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FCC 47 CFR PART 15 SUBPART C &
INDUSTRY CANADA RSS-247 ISSUE 2 February 2017

CERTIFICATION TEST REPORT

For

Product Name: Decanter

MODEL No.: WB-168, WB-568, WB-888

Trademark: Winebetter™

FCC ID: 2ANFAWB168

IC: 23350-WB168

HVIN: WB-168

REPORT NO.: ES180105018E

ISSUE DATE: October 26, 2017

Prepared for

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Prepared by

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1 TEST RESULT CERTIFICATION

Applicant:	Zhejiang Anka Electric Co., Ltd. Sanjiang street Sanjiang industrial gathering area Jiang two road on the 15th, Shengzhou City, Zhejiang Province, China
Manufacturer:	Zhejiang Anka Electric Co., Ltd. Sanjiang street Sanjiang industrial gathering area Jiang two road on the 15th, Shengzhou City, Zhejiang Province, China
Product Description:	Decanter
Model Number:	WB-168, WB-568, WB-888 (Note: These models are identical in circuitry and electrical, mechanical and physical construction; the differences are the color and model no. for trading purpose. We prepare WB-168 for test.)
File Number:	ES180105018E
Date of Test:	June 16, 2017 to June 17, 2017

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C IC RSS-GEN, Issue4, November 2014 IC RSS-247 Issue2, February 2017	PASS

The above equipment was tested by EMTEK (SHENZHEN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2, Part 15.247, IC RSS-247 IC RSS-GEN.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : June 16, 2017 to June 17, 2017

Prepared by : Yaping Shen
YapingShen /Editor

Reviewer : Joe Xia
Joe Xia /Supervisor

EMTEK (SHENZHEN) CO., LTD. TESTING

Approve & Authorized Signer :
Lisa Wang/Manager

2 EUT TECHNICAL DESCRIPTION

Characteristics	Description
Device Type	Bluetooth V4.2
Data Rate	1Mbps for GFSK modulation 2Mbps for pi/4-DQPSK modulation 3Mbps for 8DPSK modulation
Modulation:	GFSK, pi/4-DQPSK, 8DPSK
Operating Frequency Range(s):	2402-2480MHz
Number of Channels:	79 channels
Transmit Power Max:	-1.995 dBm
Antenna Type	PCB Antenna
Antenna Gain	0 dBi
Power supply	DC 7.4V from inner battery or DC 9V from Adapter
Adapter	Model: SA/12PA/12FUS090100 Input: 100-240V~ 50/60Hz 0.5A Output: DC 9V 1.0A
Product SW/HW version	V1.0/V1.0
Radio SW/HW version	V1.0/V1.0

Note: *for more details, please refer to the User's manual of the EUT.*

3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict
15.247(a)(1) RSS-247.5.1(2)	20 dB Bandwidth	PASS
15.247(a)(1) RSS-247.5.1(4)	Carrier Frequency Separation	PASS
15.247(a)(1) RSS-247.5.1(4)	Number of Hopping Frequencies	PASS
15.247(a)(1) RSS-247.5.1(5)	Average Time of Occupancy (Dwell Time)	PASS
15.247(b)(1) RSS-247.5.4(4)	Maximum Peak Conducted Output Power	PASS
15.247(c) RSS-247 5.5	Conducted Spurious Emissions	PASS
15.247(d) 15.209 RSS-Gen.6.13	Radiated Spurious Emissions	PASS
15.207 RSS-Gen 8.8	Conducted Emission	PASS
15.203 RSS-Gen 6.7	Antenna Application	PASS
RSS-Gen.6.6	99% Occupied Bandwidth	PASS
NOTE1: N/A (Not Applicable)		

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:
FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart C
DA 00-705
IC RSS-Gen, ISSUE 4 November 2014
IC RSS-247 , ISSUE2 February 2017
ANSI C63.10

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/20/2017
L.I.S.N.	Schwarzbeck	NNLK8129	8129203	05/20/2017
50Ω Coaxial Switch	Anritsu	MP59B	M20531	N/A
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	05/21/2017
Voltage Probe	Rohde & Schwarz	TK9416	N/A	05/21/2017
I.S.N	Rohde & Schwarz	ENY22	1109.9508.02	05/21/2017

4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	05/21/2017
Pre-Amplifier	HP	8447D	2944A07999	05/20/2017
Bilog Antenna	Schwarzbeck	VULB9163	142	05/20/2017
Loop Antenna	ARA	PLA-1030/B	1029	05/21/2017
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	05/21/2017
Horn Antenna	Schwarzbeck	BBHA 9120	D143	05/20/2017
Cable	Schwarzbeck	AK9513	ACRX1	05/21/2017
Cable	Rosenberger	N/A	FP2RX2	05/21/2017
Cable	Schwarzbeck	AK9513	CRPX1	05/21/2017
Cable	Schwarzbeck	AK9513	CRRX2	05/21/2017

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	05/20/2017
Power meter	Anritsu	ML2495A	0824006	05/20/2017
Power sensor	Anritsu	MA2411B	0738172	05/20/2017
Spectrum Analyzer	Agilent	N9010A	My53470879	05/20/2017

Remark: *Each piece of equipment is scheduled for calibration once a year.*

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.
The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (1Mbps for GFSK modulation; 3Mbps for 8DPSK modulation) were used for all test.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list for Bluetooth v4.2:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	39	2441	…	…
1	2403	40	2442	76	2478
2	2404	41	2443	77	2479
…	…	…	…	78	2480
Note: fc=2402MHz+(k-1)×1MHz k=1 to 79					

Test Frequency and channel for Bluetooth v4.2:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	39	2441	78	2480

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab. : Accredited by CNAS, 2016.10.24
The certificate is valid until 2022.10.28
The Laboratory has been assessed and proved to be in compliance with CNAS-CL01: 2006(identical to ISO/IEC17025: 2005)
The Certificate Registration Number is L2291

: Accredited by TUV Rheinland Shenzhen, 2010.5.25
The Laboratory has been assessed according to the requirements ISO/IEC 17025.

: Accredited by FCC
Designation Number: CN1204
Test Firm Registration Number: 882943.

: Accredited by Industry Canada, November 24, 2015
The Certificate Registration Number is 4480A-2

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

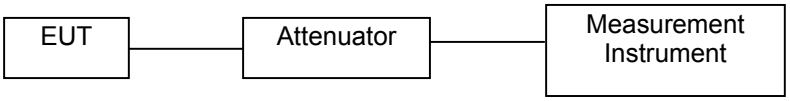
Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test	±2.0dB
Radiated Emission Test	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5℃
Humidity	±3%

Measurement Uncertainty for a level of Confidence of 95%

7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP 1

The Bluetooth v4.2 component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP 2

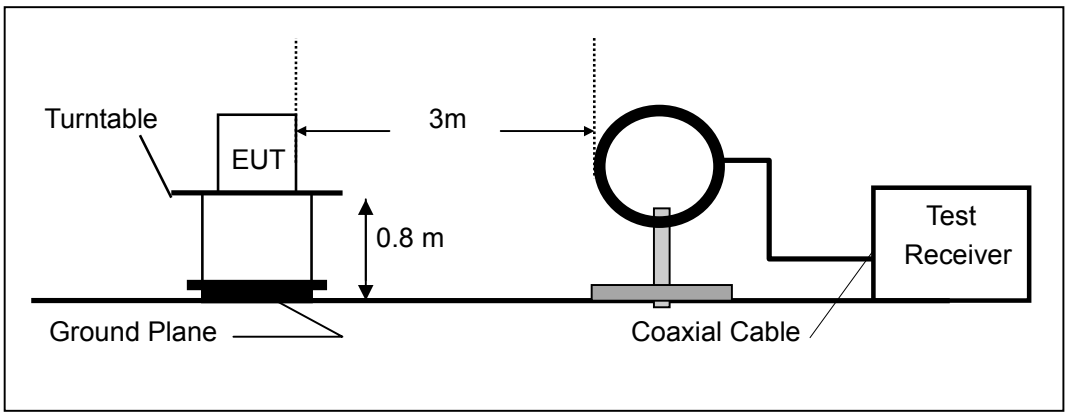
The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

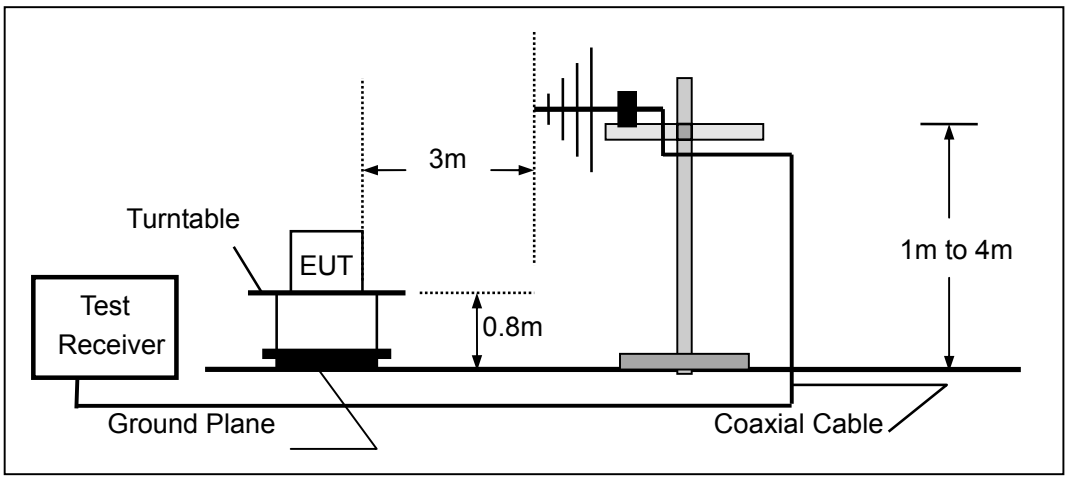
Above 30MHz：
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz:
(Note: the FCC's permission to use 1.5 m as an alternative per TCBC Conf call of Dec. 2, 2014.)
The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

