



REPORT No.: SZ19010009W04

TEST REPORT

APPLICANT : GN Audio USA Inc.

PRODUCT NAME : Bluetooth Stereo Headset

MODEL NAME : OTE100

BRAND NAME : Jabra

FCC ID : BCE-OTE100

STANDARD(S) : 47 CFR Part 15 Subpart C

RECEIPT DATE : 2019-01-02

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REPORT No.: SZ19010009W04

Change History		
Version	Date	Reason for change
1.0	2019-03-22	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	GN Audio USA Inc.
Applicant Address:	900 Chelmsford Street, Tower II - 8th Floor, Lowell, MA 01851, USA
Manufacturer:	FLEXTRONICS MANUFACTURING (ZHUHAI) CO., LTD.
Manufacturer Address:	Xin Qing Science & Technology Industrial Park, Jing An, Doumen, Zhuhai, P.R. China 519180

1.2. Equipment Under Test (EUT) Description

Product Name:	Bluetooth Stereo Headset	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	B.16	
Software Version:	0.2.0	
Equipment Type:	Bluetooth classic	
Modulation Type:	FHSS (GFSK(1Mbps), $\pi/4$ -DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps))	
Operating Frequency Range:	The frequency range used is 2402MHz – 2480MHz (79 channels, at intervals of 1MHz);	
Antenna Type:	PCB Antenna	
Antenna Gain:	3.75 dBi	
Accessory Information:	Battery	
	Brand Name:	N/A
	Model No.:	AHB553436TPJT
	Serial No.:	(N/A, marked #1 by test site)
	Capacity:	765.00mAh
	Rated Voltage:	3.7 V
	Charge Limit:	4.2 V

Note 1: The EUT contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies is $F(\text{MHz})=2402+1*n$ ($0 \leq n \leq 78$). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).



Note 2: The EUT connected to the serial port of the computer with a serial communication cable, 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 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3. 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
1	15.203	Antenna Requirement	N/A	N/A	PASS
2	15.247(a)	Number of Hopping Frequency	Mar 22, 2019	Zhou Zijiang	PASS
3	N/A	Duty Cycle Of Test Signal	Feb 28, 2019	Zhou Zijiang	PASS
4	15.247(b)	Maximum Peak Conducted Output Power	Feb 28, 2019	Zhou Zijiang	PASS
5	15.247(a)	20dB Bandwidth	Feb 28, 2019	Zhou Zijiang	PASS
6	15.247(a)	Carrier Frequency Separation	Mar 22, 2019	Zhou Zijiang	PASS
7	15.247(a)	Time of Occupancy (Dwell time)	Feb 28, 2019	Zhou Zijiang	PASS
8	15.247(d)	Conducted Spurious Emission	Feb 28, 2019	Zhou Zijiang	PASS
9	15.207	Conducted Emission	Feb 20, 2019	Wang Dalong	PASS
10	15.247(d)	Restricted Frequency Bands	Feb 20, 2019	Wang Dalong	PASS
11	15.209, 15.247(d)	Radiated Emission	Feb 19, 2019	Wang Dalong	PASS

Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The Ref offset 1.0dB means the cable loss is 1.0dB.



1.4. 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.

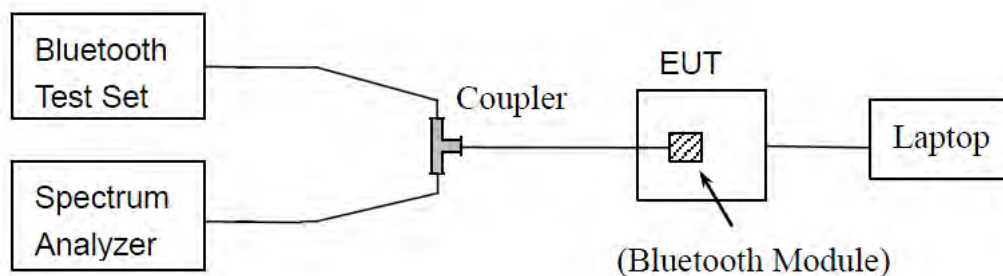
2.2. Number of Hopping Frequency

2.2.1. 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.

2.2.2. 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.

**B. Equipments List:**

Please reference ANNEX B(4).

2.2.3. 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

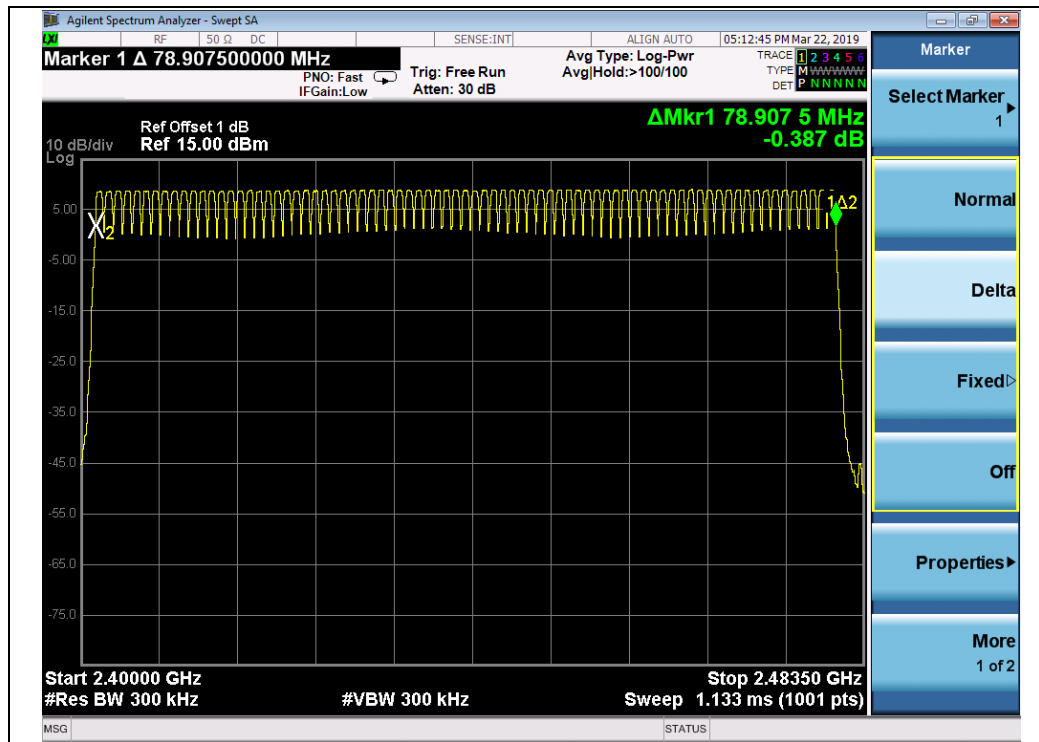
2.2.4. Test Result

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.

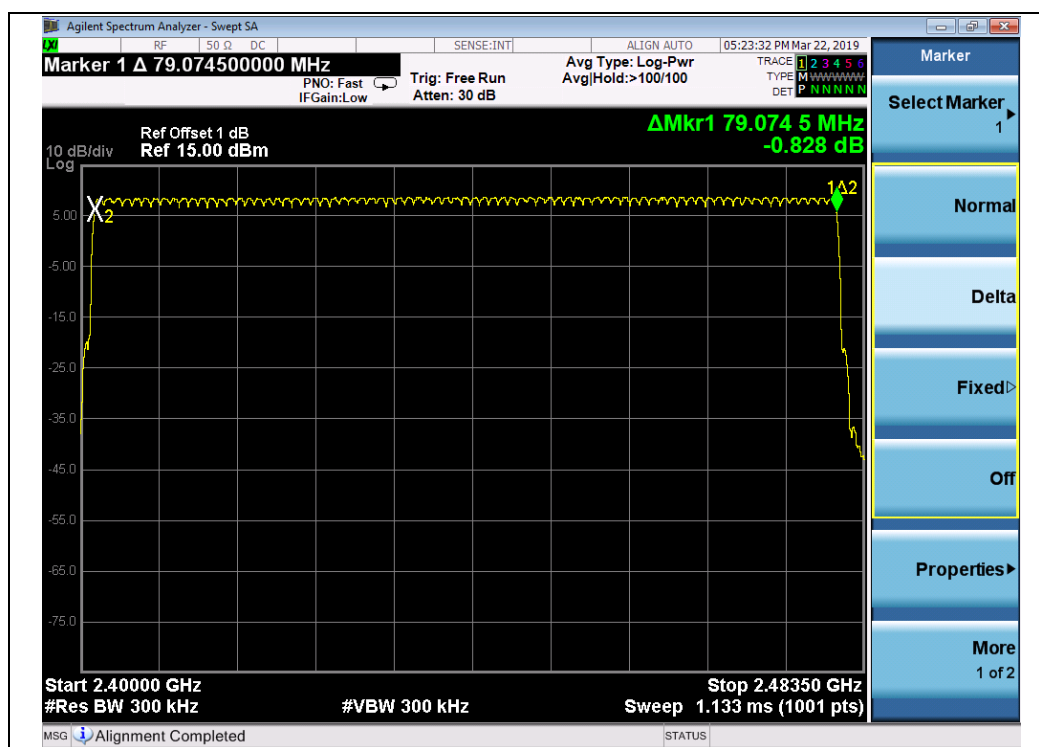
A. Test Verdict:

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

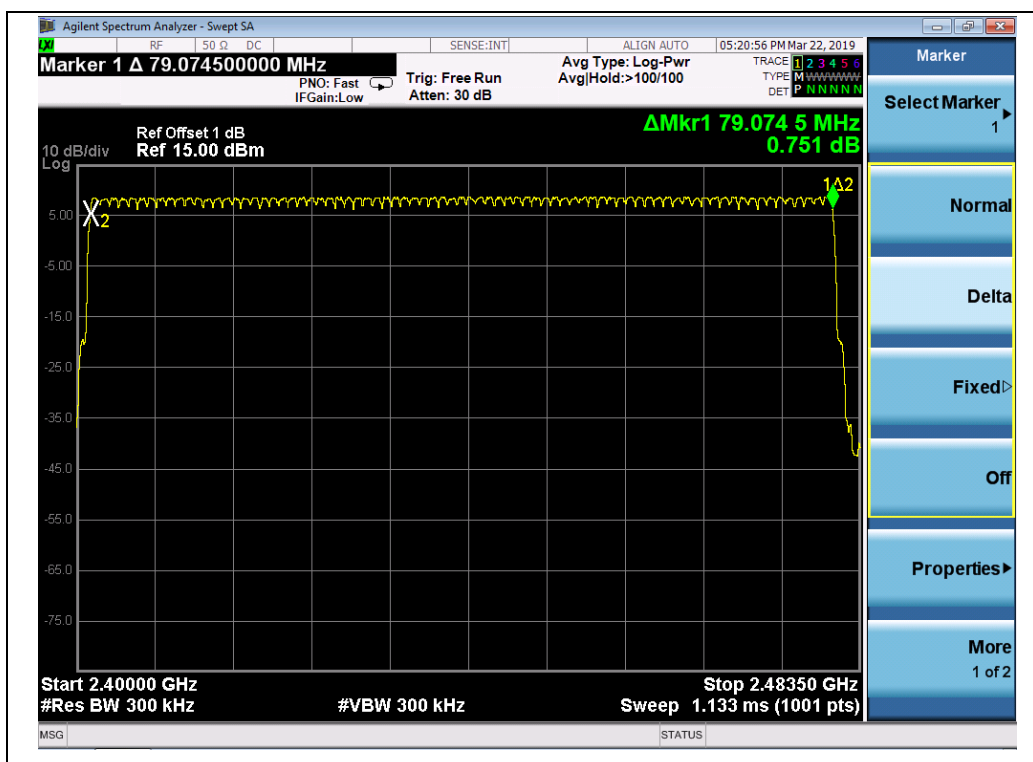
B. Test Plots:



(GFSK)



($\pi/4$ -DQPSK)



(8- DPSK)

2.3. Duty Cycle Of Test Signal

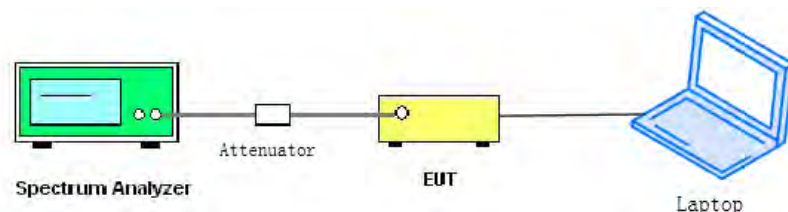
2.3.1. Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this subclause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than $\pm 2\%$; otherwise, the duty cycle is considered to be nonconstant.

2.3.2. Test Description

A. Test Set:



ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

B. Equipments List:

Please refer ANNEX B(4).

**2.3.3. Test Result****A. Test Verdict:**

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
GFSK	61.54	2.11
$\pi/4$ -DQPSK	61.54	2.11
8-DPSK	61.54	2.11

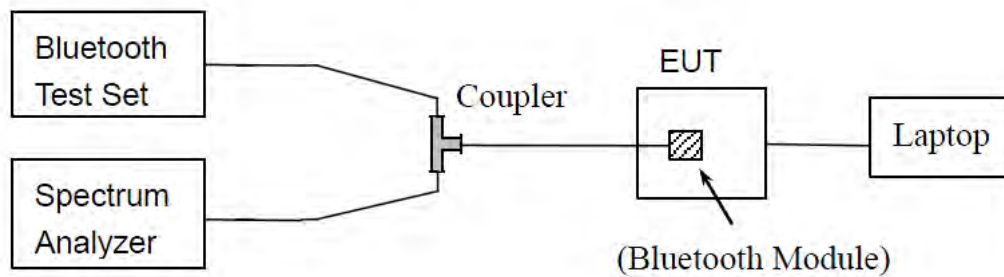
2.4. Maximum Peak Conducted Output Power

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.

B. Equipments List:

Please refer ANNEX B(4).



