

# TEST REPORT

Test Report No.: 9027FC

Applicant : Clarion Co., Ltd.  
 EUT : Bluetooth module  
 Model No. : UGZZ5-X01  
 Serial No. : 001E3DAAE3BE (Radiated Emission Test)  
 001E3DAAE700 (Conducted RF Test via Antenna Terminal)  
 FCC ID : SJ2HGZ0036  
 Issue Date : 1 July 2009  
 Date of Test : 23 June 2009 (Radiated Emission Test)  
 25 June 2009 (Conducted RF Test via Antenna Terminal)  
 Test Standard : FCC Part 15 Subpart C § 15.247  
 Procedure : ANSI C63.4: 2003 PUBLIC NOTICE DA 00-705  
 PUBLIC NOTICE DA 00-1407  
 Test Results : Pass

Approved By: \_\_\_\_\_

Manager / Jiro Ogiwara

Reviewed By: \_\_\_\_\_

/ Yukihiro Minegishi

/ Kentaro Fukuda

Tested By: \_\_\_\_\_

/ Yukihiro Minegishi

/ Masashi Tsukui

**NVLAP**<sup>®</sup>

NVLAP LAB CODE 200607-0

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## Revised Record

<b>Revised Record</b>					
Number of Revised Time	Mark	Issue Date	Person in Charge	Detail of Revision	Approved By
Initial	-	1 July 2009	Masashi Tsukui	-	Jiro Ogiwara

## 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	Clarion Co., Ltd.
Address	1410 Inada Hitachinaka-Shi, Ibaraki-Ken, 312-8505 JAPAN

### 2.2 Product Description

EUT	Bluetooth module
Model No.	UGZZ5-X01
Serial No.	001E3DAAE3BE (Radiated Emission Test) 001E3DAAE700 (Conducted RF Test via Antenna Terminal)
FCC ID	SJ2HGZ0036
Production Stage	Production
Type of Wide Band Modulation	FHSS Frequency Hopping (79ch) AFH: Adaptive Frequency Hopping (20ch)
Type of Modulation	GFSK
ITU Code	F1D
Power Supply	DC 3.30 V
Operating Voltage Range	DC 3.10V Min. DC 3.50V Max.
Operating Temperature Range	-30.0 degree C Min. 85.0 degree C Max.
Weight	10.6g
Dimensions of EUT	W 39.3mm * L 76.6mm * H 3.9mm
Antenna Type	Inverted F
Max Antenna Gain	-3.10dBi
Operating Clocks	26MHz
Receipt Date of Tested Sample	22 June 2009

EUT is Bluetooth module with the external antenna.

This is operated within the bands 2400 - 2483.5MHz frequency hopping intentional radiators.

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	Tested	Worst Margin	Results
1	AC Powerline Conducted Emission	ANSI C63.4: 2003	FCC 15.207	Conducted Emission Test	N/A	-	N/A*1
2	Carrier Frequency Separation	Public Notice DA00-705	FCC 15.247 (a)(1)	Conducted RF Test via Antenna Terminal	Performed	-	Pass
3	Number of Hopping Frequency	Public Notice DA00-1407	FCC 15.247 (a)(1)(iii)		Performed	-	Pass
4	Dwell Time		FCC 15.247 (a)(1)(iii)		Performed	-	Pass
5	Maximum Peak Output Power		FCC 15.247 (b)(1)		Performed	-	Pass
6	Band Edge Compliance		FCC 15.247(d)		Performed	-	Pass
7	Spurious RF Conducted Emission		FCC 15.247(d)		Performed	-	Pass
8	Radiated Emission		FCC 15.247(d)		Radiated Emission Test	Performed	Quasi-Peak : 9.1dB Transmitting Mode: 2402MHz Type of Modulation: GFSK Modulation Frequency: 86.019MHz Antenna Polarization: Vertical

\*1: This EUT is intended for use in vehicles. So this measurement is not applied to this EUT.

## 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 Subpart C regulation test were performed on the shielded room, and radiated interference field strength test was performed on the 10m 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) and listed by Industry Canada (No.4389A-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 and Public Notice DA00-1407 released June 26, 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 1GHz to 25GHz was investigated with the spectrum (peak detector function) under the FCC regulation section 15.209 (e) and 15.35 (b). For above 18GHz, 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 (500uV/m). Data is presented for the “worst case” measurements, that EUT was normal operated.
4. Radiate testing in the range of 30MHz to 1000MHz was performed at an antenna to EUT distance of 3 meters under the 15.209 (e) and 15.31(f)(1).
5. Tests were performed with the representative channel operation as follows.
  - a. Lowest Frequency Channel: 0ch 2402MHz
  - b. Middle Frequency Channel: 39ch 2441MHz
  - c. Highest Frequency Channel: 78ch 2480MHz



## 3.2 Operating Modes

### Transmitting Mode

Type of Modulation		GFSK
Signal Pattern		PRBS9
Signal Packet Type	GFSK	DH5
Representative Channel		0ch 2402MHz (Lowest Frequency Channel)
		39ch 2441MHz (Middle Frequency Channel)
		78ch 2480MHz (Highest Frequency Channel)

#### Remarks:

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

Signal Packet Type: DH5:

Data high rate, ACL type packet

Data payload with CRC, without FEC

Fully transmission within one consecutive 625us transmission slots

Number of slot = 5

Data size of payload = 339 bytes

Software (Controller): AIO Easy Tester Lite! Ver1.27 software supplied by ALPS ELECTRIC CO.,

LTD. was used to set up to the Bluetooth operating mode except for AFH

operating mode.

In order to establish the AFH operating mode, Ceva Host Controller Data

Transfer Tester Version BT1.2 software supplied by Ceva, Inc. was used.

### 3.3 Configuration of Tested System

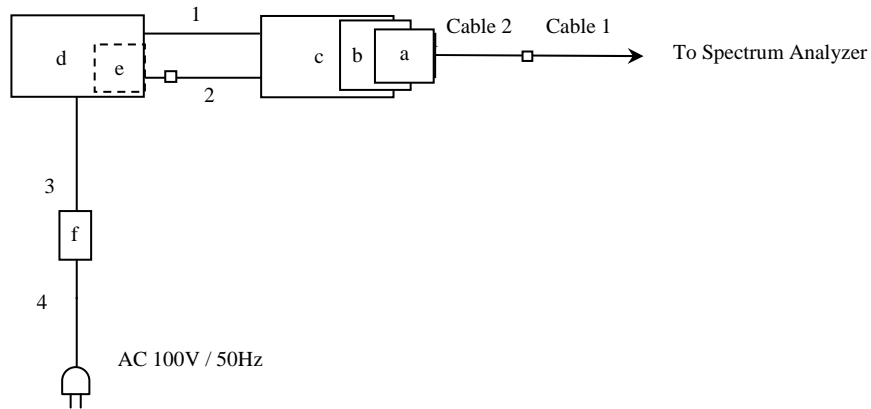
#### (1) Conducted RF Test via Antenna Terminal

These numbers and the marks in the picture are corresponding to the numbers and the marks in tables shown.

