

TEST REPORT

Test Report No.: 7141F

Applicant : Kenwood Corporation
EUT : MONITOR with DVD RECEIVER
Model No. : DNX8120
Serial No. : PPK00006 (Radiated Emission Test)
PPE00024 (Conducted RF Test via Antenna Terminal)
FCC ID : IOM39576
Issue Date : 3 March 2008
Date of Test : 24, 25 January 2008 (Radiated Emission Test)
19 February 2008 (Conducted RF Test via Antenna Terminal)
Test Standard : FCC Part 15 Subpart C § 15.207, 15.247 (10-1-07 Edition)
Procedure : ANSI C63.4: 2003 PUBLIC NOTICE DA 00-705
Test Results : PASS

Approved By:


Manager / Kenzo Furuta

NVLAP LAB CODE 200607-0

Reviewed By:


Chief Engineer / Takeshi Matsumura

Tested By:


Engineer / Shin Itakura

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Revised Record

| Revised Record | | | | |
|------------------------|--------------|------------------|--------------------|-------------|
| Number of Revised Time | Date | Person in Charge | Detail of Revision | Approved By |
| Initial | 3 March 2008 | S. Itakura | - | - |

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 | Kenwood Corporation |
| Address | 2967-3 Ishikawa-machi Hachioji-shi Tokyo 192-8525 Japan |

2.2 Product Description

| | |
|-------------------------------|--|
| EUT | MONITOR with DVD RECEIVER |
| Model No. | DNX8120 |
| Serial No. | PPK00006 (Radiated Emission Test) PPE00024 (Conducted RF Test via Antenna Terminal) |
| FCC ID | IOM39576 |
| Production Stage | PRE-Production |
| Type of Wide Band Modulation | FHSS with AFH |
| Type of Modulation | GFSK |
| ITU Code | F1D |
| Power Supply | DC 12.0V from Battery |
| Operating Voltage Range | DC 10.5V Min. DC 16.0V Max. |
| AC Adaptor | - |
| Operating Temperature Range | -20°C Min. 60°C Max. |
| Weight | 2.6kg |
| Dimensions of EUT | W182.0mm × D163.0mm × H112.0mm |
| Antenna Type | Inverted F |
| Max Antenna Gain | -0.92dBi |
| Operating Clocks | 32.768kHz,4.3320MHz,10.250MHz,11.0592MHz,12.000MHz, 13.000MHz,14.7456MHz,16.369MHz and 27.0000MHz |
| Receipt Date of Tested Sample | 17 January 2008 (Radiated Emission Test) 1 February 2008 (Conducted RF Test via Antenna Terminal) |

EUT is "MONITOR with DVD RECEIVER" including 2.4GHz Bluetooth module.

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 | Deviation | Worst Margin | Results |
|-----|---------------------------------|--|------------------------|--|------------------------|--------------|---|
| 1 | AC Powerline Conducted Emission | ANSI C63.4: 2003 | FCC 15.207 | Conducted Emission Test | 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 | 7.2dB Transmitting Mode: 2402MHz Frequency: 4804.000MHz Antenna Polarization: Vertical |
| 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 Subpart C 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) 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.
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). 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 (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. 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 | DH1, DH3, DH5 for Dwell time test. DH5 for other test |
| Representative Channel | | CH0 2402MHz (Lowest Frequency Channel) |
| | | CH39 2441MHz (Middle Frequency Channel) |
| | | CH78 2480MHz (Highest Frequency Channel) |
| DVD | | Playing |

Remarks:

| | |
|------------------------|---|
| Signal Pattern PRBS9: | <u>Periodic Pseudo Random Bit Sequence, $2^9 - 1$</u> |
| Signal Packet Type: | <u>Data high rate, ACL type packet</u> |
| DH1, 3, 5: | <u>Data payload with CRC, without FEC</u> |
| | <u>Fully transmission within one consecutive 625-microsecond transmission slots</u> |
| | <u>Number of slot = 1(DH1), 3(DH3), 5(DH5)</u> |
| | <u>Data size of payload = 27bytes (DH1), 183bytes (DH3), 339bytes (DH5)</u> |
| Software (Controller): | <u>The test software supplied by Kenwood Corporation was used to set up the Bluetooth operating mode.</u> |

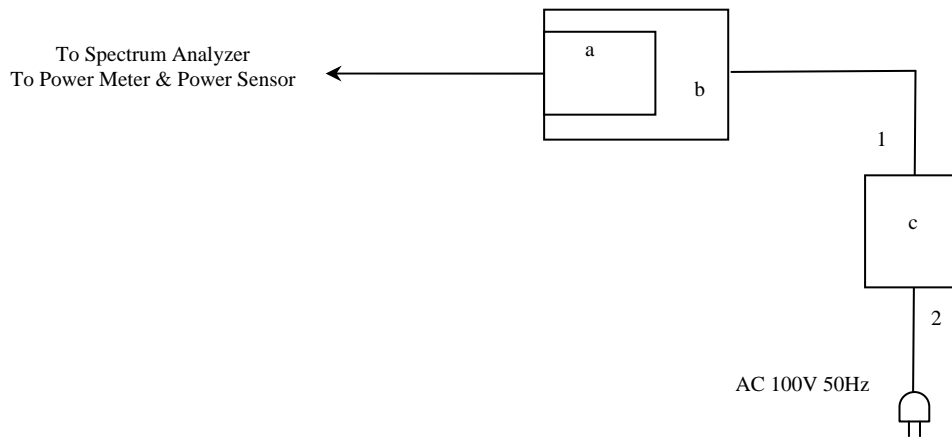
3.3 Configuration of Tested System

(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 below.

Test Setting for Normal Frequency Hopping and Non Frequency Hopping Mode

Power Supply of EUT: DC12.0V from Regulated DC Power Supply “c”.