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

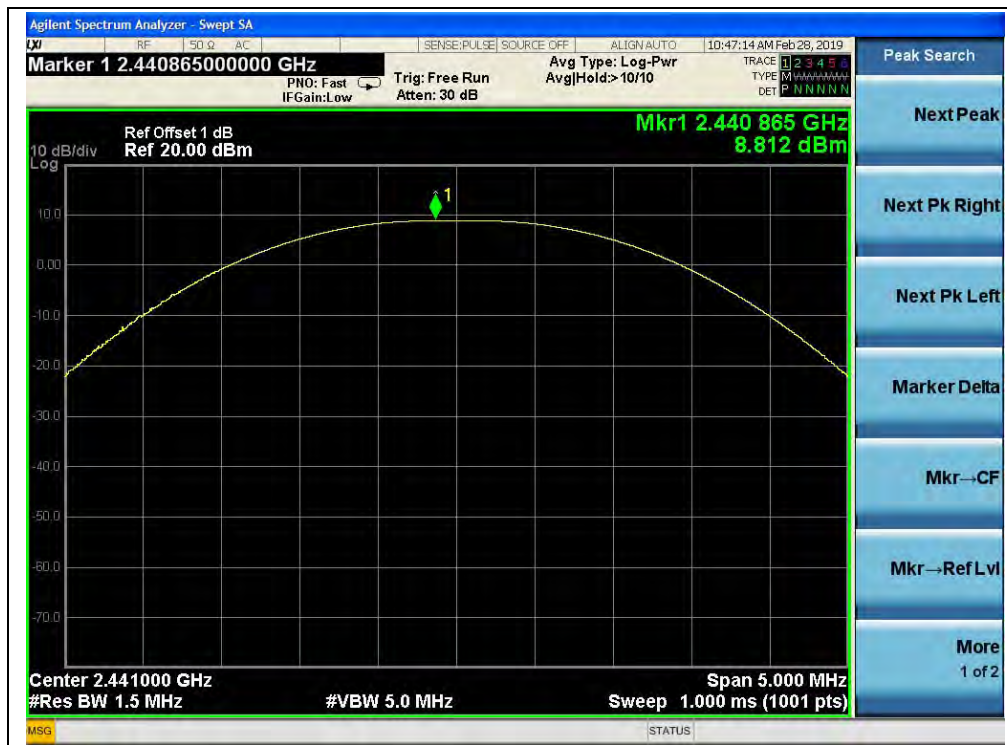
A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	8.796	0.008	20.96	0.125	PASS
39	2441	8.812	0.008			PASS
78	2480	8.718	0.007			PASS

B. Test Plots:



(GFSK, Channel 0, 2402MHz)



(GFSK, Channel 39, 2441MHz)



(GFSK, Channel 78, 2480MHz)

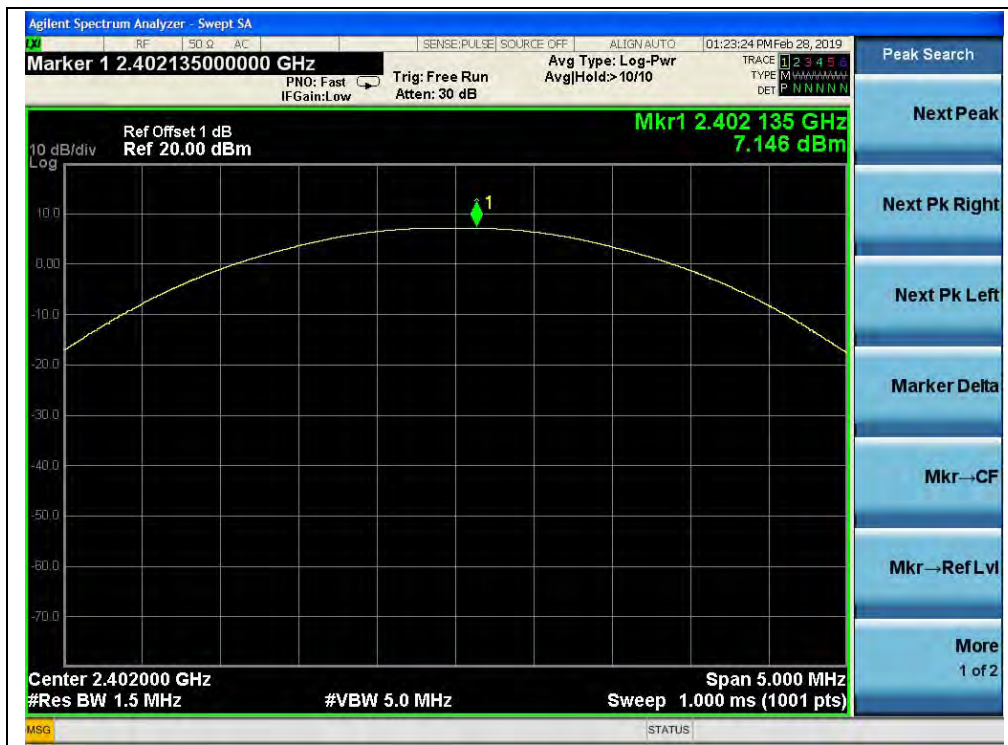


$\pi/4$ -DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Output Peak Power		Limit		Verdict
		dBm	W	dBm	W	
0	2402	7.146	0.005	20.96	0.125	PASS
39	2441	7.255	0.005			PASS
78	2480	7.175	0.005			PASS

B. Test Plots:



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



($\pi/4$ -DQPSK, Channel 39, 2441MHz)



($\pi/4$ -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	7.659	0.006	20.96	0.125	PASS
39	2441	7.824	0.006			PASS
78	2480	7.746	0.006			PASS

B. Test Plots:



(8-DPSK, Channel 0, 2402MHz)



(8-DPSK, Channel 39, 2441MHz)



(8-DPSK, Channel 78, 2480MHz)

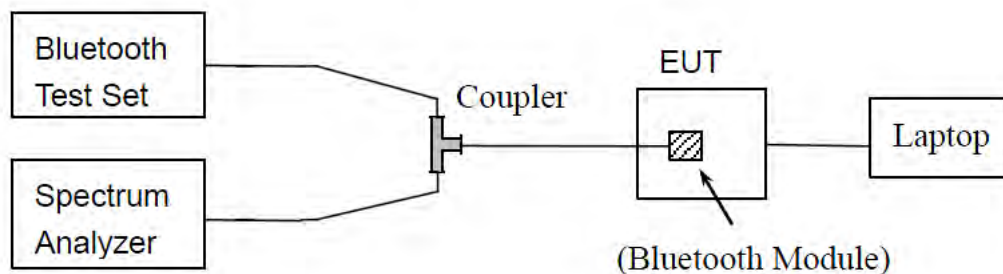
2.5.20dB Bandwidth

2.5.1. 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.

2.5.2. 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.

B. Equipments List:

Please refer ANNEX B(4).

2.5.3. 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



2.5.4. Test Result

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

GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.113	PASS
39	2441	1.112	PASS
78	2480	1.110	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	1.413	PASS
39	2441	1.411	PASS
78	2480	1.408	PASS

B. Test Plots:



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



($\pi/4$ -DQPSK, Channel 39, 2441MHz)



($\pi/4$ -DQPSK, Channel 78, 2480MHz)

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

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.401	PASS
39	2441	1.398	PASS
78	2480	1.397	PASS

B. Test Plots:

(8-DPSK, Channel 0, 2402MHz)



(8-DPSK, Channel 39, 2441MHz)



(8-DPSK, Channel 78, 2480MHz)

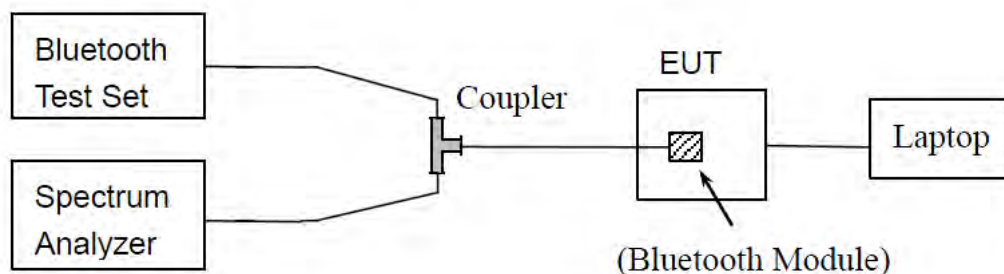
2.6. Carried Frequency Separation

2.6.1. 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.

2.6.2. 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.

B. Equipments List:

Please refer ANNEX B(4).

2.6.3. 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.

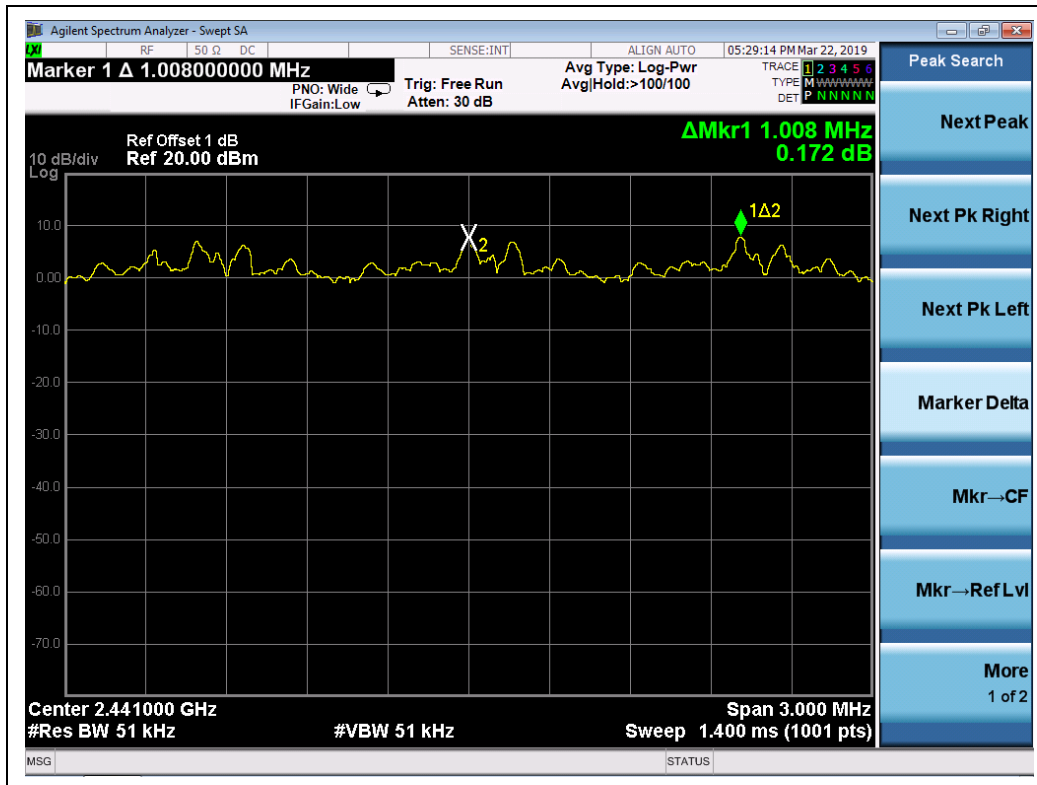
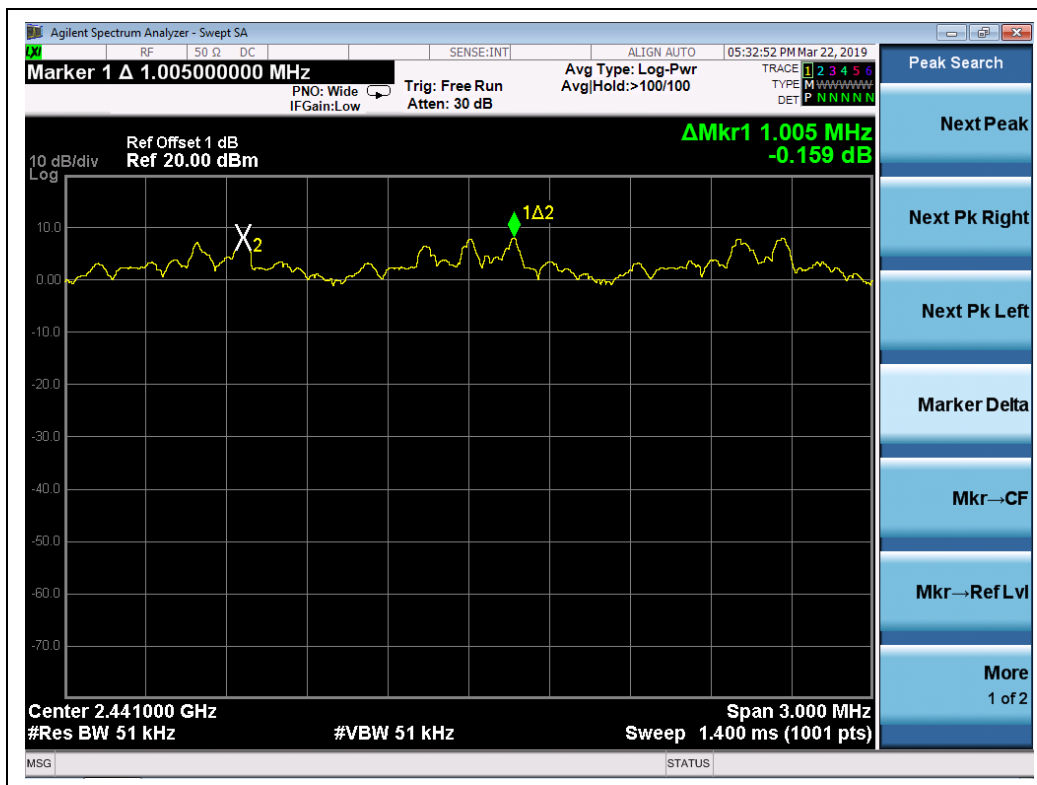
2.6.4. Test Result

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	0.960	1.110	two-thirds of the 20dB bandwidth	PASS
$\pi/4$ -DQPSK	39 and 40	1.008	1.408		PASS
8-DPSK	39 and 40	1.005	1.397		PASS



(GFSK)

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

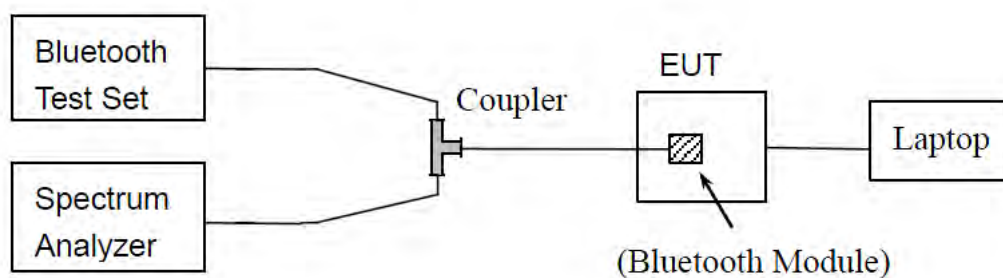
2.7. Time of Occupancy (Dwell time)

2.7.1. 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.

2.7.2. 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.

B. Equipments List:

Please refer ANNEX B(4).

