RF TEST REPORT

Applicant	Huawei Technologies Co., Ltd.
FCC ID	QISLYA-LX9
Product	Smart Phone
Model	LYA-L29, LYA-L09
Report No.	R2004H0081-R1V2
Issue Date	May 15, 2020

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Peng Tao

Performed by: Peng Tao

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Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	Frequency Hopping System	15.247 (g), (h)	Pass
2	Peak Power Output -Conducted	15.247(b)(1)	Pass
3	99% Bandwidth and 20dB Bandwidth	15.247(a)(1)	Pass
4	Frequency Separation	15.247(a)(1)	Pass
5	Time of Occupancy (Dwell Time)	15.247(a)(1)(iii)	Pass
6	Band Edge Compliance	15.247(d)	Pass
7	Number of Hopping Frequency	15.247(a)(1)(iii)	Pass
8	Spurious RF Conducted Emissions	15.247(d)	Pass
9	Unwanted Emissions	15.247(d),15.205,15.209	Pass
10	Conducted Emissions	15.207	Pass
Date of Testing: April 10, 2020 ~ April 18, 2020			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

Note: This revised report (Report No.: R2004H0081-R1V2) supersedes and replaces the previously issued report (Report No.: R2004H0081-R1V1). Please discard or destroy the previously issued report and dispose of it accordingly.

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1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
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Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

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2 General Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

General information

EUT Description					
Model	LYA-L29, LYA-L09				
SN:	LHS0219904001091				
Hardware Version	HL2LAYAM				
Software Version	10.1.0.162(C432E3R1P5)				
Power Supply	Battery/AC adapter				
Antenna Type	Internal Antenna				
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)				
Antenna Gain	-1.19dBi				
Test Mode(s)	UHD				
Modulation Type	π/4-DQPSK	8DPSK	π/4-DQPSK	GFSK	GFSK
Occupied Channel Bandwidth	BT UHD 2MHz	BT UHD 2MHz	BT UHD 4MHz	BLE 2MHz	BLE 2MHz
Data Rate	4Mbps	6Mbps	8Mbps	1Mbps	2Mbps
Max. Conducted Power	8.38dBm				
Operating Frequency Range(s)	2404-2478MHz				
EUT Accessory					
Adapter 1	Manufacturer: HuaweiTechnologies Co., Ltd. Model: HW-100400A00				
Adapter 2	Manufacturer: HuaweiTechnologies Co., Ltd. Model: HW-100400U00				
Adapter 3	Manufacturer: HuaweiTechnologies Co., Ltd. Model: HW-100400E00				
Adapter 4	Manufacturer: HuaweiTechnologies Co., Ltd. Model: HW-100400B00				
Battery 1	Manufacturer: HuaweiTechnologies Co., Ltd. (SCUD (Fujian) Electronics Co., LTD.) Model: HB486486ECW				

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Battery 2	Manufacturer: HuaweiTechnologies Co., Ltd. (Huizhou Desay Battery Co., Ltd.) Model: HB486486ECW
Earphone 1	Manufacturer: Jiangxi Lianchuang Hongsheng Electronic Co. ,LTD Model: MEMD1632B729003
Earphone 2	Manufacturer: GoerTek Inc. Model: Windy-S
Earphone 3	Manufacturer: Boluo County Quancheng Electronic Co.,ltd Model: 1331-3301-6001-TC-088
Earphone 4	Manufacturer: Foster Electric Co.,(Guangzhou) LTD. Sales Dep. Model: 630276
USB Cable 1	Manufacturer: Ningbo Broad Telecommunication Co., Ltd
USB Cable 2	Manufacturer: LUXSHARE Precision Industry Co., Ltd.
USB Cable 3	Manufacturer: HUIZHOU DEHONG TECHNOLOGY CO.,LTD.
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. 2.There is more than one USB cable, one Adapter/ Battery/ Earphone and USB Cable, each one should be applied throughout the compliance test respectively, and however, only the worst case (Adapter 1/ Battery 1/ Earphone 2 and USB Cable 2) will be recorded in this report.	

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3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 15C (2019) Radio Frequency Devices

ANSI C63.10 (2013)

Reference standard:

KDB 558074 D01 15.247 Meas Guidance v05r02

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4 Information about the FHSS characteristics

4.1 Frequency Hopping System Requirement

Standard requirement:
(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 hop sets 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.
Compliance for section 15.247(g):
According to Bluetooth Core Specification, the Bluetooth system transmits the packets with the pseudorandom hopping frequency with a continuous data and short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.
Compliance for section 15.247(h):
According to Bluetooth Core Specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.
According to Bluetooth Core Specification, the Bluetooth system is designed not have the ability to coordinate with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.

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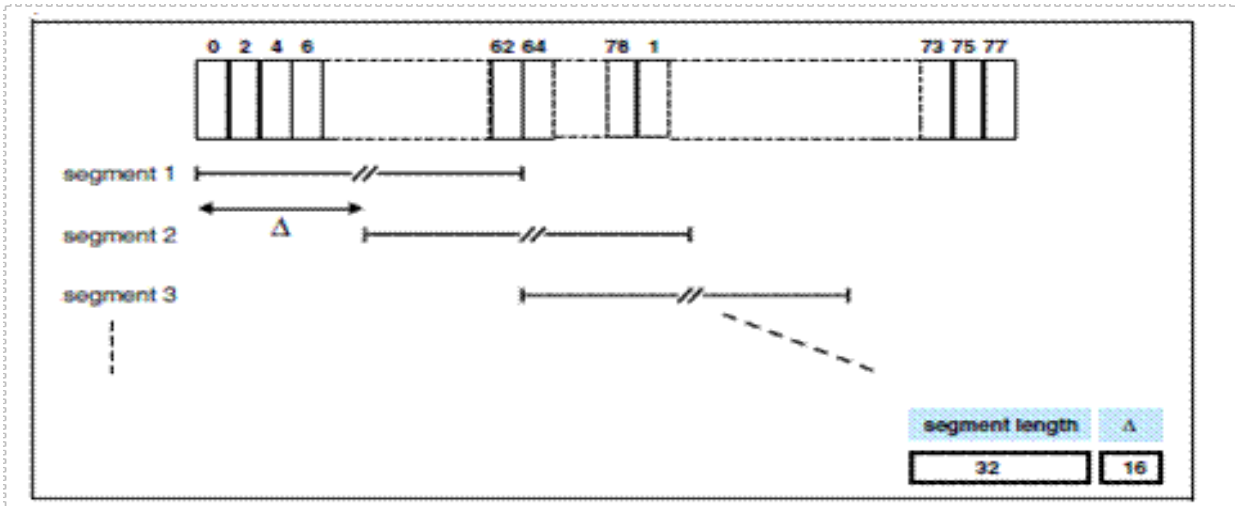
4.2 Pseudorandom Frequency Hopping Sequence

Frequency Hopping Systems. A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. The frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence. The wide RF bandwidth needed by such a system is not required by spreading of the RF energy about the carrier but rather to accommodate the range of frequencies to which the carrier frequency can hop. The test of a frequency hopping system is that the near term distribution of hops appears random, the long term distribution appears evenly distributed over the hop set, and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

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 pioneer 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.

The selection scheme chooses a segment of 32 hop frequencies spanning about 64 MHz and visits these hops in a pseudo-random order. Next, a different 32-hop segment is chosen, etc. In the page, master page response, slave page response, page scan, inquiry, inquiry response and inquiry scan hopping sequences, the same 32-hop segment is used all the time (the segment is selected by the address; different devices will have different paging segments).

When the basic channel hopping sequence is selected, the output constitutes a pseudo-random sequence that slides through the 37 hops. The principle is depicted in the figure below.



Hop selection scheme in CONNECTION state.

The smallest number of Hopping channel is 15. Pseudorandom Frequency Hopping Sequence Table as below:Channel:3, 6,7, 9,12,14,18, 22, 25,26,28,30,33,36,37, etc.

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.

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4.3 Equal Hopping Frequency Use

All Bluetooth units participating in the Pico net are time and hop-synchronized to the channel. Each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event.

4.4 System Receiver Input Bandwidth

Each channel bandwidth is 1MHz. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

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4.5 Test Configuration

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

Test Cases	Test Modes
Peak Power Output -Conducted	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
99% Bandwidth and 20dB Bandwidth	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Frequency Separation	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Time of Occupancy (Dwell Time)	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Band Edge Compliance	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Number of Hopping Frequency	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Spurious RF Conducted Emissions	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Unwanted Emission	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)
Conducted Emission	BT 2MHz π/4-DQPSK(4Mbps) / BT 2MHz 8DPSK(6Mbps) / BT 4MHz π/4-DQPSK(8Mbps) / BLE 2MHz GFSK(1Mbps) / BLE 2MHz GFSK(2Mbps)

The Test Mode for each of the following tests for BT UHD:

Test Cases	BT UHD Normal Mode
Peak Power Output -Conducted	O
99% Bandwidth and 20dB Bandwidth	O
Frequency Separation	O
Time of Occupancy (Dwell Time)	O
Band Edge Compliance	O
Number of Hopping Frequency	O
Spurious RF Conducted Emissions	O
Unwanted Emission	O
Conducted Emission	O
Note：“O”: tested.	