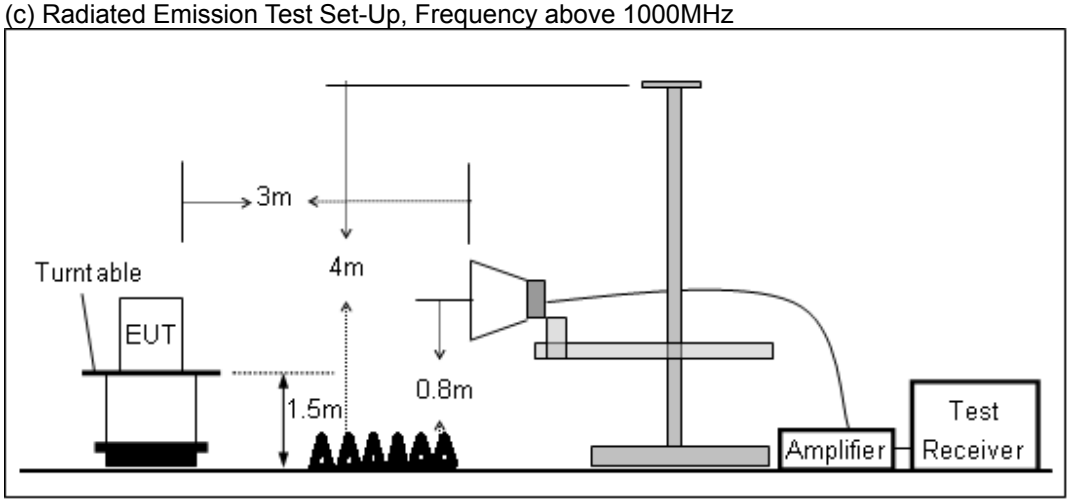
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

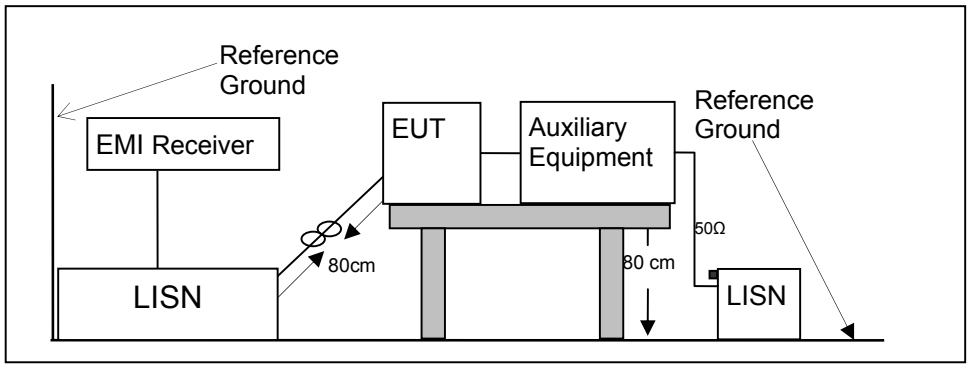


7.3 CONDUCTED EMISSION TEST SETUP

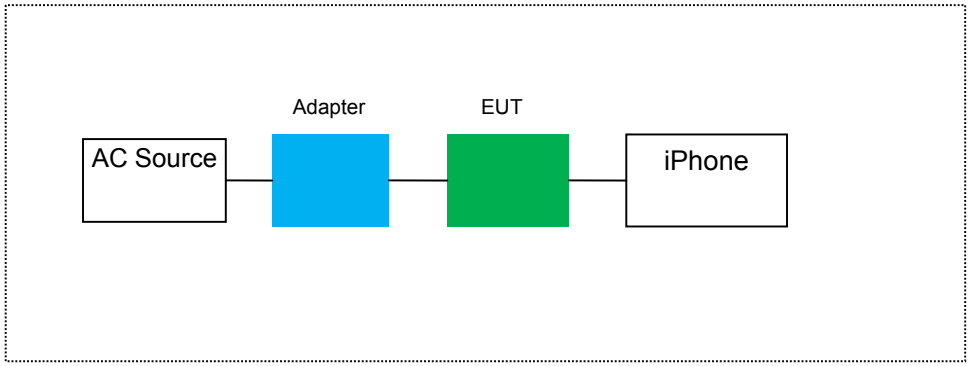
The mains cable of the EUT (Perfect Share Mini) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.8 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



7.5 SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	S/N	Note
1.	iPhone	Apple	A1526	N/A	N/A

Notes:

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

8 FREQUENCY HOPPING SYSTEM REQUIREMENTS

8.1 Standard Applicable

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

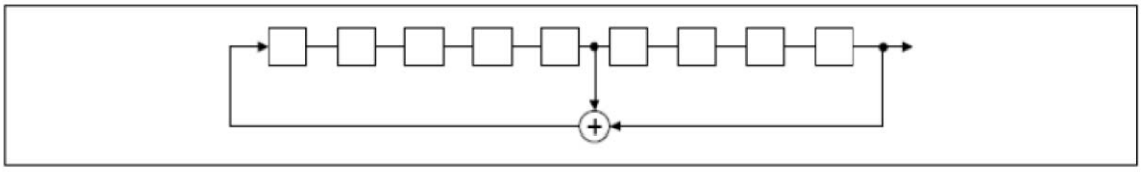
(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

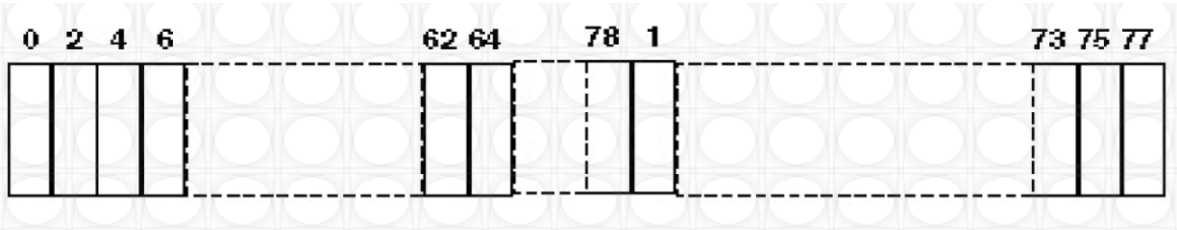
8.2 EUT Pseudorandom Frequency Hopping Sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master; the phase in the hopping sequence is determined by the Bluetooth clock of the master.The channel is divide into time slots where each slot corresponds to an RF hop frequency. Consecutive hops correspond to different RF hop frequencies. The normal hop is 1 600 hops/s.

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones. Number of shift register stages: 9
Length of pseudo-random sequence: 29-1 = 511 bits
Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence



Each frequency used equally on the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

8.3 Equal Hopping Frequency Use

All Bluetooth units participating in the piconet are time and hop-synchronized to the channel.

Example of a 79 hopping sequence in data mode:
35, 27, 6, 44, 14, 61, 74, 32, 1, 11, 23, 2, 55, 65, 29, 3, 9, 52, 78, 58, 40, 25, 0, 7, 18, 26, 76, 60, 47, 50, 2, 5, 16, 37, 70, 63, 66, 54, 20, 13, 4, 8, 15, 21, 26, 10, 73, 77, 67, 69, 43, 24, 57, 39, 46, 72, 48, 33, 17, 31, 75, 19, 41, 62, 68, 28, 51, 66, 30, 56, 34, 59, 71, 22, 49, 64, 38, 45, 36, 42, 53
Each Frequency used equally on the average by each transmitter

8.4 Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH- enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

9 TEST REQUIREMENTS

9.1 20DB BANDWIDTH

9.1.1 Applicable Standard

According to FCC Part 15.247(a)(1) and DA 00-705
According to IC RSS-247

9.1.2 Conformance Limit

No limit requirement.

9.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.1.4 Test Procedure

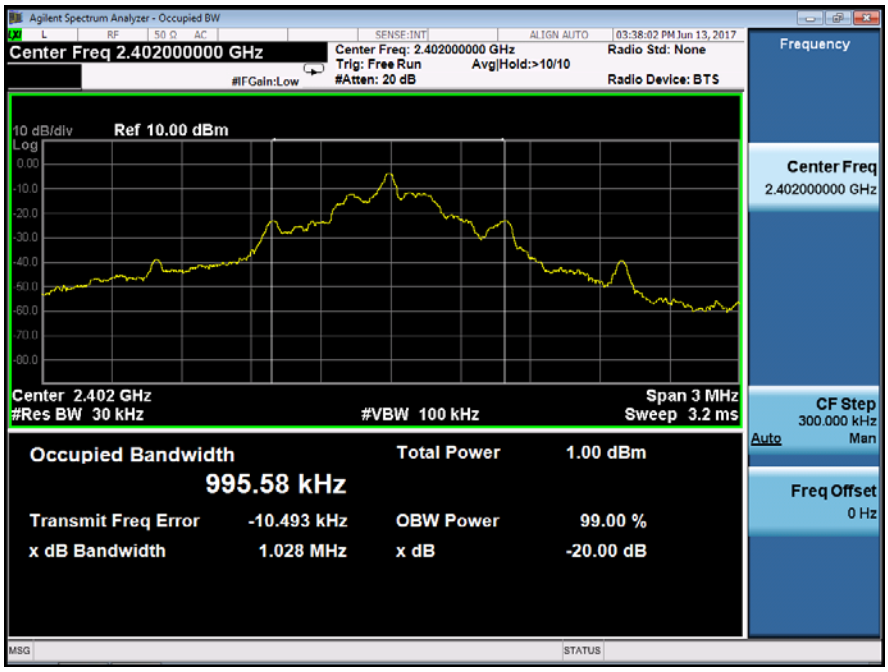
The EUT was operating in Bluetooth v4.2 mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously
Set RBW = 30 kHz.
Set the video bandwidth (VBW) =100 kHz.
Set Span= approximately 2 to 3 times the 20 dB bandwidth
Set Detector = Peak.
Set Trace mode = max hold.
Set Sweep = auto couple.
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. 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 markerdelta 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.
If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.
Measure and record the results in the test report.

