



REPORT No.: SZ19120146W01

TEST REPORT

APPLICANT : RM Acquisition LLC

PRODUCT NAME : ClearDryve 220

MODEL NAME : ClearDryve 220

BRAND NAME : Rand McNally

FCC ID : A4C91007A

STANDARD(S) : 47 CFR Part 15 Subpart C

RECEIPT DATE : 2019-12-13

TEST DATE : 2019-12-17 to 2020-03-02

ISSUE DATE : 2020-03-09

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Change History		
Version	Date	Reason for change
1.0	2020-03-09	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	RM Acquisition LLC
Applicant Address:	9855 Woods Drive Skokie Illinois United States 60077
Manufacturer:	RM Acquisition LLC
Manufacturer Address:	9855 Woods Drive Skokie Illinois United States 60077

1.2. Equipment Under Test (EUT) Description

Product Name:	ClearDryve 220	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	V1	
Software Version:	V10	
Equipment Type:	Bluetooth classic	
Bluetooth Version:	5.0	
Modulation Type:	FHSS (GFSK(1Mbps), $\pi/4$ -DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))	
Operating Frequency Range:	2402MHz – 2480MHz	
Antenna Type:	FPC Antenna	
Antenna Gain:	1.75dBi	
Accessory Information:	Battery	
	Brand Name:	CEL
	Model No.:	CEL602240
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	500mAh
	Rated Voltage:	3.7V
	Charge Limit:	4.2V

Note 1: We use the dedicated software to control the EUT into the test mode, and then use MT8852B base station to control the EUT continuous transmission.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



1.3. The Channel Number and Frequency

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Note 1: The Lowest Channel 0, Middle 39 and Highest 78 were selected for test in the report.



1.4. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result	Method determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	15.247(a)1 15.247(h)	Hopping Mechanism	N/A	N/A	PASS	No deviation
3	15.247(a)	Number of Hopping Frequency	Mar 02, 2019	Tu Yanan	PASS	No deviation
4	N/A	Duty Cycle	Mar 02, 2019	Tu Yanan	PASS	No deviation
5	15.247(b)	Maximum Peak Conducted Output Power	Mar 02, 2019	Tu Yanan	PASS	No deviation
6	15.247(b)	Maximum Average Conducted Output Power	Mar 02, 2019	Tu Yanan	PASS	No deviation
7	15.247(a)	20dB Bandwidth	Mar 02, 2019	Tu Yanan	PASS	No deviation
8	15.247(a)	Carrier Frequency Separation	Mar 02, 2019	Tu Yanan	PASS	No deviation
9	15.247(a)	Time of Occupancy (Dwell time)	Mar 02, 2019	Tu Yanan	PASS	No deviation
10	15.247(d)	Conducted Spurious Emission	Dec 27, 2019	Tu Yanan	PASS	No deviation
11	15.207	Conducted Emission	N/A	N/A	N/A	N/A ^{Note1}
12	15.247(d)	Restricted Frequency Bands	Dec 24, 2019	Yang Jie	PASS	No deviation



13	15.209, 15.247(d)	Radiated Emission	Dec 18, 2019	Yang Jie	PASS	No deviation
Note 1: Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Note 2: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013 and KDB558074 D01 v05r02. Note 3: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The Ref offset 1.5dB means the cable loss is 1.5dB. Note 4: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.						

1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15-35
Relative Humidity (%):	30-60
Atmospheric Pressure (kPa):	86-106

2.47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Hopping Mechanism

2.2.1. Requirement

According to FCC §15.247(a)(1), a frequency hopping spread spectrum 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.

According to FCC §15.247(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.

2.2.2. Result: Compliant

The hopping mechanism of the EUT is in compliance with the document "**Bluetooth core specification v5.1**".

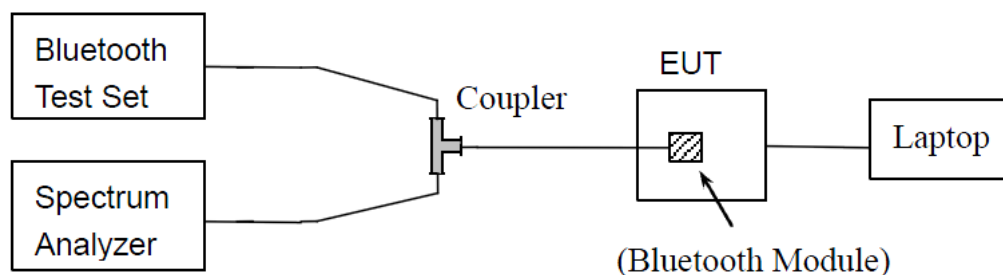
2.3. Number of Hopping Frequency

2.3.1. Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

2.3.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.3.3. Test Procedure

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

Span = the frequency band of operation

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize



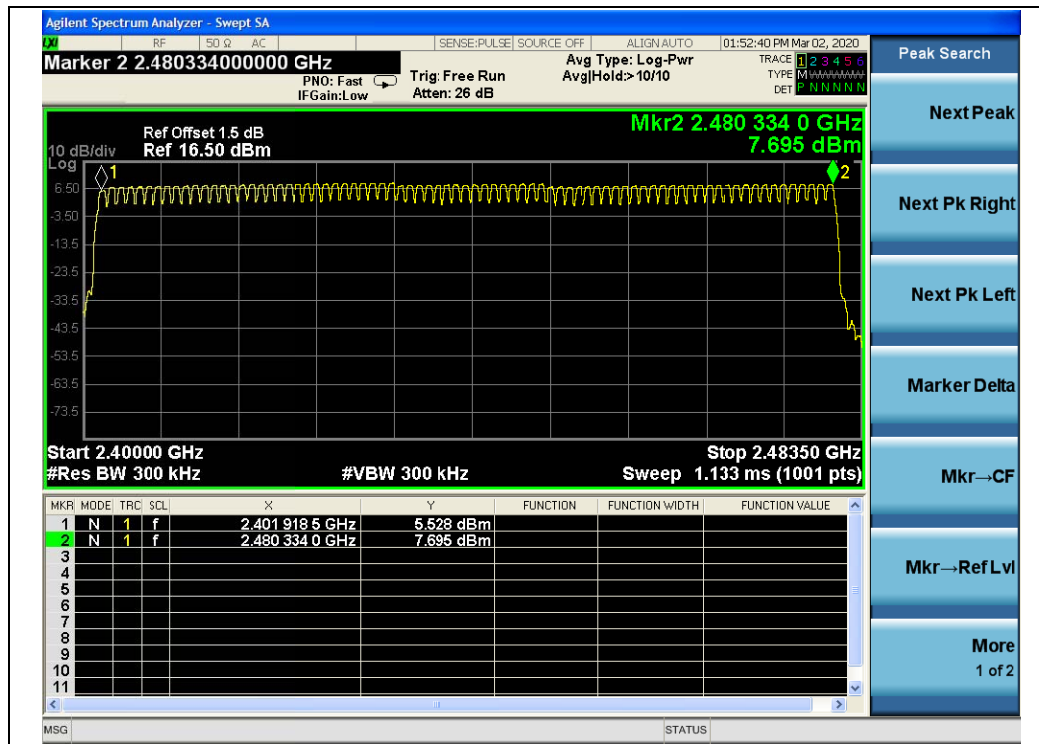
2.3.4. Test Result

The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

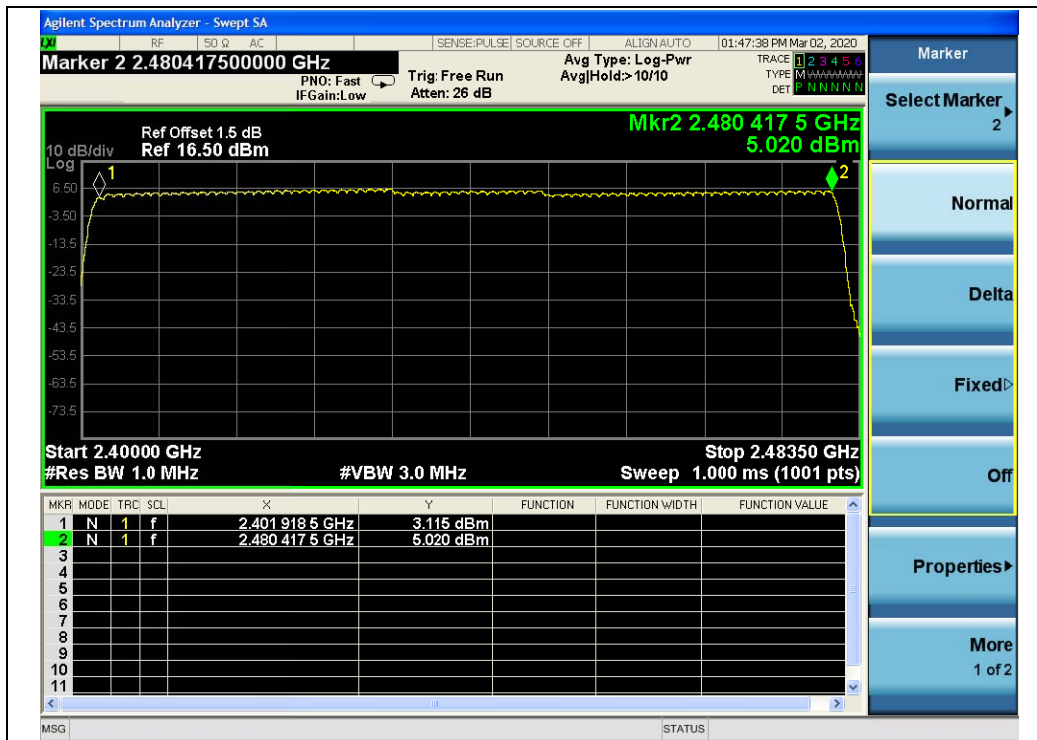
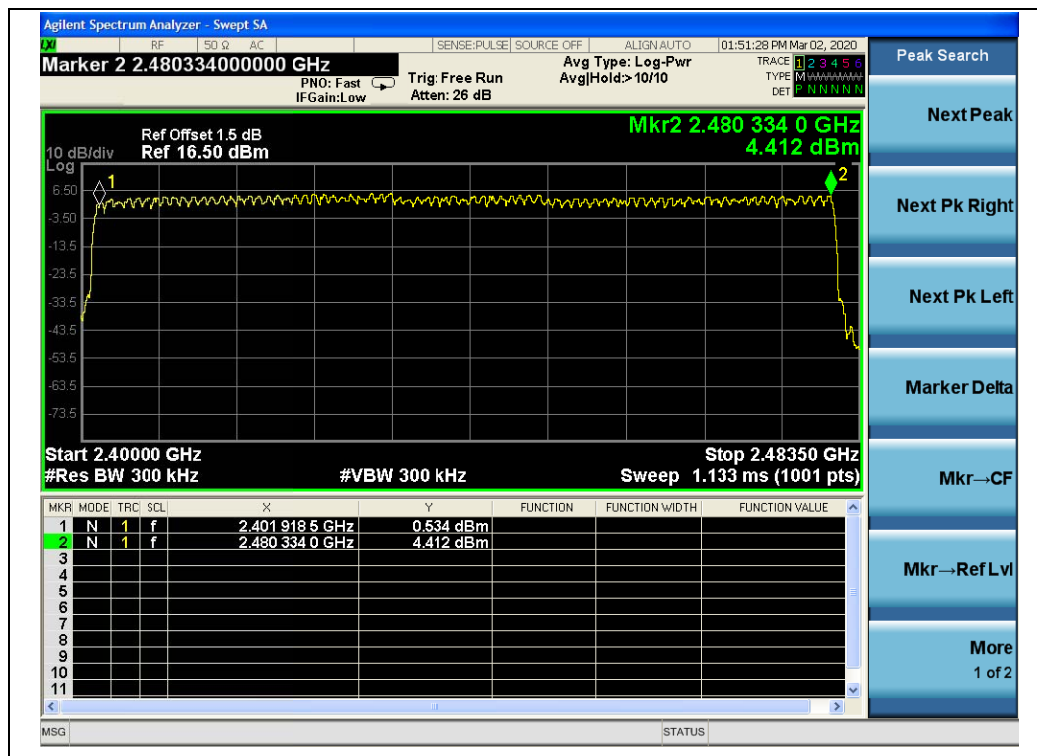
A. Test Verdict:

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	PASS
$\pi/4$ -DQPSK	2400 - 2483.5	79	15	PASS
8-DPSK	2400 - 2483.5	79	15	PASS

B. Test Plots:



(GFSK)

 $(\pi/4\text{-DQPSK})$  (8-DPSK)

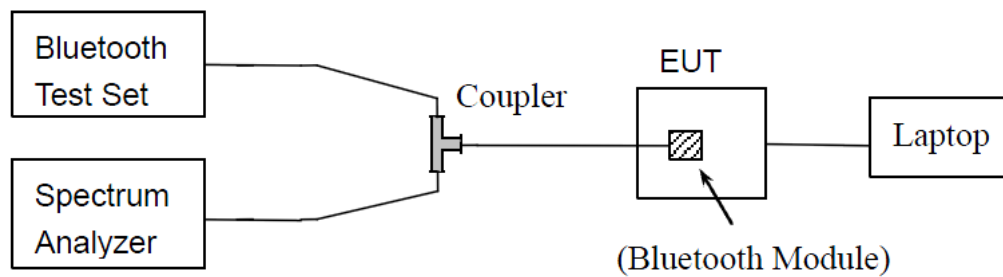
2.4. Maximum Peak Conducted Output Power

2.4.1. Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

2.4.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.



2.4.3. Test Result

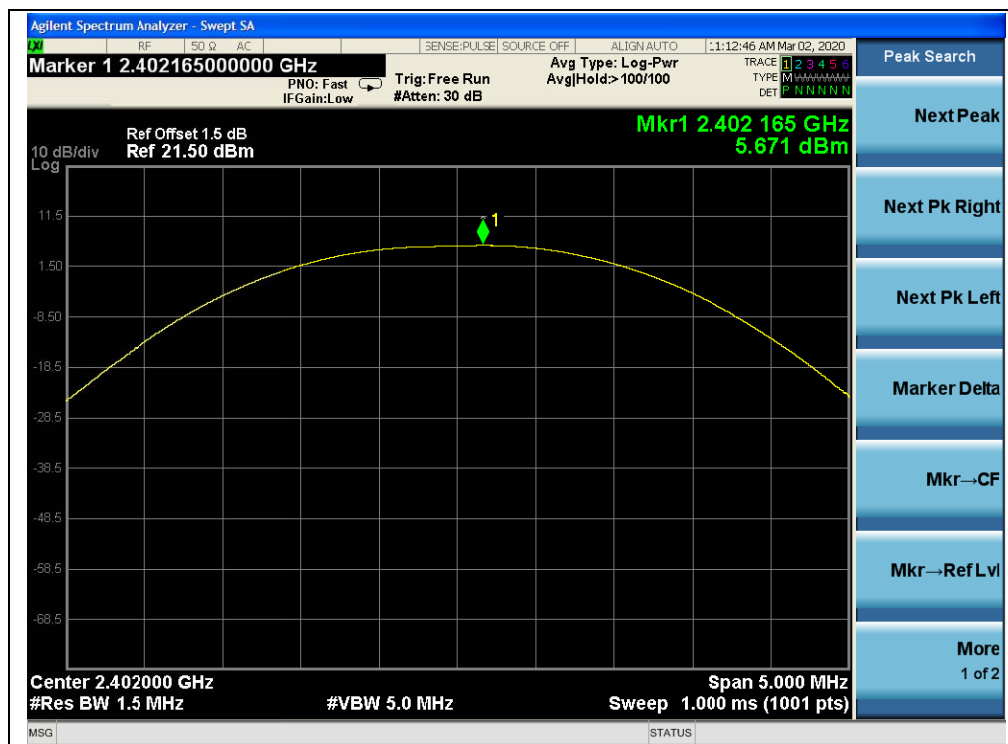
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the module.

GFSK Mode

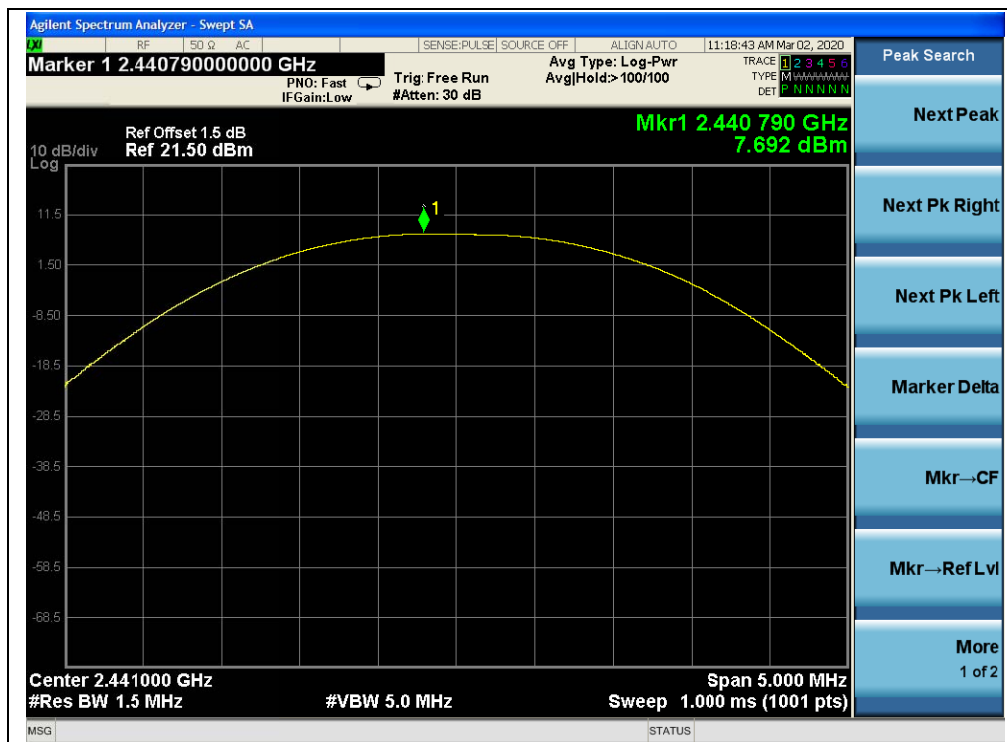
A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	5.67	0.004	20.96	0.125	PASS
39	2441	7.69	0.006			PASS
78	2480	7.94	0.006			PASS

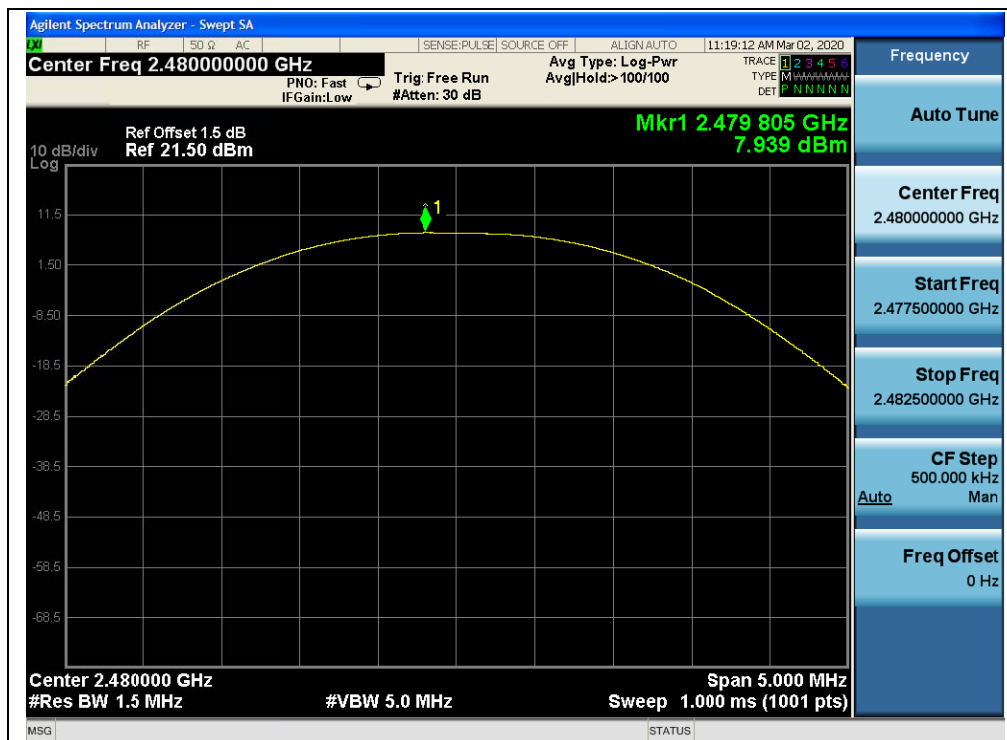
B. Test Plots:



(GFSK, Channel 0, 2402MHz)



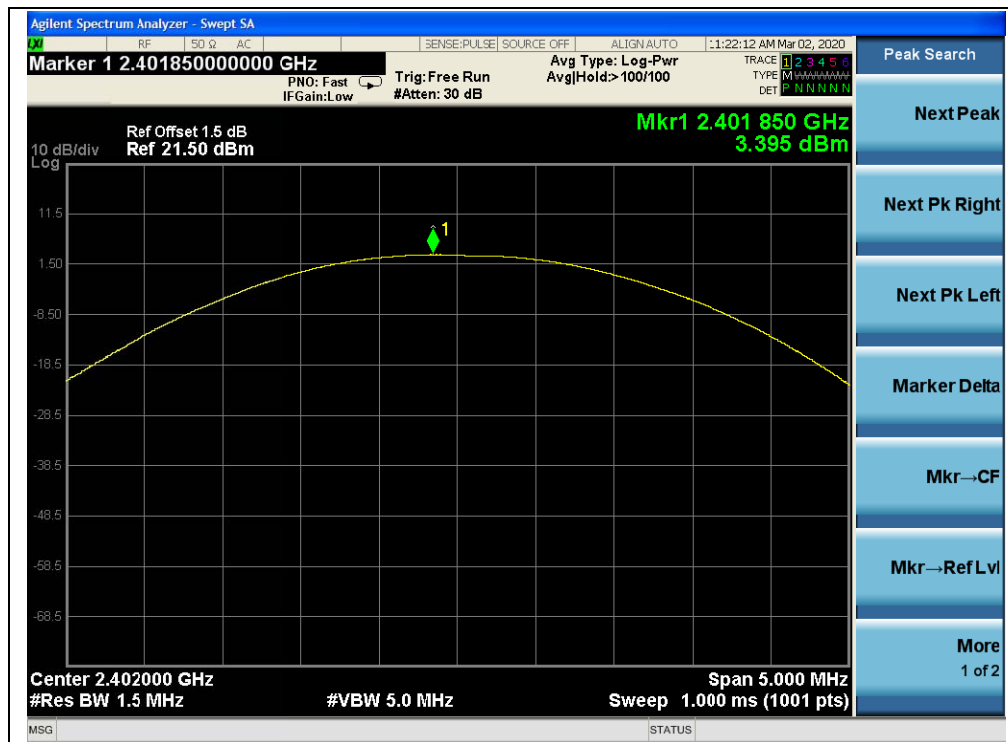
(GFSK, Channel 39, 2441MHz)



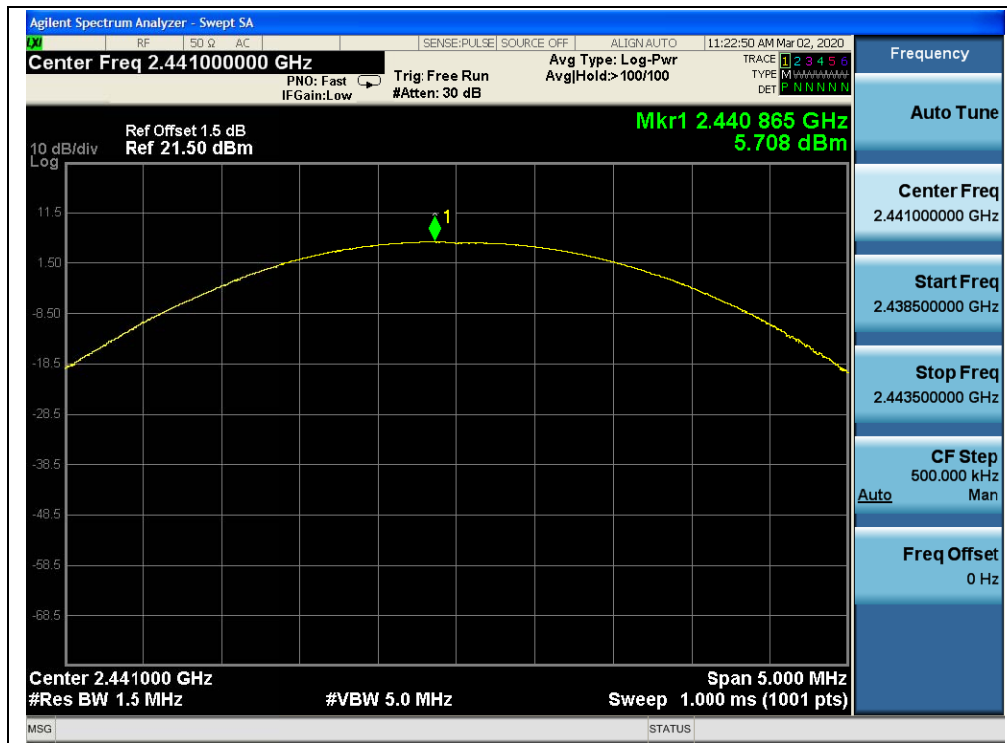
(GFSK, Channel 78, 2480MHz)