List of EUT and Accessories

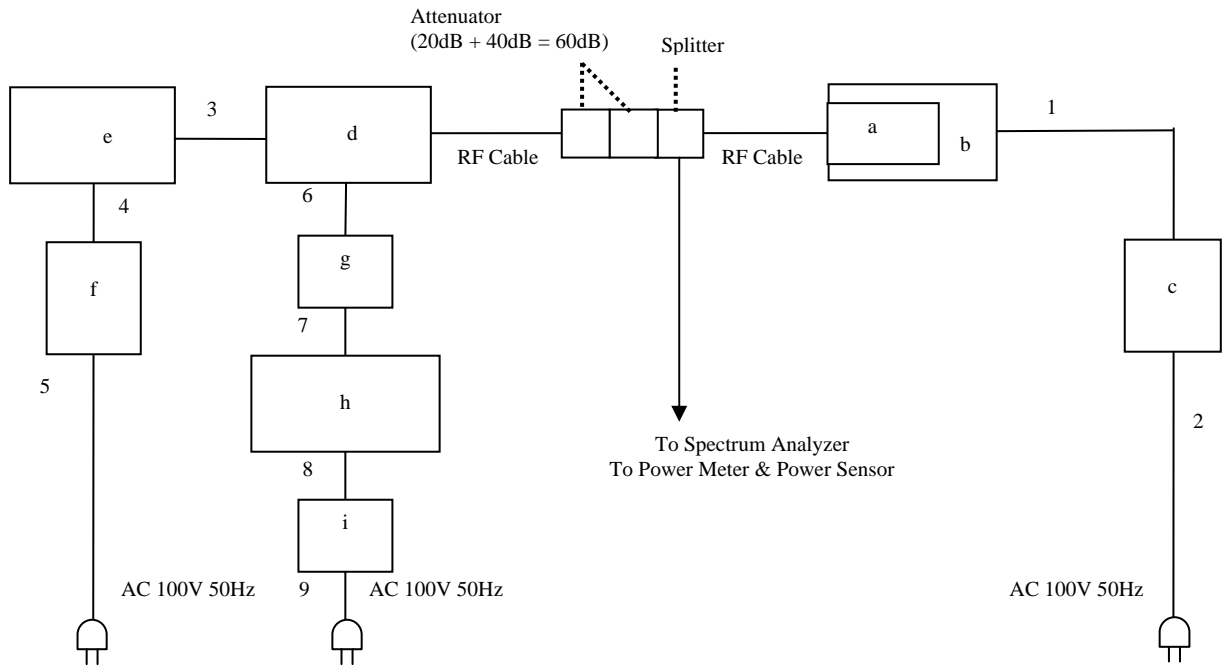
| | Product Name | M/N | S/N | Manufacturer | EUT / Accessory | FCC ID / DoC |
|---|---------------------------|---------------------|----------|---------------------|-----------------|--------------|
| a | MONITOR with DVD RECEIVER | DNX8120 (RF Module) | PPE00024 | Kenwood Corporation | EUT | IOM39576 |
| b | Jig | DNX8220BT | PPE00024 | Kenwood Corporation | Accessory | |
| c | Regulated DC Power Supply | PMC18-3A | FB000315 | KIKUSUI | Accessory | - |

Interface Cables

| | Cable Type | M/N | Shielded | Ferrite Core | Material of Connector | Length | Treatment for the Extra Length |
|---|------------|-----|----------|--------------|-----------------------|--------|--------------------------------|
| 1 | DC Cable | - | No | No | Plastic | 2.20m | - |
| 2 | AC Cable | - | No | No | Plastic | 2.45m | - |

Test Setting for Adaptive Frequency Hopping Mode

Power Supply of EUT: DC12.0V from Regulated DC Power Supply “c”.



List of EUT and Accessories

| | Product Name | M/N | S/N | Manufacturer | EUT / Accessory | FCC ID / DoC |
|---|---------------------------|----------------------|----------------|---------------------|-----------------|--------------|
| a | MONITOR with DVD RECEIVER | DNX8120 (RF Module) | PPE00024 | Kenwood Corporation | EUT | IOM39576 |
| b | Jig | DNX8220BT | PPE00024 | Kenwood Corporation | Accessory | |
| c | Regulated DC Power Supply | PMC18-3A | FB000315 | KIKUSUI | Accessory | - |
| d | Car Audio System | KCA-BT200 | PPE00019 | Kenwood Corporation | Accessory | - |
| e | CD Receiver | KDC-W5641U | KE1447V1100106 | Kenwood Corporation | Accessory | - |
| f | Regulated DC Power Supply | PMC18-5A | LJ001201 | KIKUSUI | Accessory | - |
| g | Evaluation Board | WB4-40 | 18 | Parrot | Accessory | - |
| h | Personal Computer | N1010vP180x 420DC120 | TW30710675 | Hewlett Packard | Accessory | - |
| i | AC/DC Adapter | ADP-75HB | MVT0305016771 | Hewlett Packard | Accessory | - |

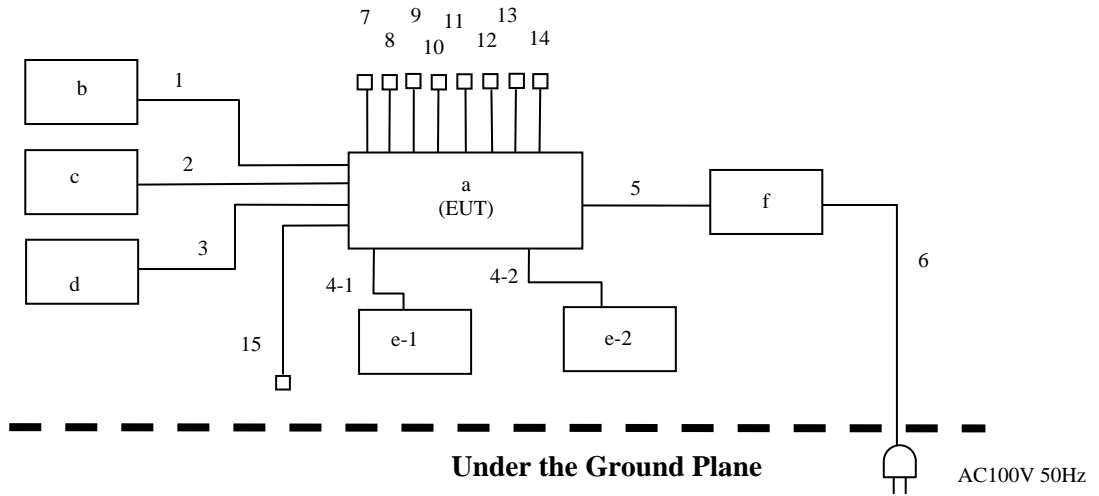
Interface Cables

| No. | Cable Type | M/N | Shielded | Ferrite Core | Material of Connector | Length | Notes |
|-----|----------------------|-----|----------|--------------|-----------------------|--------|-------|
| 1 | DC Cable | - | No | No | Plastic | 2.20m | - |
| 2 | AC Cable | - | No | No | Plastic | 2.45m | - |
| 3 | Interface Cable (*1) | - | Yes | No | Metal | 1.41m | - |
| 4 | DC Cable | - | No | No | Plastic | 1.05m | - |
| 5 | AC Cable | - | No | No | Plastic | 2.45m | - |
| 6 | Bus Cable | - | No | No | Plastic | 0.44m | - |
| 7 | RS232C Cable | - | No | No | Metal | 1.62m | - |
| 8 | DC Cable | - | No | No | Plastic | 1.80m | - |
| 9 | AC Cable | - | No | No | Plastic | 1.80m | - |

(*1) : This cable is able to provide "Signal-Interface" and "DC Power-Supply".