Test Results

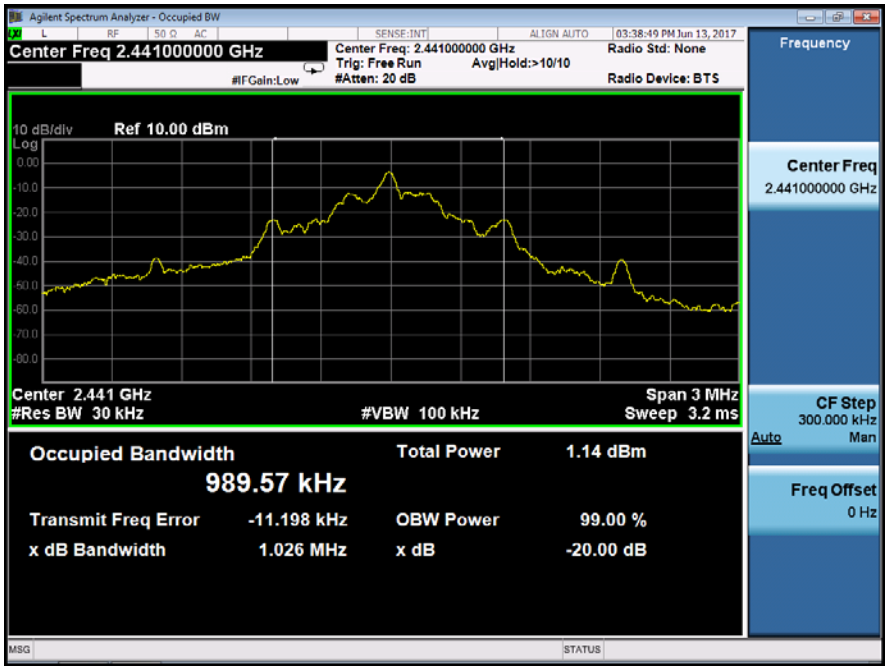
Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	King Kong

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (kHz)	Limit (kHz)	Verdict
GFSK	00	2402	1.028	N/A	PASS
	39	2441	1.026	N/A	PASS
	78	2480	1.025	N/A	PASS
8DPSK	00	2402	1.155	N/A	PASS
	39	2441	1.153	N/A	PASS
	78	2480	1.160	N/A	PASS
Note: N/A (Not Applicable)					

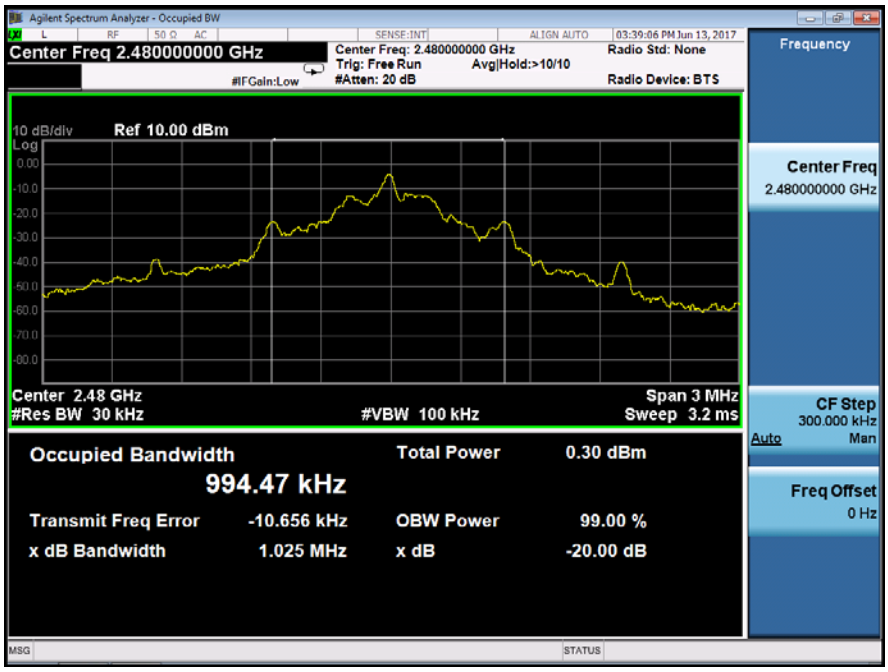
Test Model	20dB Bandwidth Bluetooth v4.2 Channel 0: 2402MHz	GFSK Modulation



Test Model	20dB Bandwidth Bluetooth v4.2 Channel 39: 2441MHz	GFSK Modulation



Test Model	20dB Bandwidth Bluetooth v4.2 Channel 78: 2480MHz	GFSK Modulation



Test Model	20dB Bandwidth Bluetooth v4.2 Channel 0: 2402MHz	8DPSK Modulation

Test Model	20dB Bandwidth Bluetooth v4.2 Channel 39: 2441MHz	8DPSK Modulation

Test Model	20dB Bandwidth Bluetooth v4.2 Channel 78: 2480MHz	8DPSK Modulation

9.2 99%BANDWIDTH

9.2.1 Applicable Standard

According to IC RSS-247

9.2.2 Conformance Limit

No limit requirement.

9.2.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.2.4 Test Procedure

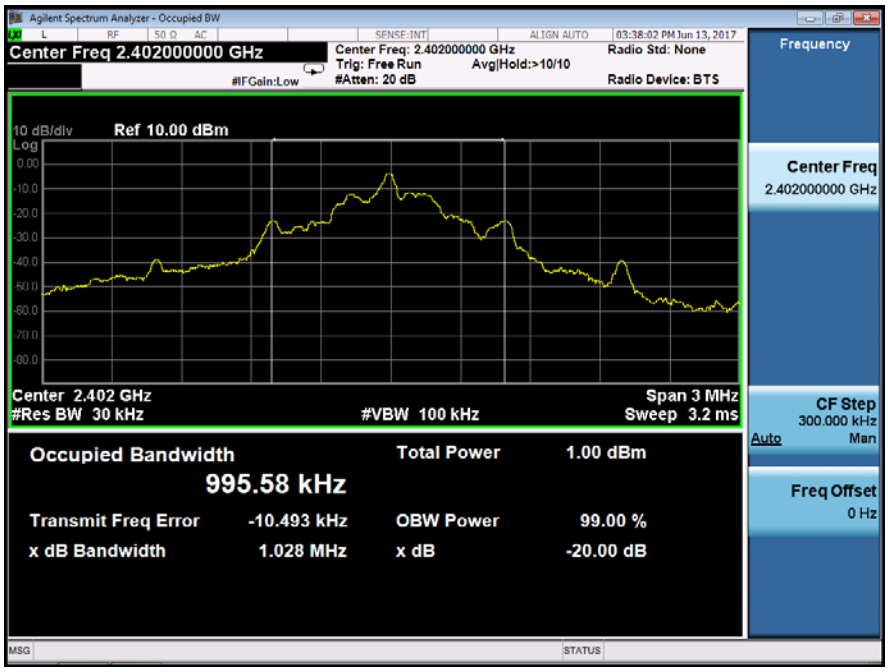
The EUT was operating inBluetoothv2.1mode and controlled its channel. Printed out the test result from the spectrum by hard copy function.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously
Set RBW = 1%-5% OBW
Set the video bandwidth (VBW) ≥100kHz.
Set Span= approximately 2 to 3 times the 20 dB bandwidth
Set Detector = Peak.
Set Trace mode = max hold.
Set Sweep = auto couple.
The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.Use the marker-to-peak function to set the marker to the peak of the emission. Use themarker-delta function to measure 20 dB down one side of the emission. Reset the markerdeltafunction, and move the marker to the other side of the emission, until it is (asclose as possible to) even with the reference marker level. The marker-delta reading atthis point is the 20 dB bandwidth of the emission.
If this value varies with differentmodes of operation (e.g., data rate, modulation format, etc.), repeat this test for eachvariation.
Measure and record the results in the test report.

Test Results

Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	KK

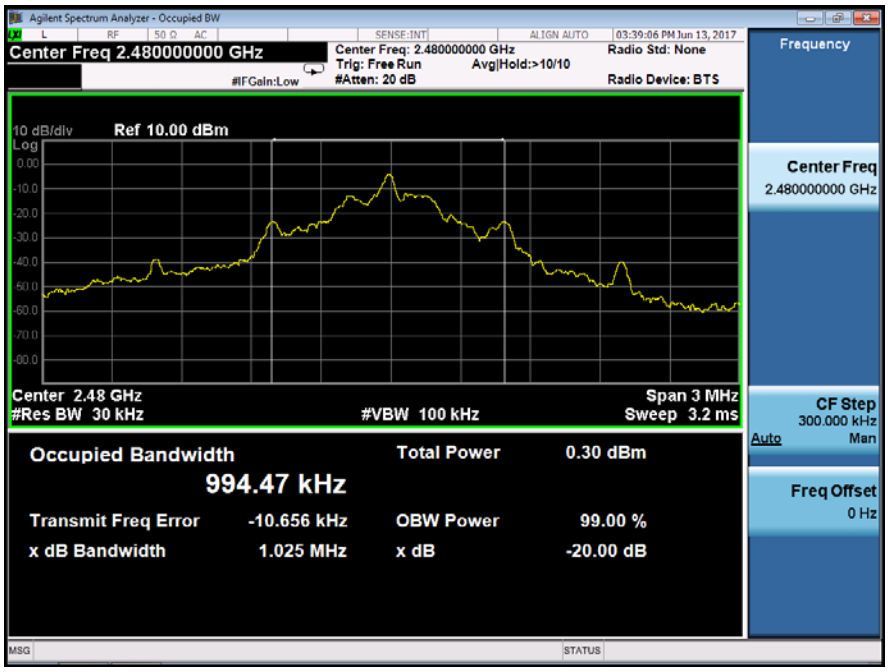
Modulation Mode	Channel Number	Channel Frequency (MHz)	99% Measurement Bandwidth(KHz)	Verdict
GFSK	0	2402	995.58	PASS
	39	2441	989.57	PASS
	78	2480	994.47	PASS
8DPSK	0	2402	1130.20	PASS
	39	2441	1131.90	PASS
	78	2480	1133.20	PASS
Note: N/A (Not Applicable)				