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5 Test Case Results

5.1 Peak Power Output –Conducted

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the spectrum analyzer .The EUT is controlled by the PC set to ensure max power transmission. The peak detector is used.

Use the following spectrum analyzer settings:
1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.
Allow trace to stabilize.
Use the marker-to-peak function to set the marker to the peak of the emission.

Test Setup

Limits

Rule Part 15.247 (b) (1)specifies that " For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.”

Peak Output Power	≤ 0.125W (21dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=0.44 dB.

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Test Results

BT UHD Normal Mode

Mode	Frequency (MHz)	Peak Output Power (dBm)	Limit (dBm)	Conclusion
BT 2MHz π/4-DQPSK(4Mbps)	2404	8.07	21	PASS
	2440	9.38	21	PASS
	2478	7.96	21	PASS
BT 2MHz 8DPSK(6Mbps)	2404	8.50	21	PASS
	2440	9.57	21	PASS
	2478	8.34	21	PASS
BT 4MHz π/4-DQPSK(8Mbps)	2404	7.84	21	PASS
	2440	9.09	21	PASS
	2476	8.05	21	PASS
BLE 2MHz GFSK(1Mbps)	2404	4.81	21	PASS
	2440	5.78	21	PASS
	2478	4.90	21	PASS
BLE 2MHz GFSK(2Mbps)	2404	5.18	21	PASS
	2440	6.49	21	PASS
	2478	5.12	21	PASS

Note: The measured power density (dBm) has the offset with cable loss already.

Note: For AFH mode using 20 hopping channels, the maximum output power limit is 21dBm.

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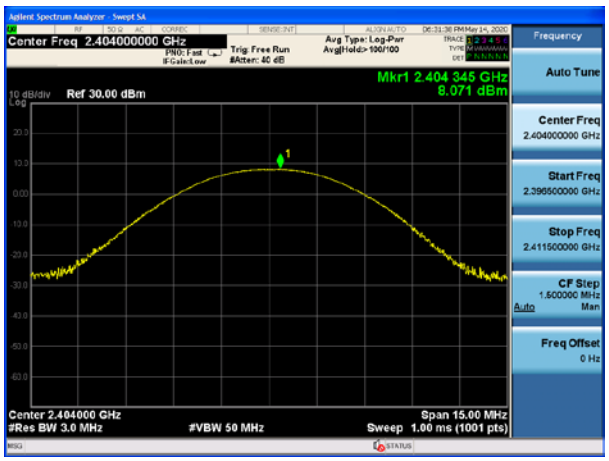
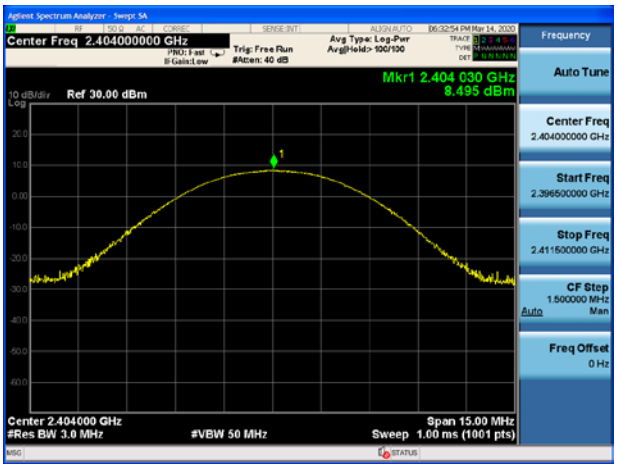
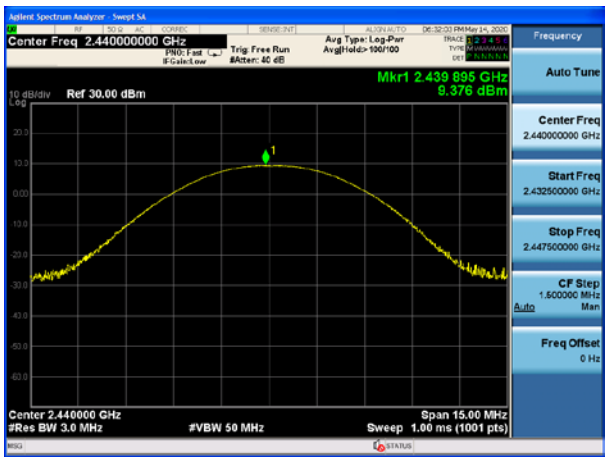
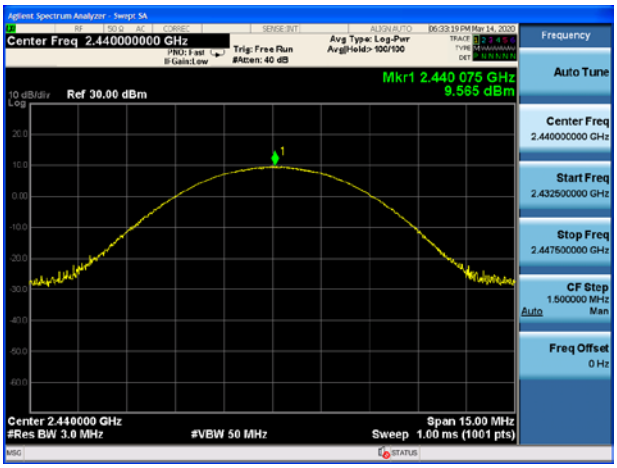
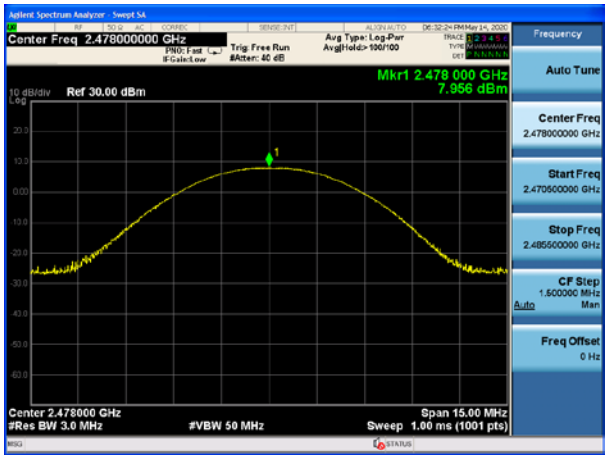
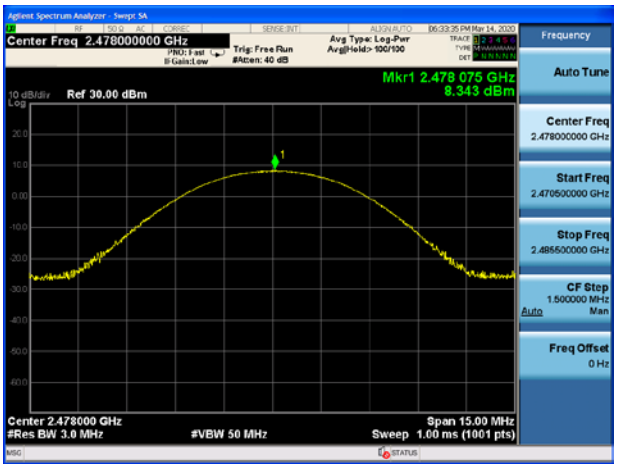
BT UHD Normal Mode

BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2404	BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2404
	
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2440	BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2440
	
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2478	BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2478
	

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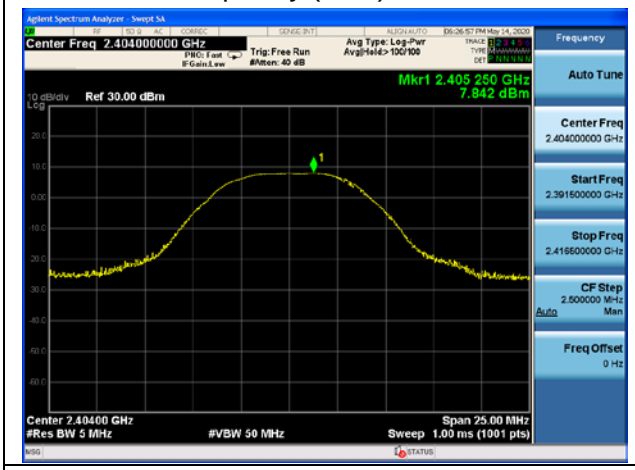
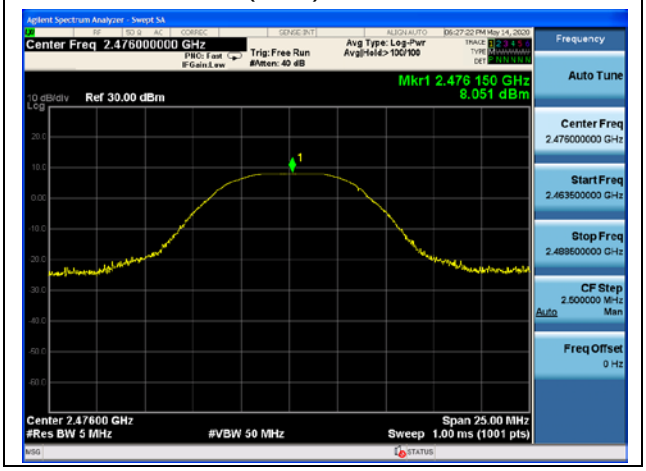
BT 4MHz π/4-DQPSK(8Mbps) , Carrier frequency (MHz): 2404