Power Supply of EUT: DC 3.3V from QUICK STARTER KIT Board “c”.

(Power supply to QUICK STARTER KIT Board “c” was supplied by Note PC “d” USB.)

#### Test Setting for Normal Frequency Hopping and Non Frequency Hopping Mode



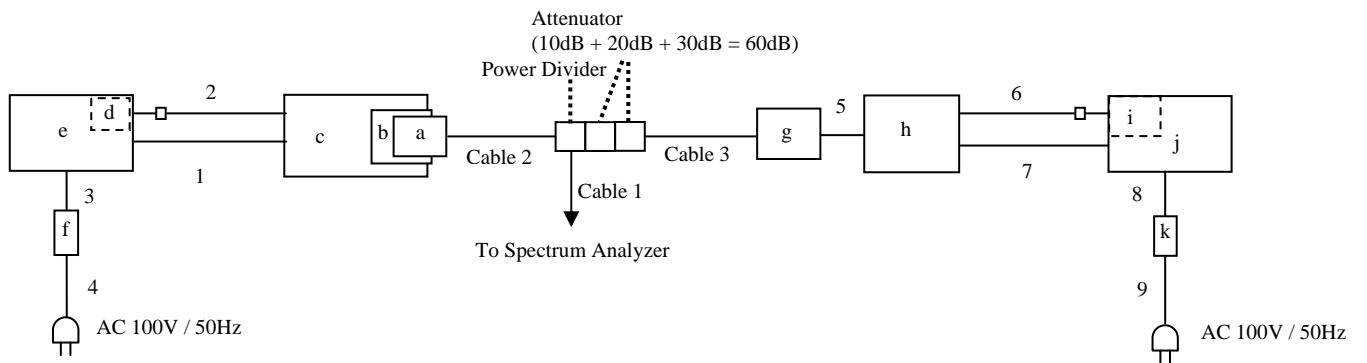
#### List of EUT and Accessories

	Product Name	Model No.	Serial No.	Manufacturer	EUT / Accessory	Notes
a	Bluetooth module	UGZZ5-X01	001E3DAAE700	ALPS Corporation	EUT	SJ2HGZ0036
b	Jig	FX417Z25	26	ALPS Corporation	Accessory	-
c	QUICK STARTER KIT Board	FX364Z12-1	5	ALPS Corporation	Accessory	-
d	Note PC	2662-LFJ	00045-123-245-834	IBM Corporation	Accessory	-
e	RS-232C Serial I/O Card	N217	0310000262	Socket Corporation	Accessory	-
f	AC Adapter for Note PC	02K6810	10	IBM Corporation	Accessory	-

#### Interface Cables

	Cable Type	Model No.	Shielded	Ferrite Core	Material of Connector	Length	Notes
1	RS-232C Cable	-	Yes	No	Plastic	2.10m	-
2	USB Cable	-	Yes	No	Metal	2.10m	-
3	DC Cable	-	No	No	Plastic	1.80m	-
4	AC Cable	-	No	No	Plastic	1.00m	-

**Test Setting for Adaptive Frequency Hopping Mode**



**List of EUT and Accessories**

	Product Name	Model No.	Serial No.	Manufacturer	EUT / Accessory	Notes
a	Bluetooth module	UGZZ5-X01	001E3DAAE700	ALPS Corporation	EUT	SJ2HGZ0036
b	Jig	FX417Z25	26	ALPS Corporation	Accessory	-
c	QUICK STARTER KIT Board	FX364Z12-1	5	ALPS Corporation	Accessory	-
d	RS-232C Serial I/O Card	N217	0310000262	Socket Corporation	Accessory	-
e	Note PC	2662-LFJ	00045-123-245-834	IBM Corporation	Accessory	-
f	AC Adapter for Note PC	02K6810	10	IBM Corporation	Accessory	-
g	Bluetooth module	UGZZ5-X02	3	ALPS Corporation	Accessory	-
h	QUICK STARTER KIT Board	FX364Z12-1	4	ALPS Corporation	Accessory	-
i	RS-232C Serial I/O Card	PM-020	R16994	Brainboxes Japan Corporation	Accessory	-
j	Note PC	CF-B5F	0GKSA03930	Panasonic Corporation	Accessory	-
k	AC Adapter for Note PC	CF-AA1533 J C1	C000703316C	Panasonic Corporation	Accessory	-

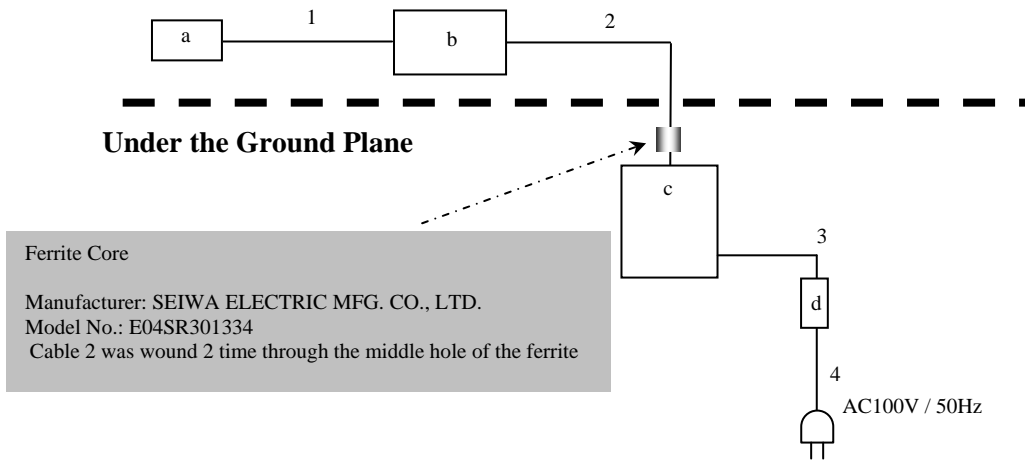
**Interface Cables**

	Cable Type	Model No.	Shielded	Ferrite Core	Material of Connector	Length	Notes
1	USB Cable	-	Yes	No	Metal	2.10m	-
2	RS-232C Cable	-	Yes	No	Plastic	2.10m	-
3	DC Cable	-	No	No	Plastic	1.80m	-
4	AC Cable	-	No	No	Plastic	1.00m	-
5	Bus Cable	-	No	No	Plastic	0.60m	-
6	USB Cable	-	Yes	No	Metal	2.05m	-
7	RS-232C Cable	-	Yes	No	Plastic	1.85m	-
8	DC Cable	-	No	No	Plastic	1.80m	-
9	AC Cable	-	No	No	Plastic	0.80m	-

