

TEST REPORT		
Report Number..... :	90483-22-72-22-PP001	
Date of issue .....	2022-06-20	
Tested by (+signature) .....	Duke	<i>Duke Chen</i>
Approved by (+signature).... :	Jason	<i>Jason gao</i>
Testing Laboratory name..... :	SLG-CPC Testlaboratory Co., Ltd.	
Address .....	No. 11, Wu Song Road, Dongcheng District, Dongguan, Guangdong Province, China 523117	
Applicant's name .....	Rangland Ltd Liability	
Address .....	282 DuPont Ave. Newburgh, NY 12550	
Manufacturer's name .....	Rangland Ltd Liability	
Address .....	282 DuPont Ave. Newburgh, NY 12550	
Factory's name .....	Rangland Ltd Liability	
Address .....	282 DuPont Ave. Newburgh, NY 12550	
Standard(s)..... :	FCC 47 CFR Part 15, Subpart C	
Test item description..... :	Golf Cart Speaker	
Trade Mark..... :	Rangland	
Model/Type reference..... :	BT150	
FCC ID .....	2A6PZ-BT150	
Date of receipt of test item .. :	2022-04-25	
Date (s) of performance of test..... :	2022-04-26 to 2022-06-19	
Summary of Test Results..... :	<b>Pass</b>	
The Summary of Test Results based on a technical opinion belongs to the standard(s).		
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**Modified Information**

Version	Report No.	Revision Data	Summary
Ver.1.0	90483-22-72-22-PP001	/	Original Version

## 1 EUT TECHNICAL DESCRIPTION

Characteristics	Description
Product	Golf Cart Speaker
Model Number	BT150
Device Type	Bluetooth V5.0
Data Rate	1Mbps for BT V4.2 GFSK modulation 2Mbps for BT V4.2 pi/4-DQPSK modulation 3Mbps for BT V4.2 8DPSK modulation
Modulation:	GFSK modulation for BT V4.2 (1Mbps) pi/4-DQPSK modulation for BT V4.2 (2Mbps) 8DPSK modulation for BT V4.2 (3Mbps)
Operating Frequency Range(s):	2402-2480MHz
Number of Channels:	79 channels
Transmit Power Max:	0.91 dBm
Antenna Type	PCB Antenna
Antenna Gain	0.5 dBi
Power supply	<input checked="" type="checkbox"/> DC supply: DC 5.0V
Temperature Range:	-20°C ~ +55°C

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

## 2 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
15.247(a)(1)	20 dB Bandwidth	PASS	
15.247(a)(1)	Carrier Frequency Separation	PASS	
15.247(a)(1)	Number of Hopping Frequencies	PASS	
15.247(a)(1)	Average Time of Occupancy (Dwell Time)	PASS	
15.247(b)(1)	Maximum Peak Conducted Output Power	PASS	
15.247(d)	Conducted Spurious Emissions	PASS	
15.247(d) 15.209	Radiated Spurious Emissions	PASS	
15.207	Conducted Emission	PASS	
15.203	Antenna Application	PASS	
15.247 (a) (1)/g/h	Frequency Hopping System	PASS	
NOTE1: N/A (Not Applicable)			

### RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2A6PZ-BT150 filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

### 3 TEST METHODOLOGY

#### 3.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 15, Subpart C

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

#### 3.2 MEASUREMENT EQUIPMENT USED

Equipment	Model	Manufacturer	S/N	Last Cal.	Cal. Intervae
<b>RF Connected Test</b>					
Vector Signal Generater	Rohde & Schwarz	SMBV100B(6G)	101166	2021/07/30	2022/07/29
Analog Signal Generator	Rohde & Schwarz	SMB100A(40G)	181333	2021/07/30	2022/07/29
Signal Analyzer	Rohde & Schwarz	FSV40	101527	2022/04/19	2023/04/18
Power Analyzer	Rohde & Schwarz	OSP-B157W8	N/A	2021/09/23	2022/09/22
Wideband Radio Communication Tester	R&S	CMW270	101985	2021/07/30	2022/07/29
Temperature&Humidity test chamber	ESPEC	VC 4018	/	2022/03/23	2023/03/22
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	166898	2021/09/07	2022/09/06
<b>Radiated Emission Test</b>					
EMI Test Receiver	KEYSIGHT	N9010A	MY56070465	2021/12/10	2022/12/09
EMI Test Receiver	Rohde & Schwarz	FSV40	101511	2022/04/19	2023/04/18
Bilog Antenna	Schwarzbeck	VULB 9163	01335	2020/04/28	2023/04/27
Power Amplifier	EMEC	EM330	060676	2021/12/10	2022/12/10
Cable	Tuyue	F4309	L-400-NmNm-12000	2021/12/10	2022/12/10
Horn Antenna	Schwarzbeck	BBHA9120D	1779	2022/04/21	2025/04/20
Horn Antenna	Schwarzbeck	BBHA9170	00954	2019/10/09	2022/10/08
Power Amplifier	Rohde & Schwarz	SCU-18F	180118	2022/04/21	2025/04/20
Active Loop Antenna	ETS LINDGREN	6512	41623	2022/04/23	2025/04/23
Test Software	Farad	EZ-EMC	Ver.CPC-3A 1	/	/
<b>Conducted Emission Test</b>					
LISN	Schwarzbeck	NSLK 8127	8127-892	2022/03/19	2023/03/18
LISN	Schwarzbeck	NSLK 8127	8127-437	2021/08/11	2022/08/10
EMI Test Receiver	R&S	ESR3	102124	2021/12/10	2022/12/09
Pulse Limiter	R&S	ESH3-Z2	357.8810.52	2021/12/10	2022/12/09
Test Software	Farad	EZ-EMC	Ver.CPC-3A 1	/	/

### 3.3 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 Bluetooth V5.0 GFSK modulation; 2Mbps for Bluetooth V5.0 pi/4-DQPSK modulation; 3Mbps for Bluetooth V5.0 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 V5.0

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: $f_c = 2402\text{MHz} + (k-1) \times 1\text{MHz}$ $k=1$ to 79					

Test Frequency and channel for Bluetooth V5.0

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

## 4 FACILITIES AND ACCREDITATIONS

### 4.1 FACILITIES

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

No. 11, Wu Song Road, Dongcheng District, Dongguan, Guangdong Province, China 523117

The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.10 and CISPR Publication 32.

### 4.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab. :

Accredited by ISED, October 04 2021

CAB identifier: CN0126

Company Number: 27767

Accredited by A2LA, October 04 2021

The Certificate Registration Number is 6325.01

Name of Firm : SLG-CPC Testlaboratory Co., Ltd.

Site Location : No. 11, Wu Song Road, Dongcheng District, Dongguan,  
Guangdong Province, China 523117



## 5 TEST SYSTEM UNCERTAINTY

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

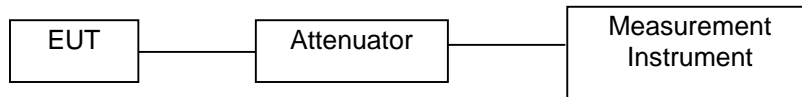
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\%$
Conducted Emissions Test	$\pm 3.08\text{dB}$
Radiated Emission Test	$\pm 4.60\text{dB}$
Power Density	$\pm 0.9\%$
Occupied Bandwidth Test	$\pm 2.3\%$
Band Edge Test	$\pm 1.2\%$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 3.2\%$
Humidity	$\pm 2.5\%$

Measurement Uncertainty for a level of Confidence of 95%

## 6 SETUP OF EQUIPMENT UNDER TEST

### 6.1 RADIO FREQUENCY TEST SETUP 1

The Bluetooth V5.0 component's antenna port(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.



### 6.2 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 0.8meters 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:

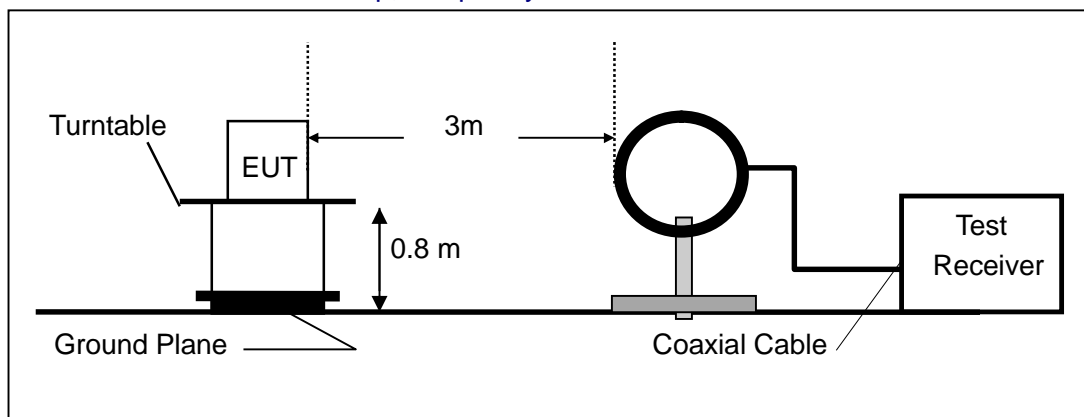
The EUT is placed on a turntable 0.8meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is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

Above 1GHz:

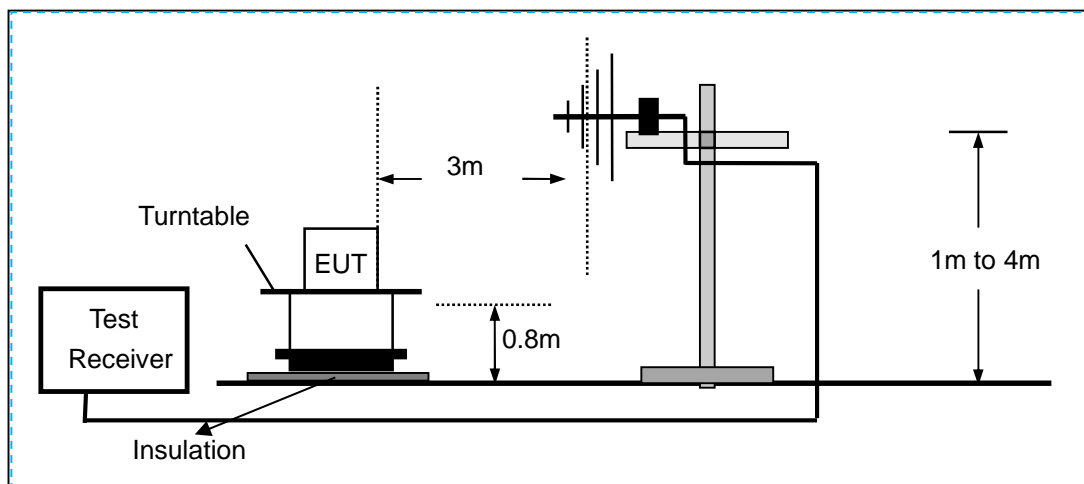
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)

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).

