) = 34.5 dBuV/m

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	259.310	36.5	-2.0	34.5	46.0	11.5	

Level in uV/m = Common Antilogarithm: 10^(34.5/20) = 53.1 uV/m

13.3 Test Results

Serial No.	:	CRF001
Power	:	Before Test: DC 2.828V from Battery
		After Test: DC 2.558V from Battery
Mode	:	Transmitting Mode, Non Frequency Hopping
Temperature	:	23.8℃
Humidity	:	58.6%
Regulation	:	FCC Part15 C §15.247 (d)

The spurious emission data are attached next page.

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Lch
Remark4           : XY
*************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1    500.000     21.1      -2.2       18.9        46.0     27.1   Floor Noise
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Lch
Remark4 : XY
****

Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2390.000	43.4	-5.8	37.6	74.0	36.4	Floor Noise
2	4804.000	42.9	0.7	43.6	74.0	30.4	Floor Noise
3	7206.000	43.5	4.0	47.5	74.0	26.5	Floor Noise
4	9608.000	44.6	6.9	51.5	74.0	22.5	Floor Noise
5	12010.000	46.1	7.8	53.9	74.0	20.1	Floor Noise

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4804.000	46.3	0.7	47.0	74.0	27.0	

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Lch
Remark4 : XY
****

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2390.000	32.5	-5.8	26.7	54.0	27.3	Floor Noise
2	4804.000	30.8	0.7	31.5	54.0	22.5	Floor Noise
3	7206.000	31.5	4.0	35.5	54.0	18.5	Floor Noise
4	9608.000	31.5	6.9	38.4	54.0	15.6	Floor Noise
5	12010.000	32.9	7.8	40.7	54.0	13.3	Floor Noise

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4804.000	36.3	0.7	37.0	54.0	17.0	

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Lch
Remark4           : YZ
************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1    500.000     21.1      -2.2       18.9        46.0     27.1   Floor Noise
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Lch
Remark4 : YZ
****

Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2390.000	43.4	-5.8	37.6	74.0	36.4	Floor Noise
2	4804.000	44.9	0.7	45.6	74.0	28.4	
3	7206.000	43.5	4.0	47.5	74.0	26.5	Floor Noise
4	9608.000	44.6	6.9	51.5	74.0	22.5	Floor Noise
5	12010.000	46.1	7.8	53.9	74.0	20.1	Floor Noise

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4804.000	45.2	0.7	45.9	74.0	28.1	

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Lch
Remark4           : YZ
*********************************************************************************************
Final Result

--- Horizontal Polarization (AV)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   2390.000     32.5      -5.8       26.7       54.0      27.3  Floor Noise
  2   4804.000     34.9       0.7       35.6       54.0      18.4
  3   7206.000     31.5       4.0       35.5       54.0      18.5  Floor Noise
  4   9608.000     31.5       6.9       38.4       54.0      15.6  Floor Noise
  5  12010.000     32.9       7.8       40.7       54.0      13.3  Floor Noise

--- Vertical Polarization (AV)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4804.000     32.7       0.7       33.4       54.0      20.6
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Lch
Remark4           : ZX
*************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]    [dB]
  1    500.000     21.1      -2.2       18.9        46.0      27.1   Floor Noise
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Lch
Remark4 : ZX
****

Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2390.000	43.4	-5.8	37.6	74.0	36.4	Floor Noise
2	4804.000	43.9	0.7	44.6	74.0	29.4	
3	7206.000	43.5	4.0	47.5	74.0	26.5	Floor Noise
4	9608.000	44.6	6.9	51.5	74.0	22.5	Floor Noise
5	12010.000	46.1	7.8	53.9	74.0	20.1	Floor Noise

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4804.000	45.8	0.7	46.5	74.0	27.5	

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Lch
Remark4 : ZX
****

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2390.000	32.5	-5.8	26.7	54.0	27.3	Floor Noise
2	4804.000	32.3	0.7	33.0	54.0	21.0	
3	7206.000	31.5	4.0	35.5	54.0	18.5	Floor Noise
4	9608.000	31.5	6.9	38.4	54.0	15.6	Floor Noise
5	12010.000	32.9	7.8	40.7	54.0	13.3	Floor Noise

