

# TEST REPORT

Test Report No.: 10049FC

Applicant : Clarion Co., Ltd.  
EUT : Bluetooth module  
Model No. : UGZZ5-X01  
Serial No. : 001E3DAAE3BE  
FCC ID : SJ2HGZ0036  
Issue Date : 2 September 2010  
Date of Test : 27 August 2010  
Test Standard : FCC Part 15 Subpart C  
ANSI C63.4: 2003  
PUBLIC NOTICE DA 00-705  
PUBLIC NOTICE DA 00-1407  
Test Results : Pass



NVLAP LAB CODE 200607-0

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

Manager / Jiro Ogiwara

2010  
9.2

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

/ Kentaro Fukuda

2010.9.2

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

/ Masashi Tsukui

2010.9.2

## Table of Contents

<b>Revised Record .....</b>	<b>3</b>
<b>1 Test Report .....</b>	<b>4</b>
<b>2 General Information .....</b>	<b>4</b>
2.1 Applicant Information .....	4
2.2 Product Description .....	4
2.3 Summary of Test and Inspection Result .....	5
2.4 Test Methodology .....	6
2.5 Test Facility .....	6
<b>3 System Test Configuration .....</b>	<b>7</b>
3.1 Justification .....	7
3.2 Operating Modes .....	8
3.3 Configuration of Tested System .....	9
3.4 Test Instruments .....	10
3.5 Special Test Condition .....	10
3.6 Equipment Modifications .....	10
<b>4 Antenna Requirement .....</b>	<b>11</b>
<b>5 Radiated Emission .....</b>	<b>12</b>
5.1 Test Setup .....	12
5.2 Radiated Emission Calculation .....	12
5.3 Test Results .....	13
<b>6 Photos of Tested EUT and Test Setup .....</b>	<b>16</b>
<b>Appendix 1: AFH-Hopping Sequence .....</b>	<b>17</b>
<b>Appendix 2: Certificate of Accreditation .....</b>	<b>19</b>
<b>Appendix 3: Test Instruments .....</b>	<b>20</b>

## Revised Record

<b>Revised Record</b>					
Number of Revised Time	Mark	Issue Date	Person in Charge	Detail of Revision	Approved By
Initial	-	2 September 2010	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
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	2.10dBi
Operating Clocks	26MHz
Receipt Date of Tested Sample	23 August 2010

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	Radiated Emission	ANSI C63.4: 2003  Public Notice DA00-705  Public Notice DA00-1407	FCC 15.247(d)	Radiated Emission Test	Performed	Peak : 19.8dB Average : 10.0dB  Transmitting Mode: 2402MHz Type of Modulation: GFSK Modulation Frequency: 4804.000MHz Antenna Polarization: Horizontal	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 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:	<u>Periodic Pseudo Random Bit Sequence. <math>2^9 - 1</math></u>
Signal Packet Type:	
DH5:	<u>Data high rate, ACL type packet</u>
	<u>Data payload with CRC, without FEC</u>
	<u>Fully transmission within one consecutive 625us transmission slots</u>
	<u>Number of slot = 5</u>
	<u>Data size of payload = 339 bytes</u>
Software (Controller):	<u>AIO Easy Tester Lite! Ver1.40 software supplied by ALPS ELECTRIC CO., LTD. was used to set up to the Bluetooth operating mode.</u>

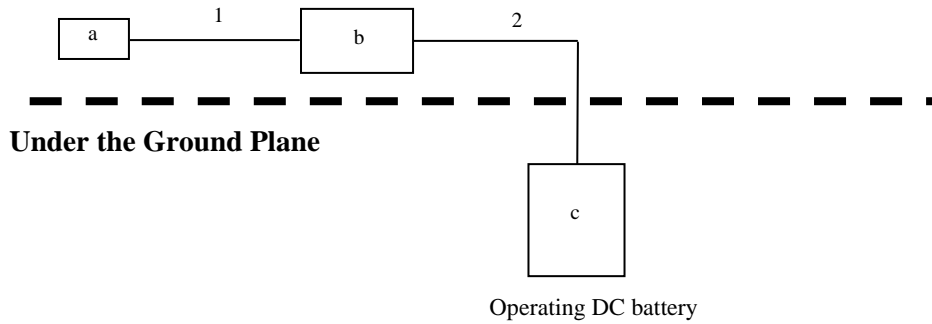


### 3.3 Configuration of Tested System

#### 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	EUT	SJ2HGZ0036
b	QUICK STARTER KIT Board	QSK	163	ALPS	Accessory	-
c	Note PC	COMPAQ 6170b	CNU8082PFZ	HP	Accessory	-