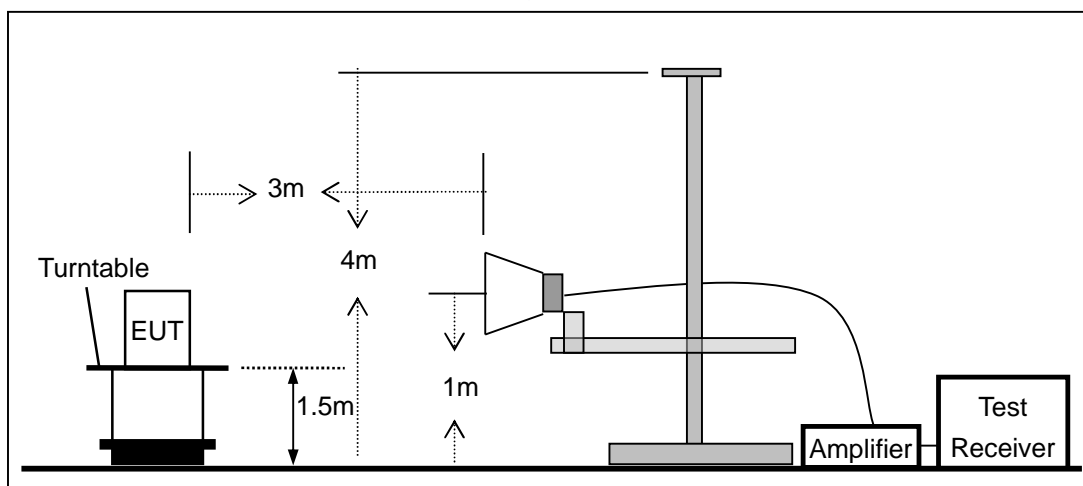
#### (a) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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

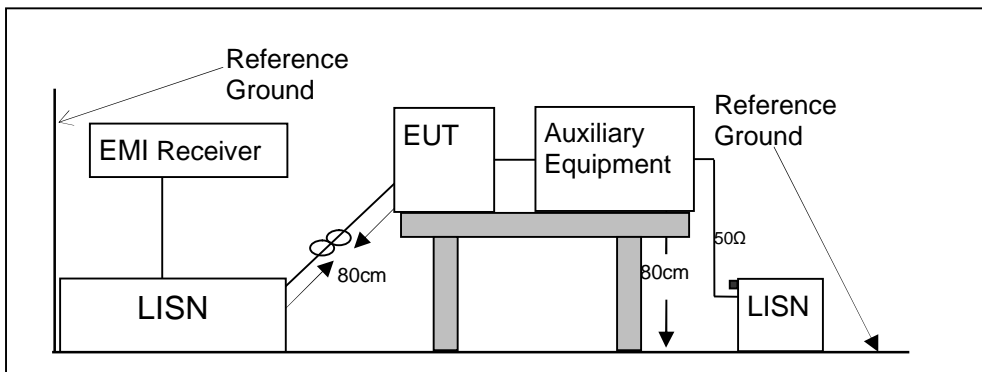


### 6.3 CONDUCTED EMISSION TEST SETUP

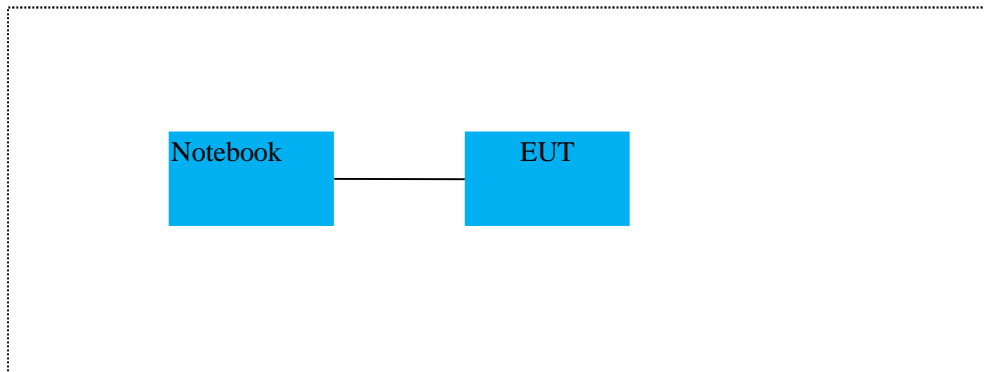
The mains cable of the EUT (Perfect Share Mini) must be connected to LISN. The LISN shall be placed 0.8m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other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

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.



#### 6.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



#### 6.5 SUPPORT EQUIPMENT

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	MPNXB1505007	MP1XHYV7
Adapter	HUAWEI	HW-200675CD1	/

**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.

## 7 FREQUENCY HOPPING SYSTEM REQUIREMENTS

### 7.1 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.

### 7.2 EUT Pseudorandom Frequency Hopping Sequence

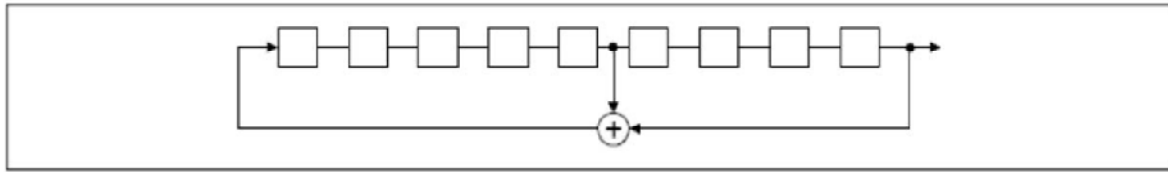
The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels.

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 divided 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.

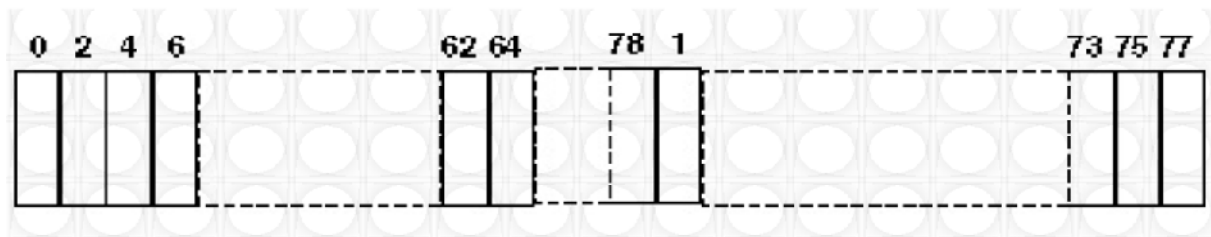
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones. Number of shift register stages: 9

Length of pseudo-random sequence:  $2^9 - 1 = 511$  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.

### 7.3 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

### 7.4 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.

## 8 TEST REQUIREMENTS

### 8.1 20DB BANDWIDTH

#### 8.1.1 Applicable Standard

According to FCC Part 15.247(a)(1) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

#### 8.1.2 Conformance Limit

No limit requirement.

#### 8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

#### 8.1.4 Test Procedure

The EUT was operating in Bluetooth V5.0 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.