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2440

BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2476



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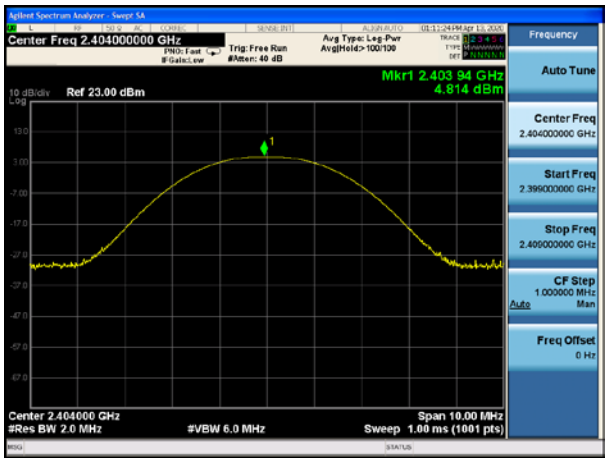
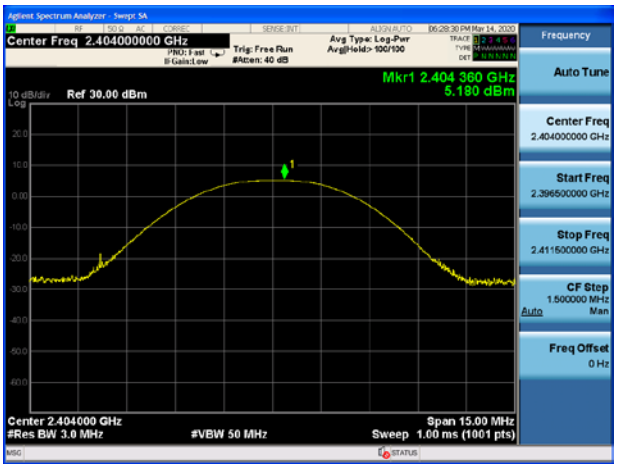
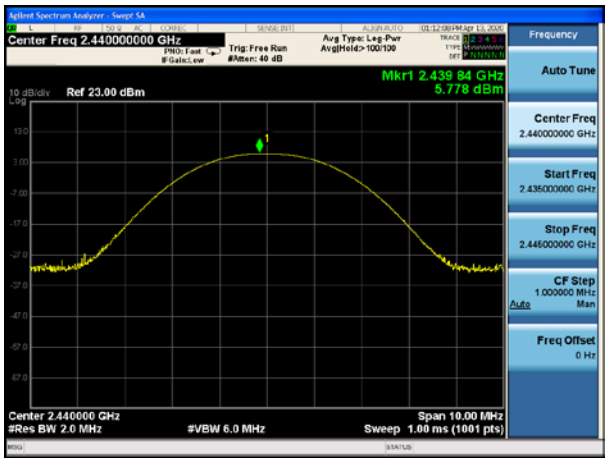
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2404



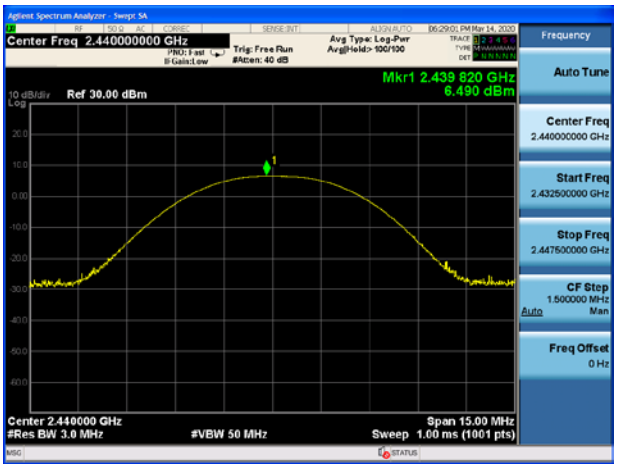
BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2404



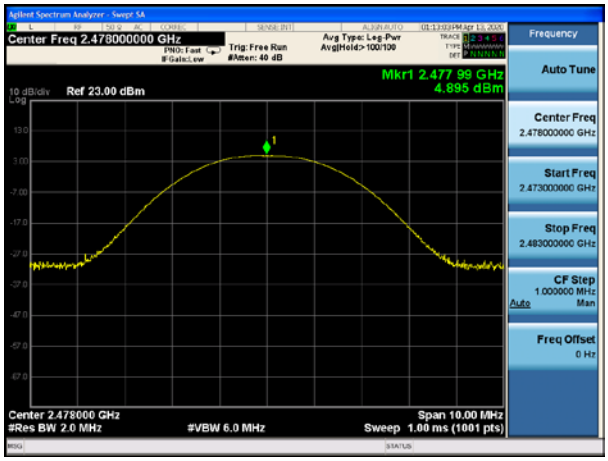
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2440



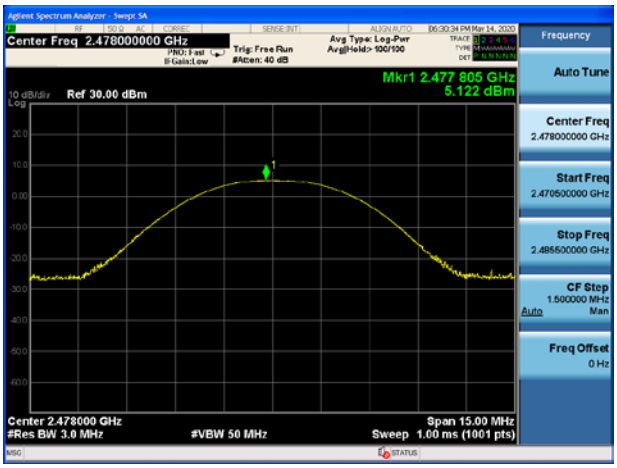
BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2440



BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2478



BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2478



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5.2 99% Bandwidth and 20dB Bandwidth

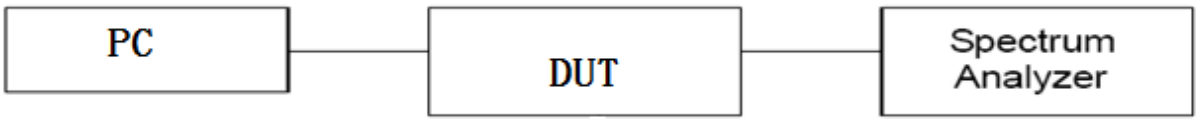
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through a known loss cable. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value.

Test Setup



Limits

No specific occupied bandwidth requirements in part 15.247(a) (1).

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=936 Hz.

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Test Results

BT UHD Normal Mode

Mode		Frequency (MHz)	99% bandwidth(MHz)	20dB Bandwidth(MHz)
BT UHD	BT 2MHz π/4-DQPSK(4Mbps)	2404	2.3593	2.512
		2440	2.3477	2.512
		2478	2.3509	2.515
	BT 2MHz 8DPSK(6Mbps)	2404	2.3502	2.518
		2440	2.3446	2.516
		2478	2.3436	2.514
	BT 4MHz π/4-DQPSK(8Mbps)	2404	4.3737	4.403
		2440	4.3721	4.394
		2476	4.3836	4.421
	BLE 2MHz GFSK(1Mbps)	2404	1.0269	1.163
		2440	1.0261	1.165
		2478	1.0268	1.163
	BLE 2MHz GFSK(2Mbps)	2404	2.0469	2.200
		2440	2.0449	2.208
		2478	2.0374	2.210

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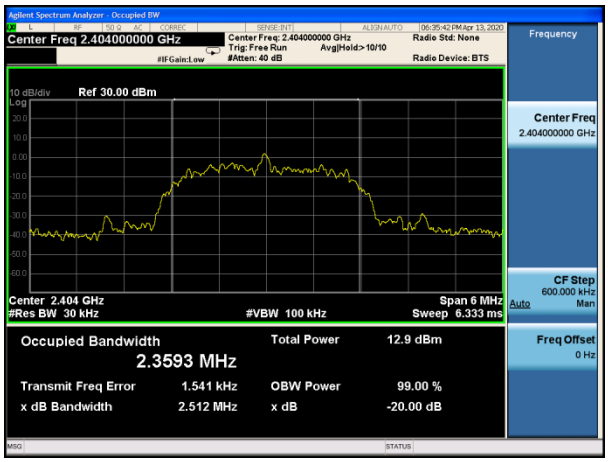
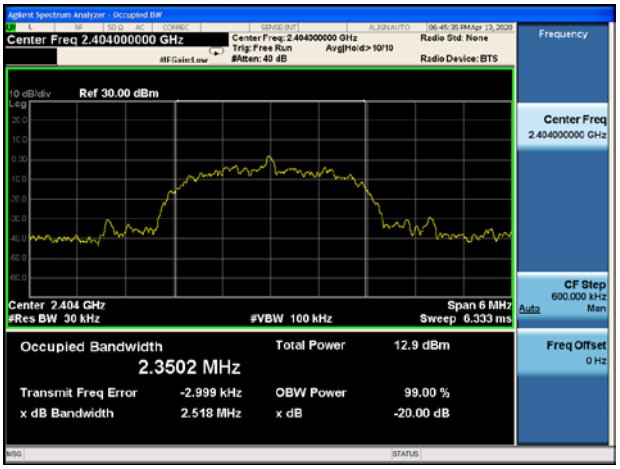
BT UHD Normal Mode