Test Model	99% Bandwidth	
	Bluetooth v4.2 with classic mode	
	Channel 0: 2402MHz	GFSKModulation



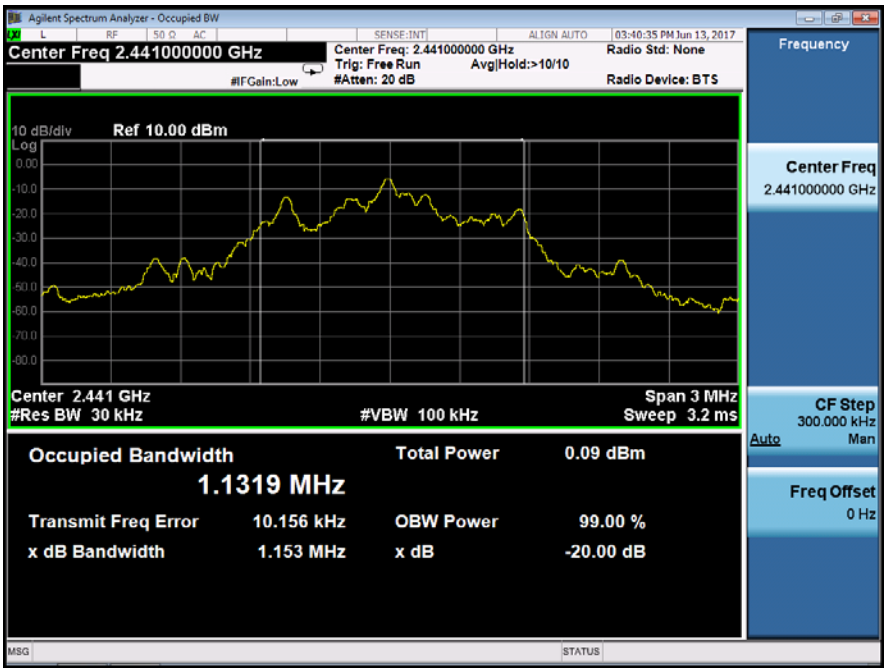
Test Model	99% Bandwidth	
	Bluetooth v4.2 with classic mode	
	Channel 39: 2441MHz	GFSKModulation

Test Model	99% Bandwidth	
	Bluetooth v4.2 with classic mode	
	Channel 78: 2480MHz	GFSKModulation



Test Model	99% Bandwidth	
	Bluetooth v4.2 with classic mode	
	Channel 0: 2402MHz	8DPSKModulation

Test Model	20dB Bandwidth & 99% Bandwidth	
	Bluetooth v4.2 with classic mode	
	Channel 39: 2441MHz	8DPSKModulation



Test Model	20dB Bandwidth & 99% Bandwidth	
	Bluetooth v4.2 with classic mode	
	Channel 78: 2480MHz	8DPSKModulation

9.3 CARRIER FREQUENCY SEPARATION

9.3.1 Applicable Standard

According to FCC Part 15.247(a)(1) and DA 00-705
According to IC RSS-247

9.3.2 Conformance Limit

Frequency hopping systems operating in the 2400-2483.5MHz band shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.
In case of an output power less than 125mW, the frequency hopping system may have channels separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

9.3.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.3.4 Test Procedure

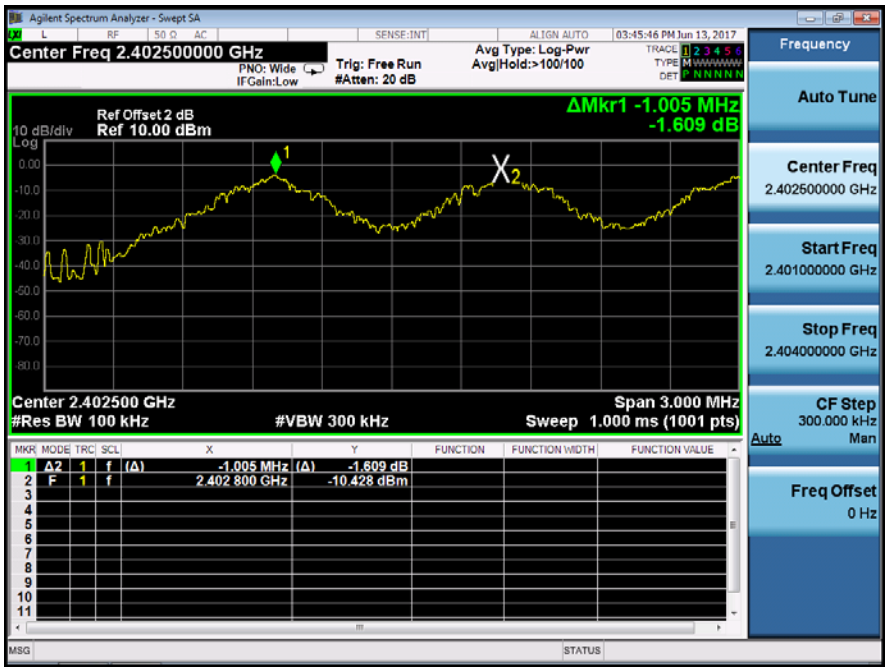
■ According to FCC Part15.247(a)(1)& According to IC RSS-247
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Set the RBW =100kHz. Set VBW =300kHz.
Set the span = wide enough to capture the peaks of two adjacent channels
Set Sweep time = auto couple.
Set Detector = peak. Set Trace mode = max hold.
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

Test Results

Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	King Kong

Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (kHz)	Limit (kHz)	Verdict
GFSK	0	2402	1005	>685	PASS
	39	2441	1035	>684	PASS
	78	2480	987	>683	PASS
pi/4-DQPSK	0	2402	984	>770	PASS
	39	2441	945	>769	PASS
	78	2480	996	>773	PASS
Note: GFSK, 8DPSK = 20dB bandwidth * 2/3, if it is greater than 25kHz and the output power is less than 125mW (21dBm).					

Test Model	Carrier Frequency Separation Bluetooth v4.2 Channel 0: 2402MHz	GFSK Modulation

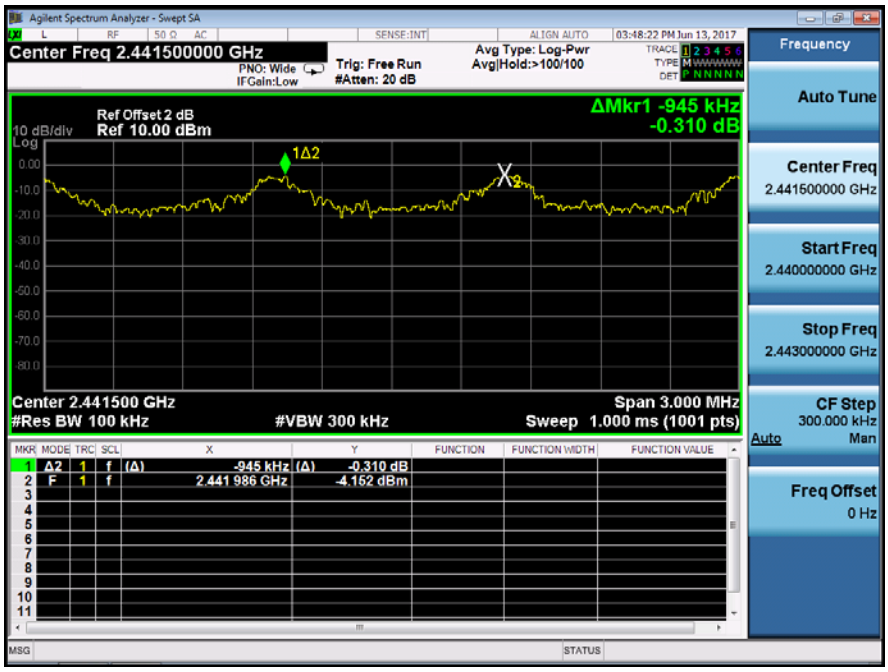


Test Model	Carrier Frequency Separation Bluetooth v4.2 Channel 39: 2441MHz	GFSK Modulation

Test Model	Carrier Frequency Separation Bluetooth v4.2 Channel 78: 2480MHz	GFSK Modulation

Test Model	Carrier Frequency Separation Bluetooth v4.2 Channel 0: 2402MHz	8DPSK Modulation

Test Model	Carrier Frequency Separation Bluetooth v4.2 Channel 39: 2441MHz	8DPSK Modulation



Test Model	Carrier Frequency Separation Bluetooth v4.2 Channel 78: 2480MHz	8DPSK Modulation

9.4 NUMBER OF HOPPING FREQUENCIES

9.4.1 Applicable Standard

According to FCC Part 15.247(a)(1) (iii)and DA 00-705
According to IC RSS-247

9.4.2 Conformance Limit

Frequency hopping systems operating in the 2400-2483.5MHz band shall use at least 15 channels.

9.4.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.4.4 Test Procedure

■ According to FCC Part15.247(a)(1)(iii) and IC RSS-247
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation (2400-2483.5MHz)
RBW ≥ 100KHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies.