(2) Radiated Emission Test

These numbers and the marks in the picture are corresponding to the numbers and the marks in Tables below.
 Power Supply of EUT: DC12.0V from Regulated DC Power Supply “f”.



List of EUT and Accessories

| | Product Name | M/N | S/N | Manufacturer | EUT / Accessory | FCC ID / DoC |
|-----|---------------------------|-------------|-------------|---------------------|-----------------|--------------|
| a | MONITOR with DVD RECEIVER | DNX8120 | PPK00006 | Kenwood Corporation | EUT | IOM39576 |
| b | Microphone | W01-1676-05 | 8 | HOSHIDEN | Accessory | - |
| c | FM Antenna | LR-36 | 3 | - | Accessory | - |
| d | GPS Antenna | - | 4 | - | Accessory | - |
| e-1 | Speaker | PR-100S | 50704401298 | BM Audio Labs. Inc | Accessory | - |
| e-2 | | | | | | |
| f | Regulated DC Power Supply | PA18-3A | 6110066 | Kenwood Corporation | Accessory | - |

Interface Cables

| | Cable Type | M/N | Shielded | Ferrite Core | Material of Connector | Length | Notes |
|-----|-------------------|-----|----------|--------------|-----------------------|--------|--|
| 1 | Mic Cable | - | No | No | Plastic | 3.00m | Fold back and forth in the center |
| 2 | FM Antenna Cable | - | Yes | No | Plastic | 3.35m | |
| 3 | GPS Antenna Cable | - | Yes | No | Plastic | 4.93m | |
| 4-1 | Speaker Cable | - | No | No | Plastic | 3.06m | |
| 4-2 | | | | | | | |
| 5 | DC Cable | - | No | No | Plastic | 2.21m | - |
| 6 | AC Cable | - | No | No | Plastic | 2.00m | - |
| 7 | RELAY Cable | - | No | No | Plastic | 1.02m | Cable End is open |
| 8 | AV Cable | - | Yes | No | Plastic | 0.30m | Cable End is open |
| 9 | | | | | | | |
| 10 | REVERSE Cable | - | No | No | Plastic | 5.95m | Fold back and forth in the center Cable End is open |
| 11 | PRK-SW Cable | - | No | No | Plastic | 1.98m | |
| 12 | i-Pod Audio Cable | - | No | No | Plastic | 1.00m | |
| 13 | i-Pod Video Cable | - | No | No | Plastic | 1.00m | |
| 14 | USB Cable | - | Yes | No | Metal | 1.00m | |
| 15 | TV Tuner Cable | - | Yes | No | Metal | 3.00m | |

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 | -0.92dBi |

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. : PPE00024
 Power : DC 12.0V
 Mode : Transmitting Mode, Non Frequency Hopping
 Temperature : 22.9°C
 Humidity : 53.4 %

(1) Operation Mode: Transmitting Mode (GFSK Modulation)

| CH | Frequency [MHz] | 20dB Bandwidth [MHz] |
|---------------|-----------------|----------------------|
| 0ch(Lowest) | 2402.0 | 0.877 |
| 39ch(Middle) | 2441.0 | 0.863 |
| 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. : PPE00024
 Power : DC 12.0V
 Mode : Transmitting Mode, Frequency Hopping
 Transmitting Mode, Adoptive Frequency Hopping
 Temperature : 22.9°C
 Humidity : 53.4 %
 Regulation : FCC Part15 C §15.247 (a)(1)

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

| Channel | Channel Separation [MHz] | Limit *1 [MHz] |
|------------------------------|--------------------------|----------------|
| Low Frequency (0ch-1ch) | 0.955 | > 0.585 |
| Middle Frequency (38ch-39ch) | 1.015 | > 0.576 |
| High Frequency (77ch-78ch) | 1.010 | > 0.581 |

Transmitting Mode, Adoptive Frequency Hopping (20ch)

| Channel | Channel Separation [MHz] | Limit *1 [MHz] |
|------------------------------|--------------------------|----------------|
| Low Frequency (0ch-1ch) | 1.000 | > 0.585 |
| Middle Frequency (38ch-39ch) | 1.010 | > 0.576 |
| High Frequency (77ch-78ch) | 1.015 | > 0.581 |

*1: Limit value of Carrier Frequency Separation is 2/3 of 20dB Bandwidth.
 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. : PPE00024
 Power : DC 12.0V
 Mode : Transmitting Mode, Frequency Hopping
 Transmitting Mode, Adoptive Frequency Hopping
 Temperature : 22.9°C
 Humidity : 53.4 %
 Regulation : FCC Part15 C §15.247 (a)(1)(iii)

(1) 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 | ≥ 15 |

Adaptive Frequency Hopping: Intelligent hopping techniques to avoid interference to other transmission.

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. : PPE00024
 Power : DC 12.0V
 Mode : Transmitting Mode (DH1, DH3, DH5), Frequency Hopping
 Transmitting Mode (DH1, DH3, DH5), Adoptive Frequency Hopping
 Temperature : 22.9°C
 Humidity : 53.4 %
 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] |
| DH1 | 147.20 | 400 |
| DH3 | 274.72 | 400 |
| DH5 | 316.48 | 400 |

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

| GFSK Modulation | | |
|-----------------|-----------------|------------|
| Packet | Dwell Time [ms] | Limit [ms] |
| DH1 | 147.20 | 400 |
| DH3 | 274.72 | 400 |
| DH5 | 316.48 | 400 |

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

Time of Occupancy (Dwell Time) for Packet Type DH1

The frequency-hopping rate of Bluetooth system is 1600hops per 1 second.
A DH1 packet needs 1 time slot for transmitting and 1 time slot for receiving.

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

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

Transmitting time is 0.460 ms.
Then, dwell time is $320.11 \times 0.460 \text{ ms} = 147.20 \text{ ms}$ per 31.6 seconds.

Time of Occupancy (Dwell Time) for Packet Type DH3

The frequency-hopping rate of Bluetooth system is 1600hops per 1 second.
A DH3 packet needs 3 times slot for transmitting and 1 time slot for receiving.