**(2) Radiated Emission Test**

These numbers and the marks in the picture are corresponding to the numbers and the marks in tables shown.  
 Power Supply of EUT: DC 3.3V from QUICK STARTER KIT Board “b”.

(Power supply to QUICK STARTER KIT Board “b” was supplied by Note PC “c” USB.)



**List of EUT and Accessories**

	Product Name	Model No.	Serial No.	Manufacturer	EUT / Accessory	FCC ID / DoC
a	Bluetooth module	UGZZ5-X01	001E3DAAE3BE	ALPS Corporation	EUT	SJ2HGZ0036
b	QUICK STARTER KIT Board	FX364Z12-1	4	ALPS Corporation	Accessory	-
c	Note PC	2662-LFJ	00045-123-245-834	IBM Corporation	Accessory	-
d	AC Adapter for Note PC	02K6810	10	IBM Corporation	Accessory	-

**Interface Cables**

	Cable Type	Model No.	Shielded	Ferrite Core	Material of Connector	Length	Treatment for the Extra Length
1	Bus Cable	-	No	No	Plastic	0.80m	-
2	USB Cable	-	Yes	No	Metal	2.05m	-
3	DC Cable	-	No	No	Plastic	1.80m	-
4	AC Cable	-	No	No	Plastic	1.00m	-

### 3.4 Test Instruments

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

### 3.5 Special Test Condition

Nothing.

### 3.6 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	-3.10dBi

## 5 AC Powerline Conducted Emission

N/A

This EUT is intended for use in vehicles. 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. : 001E3DAAE700  
 Power : DC 3.3V  
 Mode : Transmitting Mode, Non Frequency Hopping  
 Temperature : 23.5 degree C  
 Humidity : 58.6%

#### GFSK Modulation

Channel	Frequency [MHz]	20dB Bandwidth [MHz]
0ch (Lowest)	2402.0	0.862
39ch (Middle)	2441.0	0.906
78ch (Highest)	2480.0	0.858

## 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. : 001E3DAAE700  
 Power : DC 3.3V  
 Mode : Transmitting Mode, Frequency Hopping  
           Transmitting Mode, AFH  
 Temperature : 23.5 degree C  
 Humidity : 58.6%  
 Regulation : FCC Part15 C §15.247 (a)(1)

#### GFSK Modulation Frequency Hopping (79ch)

Channel	Channel Separation [MHz]	Limit *1 [MHz]
0ch-1ch (Lowest)	0.998	> 0.575
38ch-39ch (Middle)	0.992	> 0.604
77ch-78ch (Highest)	1.016	> 0.572

#### Adaptive Frequency Hopping (20ch)

Channel	Channel Separation [MHz]	Limit *1 [MHz]
0ch-1ch (Lowest)	1.004	> 0.575
38ch-39ch (Middle)	1.004	> 0.604
77ch-78ch (Highest)	1.004	> 0.572

\*1: Limit value of Carrier Frequency Separation is 2 / 3 of 20dB Bandwidth.  
 Limit is two-thirds of the 20dB bandwidth of the hopping channel provided the systems operate with an output power no greater than 125mW.  
 Refer the result of 20dB Bandwidth to Section 6.

## 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. : 001E3DAAE70000037a01f019  
 Power : DC 3.3V  
 Mode : Transmitting Mode, Frequency Hopping  
           Transmitting Mode, AFH  
 Temperature : 23.5 degree C  
 Humidity : 58.6%  
 Regulation : FCC Part15 C §15.247 (a)(1)(iii)

#### GFSK Modulation

Mode	Number of Channel [times]	Limit [times]
Frequency Hopping (79ch)	79	>= 15
Adaptive Frequency Hopping (20ch)	20	>= 15

## 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. : 001E3DAAE700  
 Power : DC 3.3V  
 Mode : Transmitting Mode, Frequency Hopping  
           Transmitting Mode, AFH  
 Temperature : 23.5 degree C  
 Humidity : 58.6%  
 Regulation : FCC Part15 C §15.247 (a)(1)(iii)

#### GFSK Modulation

Frequency Hopping (79ch)			Adaptive Frequency Hopping (20ch)		
Channel	Dwell Time [ms]	Limit [ms]	Channel	Dwell Time [ms]	Limit [ms]
0ch (Lowest)	320.11	<= 400	0ch (Lowest)	318.67	<= 400
39ch (Meddle)	317.98	<= 400	39ch (Meddle)	318.67	<= 400
78ch (Highest)	320.11	<= 400	78ch (Highest)	321.87	<= 400

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

Worst-Case of Frequency Hopping (79ch) is shown the following.

### **Time of Occupancy (Dwell Time) for GFSK Modulation**

The frequency-hopping rate of Bluetooth system is 1600 hops per 1s.

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 1s.

The number of hopping channel is 79.

The number of times that appears in 1 channel per 1s is as follows.

$$266.67 / 79 = 3.37 \text{ times}$$

The average time of occupancy on any channel shall not be greater than 0.4s (400ms) within a period of 0.4s multiplied by the number of hopping channels employed  $0.4 * 79 = 31.6\text{s}$

The number of times that appears in 1 channel per 31.6s is as follows.

$$3.37 * 31.6 = 106.49 \text{ times}$$

Transmitting time is 3.006ms.

Then, dwell time is  $106.49 * 3.006\text{ms} = 320.11\text{ms}$  per 31.6s.

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

Worst-Case of AFH (20ch) is shown the following.

### **Time of Occupancy (Dwell Time) for GFSK Modulation**

The frequency-hopping rate of Bluetooth system is 1600 hops per 1s.

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 1s.

The number of hopping channel is 20.