 **$\pi/4$ -DQPSK Mode****A. Test Verdict:**

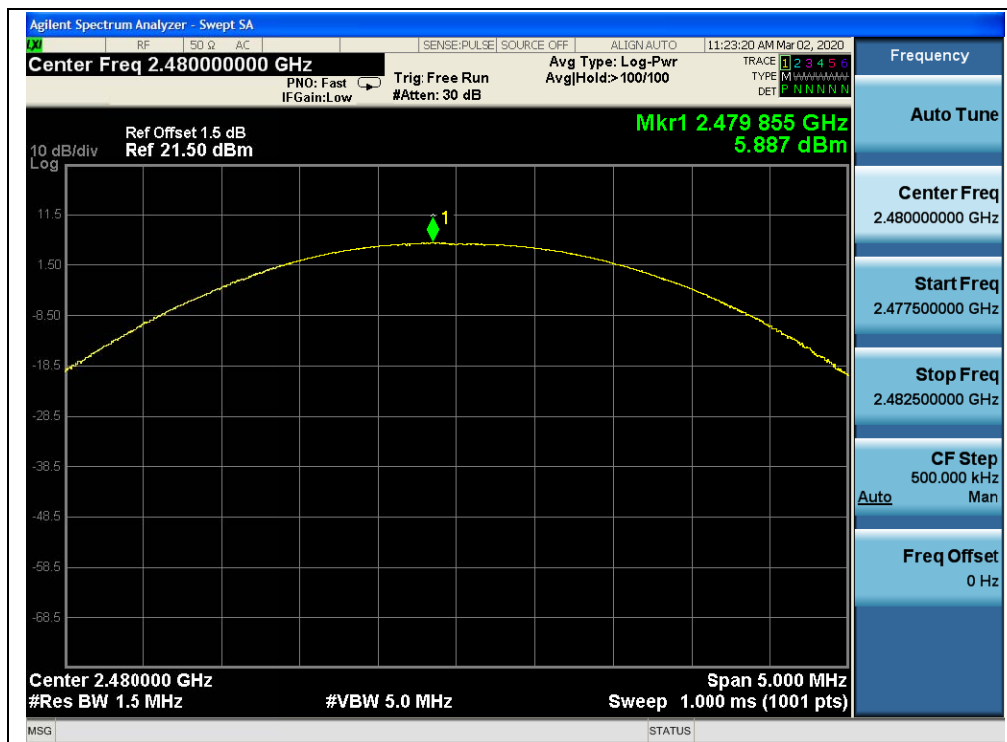
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	3.40	0.002	20.96	0.125	PASS
39	2441	5.71	0.004			PASS
78	2480	5.89	0.004			PASS

B. Test Plots:

(π/4-DQPSK, Channel 0, 2402MHz)



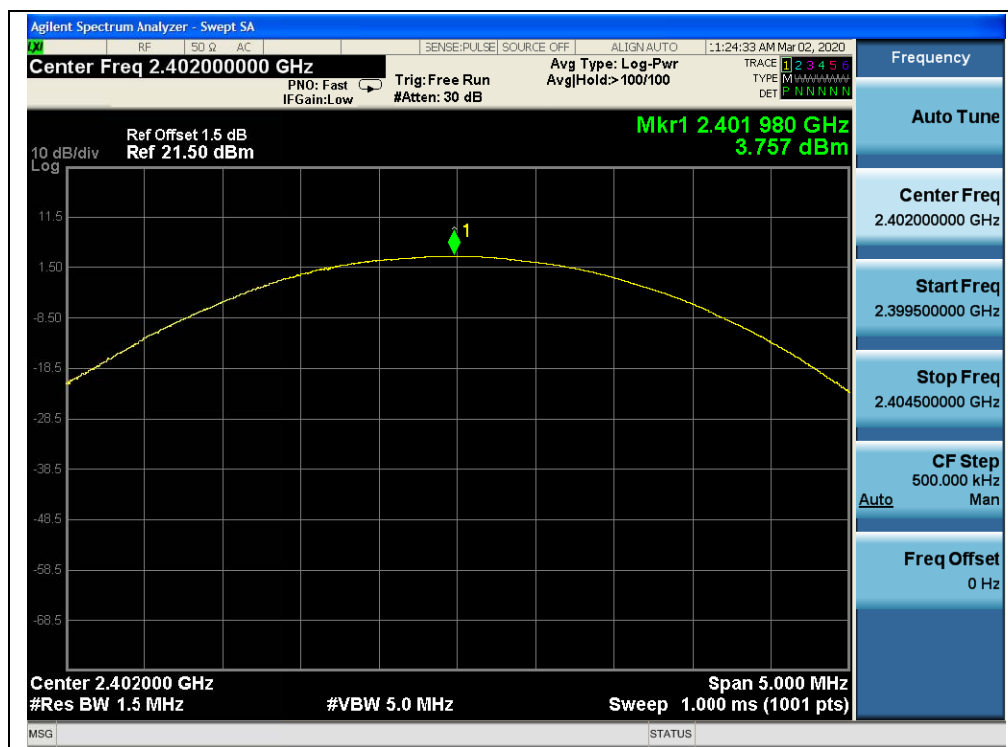
(π/4-DQPSK, Channel 39, 2441MHz)



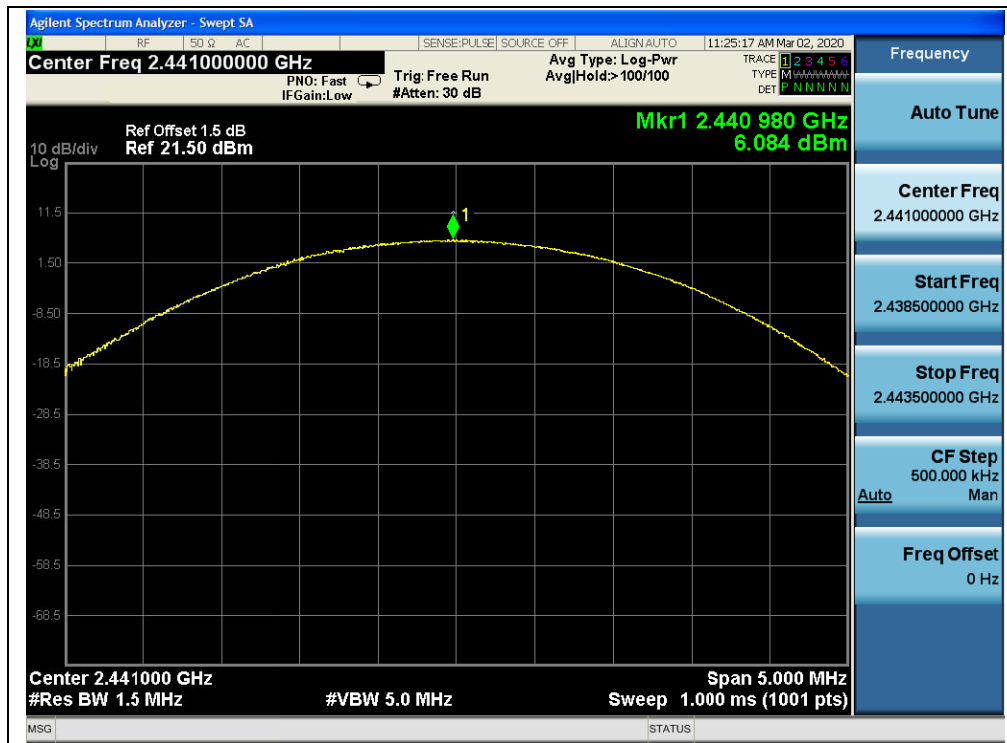
(π/4-DQPSK, Channel 78, 2480MHz)

**8-DPSK Mode****A. Test Verdict:**

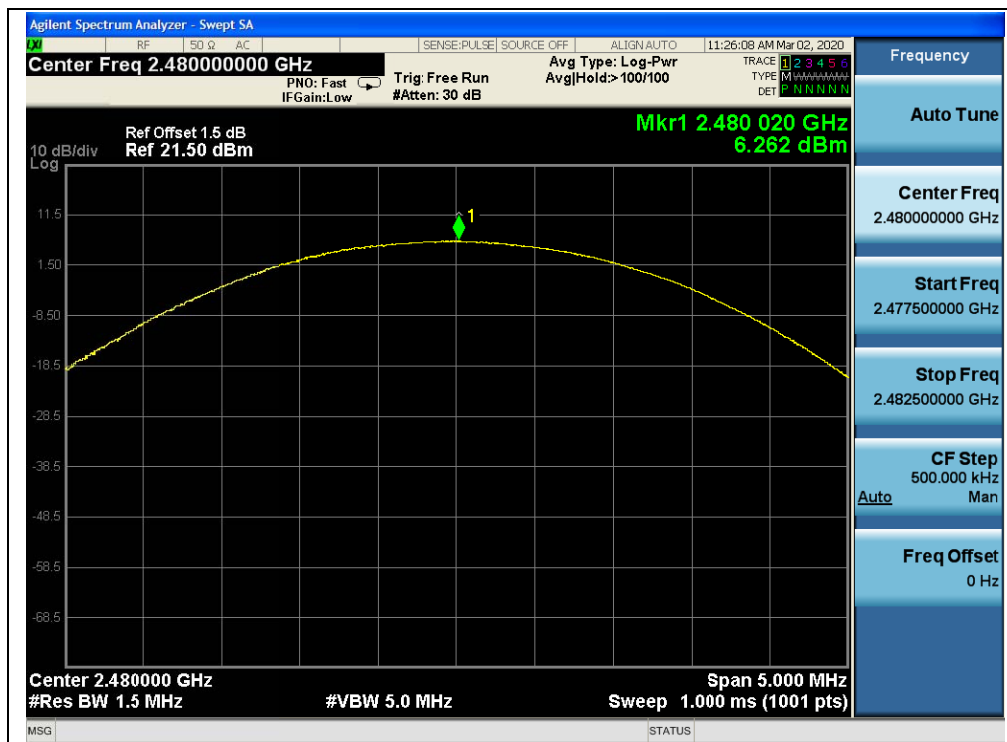
Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	3.76	0.002	20.96	0.125	PASS
39	2441	6.08	0.004			PASS
78	2480	6.26	0.004			PASS

B. Test Plots:

(8-DPSK, Channel 0, 2402MHz)



(8-DPSK, Channel 39, 2441MHz)



(8-DPSK, Channel 78, 2480MHz)

2.5. Maximum Average Conducted Output Power

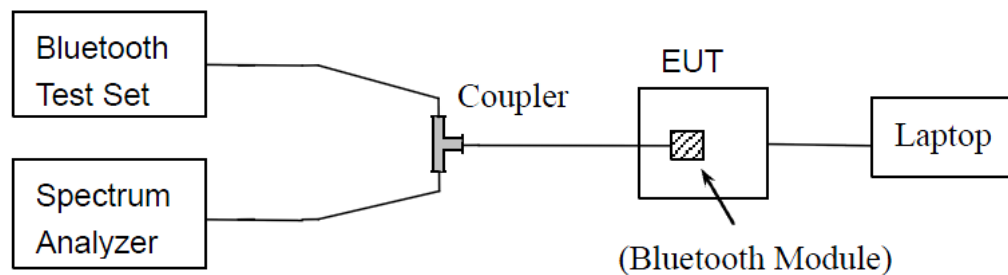
2.5.1. Requirement

According to FCC section 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: The maximum average conducted output power of the intentional radiator shall not exceed 1 Watt.

2.5.2. Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.5.3. Test procedure

KDB 558074 Section 8.3.2 was used in order to prove compliance.



2.5.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the module.

GFSK Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
				dBm		dBm	W	
0	2402	4.37	1.10	5.47	0.004	20.96	0.125	PASS
39	2441	6.53		7.63	0.006			PASS
78	2480	6.73		7.83	0.006			PASS

$\pi/4$ -DQPSK Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
				dBm		dBm	W	
0	2402	-0.27	1.10	0.83	0.001	20.96	0.125	PASS
39	2441	2.02		3.12	0.002			PASS
78	2480	2.12		3.22	0.002			PASS

8-DPSK Mode

Channel	Frequency (MHz)	Average Power				Limit		Verdict
		Measured	Duty Factor	Duty factor Calculated				
				dBm		dBm	W	
0	2402	-0.42	1.12	0.70	0.001	20.96	0.125	PASS
39	2441	2.07		3.19	0.002			PASS
78	2480	2.25		3.37	0.002			PASS

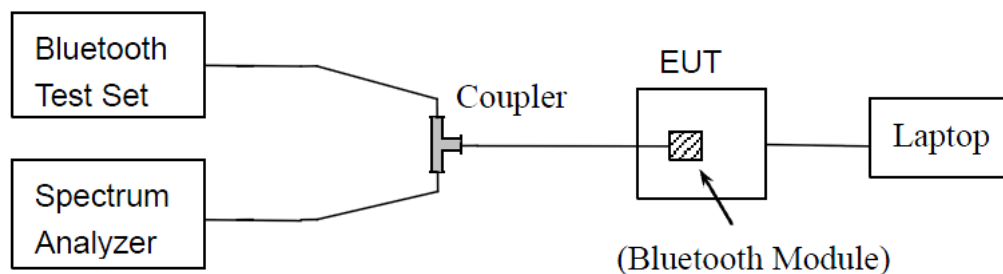
2.6.20dB Bandwidth

2.6.1. Definition

According to FCC §15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) taking the total RF output power.

2.6.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.6.3. Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW $\geq$ 1% of the 20 dB bandwidth

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold



2.6.4. Test Result

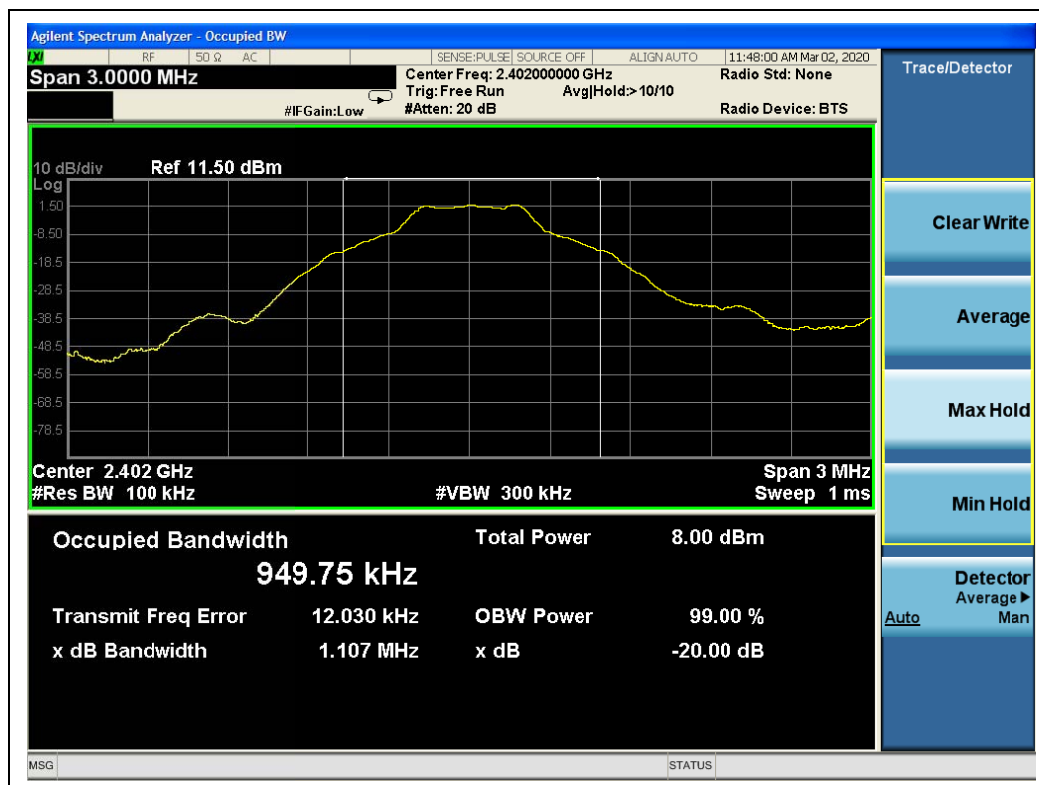
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

GFSK Mode

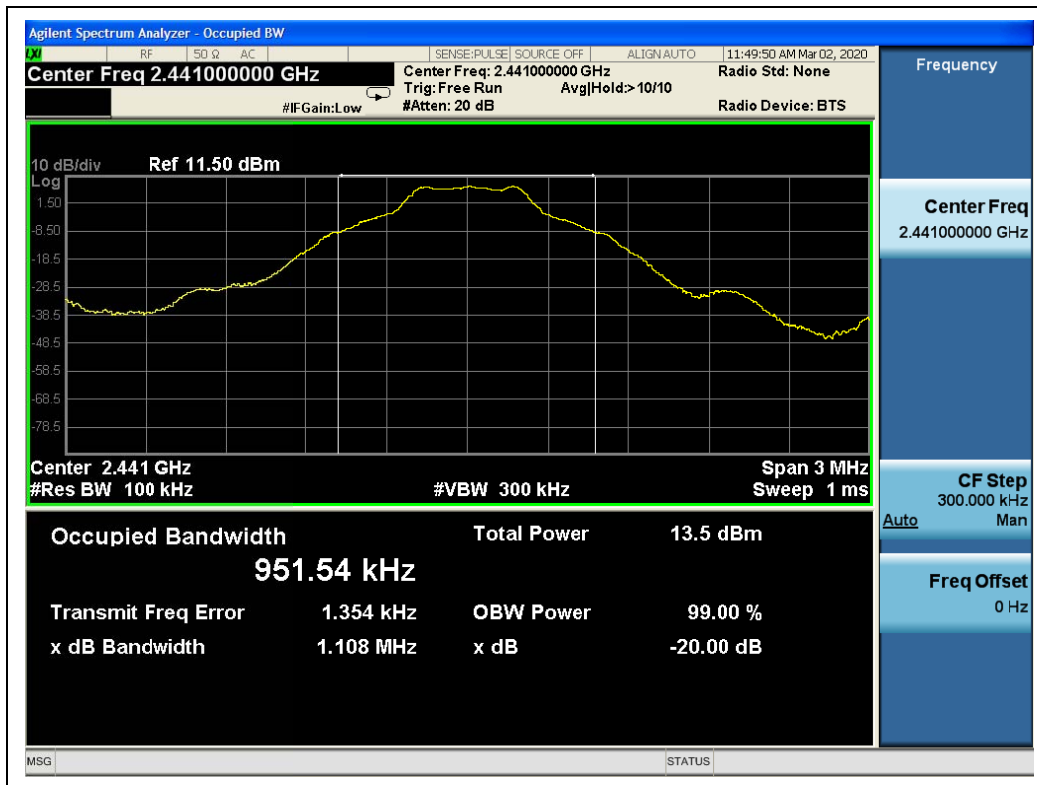
A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.107	PASS
39	2441	1.108	PASS
78	2480	1.108	PASS

B. Test Plots:



(GFSK, Channel 0, 2402MHz)



(GFSK, Channel 39, 2441MHz)



(GFSK, Channel 78, 2480MHz)

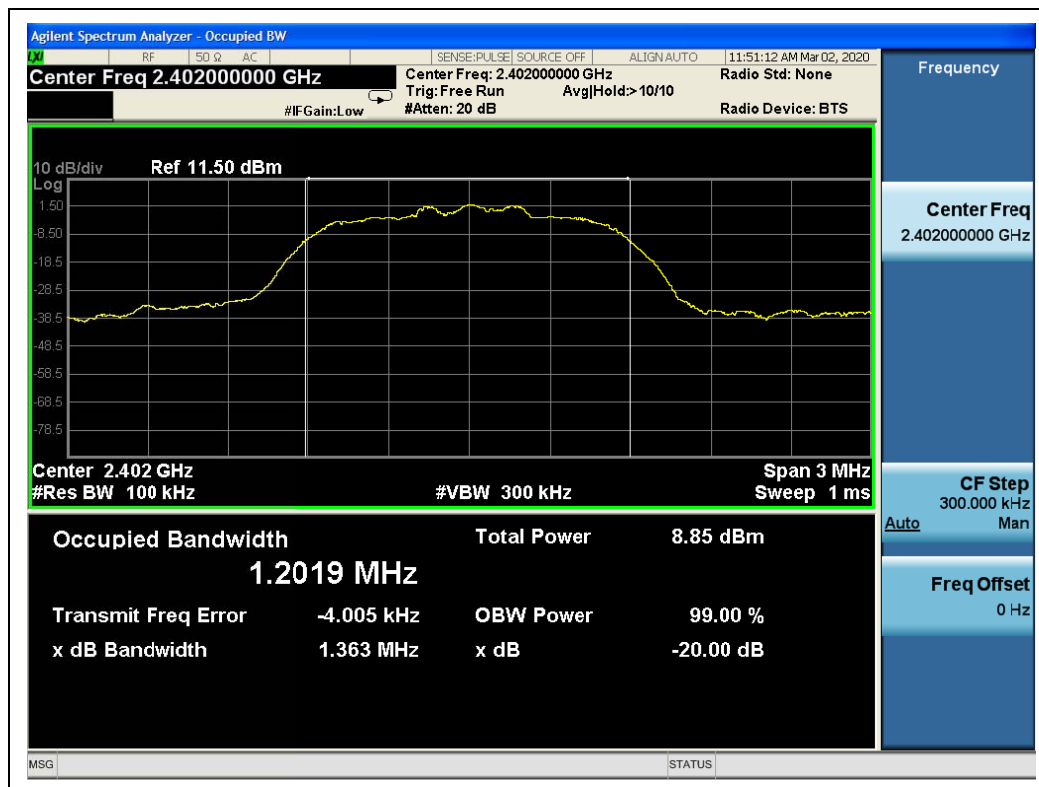


$\pi/4$ -DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.363	PASS
39	2441	1.360	PASS
78	2480	1.361	PASS

B. Test Plots:



($\pi/4$ -DQPSK, Channel 0, 2402MHz)



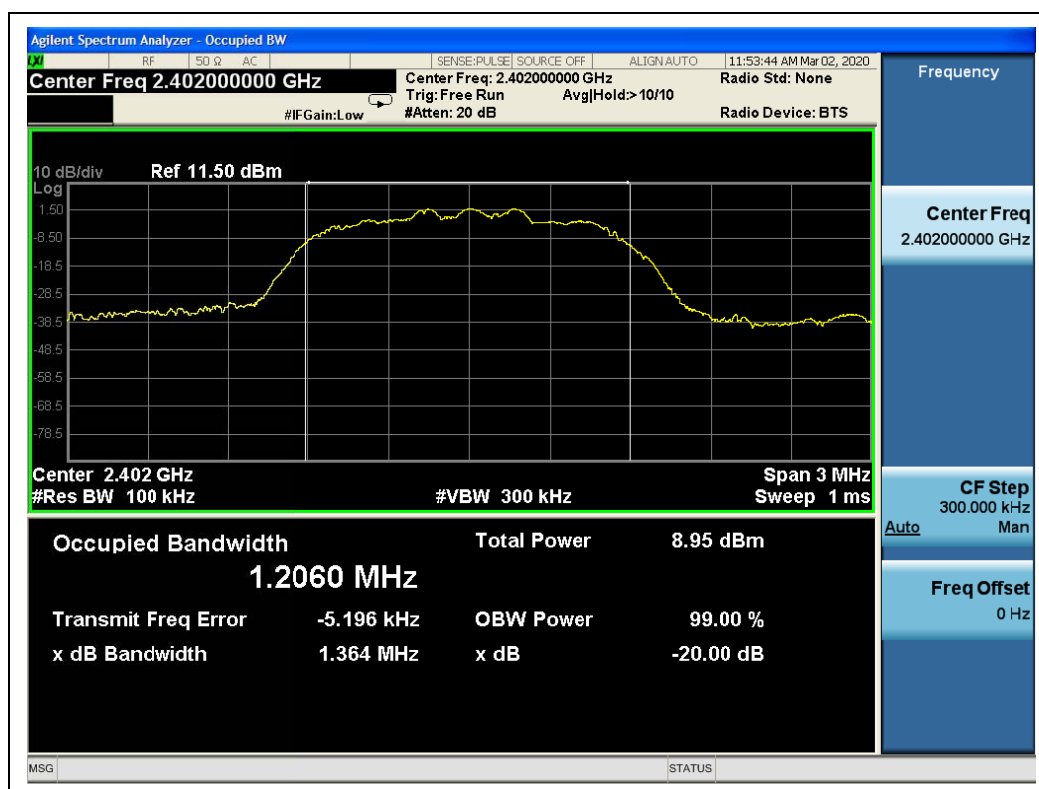
(π/4-DQPSK, Channel 39, 2441MHz)



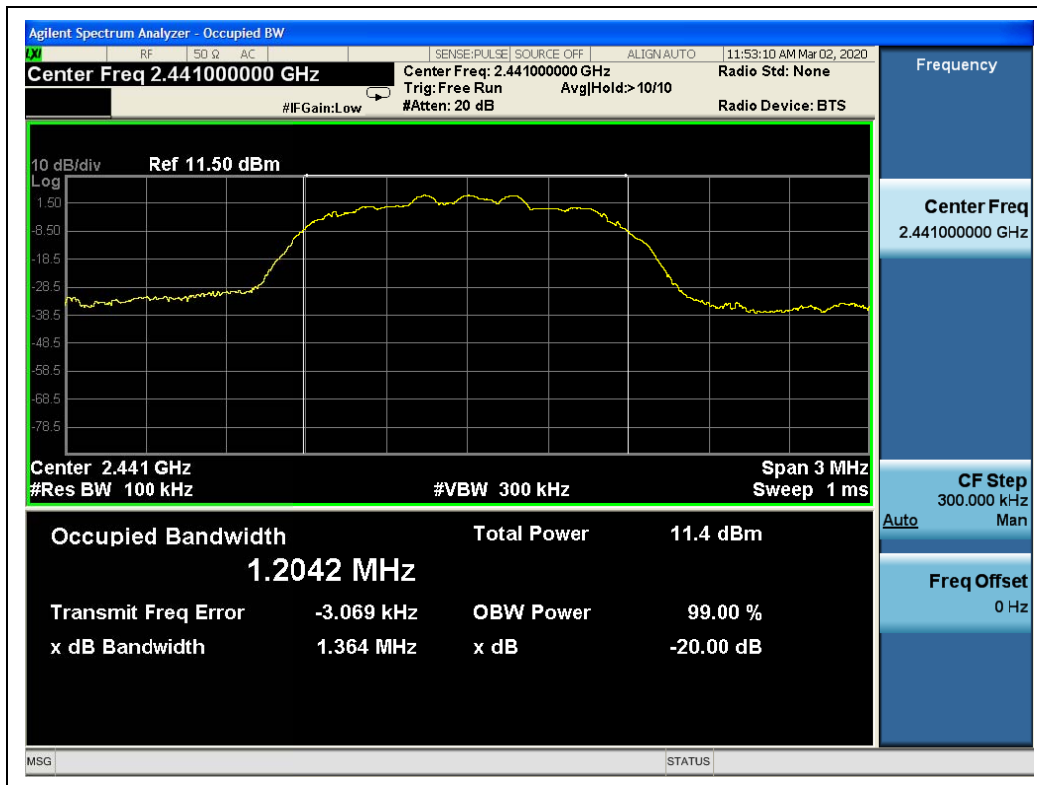
(π/4-DQPSK, Channel 78, 2480MHz)