In a DH3 packet, it hops 400 times for transmitting per 1 second.
The number of hopping channel is 79.
The number of times that appears in 1 channel per 1 second is as follows.
 $400/79=5.06$ [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 $0.4 \times 79 = 31.6$ seconds
The number of times that appears in 1 channel per 31.6 seconds is as follows.
 $5.06 \times 31.6 = 159.90$ [times]

Transmitting time is 1.717ms.
Then, dwell time is $161.16 \times 1.717 \text{ ms} = 274.72 \text{ ms}$ per 31.6 seconds.

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 $0.4 \times 79 = 31.6$ seconds
The number of times that appears in 1 channel per 31.6 seconds is as follows.
 $3.37 \times 31.6 = 106.49$ [times]

Transmitting time is 2.967 ms.
Then, dwell time is $106.49 \times 2.967 \text{ ms} = 316.48 \text{ ms}$ per 31.6 seconds.

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

Time of Occupancy (Dwell Time) for Packet Type DH1

The frequency-hopping rate of Bluetooth system is 1600hops per 1 second.
A DH1 packet needs 1 time slot for transmitting and 1 time slot for receiving.

In a DH1 packet, it hops 800 times for transmitting per 1 second.
The number of hopping channel is 20.
The number of times that appears in 1 channel per 1 second is as follows.
 $800/20=40$ [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 $0.4 \times 20 = 8.0$ seconds
The number of times that appears in 1 channel per 8.0 seconds is as follows.
 $40 \times 8.0 = 320.00$ [times]

Transmitting time is 0.460 ms.
Then, dwell time is $320.00 \times 0.460\text{ms} = 147.20\text{ms}$ per 8.0 seconds.

Time of Occupancy (Dwell Time) for Packet Type DH3

The frequency-hopping rate of Bluetooth system is 1600hops per 1 second.
A DH3 packet needs 3 times slot for transmitting and 1 time slot for receiving.

In a DH3 packet, it hops 400 times for transmitting per 1 second.
The number of hopping channel is 20.
The number of times that appears in 1 channel per 1 second is as follows.
 $400/20=20$ [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 $0.4 \times 20 = 8.0$ seconds
The number of times that appears in 1 channel per 8.0 seconds is as follows.
 $20 \times 8.0 = 160.00$ [times]

Transmitting time is 1.717 ms.
Then, dwell time is $160.00 \times 1.717\text{ms} = 274.72\text{ms}$ per 8.0 seconds.

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 $0.4 \times 20 = 8.0$ seconds
The number of times that appears in 1 channel per 8.0 seconds is as follows.
 $13.34 \times 8.0 = 106.72$ [times]

Transmitting time is 2.967 ms.
Then, dwell time is $106.72 \times 2.967\text{ms} = 316.48\text{ms}$ 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. : PPE00024
 Power : DC 12.0V
 Mode : Transmitting Mode, Non Frequency Hopping
 Temperature : 22.9°C
 Humidity : 53.4 %
 Regulation : FCC Part15 C §15.247 (b)(1)

(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 | -4.99 | 0.56 | 0.33 | -4.10 | 0.389 | 30.0 | 1000 |
| 39ch(Middle) | 2441 | -5.56 | 0.60 | 0.33 | -4.63 | 0.344 | 30.0 | 1000 |
| 78ch(Highest) | 2480 | -6.68 | 0.57 | 0.33 | -5.78 | 0.264 | 30.0 | 1000 |

Result = Reading + Cable Loss1 + Cable Loss2

Note: Cable Loss1: RF Cable

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:

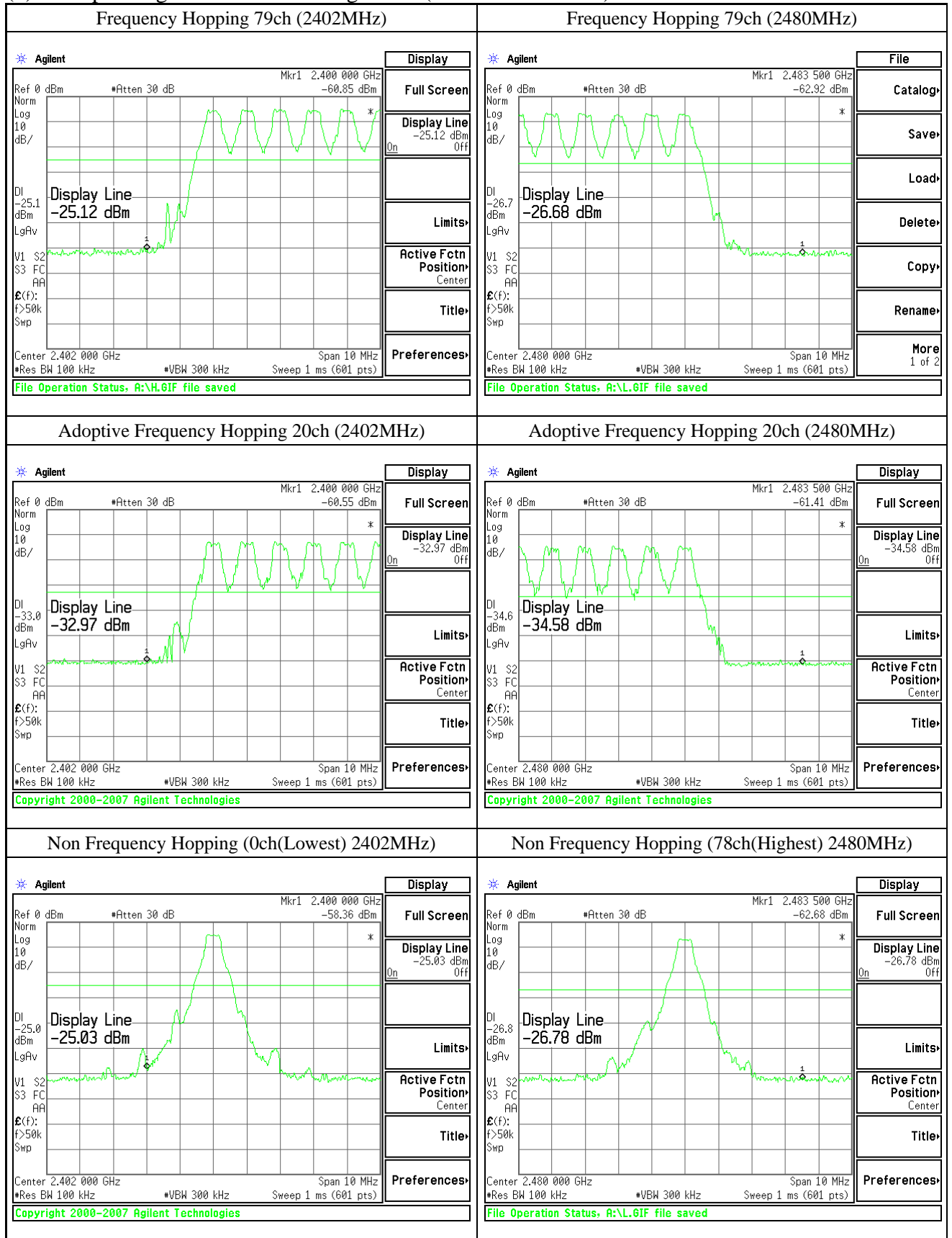
| | |
|---------------|--------|
| Detector Mode | Peak |
| RBW | 100kHz |
| VBW | 100kHz |
| Span | 10MHz |
| Sweep Time | Auto |