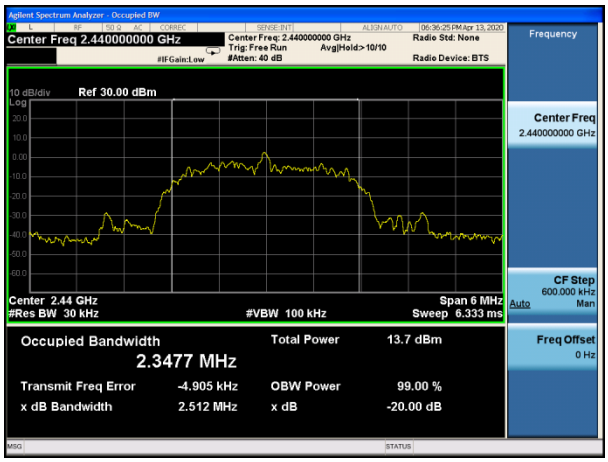
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2404



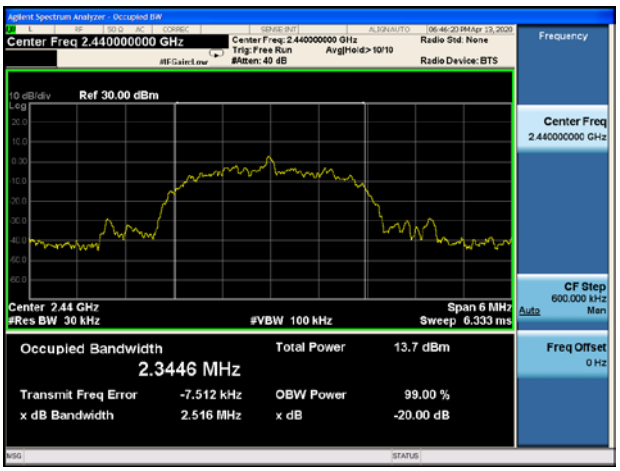
BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2404



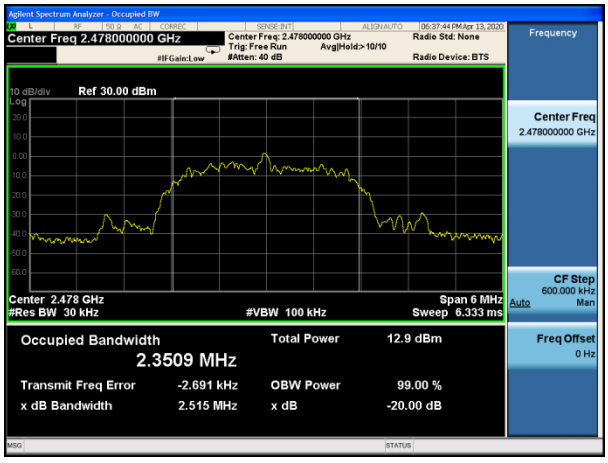
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2440



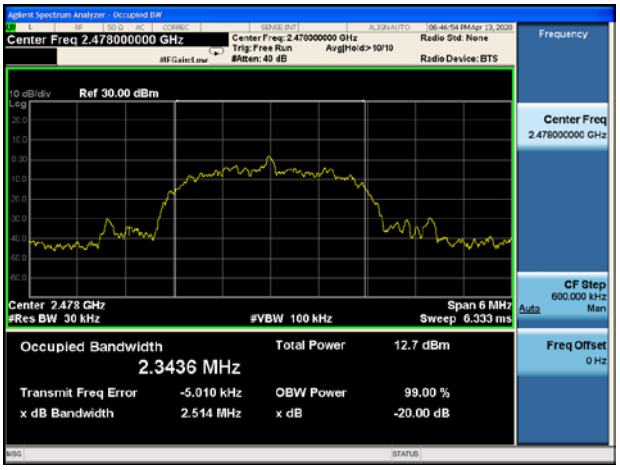
BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2440



BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2478



BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2478



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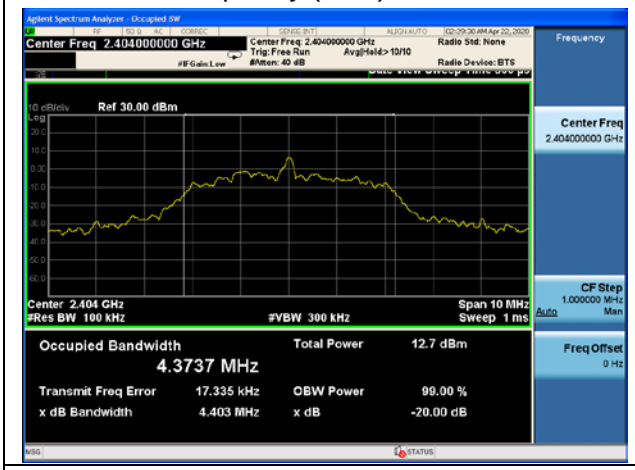
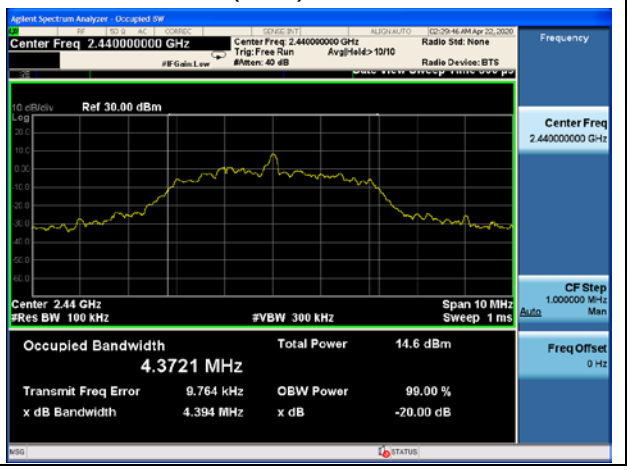
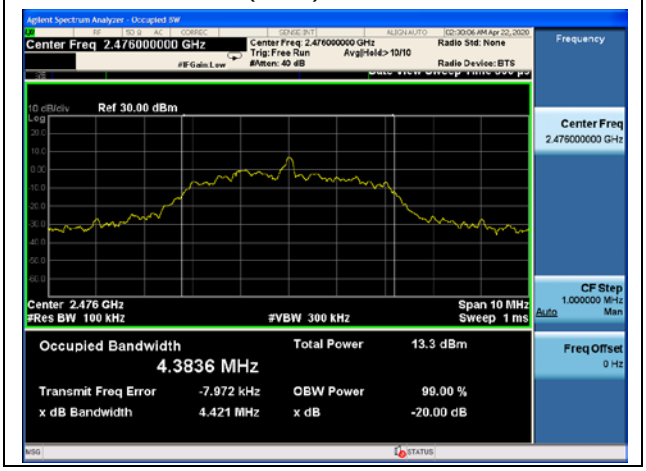
BT 4MHz π/4-DQPSK(8Mbps) , Carrier frequency (MHz): 2404



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2440



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2476



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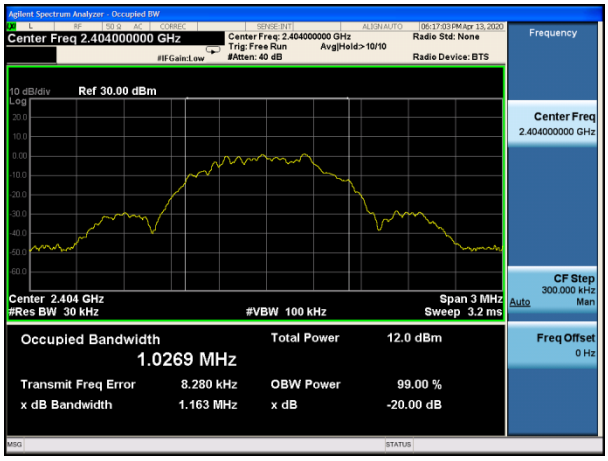
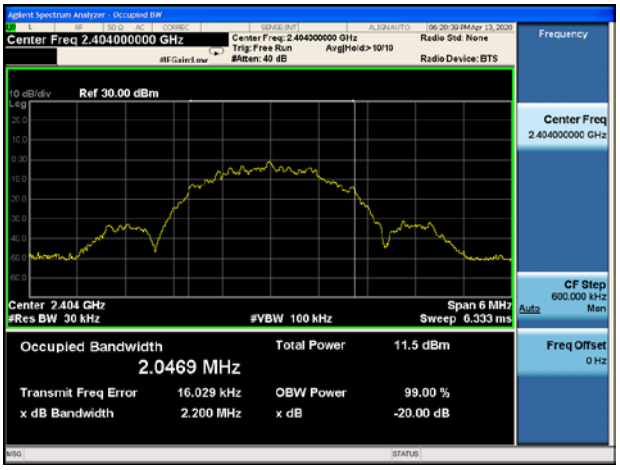
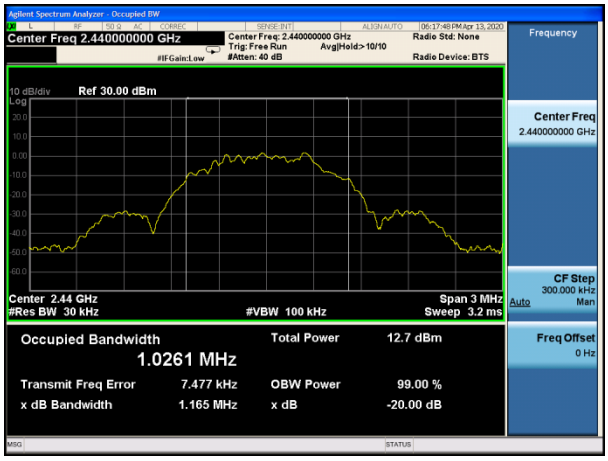
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2404