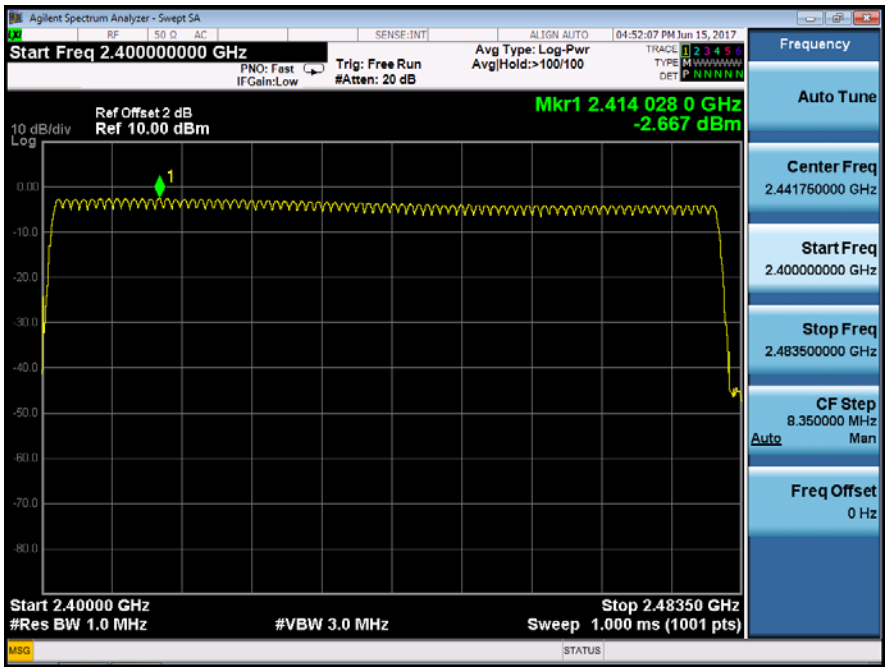
Test Results

Bluetooth (GFSK, 8DPSK) mode have been tested, and the worst result(GFSK) was report as below:

Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	King Kong

Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel limit
2402-2480	79	＞15

Test Model	Number Of Hopping Frequencies Bluetooth v4.2 Span: 2400-2483.5MHz



9.5 AVERAGE TIME OF OCCUPANCY (DWELL TIME)

9.5.1 Applicable Standard

According to FCC Part 15.247(a)(1)(iii) and DA 00-705
According to IC RSS-247

9.5.2 Conformance Limit

For frequency hopping systems operating in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4s within a period of 0.4s multiplied by the number of hopping channels employed.

9.5.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

9.5.4 Test Procedure

- According to FCC Part15.247(a)(1)(iii) and IC RSS-247

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel
RBW = 1 MHz
VBW ≥ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak
Trace = max hold
If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section.

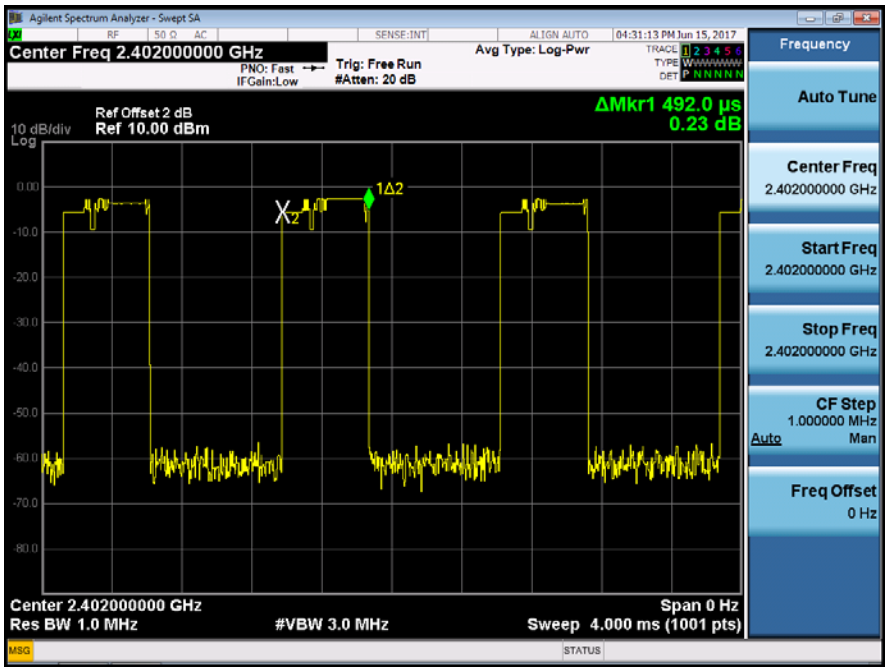
9.5.5 Test Results

Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	King Kong
CH 0:	2402MHz		

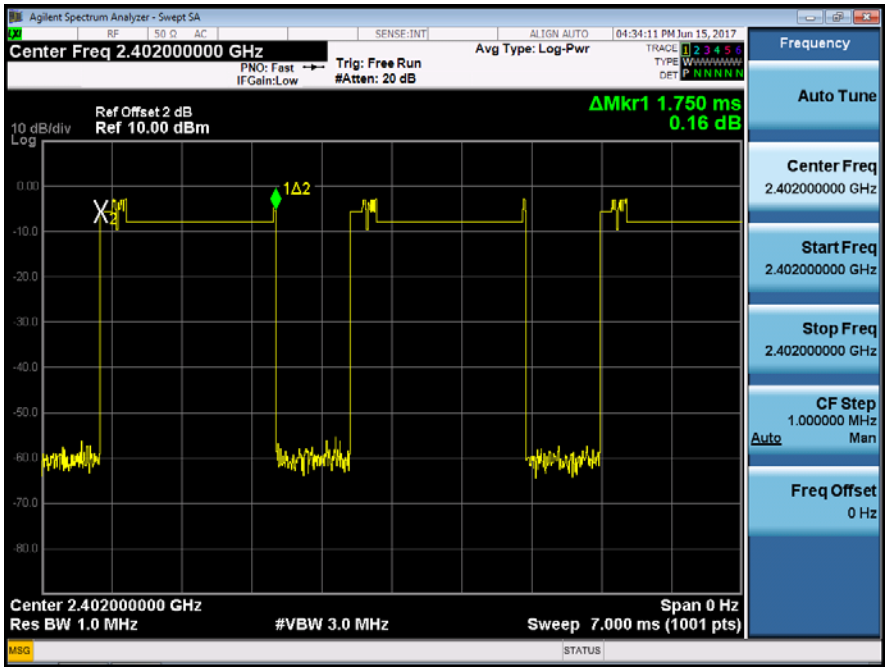
Modulation Mode	Channel Number	Packet type	Pluse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	0	DH1	0.492	157.44	<400	PASS
	0	DH3	1.750	280.00	<400	PASS
	0	DH5	2.990	318.94	<400	PASS
8DPSK	0	DH1	0.504	161.28	<400	PASS
	0	DH3	1.757	281.12	<400	PASS
	0	DH5	3.000	320.01	<400	PASS

Note: Dwell Time(DH1)=PW*(1600/2/79)*31.6
Dwell Time(DH3)=PW*(1600/4/79)*31.6
Dwell Time(DH5)=PW*(1600/6/79)*31.6

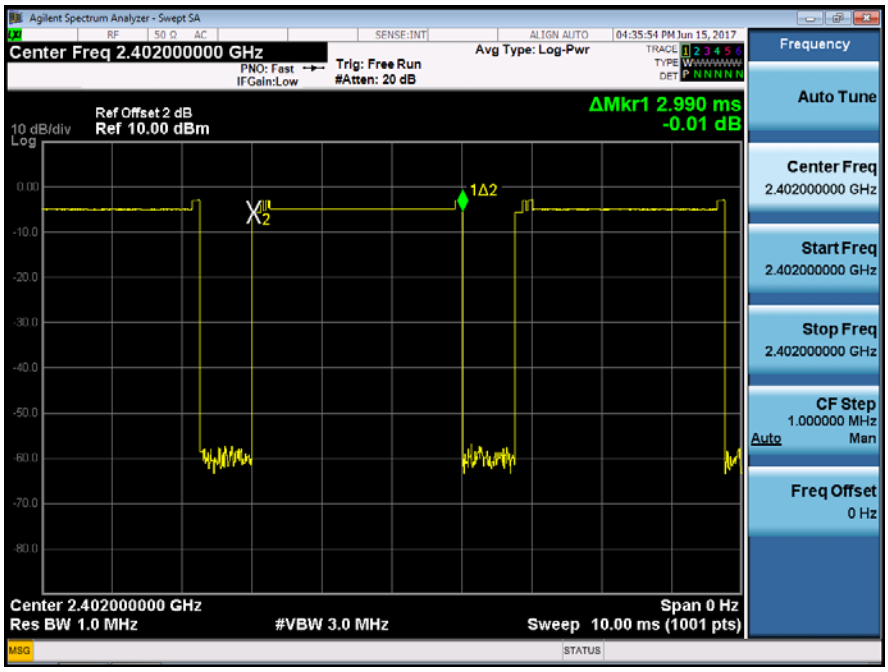
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2402MHz GFSK DH1



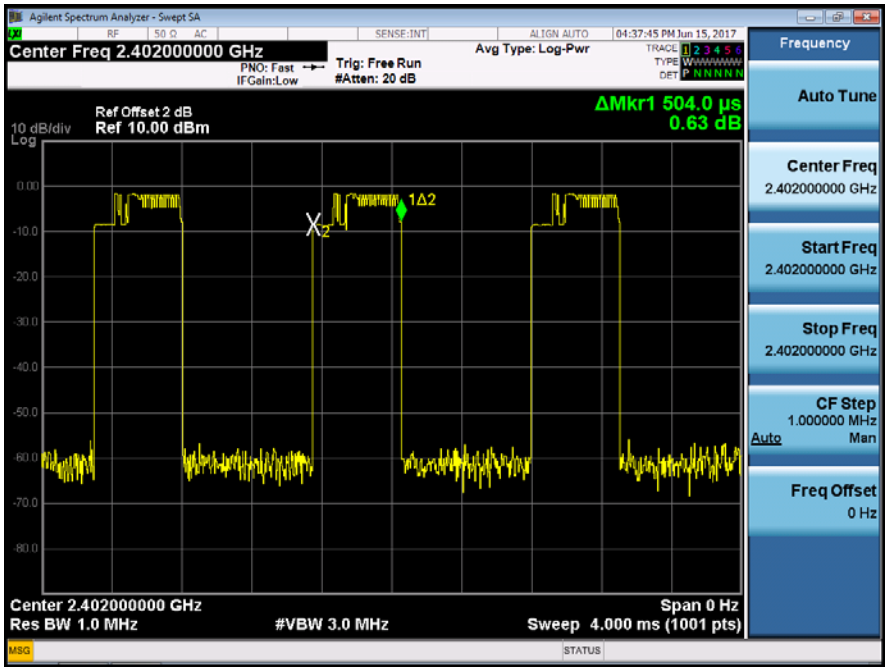
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2402MHz GFSK DH3