**8-DPSK Mode****A. Test Verdict:**

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.364	PASS
39	2441	1.364	PASS
78	2480	1.375	PASS

B. Test Plots:

(8-DPSK, Channel 0, 2402MHz)



(8-DPSK, Channel 39, 2441MHz)



(8-DPSK, Channel 78, 2480MHz)

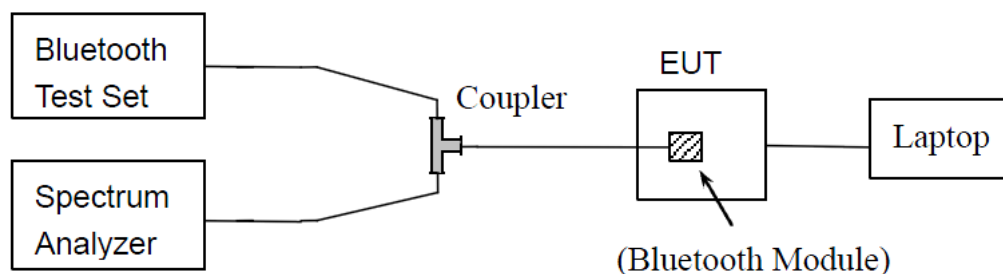
2.7. Carried Frequency Separation

2.7.1. Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

2.7.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.7.3. Test Procedure

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

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) $\geq$ RBW

Sweep = auto

Detector function = peak

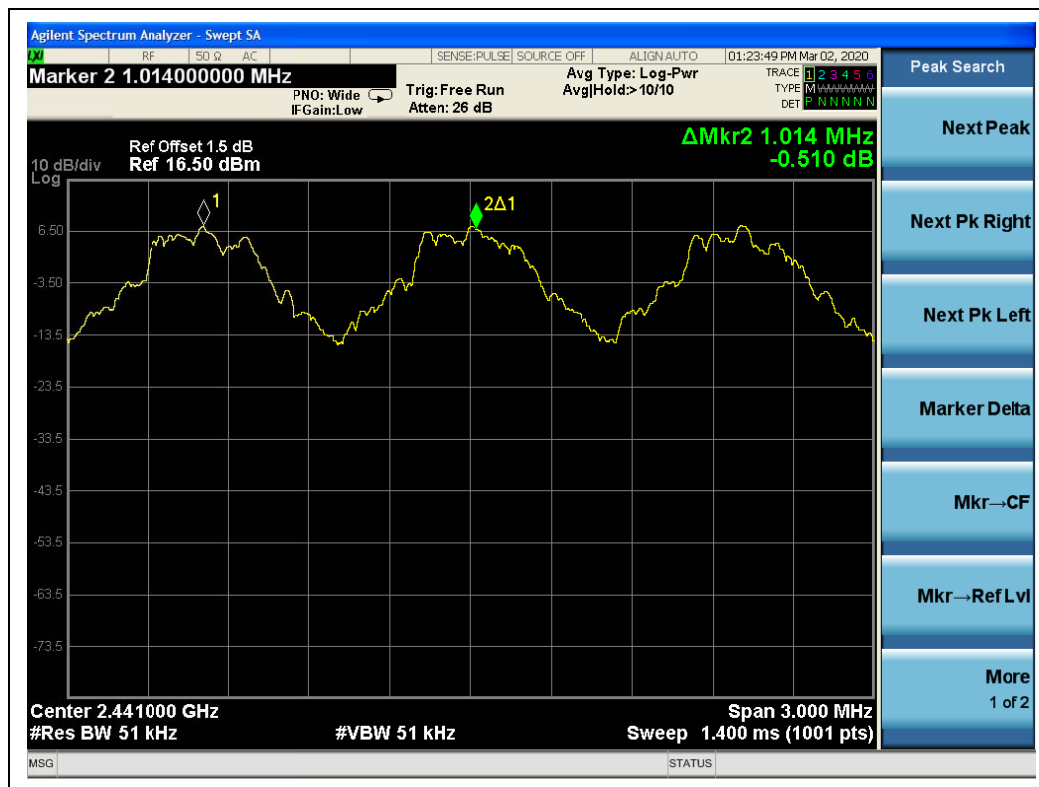
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

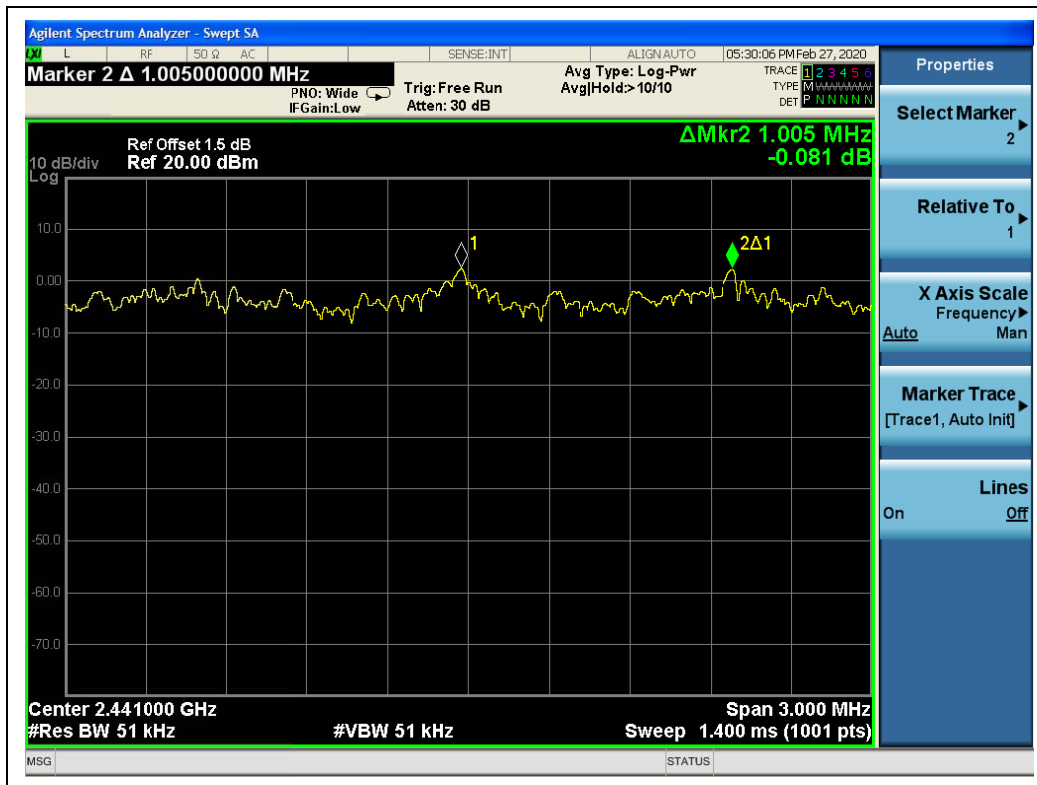
2.7.4. Test Result

The Bluetooth Module operates at hopping-on test mode. For any adjacent channels (e.g. the channel 39 and 40 as showed below), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section 2.4.4), whichever is greater. So, the verdict is PASSING.

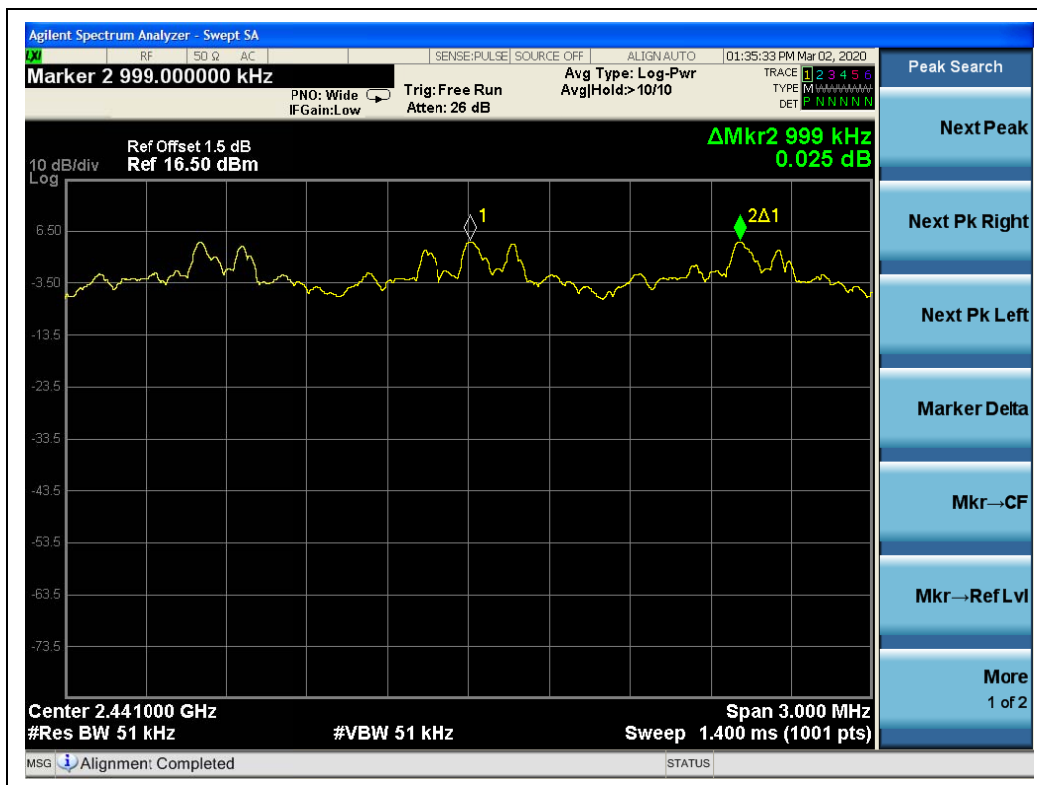
Test Mode	Measured Channel Numbers	Carried Frequency Separation	20dB bandwidth (MHz)	Min. Limit	Verdict
GFSK	39 and 40	1.014	1.108	two-thirds of the 20dB bandwidth	PASS
$\pi/4$ -DQPSK	39 and 40	1.005	1.363		PASS
8-DPSK	39 and 40	0.999	1.375		PASS



(GFSK)



($\pi/4$ -DQPSK)



(8-DPSK)

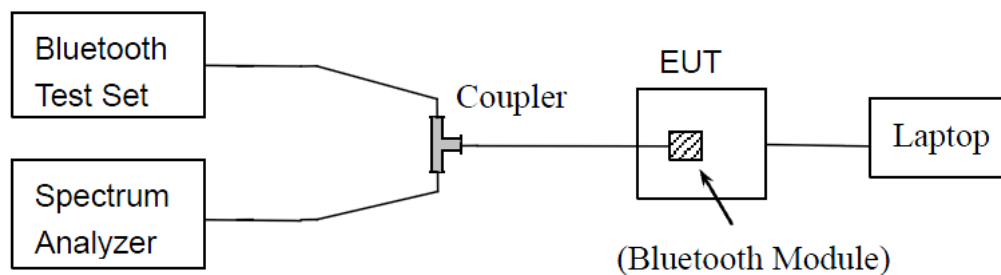
2.8. Time of Occupancy (Dwell time)

2.8.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

2.8.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.8.3. Test Procedure

Option 1:

DH1: Dwell time equal to Pulse time (ms) * (1600 / 2 / 79) * 31.6 Millisecond
DH3: Dwell time equal to Pulse time (ms) * (1600 / 4 / 79) * 31.6 Millisecond
DH5: Dwell time equal to Pulse Time (ms) * (1600 / 6 / 79) * 31.6 Millisecond

AFH Mode:

DH1: Dwell time equal to Pulse time (ms) * (800 / 2 / 20) * (0.4 * 20) Millisecond
DH3: Dwell time equal to Pulse time (ms) * (800 / 4 / 20) * (0.4 * 20) Millisecond
DH5: Dwell time equal to Pulse Time (ms) * (800 / 6 / 20) * (0.4 * 20) Millisecond



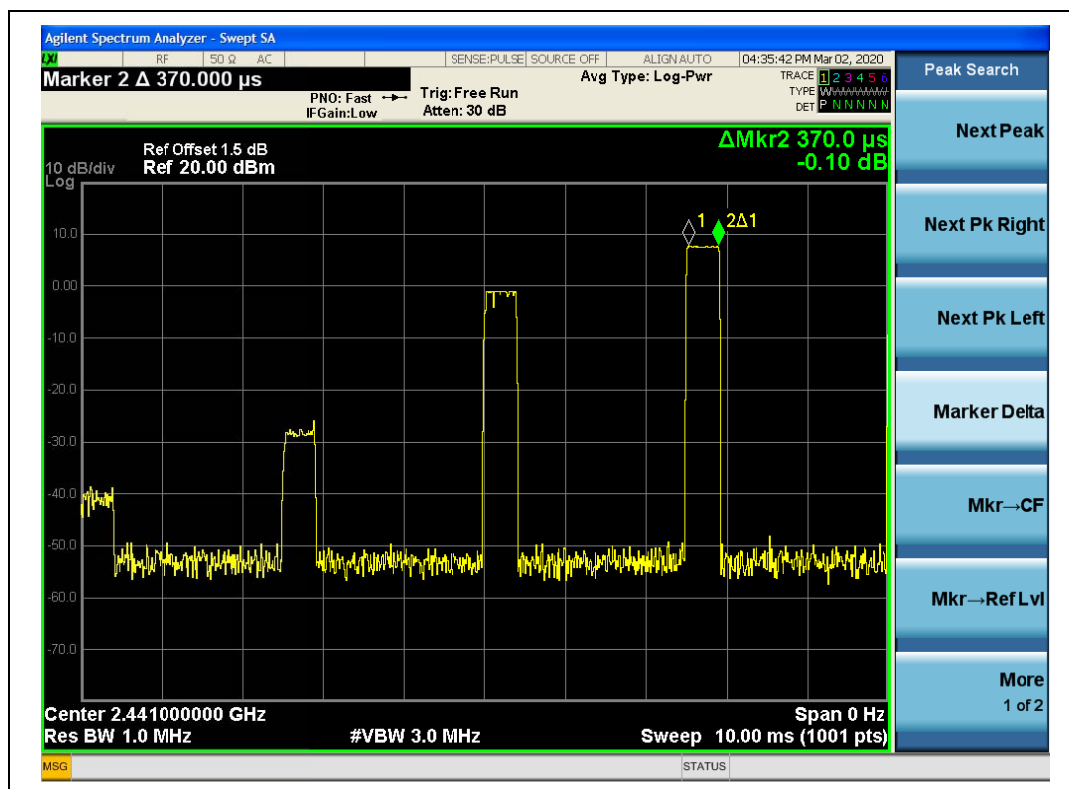
2.8.4. Test Result

GFSK Mode

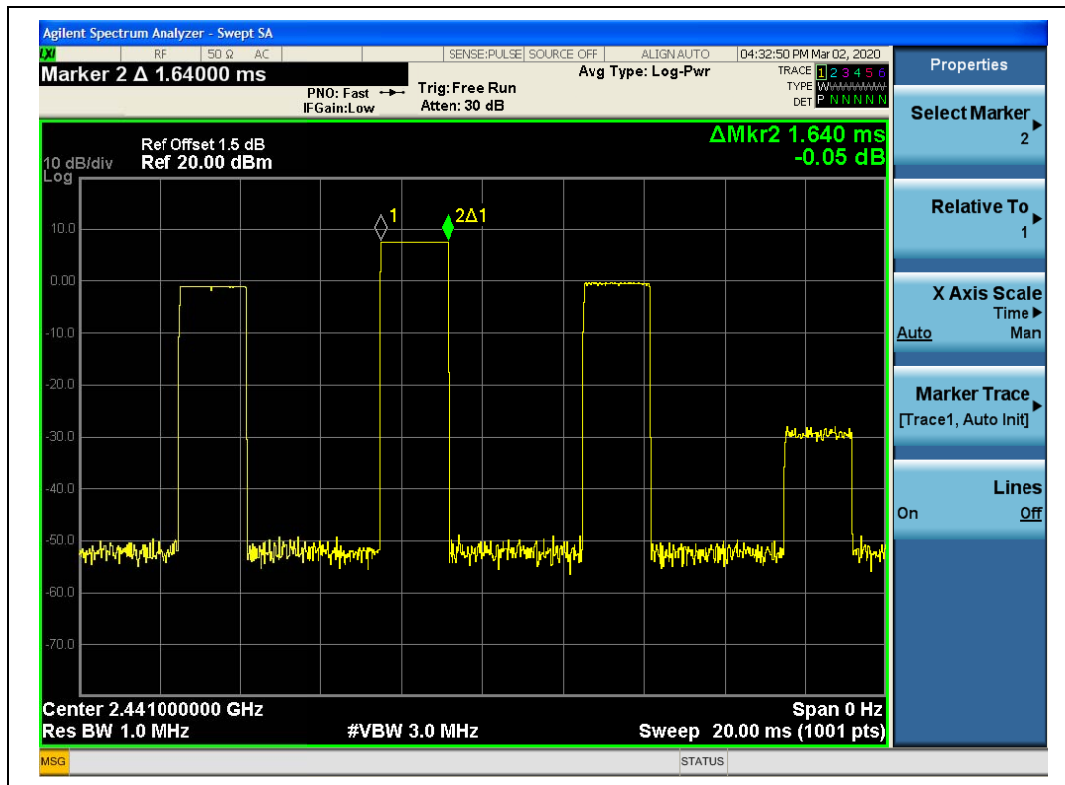
A. Test Verdict:

DH Packet	Pulse Width (ms)	Dwell Time (ms)		Limit (sec)	Verdict
		Normal Mode	AFH Mode		
DH1	0.370	118.40	59.20	0.4	PASS
DH3	1.640	262.40	131.20		PASS
DH5	2.860	305.07	152.53		PASS

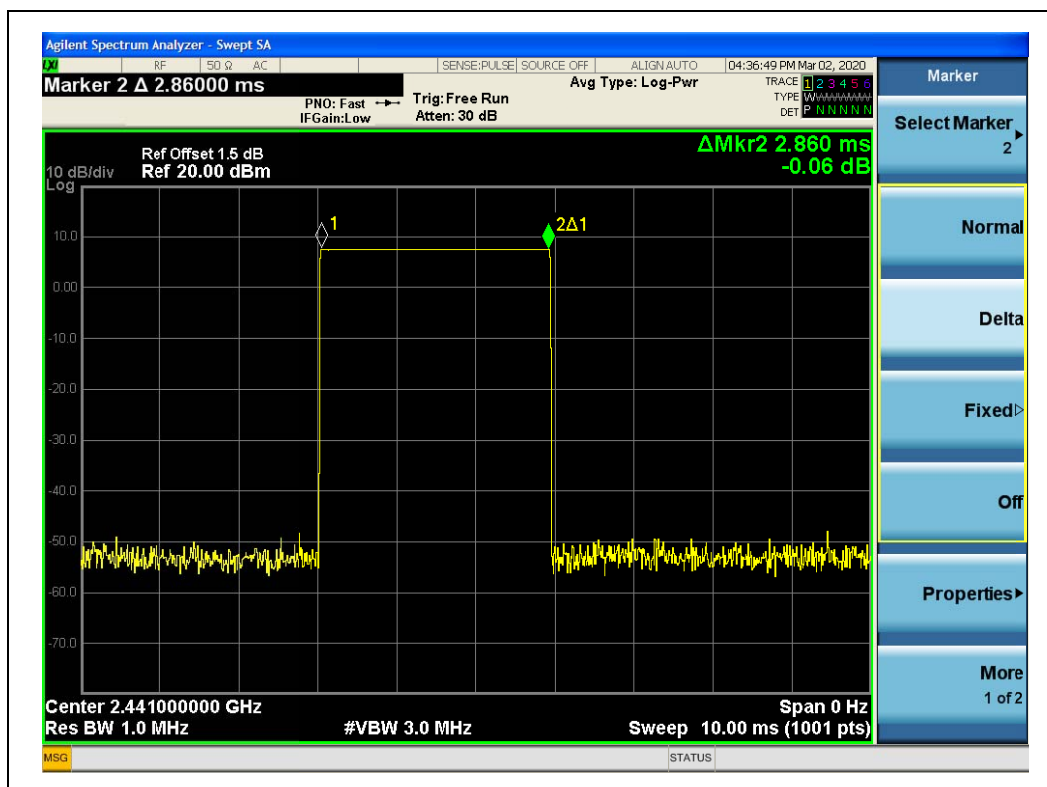
B. Test Plots:



(DH1, GFSK)



(DH3, GFSK)



(DH5, GFSK)

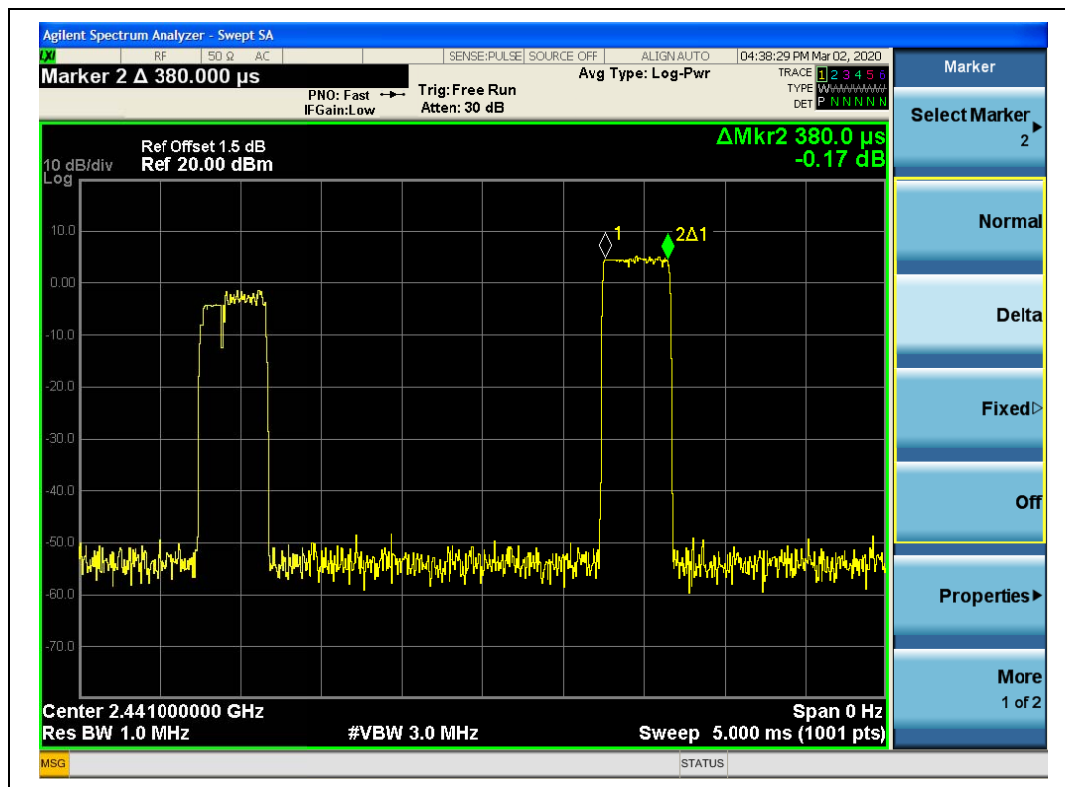


$\pi/4$ -DQPSK Mode

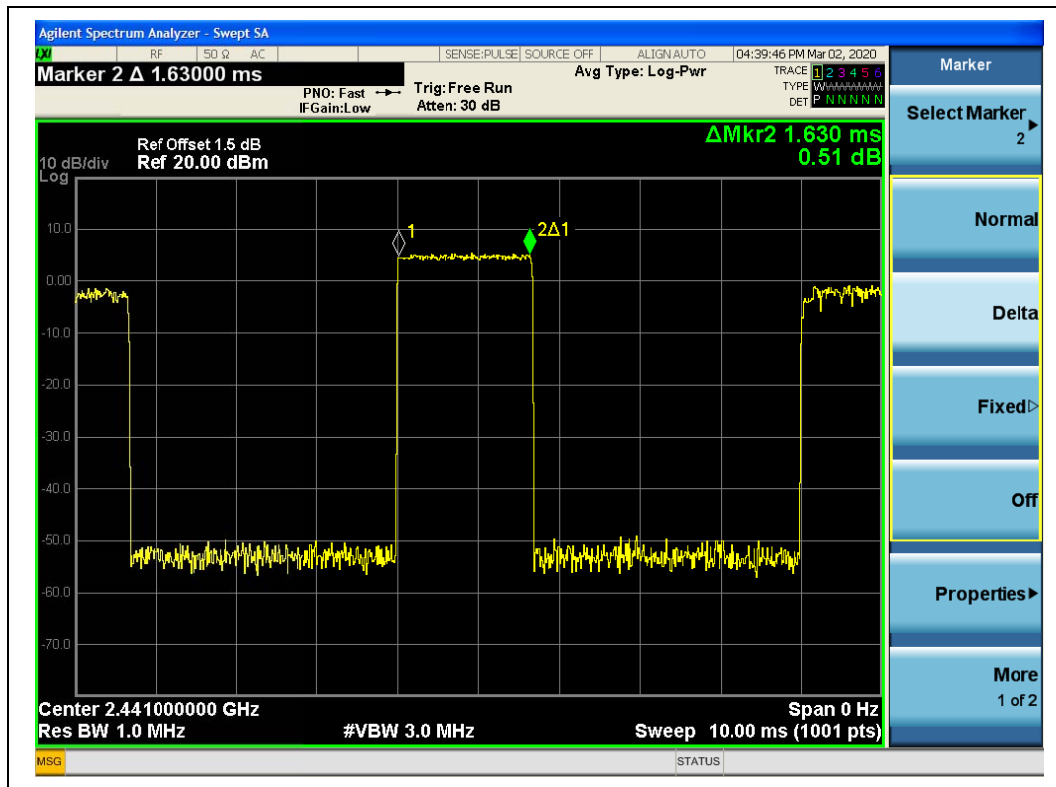
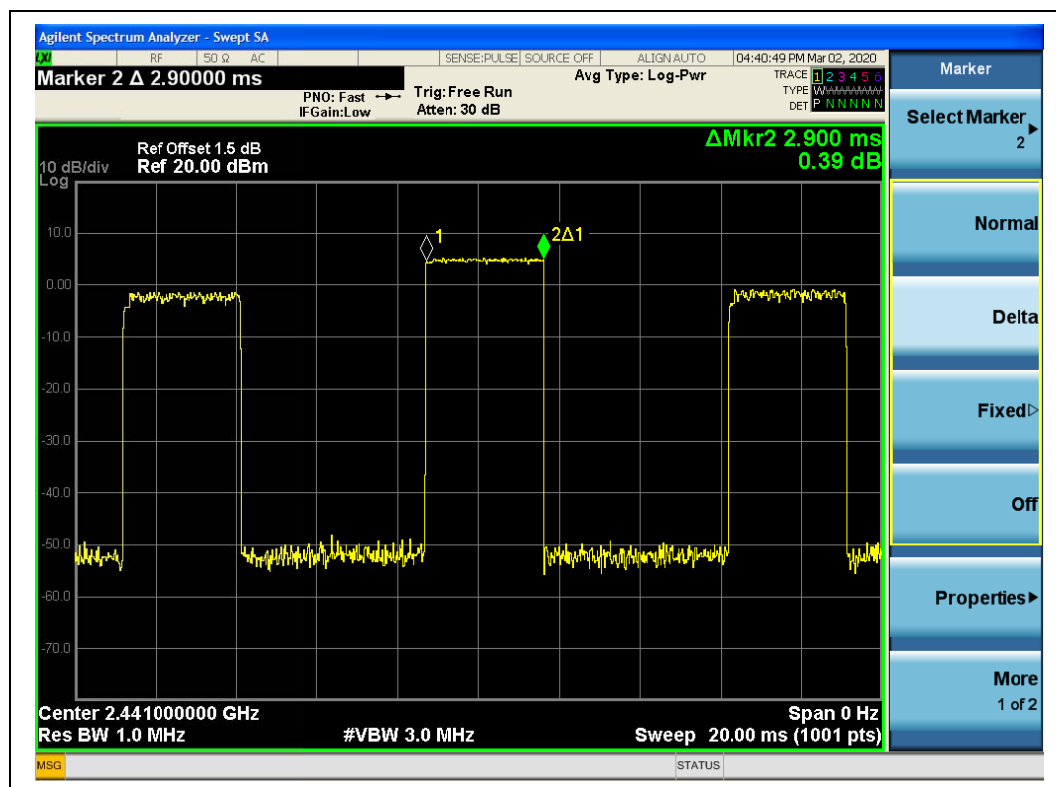
A. Test Verdict:

DH Packet	Pulse Width (ms)	Dwell Time (ms)		Limit (sec)	Verdict
		Normal Mode	AFH Mode		
DH1	0.380	121.60	60.80	0.4	PASS
DH3	1.630	260.80	130.40		PASS
DH5	2.900	309.33	154.67		PASS

B. Test Plots:



(DH1, $\pi/4$ -DQPSK)


(DH3, $\pi/4$ -DQPSK)

(DH5, $\pi/4$ -DQPSK)

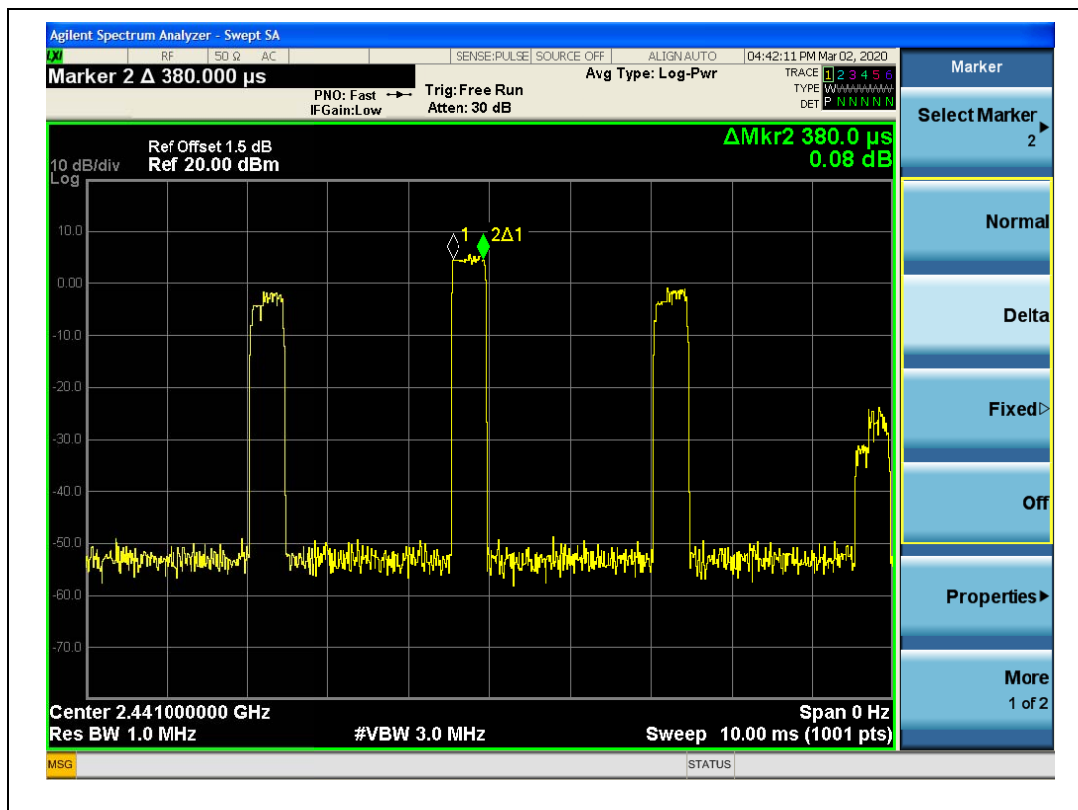


8-DPSK mode

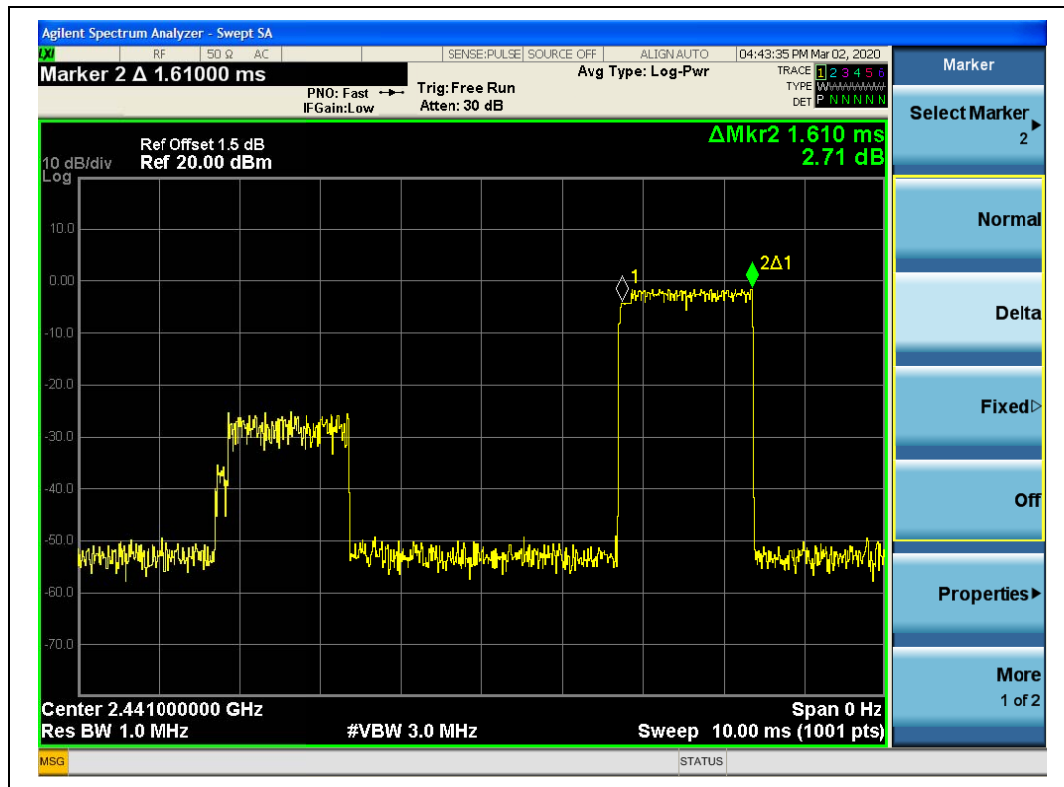
A. Test Verdict:

DH Packet	Pulse Width (ms)	Dwell Time (ms)		Limit (sec)	Verdict
		Normal Mode	AFH Mode		
DH1	0.380	121.60	60.80	0.4	PASS
DH3	1.610	257.60	128.80		PASS
DH5	2.880	307.20	153.60		PASS

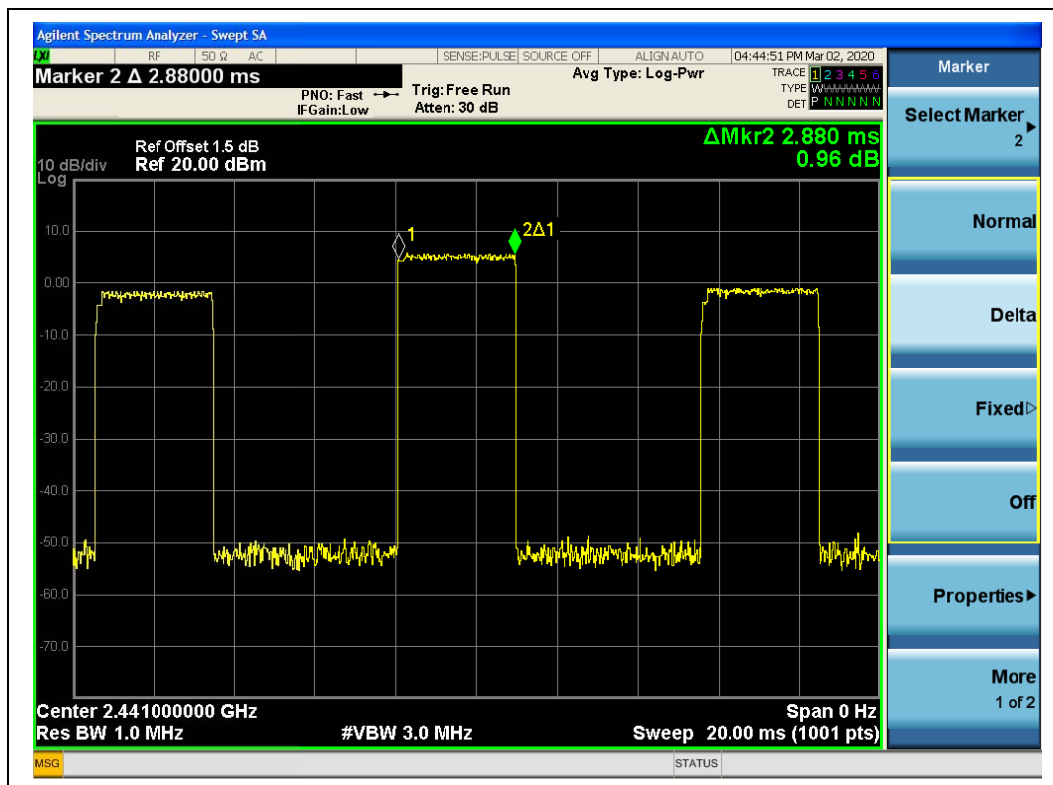
B. Test Plots:



(DH1, 8-DPSK)



(DH3, 8-DPSK)



(DH5, 8-DPSK)

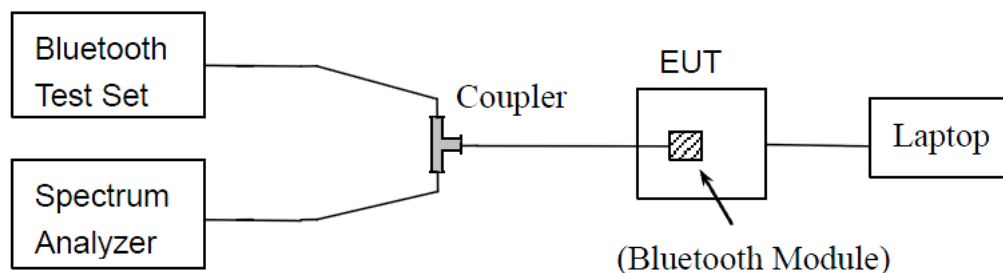
2.9. Conducted Spurious Emissions

2.9.1. Requirement

According to FCC §15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

2.9.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

2.9.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.



2.9.4. Test Result

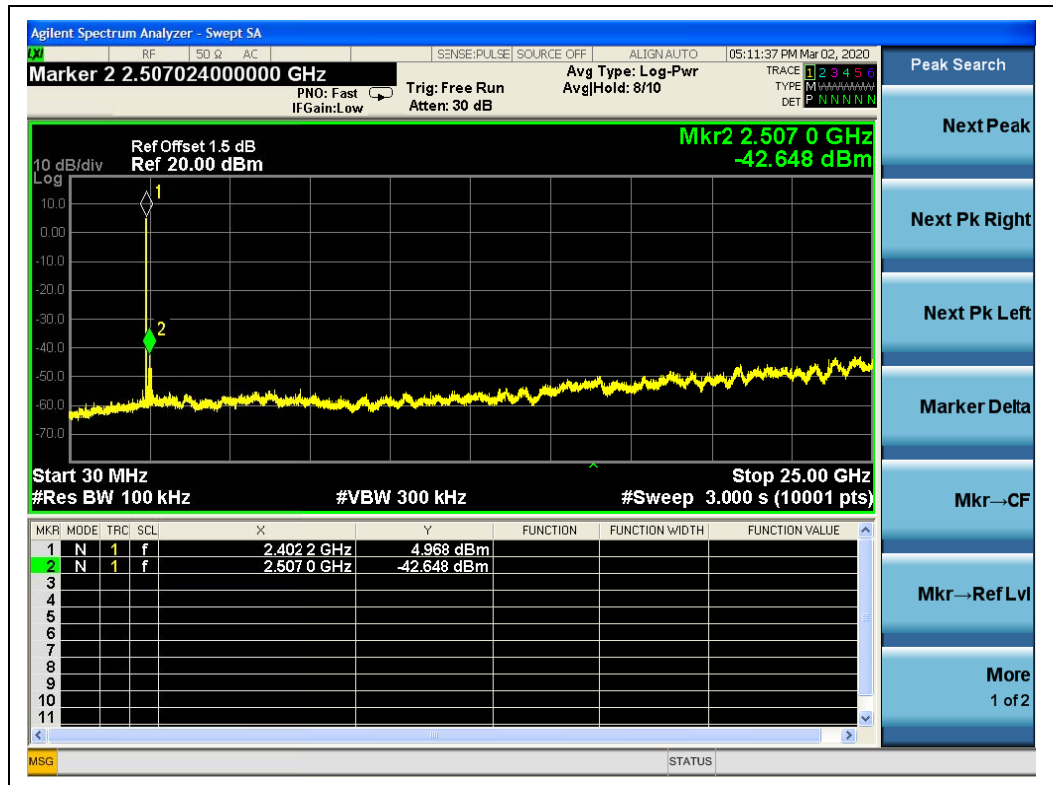
The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

GFSK Mode

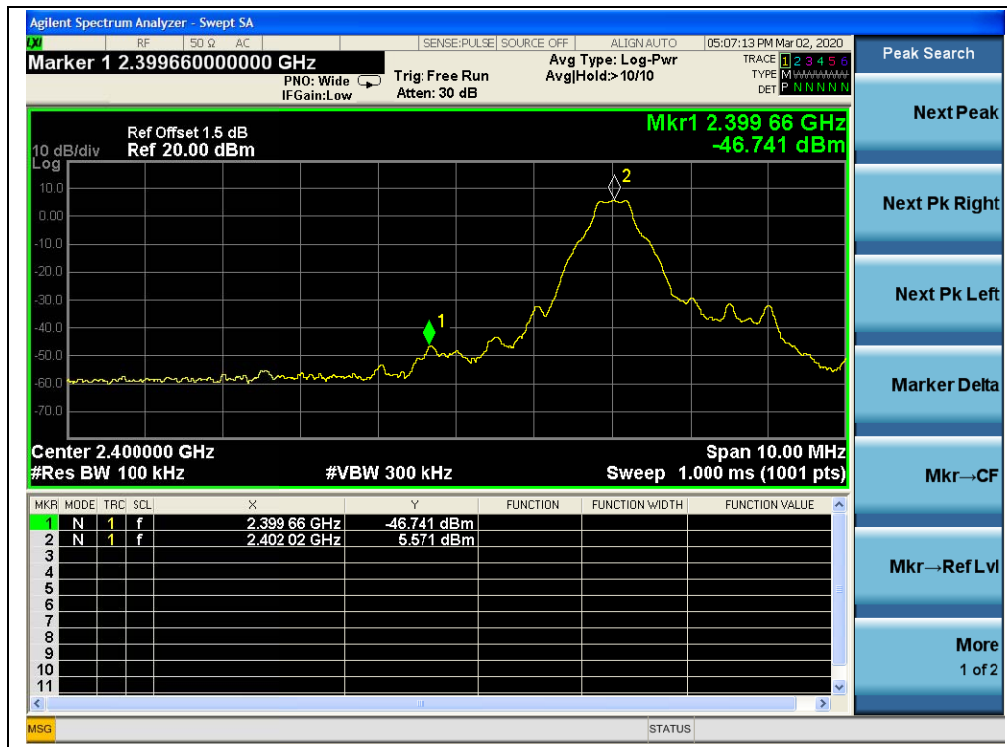
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
0	2402	-42.65	4.97	-15.03	PASS
39	2441	-43.28	5.10	-14.90	PASS
78	2480	-43.45	7.10	-12.90	PASS

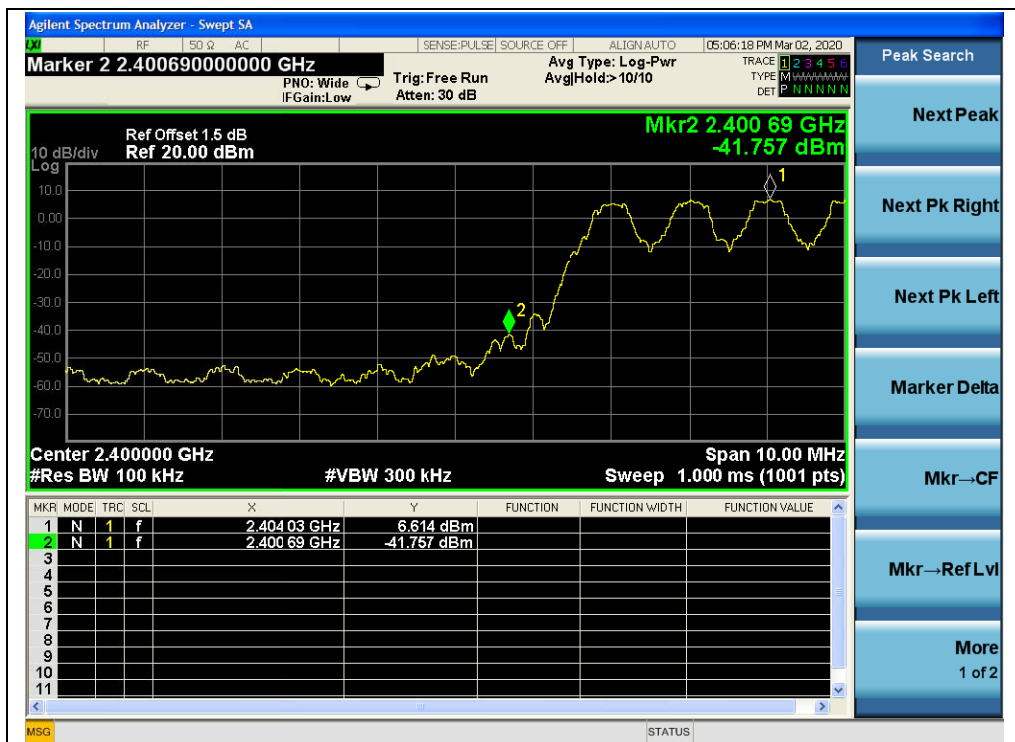
B. Test Plots:



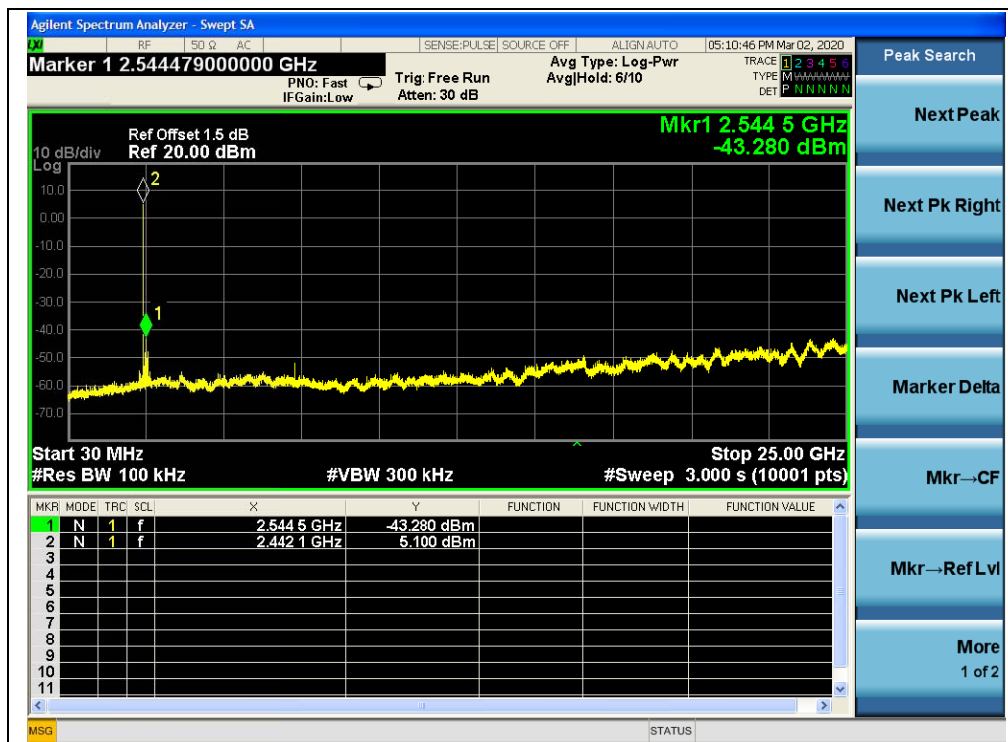
(Channel = 0, 30MHz to 25GHz, GFSK Mode)



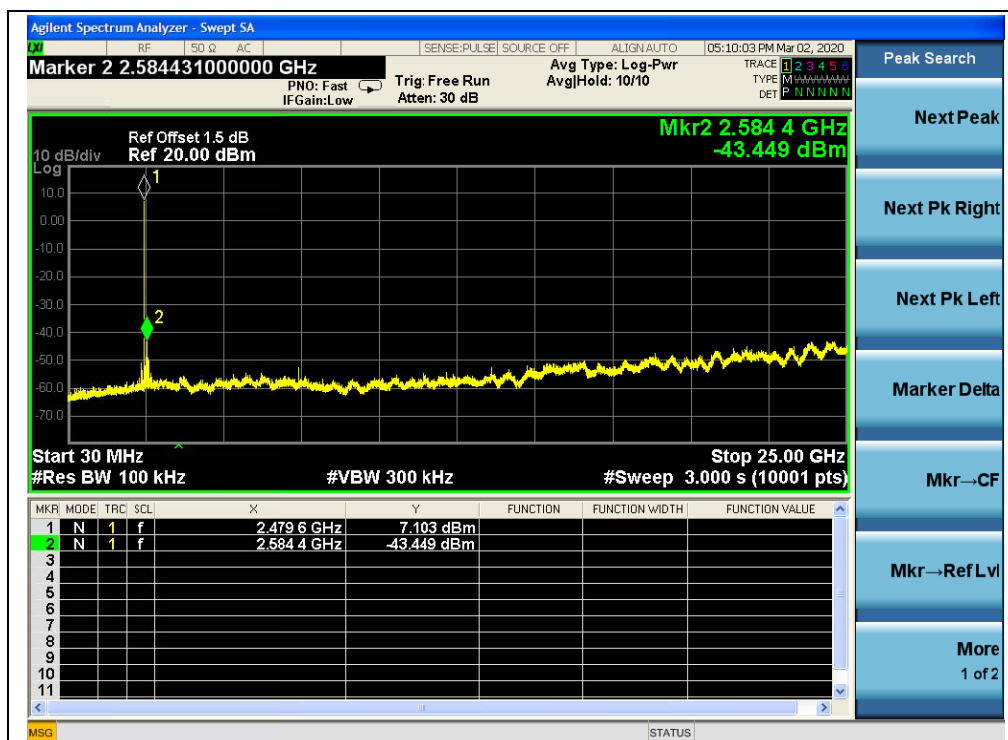
(Channel = 0, Band edge, GFSK Mode)



(Channel = 0, Band edge with hopping on, GFSK Mode)



(Channel = 39, 30MHz to 25GHz, GFSK Mode)



(Channel = 78, 30MHz to 25GHz, GFSK Mode)



(Channel = 78, Band edge, GFSK Mode)



(Channel = 78, Band edge with hopping on, GFSK Mode)