#### Interface Cables

	Cable Type	Model No.	Shielded	Ferrite Core	Length	Treatment for the Extra Length
1	Bus Cable	-	No	No	0.82m	-
2	USB Cable	-	Yes	No	2.05m	-

### 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	2.10dBi

## 5 Radiated Emission

### 5.1 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 (10049FC)".

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

### 5.2 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.

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

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

### 5.3 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.	: 21.7 degree C / 74.6%
Operator	: Masashi Tsukui		
Remark	: Transmitting Mode GFSK Modulation		

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

##### 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	
33.208	V	45.6			-13.4	32.2			40.0	7.8			*

##### 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	
4804.000	H			53.2	1.0			54.2	74.0			19.8	
4804.000	H		43.0		1.0		44.0		54.0		10.0		
4804.000	V			50.1	1.0			51.1	74.0			22.9	
4804.000	V		39.9		1.0		40.9		54.0		13.1		
7206.000	H			44.7	3.6			48.3	74.0			25.7	* Floor Noise
7206.000	H		31.8		3.6		35.4		54.0		18.6		* Floor Noise
9608.000	H			44.4	6.9			51.3	74.0			22.7	* Floor Noise
9608.000	H		31.5		6.9		38.4		54.0		15.6		* Floor Noise
12010.000	H			43.2	8.0			51.2	74.0			22.8	Floor Noise
12010.000	H		32.8		8.0		40.8		54.0		13.2		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.	: 21.7 degree C / 74.6%
Operator	: Masashi Tsukui		
Remark	: Transmitting Mode GFSK Modulation		

### 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	
33.201	V	47.0			-13.4	33.6			40.0	6.4			*
90.320	V	43.9			-15.5	28.4			43.5	15.1			*

#### 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			51.4	1.3			52.7	74.0			21.3	
4882.000	H		41.2		1.3			42.5	54.0		11.5		
4882.000	V			47.7	1.3			49.0	74.0			25.0	
4882.000	V		37.0		1.3			38.3	54.0		15.7		
7323.000	H			42.2	3.9			46.1	74.0			27.9	Floor Noise
7323.000	H		31.9		3.9			35.8	54.0		18.2		Floor Noise
9764.000	H			43.9	6.8			50.7	74.0			23.3	* Floor Noise
9764.000	H		31.7		6.8			38.5	54.0		15.5		* Floor Noise
12205.000	H			44.6	7.7			52.3	74.0			21.7	Floor Noise
12205.000	H		32.6		7.7			40.3	54.0		13.7		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.	: 21.7 degree C / 74.6%
Operator	: Masashi Tsukui		
Remark	: Transmitting Mode		
	: GFSK Modulation		

**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
33.297	V	46.6			-13.4	33.2			40.0	6.8			*

**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
2483.500	H			59.7	-5.1			54.6	74.0			19.4	
2483.500	H		35.6		-5.1		30.5		54.0		23.5		
2483.500	V			58.7	-5.1			53.6	74.0			20.4	
2483.500	V		34.0		-5.1		28.9		54.0		25.1		
4960.000	H			51.8	1.6			53.4	74.0			20.6	
4960.000	H		42.2		1.6		43.8		54.0		10.2		
4960.000	V			47.9	1.6			49.5	74.0			24.5	
4960.000	V		37.8		1.6		39.4		54.0		14.6		
7440.000	H			44.9	4.3			49.2	74.0			24.8	Floor Noise
7440.000	H		33.1		4.3		37.4		54.0		16.6		Floor Noise
9920.000	H			43.5	7.1			50.6	74.0			23.4	* Floor Noise
9920.000	H		31.9		7.1		39.0		54.0		15.0		* Floor Noise
12400.000	H			41.9	7.6			49.5	74.0			24.5	Floor Noise
12400.000	H		32.5		7.6		40.1		54.0		13.9		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)).