11.2 Test Results

Serial No. : PPE00024
Power : DC 12.0V
Mode : Transmitting Mode, Frequency Hopping (79ch)
Transmitting Mode, Adoptive Frequency Hopping (20ch)
Transmitting Mode, Non Frequency Hopping
Temperature : 22.9°C
Humidity : 53.4 %
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).

(1) Operating Mode: Transmitting Mode (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:

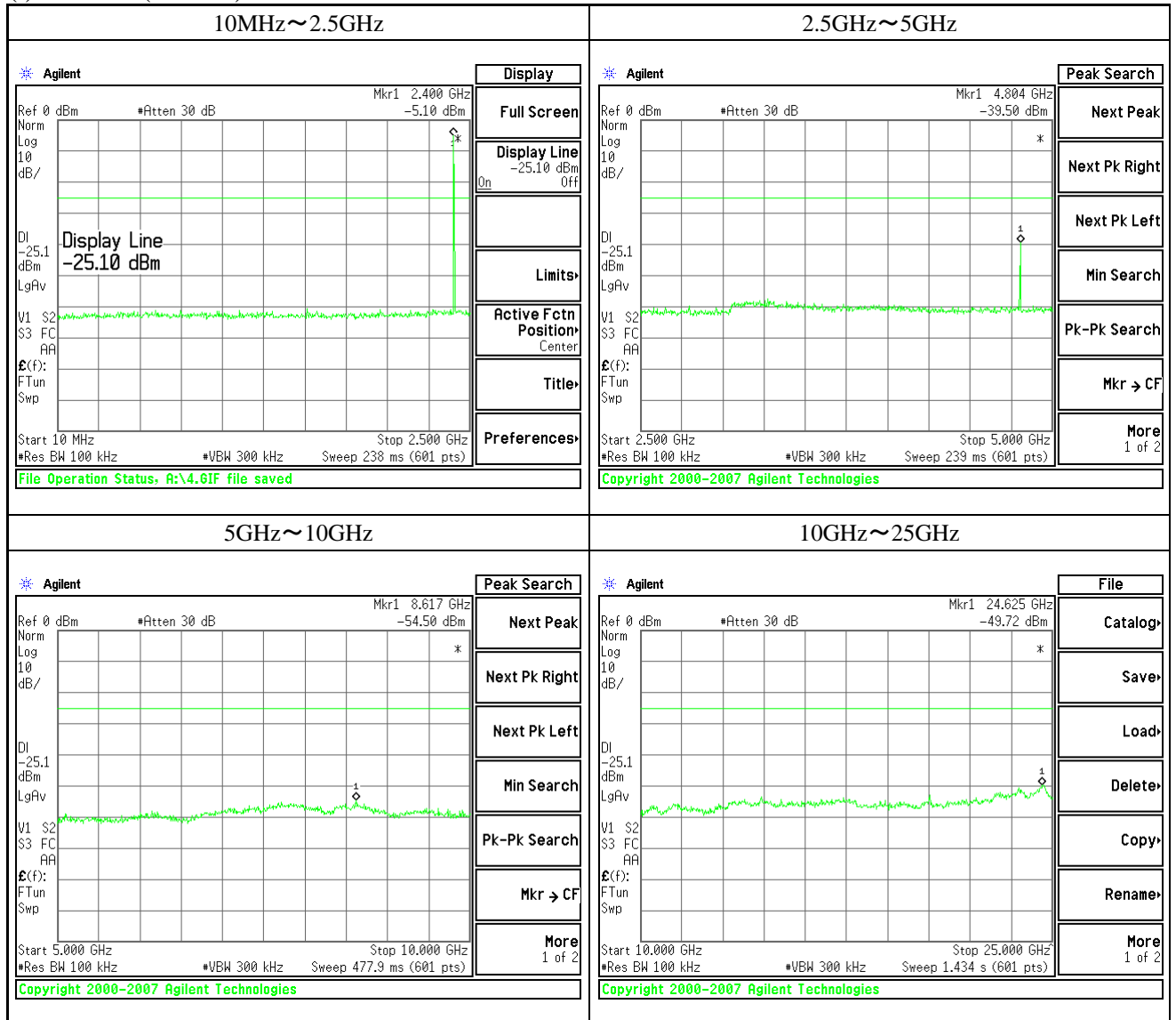
| Detector Mode | Peak |
|---------------|--------|
| RBW | 100kHz |
| VBW | 100kHz |
| Sweep Time | Auto |