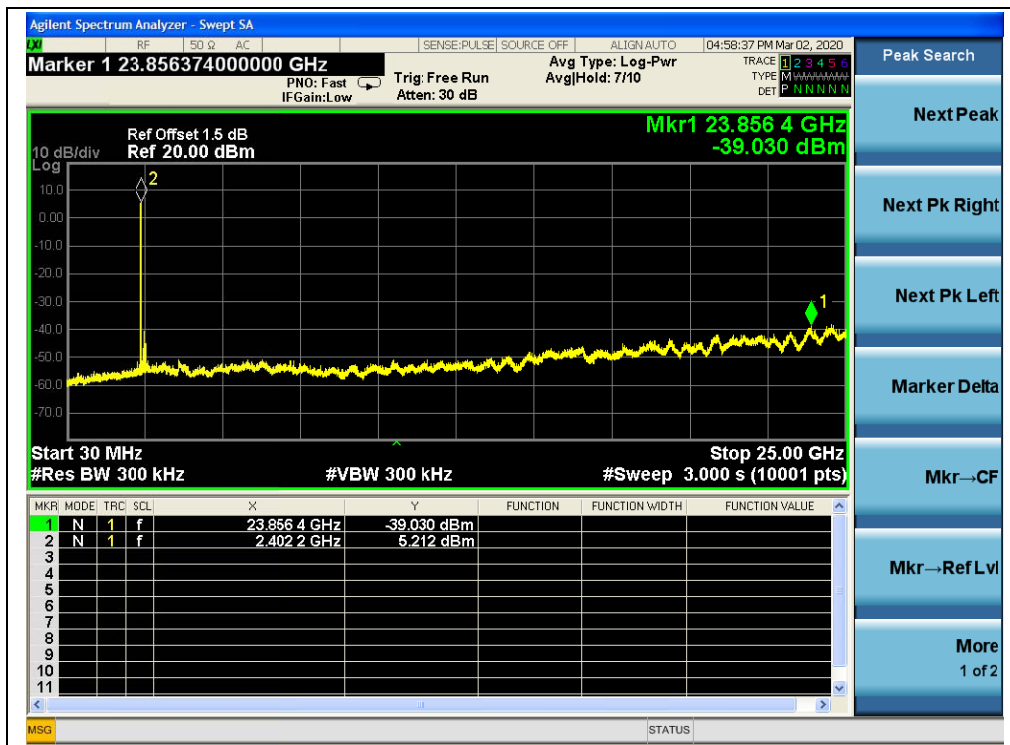


$\pi/4$ -DQPSK Mode

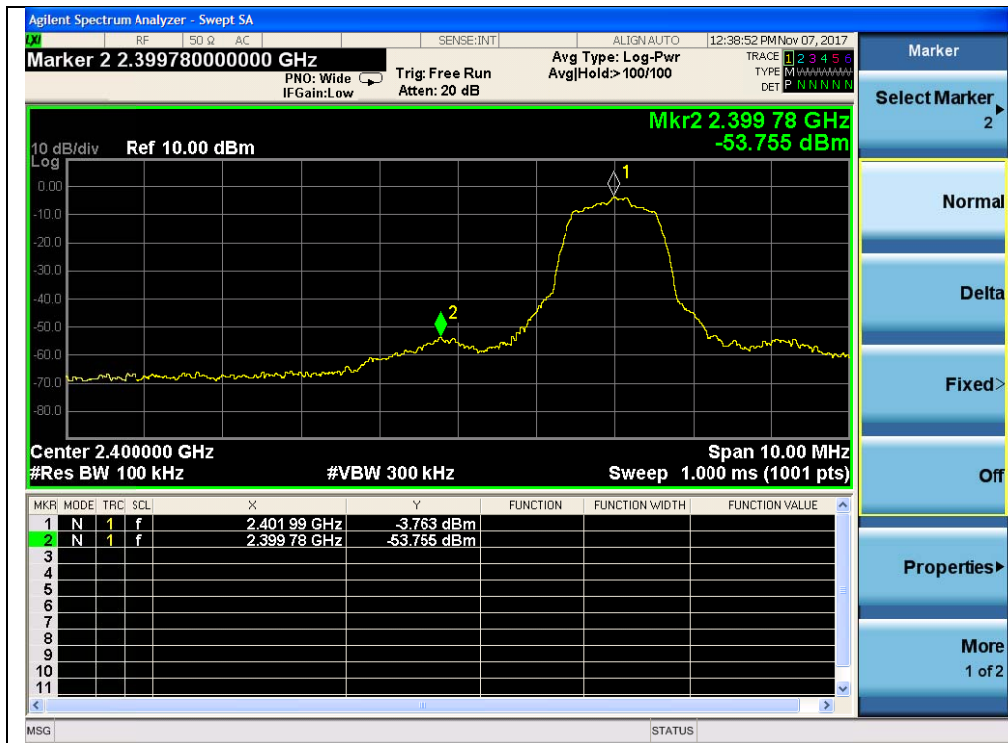
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
0	2402	-39.03	5.21	-14.79	PASS
39	2441	-39.22	7.51	-12.49	PASS
78	2480	-39.03	7.79	-12.21	PASS

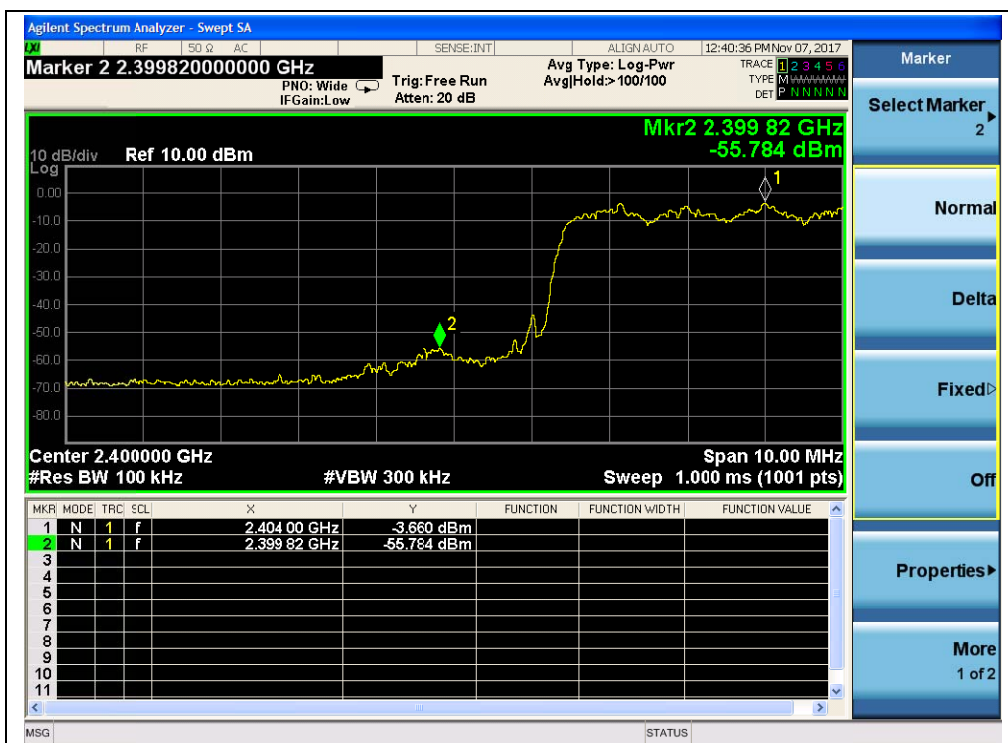
B. Test Plots:



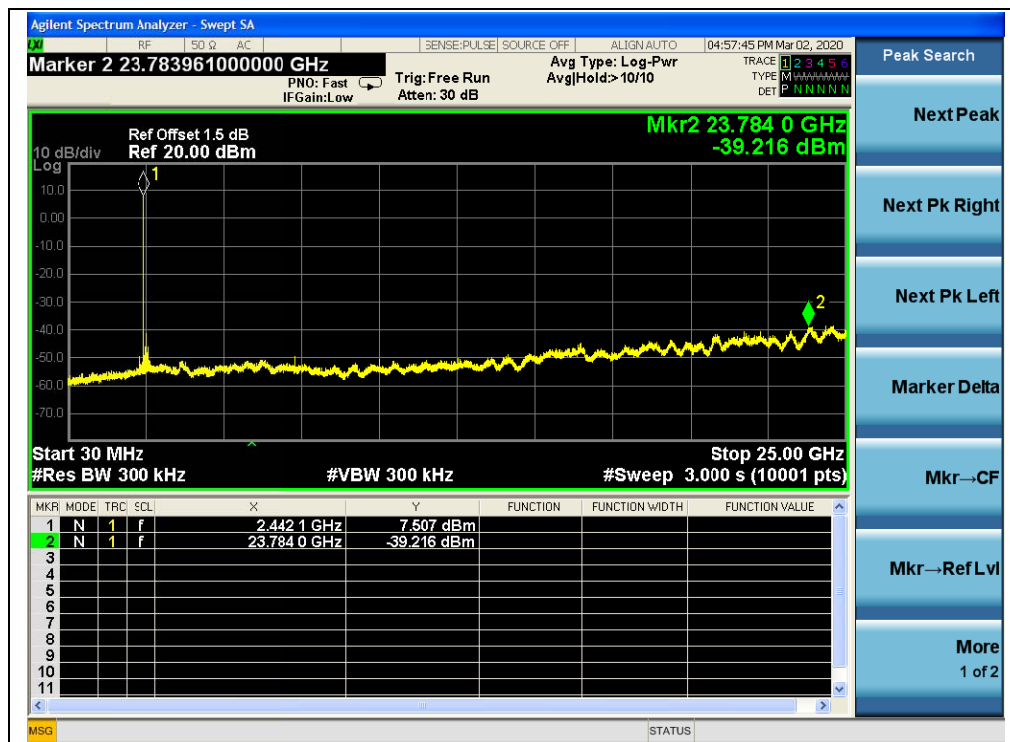
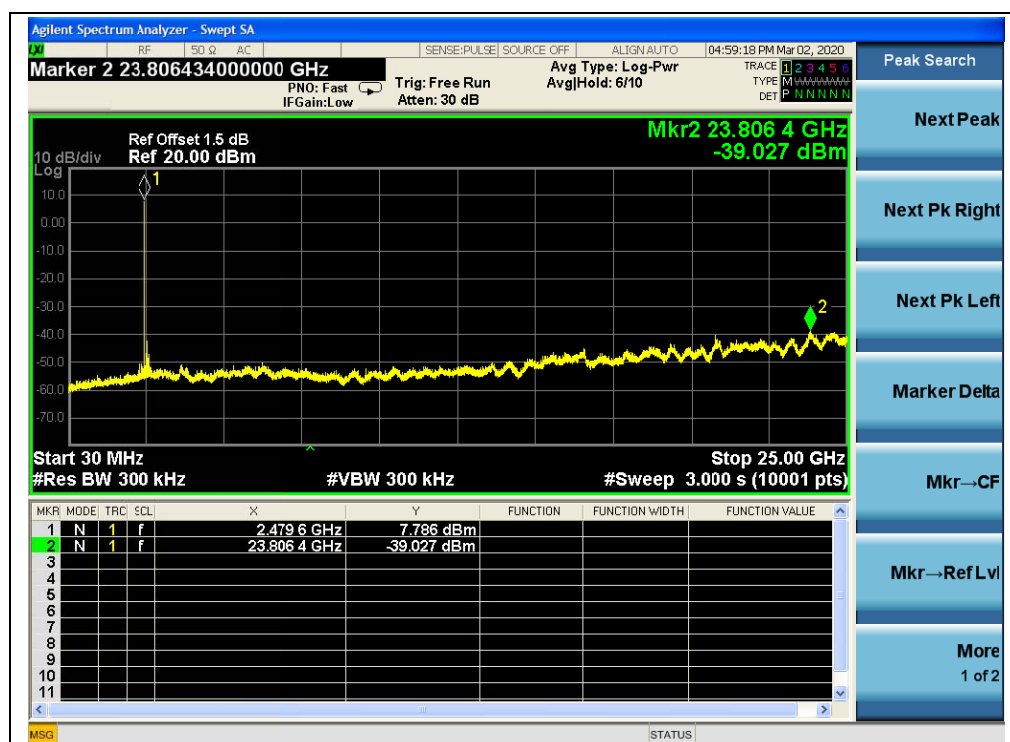
(Channel = 0, 30MHz to 25GHz, $\pi/4$ -DQPSK)

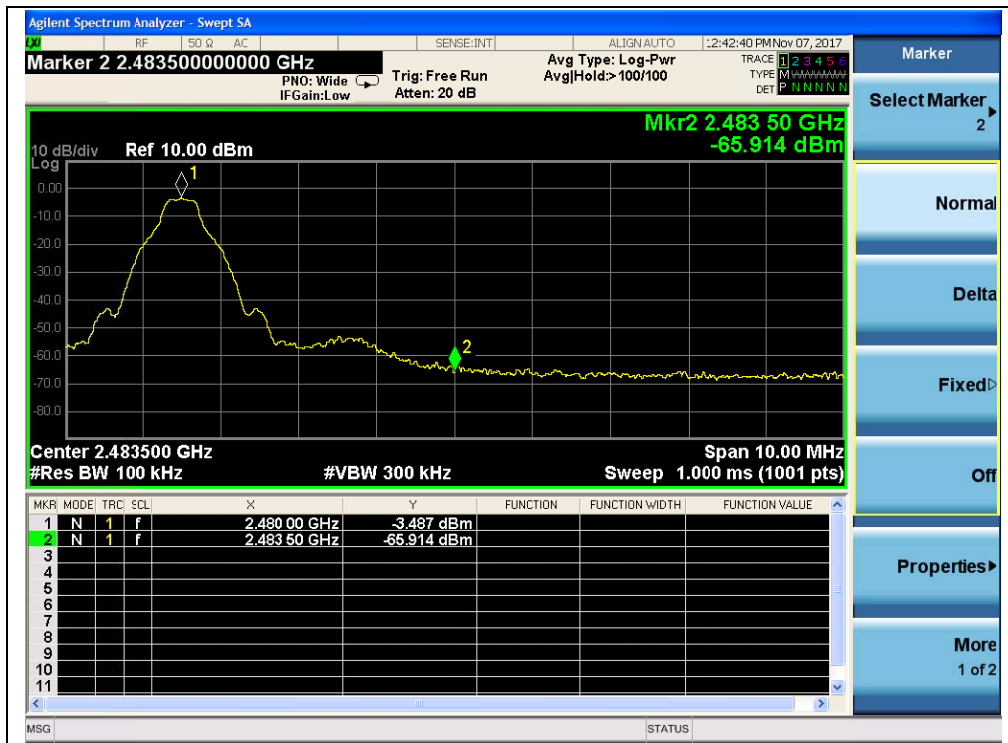


(Channel = 0, Band edge, $\pi/4$ -DQPSK)

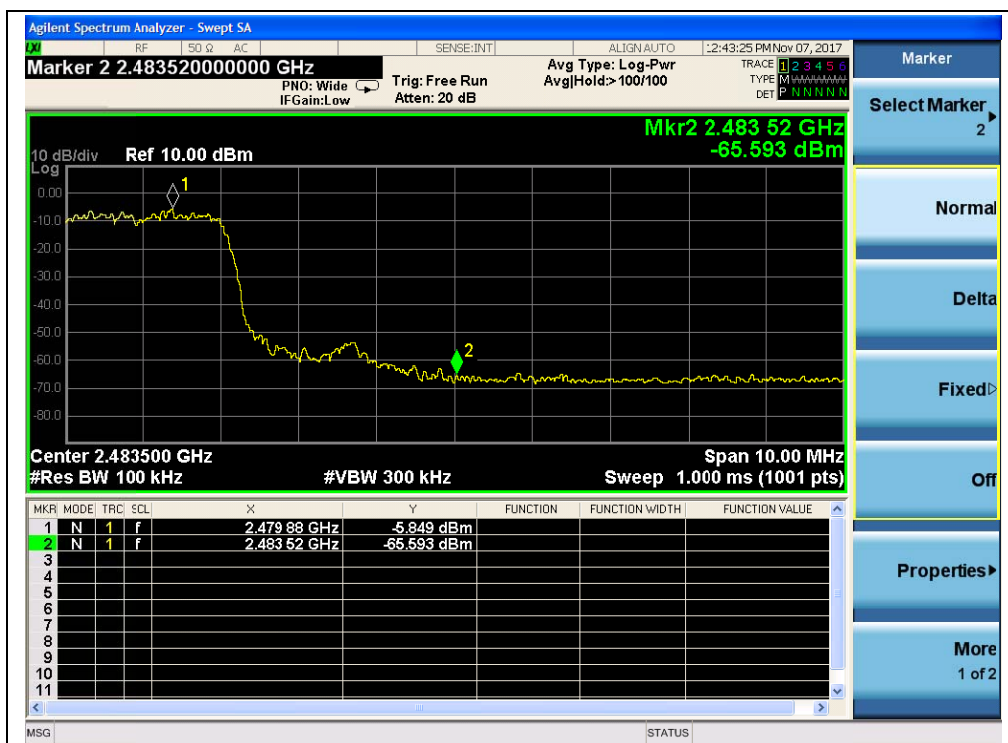


(Channel = 0, Band edge with hopping on, $\pi/4$ -DQPSK)

(Channel = 39, 30MHz to 25GHz, $\pi/4$ -DQPSK)(Channel = 78, 30MHz to 25GHz, $\pi/4$ -DQPSK)



(Channel = 78, Band edge, $\pi/4$ -DQPSK)



(Channel = 78, Band edge with hopping on, $\pi/4$ -DQPSK)

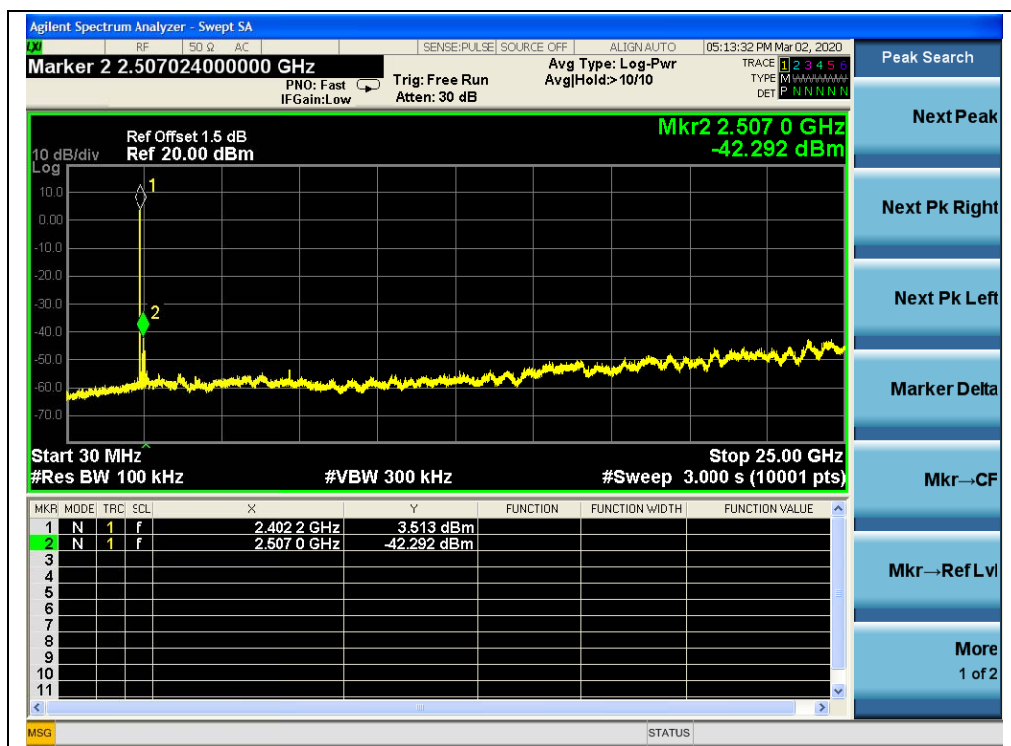


8-DPSK Mode

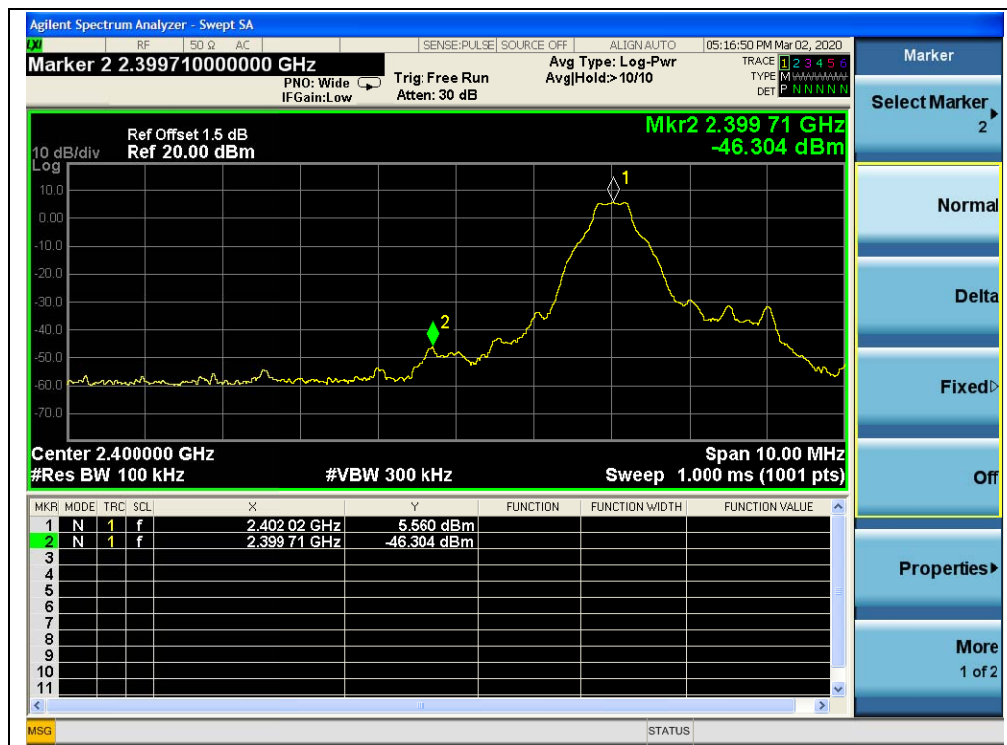
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
0	2402	-42.29	3.51	-16.49	PASS
39	2441	-42.39	6.07	-13.93	PASS
78	2480	-44.62	7.52	-12.48	PASS

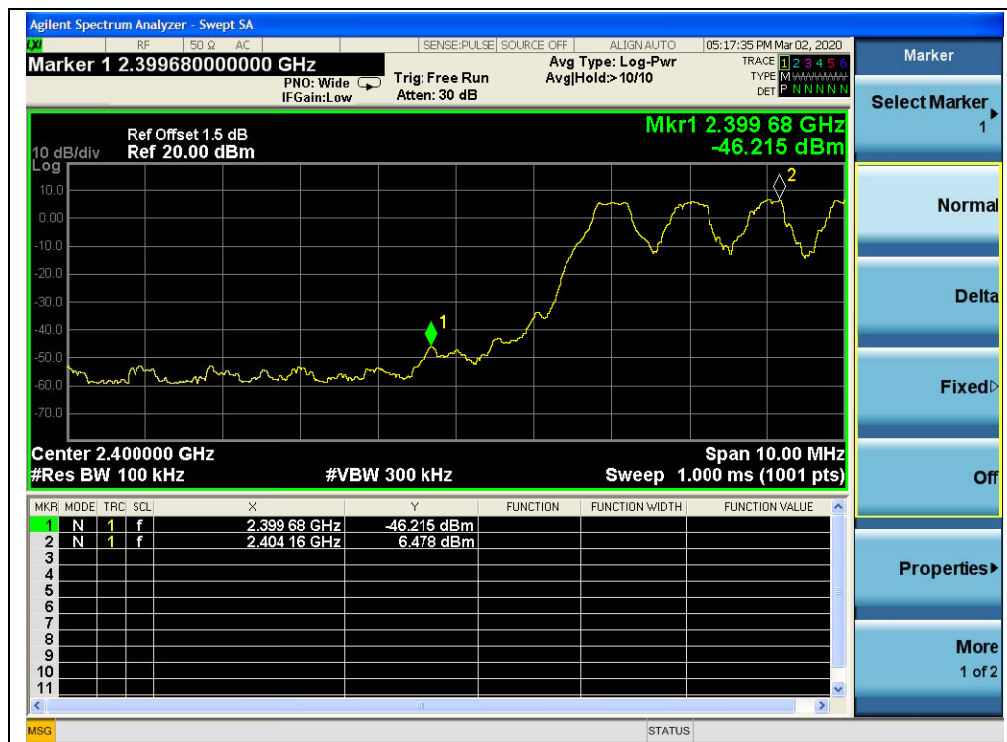
B. Test Plots:



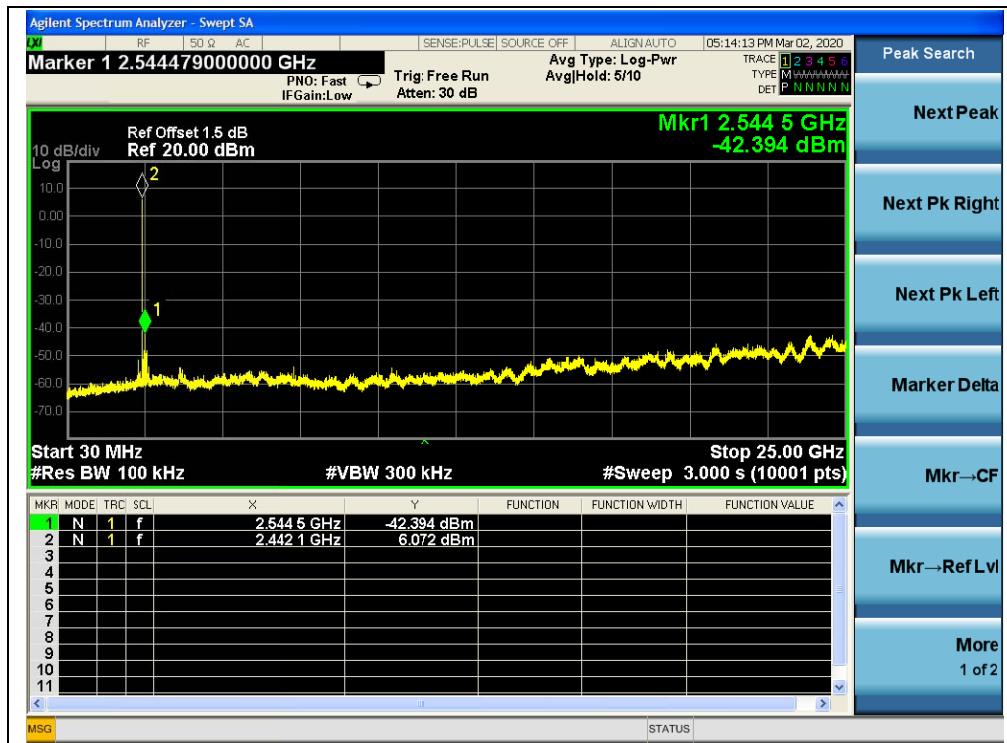
(Channel = 0, 30MHz to 25GH, 8-DPSK)