## 6 Photos of Tested EUT and Test Setup

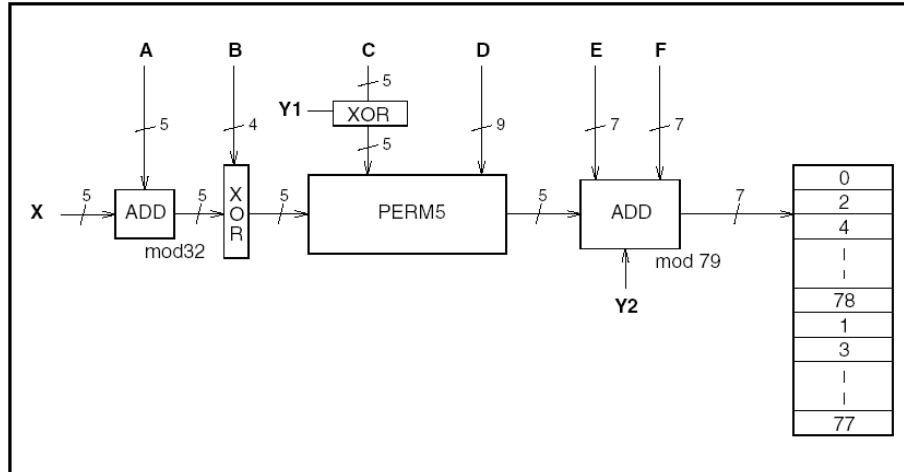
Setup photo with EUT has been submitted as separate document named “Test Setup Photos (10049FC)”.



## Appendix 1: AFH-Hopping Sequence

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

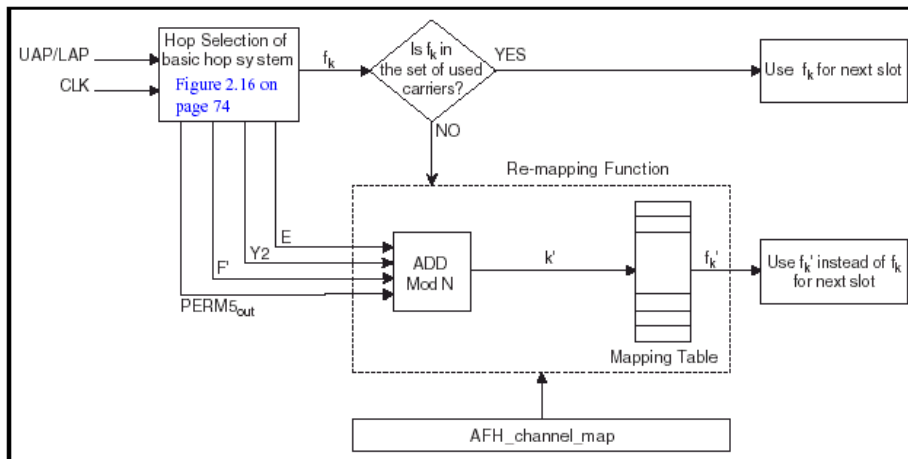
### 1. In the case of 79Hopping



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	$CLKE_1 / CLKN_1$	$CLKE_1 / CLKN_1 / 1$	$CLK_1$
Y2	0	$32 \times CLKE_1 /$ $32 \times CLKN_1$	$32 \times CLKE_1 /$ $32 \times CLKN_1 /$ $32 \times 1$	$32 \times CLK_1$
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 Communiqué dated January 2009).*

2009-10-01 through 2010-09-30  
*Effective dates*



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

NVLAP-01C (REV. 2009-01-28)

## Appendix 3: Test Instruments

## Radiated Emission Test

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date (Interval: 1 year)		
10m Anechoic Chamber	TDK Co., Ltd.	DA-06912	-	2 February 2010	●	
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100148	15 July 2010	●	
Spectrum Analyzer	Agilent Technologies	E4407B	MY44221019	29 April 2010	●	
		E4446A	US42070181	22 October 2009	●	
Amplifier	Agilent Technologies	83017A	3950M00169	27 July 2010	●	
		8447D	2944A06812		●	
RF Selector	TOYO Corporation	NS4900	0302-010		●	
Tunable Filter	TOYO Corporation	NF-49BT	No.1		○	
RF Filter	Microtronics	BRM50702-01	020		○	
RF Cable	SUHNER	RG214	RG1		-	●
			RG3			●
			RG5			●
			RG7			●
			RG8			●
	HP	HP8120-4782	163 9232	27 July 2010		●
	SUHNER	SUCOFLEX 106	SU1			●
		SUCOFLEX 103	SU5			●
HP	85381C	No.3	○			
Attenuator	KYORITSU	KPD-602	220142	●		
Antenna	Schwarzbeck	BBA9106	No.3	16 December 2009	○	
		UHALP9108-A	0160		○	
		VULB9160	3179		●	
		VHA9103	No.3 (+D3-1, 2)		○	
		UHA9105	No.3		○	
	EMCO	3115	9403-4232	3 February 2010	●	
		3116	9311-2227		●	
Digital Multi Meter	Agilent Technologies	34401A	MY41038383	20 July 2010	○	
Hygro Thermograph	SEKONIC	ST-50	HE01-00511	2 March 2010	●	
Software	TOYO Corporation	EP5/RE Ver.3.7.0	0208086	-	●	

Note:

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