12.2 Test Results

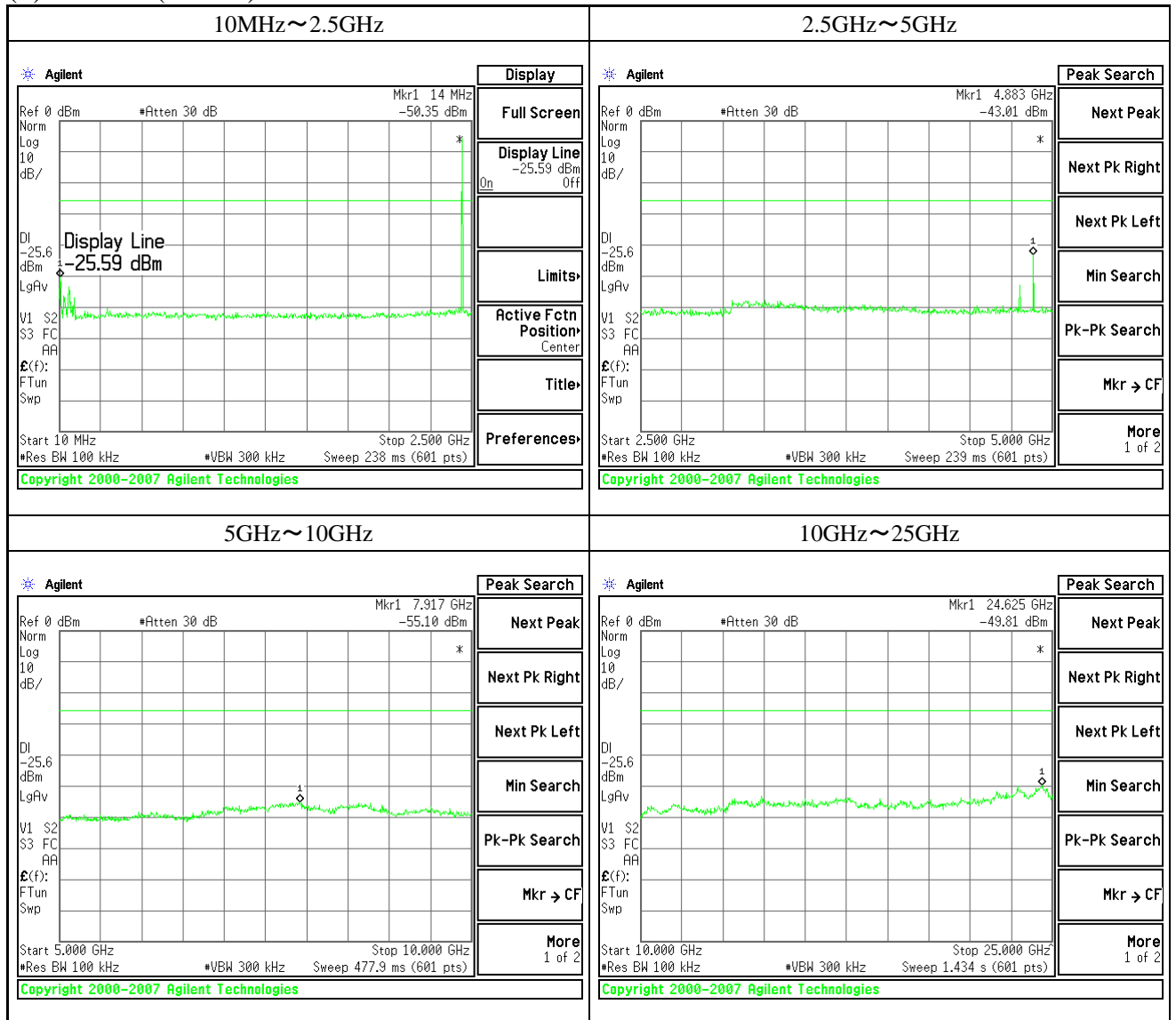
Serial No. : PPE00024
Power : DC 12.0V
Mode : Transmitting Mode, Non Frequency Hopping
Temperature : 22.9°C
Humidity : 53.4 %
Regulation : FCC Part15 C §15.247 (d)

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).

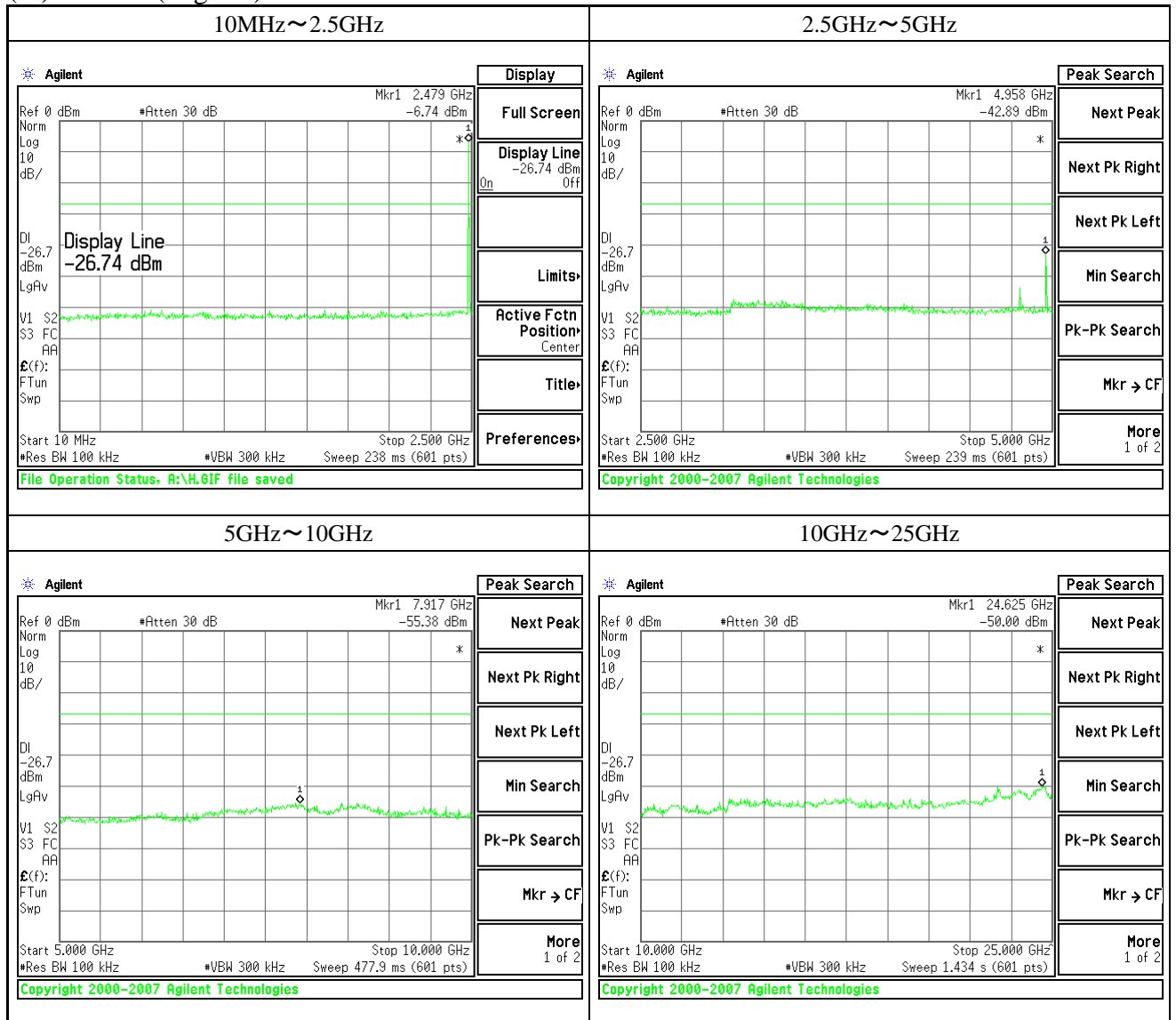
- (1) Operating Mode: Transmitting Mode (GFSK Modulation)
- (i) 0ch (Lowest) 2402MHz



(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 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 separate document named "Test Setup Photos (7141F)".

