

TEST REPORT For FCC

Test Report No. : CTK-2012-00527
Date of Issue : June 18, 2012
FCC ID : BV2-AH-NCW500
Model/Type No. : AH-NCW500
Kind of Product : Wireless Headphones
Applicant : D&M Holdings Inc.
Applicant Address : 2-1 Nisshin-cho, Kawasaki-ku, Kawasaki-shi, Kanagawa, Japan
Manufacturer : Cresyn Co., Ltd.
Manufacturer Address : 8-22, Jamwon-dong, Seocho-gu, Seoul , Korea
Contact Person : Tsuyoshi Kondo / General Manager
Telephone : +81-44-670-2653
Received Date : May 29, 2012
Test period : Start : June 04, 2012 End : June 18, 2012

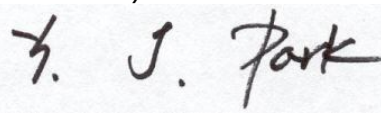
The test results presented in this report relate only to the object tested.

Tested by



Won-Jae, Hwang
Test Engineer
Date: June 18, 2012

Reviewed by



Young-Joon, Park
Technical Manager
Date: June 18, 2012



CTK Co., Ltd.
The Prime Leader of Global Regulatory Certification

CTK Co., Ltd.

386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea

Tel: +82-31-339-9970 Fax: +82-31-339-9855

www.e-ctk.com

REPORT REVISION HISTORY

Date	Revision	Page No
June 18, 2012	Issued (CTK-2012-00527)	All

This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.



CTK Co., Ltd.
The Prime Leader of Global Regulatory Certification

CTK Co., Ltd.

386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea

Tel: +82-31-339-9970 Fax: +82-31-339-9855

www.e-ctk.com

TABLE OF CONTENTS

REPORT REVISION HISTORY	2
1.0 General Product Description	4
1.1 Tested Frequency.....	4
1.2 Tested Mode.....	4
1.3 Device Modifications.....	5
1.4 Peripheral Devices	5
1.5 Calibration Details of Equipment Used for Measurement	5
1.6 Test Facility.....	5
1.7 Laboratory Accreditations and Listings.....	6
2.0 Summary of tests	7
2.1 Transmitter Requirements.....	8
2.1.1 Carrier Frequency Separation	8
2.1.2 Number of Hopping Frequencies	10
2.1.4 Time of Occupancy (Dwell Time).....	19
2.1.5 Maximum peak Conducted Output Power	25
2.1.6 Band-edge	30
2.1.7 Field Strength of Emissions	41
2.1.8 AC Conducted Emissions.....	44
APPENDIX A – Test Equipment Used For Tests	44

1.0 General Product Description

Equipment model name	AH-NCW500
Serial number	Prototype
EUT condition	Pre-production, not damaged
Antenna type	Chip antenna Gain -1 dBi
Frequency Range	2402 MHz - 2480 MHz
RF power	6.938 dBm Peak Conducted (GFSK) 5.562 dBm Peak Conducted (8-DPSK)
Number of channels	79
Channel Spacing	1 MHz
Channel Access Protocol	Frequency Hopping
Type of Modulation	GFSK(1 Mbps), DQPSK(2 Mbps), 8-DPSK(3 Mbps)
Power Source	DC 3.7 V (Lithium Ion Rechargeable Battery)

1.1 Tested Frequency

	LOW	MID	HIGH
Frequency (MHz)	2402	2441	2480

1.2 Tested Mode

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

Tested Ch	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH 5
Low, Mid, High	FHSS	8-DPSK	3DH 5



CTK Co., Ltd.
The Prime Leader of Global Regulatory Certification

CTK Co., Ltd.

386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea

Tel: +82-31-339-9970 Fax: +82-31-339-9855

www.e-ctk.com

1.3 Device Modifications

The following modifications was applied by the applicant:

Not applicable

1.4 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	DELL INC.	Inspiron 6400	-
Switching Adapter2	DDongguang Lite Power 2nd Plant	LA65NS0-00	-
UNIVERSAL RADIO COMMUNICATION TESTER	R O H D E & S C H W A R Z	CMU 200	106765

1.5 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.6 Test Facility

The measurement facility is located at 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea.



CTK Co., Ltd.
The Prime Leader of Global Regulatory Certification





CTK Co., Ltd.

386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea

Tel: +82-31-339-9970 Fax: +82-31-339-9855

www.e-ctk.com

1.7 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 m & 10 m OATS, 3 m & 10 m SAC and Conducted Test Site to perform FCC Part 15/18 measurements	 805871
JAPAN	VCCI	10 m OATS, 3 m & 10 m SAC and Conducted Test Site	 R-948, C-986, T-1843
KOREA	KCC	EMI (10 m OATS, 10 m SAC and Conducted Test Site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and Interruptions)	 No. 51, KR0025
International	KOLAS	EMC	

2.0 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.247(a)	Carrier Frequency Separation	> 25 kHz	Conducted	C
15.247(a)	Number of Hopping Frequencies	> 15 hops		C
15.247(a)	20 dB Bandwidth	NA		C
15.247	Dwell Time	< 0.4 seconds		C
15.247(b)	Transmitter Output Power	< 0.125 Watts		C
15.247(d)	Conducted Spurious emission	> 20 dBc		C
15.247(d)	Band Edge	> 20 dBc		C
15.209	Field Strength of Harmonics	15.209(a)	Radiated	C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	NA

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:
- FCC Part 15.247, ANSI C63.4-2003

2.1 Transmitter Requirements

2.1.1 Carrier Frequency Separation

Test Location

RF Test Room

Test Procedures

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function enabled.
After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

Span = 3 MHz (wide enough to capture the peaks of two adjacent channels)