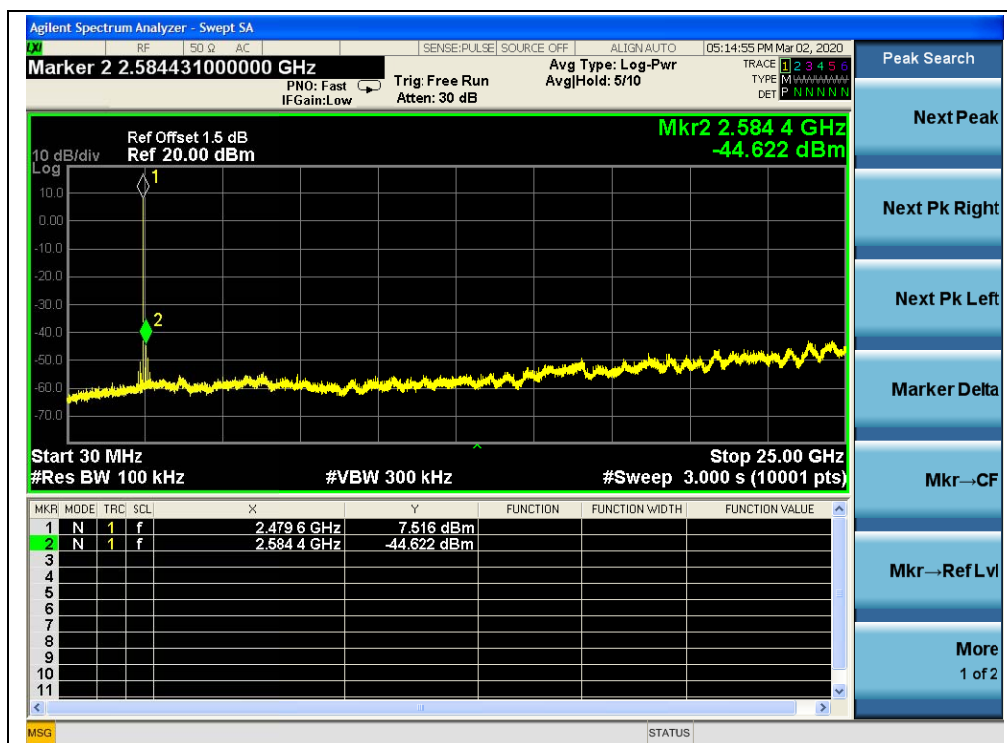
(Channel = 0, Band edge, 8-DPSK)



(Channel = 0, Band edge with hopping on, 8-DPSK)



(Channel = 39, 30MHz to 25GHz, 8-DPSK)



(Channel = 78, 30MHz to 25GH, 8-DPSK)



(Channel = 78, Band edge, 8-DPSK)



(Channel = 78, Band edge with hopping on, 8-DPSK)

2.10. Conducted Emission

2.10.1. Requirement

According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

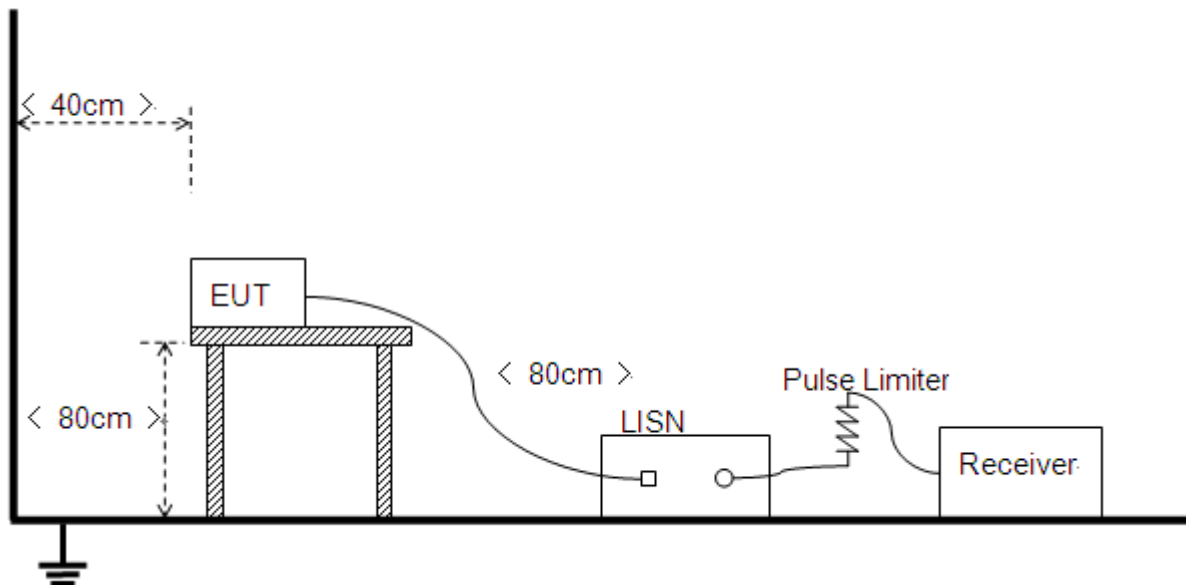
Frequency (MHz)	range	Conducted Limit (dB μ V)	
		Quai-peak	Average
0.15 - 0.50		66 to 56	56 to 46
0.50 - 5		56	46
5- 30		60	50

NOTE:

- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.10.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.



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2.10.3. Test Result

This test case does not apply this kind of EUT.

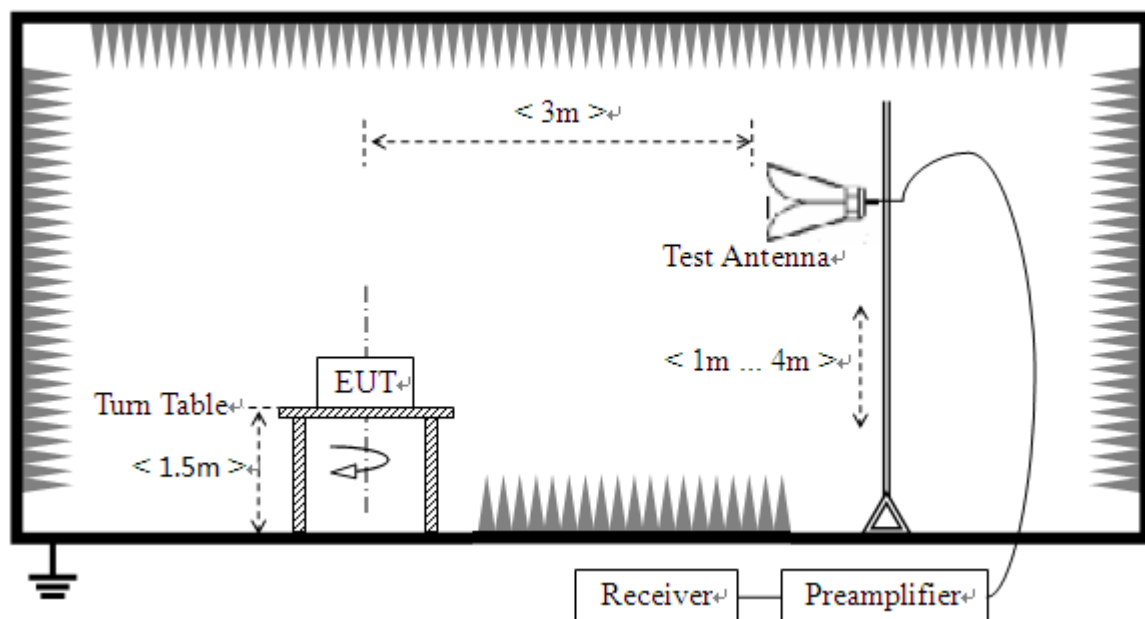
2.11. Restricted Frequency Bands

2.11.1. Requirement

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.11.2. Test Description

A. Test Setup:



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under non hopping-on test mode transmitting 339 bytes DH5, 679 bytes 2DH5 and 1021 bytes 3DH5 packages at maximum power.

For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.



2.11.3. Test Procedure

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 KHz for $f < 1\text{GHz}$

VBW = 3 MHz for peak and 10Hz for average

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize.

2.11.4. Test Result

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V/m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

AFactor: Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2329.12	PK	59.11	-29.67	32.56	62.00	74	PASS
0	2329.85	AV	46.01	-29.67	32.56	48.90	54	PASS
78	2486.62	PK	57.87	-29.67	32.56	60.76	74	PASS
78	2486.40	AV	45.21	-29.67	32.56	48.10	54	PASS



Keysight Spectrum Analyzer - Swept SA

RF PRESEL: 50 Ω DC SENSE: INT

Marker 2 2.32912000000 GHz

Trig: Free Run Avg Type: Voltage Avg Hold: >100/100

PNO: Fast IF Gain: Low #Asten: 6 dB

09:28:00 PM Dec 18, 2019

TRACE 1 2.3 5.6 TYPE MMWMMW DET P PNNNN

10 dB/div Ref 100.00 dBμV

Mkr2 2.329 120 GHz 59.107 dBμV

Start 2.30000 GHz Stop 2.40400 GHz

Res BW (CISPR) 1 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.390 000 GHz	56.796 dBμV			
2	N	1	f	2.329 120 GHz	59.107 dBμV			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Marker

Select Marker 2

Normal

Delta

Fixed

Off

Properties

More 1 of 2

Keysight Spectrum Analyzer - Swept SA

RL RF PRESEL 50 Ω DC SENSE:INT ALIGN OFF 09:32:08 PM Dec 18, 2019

Marker 2 2.329848000000 GHz PNO: Fast IF Gain: Low Trig: Free Run #A: 6 dB Avg Type: Voltage Avg Hold: >100/100 TRACE 1 2 3 4 5 6 TYPE MIN MAX MIN DET AP NNNNN

Ref 100.00 dBμV

Mkr2 2.329 848 GHz 46.014 dBμV

10 dB/div Log

93.0
83.0
73.0
63.0
53.0
43.0
33.0
23.0
13.0

Start 2.30000 GHz Stop 2.40400 GHz
Res BW (CISPR) 1 MHz #VBW 3.0 MHz Sweep 11.93 s (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.390 000 GHz	45.483 dBμV			
2	N	1	f	2.329 848 GHz	46.014 dBμV			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG STATUS

Marker

Select Marker 2

Normal

Delta

Fixed

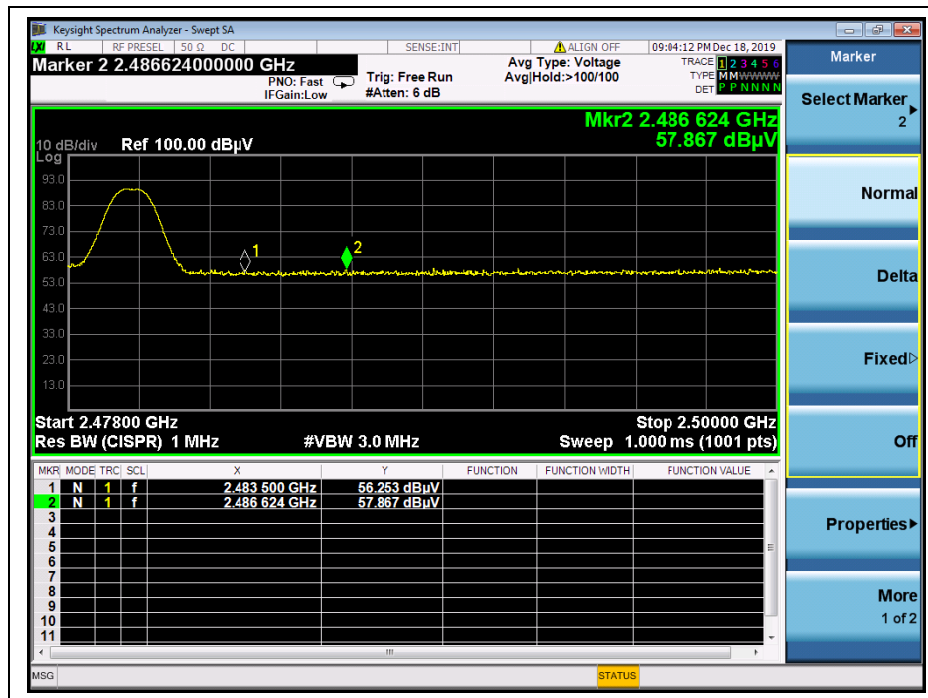
Off

Properties

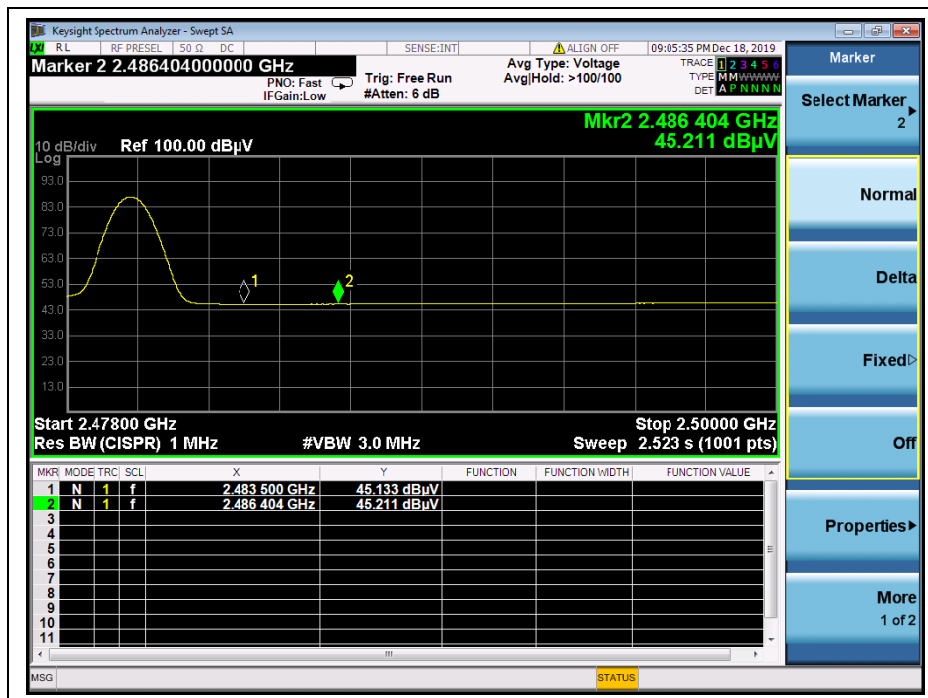
More 1 of 2

MORLAB

E-mail: service@morlab.cn



(PEAK, Channel = 78, GFSK)



(AVG, Channel = 78, GFSK)

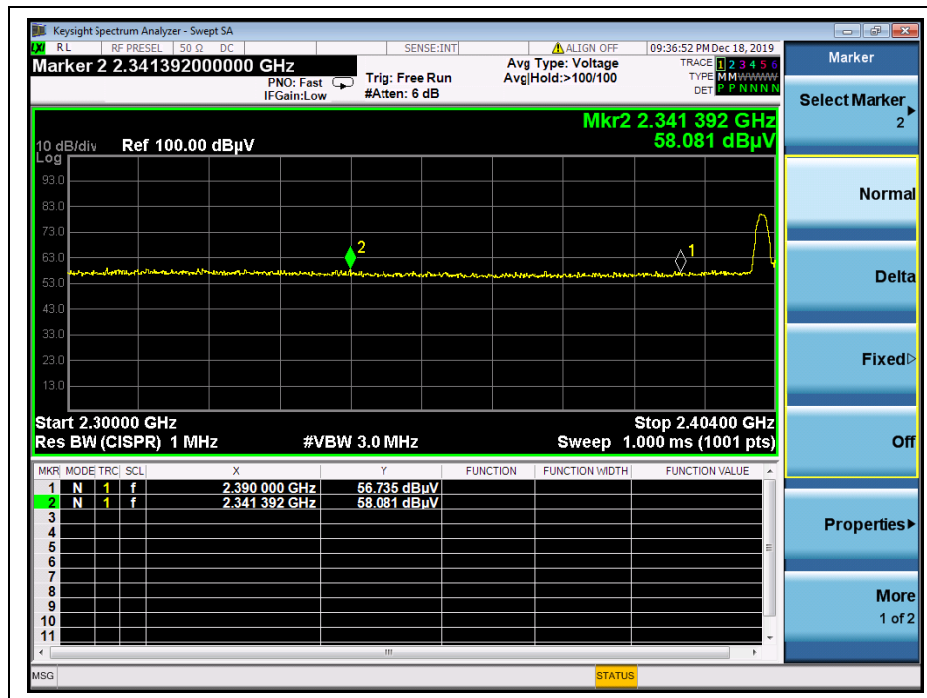


$\pi/4$ -DQPSK Mode

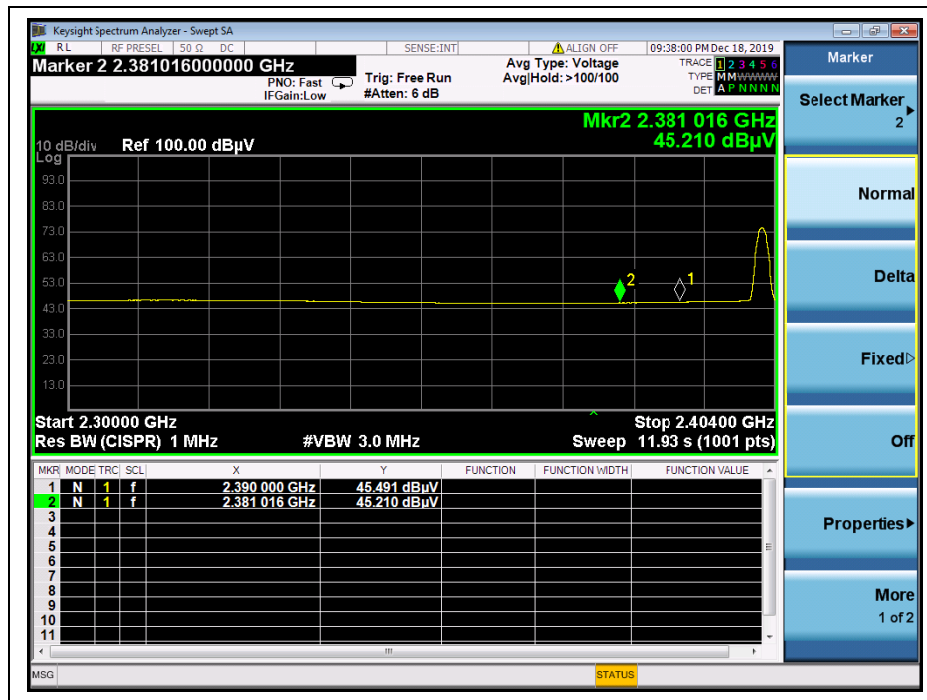
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
0	2341.39	PK	58.08	-29.67	32.56	60.97	74	PASS
0	2390.00	AV	45.49	-29.67	32.56	48.38	54	PASS
78	2486.10	PK	57.96	-29.67	32.56	60.85	74	PASS
78	2485.52	AV	45.20	-29.67	32.56	48.09	54	PASS

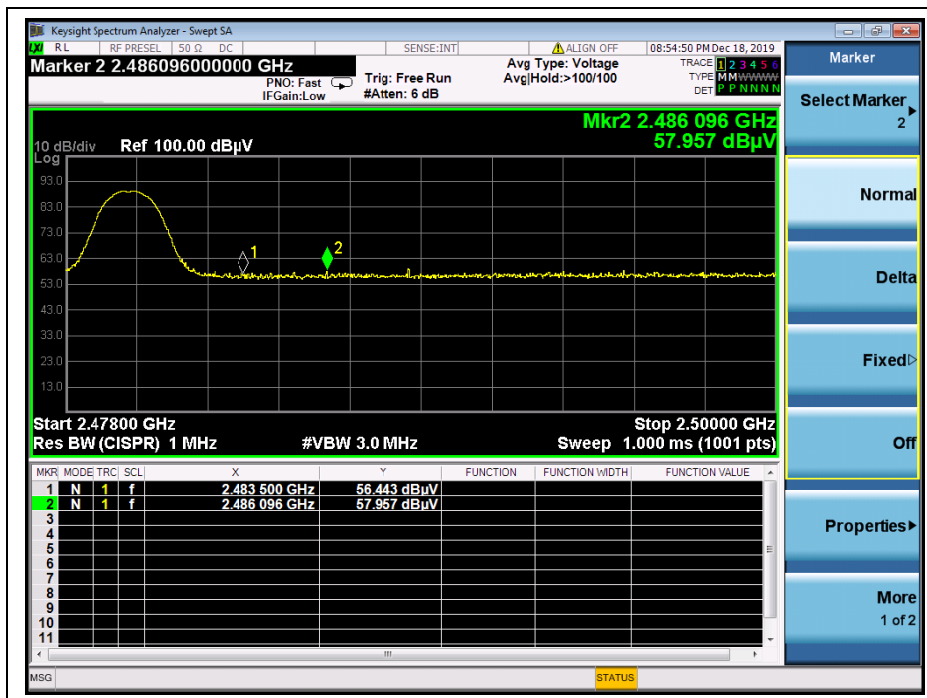
B. Test Plots:



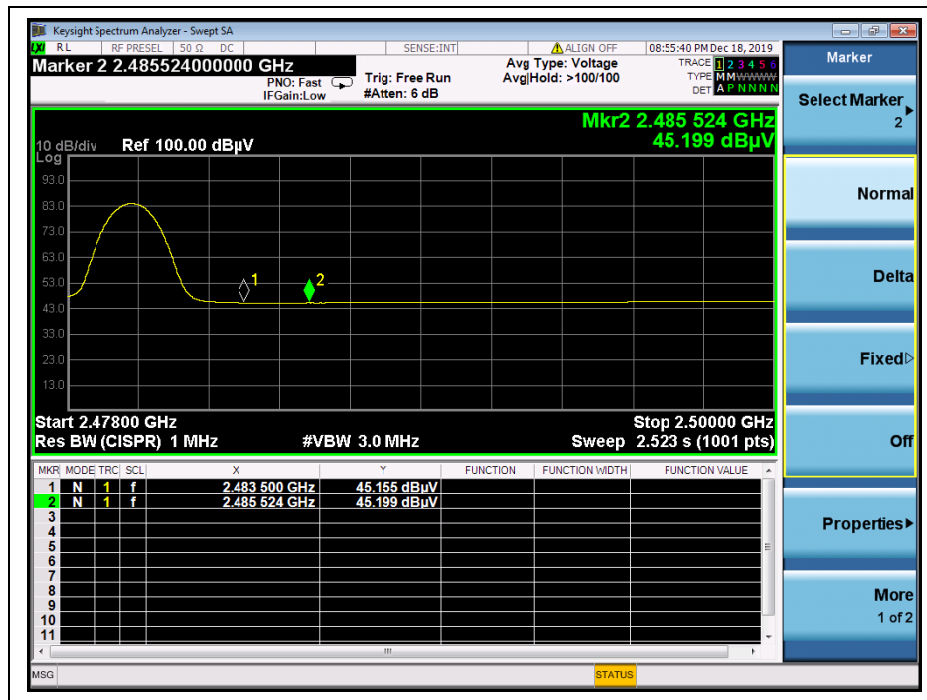
(PEAK, Channel = 0, $\pi/4$ -DQPSK)



(AVG, Channel = 0, $\pi/4$ -DQPSK)



(PEAK, Channel = 78, $\pi/4$ -DQPSK)

(AVG, Channel = 78, $\pi/4$ -DQPSK)

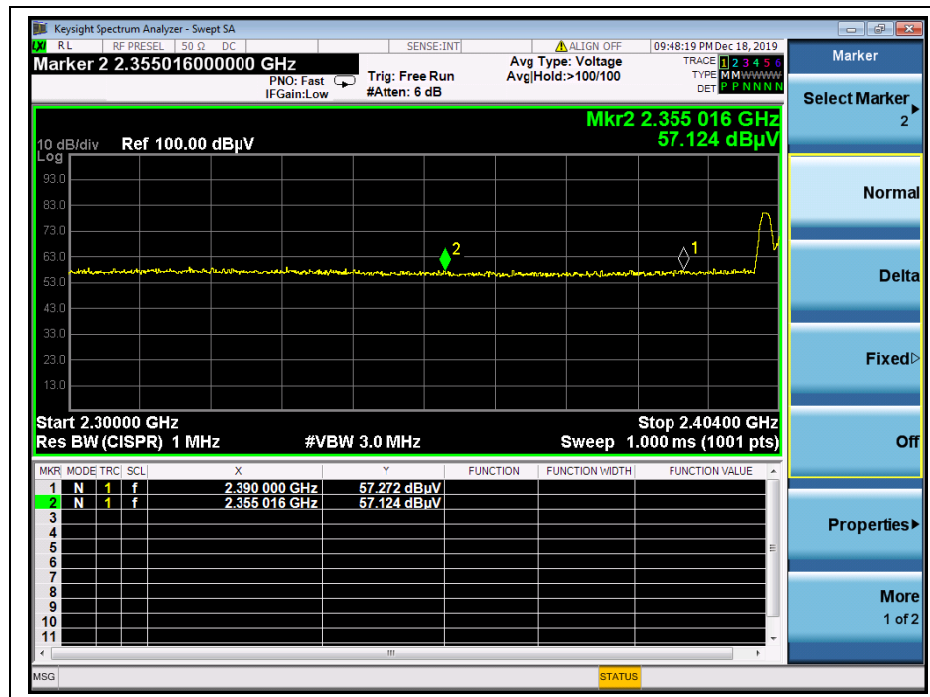


8-DPSK Mode

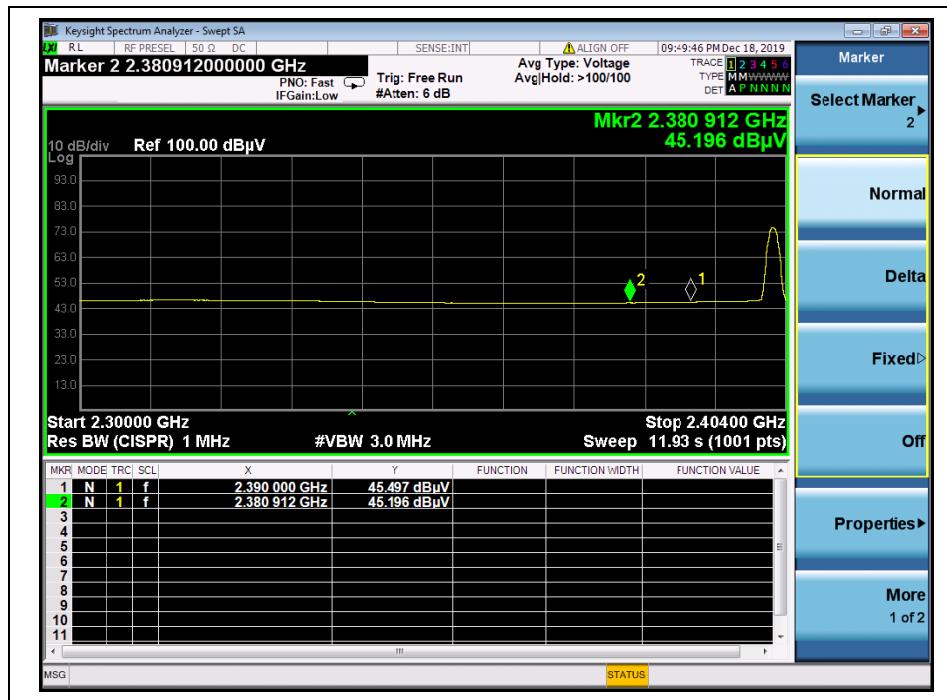
A. Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBuV/m)	Limit (dBuV/m)	Verdict
		PK/ AV						
0	2390.00	PK	57.27	-29.67	32.56	60.16	74	PASS
0	2390.00	AV	45.50	-29.67	32.56	48.39	54	PASS
78	2490.61	PK	58.43	-29.67	32.56	61.32	74	PASS
78	2486.38	AV	45.21	-29.67	32.56	48.10	54	PASS