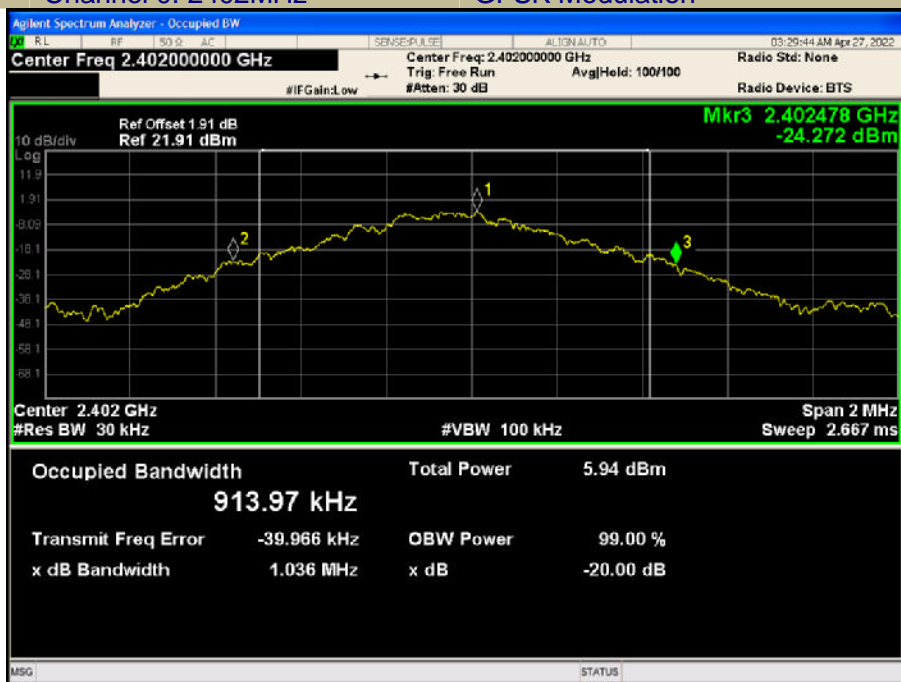
### Test Results

Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

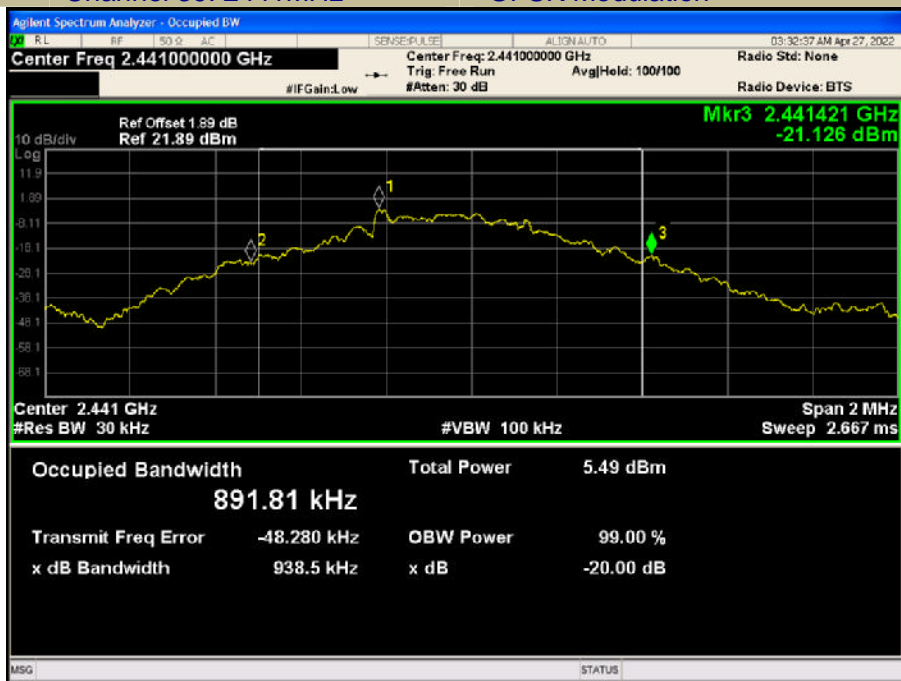
Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (MHz)	Limit (MHz)	Verdict
GFSK	00	2402	1.036	N/A	PASS
	39	2441	0.939	N/A	PASS
	78	2480	1.017	N/A	PASS
pi/4-DQPSK	00	2402	1.274	N/A	PASS
	39	2441	1.284	N/A	PASS
	78	2480	1.310	N/A	PASS
8DPSK	00	2402	1.255	N/A	PASS
	39	2441	1.261	N/A	PASS
	78	2480	1.247	N/A	PASS
Note: N/A (Not Applicable)					



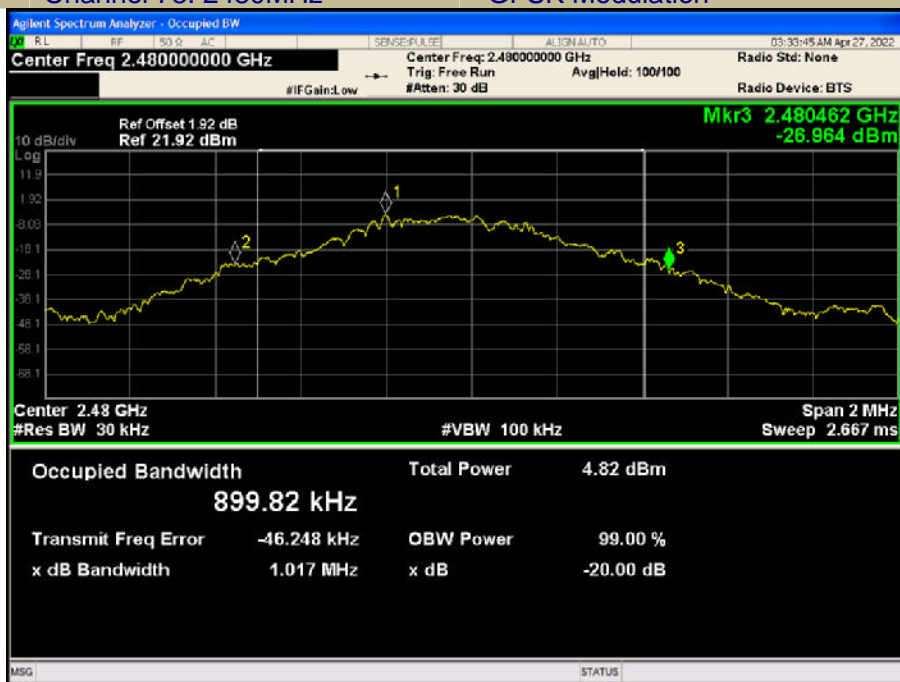
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 0: 2402MHz	GFSK Modulation



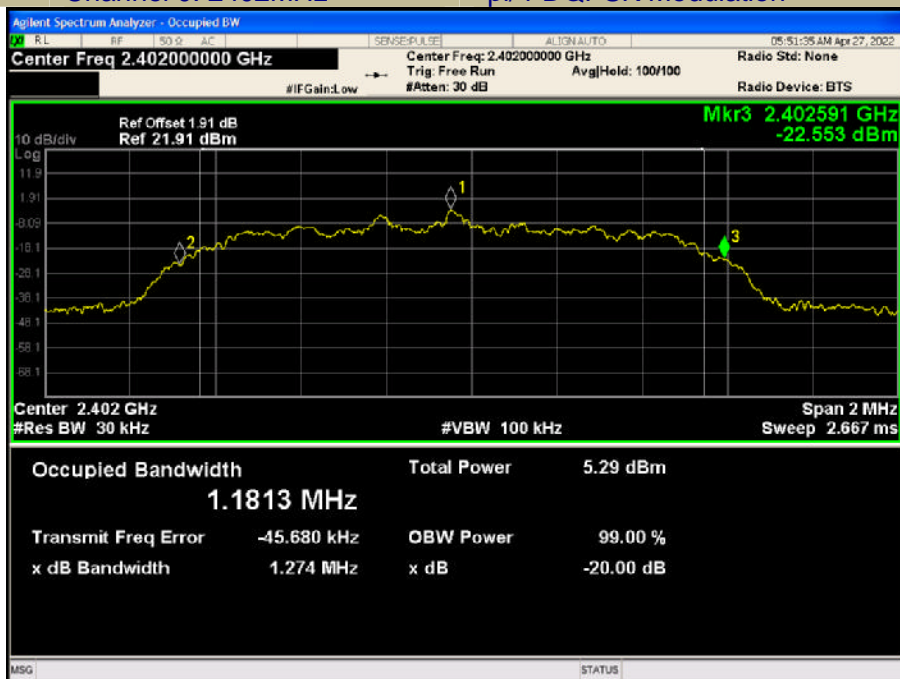
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 39: 2441MHz	GFSK Modulation



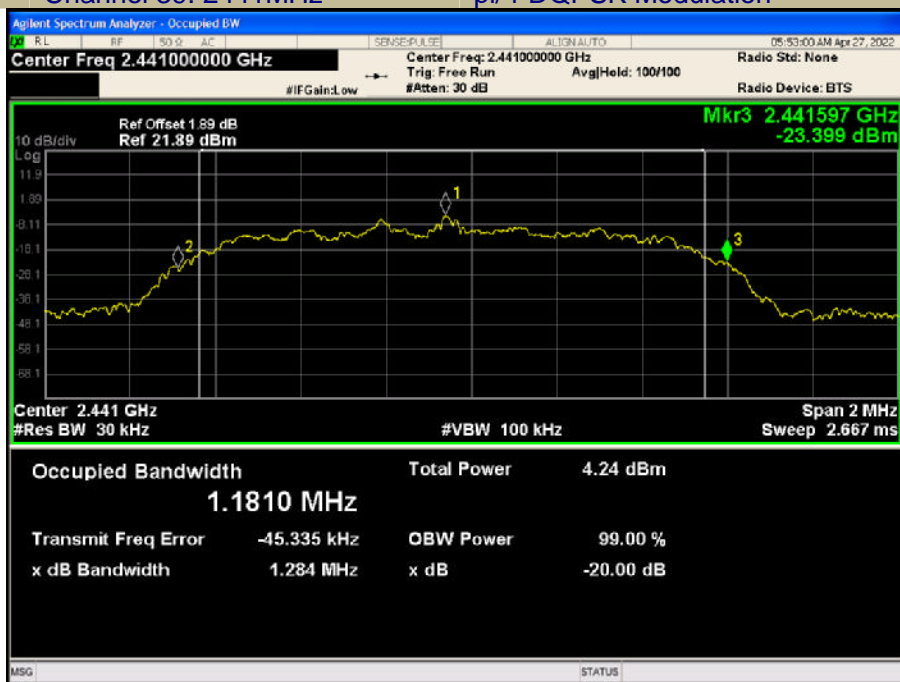
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 78: 2480MHz	GFSK Modulation