RBW = 30 kHz ($\geq 1\%$ of the span) Sweep = auto

VBW = 30 kHz (\geq RBW) Detector function = peak

Trace = max hold

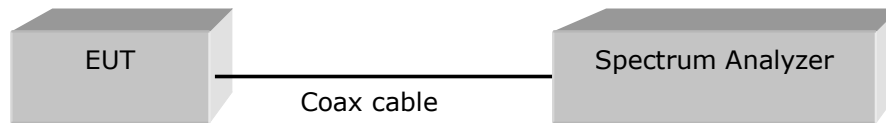


Figure 1 : Measurement setup for the carrier frequency separation

Limit

§15.247(a)(1) Frequency hopping system operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-third of 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Channel	Adjacent Hopping Channel Separation (kHz)	Two-third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
2441MHz	995	571.5	25	Complies

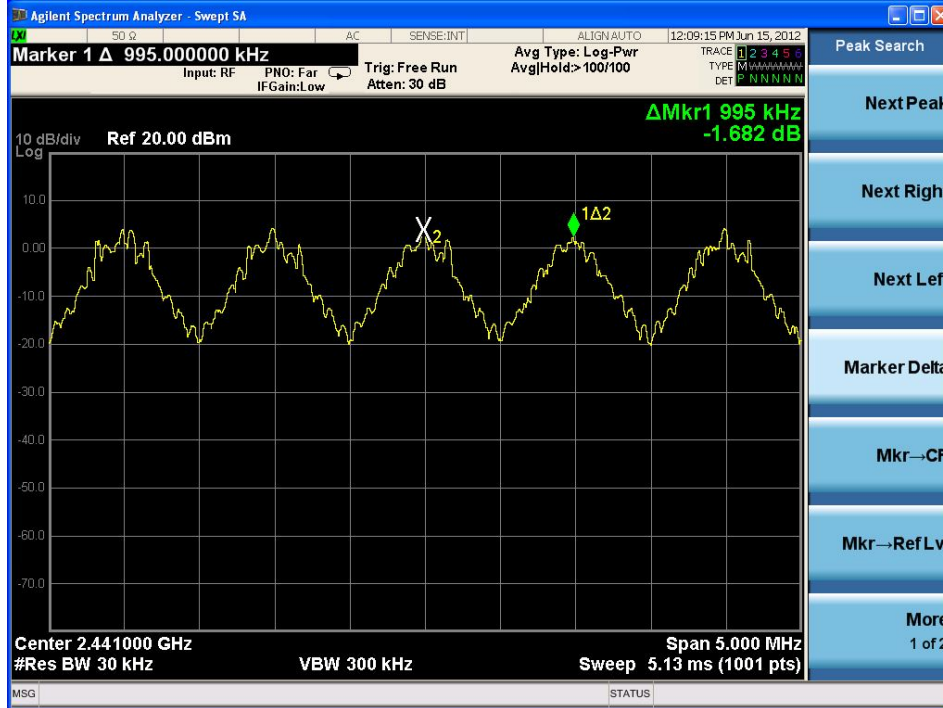
Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Channel	Adjacent Hopping Channel Separation (kHz)	Two-third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
2441MHz	995	829.3	25	Complies

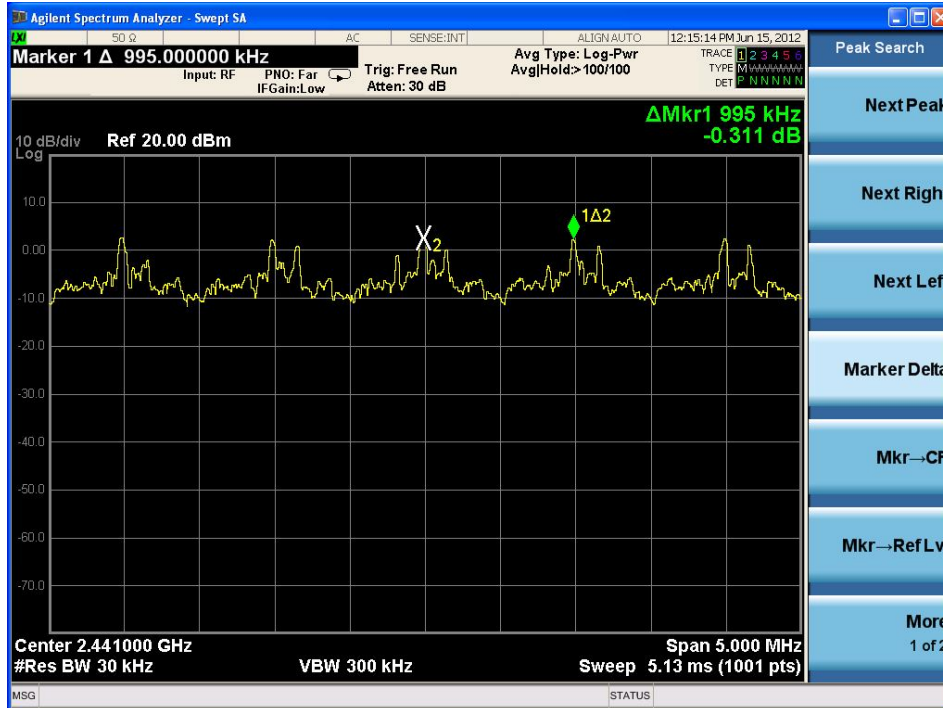
See next pages for actual measured spectrum plots.