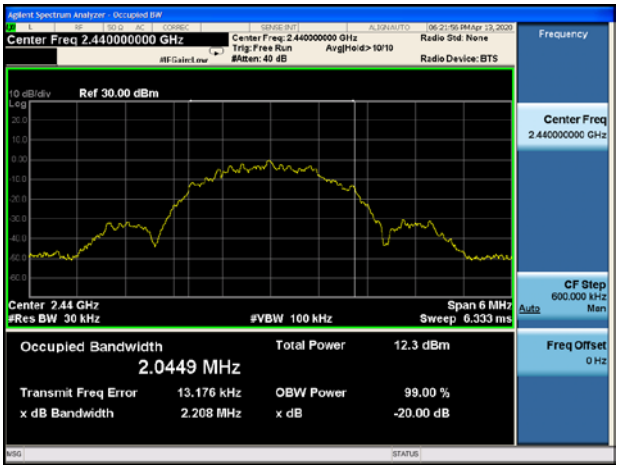
BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2404



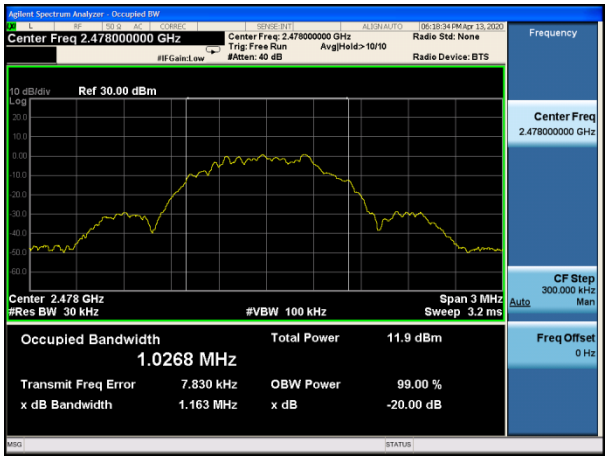
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2440



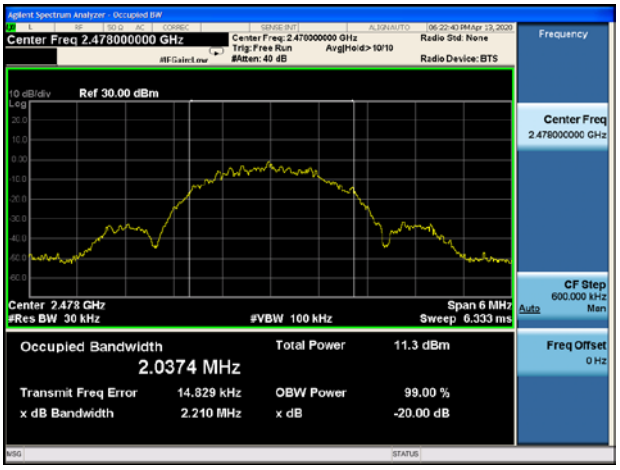
BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2440



BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2478



BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2478



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5.3 Frequency Separation

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

During the process of the testing, The EUT was connected to the spectrum analyzer .The EUT is controlled by the PC set to ensure max power transmission. RBW is set to 30 kHz and VBW is set to 100 kHz on spectrum analyzer. Set EUT on Hopping on mode.

Test setup

Limits

Rule Part 15.247(a)(1)specifies that “Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. ”

Note: The value of two-thirds of 20 dB bandwidth is always greater than 25 kHz.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U=936 Hz.

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Test Results:

BT UHD Normal Mode

Packet type	Carrier frequency (MHz)	Carrier frequency separation(kHz)	20dB Bandwidth(kHz)	Limit (kHz)	Conclusion
BT 2MHz π/4-DQPSK(4Mbps)	2404	2010	2512.0	1674.7	PASS
	2440	1998	2512.0	1674.7	PASS
	2478	1998	2515.0	1676.7	PASS
BT 2MHz 8DPSK(6Mbps)	2404	2016	2518.0	1678.7	PASS
	2440	1986	2516.0	1677.3	PASS
	2478	1980	2514.0	1676.0	PASS
BT 4MHz π/4-DQPSK(8Mbps)	2404	3990	4403.0	2935.3	PASS
	2440	4000	4394.0	2929.3	PASS
	2476	3990	4421.0	2947.3	PASS
BLE 2MHz GFSK(1Mbps)	2404	1998	1163.0	775.3	PASS
	2440	1998	1165.0	776.7	PASS
	2478	1998	1163.0	775.3	PASS
BLE 2MHz GFSK(2Mbps)	2404	1986	2200.0	1466.7	PASS
	2440	2004	2208.0	1472.0	PASS
	2478	2028	2210.0	1473.3	PASS
Note: The limit is two-thirds of 20 dB bandwidth.					

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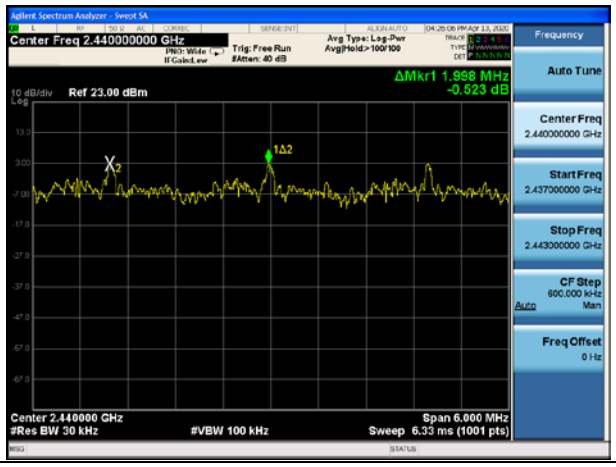
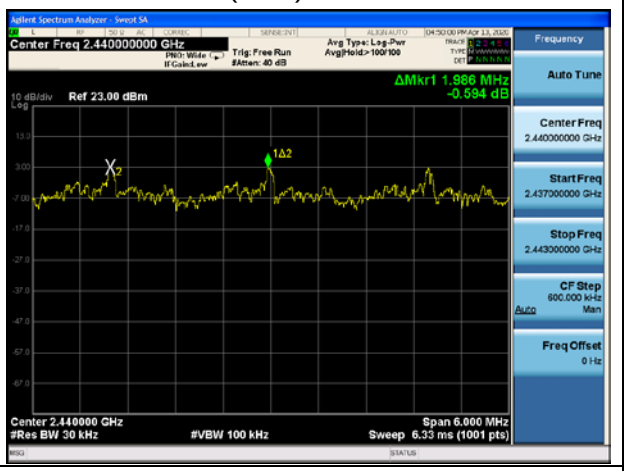
BT UHD Normal Mode

BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2404	BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2404
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2440	BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2440
	
BT 2MHz π/4-DQPSK(4Mbps) CH37, Carrier frequency (MHz): 2478	BT 2MHZ 8DPSK(6Mbps) CH37, Carrier frequency (MHz): 2478