2.7.3. Test Procedure

Option 1:

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

AFH Mode:

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



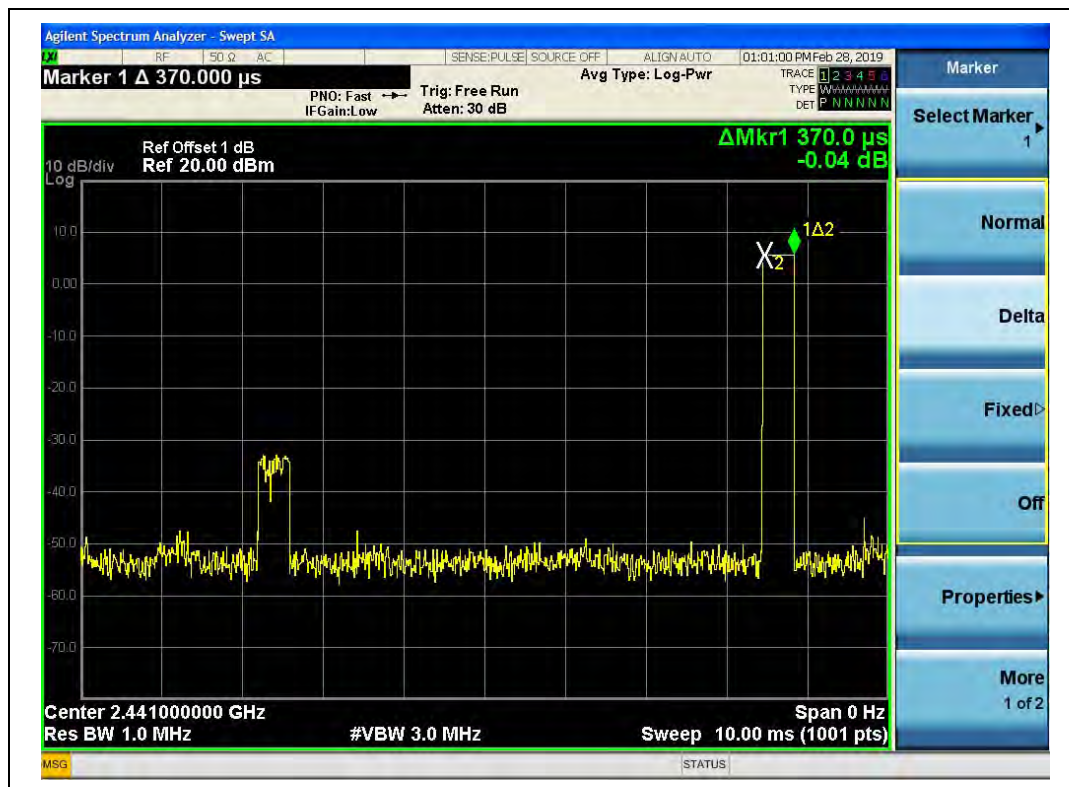
2.7.4. Test Result

GFSK Mode

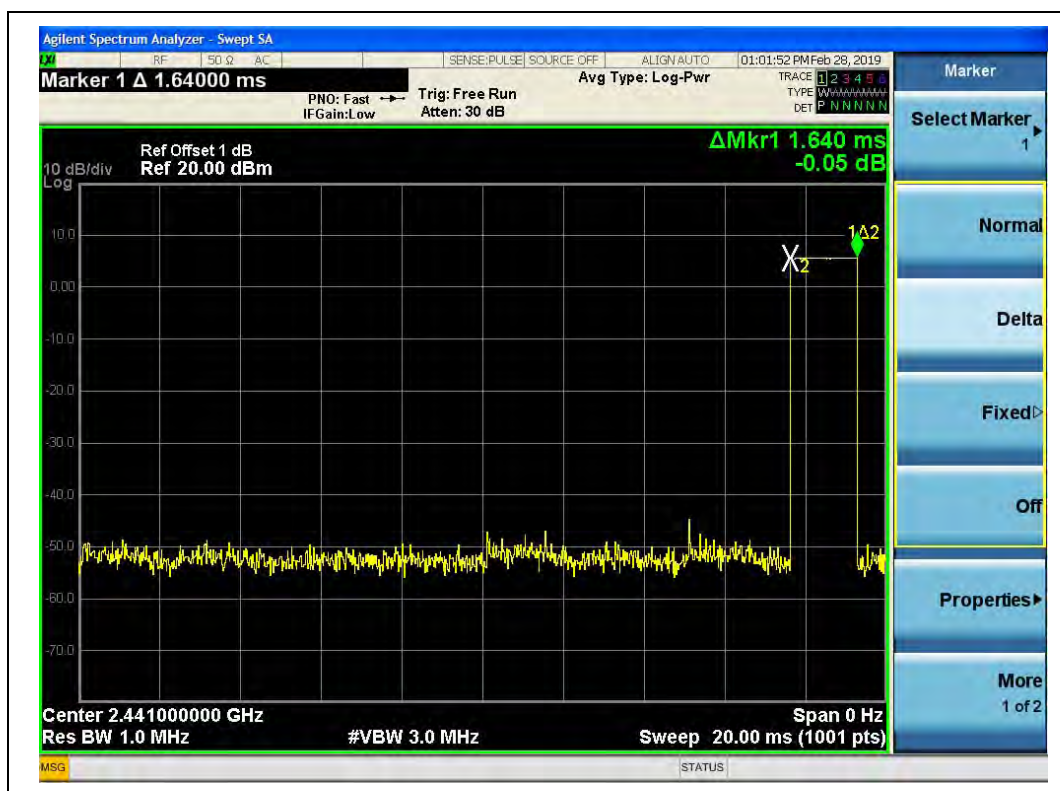
A. Test Verdict:

DH Packet	Pulse Width (ms)	Dwell Time (ms)		Limit (sec)	Verdict
		Normal Mode	AFH Mode		
DH1	0.37	118.40	59.20	0.4	PASS
DH3	1.64	262.40	131.20		PASS
DH5	2.88	307.20	153.60		PASS

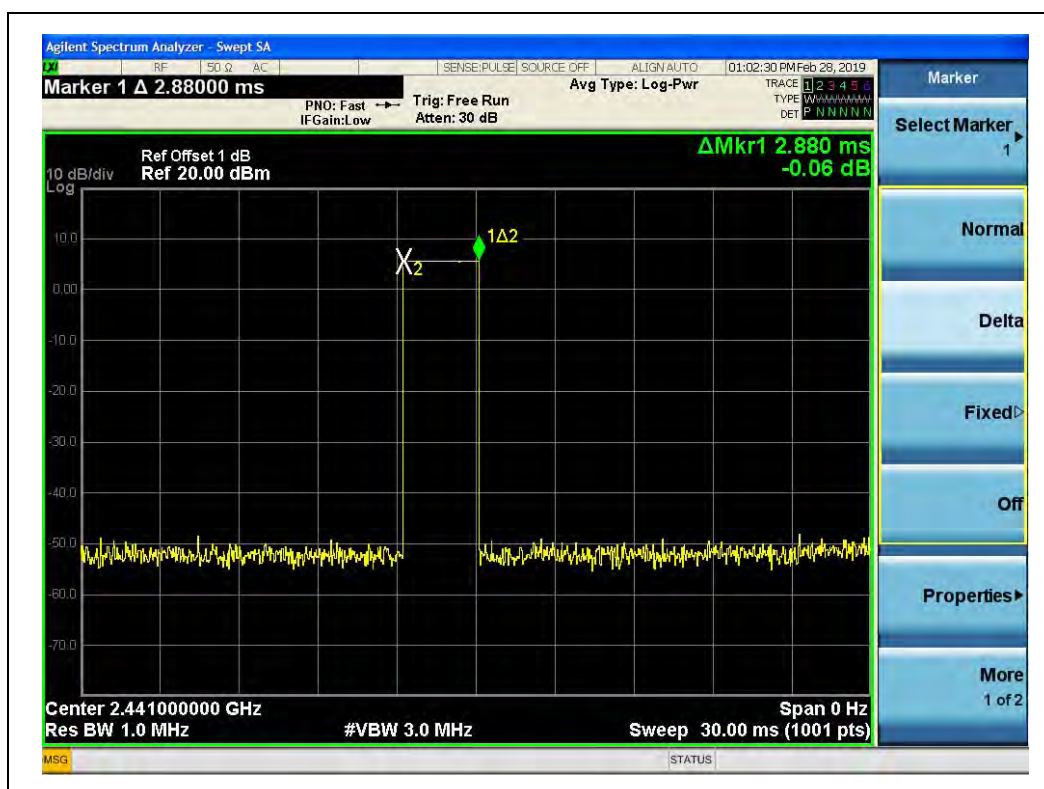
B. Test Plots:



(DH1, GFSK)



(DH3, GFSK)



(DH5, GFSK)

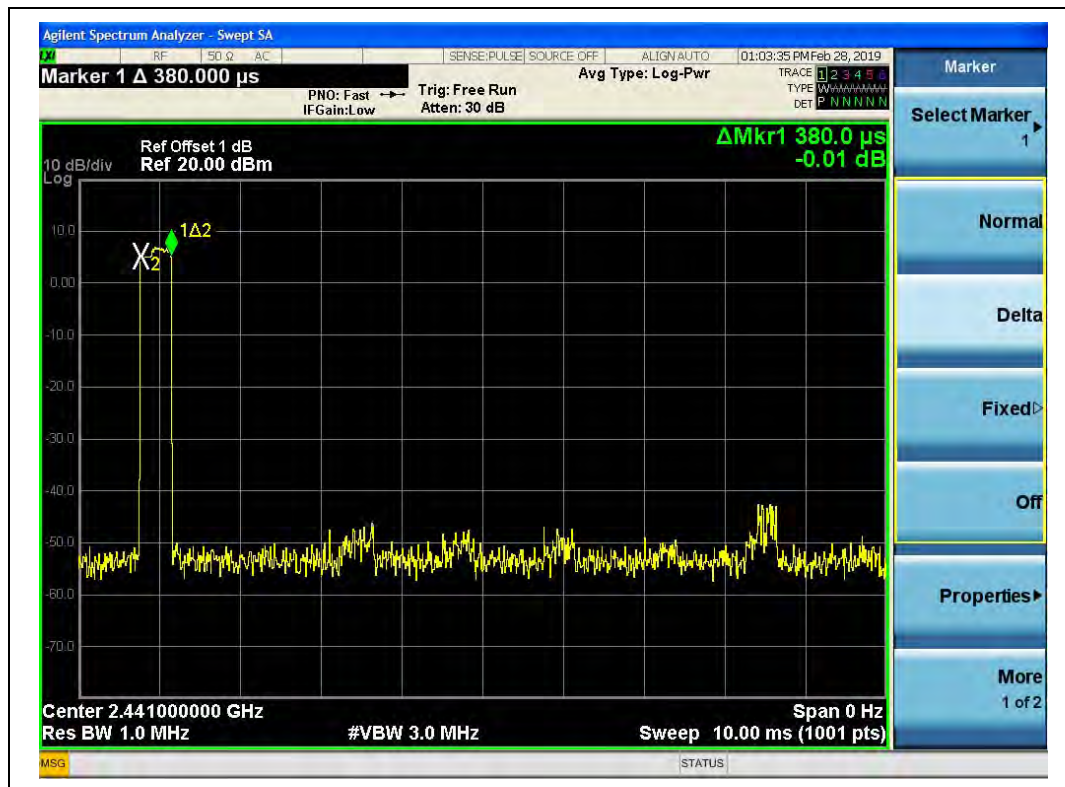


$\pi/4$ -DQPSK Mode

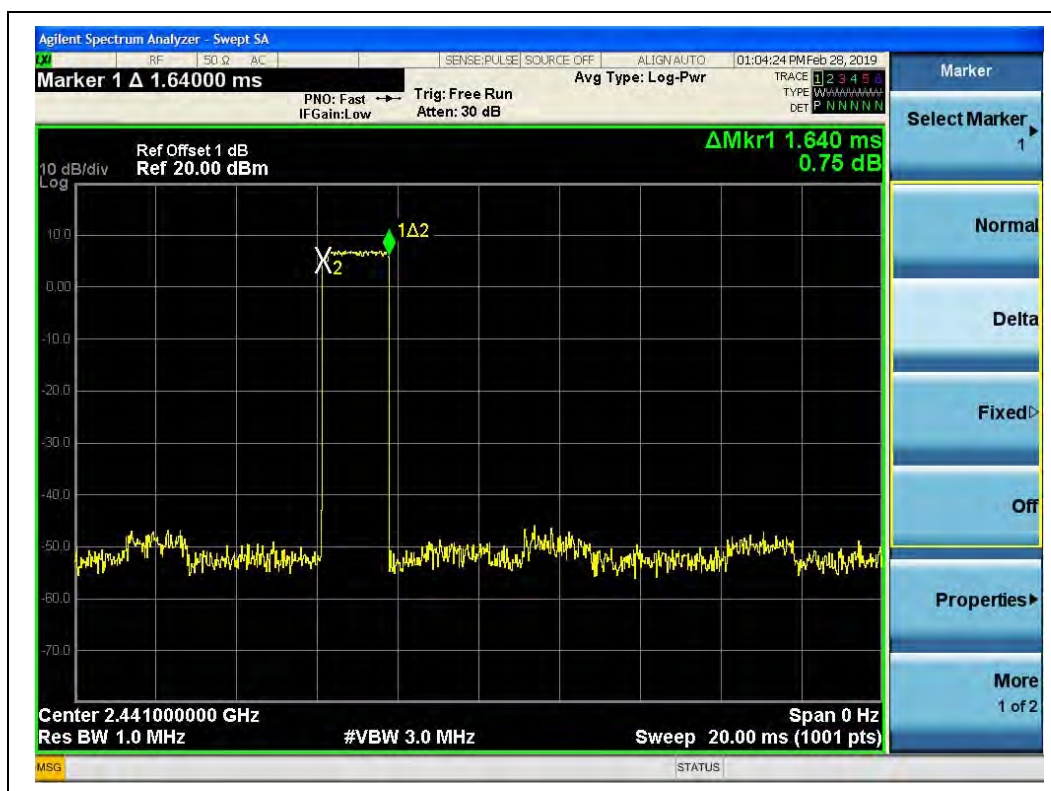
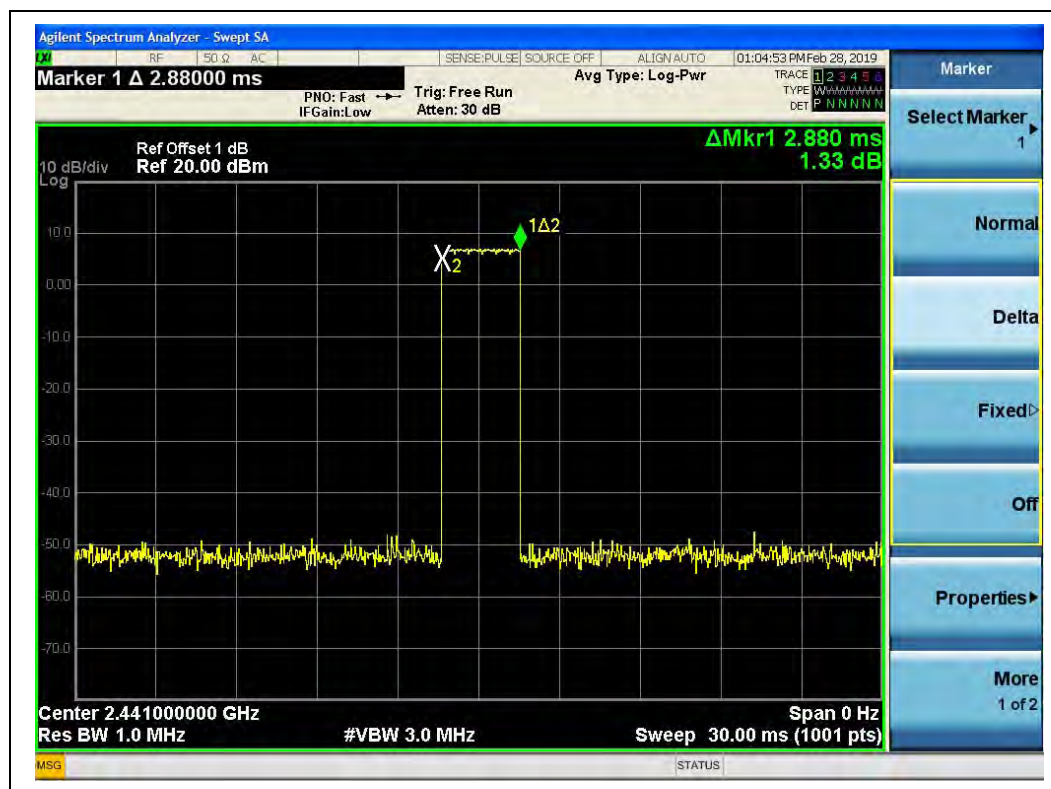
A. Test Verdict:

DH Packet	Pulse Width (ms)	Dwell Time (ms)		Limit (sec)	Verdict
		Normal Mode	AFH Mode		
DH1	0.38	121.60	60.80	0.4	PASS
DH3	1.64	262.40	131.20		PASS
DH5	2.88	307.20	153.60		PASS

B. Test Plots:



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


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

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

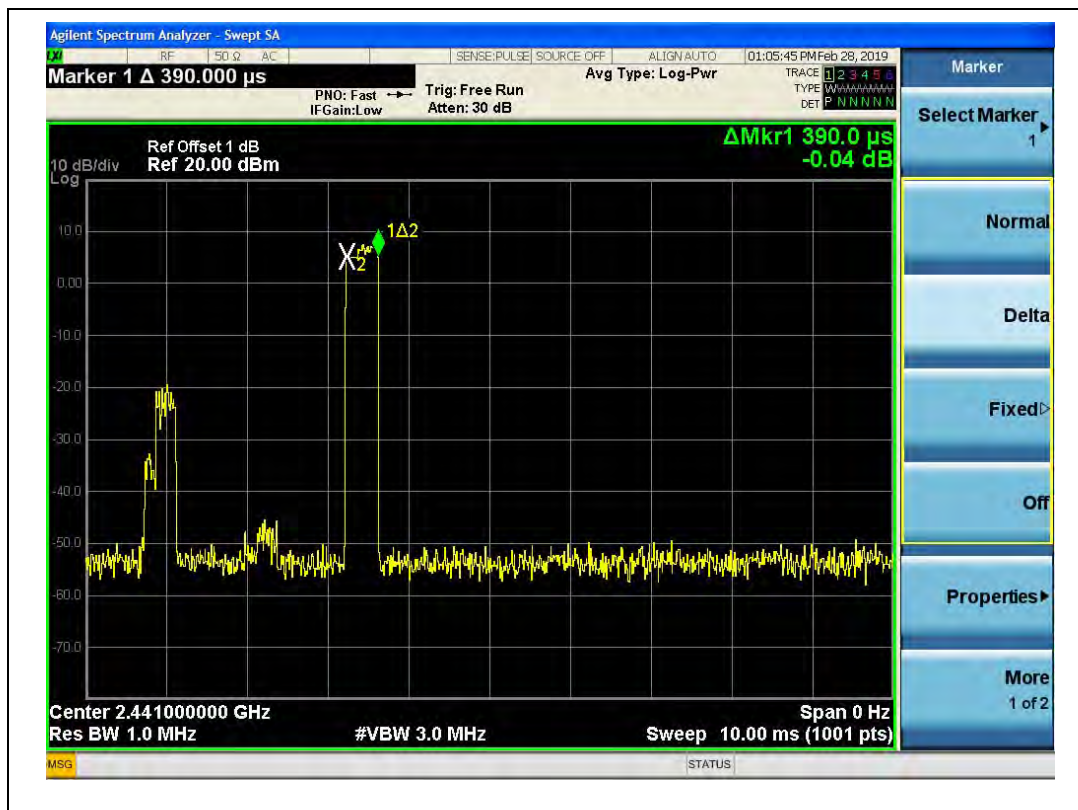


8-DPSK mode

A. Test Verdict:

DH Packet	Pulse Width (ms)	Dwell Time (ms)		Limit (sec)	Verdict
		Normal Mode	AFH Mode		
DH1	0.39	124.80	62.40	0.4	PASS
DH3	1.62	259.20	129.60		PASS
DH5	2.88	307.20	153.60		PASS

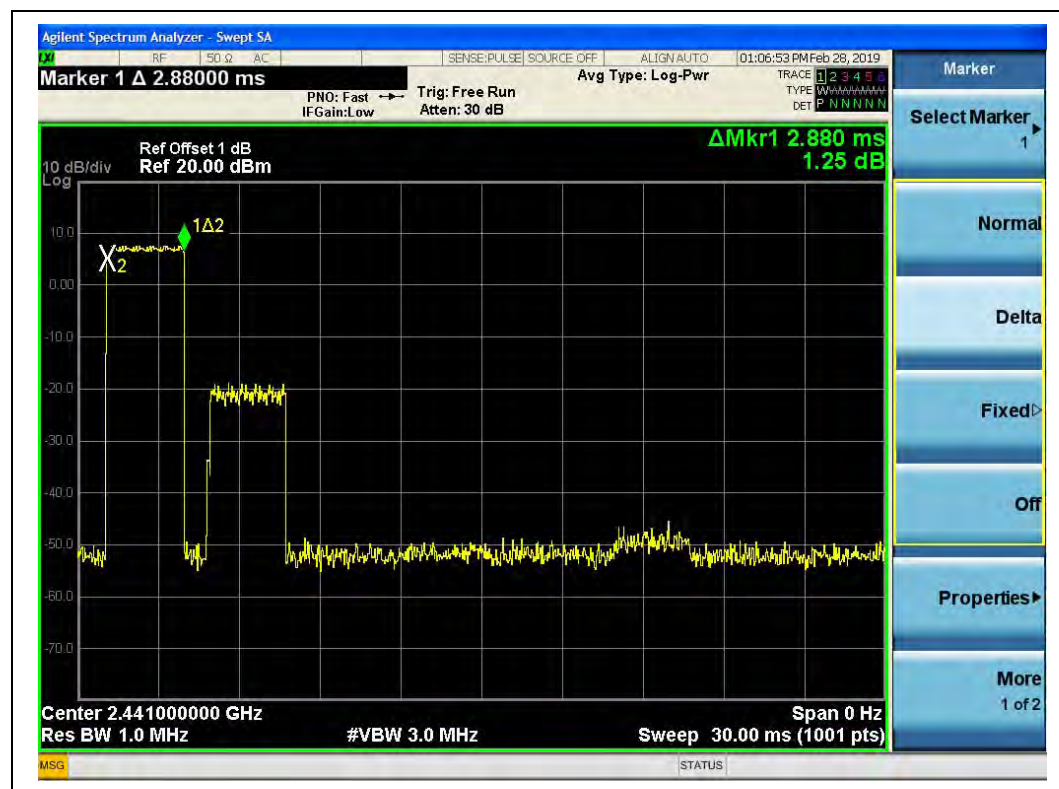
B. Test Plots:



(DH1, 8-DPSK)



(DH3, 8-DPSK)



(DH5, 8-DPSK)

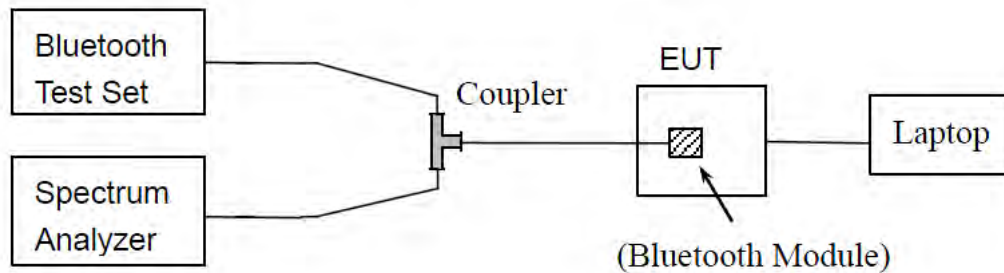
2.8. Conducted Spurious Emissions

2.8.1. 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.

2.8.2. 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.

B. Equipments List:

Please refer ANNEX B(4).

2.8.3. 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.



2.8.4. 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

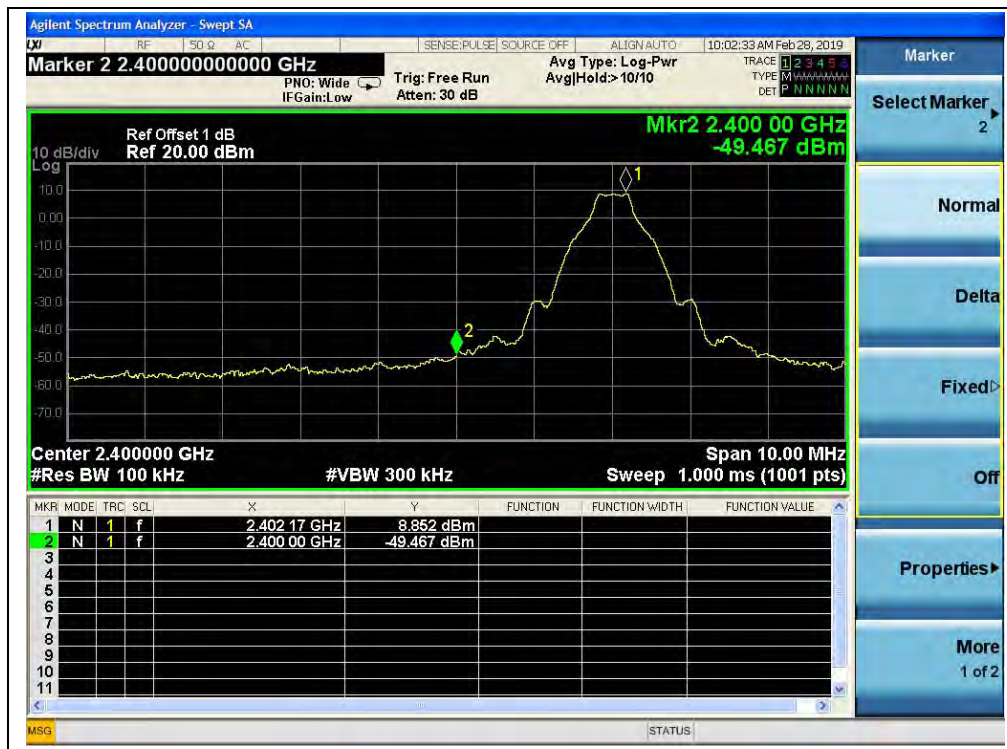
A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
0	2402	-43.42	7.74	-12.26	PASS
39	2441	-41.83	8.43	-11.57	PASS
78	2480	-43.40	8.34	-11.66	PASS

B. Test Plots:



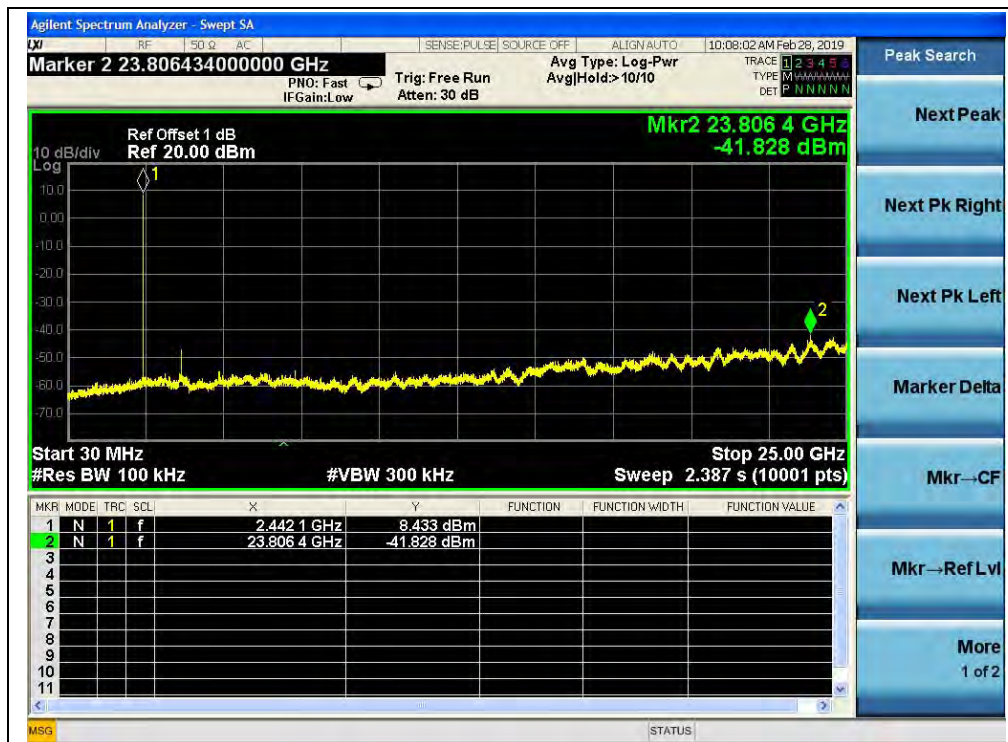
(Channel = 0, 30MHz to 25GHz, GFSK Mode)



(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)

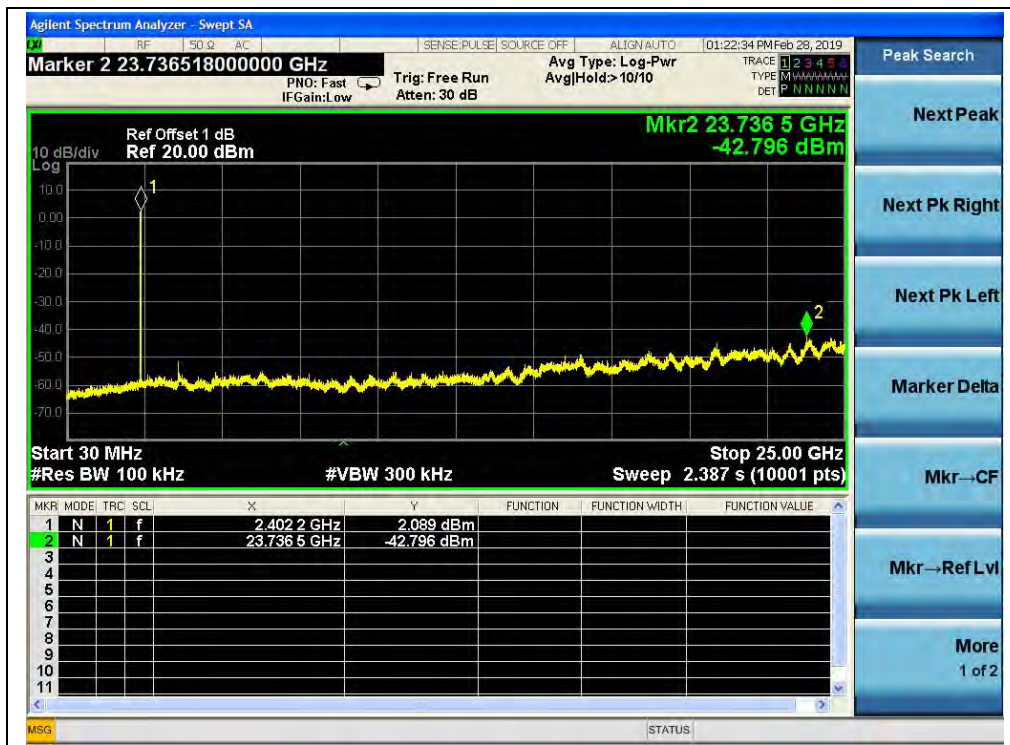


$\pi/4$ -DQPSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit (dBm)		Verdict
			Carrier Level	Calculated -20dBc Limit	
0	2402	-42.80	2.09	-17.91	PASS
39	2441	-42.90	3.23	-16.77	PASS
78	2480	-42.42	1.62	-18.38	PASS