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 36.5 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.

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

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

13.3 Test Results

Transmitter Spurious Emissions

| | | | |
|--------------|-----------------------------|------------------------------------|-----------------------------------|
| Product | : MONITOR with DVD RECEIVER | Model | : DNX8120 |
| Serial No. | : PPK00006 | Test Standard | : FCC Part15 Subpart C §15.247(d) |
| Power Supply | : DC 12.0V | | |
| Operator | : S. Itakura | Temperature / Humidity (Test Date) | : |
| | | 21.1°C / 38.6% | (24 January) |
| Remark | : Transmitting Mode | 21.7°C / 24.8% | (25 January) |
| | : GFSK Modulation | | |
| | : DVD Playing | | |

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 | |
| 324.007 | H | 41.4 | | | -5.1 | 36.3 | | | 46.0 | 9.7 | | | |
| 324.011 | V | 36.8 | | | -5.1 | 31.7 | | | 46.0 | 14.3 | | | |
| 378.014 | H | 41.3 | | | -4.3 | 37.0 | | | 46.0 | 9.0 | | | * |
| 378.008 | V | 39.1 | | | -4.3 | 34.8 | | | 46.0 | 11.2 | | | * |
| 405.012 | H | 40.9 | | | -3.9 | 37.0 | | | 46.0 | 9.0 | | | |
| 405.009 | V | 41.9 | | | -3.9 | 38.0 | | | 46.0 | 8.0 | | | |
| 540.013 | H | 36.1 | | | -1.0 | 35.1 | | | 46.0 | 10.9 | | | * |
| 540.012 | V | 38.1 | | | -1.0 | 37.1 | | | 46.0 | 8.9 | | | * |
| 756.008 | H | 32.4 | | | 3.4 | 35.8 | | | 46.0 | 10.2 | | | * |
| 756.013 | V | 27.4 | | | 3.4 | 30.8 | | | 46.0 | 15.2 | | | * |

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 | |
| 4804.000 | H | | | 51.9 | 1.2 | | | 53.1 | 74.0 | | | 20.9 | |
| 4804.000 | H | | 44.3 | | 1.2 | | | 45.5 | 54.0 | | 8.5 | | |
| 4804.000 | V | | | 53.1 | 1.2 | | | 54.3 | 74.0 | | | 19.7 | |
| 4804.000 | V | | 45.6 | | 1.2 | | | 46.8 | 54.0 | | 7.2 | | |

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)).

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 | |
| 324.010 | H | 41.5 | | | -5.1 | 36.4 | | | 46.0 | 9.6 | | | |
| 324.010 | V | 37.0 | | | -5.1 | 31.9 | | | 46.0 | 14.1 | | | |
| 378.014 | H | 41.3 | | | -4.3 | 37.0 | | | 46.0 | 9.0 | | | * |
| 378.012 | V | 39.1 | | | -4.3 | 34.8 | | | 46.0 | 11.2 | | | * |
| 405.012 | H | 40.7 | | | -3.9 | 36.8 | | | 46.0 | 9.2 | | | |
| 405.011 | V | 41.8 | | | -3.9 | 37.9 | | | 46.0 | 8.1 | | | |
| 540.011 | H | 35.9 | | | -1.0 | 34.9 | | | 46.0 | 11.1 | | | * |
| 540.007 | V | 38.0 | | | -1.0 | 37.0 | | | 46.0 | 9.0 | | | * |
| 756.012 | H | 32.8 | | | 3.4 | 36.2 | | | 46.0 | 9.8 | | | * |
| 756.011 | V | 27.3 | | | 3.4 | 30.7 | | | 46.0 | 15.3 | | | * |

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 | | | 47.9 | 1.4 | | | 49.3 | 74.0 | | | 24.7 | |
| 4882.000 | H | | 39.4 | | 1.4 | | | 40.8 | 54.0 | | 13.2 | | |
| 4882.000 | V | | | 49.8 | 1.4 | | | 51.2 | 74.0 | | | 22.8 | |
| 4882.000 | V | | 42.0 | | 1.4 | | | 43.4 | 54.0 | | 10.6 | | |

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)).

Radiated Emission: Hch (2480MHz)

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 | |
| 324.008 | H | 43.0 | | | -5.1 | 37.9 | | | 46.0 | 8.1 | | | |
| 324.010 | V | 38.2 | | | -5.1 | 33.1 | | | 46.0 | 12.9 | | | |
| 378.012 | H | 41.8 | | | -4.3 | 37.5 | | | 46.0 | 8.5 | | | * |
| 378.012 | V | 39.5 | | | -4.3 | 35.2 | | | 46.0 | 10.8 | | | * |
| 405.011 | H | 41.1 | | | -3.9 | 37.2 | | | 46.0 | 8.8 | | | |
| 405.007 | V | 42.2 | | | -3.9 | 38.3 | | | 46.0 | 7.7 | | | |
| 540.013 | H | 35.8 | | | -1.0 | 34.8 | | | 46.0 | 11.2 | | | * |
| 540.007 | V | 37.8 | | | -1.0 | 36.8 | | | 46.0 | 9.2 | | | * |
| 756.010 | H | 32.6 | | | 3.4 | 36.0 | | | 46.0 | 10.0 | | | * |
| 756.005 | V | 27.6 | | | 3.4 | 31.0 | | | 46.0 | 15.0 | | | * |

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 | |
| 4960.000 | H | | | 46.5 | 1.6 | | | 48.1 | 74.0 | | | 25.9 | |
| 4960.000 | H | | 37.2 | | 1.6 | | 38.8 | | 54.0 | | 15.2 | | |
| 4960.000 | V | | | 49.5 | 1.6 | | | 51.1 | 74.0 | | | 22.9 | |
| 4960.000 | V | | 41.2 | | 1.6 | | 42.8 | | 54.0 | | 11.2 | | |

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 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] | |
| -0.92 | -4.10 | -5.02 | 0.31 | 25 |