Carrier Frequency Separation

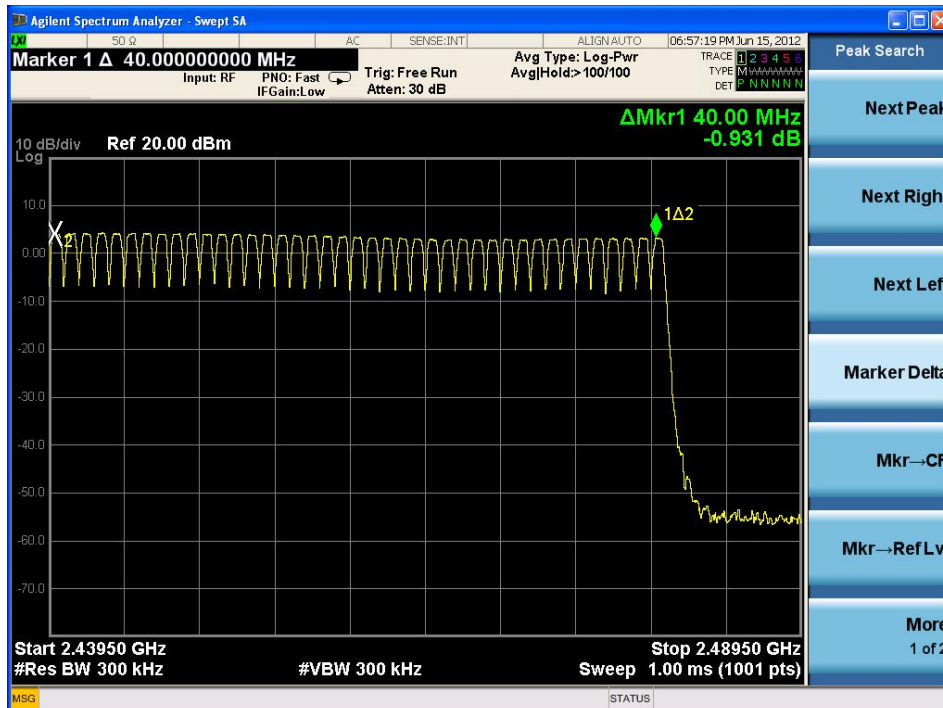
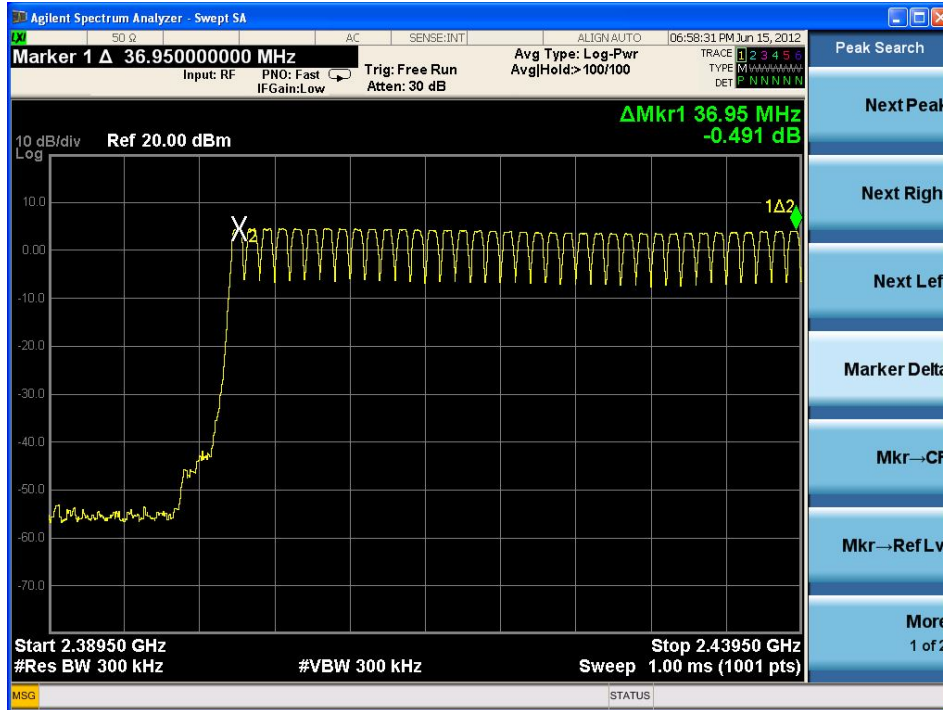
Data Rate : GFSK



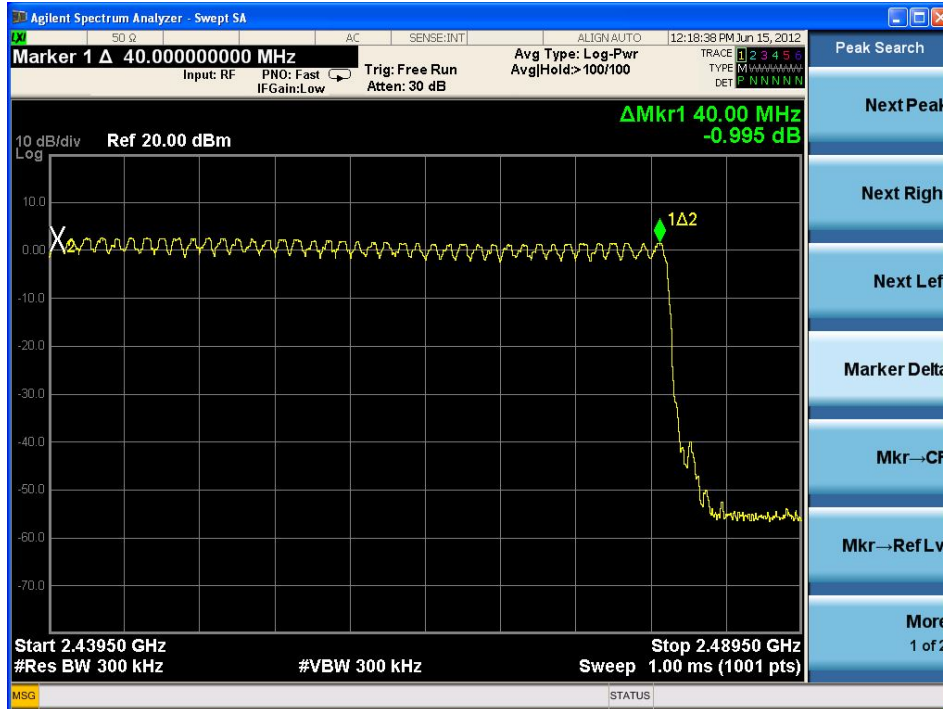
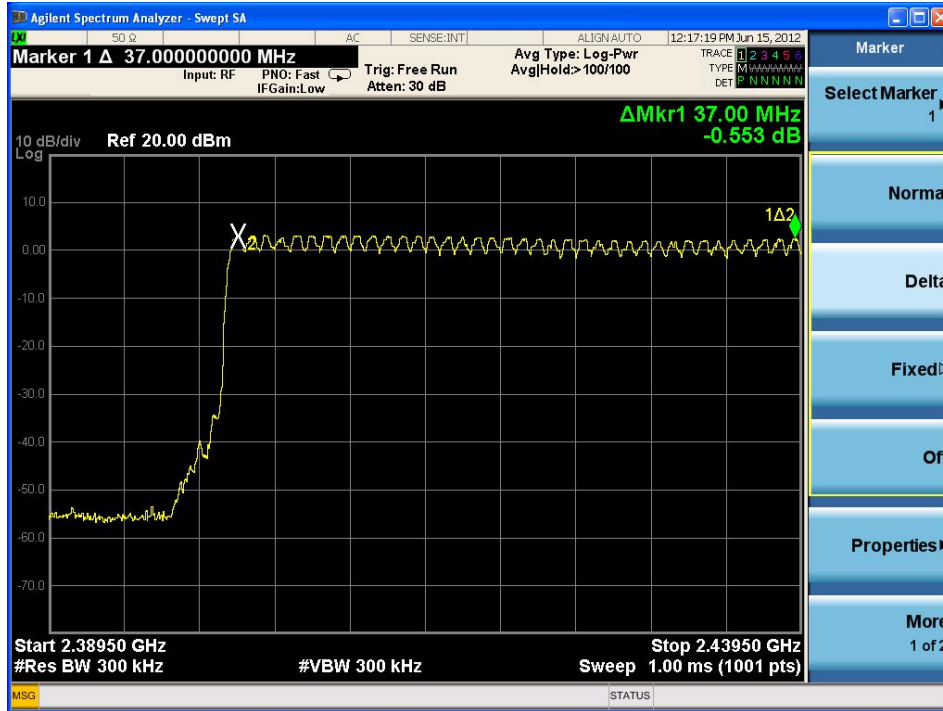
Data Rate : 8-DPSK