B. Test Plots:



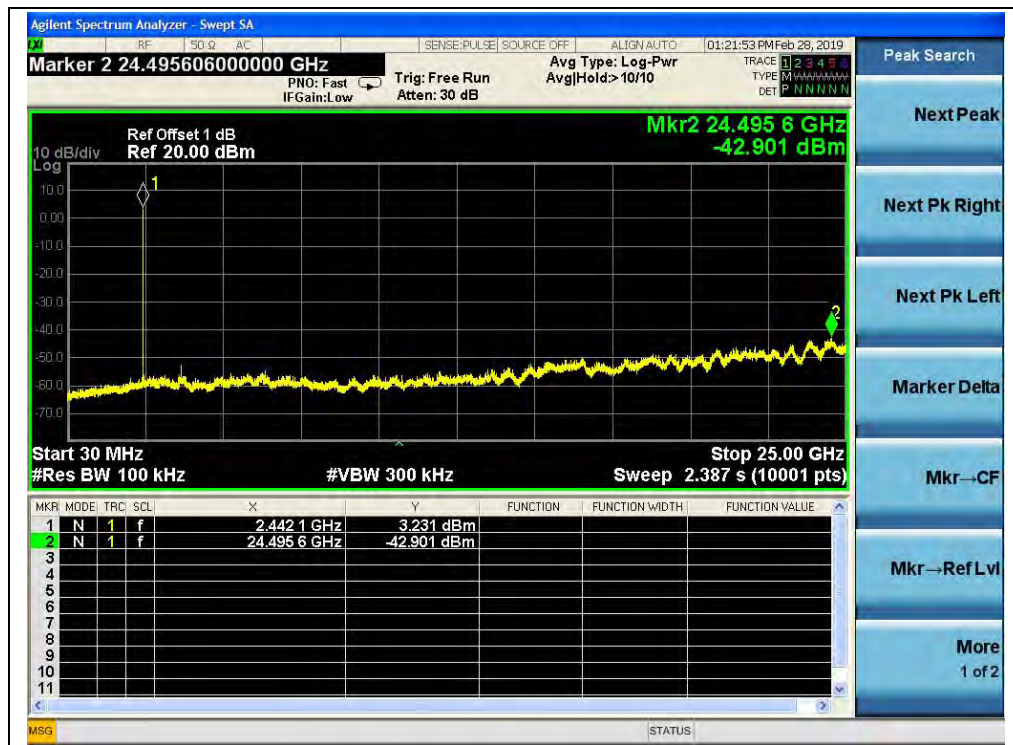
(Channel = 0, 30MHz to 25GHz, $\pi/4$ -DQPSK)



(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	-43.09	3.51	-16.49	PASS
39	2441	-45.26	3.70	-16.30	PASS
78	2480	-42.34	3.85	-16.15	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)

2.9. Conducted Emission

2.9.1. 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).

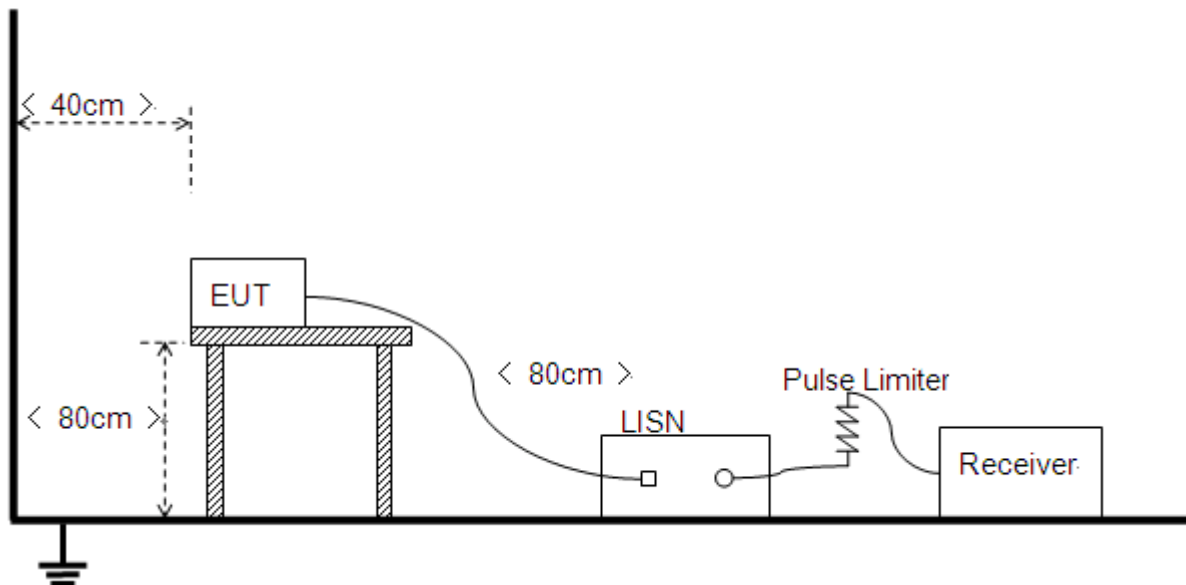
Frequency (MHz)	range	Conducted Limit (dB μ V)	
		Quai-peak	Average
0.15 - 0.50		66 to 56	56 to 46
0.50 - 5		56	46
5- 30		60	50

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.

2.9.2. 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.



The factors of the site are calibrated to correct the reading. During the measurement, the Bluetooth EUT is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX B(4).

2.9.3. Test Result

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

Test Mode: EUT+ ADAPTER+BT TX

Test voltage: AC 120V/60Hz

The measurement results are obtained as below:

$$E \text{ [dB}\mu\text{V]} = U_R + L_{\text{Cable loss}} \text{ [dB]} + A_{\text{Factor}}$$

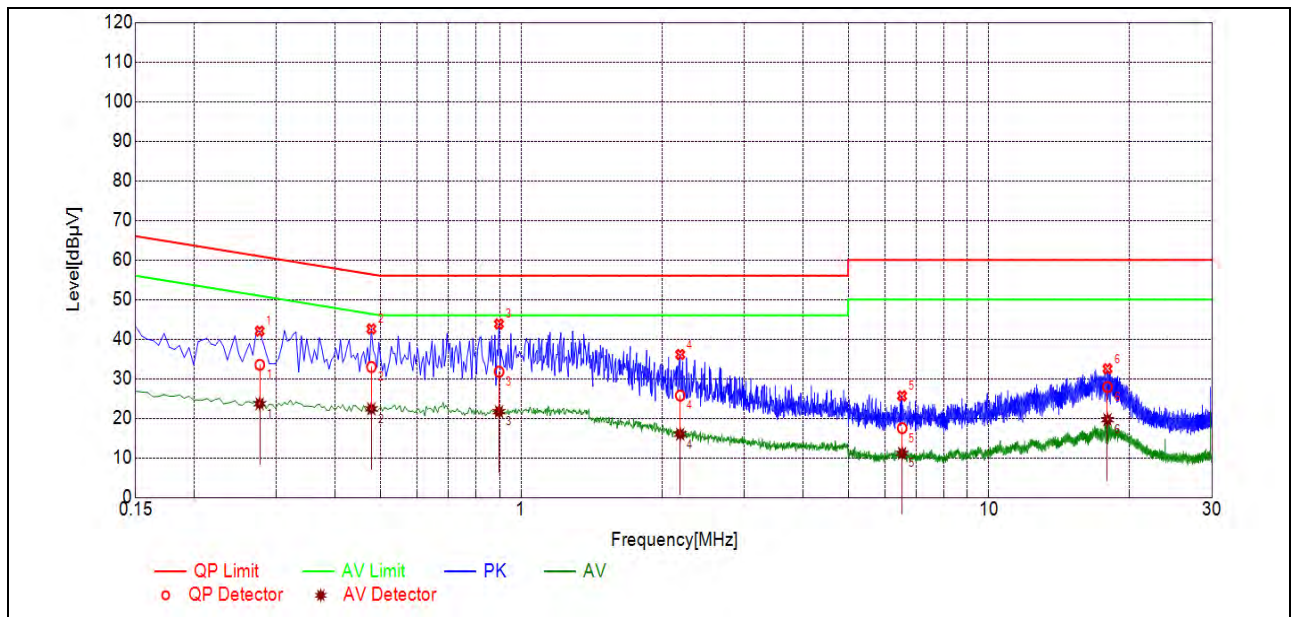
U_R : Receiver Reading

A_{Factor} : Voltage division factor of LISN



Figure 10 is a line graph showing the level [dBμV] versus frequency [MHz] for the QP and AV limits. The x-axis is logarithmic, ranging from 0.15 to 30 MHz. The y-axis is linear, ranging from 0 to 120 dBμV. The QP Limit (red line) starts at approximately 65 dBμV at 0.15 MHz, decreases to 55 dBμV at 2 MHz, and then jumps to 60 dBμV. The AV Limit (green line) starts at approximately 55 dBμV at 0.15 MHz, decreases to 45 dBμV at 2 MHz, and then jumps to 50 dBμV. The PK (blue line) and AV (green line) are noisy signals. The QP Detector (red circles) and AV Detector (black stars) are marked at various frequencies, with numbers 1 through 6 indicating specific points of interest.

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.3708	31.51	23.05	58.48	48.48	Line	PASS
2	0.7668	31.94	22.11	56.00	46.00		PASS
3	1.4228	29.61	20.72	56.00	46.00		PASS
4	4.0661	19.46	12.62	56.00	46.00		PASS
5	10.5808	23.26	15.65	60.00	50.00		PASS
6	16.8623	27.08	18.54	60.00	50.00		PASS



(N Phase)

NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.2762	33.49	23.67	60.93	50.93	Neutral	PASS
2	0.4785	32.97	22.38	56.37	46.37		PASS
3	0.8970	31.76	21.68	56.00	46.00		PASS
4	2.1881	25.74	15.99	56.00	46.00		PASS
5	6.5239	17.50	11.16	60.00	50.00		PASS
6	17.9248	27.89	19.66	60.00	50.00		PASS

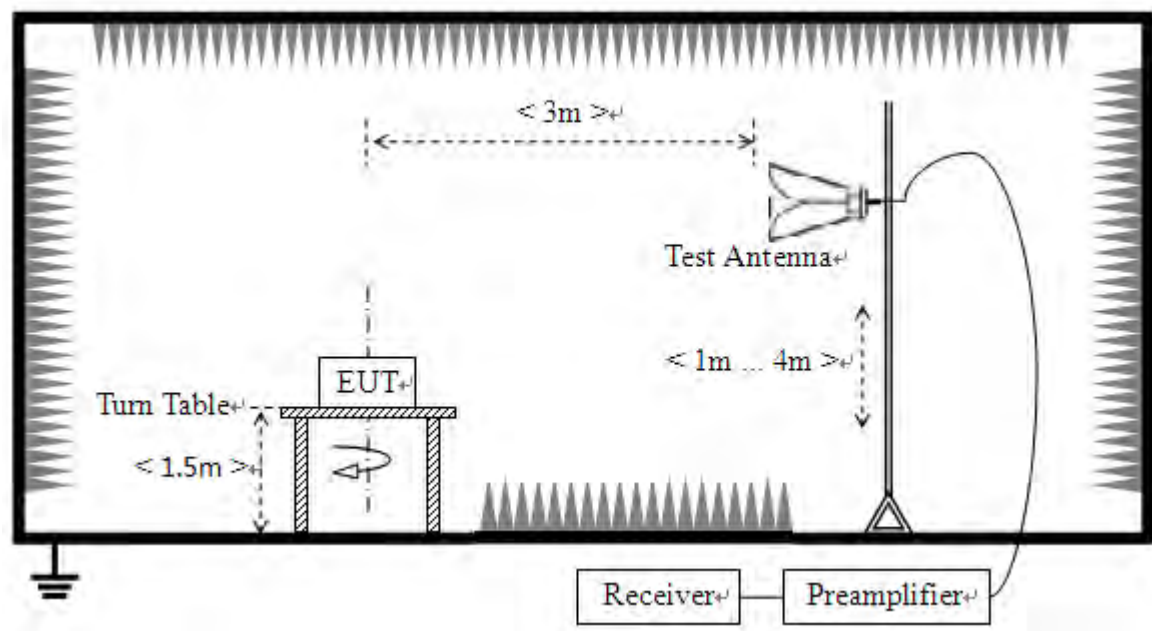
2.10. Restricted Frequency Bands

2.10.1. 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).

2.10.2. 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.

**B. Equipments List:**

Please refer ANNEX B(4).

2.10.3. 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.