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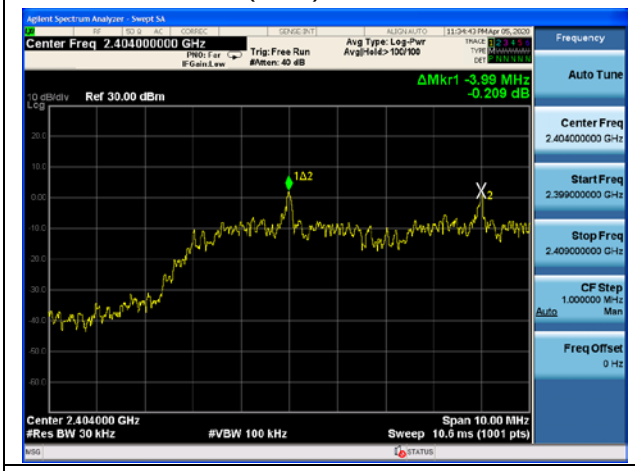
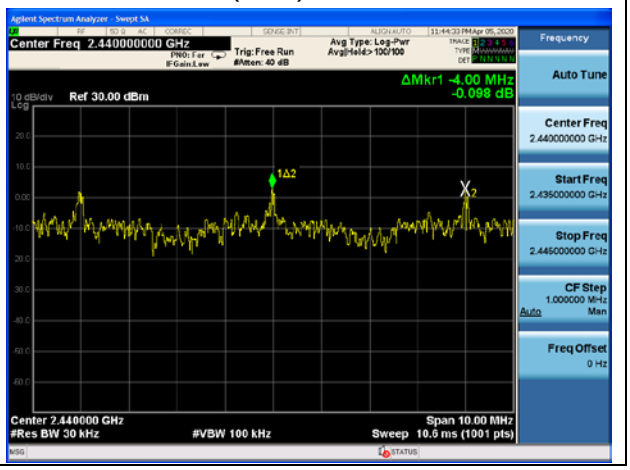
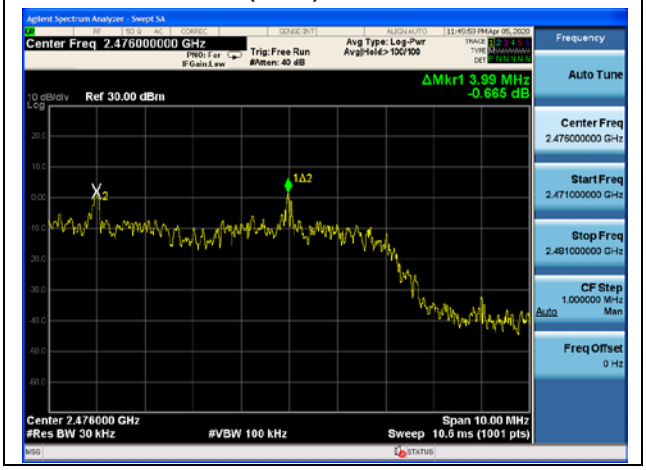
BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2404



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2440



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2476



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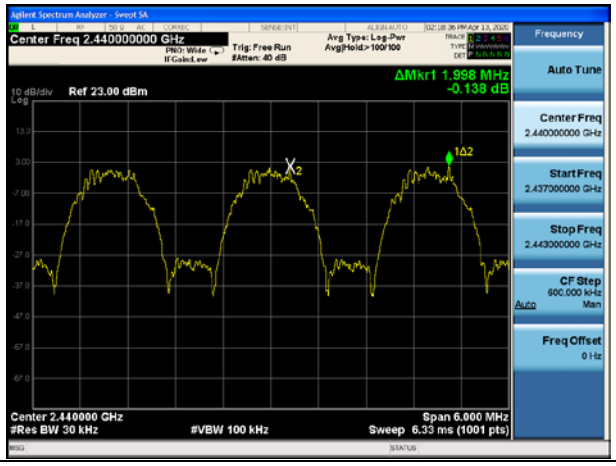
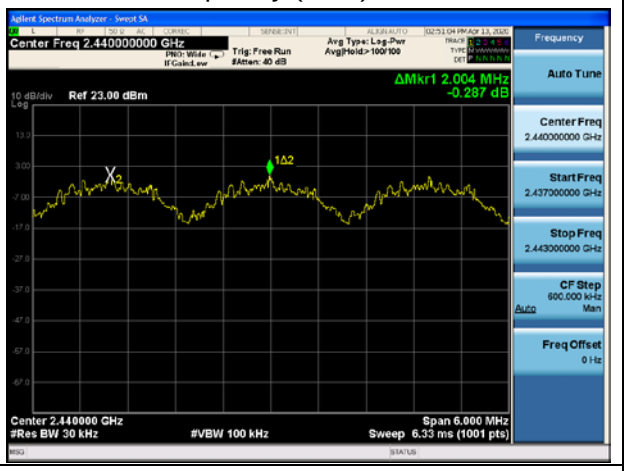
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2404

BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2404

BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2440



BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2440



BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2478

BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2478

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5.4 Time of Occupancy (Dwell Time)

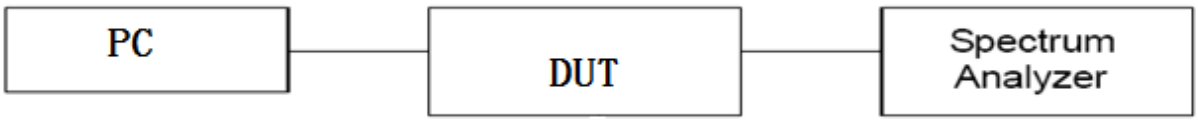
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the spectrum analyzer .The EUT is controlled by the PC set to ensure max power transmission. RBW is set to 1MHz and VBW is set to 1MHz on spectrum analyzer. The dwell time is calculated by:
Dwell time = time slot length * hop rate * 0.4s with:
In normal mode, The selected EUT Packet type uses a slot type of DH5 packet and a hopping rate of 1600(ch*hop/s) for all channels. So the final hopping rate for all channel is 1600/5=320(ch*hop/s)
In AFH mode, The selected EUT Packet type uses a slot type of DH5 packet and a hopping rate of 800(ch*hop/s) for all channels. So the final hopping rate for all channel is 800/5=160(ch*hop/s)

Test Setup



Limits

Rule Part15.247(a) specifies that " Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. 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."

Dwell time	≤ 400ms

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2.

Requirements	Uncertainty	
Dwell Time	BT 2MHz π/4-DQPSK(4Mbps)	U=0.70ms
	BT 2MHz 8DPSK(6Mbps)	U=0.70ms
	BT 4MHz π/4-DQPSK(8Mbps)	U=0.70ms
	BLE 2MHz GFSK(1Mbps)	U=0.70ms
	BLE 2MHz GFSK(2Mbps)	U=0.70ms

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Test Results:

BT UHD Normal Mode

In normal mode:

Packet type	Carrier frequency (MHz)	hop rate (1/s)	Time slot length(ms)	Dwell time (ms)	Limit (ms)	Conclusion
BT 2MHz π/4-DQPSK(4Mbps)	2404	320	0.57	72.96	400	PASS
	2440	320	0.56	71.68	400	PASS
	2478	320	0.57	72.96	400	PASS
BT 2MHz 8DPSK(6Mbps)	2404	320	0.39	49.92	400	PASS
	2440	320	0.39	49.92	400	PASS
	2478	320	0.40	51.20	400	PASS
BT 4MHz π/4-DQPSK(8Mbps)	2404	320	0.29	37.12	400	PASS
	2440	320	0.29	37.12	400	PASS
	2476	320	0.29	37.12	400	PASS
BLE 2MHz GFSK(1Mbps)	2404	320	2.13	272.64	400	PASS
	2440	320	2.13	272.64	400	PASS
	2478	320	2.12	271.36	400	PASS
BLE 2MHz GFSK(2Mbps)	2404	320	1.07	136.96	400	PASS
	2440	320	1.07	136.96	400	PASS
	2478	320	1.07	136.96	400	PASS
Note: Dwell time = time slot length * hop rate * 0.4s						

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In AFH mode:

Packet type	Carrier frequency (MHz)	hop rate (1/s)	Time slot length(ms)	Dwell time (ms)	Limit (ms)	Conclusion
BT 2MHz π/4-DQPSK(4Mbps)	2404	160	0.57	36.48	400	PASS
	2440	160	0.56	35.84	400	PASS
	2478	160	0.57	36.48	400	PASS
BT 2MHz 8DPSK(6Mbps)	2404	160	0.39	24.96	400	PASS
	2440	160	0.39	24.96	400	PASS
	2478	160	0.40	25.60	400	PASS
BT 4MHz π/4-DQPSK(8Mbps)	2404	160	0.29	18.56	400	PASS
	2440	160	0.29	18.56	400	PASS
	2476	160	0.29	18.56	400	PASS
BLE 2MHz GFSK(1Mbps)	2404	160	2.13	136.32	400	PASS
	2440	160	2.13	136.32	400	PASS
	2478	160	2.12	135.68	400	PASS
BLE 2MHz GFSK(2Mbps)	2404	160	1.07	68.48	400	PASS
	2440	160	1.07	68.48	400	PASS
	2478	160	1.07	68.48	400	PASS
Note: Dwell time = time slot length * hop rate * 0.4s						