Number of Hopping Frequencies(GFSK)



Number of Hopping Frequencies(8-DPSK)



2.1.3 20 dB bandwidth

Test Location

RF Test Room

Test Procedures

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels. After the trace being stable, Use the marker-to peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 2 MHz (approximately 2 or 3 times of the 20 dB bandwidth)

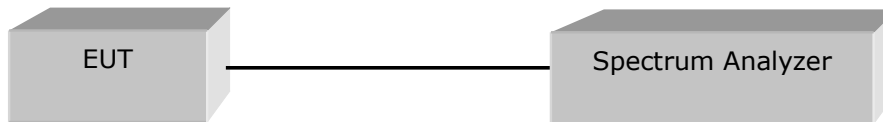
RBW = 30 kHz ($\geq 1\%$ of the span)

Sweep = auto

VBW = 30 kHz (\geq RBW)

Detector function = peak

Trace = max hold



Limit

Limit : N/A



Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	0.8517	Complies
2441	39	0.8572	Complies
2480	78	0.8564	Complies

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	1.242	Complies
2441	39	1.243	Complies
2480	78	1.244	Complies

See next pages for actual measured spectrum plots.

20 dB Bandwidth - GFSK





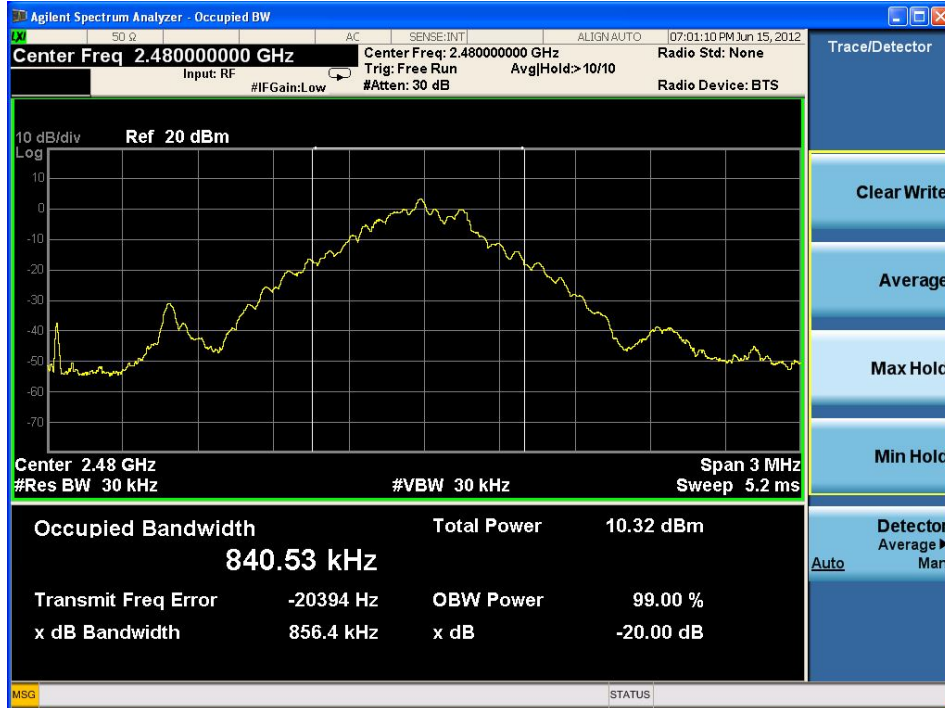
CTK Co., Ltd.
The Power Leader of Global Regulatory Certification

CTK Co., Ltd.