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4804.000	36.0	0.7	36.7	54.0	17.3	

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : XY
*********************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f       Result       Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   500.000     21.1      -2.2       18.9        46.0      27.1   Floor Noise
  2   700.000     21.0       1.0       22.0        46.0      24.0   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : XY
*********************************************************************************************
Final Result

--- Horizontal Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     43.9       0.8       44.7       74.0     29.3
  2   7323.000     44.2       4.1       48.3       74.0     25.7   Floor Noise
  3   9764.000     44.1       6.8       50.9       74.0     23.1   Floor Noise
  4  12205.000     43.7       7.7       51.4       74.0     22.6   Floor Noise

--- Vertical Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     42.7       0.8       43.5       74.0     30.5   Floor Noise
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Mch
Remark4 : XY

****

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4882.000	33.3	0.8	34.1	54.0	19.9	
2	7323.000	31.9	4.1	36.0	54.0	18.0	Floor Noise
3	9764.000	31.2	6.8	38.0	54.0	16.0	Floor Noise
4	12205.000	32.2	7.7	39.9	54.0	14.1	Floor Noise

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	4882.000	30.9	0.8	31.7	54.0	22.3	Floor Noise

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : YZ
************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   500.000     21.1      -2.2       18.9       46.0      27.1   Floor Noise
  2   700.000     21.0       1.0       22.0       46.0      24.0   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : YZ
*************************************************************************************************
Final Result

--- Horizontal Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     43.7       0.8       44.5       74.0     29.5
  2   7323.000     44.2       4.1       48.3       74.0     25.7   Floor Noise
  3   9764.000     44.1       6.8       50.9       74.0     23.1   Floor Noise
  4  12205.000     43.7       7.7       51.4       74.0     22.6   Floor Noise

--- Vertical Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     42.7       0.8       43.5       74.0     30.5   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : YZ
************************************************************************************************
Final Result

--- Horizontal Polarization (AV)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     32.6       0.8       33.4       54.0     20.6
  2   7323.000     31.9       4.1       36.0       54.0     18.0   Floor Noise
  3   9764.000     31.2       6.8       38.0       54.0     16.0   Floor Noise
  4  12205.000     32.2       7.7       39.9       54.0     14.1   Floor Noise

--- Vertical Polarization (AV)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     30.9       0.8       31.7       54.0     22.3   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : ZX
************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   500.000     21.1      -2.2       18.9       46.0      27.1   Floor Noise
  2   700.000     21.0       1.0       22.0       46.0      24.0   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : ZX
************************************************************************************************
Final Result

--- Horizontal Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     44.9       0.8       45.7       74.0     28.3
  2   7323.000     44.2       4.1       48.3       74.0     25.7   Floor Noise
  3   9764.000     44.1       6.8       50.9       74.0     23.1   Floor Noise
  4  12205.000     43.7       7.7       51.4       74.0     22.6   Floor Noise

--- Vertical Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     42.7       0.8       43.5       74.0     30.5   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Mch
Remark4           : ZX
************************************************************************************************
Final Result

--- Horizontal Polarization (AV)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     35.6       0.8       36.4       54.0     17.6
  2   7323.000     31.9       4.1       36.0       54.0     18.0   Floor Noise
  3   9764.000     31.2       6.8       38.0       54.0     16.0   Floor Noise
  4  12205.000     32.2       7.7       39.9       54.0     14.1   Floor Noise

--- Vertical Polarization (AV)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   4882.000     30.9       0.8       31.7       54.0     22.3   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Hch
Remark4           : XY
*************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1    500.000     21.1      -2.2       18.9        46.0     27.1   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Hch
Remark4           : XY
************************************************************************************************
Final Result