The number of times that appears in 1 channel per 1s is as follows.

$$266.67 / 20 = 13.34 \text{ times}$$

The average time of occupancy on any channel shall not be greater than 0.4s (400ms) within a period of 0.4s multiplied by the number of hopping channels employed  $0.4 * 20 = 8.0\text{s}$

The number of times that appears in 1 channel per 8.0s is as follows.

$$13.34 * 8.0 = 106.72 \text{ times}$$

Transmitting time is 3.016ms.

Then, dwell time is  $106.72 * 3.016\text{ms} = 321.87\text{ms}$  per 8.0s.

## 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. : 001E3DAAE700  
 Power : DC 3.3V  
 Mode : Transmitting Mode, Non Frequency Hopping  
 Temperature : 23.5 degree C  
 Humidity : 58.6%  
 Regulation : FCC Part15 C §15.247 (b)(1)

#### GFSK Modulation

Channel	Frequency [MHz]	Reading [dBm]	Cable1 Loss [dB]	Cable2 Loss [dB]	Result		Limit	
					[dBm]	[mW]	[dBm]	[mW]
0ch (Lowest)	2402	-3.59	0.64	0.55	-2.40	0.575	< 30	< 1000
39ch (Middle)	2441	-3.15	0.64	0.55	-1.96	0.637	< 30	< 1000
78ch (Highest)	2480	-2.69	0.62	0.55	-1.52	0.705	< 30	< 1000

Result = Reading + Cable1 Loss + Cable2 Loss

Note: Cable 1 Loss: RF Cable

Cable 2 Loss: 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:

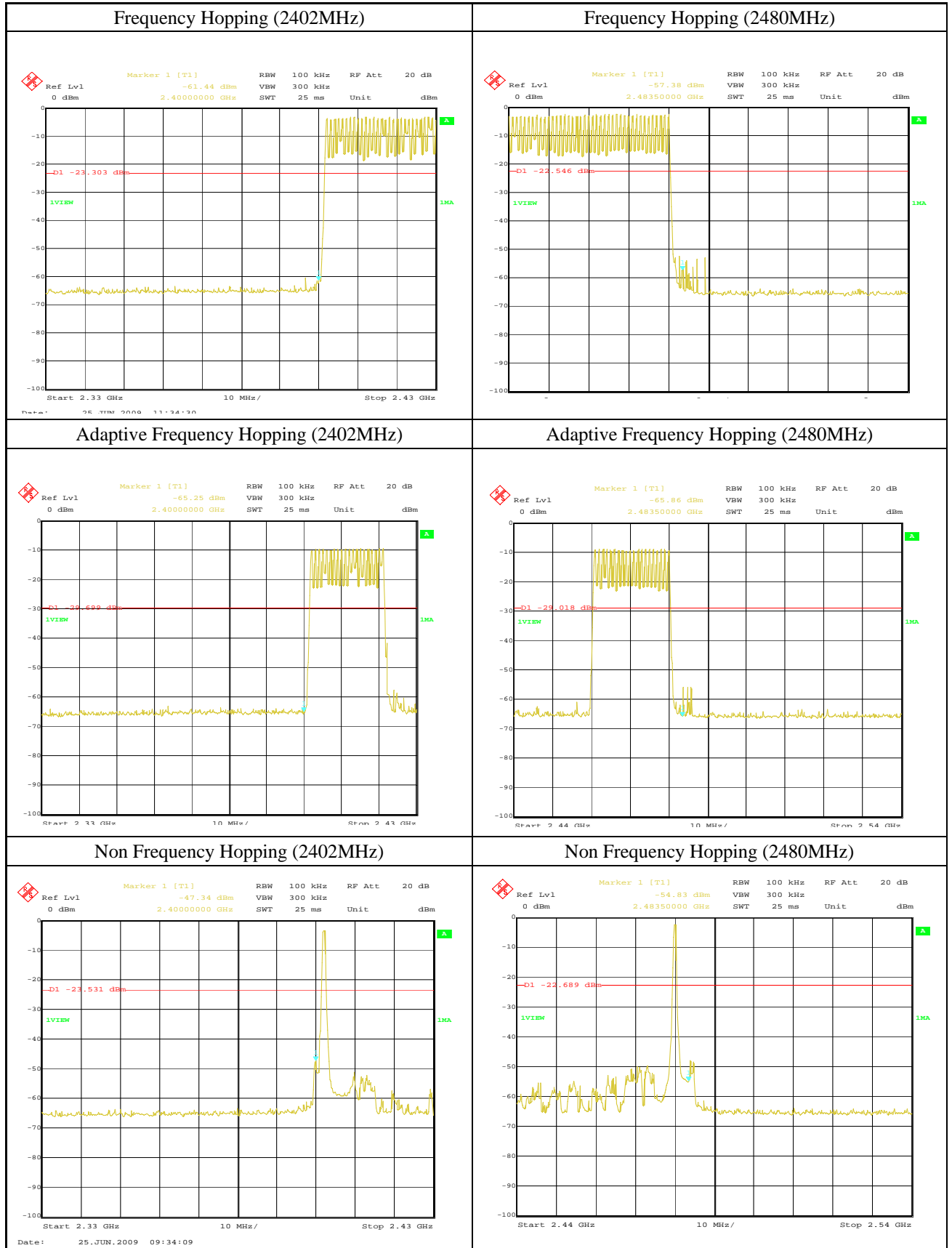
Detector Mode	Peak
RBW	100kHz
VBW	300kHz
Span	100MHz
Sweep Time	Auto

### 11.2 Test Results

Serial No. : 001E3DAAE700  
Power : DC 3.3V  
Mode : Transmitting Mode, Frequency Hopping  
Transmitting Mode, AFH  
Transmitting Mode, Non Frequency Hopping  
Temperature : 23.5 degree C  
Humidity : 58.6%  
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).