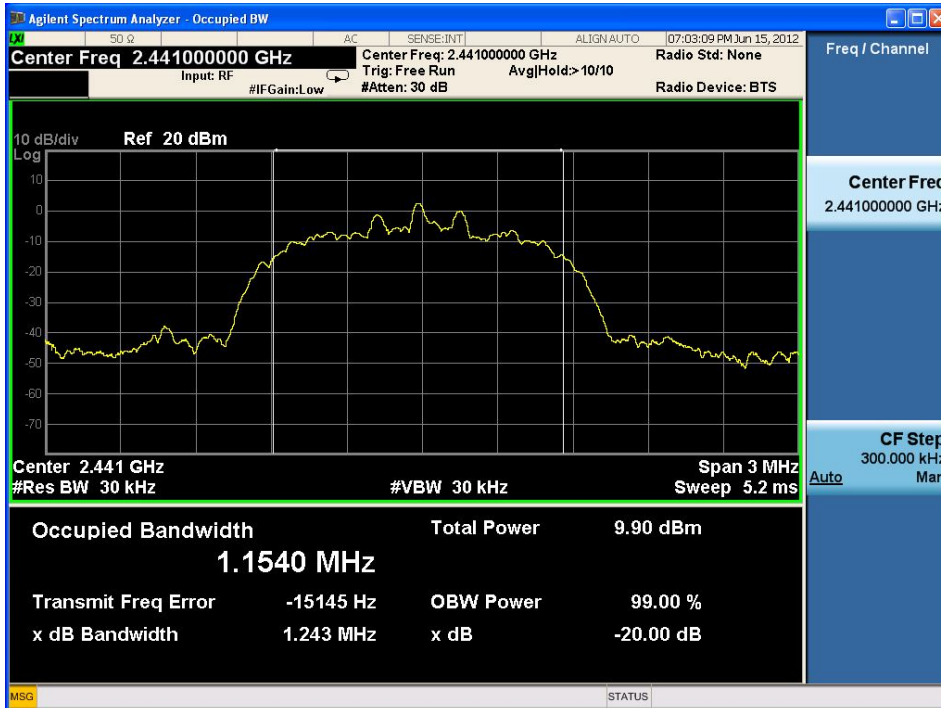
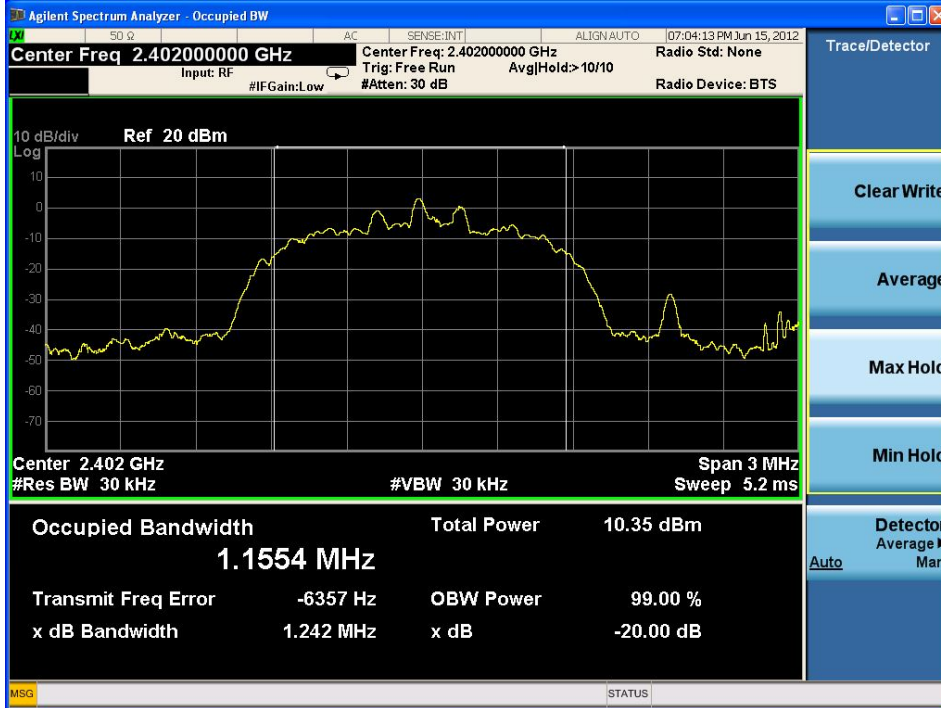
386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea

Tel: +82-31-339-9970 Fax: +82-31-339-9855

www.e-ctk.com



20 dB Bandwidth – 8-DPSK





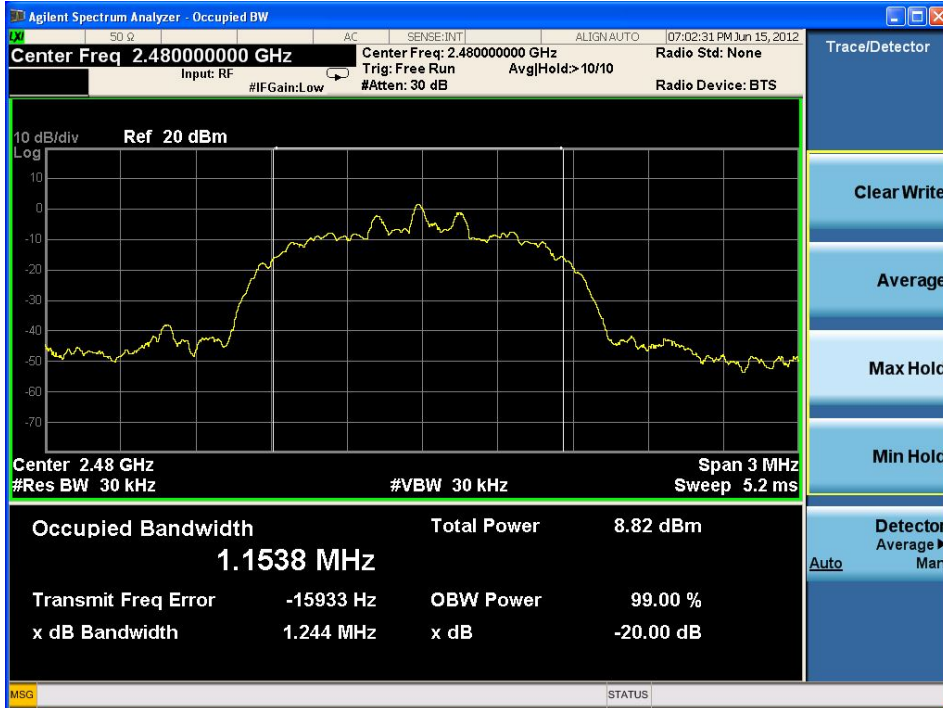
CTK Co., Ltd.
The Prime Leader of Global Regulatory Certification

CTK Co., Ltd.