2.10.4. 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

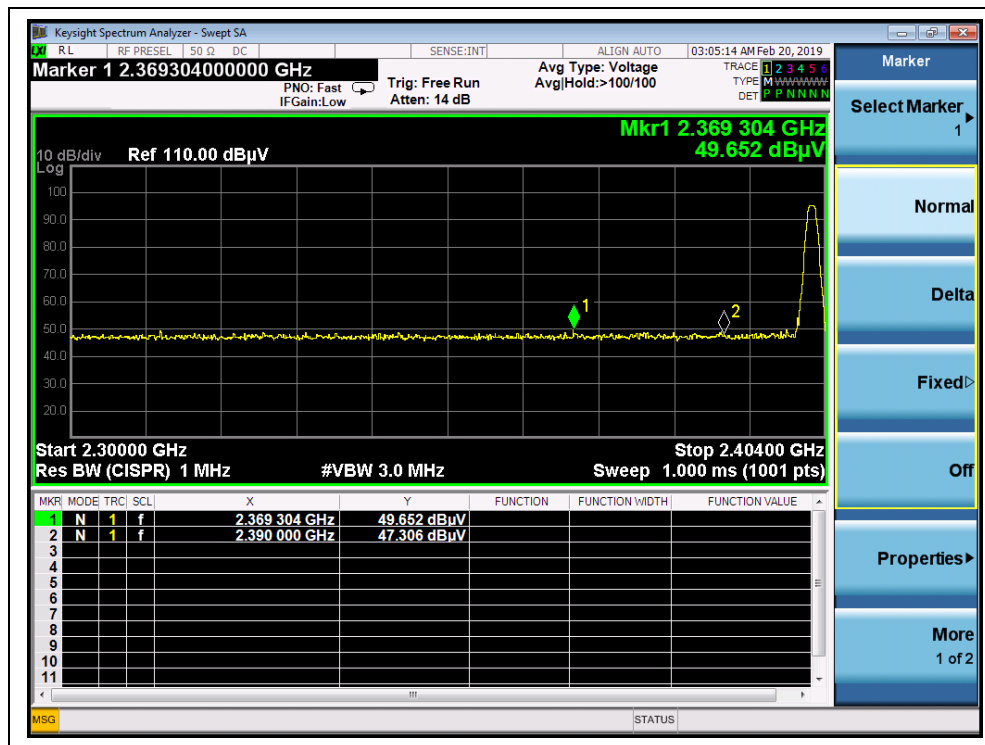
Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

GFSK Mode**A. Test Verdict:**

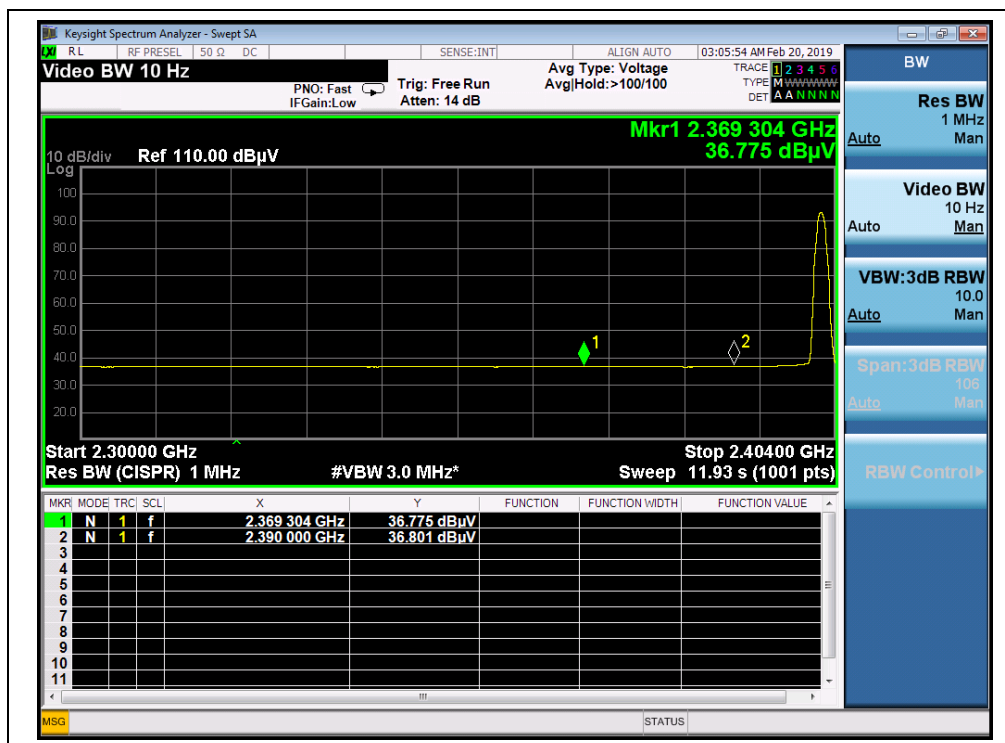
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
0	2369.30	PK	49.65	-29.67	32.56	52.54	74	PASS
0	2390.00	AV	36.80	-29.67	32.56	39.69	54	PASS
78	2492.12	PK	48.96	-29.67	32.56	51.85	74	PASS
78	2483.50	AV	36.96	-29.67	32.56	39.85	54	PASS



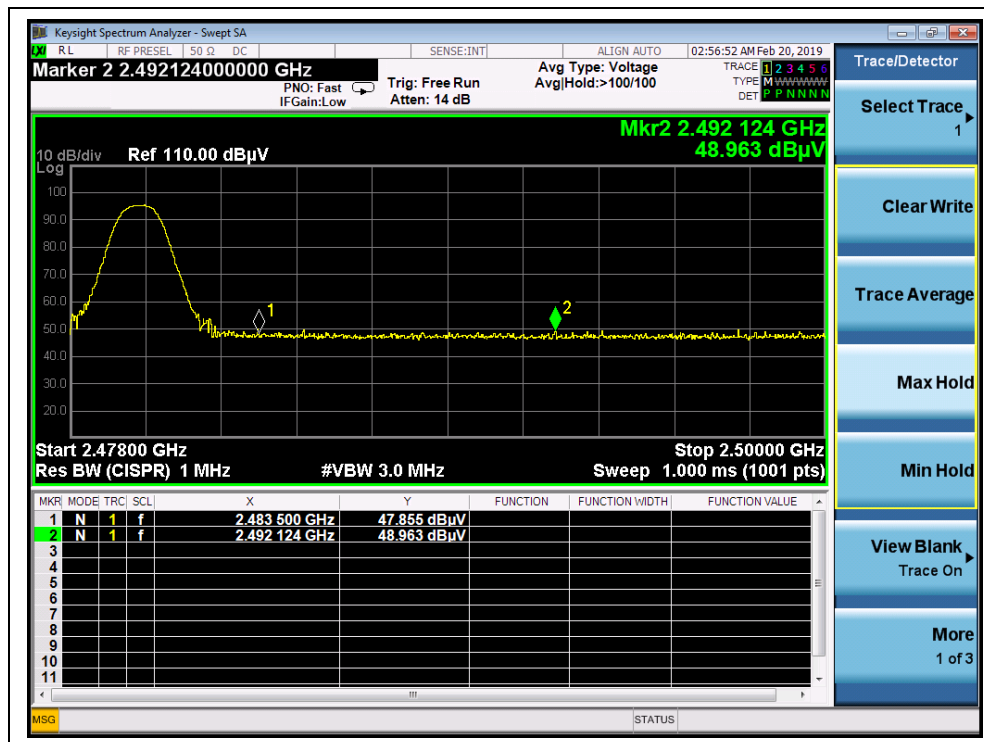
B. Test Plots:



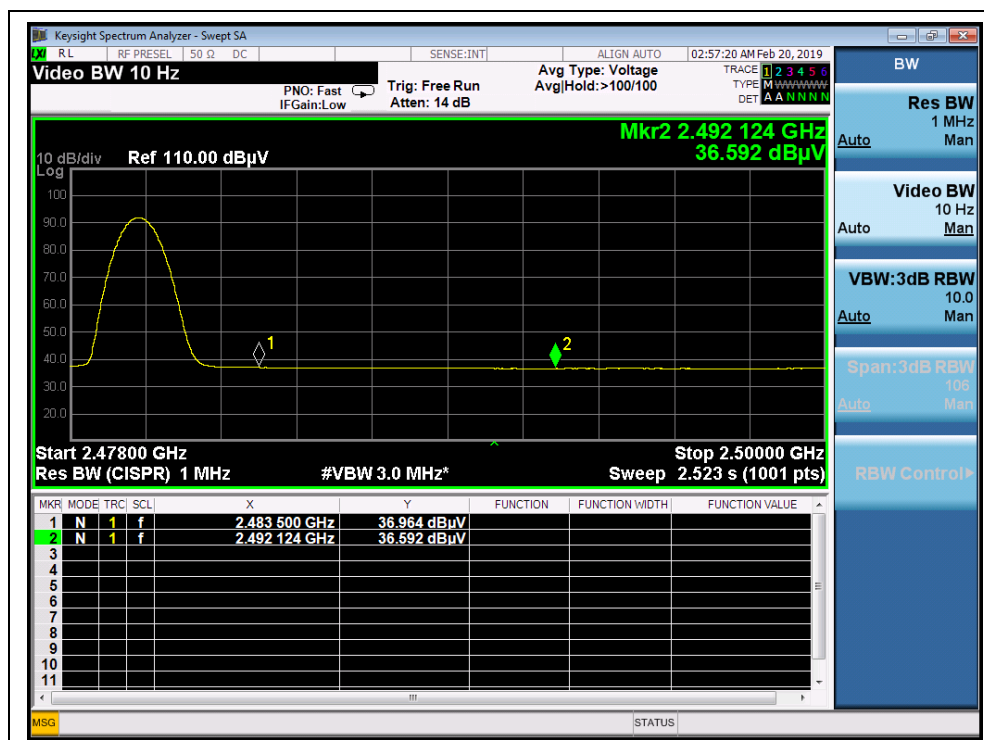
(Channel = 0, PEAK, GFSK)



(Channel = 0, AVERAGE, GFSK)



(Channel = 78, PEAK, GFSK)



(Channel = 78, AVERAGE, GFSK)

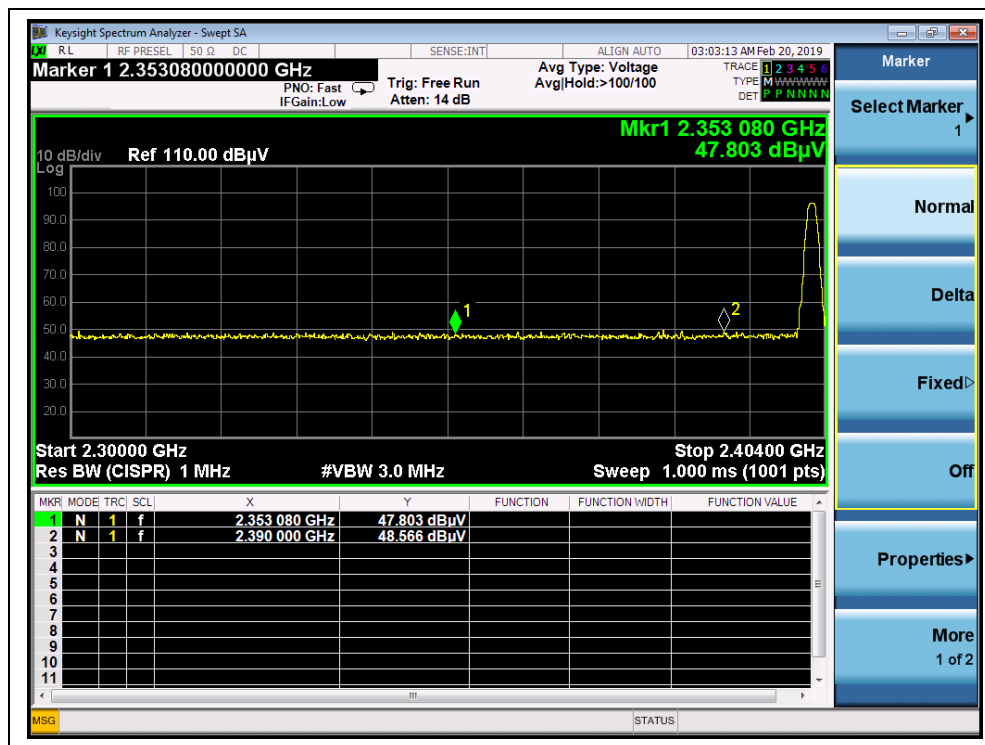


$\pi/4$ -DQPSK Mode

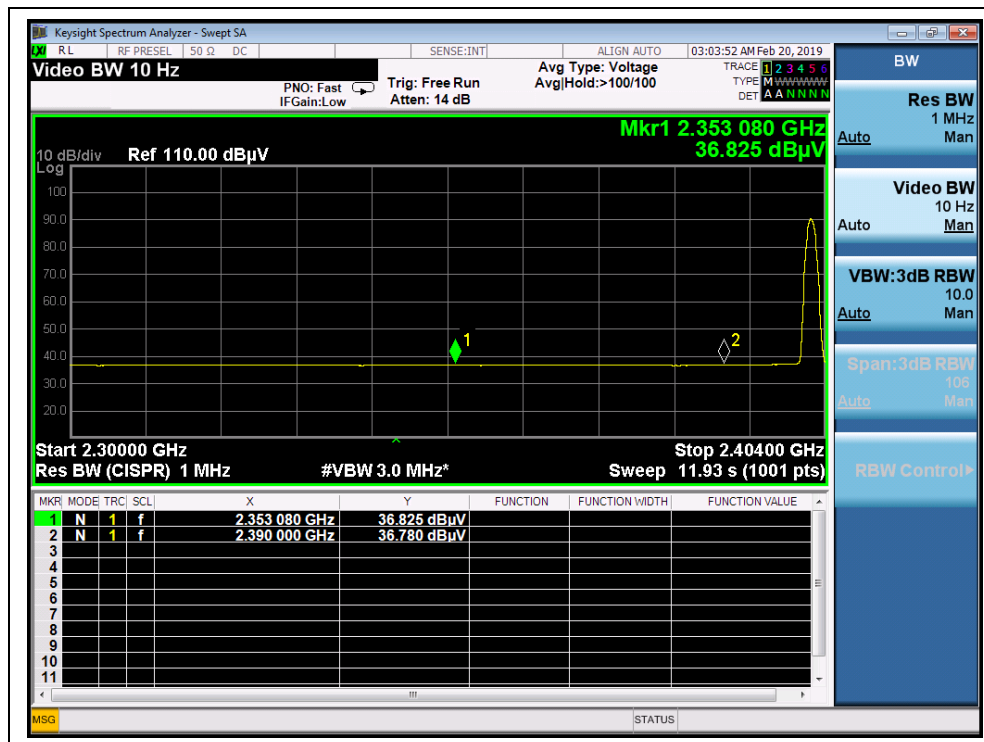
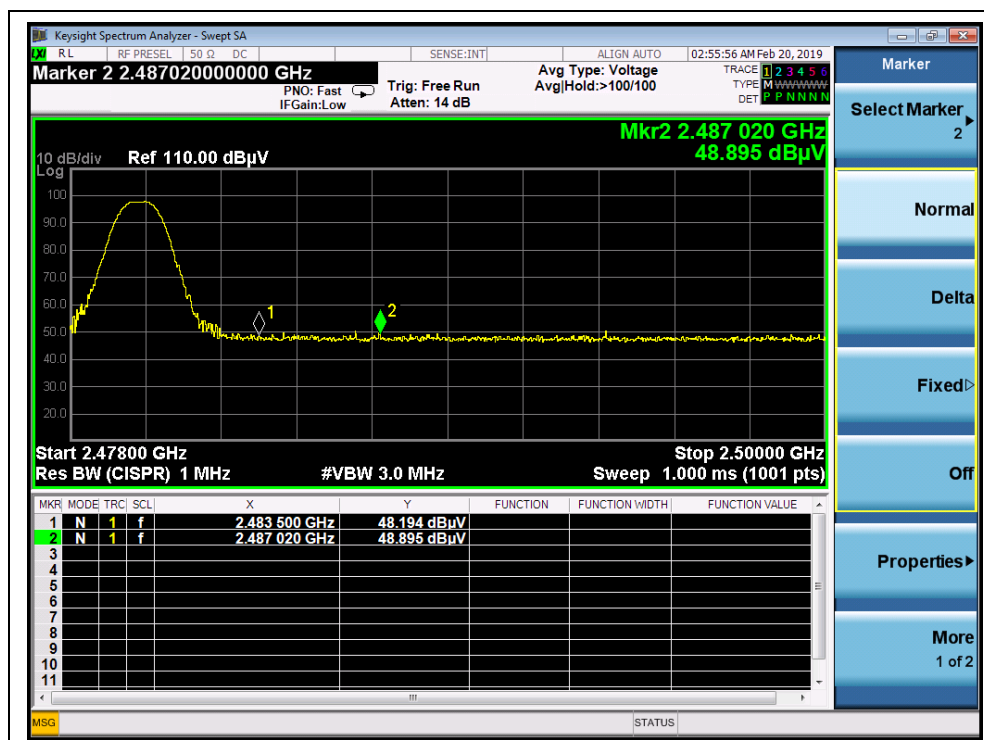
A. Test Verdict:

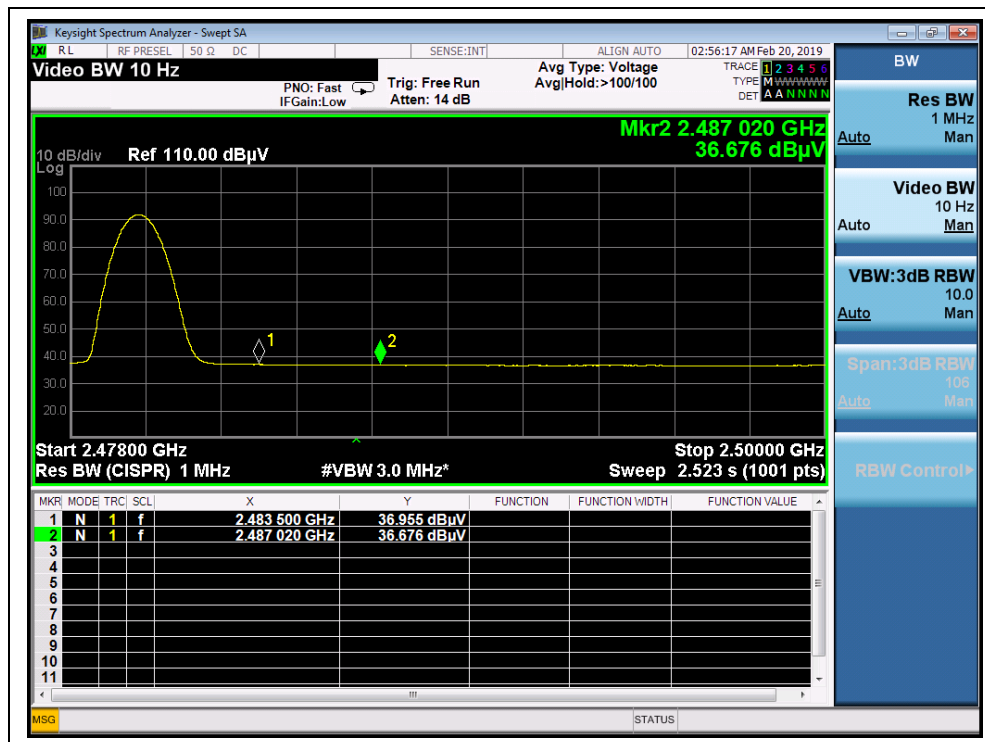
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBuV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dB μ V/m)	Limit (dB μ V/m)	Verdict
		PK/ AV						
0	2390.00	PK	48.57	-29.67	32.56	51.46	74	PASS
0	2353.08	AV	36.83	-29.67	32.56	39.72	54	PASS
78	2487.02	PK	48.90	-29.67	32.56	51.79	74	PASS
78	2483.50	AV	36.96	-29.67	32.56	39.85	54	PASS

B. Test Plots:



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

(Channel = 0, AVERAGE, $\pi/4$ -DQPSK)(Channel = 78, PEAK, $\pi/4$ -DQPSK)



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

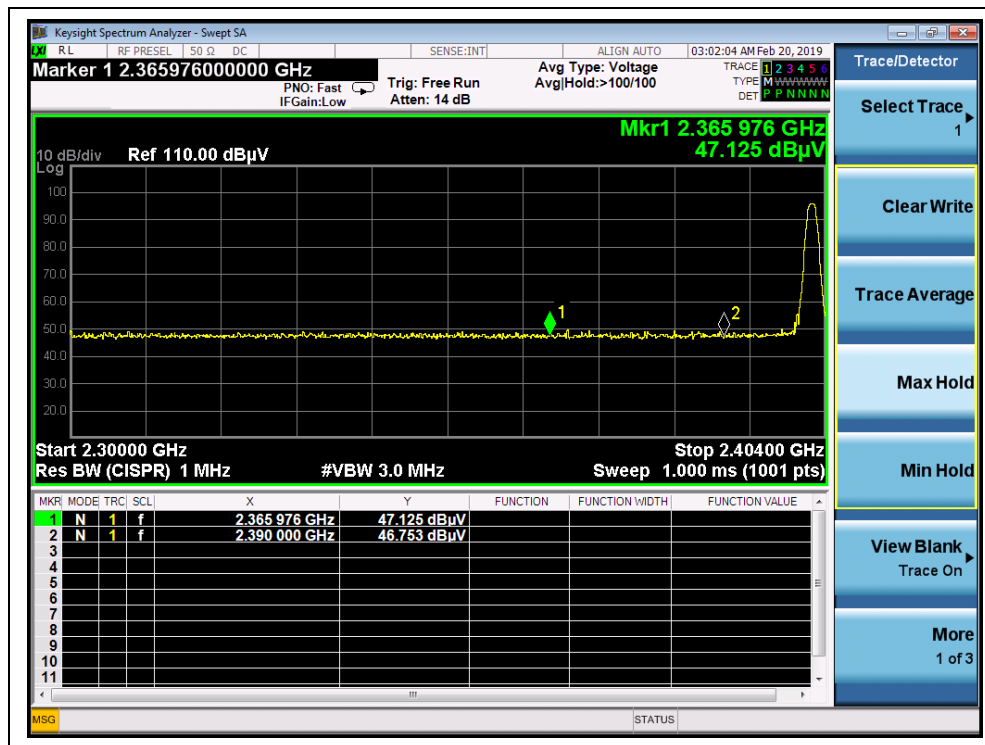
8-DPSK Mode

A. Test Verdict:

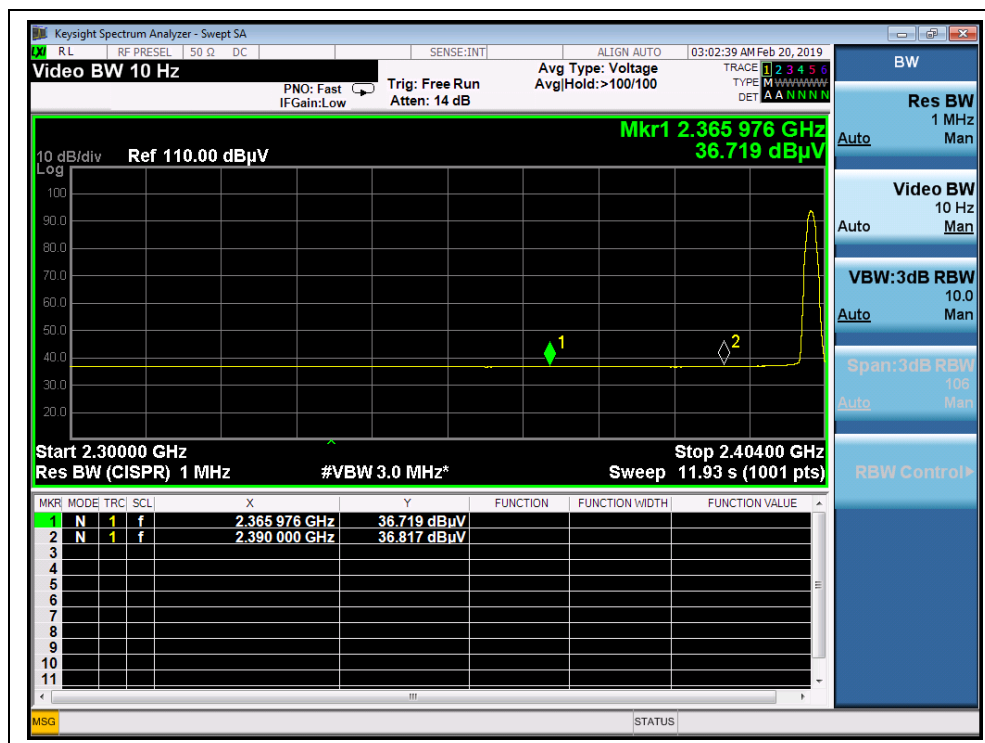
Channel	Frequency (MHz)	Detector	Receiver Reading U_R (dBμV)	A_T (dB)	A_{Factor} (dB@3m)	Max. Emission E (dBμV/m)	Limit (dBμV/m)	Verdict
		PK/ AV						
0	2365.98	PK	47.13	-29.67	32.56	50.02	74	PASS
0	2390.00	AV	36.82	-29.67	32.56	39.71	54	PASS
78	2487.15	PK	49.11	-29.67	32.56	52.00	74	PASS
78	2483.50	AV	37.09	-29.67	32.56	39.98	54	PASS



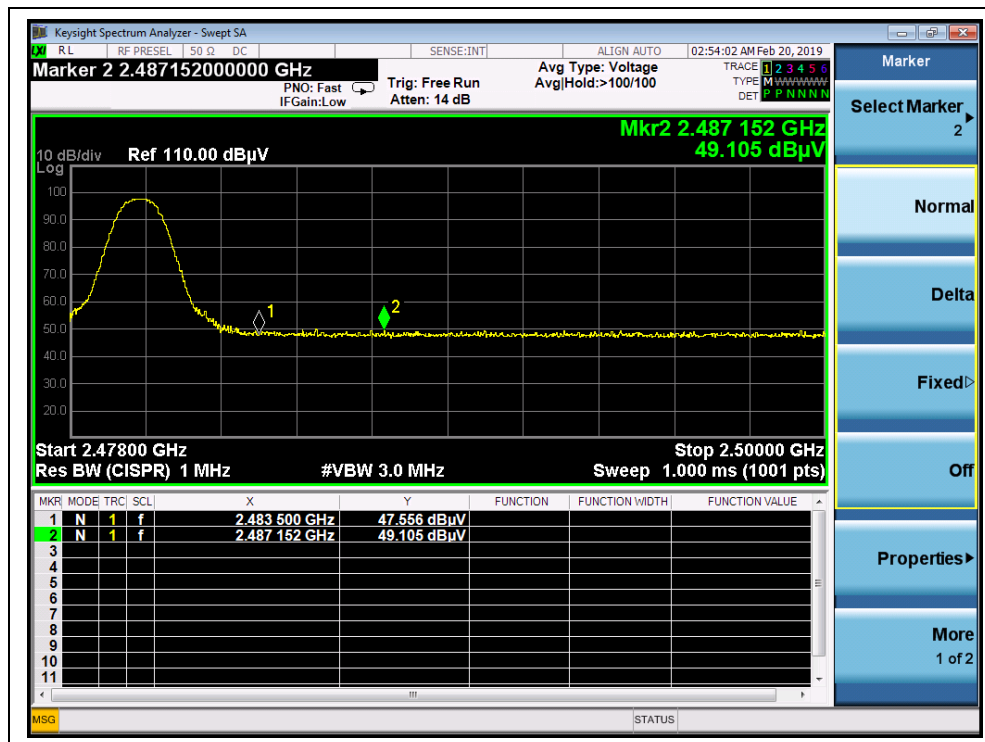
B. Test Plots:



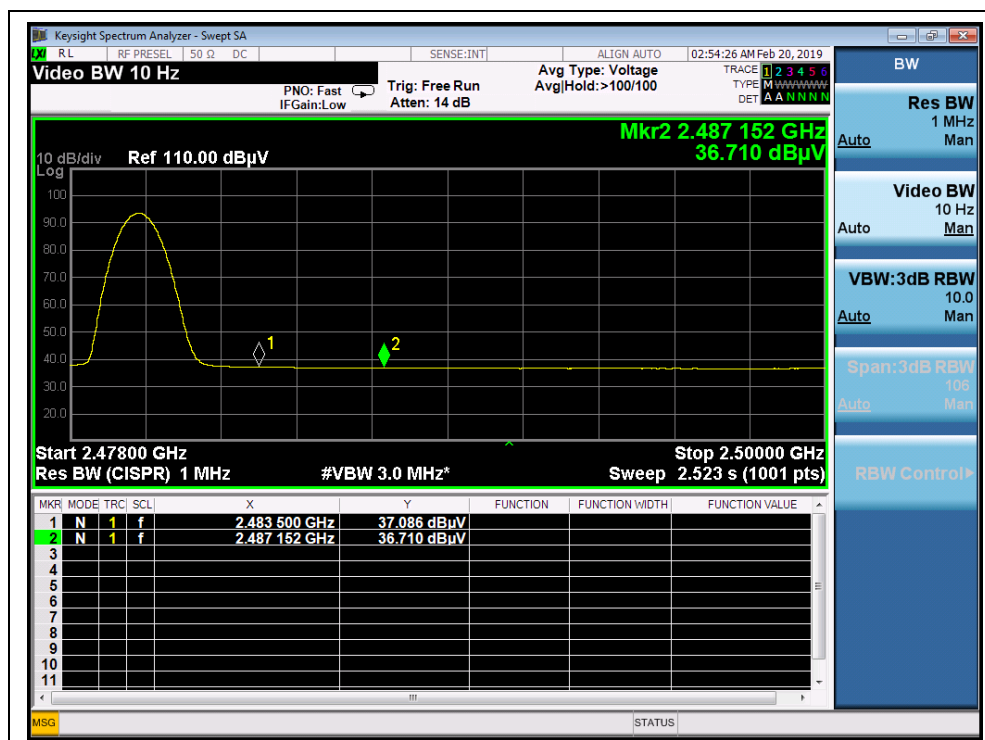
(Channel = 0, PEAK, 8-DPSK)



(Channel = 0, AVERAGE, 8-DPSK)



(Channel = 78, PEAK, 8-DPSK)



(Channel = 78, AVERAGE, 8-DPSK)

2.11. Radiated Emission

2.11.1. 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:

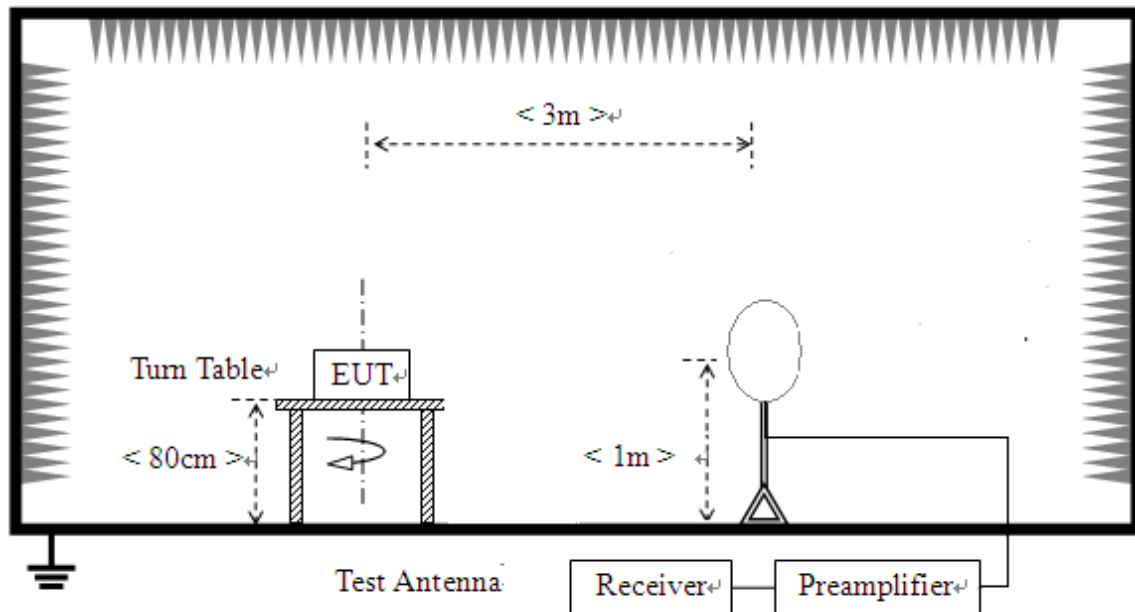
1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
2. For above 1000MHz, limit field strength 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)