GFSK Modulation





## 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:

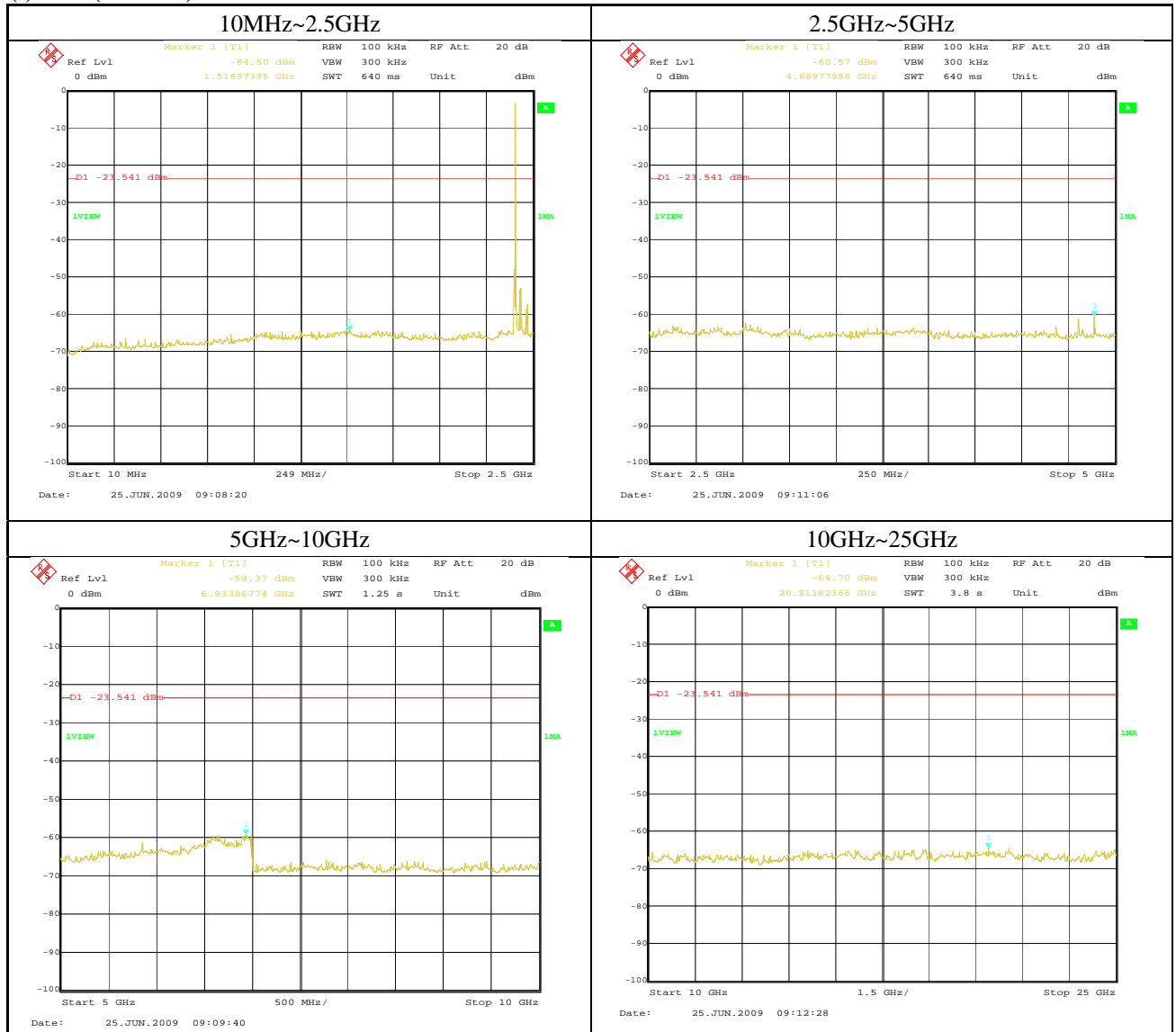
Detector Mode	Peak
RBW	100kHz
VBW	300kHz
Sweep Time	Auto

### 12.2 Test Results

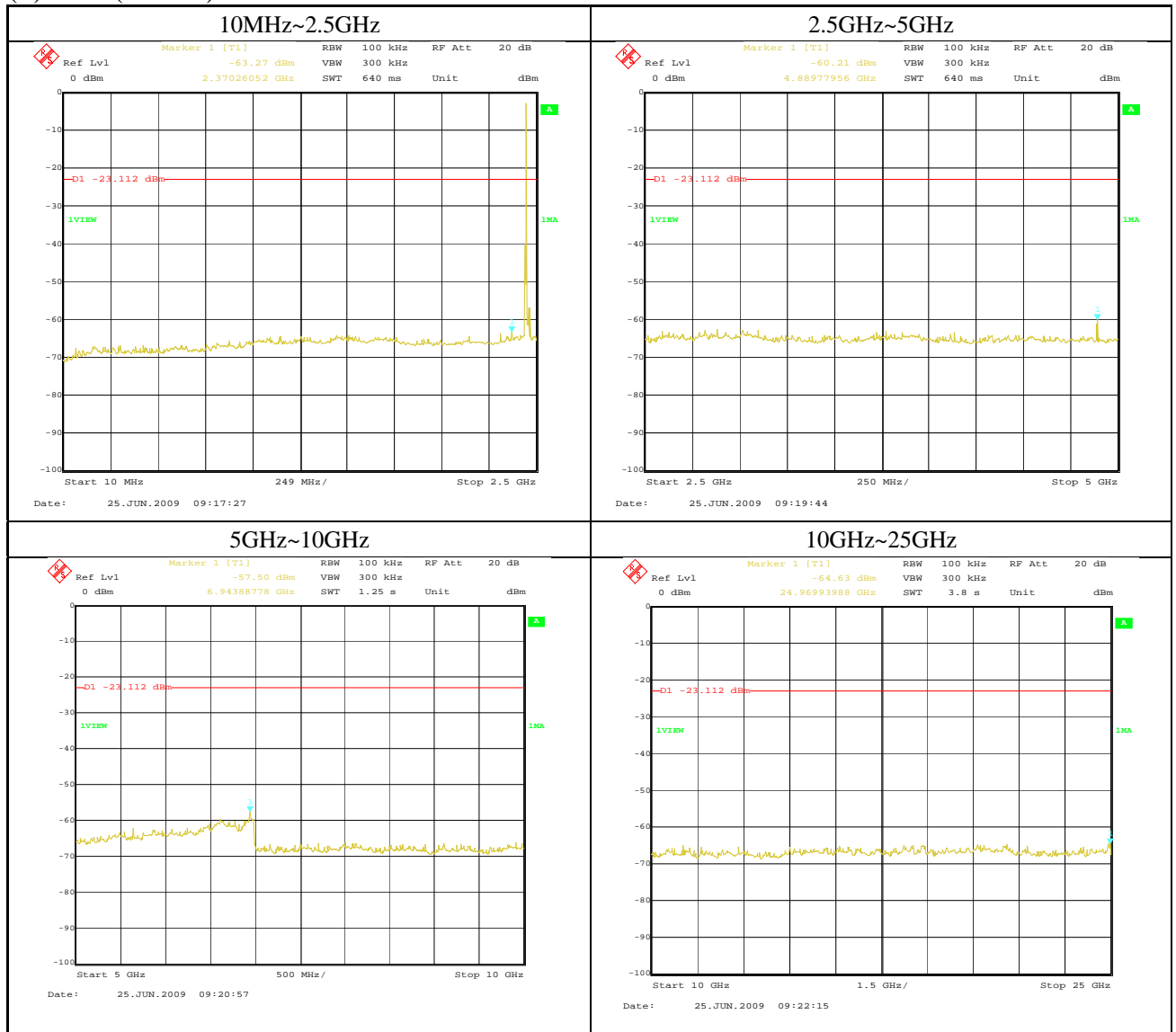
Serial No. : 001E3DAAE700  
Power : DC 3.3V  
Mode : Transmitting Mode, Non Frequency Hopping  
Temperature : 23.5 degree C  
Humidity : 58.6%  
Regulation : FCC Part15 C §15.247 (d)