386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea

Tel: +82-31-339-9970 Fax: +82-31-339-9855

www.e-ctk.com



2.1.4 Time of Occupancy (Dwell Time)

Test Location

RF Test Room

Test Procedures

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function enabled.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on any frequency be measured and set spectrum analyzer to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.
6. The AH-NCW500 has 3 type of payload, DH1, DH3, DH5. The hopping rate is 1600 per second.

The spectrum analyzer is set to:

Center frequency = the highest, middle, and the lowest channels

Span = zero

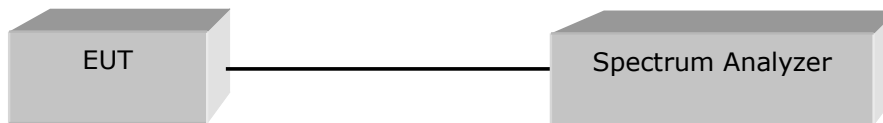
RBW = 1 MHz

Trace = max hold

VBW = 1 MHz (\geq RBW)

Detector function = peak

Sweep = as necessary to capture the entire dwell time per hopping channel



Limit

§15.247(a)(1)(iii) For frequency hopping system operating in 2400-2483.5 MHz band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Results

Time of occupancy on the TX channel in 31.6 sec = time domain slot length × hop rate ÷ number of hop per channel × 31.6

Test mode : GFSK

Channel Frequency (MHz)	Packet Type	Dwell Time (ms)	Test Results	
			Time of occupancy on the TX channel in 31.6sec (ms)	Result
2441	DH 1	0.435	139.20	Complies
	DH 3	1.700	272.00	Complies
	DH 5	2.950	314.67	Complies

DH1 Dwell time = $0.435 \text{ ms} \times (1600 \div 2) \div 79 \times 31.6 = 139.20 \text{ ms}$

DH3 Dwell time = $1.700 \text{ ms} \times (1600 \div 4) \div 79 \times 31.6 = 272.00 \text{ ms}$

DH5 Dwell time = $2.950 \text{ ms} \times (1600 \div 6) \div 79 \times 31.6 = 314.67 \text{ ms}$

Test mode : 8-DPSK

Channel Frequency (MHz)	Packet Type	Dwell Time (ms)	Test Results	
			Time of occupancy on the TX channel in 31.6sec (ms)	Result
2441	3DH 1	0.450	144.00	Complies
	3DH 3	1.695	271.20	Complies
	3DH 5	2.945	314.13	Complies

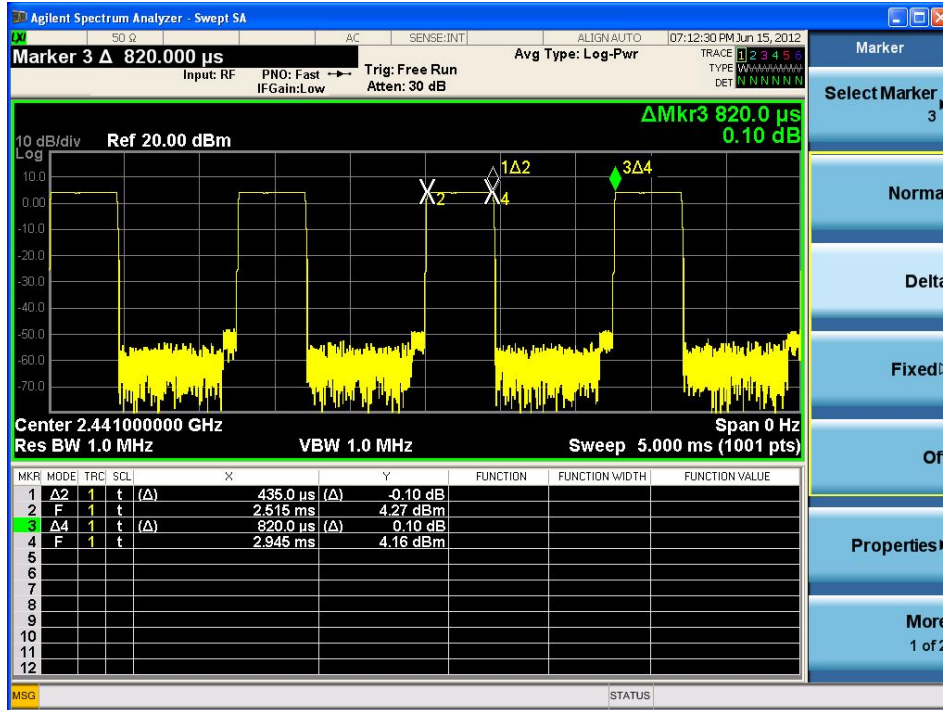
3DH1 Dwell time = $0.450 \text{ ms} \times (1600 \div 2) \div 79 \times 31.6 = 144.00 \text{ ms}$

3DH3 Dwell time = $1.695 \text{ ms} \times (1600 \div 4) \div 79 \times 31.6 = 271.20 \text{ ms}$