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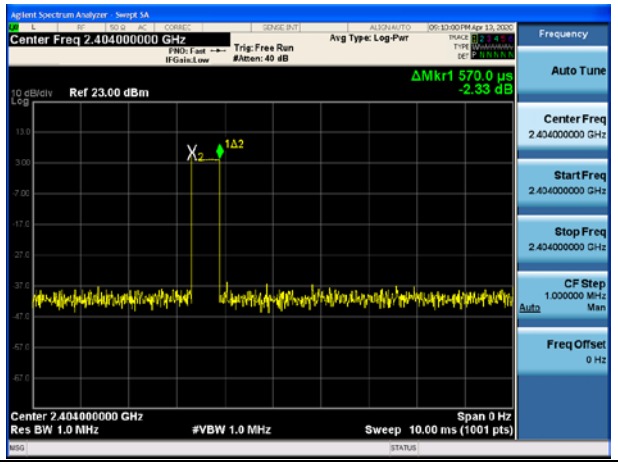
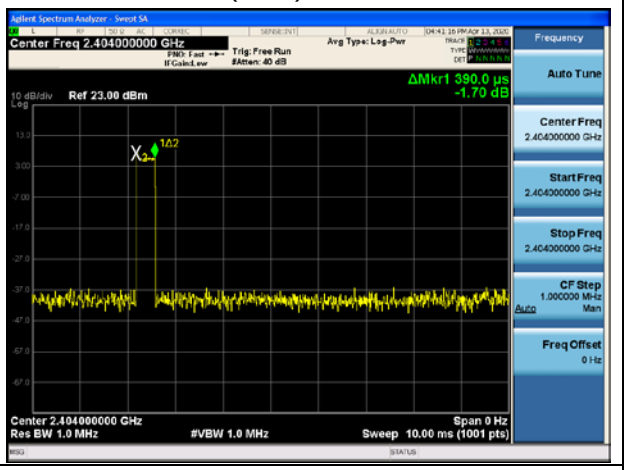
BT UHD Normal Mode

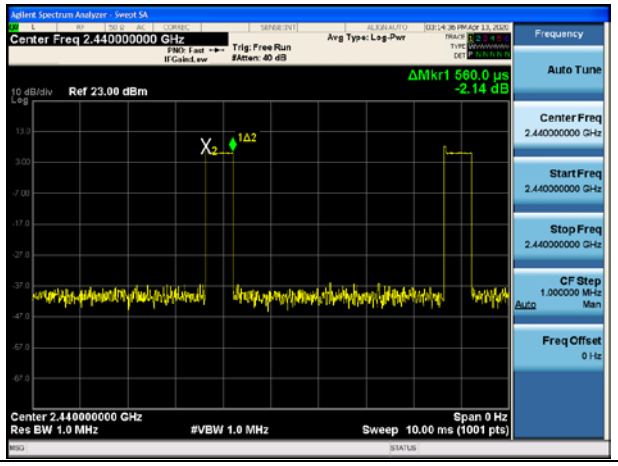
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2404



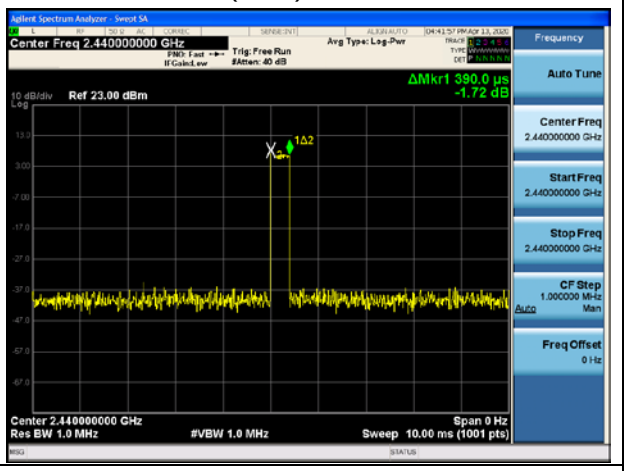
BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2404



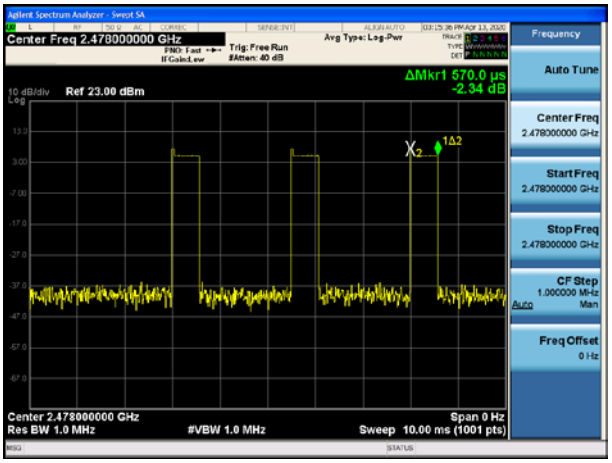
BT 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2440



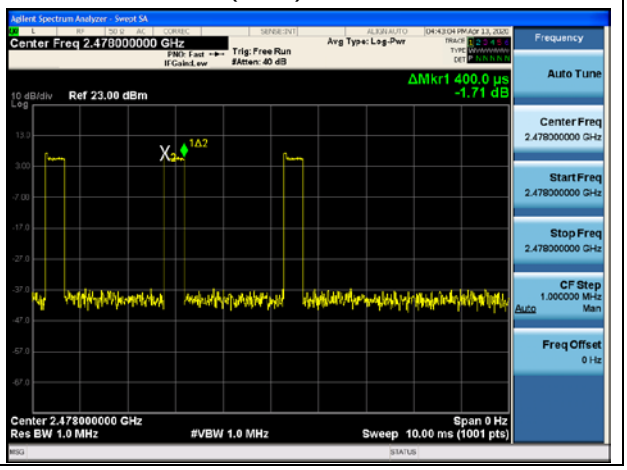
BT 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2440



BT 2MHz π/4-DQPSK(4Mbps) CH37, Carrier frequency (MHz): 2478



BT 2MHZ 8DPSK(6Mbps) CH37, Carrier frequency (MHz): 2478



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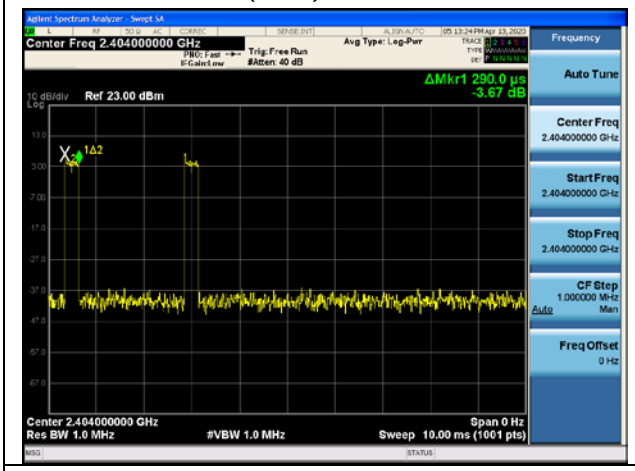
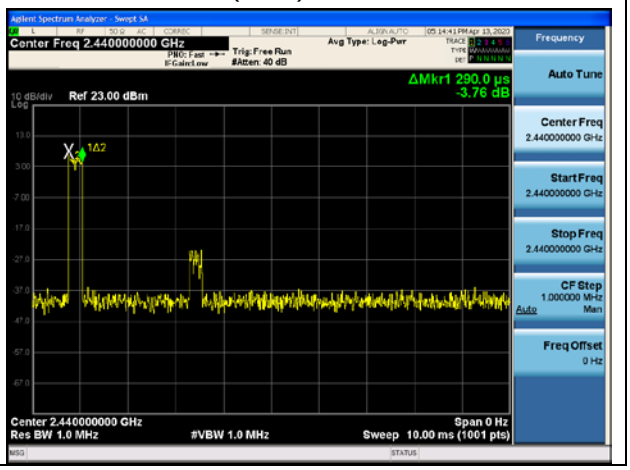
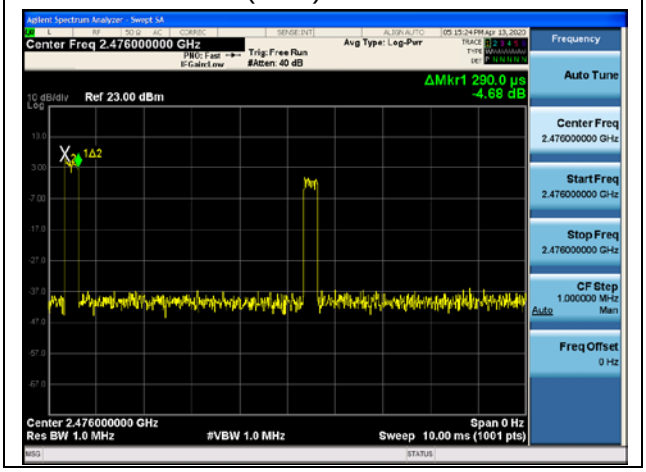
BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2404