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).

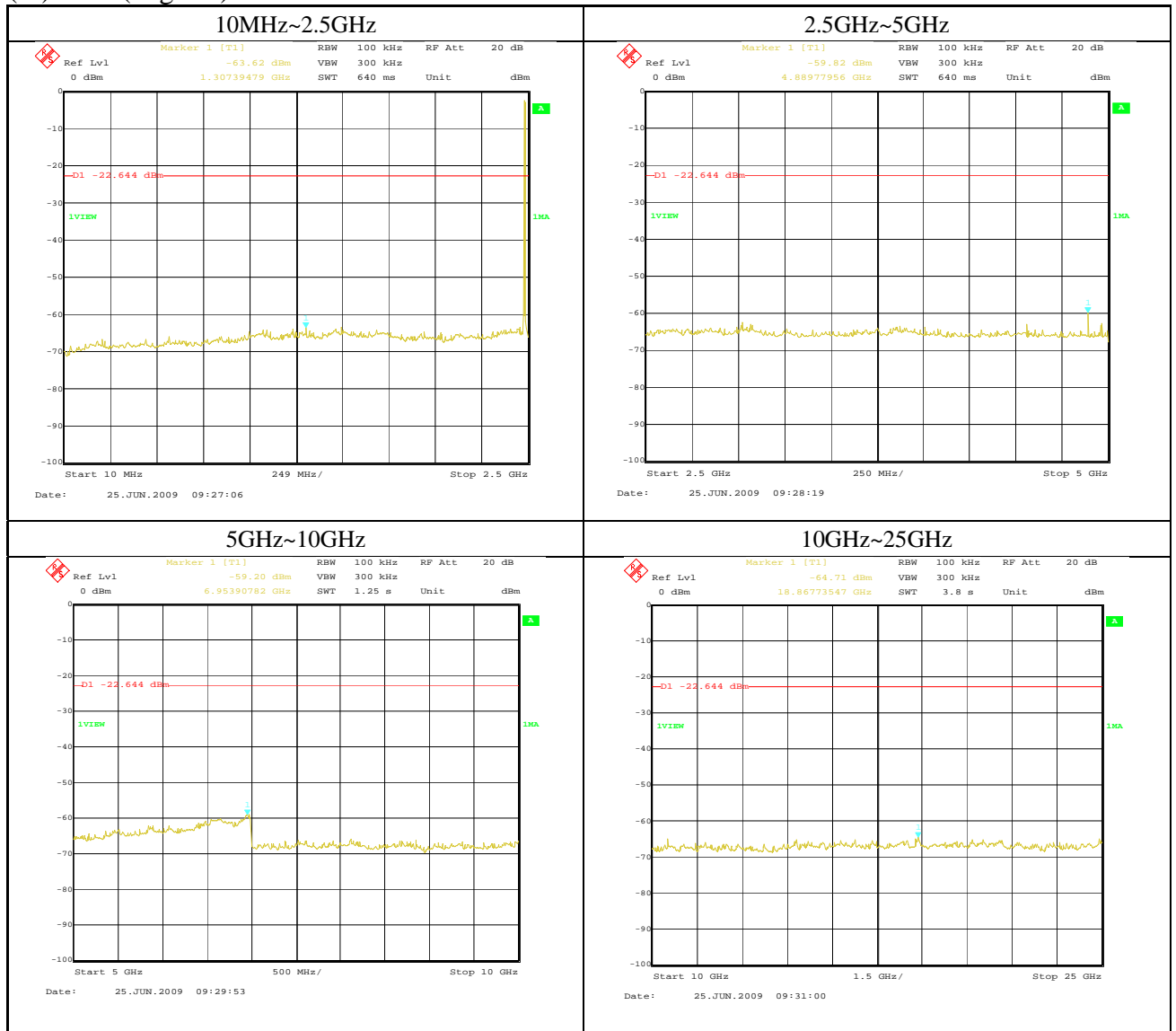
GFSK Modulation  
(i) 0ch (Lowest) 2402MHz



(ii) 39ch (Middle) 2441MHz



(iii) 78ch (Highest) 2480MHz



## 13 Radiated Emission

### 13.1 Test Setup

The test setup was made according to ANSI STD C63.4: 2003 clause 8 on the 10m semi-anechoic chamber, which allows a 3 or 1m distance measurement.

EUT was placed on non-conductive table (foam polystyrene).

The height of this table was 0.8m.

The measurement has been conducted with both horizontal and vertical antenna polarization.

For above 1GHz, the receiving antenna is fixed in the height that EUT is in the illumination area of the 3dB beamwidth of the antenna.

The turntable has been fully rotated. The highest radiation of the equipment has been recorded.

For further description of the configuration refer to separate document named "Test Setup Photos (9027FC)".

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

### 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 36.5dBuV is obtained.

The Correction Factor of -2.0dB/m is added, giving a Radiated Emission of 34.5dBuV/m.