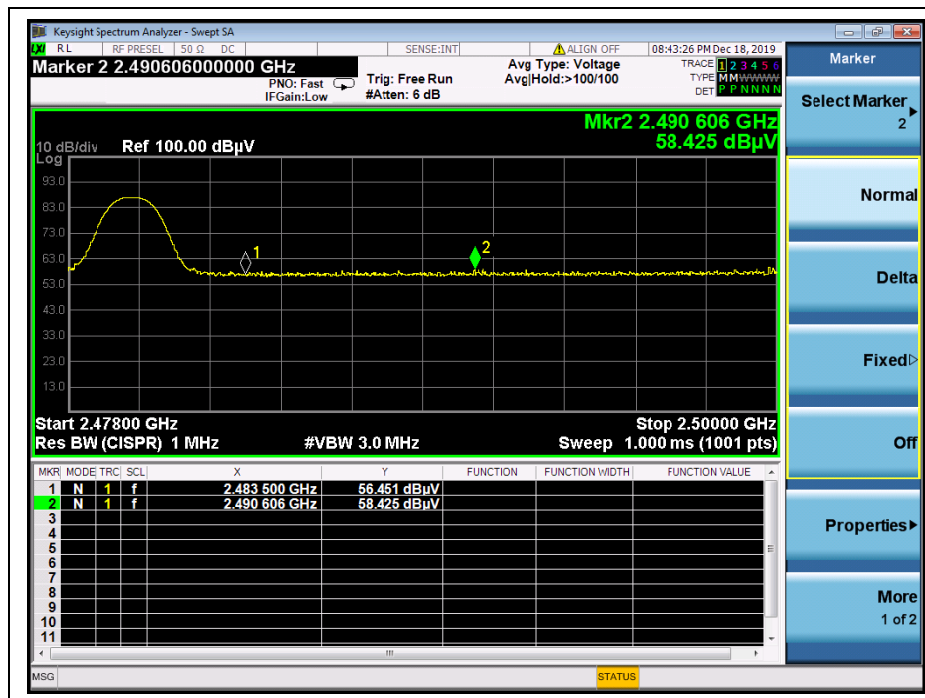
B. Test Plots:



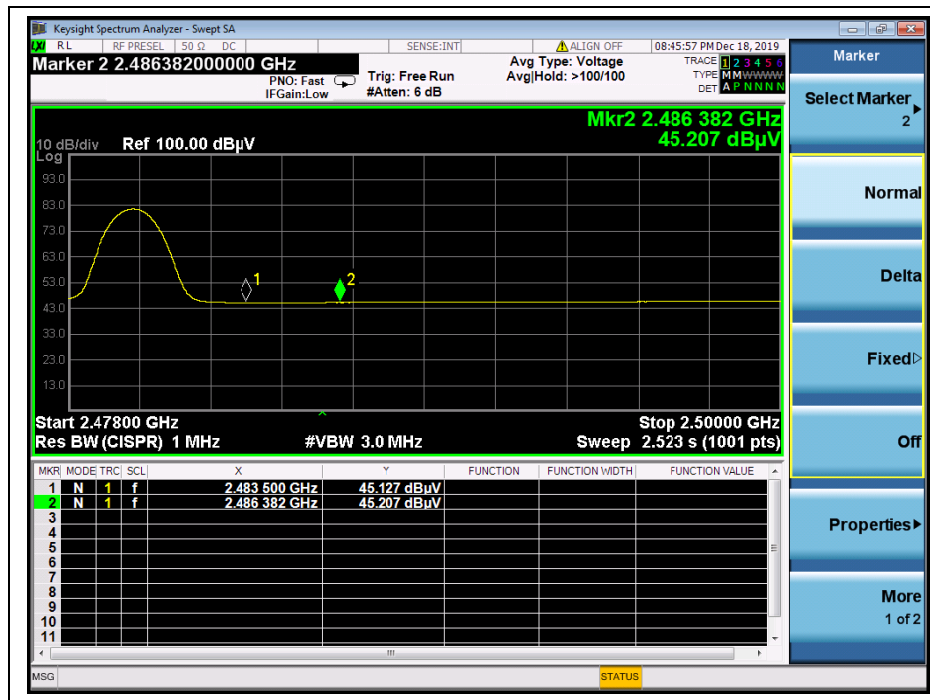
(PEAK, Channel = 0, 8-DPSK)



(AVG, Channel = 0, 8-DPSK)



(PEAK, Channel = 78, 8-DPSK)



(AVG, Channel = 78, 8-DPSK)

2.12. Radiated Emission

2.12.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

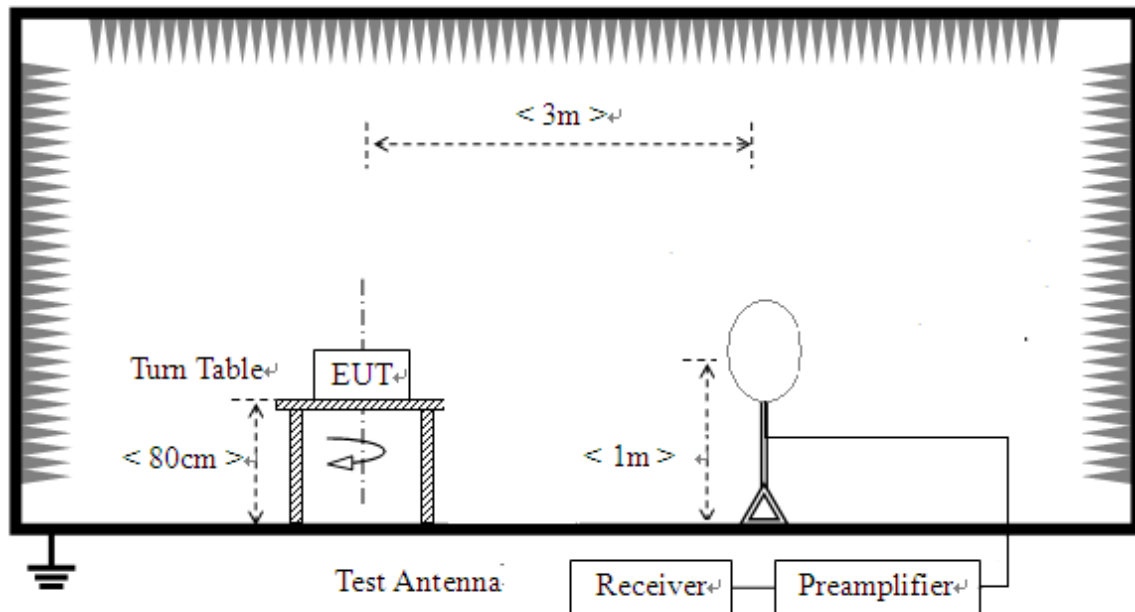
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

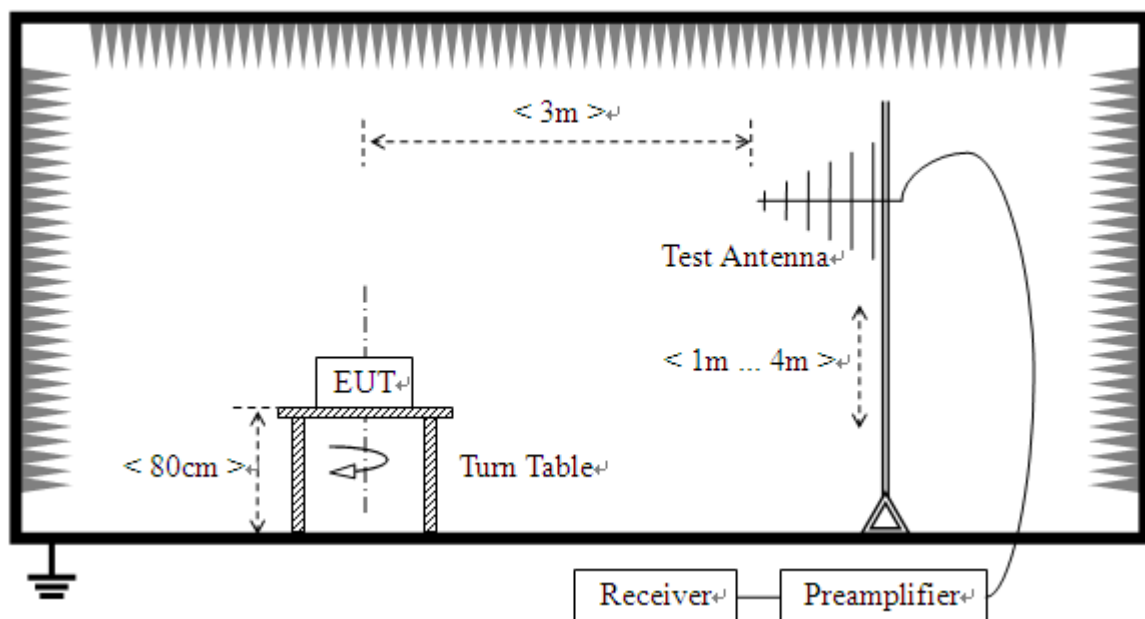
2.12.2. Test Description

A. Test Setup:

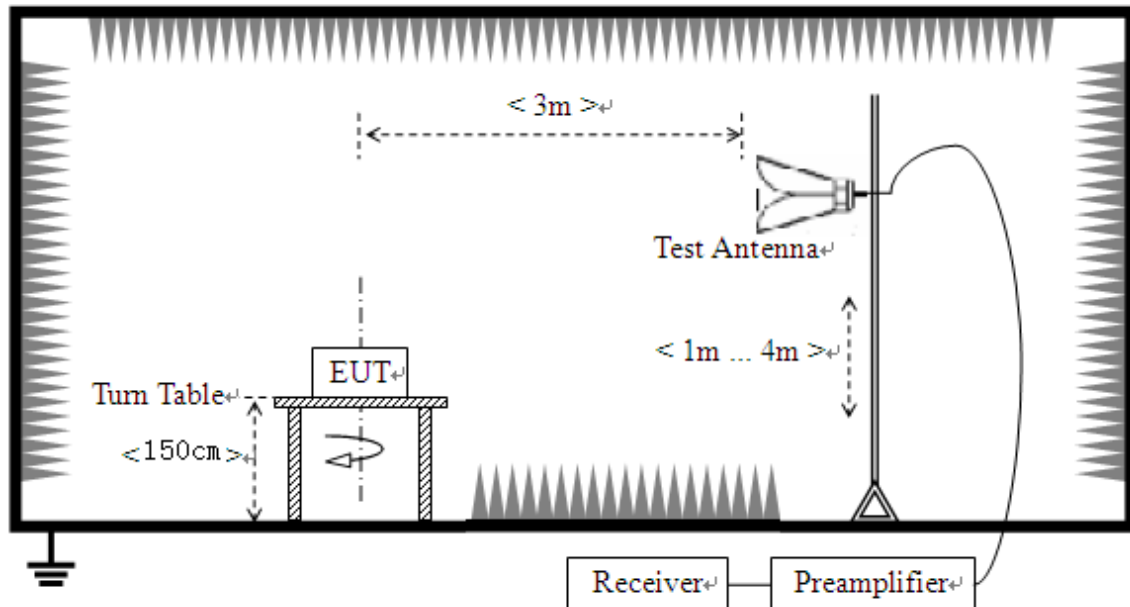
- 1) For radiated emissions from 9kHz to 30MHz



- 2) For radiated emissions from 30MHz to 1GHz



3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, the EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

- In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test antenna may have to be



higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. The emission levels at both horizontal and vertical polarizations should be tested.

2.12.3. Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

2.12.4. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

$$E [\text{dB}\mu\text{V/m}] = U_R + A_T + A_{\text{Factor}} [\text{dB}]; A_T = L_{\text{Cable loss}} [\text{dB}] - G_{\text{preamp}} [\text{dB}]$$

A_T : Total correction Factor except Antenna

U_R : Receiver Reading

G_{preamp} : Preamplifier Gain

A_{Factor} : Antenna Factor at 3m

During the test, the total correction Factor A_T and A_{Factor} were built in test software.

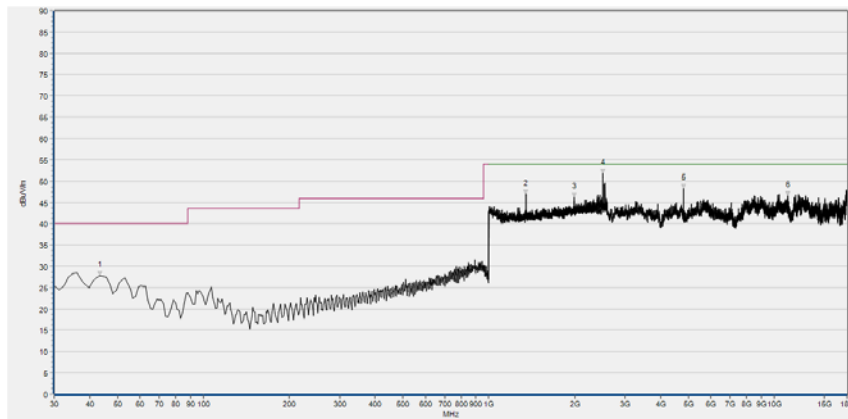
Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note3: For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

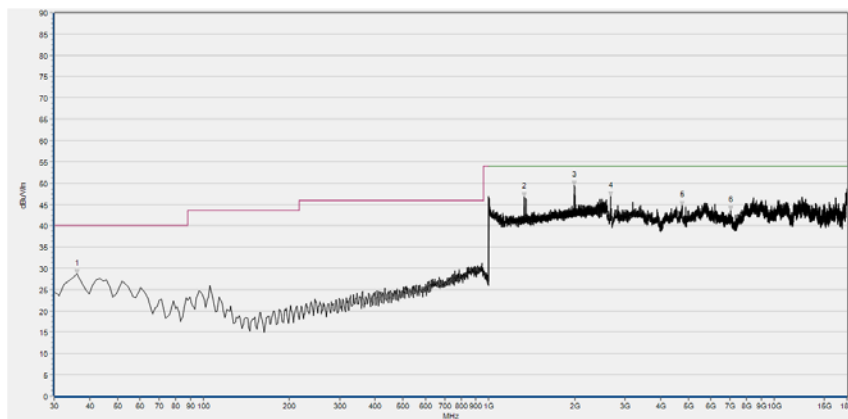
**GFSK Mode**

Plots for Channel = 0



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
43.354	27.88	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
1349.580	46.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
1996.238	46.27	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2506.300	51.87	N/A	47.14	74.00	N/A	54.00	Horizontal	PASS
4804.001	48.24	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11135.952	46.65	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

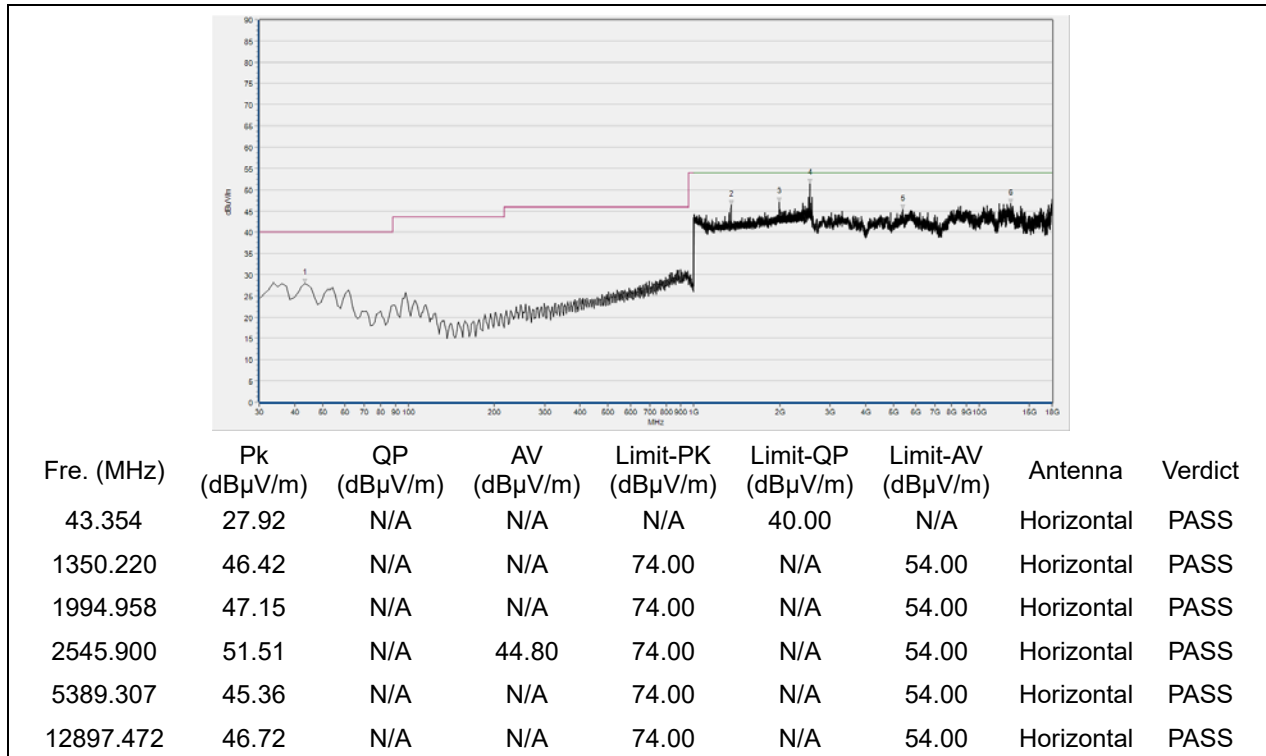
(30MHz to 18GHz, Antenna Horizontal, GFSK, channel 0)



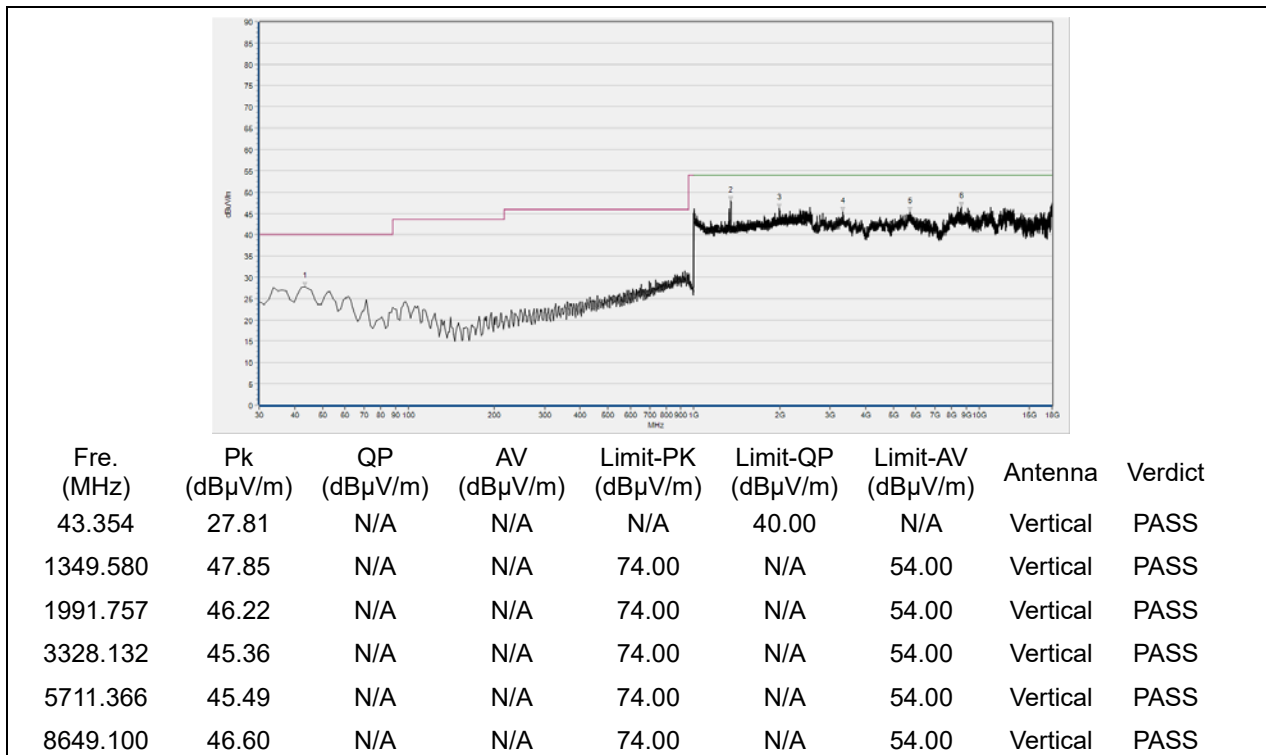
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
36.070	28.59	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1331.653	46.79	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1996.879	49.51	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2664.412	46.91	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4745.190	44.73	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
7024.805	43.56	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 18GHz, Antenna Vertical, GFSK, channel 0)

Plot for Channel = 39

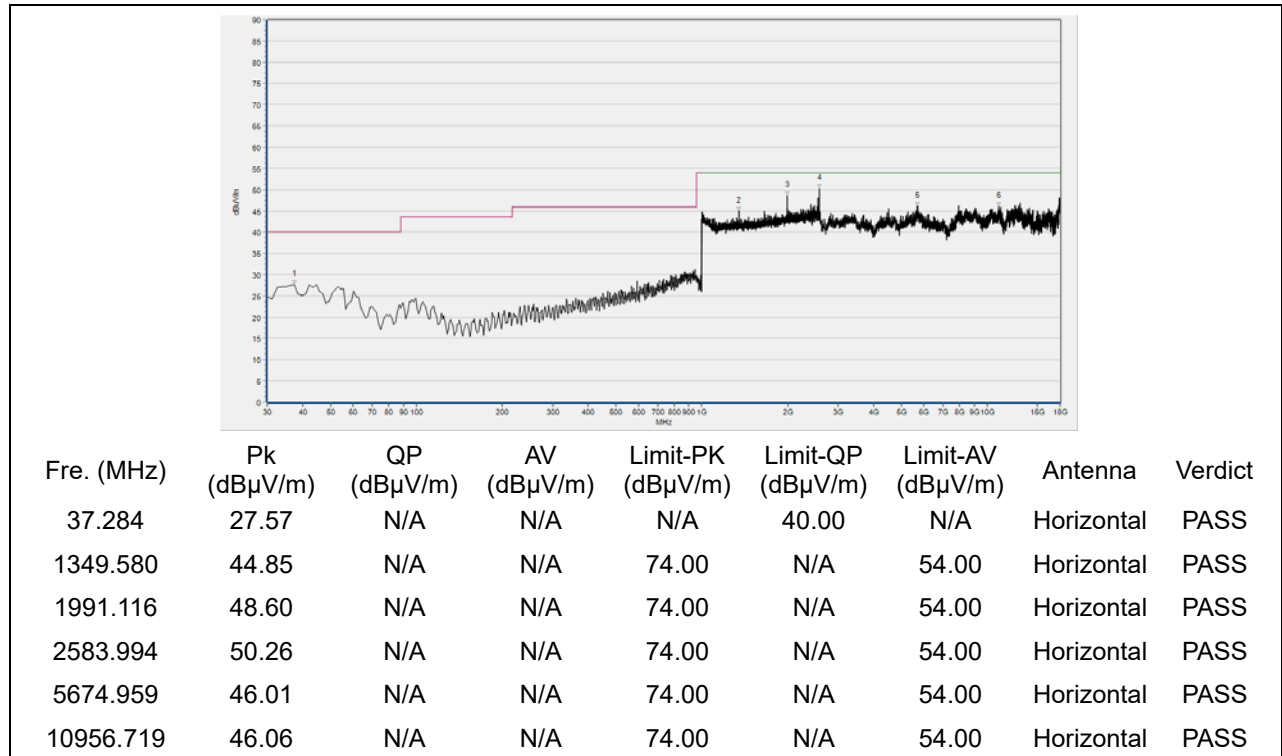


(30MHz to 18GHz, Antenna Horizontal, GFSK, channel 39)

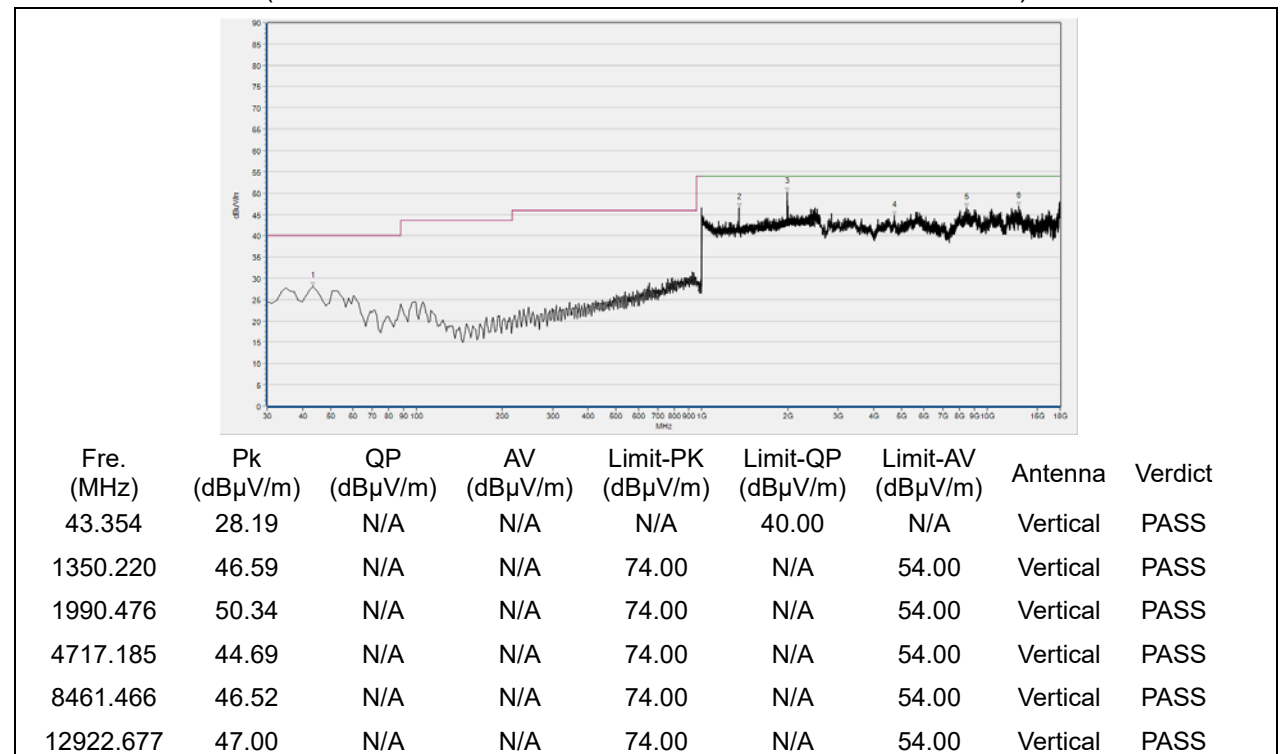


(30MHz to 18GHz, Antenna Vertical, GFSK, channel 39)