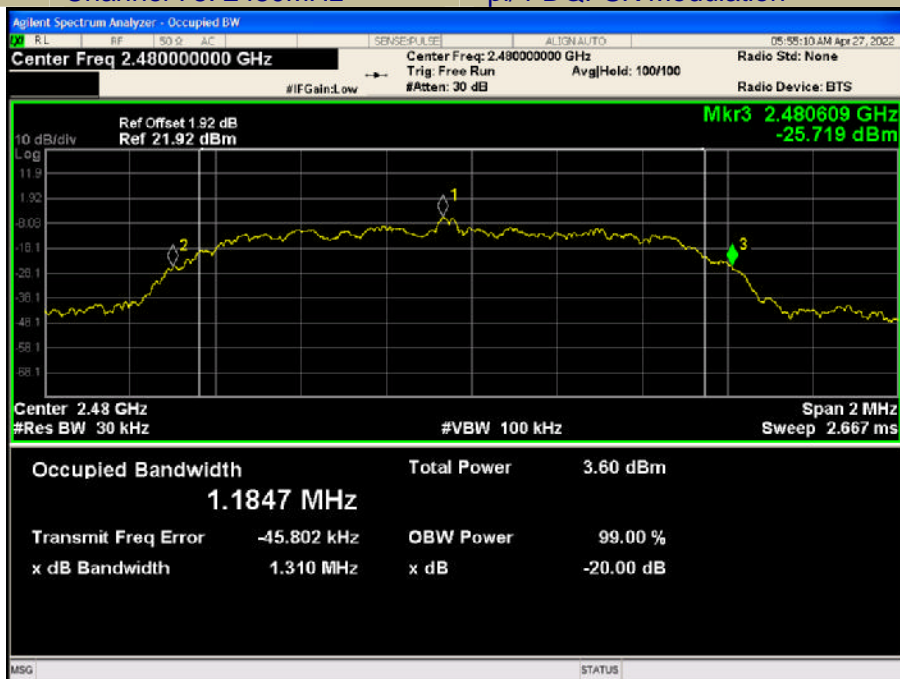
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 0: 2402MHz	pi/4-DQPSK Modulation



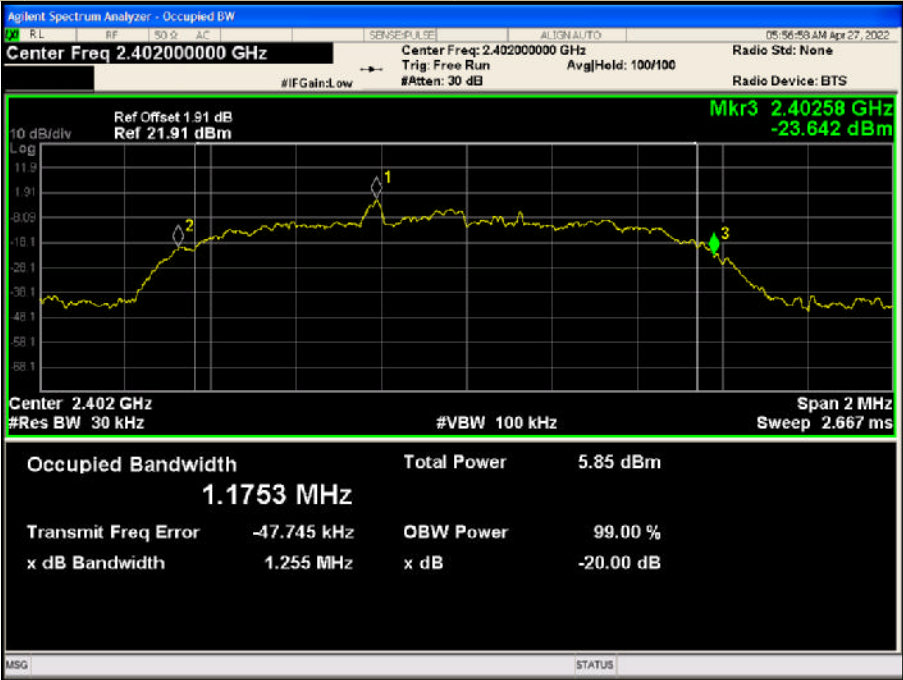
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 39: 2441MHz	pi/4-DQPSK Modulation



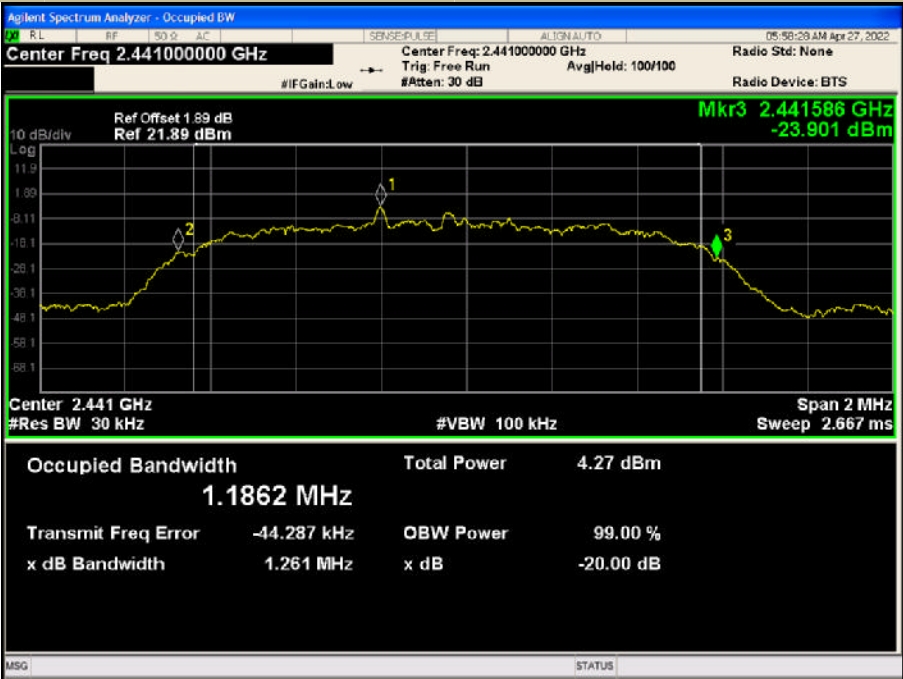
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 78: 2480MHz	pi/4-DQPSK Modulation



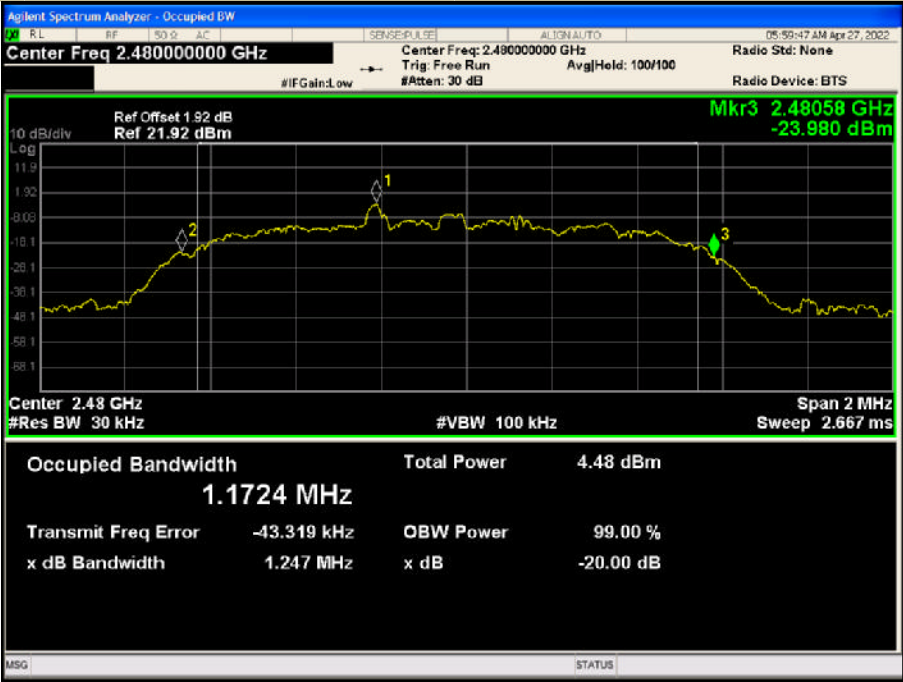
Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 0: 2402MHz	8DPSK Modulation



Test Model	20dB Bandwidth	
	Bluetooth V5.0	
	Channel 39: 2441MHz	8DPSK Modulation



Test Model	20dB Bandwidth		
	Bluetooth V5.0		
	Channel 78: 2480MHz	8DPSK Modulation	



## 8.2 CARRIER FREQUENCY SEPARATION

### 8.2.1 Applicable Standard

According to FCC Part 15.247(a)(1) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

### 8.2.2 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.

### 8.2.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

### 8.2.4 Test Procedure

■ According to FCC Part 15.247(a)(1)

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:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