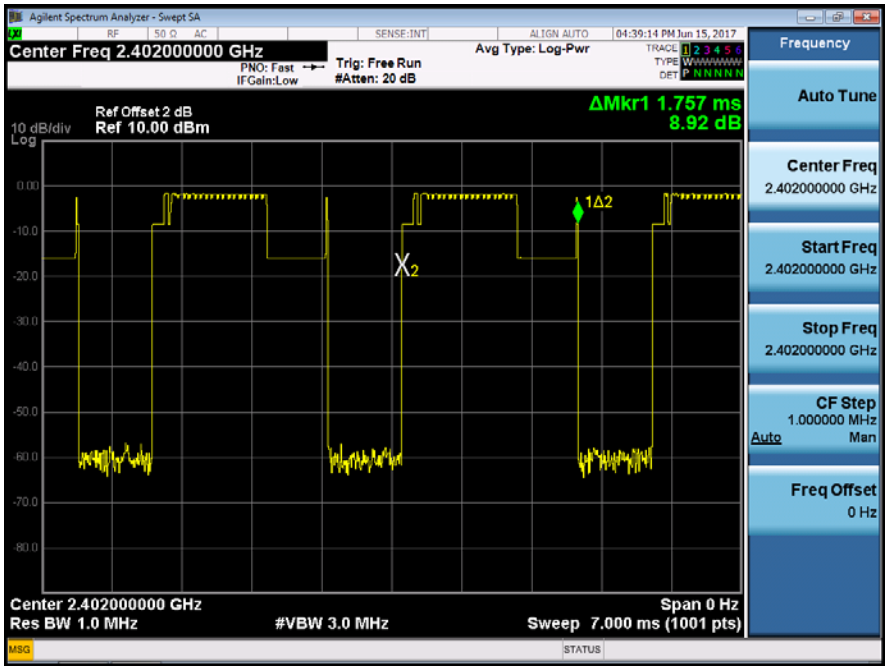
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2402MHz GFSK DH5



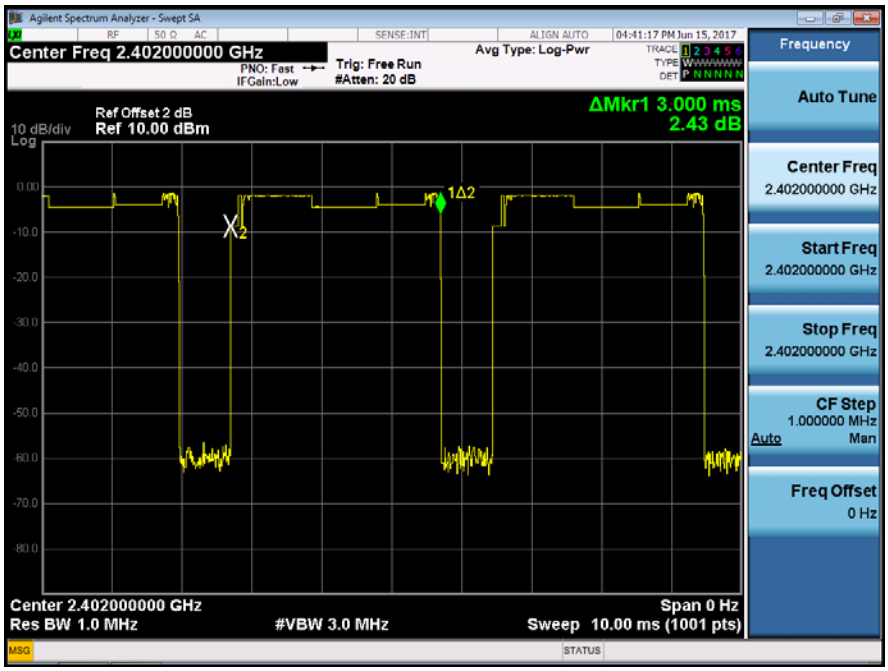
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2402MHz 8DPSK DH1



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2402MHz	8DPSK DH3



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2402MHz	8DPSK DH5

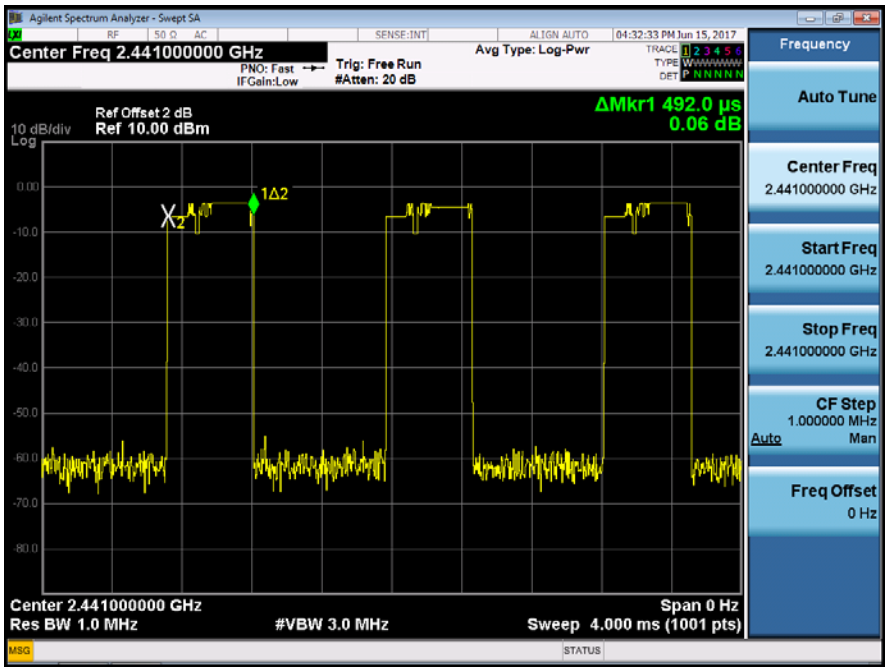


Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	King Kong
CH 0:	2441MHz		

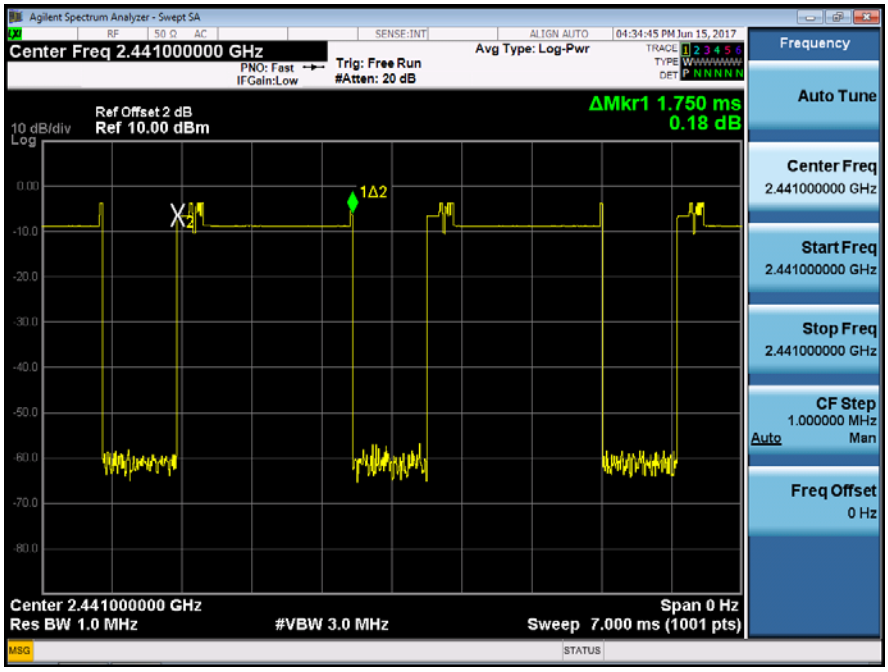
Modulation Mode	Channel Number	Packet type	Pluse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	0	DH1	0.492	157.44	<400	PASS
	0	DH3	1.750	280.00	<400	PASS
	0	DH5	2.990	318.94	<400	PASS
8DPSK	0	DH1	0.504	161.28	<400	PASS
	0	DH3	1.750	280.00	<400	PASS
	0	DH5	3.000	320.01	<400	PASS

Note: Dwell Time(DH1)=PW*(1600/2/79)*31.6
Dwell Time(DH3)=PW*(1600/4/79)*31.6
Dwell Time(DH5)=PW*(1600/6/79)*31.6