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2440



BT 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2476



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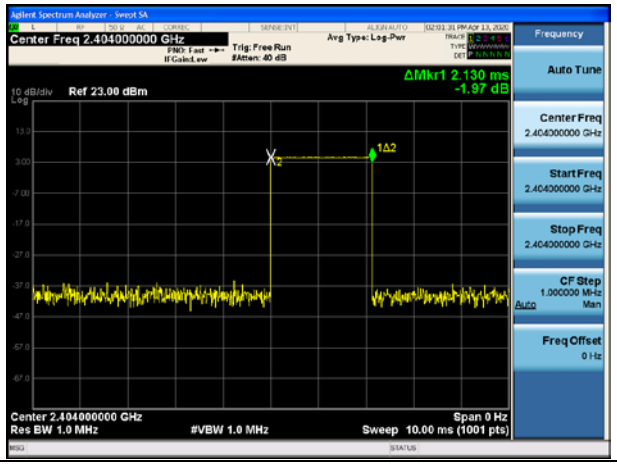
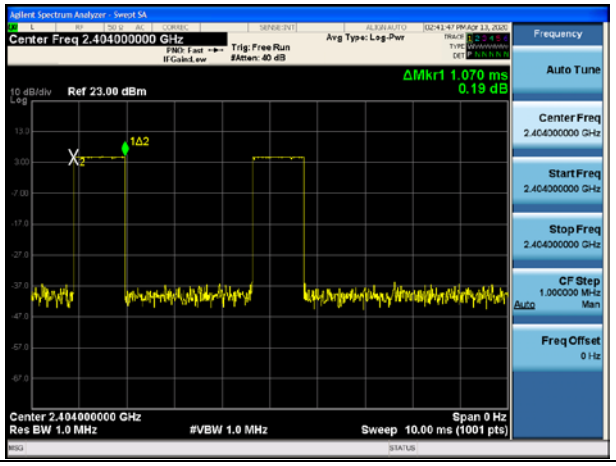
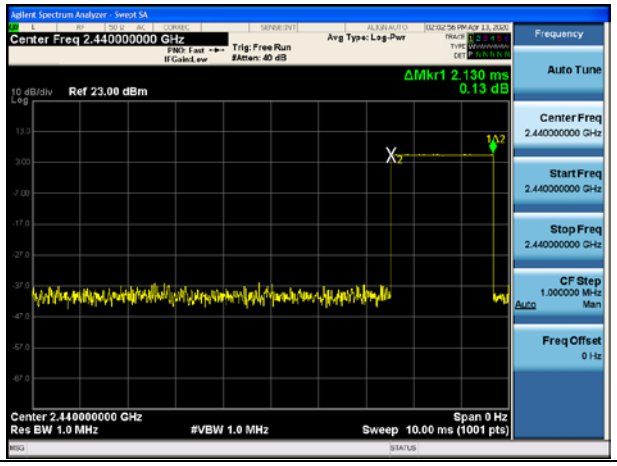
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2404



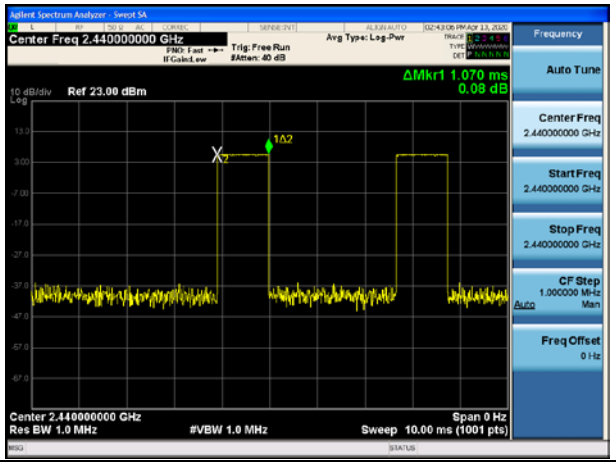
BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2404



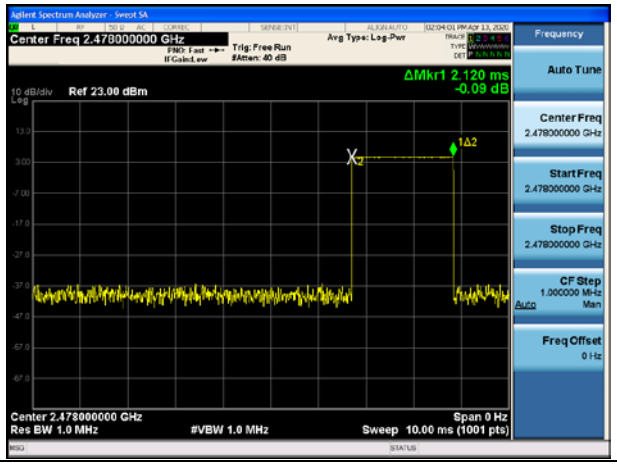
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2440



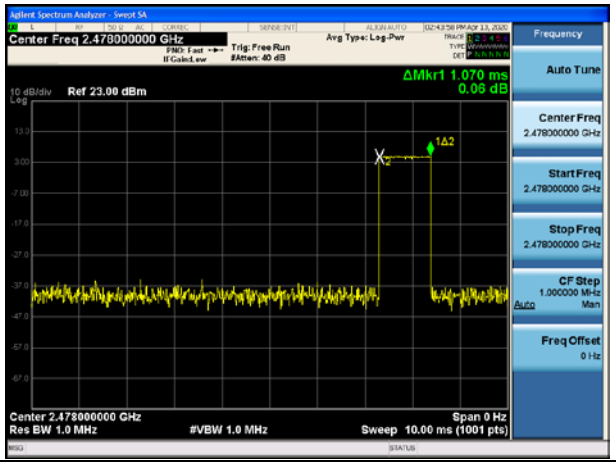
BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2440



BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2478



BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2478



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5.5 Band Edge Compliance

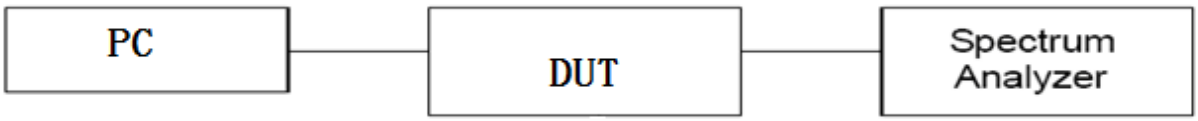
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

During the process of the testing, The EUT was connected to the spectrum analyzer .The EUT is controlled by the PC set to ensure max power transmission. The lowest and highest channels were measured. The peak detector is used. RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer. EUT test for Hopping On mode and Hopping Off mode.

Test Setup



Limits

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.”

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

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Test Results

BT UHD Normal Mode

Hopping On

BT UHD 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2404

BT UHD 2MHz π/4-DQPSK(4Mbps), Carrier frequency (MHz): 2478

BT UHD 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2404

BT UHD 2MHZ 8DPSK(6Mbps), Carrier frequency (MHz): 2478

BT UHD 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2404

BT UHD 4MHz π/4-DQPSK(8Mbps), Carrier frequency (MHz): 2476

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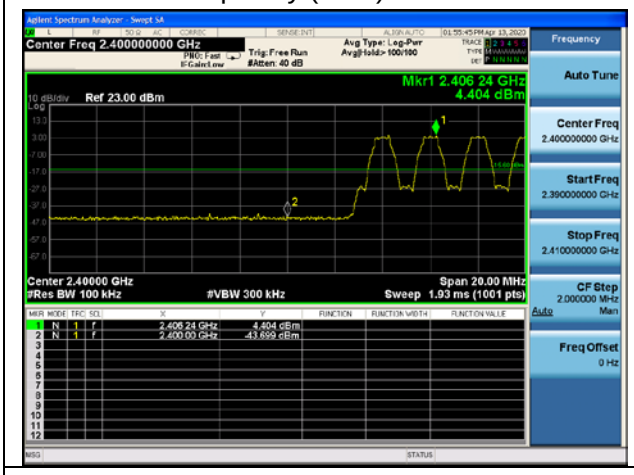
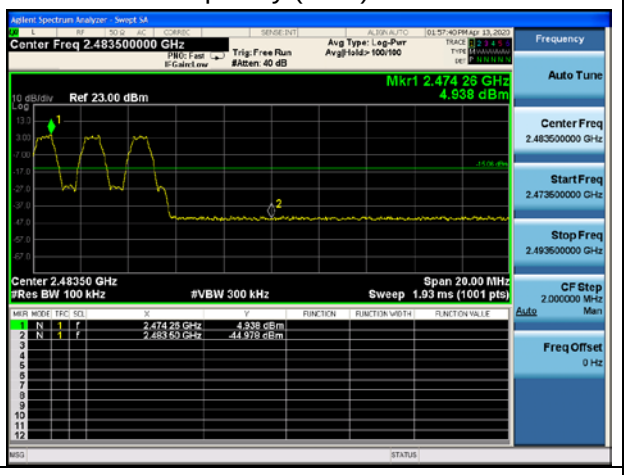
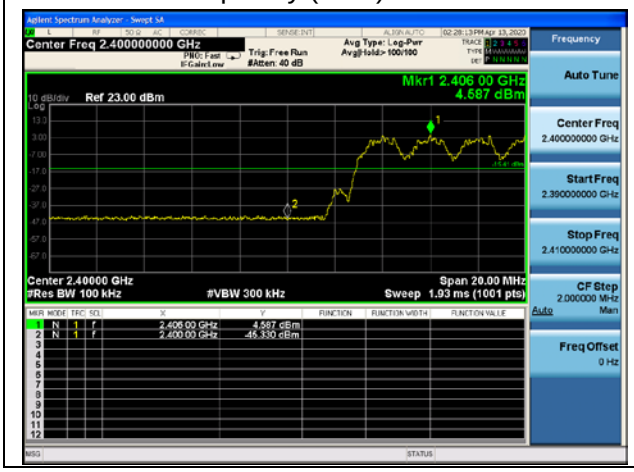
BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2404



BT UHD BLE 2MHZ GFSK(1Mbps), Carrier frequency (MHz): 2478



BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2404



BT UHD BLE 2MHZ GFSK(2Mbps), Carrier frequency (MHz): 2478

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