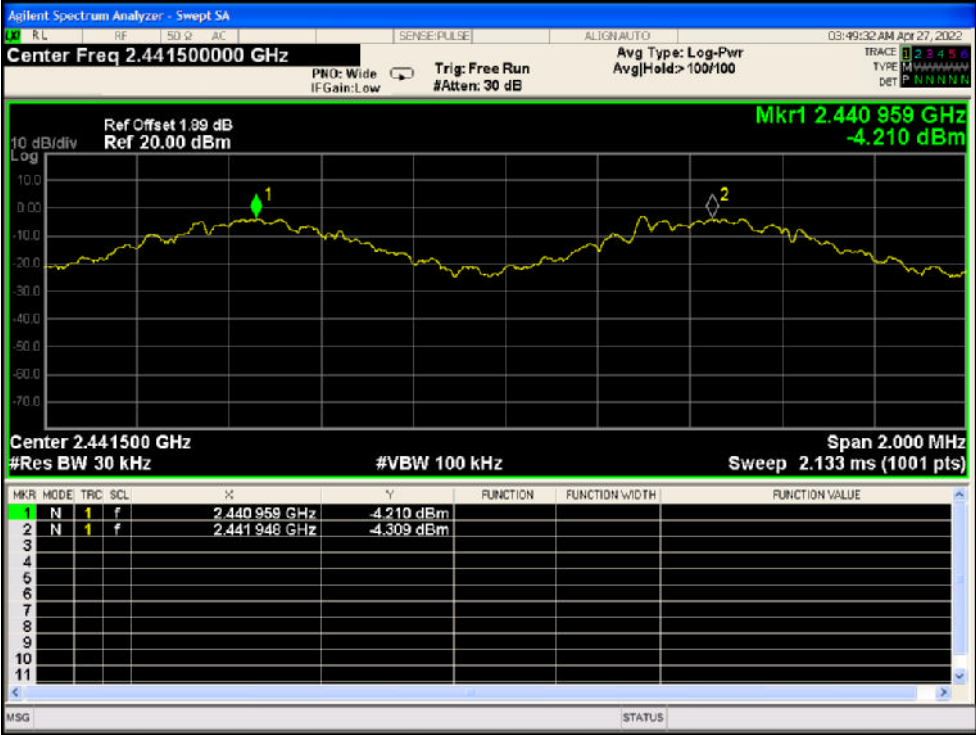
Modulation Mode	Channel Number	Channel Frequency (MHz)	Measurement Bandwidth (kHz)	Limit (kHz)	Verdict
GFSK	0	2402	1000	>690	PASS
	39	2441	989	>626	PASS
	78	2480	1021	>678	PASS
pi/4-DQPSK	0	2402	922	>849	PASS
	39	2441	1023	>856	PASS
	78	2480	1043	>873	PASS
8DPSK	0	2402	1001	>836	PASS
	39	2441	1070	>840	PASS
	78	2480	942	>831	PASS
Note: Limit = 20dB bandwidth * 2/3					



Test Model	Carrier Frequency Separation	
	Bluetooth V5.0	
	Channel 0: 2402MHz	GFSK Modulation



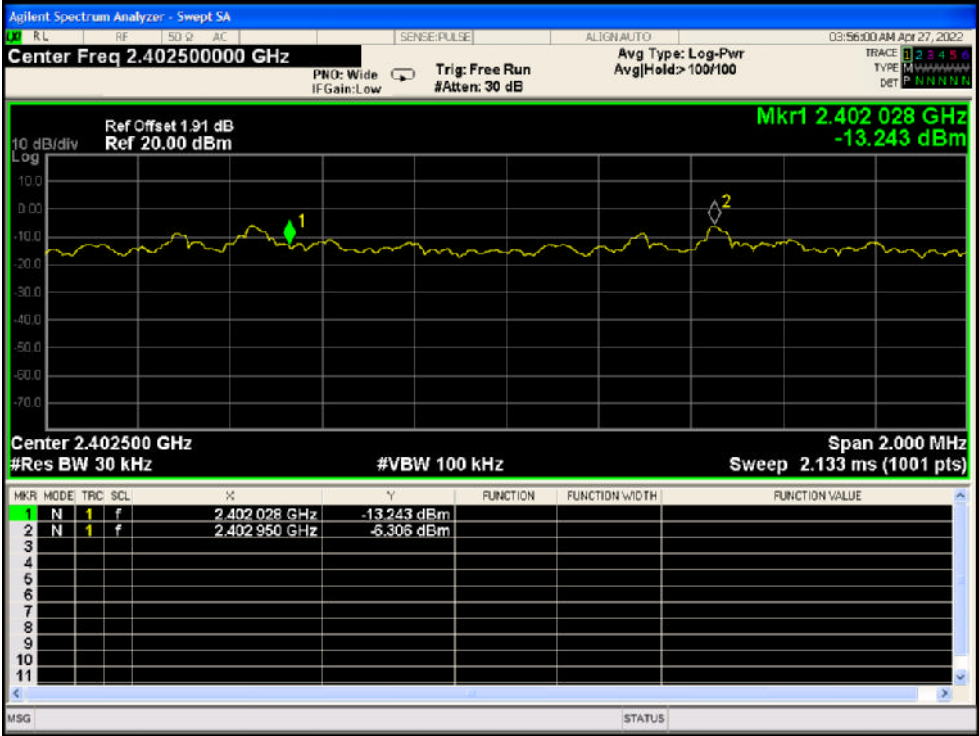
Test Model	Carrier Frequency Separation	
	Bluetooth V5.0	
	Channel 39: 2441MHz	GFSK Modulation



Test Model	Carrier Frequency Separation		
	Bluetooth V5.0		
	Channel 78: 2480MHz	GFSK Modulation	

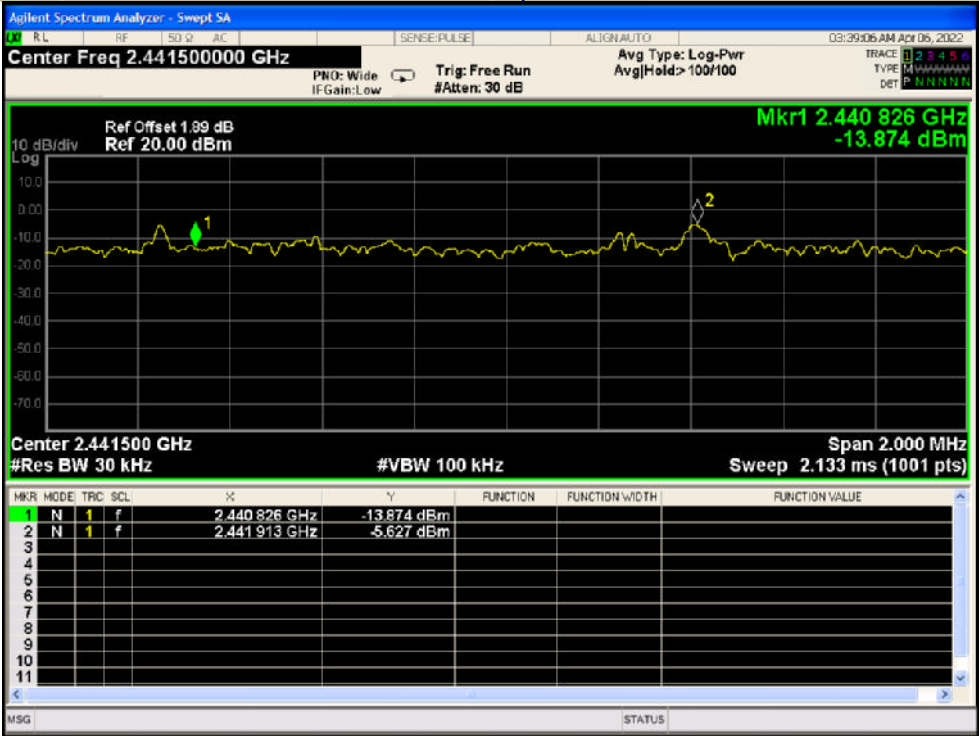


Test Model	Carrier Frequency Separation		
	Bluetooth V5.0		
	Channel 0: 2402MHz	pi/4-DQPSK Modulation	