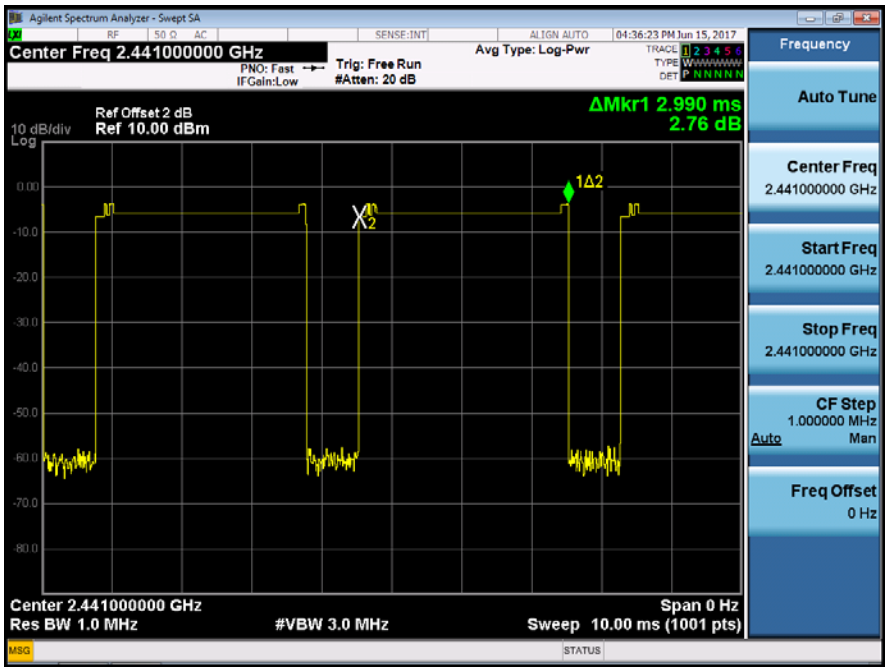
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2441MHz GFSK DH1



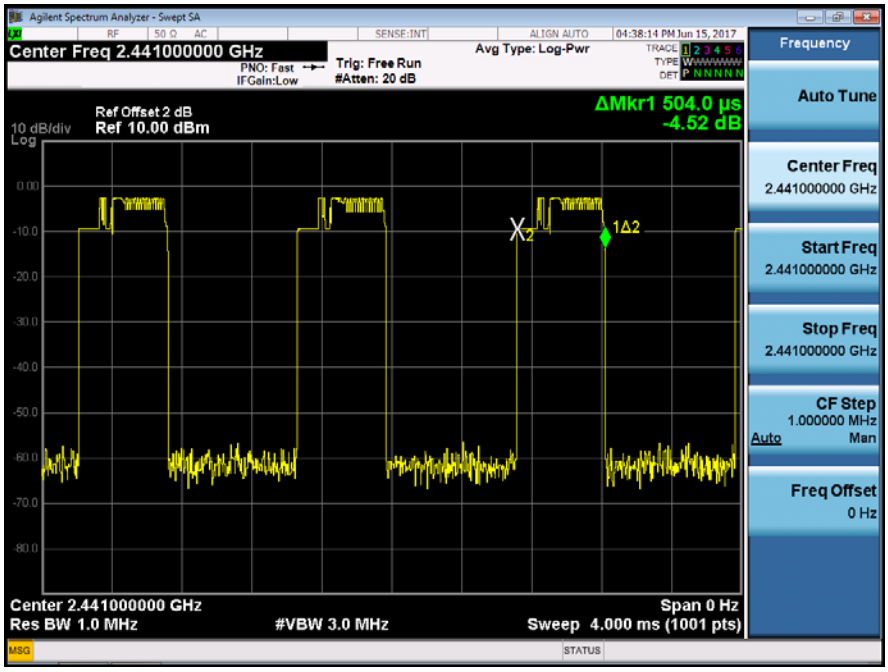
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2441MHz GFSK DH3



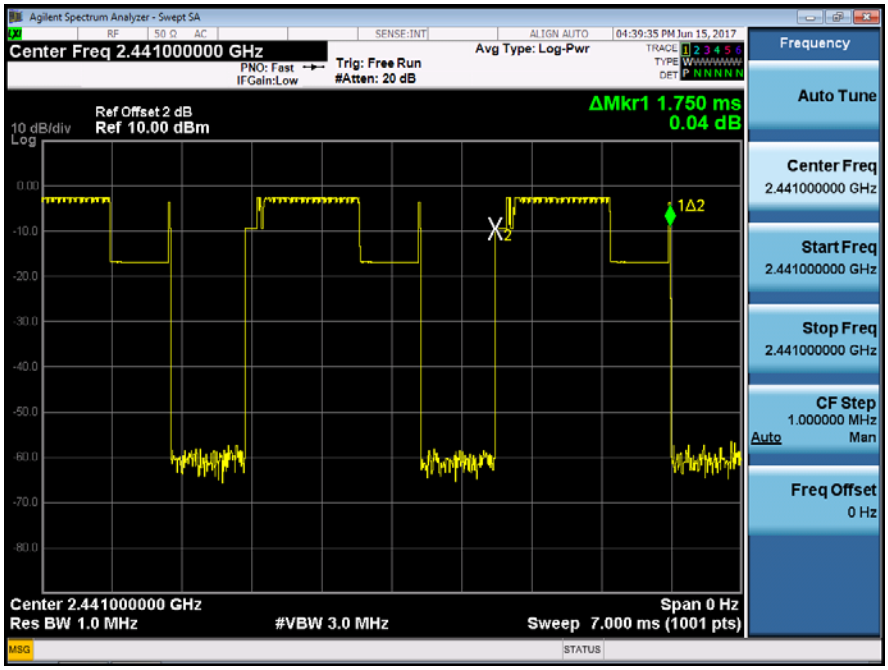
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2441MHz GFSK DH5



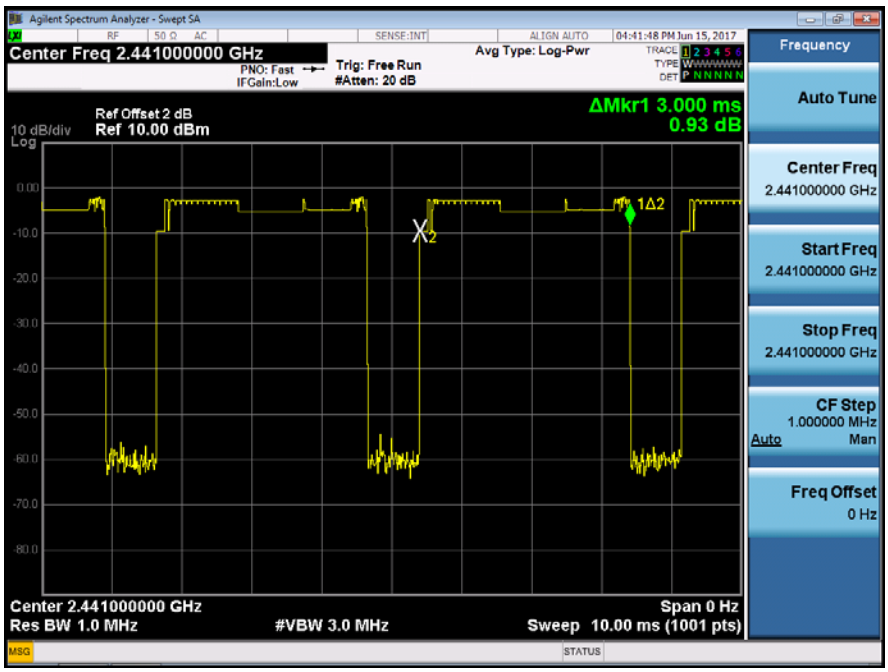
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2441MHz 8DPSK DH1



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2441MHz	8DPSK DH3



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2441MHz	8DPSK DH5

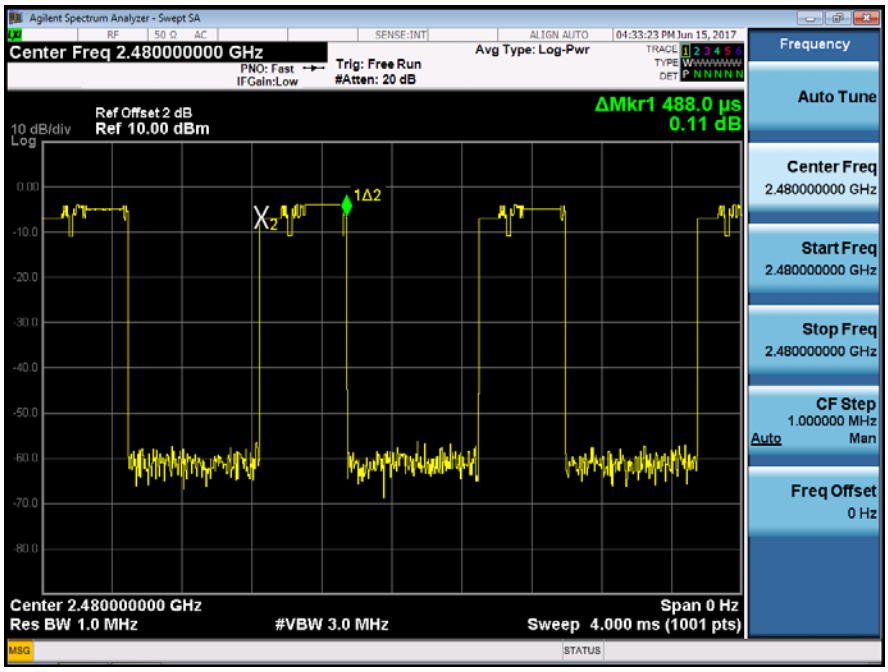


Temperature:	24℃	Test Date:	June 13, 2017
Humidity:	53 %	Test By:	King Kong
CH 0:	2480MHz		