Calculation: $C \text{ [dBm]} = A \text{ [dBi]} + B \text{ [dBm]}$

EIRP = $-5.02\text{dBm} = \underline{0.31\text{mW}}$

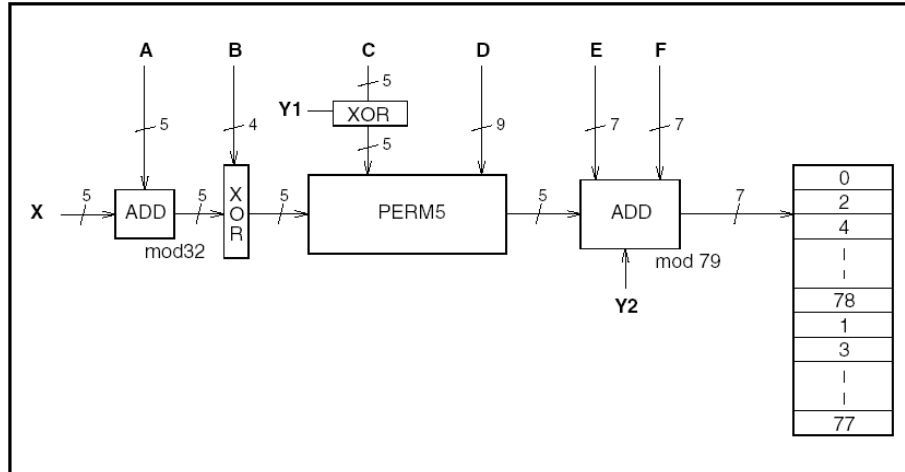
15 Photos of Tested EUT and Test Setup

Setup photo with EUT has been submitted as separate document named “Test Setup Photos (7141F)”.

Appendix 1: AFH-Hopping Sequence

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

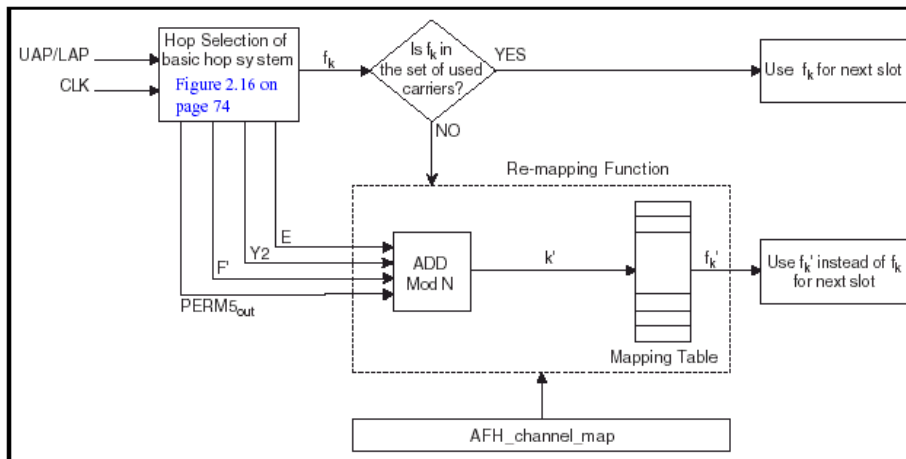
1. In the case of 79Hopping



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 | $32 \times CLKE_1 /$ $32 \times CLKN_1$ | $32 \times CLKE_1 /$ $32 \times CLKN_1 /$ 32×1 | $32 \times CLK_1$ |
| 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).*

2007-10-01 through 2008-09-30
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) | ○ |
| | Agilent Technologies | E4446A | US42070181 | 17 October 2007 (1) | ● |
| Power Meter | Rohde & Schwarz | NRVD | 838380/0043 | 5 February 2007 (1) | ○ |
| | Agilent Technologies | N1911A | MY45100612 | 8 June 2007 (1) | ○ |
| | | E4416A | MY45100855 | 4 September 2007 (1) | ● |
| Power Sensor | Rohde & Schwarz | NRV-Z1 | 838357/0001 | 5 February 2007 (1) | ○ |
| | Agilent Technologies | N1922A | MY45240439 | 8 June 2007 (1) | ○ |
| | | 8482A | MY41094396 | 4 September 2007 (1) | ● |
| RF Cable | SUHNER | SUCOFLEX 104 | RF2-2 | 3 July 2007 (1) | ● |
| | | SUCOFLEX 104E | RF3-3 | 4 April 2007 (1) | ● |
| | | SUCOFLEX 103 | SU5 | 1 August 2007 (1) | ● |
| | HP | 85381C | No.3 | | ● |
| Power Divider | Aeroflex / Inmet | 6005-03 | RF-8 | 3 July 2007 (1) | ● |
| Attenuator | Anritsu | MP721D | M04067 | 1 August 2007 (1) | ● |
| | | MP721F | M40372 | | ● |
| Multi Meter | Advantest | R6451A | 67840312 | 19 September 2007 (1) | ● |
| | Agilent Technologies | 34401A | MY41038383 | 5 June 2007 (1) | ○ |
| Temperature Chamber | TABAI ESPEC | PU-2KTH | 14006759 | 6 February 2007 (1) | ○ |
| Hygro thermograph | SEKONIC | ST-200 | HD01-000797 | 6 September 2007 (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 2007 (1) | ● |
| Spectrum Analyzer | Agilent Technologies | E4407B | MY44221019 | 23 April 2007 (1) | ● |
| | | E4446A | US42070181 | 17 October 2007 (1) | ● |
| Amplifier | Agilent Technologies | 83017A | 3950M00169 | 1 August 2007 (1) | ● |
| | | 8447D | 2944A06812 | | ● |
| RF Selector | TDK Co., Ltd | NS4900 | 0302-010 | | ● |
| Tunable Filter | TOYO Corporation | NF-49BT | No.1 | | ○ |
| RF Filter | Microtronics | ERM50702-01 | 020 | | ○ |
| RF Cable | SUHNER | RG214 | RG1 | | ● |
| | | RG214 | RG3 | | ● |
| | | RG214 | RG5 | | ● |
| | | RG214 | RG7 | | ● |
| | | RG214 | RG8 | | ● |
| | HP | HP8120-4782 | 163 9232 | ● | |
| | SUHNER | SUCOFLEX 106 | SU1 | ● | |
| | | SUCOFLEX 103 | SU5 | ● | |
| HP | 85381C | No.3 | ● | | |
| Attenuator | KYORITSU | KPD-602 | 220142 | ● | |
| Antenna | Schwarzbeck | BBA9106 | No.3 | 19 December 2007 (1) | ○ |
| | | UHALP9108-A | 0160 | | ○ |
| | | VULB9160 | 3179 | | ● |
| | | VHA9103 | No.3 (+D3-1, 2) | | ○ |
| | | UHA9105 | No.3 | | ○ |
| | EMCO | 3115 | 9403-4232 | 28 March 2007 (2) | ● |
| 3116 | 9311-2227 | ● | | | |
| Hygro thermograph | SEKONIC | ST-50 | HE01-00511 | 7 February 2007 (1) | ● |

Note:

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