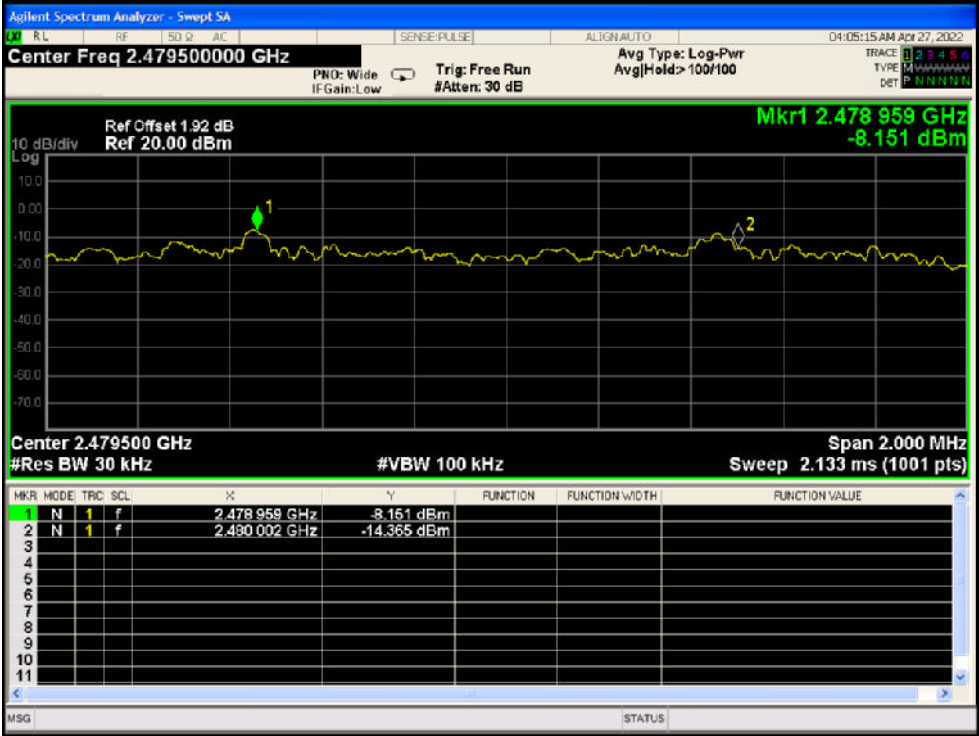




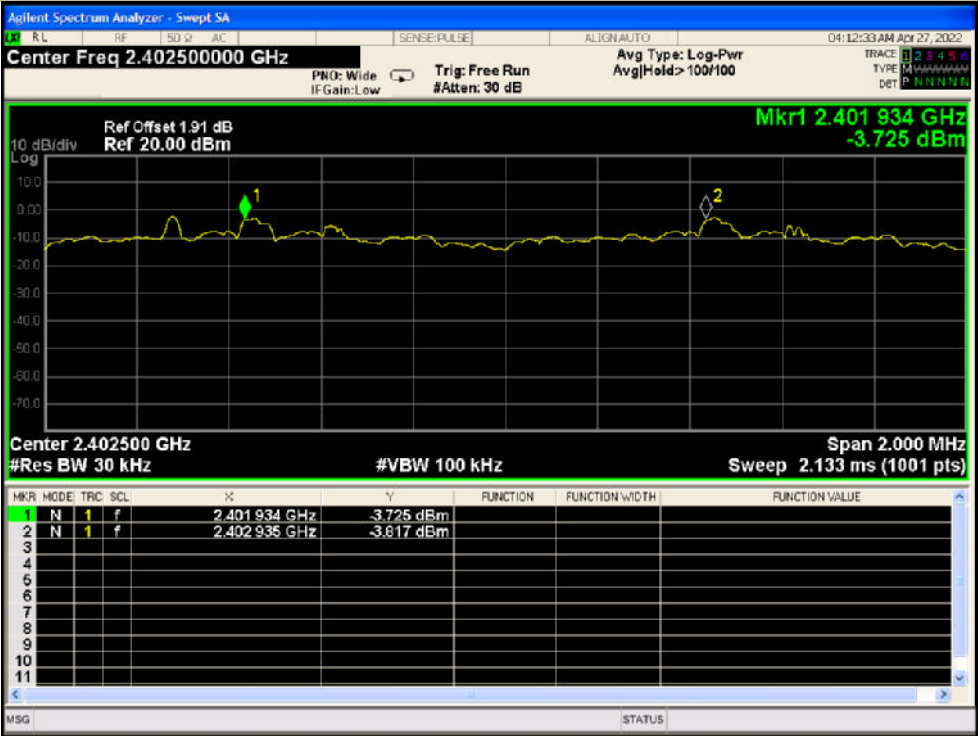
Test Model	Carrier Frequency Separation	
	Bluetooth V5.0	
	Channel 39: 2441MHz	pi/4-DQPSK Modulation



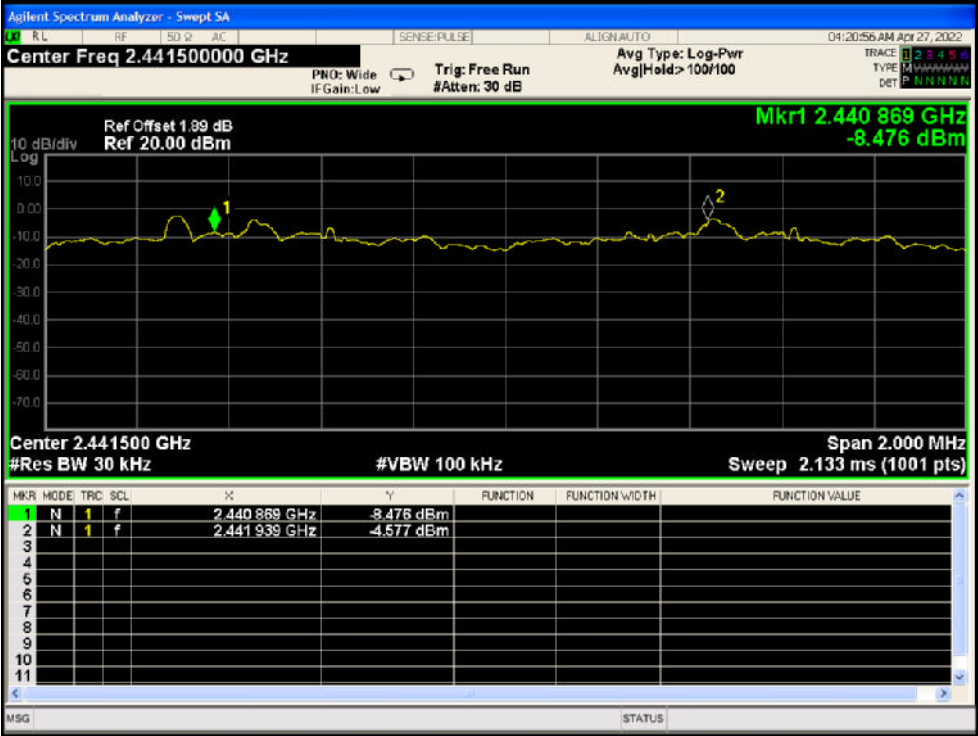
Test Model	Carrier Frequency Separation	
	Bluetooth V5.0	
	Channel 78: 2480MHz	pi/4-DQPSK Modulation



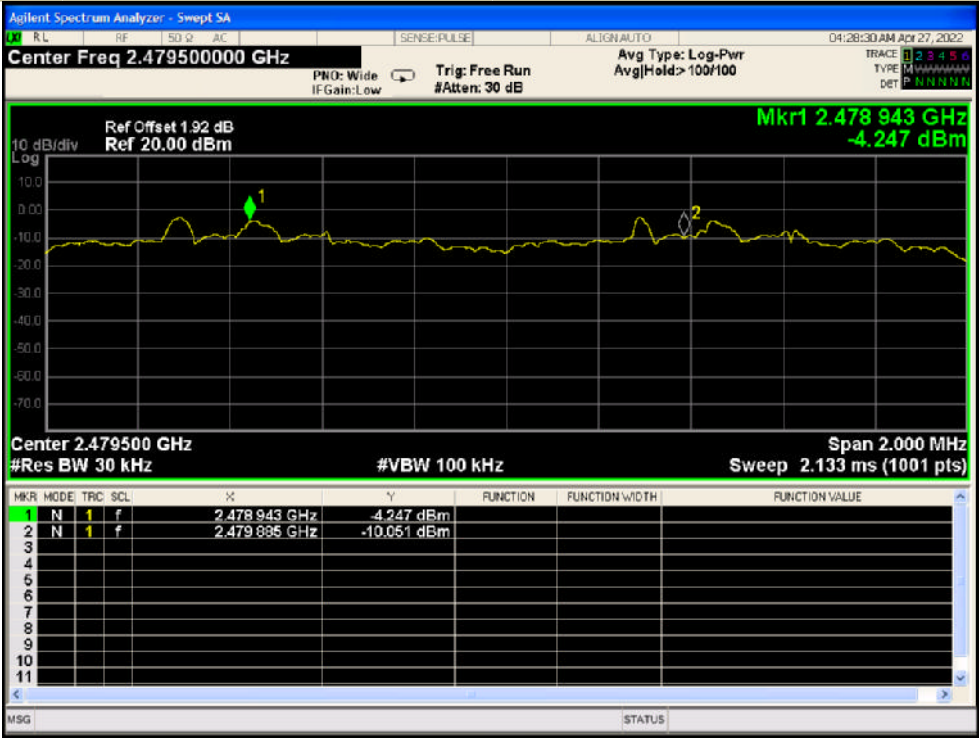
Test Model	Carrier Frequency Separation	
	Bluetooth V5.0	
	Channel 0: 2402MHz	8DPSK Modulation



Test Model	Carrier Frequency Separation	
	Bluetooth V5.0	
	Channel 39: 2441MHz	8DPSK Modulation



Test Model	Carrier Frequency Separation		
	Bluetooth V5.0		
	Channel 78: 2480MHz	8DPSK Modulation	



### 8.3 NUMBER OF HOPPING FREQUENCIES

#### 8.3.1 Applicable Standard

According to FCC Part 15.247(a)(1) (iii) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

#### 8.3.2 Conformance Limit

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

#### 8.3.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

#### 8.3.4 Test Procedure

- According to FCC Part 15.247(a)(1)(iii)

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation (2400-2483.5MHz)

RBW  $\geq$  100KHz

VBW  $\geq$  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.