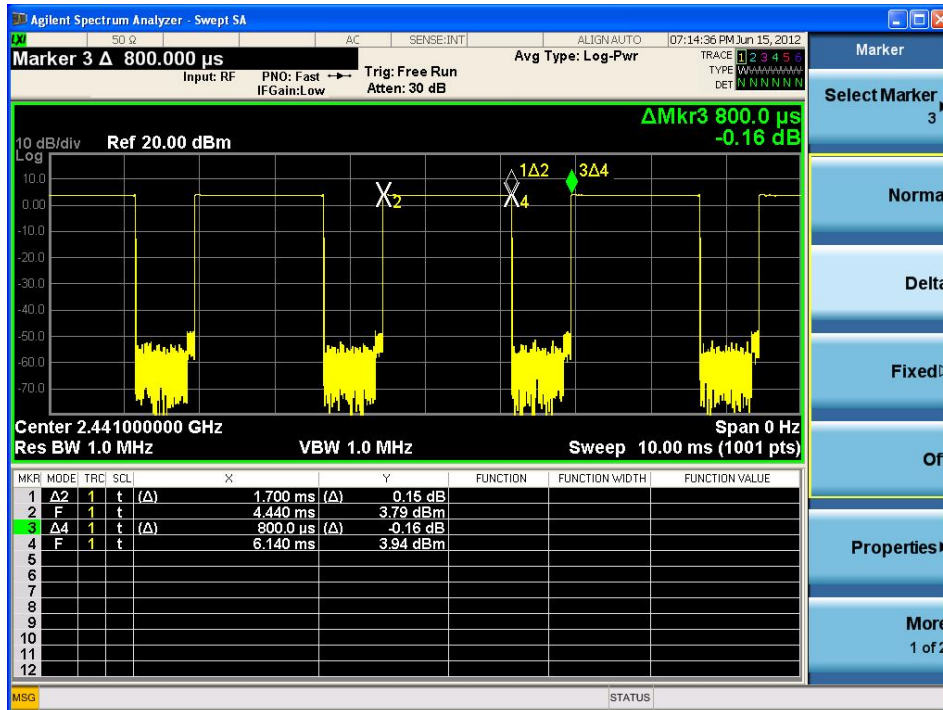
3DH5 Dwell time = $2.945 \text{ ms} \times (1600 \div 6) \div 79 \times 31.6 = 314.13 \text{ ms}$

See next pages for actual measured spectrum plots.

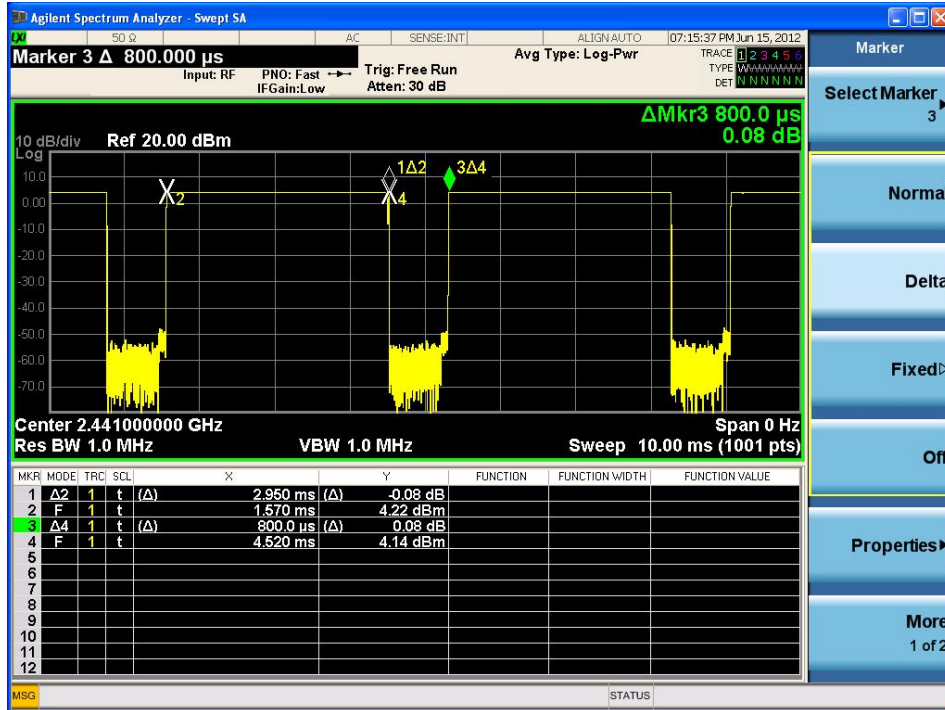
Time of Occupancy for PACKET Type DH1(GFSK)



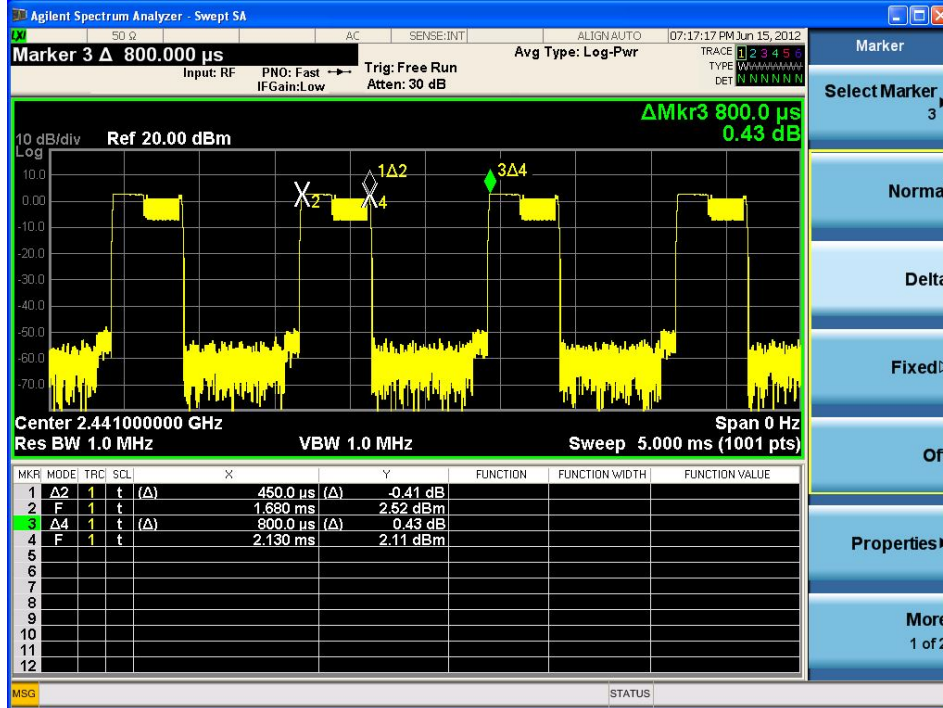
Time of Occupancy for PACKET Type DH3(GFSK)