The 34.5dBuV/m value was mathematically converted to its corresponding level in uV/m.

$$RE = 36.5 + (-2.0) = 34.5\text{dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm: } 10^{(34.5 / 20)} = 53.1\text{uV/m}$$

### 13.3 Test Results

Product	: Bluetooth module	Model	: UGZZ5-X01
Serial No.	: 001E3DAAE3BE	Test Standard	: FCC Part15 Subpart C §15.247(d)
Power Supply	: DC 3.3V	Temp. / Humid.	: 24.4 degree C / 64.2%
Operator	: Masashi Tsukui		
Remark	: Transmitting Mode		
	: GFSK Modulation		
	: Lch		

#### Radiated Emission: Lch (2402MHz)

##### Below 1GHz

Frequency [MHz]	Pol. [H / V]	Reading [dB(uV)] QP / AV / PK			Factor [dB/m]	Level [dB(uV/m)] QP / AV / PK			Limit [dB(uV/m)]	Margin [dB] QP / AV / PK			Remark
86.019	V	46.5			-15.6	30.9			40.0	9.1			*

##### Above 1GHz

Frequency [MHz]	Pol. [H / V]	Reading [dB(uV)] QP / AV / PK			Factor [dB/m]	Level [dB(uV/m)] QP / AV / PK			Limit [dB(uV/m)]	Margin [dB] QP / AV / PK			Remark
4804.000	H			52.5	1.1			53.6	74.0			20.4	
4804.000	H		43.3		1.1		44.4		54.0		9.6		
4804.000	V			45.0	1.1			46.1	74.0			27.9	
4804.000	V		34.8		1.1		35.9		54.0		18.1		
4886.000	V			45.3	1.4			46.7	74.0			27.3	
4886.000	V		32.5		1.4		33.9		54.0		20.1		
4886.050	H			51.8	1.4			53.2	74.0			20.8	
4886.050	H		35.3		1.4		36.7		54.0		17.3		
7206.000	H			43.8	4.0			47.8	74.0			26.2	* Floor Noise
7206.000	H		31.6		4.0		35.6		54.0		18.4		* Floor Noise
9608.000	H			44.5	6.9			51.4	74.0			22.6	* Floor Noise
9608.000	H		31.7		6.9		38.6		54.0		15.4		* Floor Noise

Note: \* = Out of Restricted Band.

This frequency is out of the restricted bands, so radiated emission limits specified in Section 15.209 does not apply.

15.247(d):

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Product	: Bluetooth module	Model	: UGZZ5-X01
Serial No.	: 001E3DAAE3BE	Test Standard	: FCC Part15 Subpart C §15.247(d)
Power Supply	: DC 3.3V	Temp. / Humid.	: 24.4 degree C / 64.2%
Operator	: Masashi Tsukui		
Remark	: Transmitting Mode		
	: GFSK Modulation		
	: Mch		

### Radiated Emission:Mch (2441MHz)

#### Below 1GHz

Frequency [MHz]	Pol. [H / V]	Reading [dB(uV)]			Factor [dB/m]	Level [dB(uV/m)]			Limit [dB(uV/m)]	Margin [dB]			Remark
		QP	AV	PK		QP	AV	PK		QP	AV	PK	
86.028	V	46.4			-15.6	30.8			40.0	9.2			*

#### Above 1GHz

Frequency [MHz]	Pol. [H / V]	Reading [dB(uV)]			Factor [dB/m]	Level [dB(uV/m)]			Limit [dB(uV/m)]	Margin [dB]			Remark
		QP	AV	PK		QP	AV	PK		QP	AV	PK	
4882.000	H			53.1	1.4			54.5	74.0			19.5	
4882.000	H		43.3		1.4		44.7		54.0		9.3		
4882.000	V			43.7	1.4			45.1	74.0			28.9	
4882.000	V		34.1		1.4		35.5		54.0		18.5		
4885.933	H			51.5	1.4			52.9	74.0			21.1	
4885.933	H		35.3		1.4		36.7		54.0		17.3		
4885.933	V			44.5	1.4			45.9	74.0			28.1	
4885.933	V		32.5		1.4		33.9		54.0		20.1		
7323.000	H			42.1	4.2			46.3	74.0			27.7	Floor Noise
7323.000	H		32.0		4.2		36.2		54.0		17.8		Floor Noise
9764.000	H			43.9	7.2			51.1	74.0			22.9	* Floor Noise
9764.000	H		31.5		7.2		38.7		54.0		15.3		* Floor Noise

Note: \* = Out of Restricted Band.

This frequency is out of the restricted bands, so radiated emission limits specified in Section 15.209 does not apply.

15.247(d):

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Product	: Bluetooth module	Model	: UGZZ5-X01
Serial No.	: 001E3DAAE3BE	Test Standard	: FCC Part15 Subpart C §15.247(d)
Power Supply	: DC 3.3V	Temp. / Humid.	: 24.4 degree C / 64.2%
Operator	: Masashi Tsukui		
Remark	: Transmitting Mode		
	: GFSK Modulation		
	: Hch		

**Radiated Emission: Hch (2480MHz)**

**Below 1GHz**

Frequency [MHz]	Pol. [H / V]	Reading [dB(uV)] QP / AV / PK			Factor [dB/m]	Level [dB(uV/m)] QP / AV / PK			Limit [dB(uV/m)]	Margin [dB] QP / AV / PK			Remark
86.014	V	46.4			-15.6	30.8			40.0	9.2			*

**Above 1GHz**

Frequency [MHz]	Pol. [H / V]	Reading [dB(uV)] QP / AV / PK			Factor [dB/m]	Level [dB(uV/m)] QP / AV / PK			Limit [dB(uV/m)]	Margin [dB] QP / AV / PK			Remark
4885.958	H			51.2	1.4			52.6	74.0			21.4	
4885.958	H		34.9		1.4		36.3		54.0		17.7		
4960.000	H			51.4	1.6			53.0	74.0			21.0	
4960.000	H		40.5		1.6		42.1		54.0		11.9		
4960.000	V			45.0	1.6			46.6	74.0			27.4	
4960.000	V		34.7		1.6		36.3		54.0		17.7		
7440.000	H			44.9	4.5			49.4	74.0			24.6	Floor Noise
7440.000	H		33.0		4.5		37.5		54.0		16.5		Floor Noise
9920.000	H			44.7	7.4			52.1	74.0			21.9	* Floor Noise
9920.000	H		31.7		7.4		39.1		54.0		14.9		* Floor Noise

Note: \* = Out of Restricted Band.

This frequency is out of the restricted bands, so radiated emission limits specified in Section 15.209 does not apply.

15.247(d):

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).