--- Horizontal Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   2483.500     51.4      -5.5       45.9       74.0     28.1
  2   4960.000     45.6       0.7       46.3       74.0     27.7
  3   7440.000     44.9       3.9       48.8       74.0     25.2  Floor Noise
  4   9920.000     43.8       6.5       50.3       74.0     23.7  Floor Noise
  5  12400.000     44.7       7.2       51.9       74.0     22.1  Floor Noise

--- Vertical Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   2483.500     51.1      -5.5       45.6       74.0     28.4
  2   4960.000     44.0       0.7       44.7       74.0     29.3
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Hch
Remark4 : XY
****

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	40.9	-5.5	35.4	54.0	18.6	
2	4960.000	34.5	0.7	35.2	54.0	18.8	
3	7440.000	32.5	3.9	36.4	54.0	17.6	Floor Noise
4	9920.000	31.7	6.5	38.2	54.0	15.8	Floor Noise
5	12400.000	32.5	7.2	39.7	54.0	14.3	Floor Noise

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	40.0	-5.5	34.5	54.0	19.5	
2	4960.000	32.9	0.7	33.6	54.0	20.4	

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Hch
Remark4           : YZ
*************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1    500.000     21.1      -2.2       18.9        46.0     27.1   Floor Noise
```

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 10:58

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Hch
Remark4           : YZ
*********************************************************************************************
Final Result

--- Horizontal Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   2483.500     50.5      -5.5       45.0       74.0     29.0
  2   4960.000     43.3       0.7       44.0       74.0     30.0
  3   7440.000     44.9       3.9       48.8       74.0     25.2  Floor Noise
  4   9920.000     43.8       6.5       50.3       74.0     23.7  Floor Noise
  5  12400.000     44.7       7.2       51.9       74.0     22.1  Floor Noise

--- Vertical Polarization (PK)---
No.  Frequency   Reading     c.f      Result      Limit     Margin  Remark
       [MHz]   [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1   2483.500     48.8      -5.5       43.3       74.0     30.7
  2   4960.000     43.4       0.7       44.1       74.0     29.9  Floor Noise
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Hch
Remark4 : YZ
****

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	40.1	-5.5	34.6	54.0	19.4	
2	4960.000	33.2	0.7	33.9	54.0	20.1	
3	7440.000	32.5	3.9	36.4	54.0	17.6	Floor Noise
4	9920.000	31.7	6.5	38.2	54.0	15.8	Floor Noise
5	12400.000	32.5	7.2	39.7	54.0	14.3	Floor Noise

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	39.0	-5.5	33.5	54.0	20.5	
2	4960.000	31.0	0.7	31.7	54.0	22.3	Floor Noise

```
************************************  TAIYO YUDEN CO.,LTD.  ********************************
                                          <<6365F>>                      12 June,2007 15:44

Standard          : FCC Part15 Subpart C §15.247(d)
Model No.         : SonicMan / SO2
Serial No.        : CRF001
Operator          : Fukuda
Power Supply      : DC 2.4V from Battery
Temp./Humid.      : 23.8°C / 58.6%
Remark1           : Transmitting Mode
Remark2           : GFSK Modulation
Remark3           : Hch
Remark4           : ZX
*************************************************************************************************
Final Result