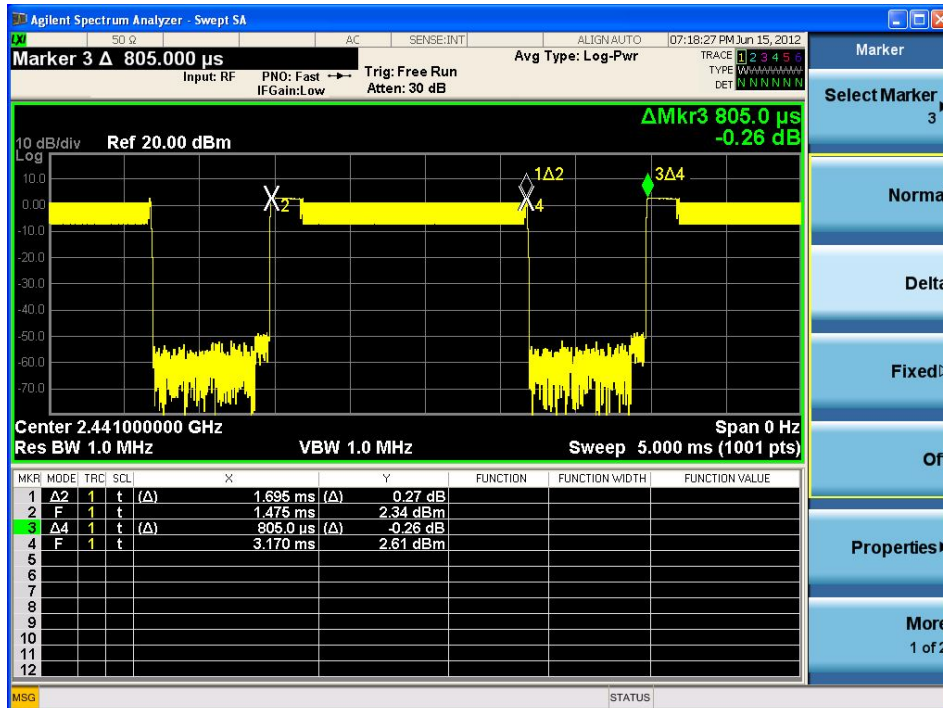
Time of Occupancy for PACKET Type DH5(GFSK)



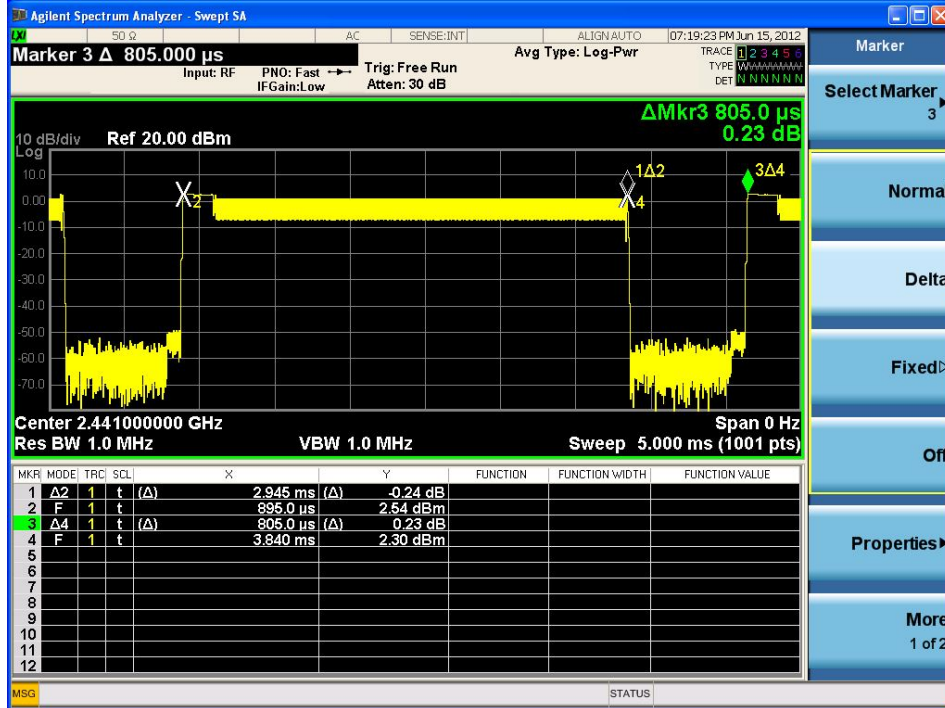
Time of Occupancy for PACKET Type 3DH1(8-DPSK)



Time of Occupancy for PACKET Type 3DH3(8-DPSK)



Time of Occupancy for PACKET Type 3DH5(8-DPSK)



2.1.5 Maximum peak Conducted Output Power

Test Location

RF Test Room

Test Procedures

The maximum peak conducted output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.

The spectrum analyzer is set to:

Center frequency = the highest, middle, and the lowest channels

Span = 5 MHz (approximately 5 times of the 20 dB bandwidth)

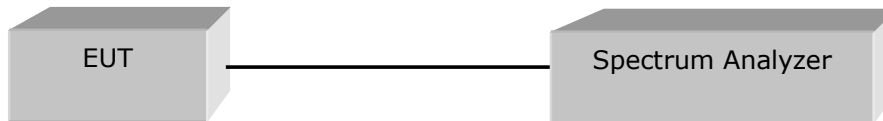
RBW = 1 MHz (greater than the 20 dB bandwidth of the emission being measured)

VBW = 1 MHz (\geq RBW)

Detector function = peak

Trace = max hold

Sweep = auto



Limit

§5.247(b)(1) The Maximum Peak Output Power Measurement is 0.125 Watts for frequency hopping system operating in 2400-2483.5 MHz employing at least 15 Hopping channels.

Test Results

Test mode : GFSK, CFG PKT Packet Type : 4 Packet Size : 27(DH1)

Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	6.938	4.941	Complies
2441	39	6.583	4.553	Complies
2480	78	5.629	3.655	Complies

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	5.969	3.952	Complies
2441	39	5.562	3.599	Complies
2480	78	4.580	2.871	Complies

See next pages for actual measured spectrum plots.