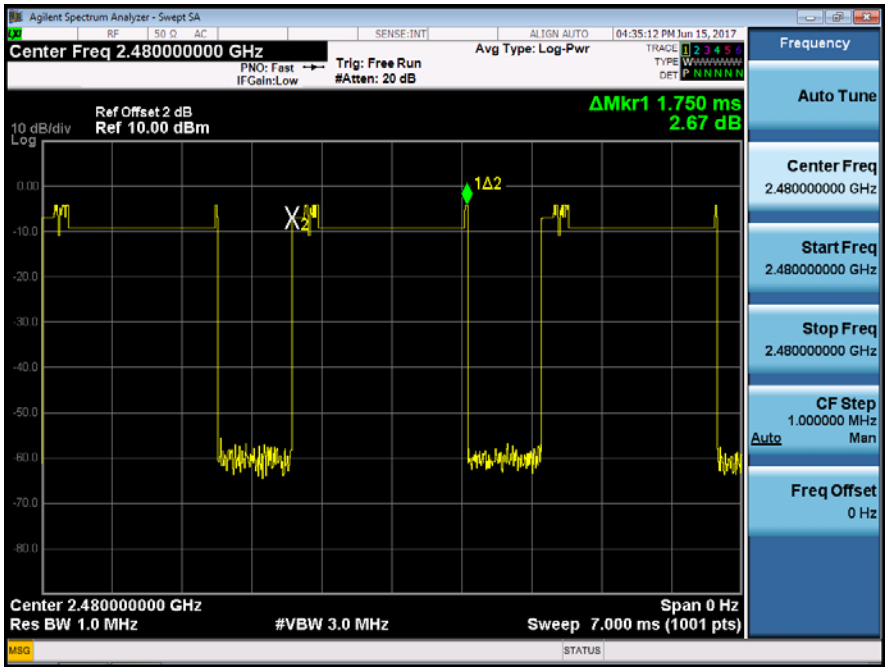
Modulation Mode	Channel Number	Packet type	Pluse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	0	DH1	0.488	156.16	<400	PASS
	0	DH3	1.750	280.00	<400	PASS
	0	DH5	3.000	320.01	<400	PASS
8DPSK	0	DH1	0.500	160.00	<400	PASS
	0	DH3	1.750	280.00	<400	PASS
	0	DH5	2.970	316.81	<400	PASS

Note: Dwell Time(DH1)=PW*(1600/2/79)*31.6
Dwell Time(DH3)=PW*(1600/4/79)*31.6
Dwell Time(DH5)=PW*(1600/6/79)*31.6

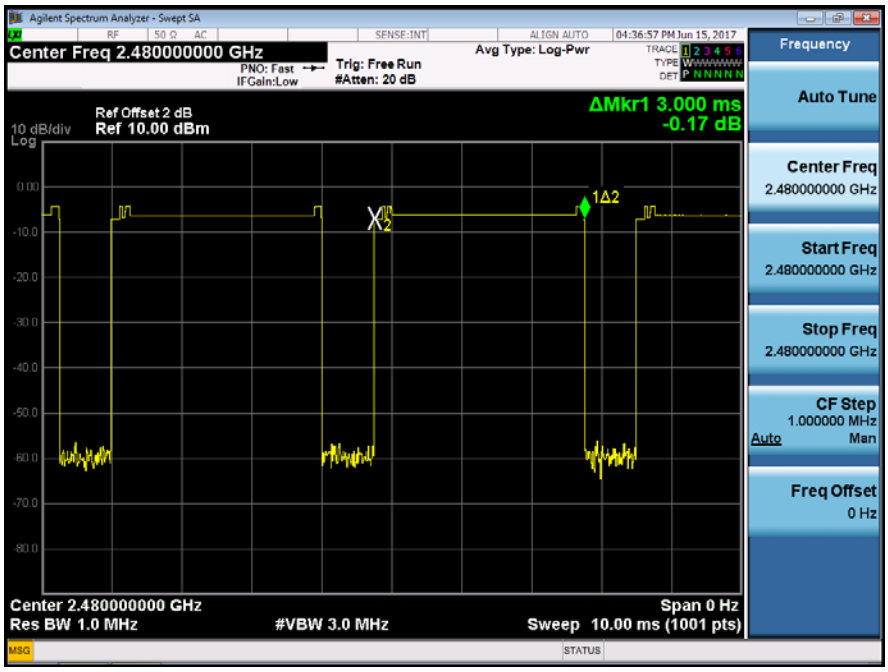
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2480MHz GFSK DH1



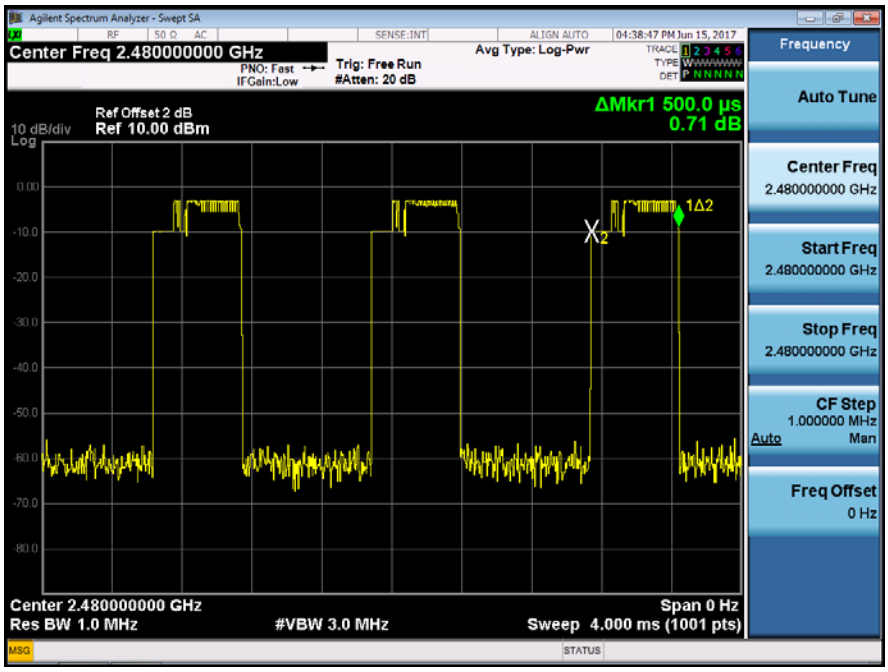
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2480MHz GFSK DH3



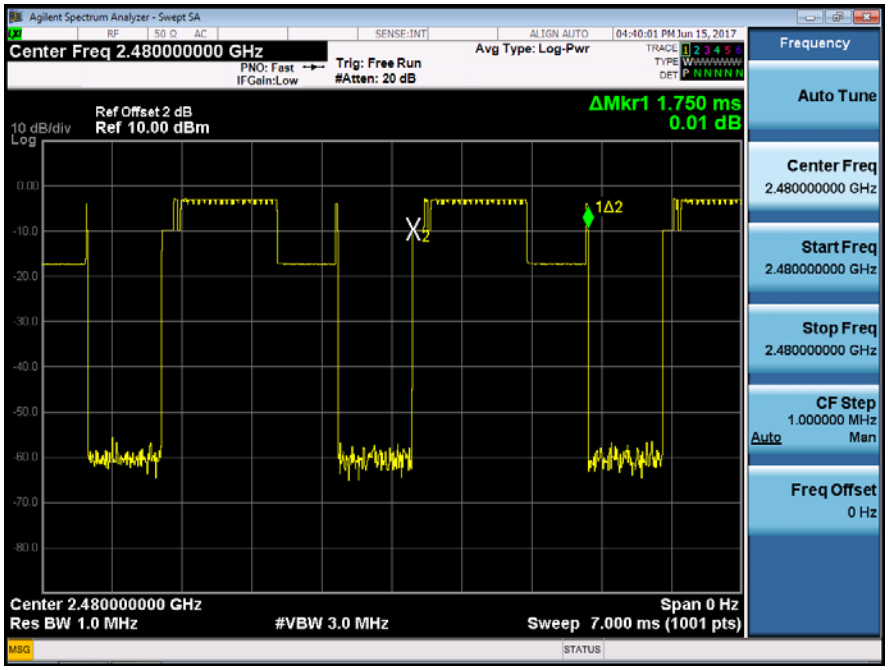
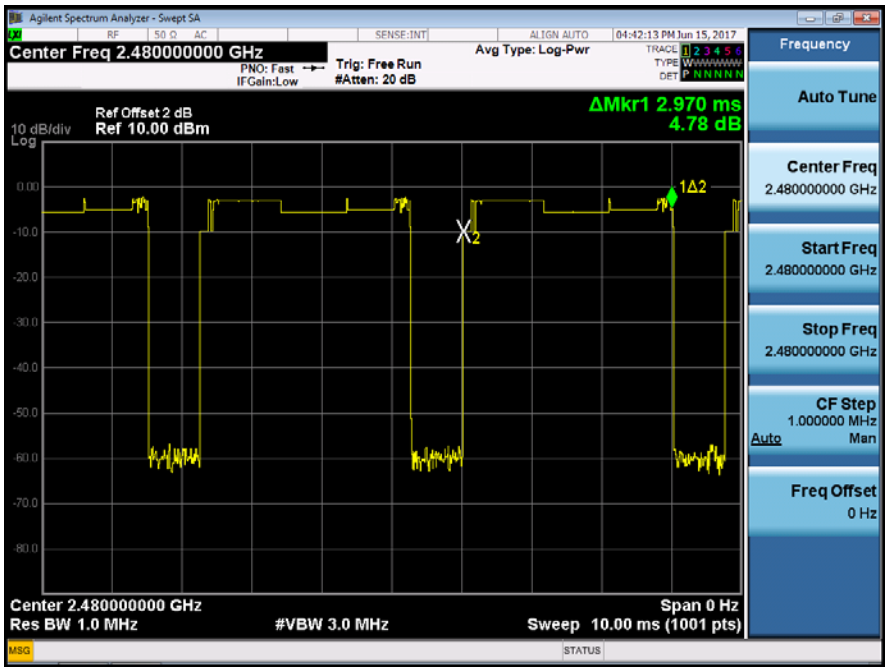
Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2480MHz	GFSK DH5



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2480MHz	8DPSK DH1



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2480MHz	8DPSK DH3



Test Model	Average Time Of Occupancy (Dwell Time) Bluetooth v4.2 CH 0: 2480MHz	8DPSK DH5