--- Horizontal Polarization (QP)---
No.  Frequency   Reading     c.f      Result       Limit     Margin  Remark
       [MHz]    [dB(μV)] [dB(1/m)] [dB(μV/m)] [dB(μV/m)]   [dB]
  1    500.000     21.1      -2.2       18.9        46.0     27.1   Floor Noise
```

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Hch
Remark4 : ZX
****

Final Result

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	50.9	-5.5	45.4	74.0	28.6	
2	4960.000	44.0	0.7	44.7	74.0	29.3	
3	7440.000	44.9	3.9	48.8	74.0	25.2	Floor Noise
4	9920.000	43.8	6.5	50.3	74.0	23.7	Floor Noise
5	12400.000	44.7	7.2	51.9	74.0	22.1	Floor Noise

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	51.9	-5.5	46.4	74.0	27.6	
2	4960.000	43.6	0.7	44.3	74.0	29.7	

********** TAIYO YUDEN CO.,LTD. **********
<<6365F>> 12 June,2007 10:58

Standard : FCC Part15 Subpart C §15.247(d)
Model No. : SonicMan / SO2
Serial No. : CRF001
Operator : Fukuda
Power Supply : DC 2.4V from Battery
Temp./Humid. : 23.8°C / 58.6%
Remark1 : Transmitting Mode
Remark2 : GFSK Modulation
Remark3 : Hch
Remark4 : ZX
****

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	40.7	-5.5	35.2	54.0	18.8	
2	4960.000	33.3	0.7	34.0	54.0	20.0	
3	7440.000	32.5	3.9	36.4	54.0	17.6	Floor Noise
4	9920.000	31.7	6.5	38.2	54.0	15.8	Floor Noise
5	12400.000	32.5	7.2	39.7	54.0	14.3	Floor Noise

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(μV)]	c.f [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Remark
1	2483.500	40.4	-5.5	34.9	54.0	19.1	
2	4960.000	32.9	0.7	33.6	54.0	20.4	

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.
(Limit [W] =60 / f [MHz], 24mW at 2.5GHz)

EIRP Calculation:

A	B	C		Limit [mW] 60 / f [MHz]
Specified Antenna Gain [dBi]	Max. RF Output Power at Antenna Terminal [dBm]	Total EIRP		
		[dBm]	[mW]	
2.044	-2.94	-0.90	0.81	25

Calculation: C [dBm] = A [dBi] + B [dBm]

EIRP = -0.90 dBm = 0.81mW

15 Photos of Tested EUT

16 Photos of Test Setup

Photos of Radiated Measurement

Axial Direction: XY-Plane

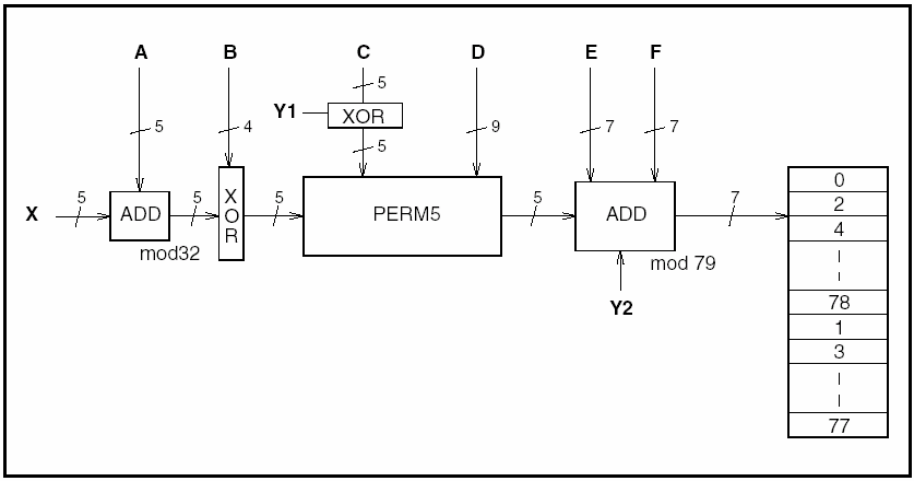
Axial Direction: YZ-Plane

Axial Direction: ZX-Plane

Appendix 1: AFH-Hopping Sequence

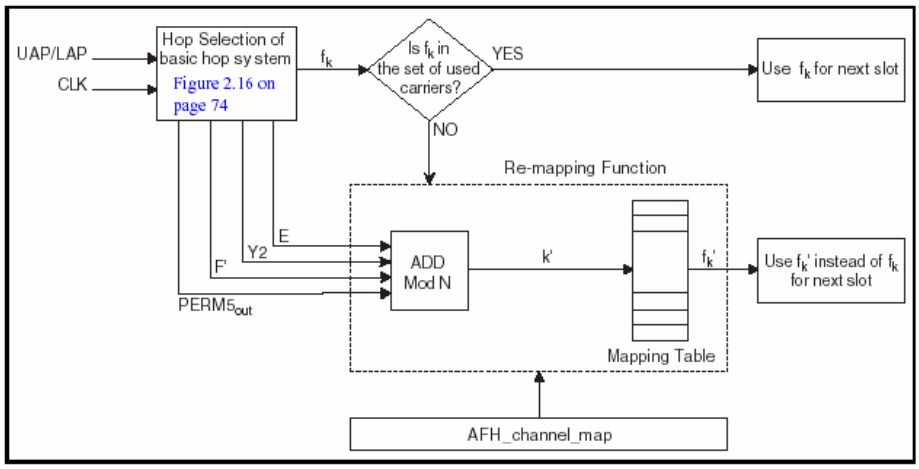
AFH-Hopping Sequence is provided for in the Bluetooth Spec 1.2. Here is an outline below.

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 160that 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: Certificate of Accreditation