Plot for Channel = 78



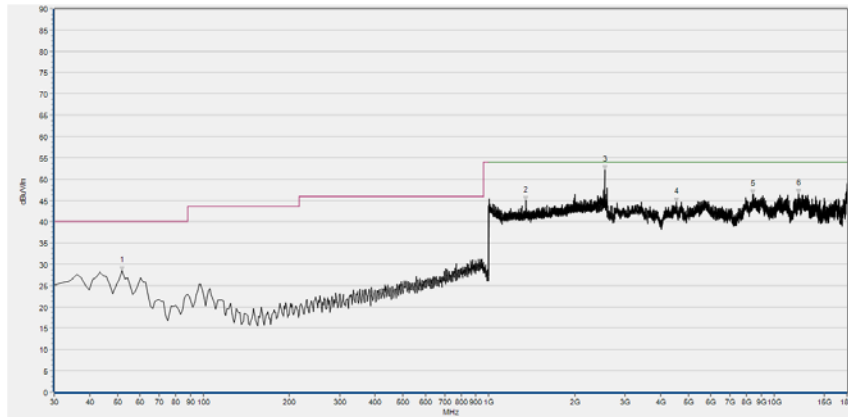
(30MHz to 18GHz, Antenna Horizontal, GFSK, channel 78)



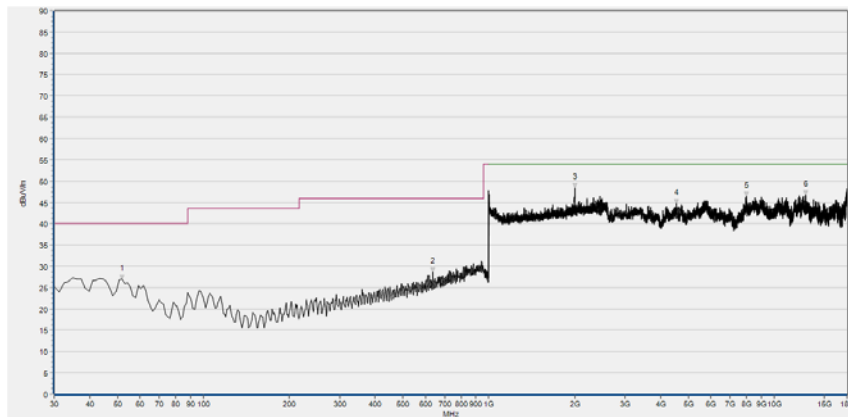
(30MHz to 18GHz, Antenna Vertical, GFSK, channel 78)

 **$\pi/4$ -DQPSK Mode**

Plots for Channel = 0



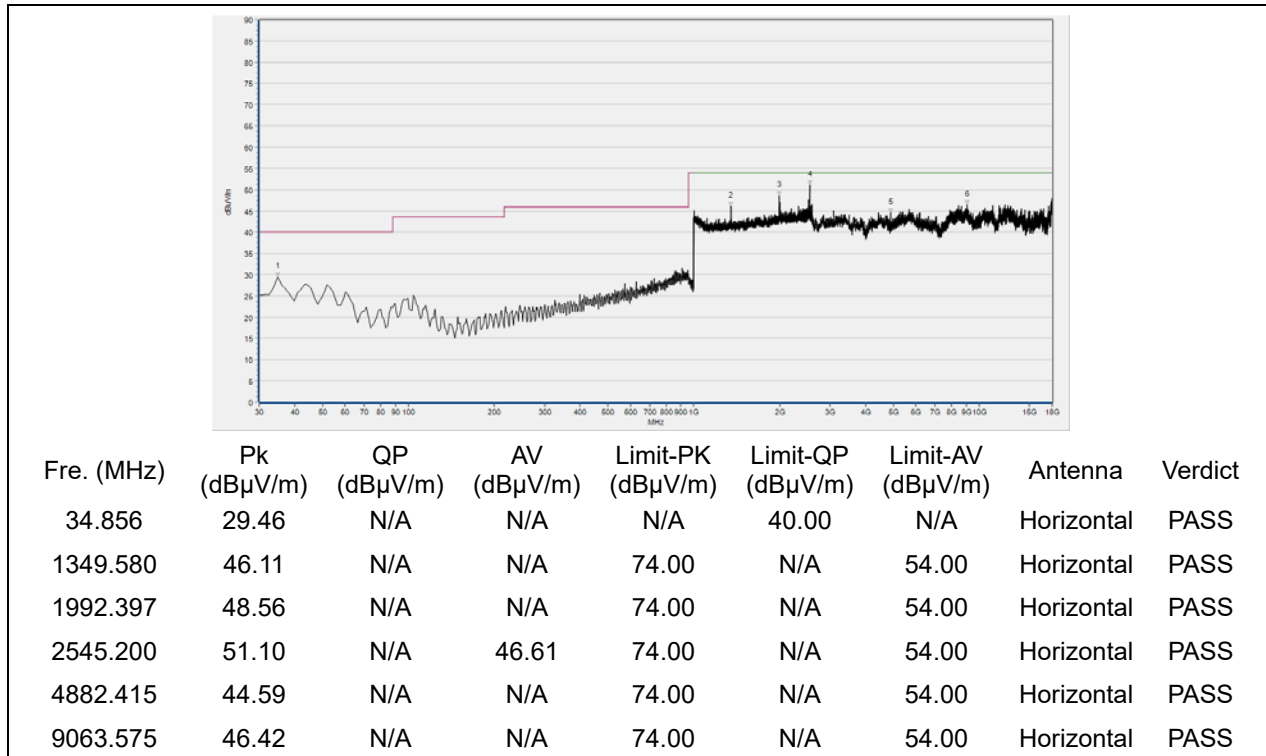
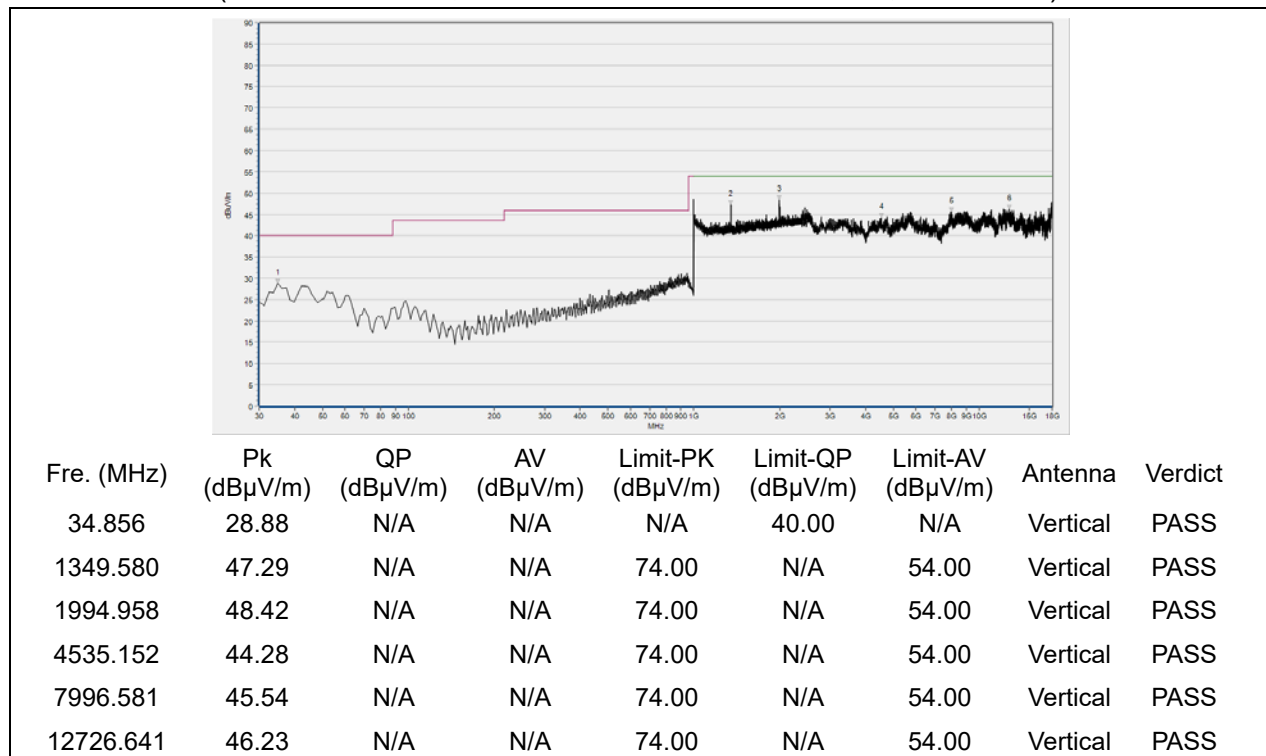
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
51.852	28.43	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
1349.580	44.93	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2544.938	52.19	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4551.955	44.61	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8419.458	46.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12144.135	46.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 18GHz, Antenna Horizontal, $\pi/4$ -DQPSK, channel 0)

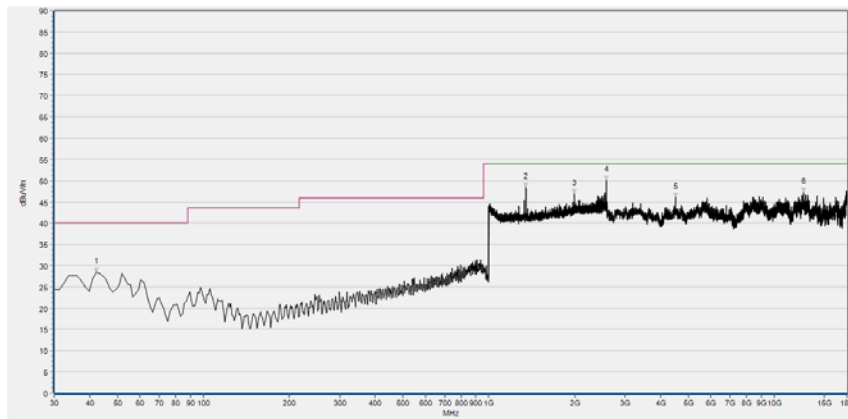
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
51.852	27.02	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
635.795	28.63	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1998.159	48.38	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4546.354	44.79	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8004.983	46.39	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12911.475	46.72	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 18GHz, Antenna Vertical, $\pi/4$ -DQPSK, channel 0)

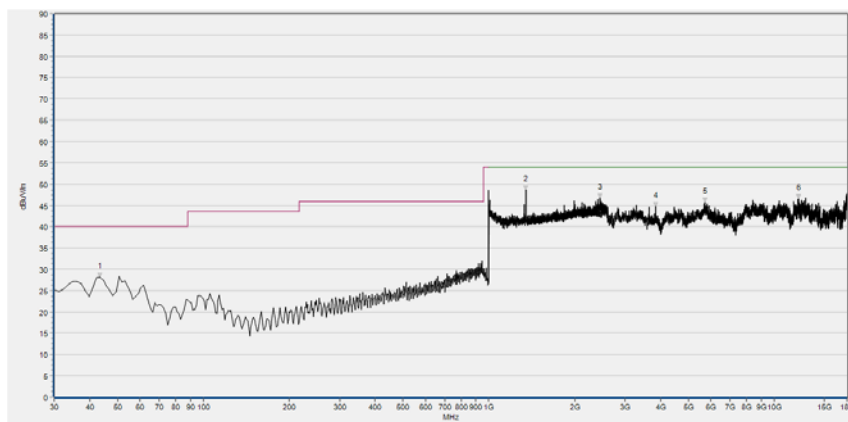
Plot for Channel = 39


(30MHz to 18GHz, Antenna Horizontal, $\pi/4$ -DQPSK, channel 39)

(30MHz to 18GHz, Antenna Vertical, $\pi/4$ -DQPSK, channel 39)

Plot for Channel = 78



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
42.140	28.51	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
1349.580	48.48	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
1996.879	46.97	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2583.994	50.14	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4501.546	46.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12679.033	47.29	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 18GHz, Antenna Horizontal, $\pi/4$ -DQPSK, channel 78)


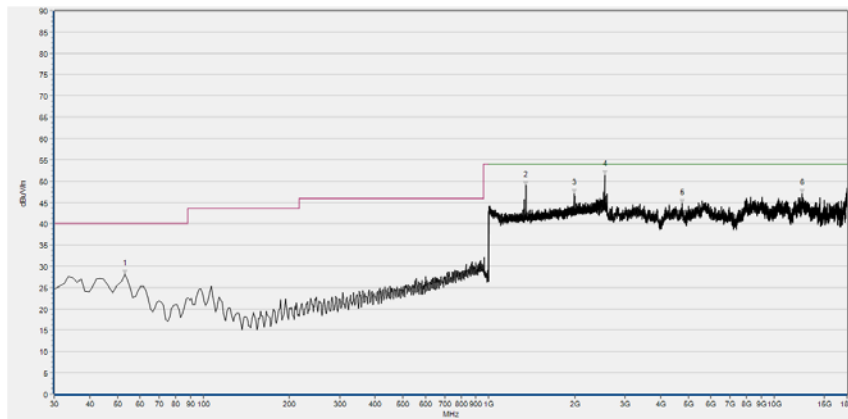
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
43.354	28.22	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1349.580	48.63	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2456.583	46.72	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3837.825	44.67	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5708.565	45.70	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12197.345	46.55	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 18GHz, Antenna Vertical, $\pi/4$ -DQPSK, channel 78)



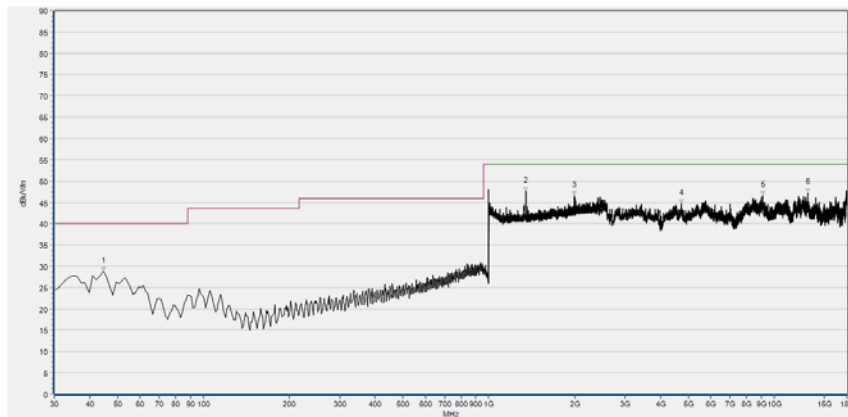
8-DPSK Mode

Plots for Channel = 0



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
53.066	28.23	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
1349.580	48.94	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
1996.238	47.14	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2544.700	51.40	N/A	46.50	74.00	N/A	54.00	Horizontal	PASS
4753.592	44.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12491.398	47.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

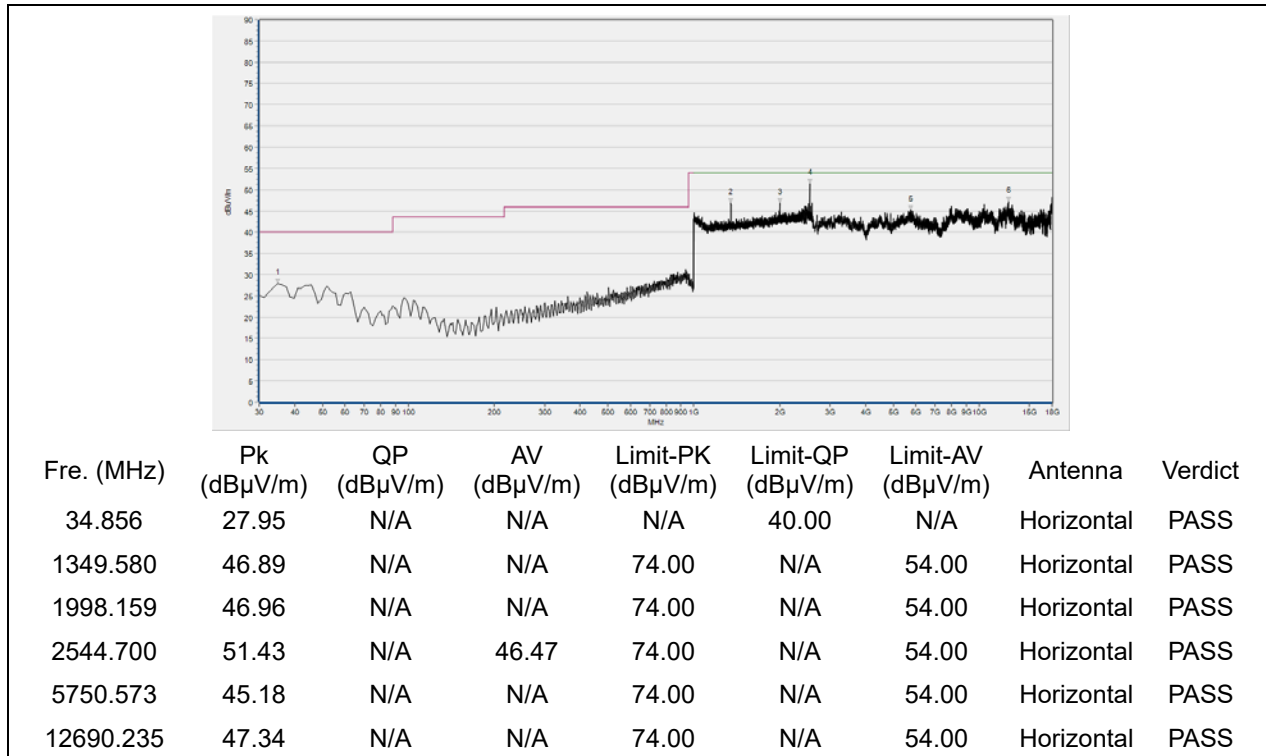
(30MHz to 18GHz, Antenna Horizontal, 8-DPSK, channel 0)



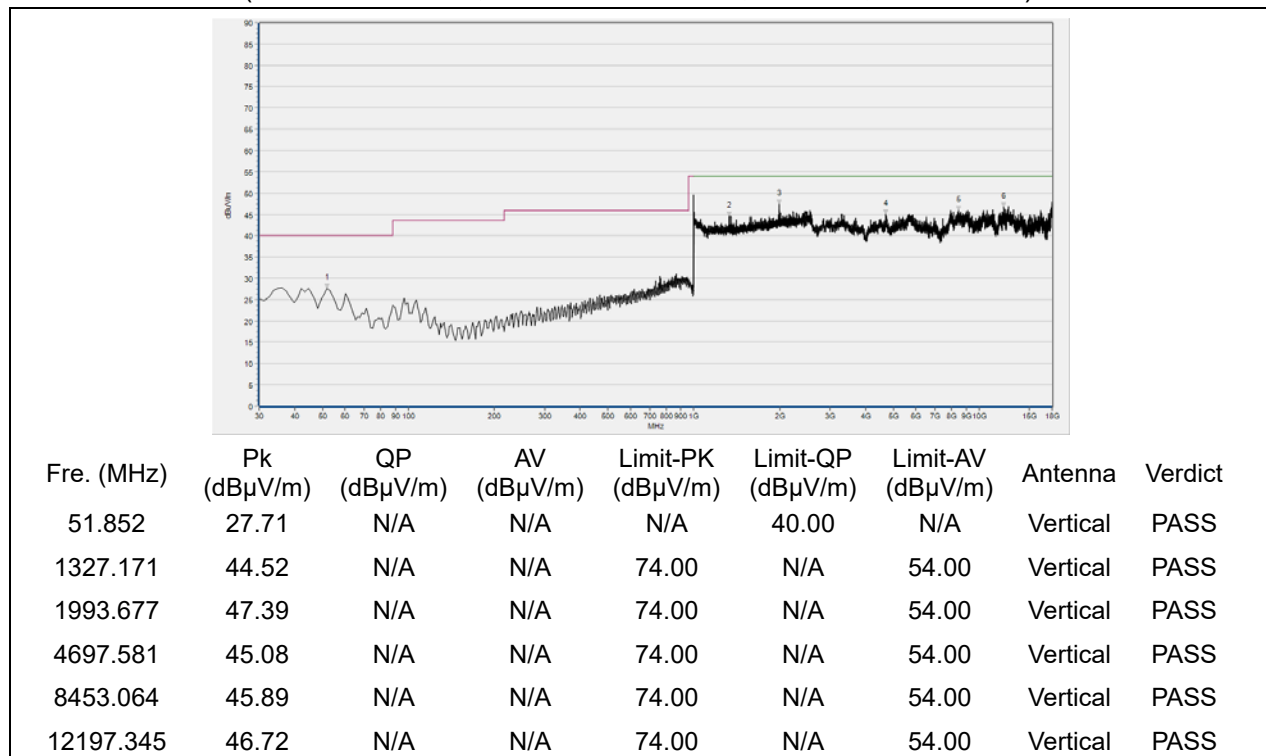
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
44.568	28.76	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1349.580	47.60	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1996.879	46.65	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4719.985	44.70	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9119.585	46.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
13096.308	47.27	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 18GHz, Antenna Vertical, 8-DPSK, channel 0)

Plot for Channel = 39

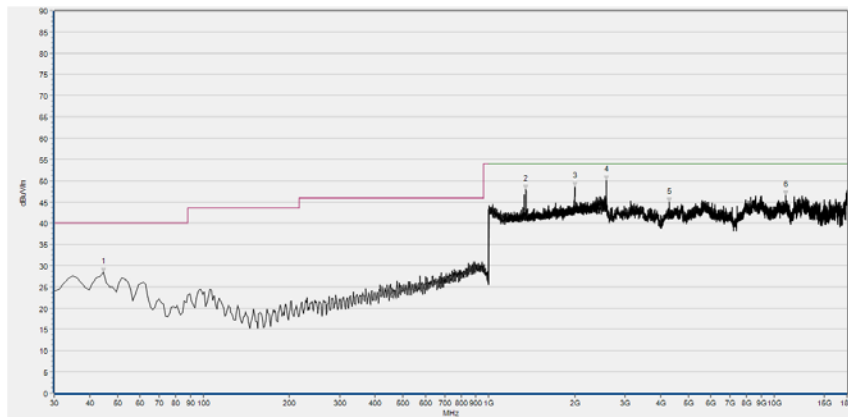


(30MHz to 18GHz, Antenna Horizontal, 8-DPSK, channel 39)



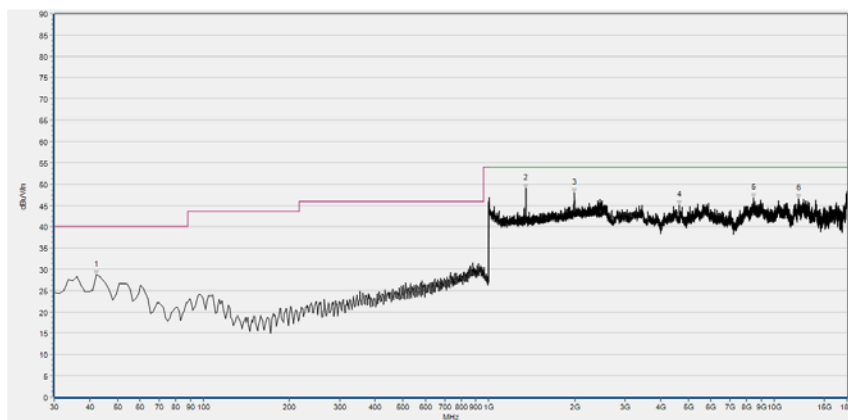
(30MHz to 18GHz, Antenna Vertical, 8-DPSK, channel 39)

Plot for Channel = 78



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
44.568	28.50	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
1349.580	47.88	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
1998.159	48.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
2583.994	50.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
4297.109	44.87	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10976.323	46.52	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 18GHz, Antenna Horizontal, 8-DPSK, channel 78)



Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
42.140	28.64	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
1349.580	49.00	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
1996.879	48.00	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4633.170	45.11	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8464.266	46.72	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12144.135	46.51	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 18GHz, Antenna Vertical, 8-DPSK, channel 78)

Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Number of Hopping Frequency	$\pm 5\%$
Peak Output Power	$\pm 2.22\text{dB}$
20dB Bandwidth	$\pm 5\%$
Carrier Frequency Separation	$\pm 5\%$
Time of Occupancy (Dwell time)	$\pm 5\%$
Conducted Spurious Emission	$\pm 2.77\text{dB}$

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Bluetooth Base Station	6K00006210	MT8852B	Anritsu	2019.04.09	2020.04.08
Directional coupler	17041703	DTO-5-30	ShangHai Huaxiang	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2019.04.09	2020.04.08
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0

**4.3 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2019.07.26	2020.07.25
Test Antenna - Bi-Log	9163-520	VULB 9163	Schwarzbeck	2019.05.08	2020.05.09
Test Antenna - Loop	1520-022	FMZB1520	Schwarzbeck	2020.02.15	2021.02.14
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2020.07.25
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2020.07.25
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2019.05.08	2020.05.09
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2019.05.08	2020.05.09
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2019.12.01	2020.11.30
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

_____ END OF REPORT _____