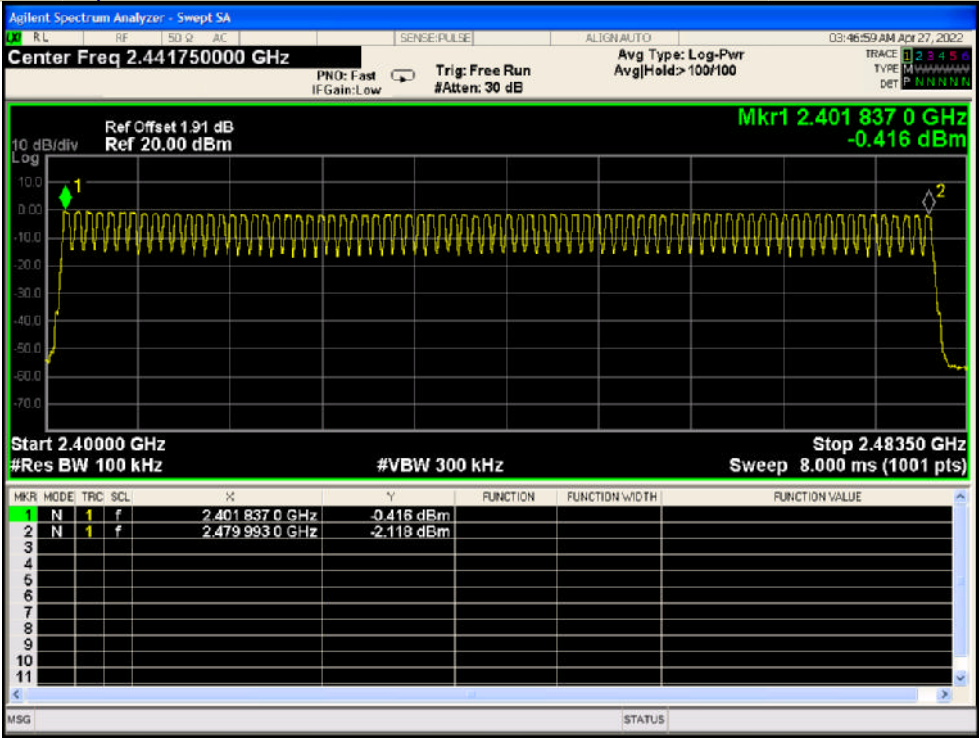
#### Test Results

Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

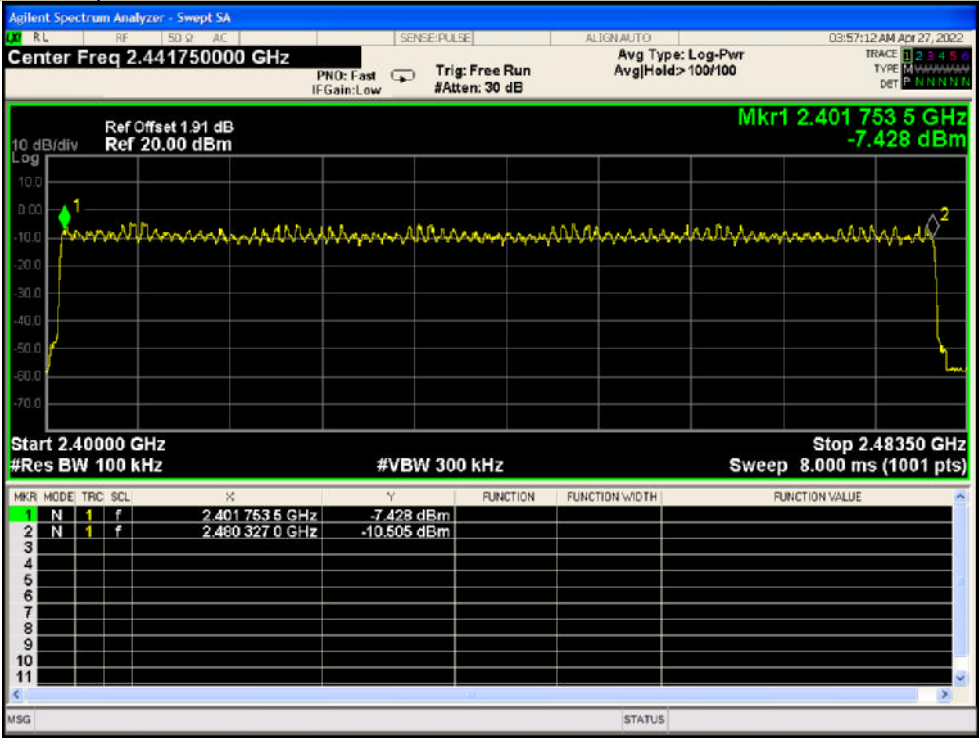
Bluetooth (GFSK, pi/4-DQPSK, 8DPSK) mode have been tested, Only the worst data is recorded:

Modulation Mode	Hopping Channel Frequency Range	Quantity of Hopping Channel	Quantity of Hopping Channel limit
GFSK	2402-2480	79	> 15
pi/4-DQPSK	2402-2480	79	> 15
8DPSK	2402-2480	79	> 15

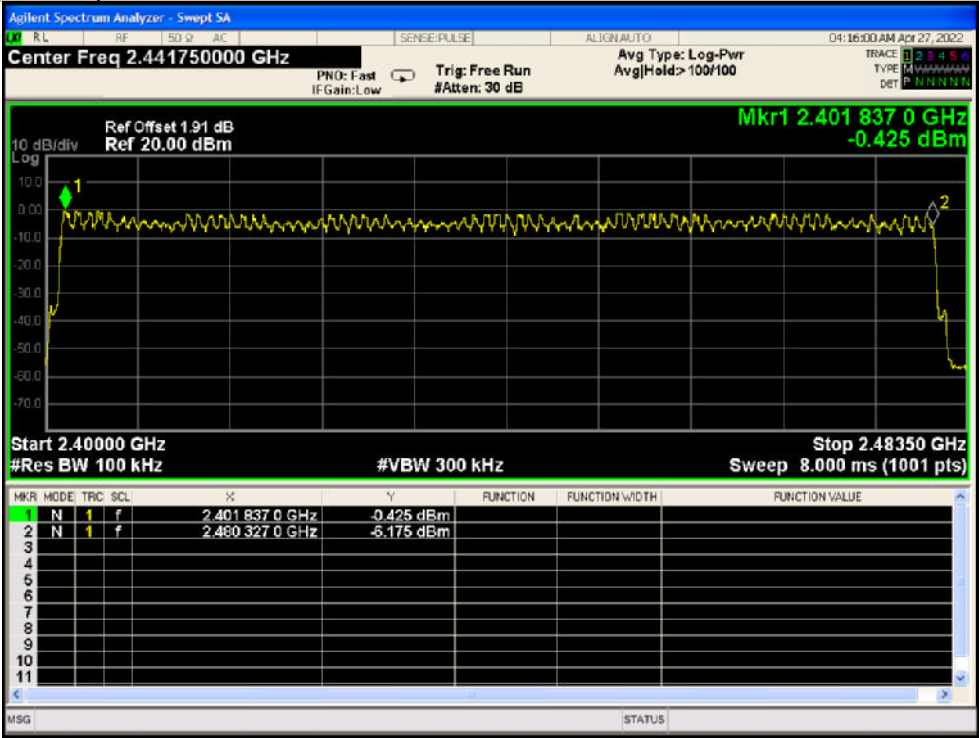
Test Model	Number Of Hopping Frequencies
	Bluetooth V5.0 GFSK
	Span: 2400-2483.5MHz



Test Model	Number Of Hopping Frequencies
	Bluetooth V5.0 pi/4-DQPSK
	Span: 2400-2483.5MHz



Test Model	Number Of Hopping Frequencies
	Bluetooth V5.0 8DPSK
	Span: 2400-2483.5MHz





## 8.4 AVERAGE TIME OF OCCUPANCY (DWELL TIME)

### 8.4.1 Applicable Standard

According to FCC Part 15.247(a)(1)(iii) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

### 8.4.2 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.

### 8.4.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

### 8.4.4 Test Procedure

■ According to FCC Part 15.247(a)(1)(iii)

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  $\geq$  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.

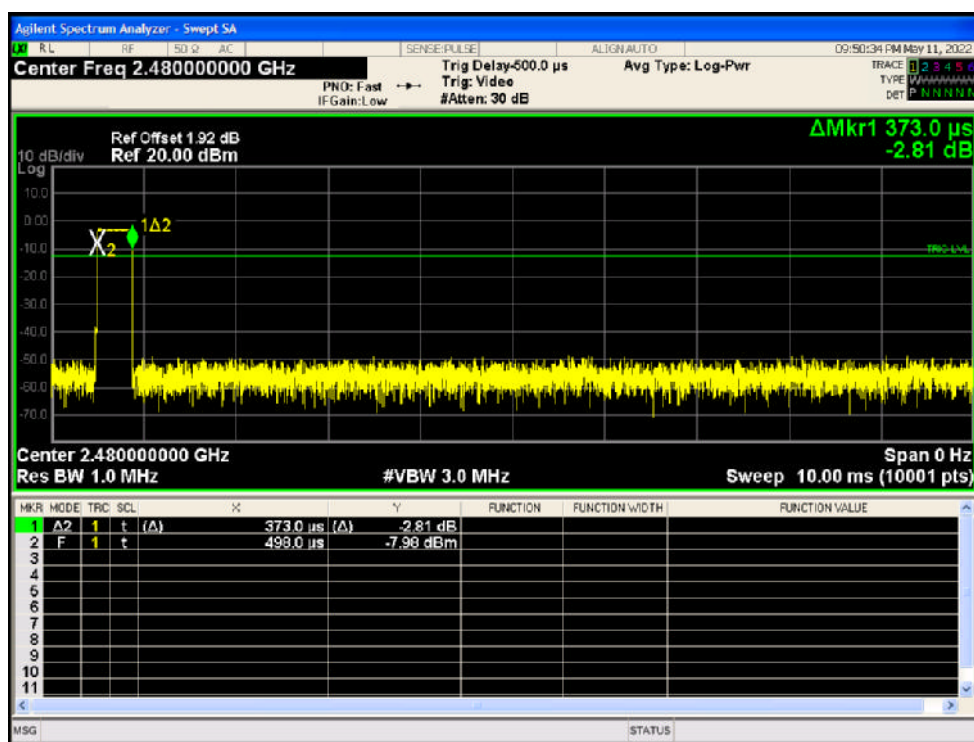
### 8.4.5 Test Results

Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

Bluetooth (GFSK, pi/4-DQPSK, 8DPSK) mode have been tested, Only the worst data is recorded:

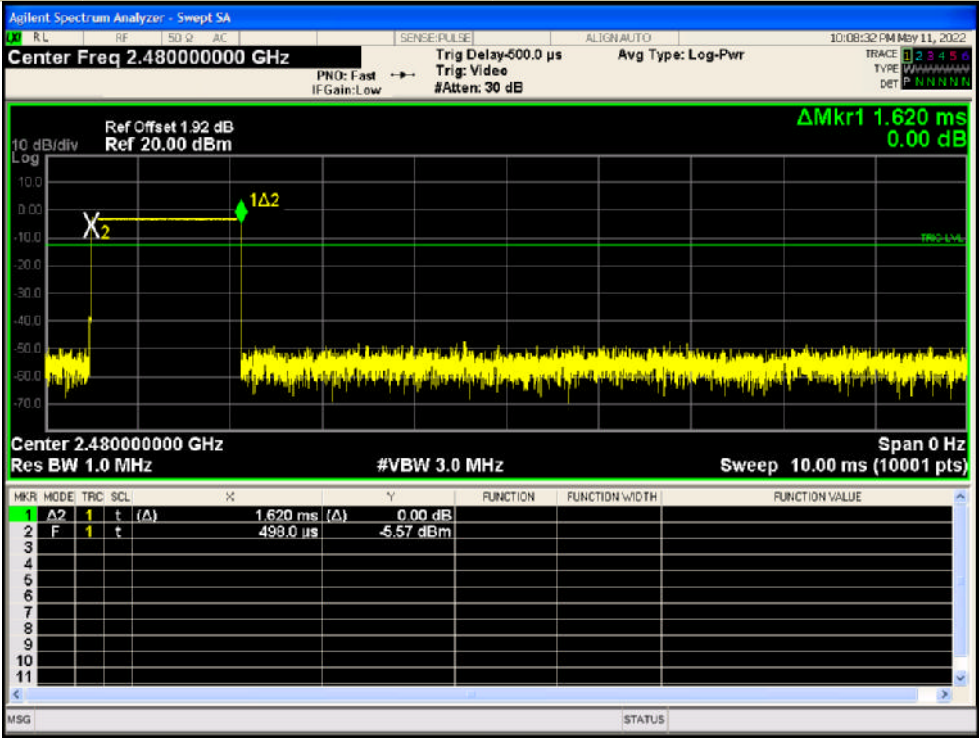
Modulation Mode	Channel Number	Packet type	Pulse width (ms)	Dwell Time (ms)	Limit (ms)	Verdict
GFSK	78	DH1	0.373	119.360	<400	PASS
	78	DH3	1.620	259.200	<400	PASS
	78	DH5	2.868	305.920	<400	PASS
Note: Dwell Time(DH1)=PW*(1600/2/79)*31.6 Dwell Time(DH3)=PW*(1600/4/79)*31.6 Dwell Time(DH5)=PW*(1600/6/79)*31.6						

Test Model	Average Time Of Occupancy (Dwell Time)	
	Bluetooth V5.0	
	CH 0: 2480MHz	GFSK DH1

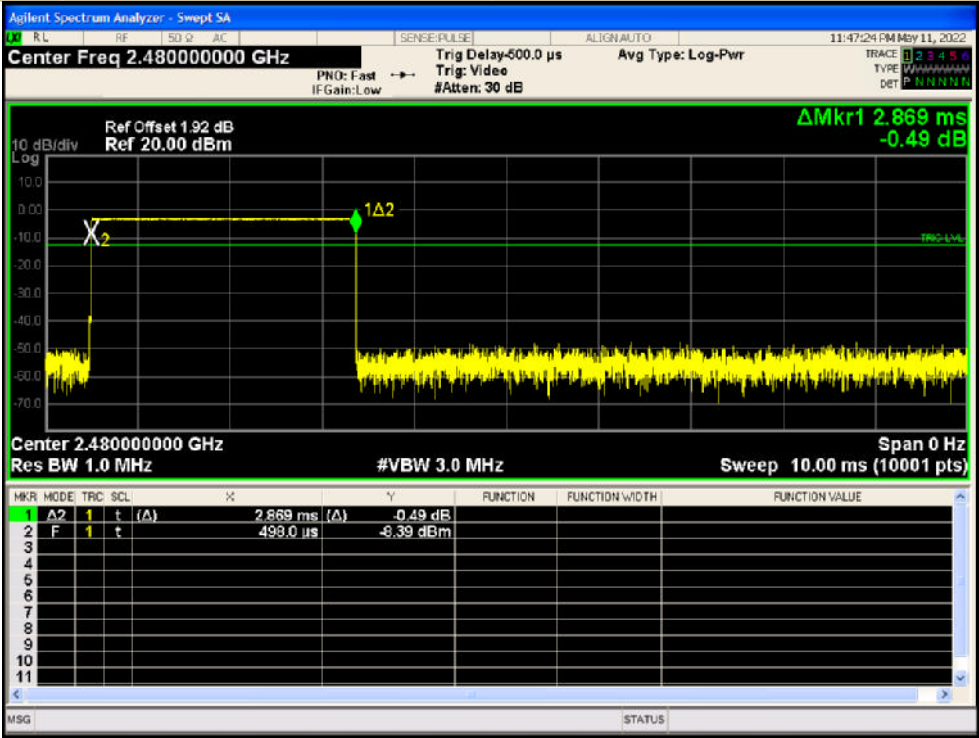




Test Model	Average Time Of Occupancy (Dwell Time)	
	Bluetooth V5.0	
	CH 0: 2480MHz	GFSK DH3



est Model	Average Time Of Occupancy (Dwell Time)	
	Bluetooth V5.0	
	CH 0: 2480MHz	GFSK DH5



## 8.5 MAXIMUM PEAK CONDUCTED OUTPUT POWER

### 8.5.1 Applicable Standard

According to FCC Part 15.247(b)(1) and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02

### 8.5.2 Conformance Limit

The max For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 8.5.3 Test Configuration

Test according to clause 6.1 radio frequency test setup 1

### 8.5.4 Test Procedure

■ According to FCC Part 15.247(b)(1)

As an alternative to a peak power measurement, compliance with the limit can be based on a measurement of the maximum conducted output power.

Use the following spectrum analyzer settings:

Set Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel (about 10MHz)

Set RBW > the 20 dB bandwidth of the emission being measured (about 3MHz)

Set VBW ≥ RBW

Set Sweep = auto

Set Detector function = peak

Set Trace = max hold

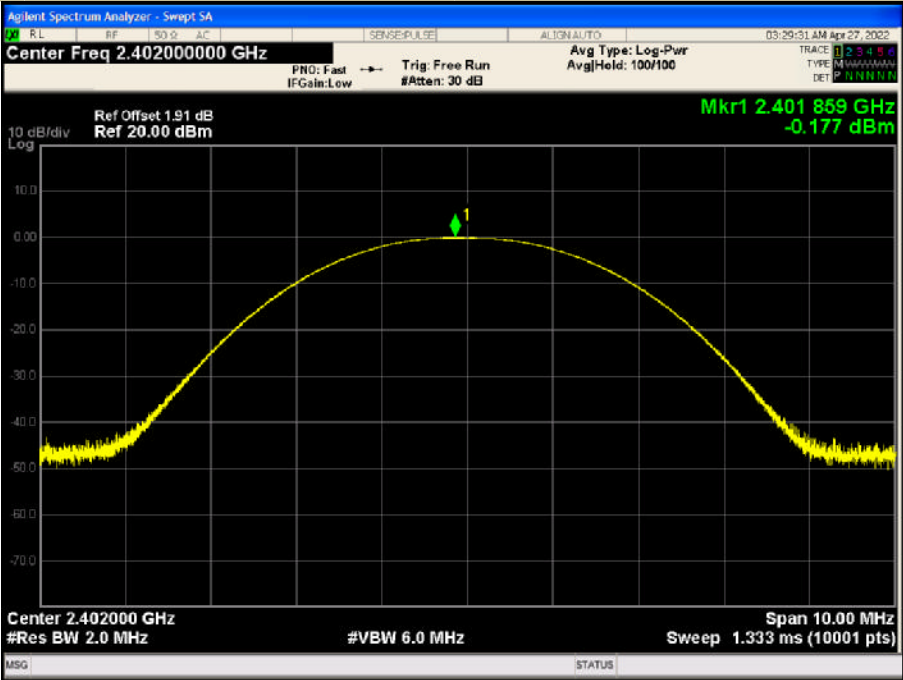
Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission to determine the peak amplitude level.

### Test Results

Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

Operation Mode	Channel Number	Channel Frequency (MHz)	Measurement Level (dBm)	Limit (dBm)	Verdict
GFSK	0	2402	-0.18	21	PASS
	39	2441	-1.19	21	PASS
	78	2480	-1.58	21	PASS
pi/4-DQPSK	0	2402	0.19	21	PASS
	39	2441	-0.72	21	PASS
	78	2480	-1.12	21	PASS
8DPSK	0	2402	0.91	21	PASS
	39	2441	-0.17	21	PASS
	78	2480	-0.54	21	PASS
Note: N/A					

Test Model	Maximum Peak Conducted Output Power		
	Bluetooth V5.0		
	Channel 0: 2402MHz	GFSK	



Test Model	Maximum Peak Conducted Output Power		
	Bluetooth V5.0		
	Channel 39: 2441MHz	GFSK	