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200607-0

Taiyo Yuden Co., Ltd. EMC Center
Takasaki-shi Gunma 370-3347
JAPAN

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).

2006-10-01 through 2007-09-30
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)

Appendix 3: Test Instruments

1. Conducted RF Test via Antenna Terminal

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date (Interval (year))	
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	14 February 2007 (1)	●
Spectrum Analyzer	Agilent Technologies	E4446A	US42070181	13 November 2006 (1)	○
RF Cable	SUHNER	SUCOFLEX 104E	RF2	4 July 2006 (1)	●
RF Cable	SUHNER	SUCOFLEX 104	RF3-2	4 July 2006 (1)	●
Power Divider	Aeroflex / Inmet	6005-03	RF-8	4 July 2006 (1)	●
Multi Meter	Advantest	R6451A	67840312	15 June 2006 (1)	●
Hydro Thermograph	SEKONIC	ST-200	HD01-000797	15 August 2006 (1)	●

2. Radiated Emission Test

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date (Interval (year))	
10m Anechoic Chamber	TDK Co., Ltd.	DA-06912	-	5-9 February 2007 (1)	●
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100148	31 July 2006 (1)	●
Spectrum Analyzer	Agilent Technologies	E4407B	MY44221019	23 April 2007 (1)	●
		E4446A	US42070181	13 November 2006 (1)	●
Amplifier		83017A	3950M00169	2 October 2006 (1)	●
		8447D	2944A06812	22 September 2006 (1)	●
RF Selector	TDK Co., Ltd	NS4900	0302-010	22 September 2006 (1)	●
Tunable Filter	TOYO Corporation	NF-49BT	No.1	2 October 2006 (1)	○
RF Filter	Microtronics	ERM50702-01	020	2 October 2006 (1)	○
RF Cable	SUHNER	RG214	RG 1	22 September 2006 (1)	●
		RG214	RG 3	22 September 2006 (1)	●
		RG214	RG 5	22 September 2006 (1)	●
		RG214	RG 8	22 September 2006 (1)	●
	HP	HP8120-4782	163 9232	22 September 2006 (1)	●
	SUHNER	SUCOFLEX 106	SU1	2 October 2006 (1)	●
		SUCOFLEX 103	SU5	2 October 2006 (1)	●
		SUCOFLEX 103	SU6	2 October 2006 (1)	○
	HP	85381C	No.3	2 October 2006 (1)	●
Attenuator	KYORITSU	KPD-602	220142	22 September 2006 (1)	●
Antenna	Schwarzbeck	BBA9106	No.3	22 December 2006 (1)	●
		UHALP9108-A	160	22 December 2006 (1)	●
		VHA9103	No.3 (+D3-1, 2)	22 December 2006 (1)	○
		UHA9105	No.3	22 December 2006 (1)	○
	EMCO	3115	9403-4232	28 March 2007 (2)	●
		3116	9311-2227	28 March 2007 (2)	●
Hydro Thermograph	SEKONIC	ST-50	HE01-00511	7 February 2007 (1)	●
Software	TOYO Corporation	EP5/RE Ver.3.7.0	0208086	-	●

Note:
●: Applied by measurement.
○: Not applied by measurement.