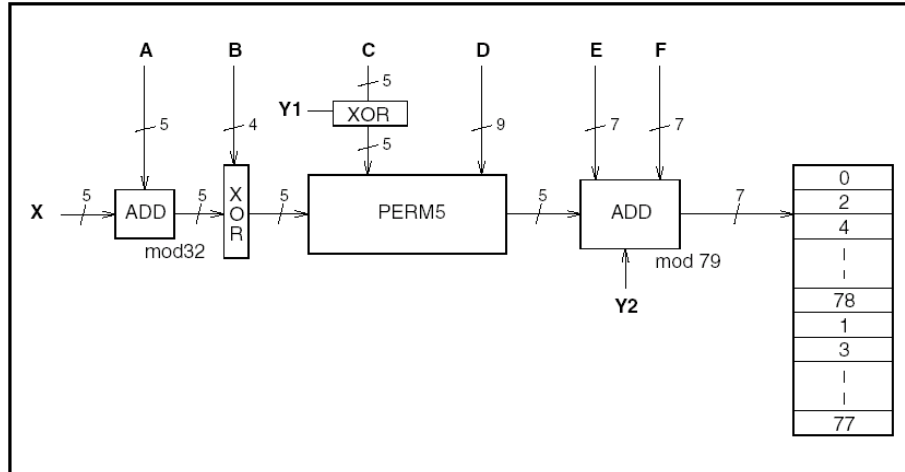
## 14 Photos of Tested EUT and Test Setup

Setup photo with EUT has been submitted as separate document named “Test Setup Photos (9027FC)”.

## Appendix 1: AFH-Hopping Sequence

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

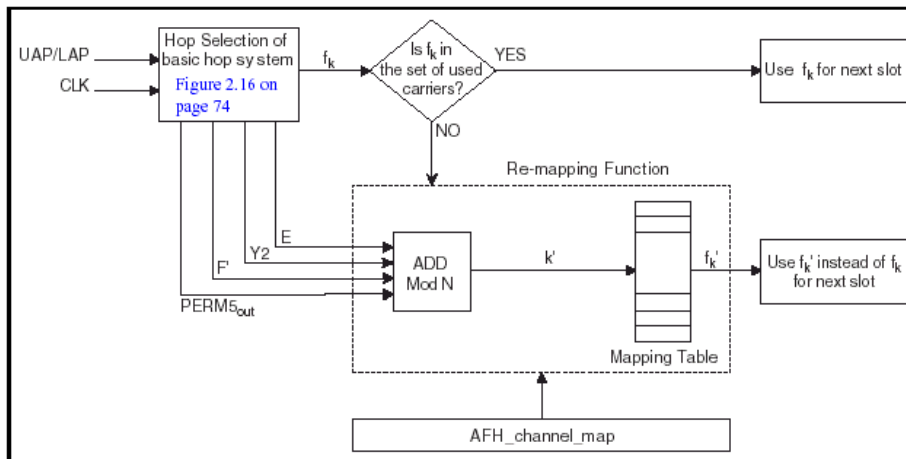
### 1. In the case of 79Hopping



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 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	$CLKN_{16-12} /$ $(CLKN_{16-12} + 16) \bmod 32 /$ $Xir_{4-0} /$ $Xir_{4-0} + 16) \bmod 32$	$Xp_{4-0} / Xi_{4-0}$	$Xprm_{4-0} /$ $Xprs_{4-0} /$ $Xir_{4-0}$	$CLK_{6-2}$
Y1	0	$CLKE_1 / CLK_{N1}$	$CLKE_1 / CLK_{N1} / 1$	$CLK_1$
Y2	0	$32 \times CLKE_1 /$ $32 \times CLK_{N1}$	$32 \times CLKE_1 /$ $32 \times CLK_{N1} /$ $32 \times 1$	$32 \times CLK_1$
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**<sup>®</sup>

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**Certificate of Accreditation to ISO/IEC 17025:2005**

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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).*

2008-10-01 through 2009-09-30  
*Effective dates*



  
*Sally A. Bruce*  
For the National Institute of Standards and Technology

## Appendix 3: Test Instruments

### 1. Conducted RF Test via Antenna Terminal

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date (Interval: 1 year)	
Spectrum Analyzer	Rohde & Schwarz	FSIQ26	840061/0004	20 February 2009	●
	Agilent Technologies	E4446A	US42070181	21 October 2008	○
Power Meter	Agilent Technologies	N1911A	MY45100612	20 February 2009	○
Power Sensor	Agilent Technologies	N1922A	MY45240439	20 February 2009	○
RF Cable	SUHNER	SUCOFLEX 104	RF2-2	1 July 2008	●
		SUCOFLEX 104E	RF3-3	1 July 2008	○
Power Divider	Aeroflex / Inmet	6005-03	RF-8	1 July 2008	●
Multi Meter	Advantest	R6451A	67840312	11 December 2008	●
	Agilent Technologies	34401A	MY41038383	25 June 2008	○
Hygro Thermograph	SEKONIC	ST-200	HD01-000797	8 May 2008	●

Note:

- : Applied by measurement.
- : Not applied by measurement.

## 2. Radiated Emission Test

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date (Interval: 1 year)	
10m Anechoic Chamber	TDK Co., Ltd.	DA-06912	-	2 February 2009	●
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100148	18 July 2008	●
Spectrum Analyzer	Agilent Technologies	E4407B	MY44221019	24 April 2009	●
		E4446A	US42070181	21 October 2008	●
Amplifier	Agilent Technologies	83017A	3950M00169	31 July 2008	●
		8447D	2944A06812	11 September 2008	●
RF Selector	TOYO Corporation	NS4900	0302-010	11 September 2008	●
Tunable Filter	TOYO Corporation	NF-49BT	No.1	31 July 2008	○
RF Filter	Microtronics	BRM50702-01	020		○
RF Cable	SUHNER	RG214	RG1	11 September 2008	●
			RG3	●	
			RG5	●	
			RG7	●	
			RG8	-	●
	HP	HP8120-4782	163 9232	11 September 2008	●
	SUHNER	SUCOFLEX 106	SU1	31 July 2008	●
		SUCOFLEX 103	SU5	●	
SUCOFLEX 103		SU6	○		
HP	85381C	No.3		●	
Attenuator	KYORITSU	KPD-602	220142	11 September 2008	●
Antenna	Schwarzbeck	BBA9106	No.3	18 December 2008	○
		UHALP9108-A	0160	○	
		VULB9160	3179	●	
		VHA9103	No.3 (+D3-1, 2)	○	
		UHA9105	No.3	○	
	EMCO	3115	9403-4232	3 February 2009	●
		3116	9311-2227	●	
Hygro Thermograph	SEKONIC	ST-50	HE01-00511	25 February 2009	●
Software	TOYO Corporation	EP5/RE Ver.3.7.0	0208086	-	●

Note:

- : Applied by measurement.
- : Not applied by measurement.