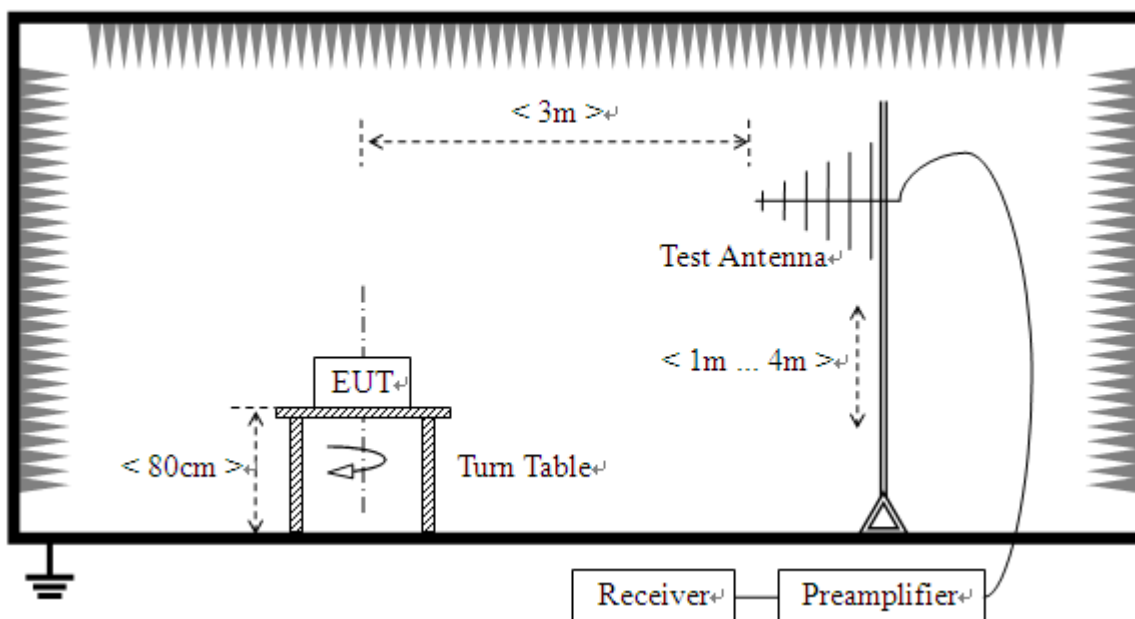
2.11.2. Test Description

A. Test Setup:

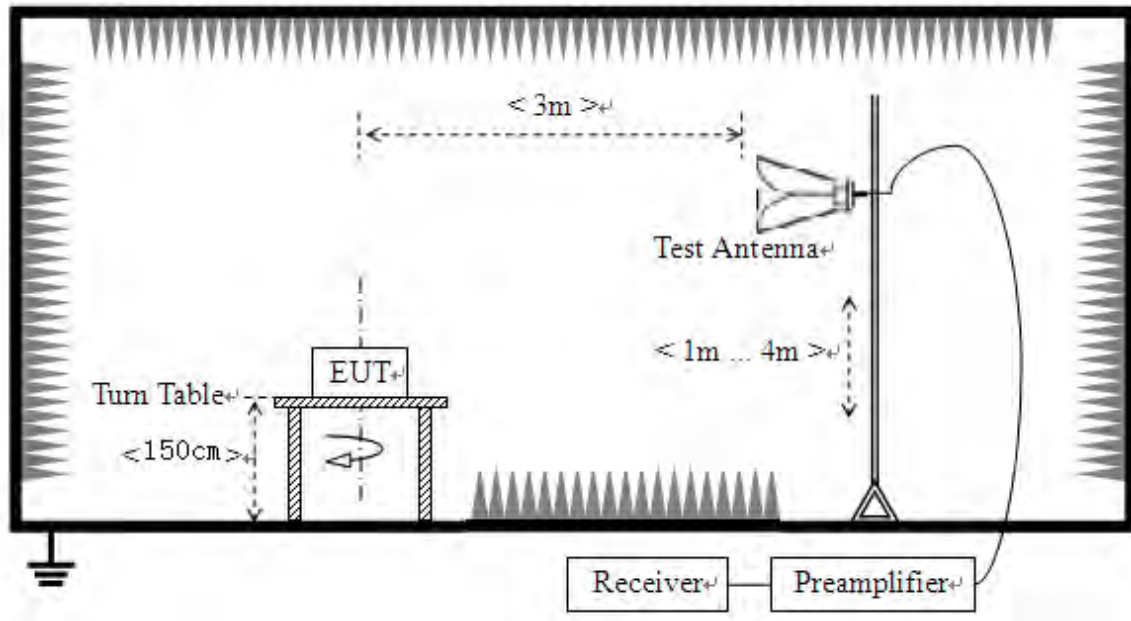
- 1) For radiated emissions from 9kHz to 30MHz



- 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.

B. Equipments List:

Please reference ANNEX B(4).

2.11.3. 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

2.11.4. 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

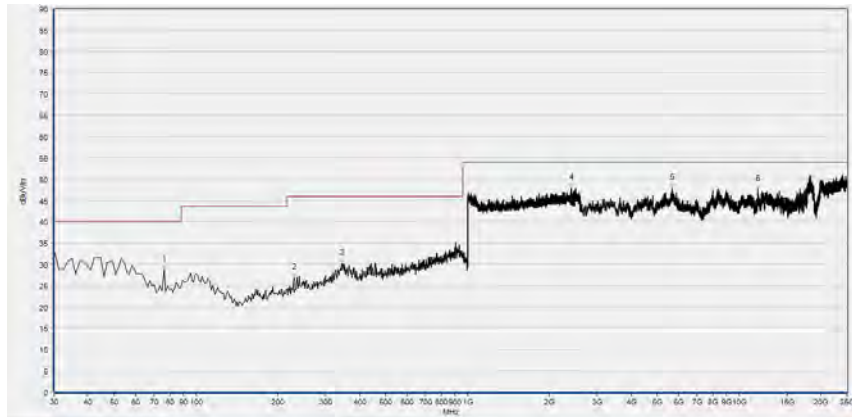
A_{Factor} : Antenna Factor at 3m

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.

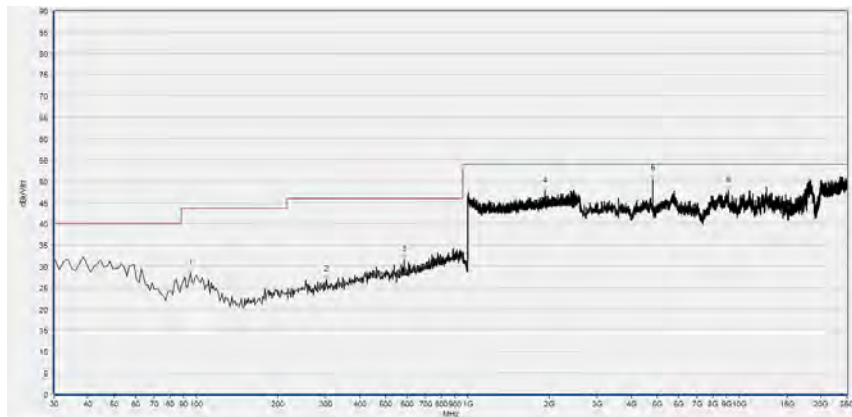
Note2: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

Note3: For the frequency, which started from 25GHz 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
76.133	28.72	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
229.099	26.88	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
344.431	30.09	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2415.606	47.89	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5675.468	48.01	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
11740.862	47.67	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

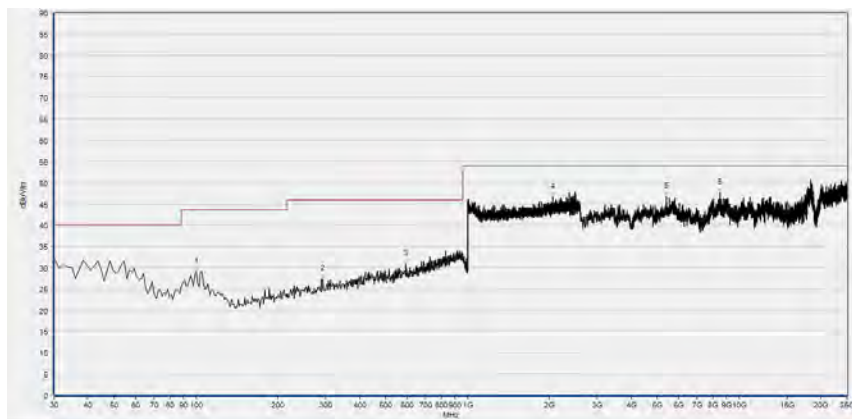
(30MHz to 25GHz, Antenna Horizontal, GFSK, channel 0)



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
95.557	28.39	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
301.940	26.81	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
582.378	31.53	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1922.609	47.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4803.746	50.43	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
9137.916	47.81	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

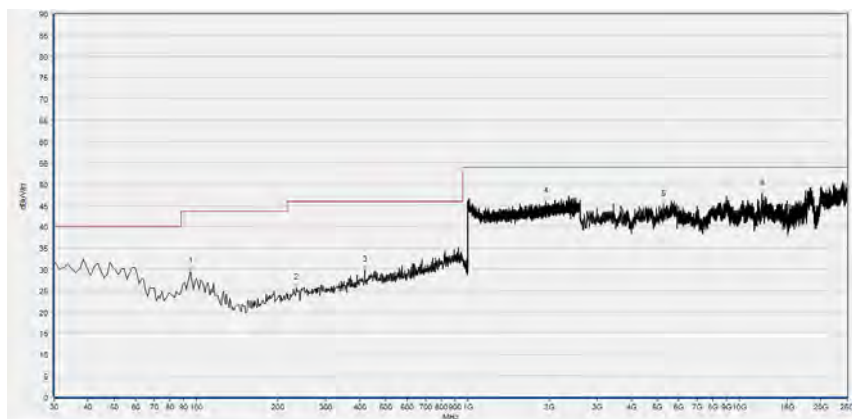
(30MHz to 25GHz, Antenna Vertical, GFSK, channel 0)

Plot for Channel = 39



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
100.413	28.99	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
293.442	27.37	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
592.090	30.84	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
2057.063	46.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5394.399	46.69	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8482.088	47.53	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

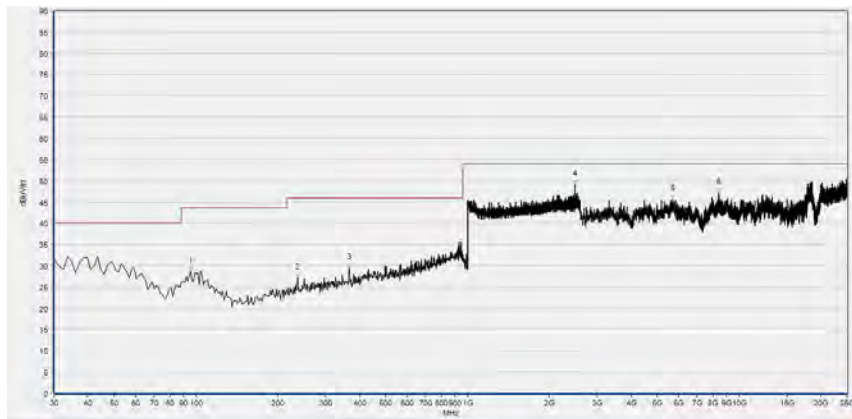
(30MHz to 25GHz, Antenna Horizontal, GFSK, channel 39)



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
95.557	29.54	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
233.955	25.65	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
418.486	29.91	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1935.414	45.87	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
5255.901	45.23	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12148.209	47.73	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

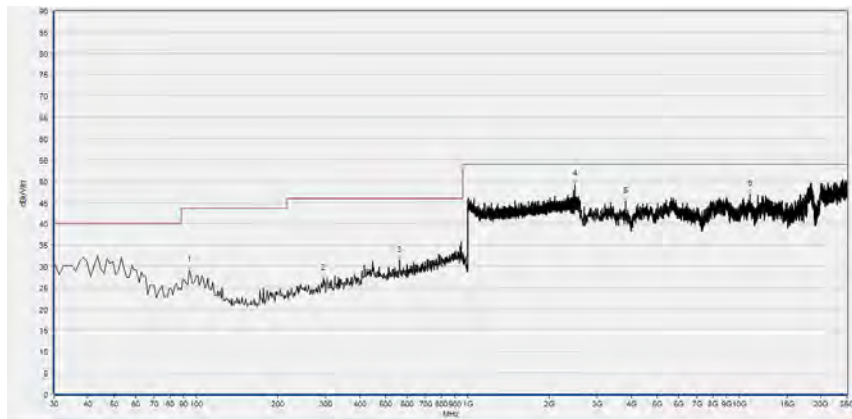
(30MHz to 25GHz, Antenna Vertical, GFSK, channel 39)

Plot for Channel = 78



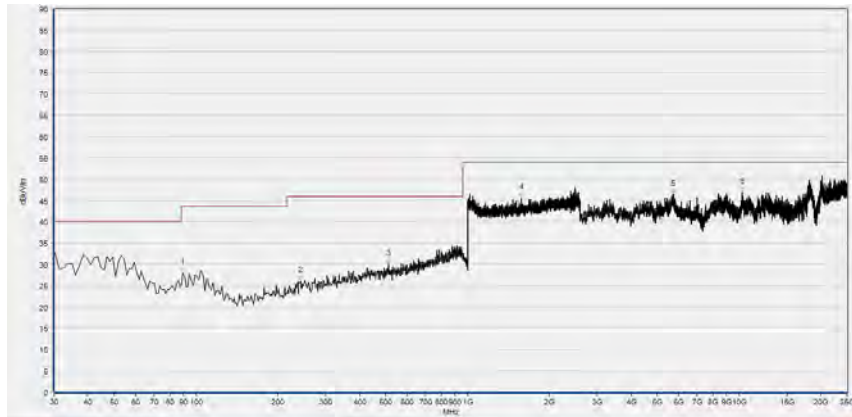
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
95.557	28.61	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
236.383	27.08	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
366.283	29.45	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2480.272	49.03	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5703.983	45.54	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8408.765	47.04	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal, GFSK, channel 78)

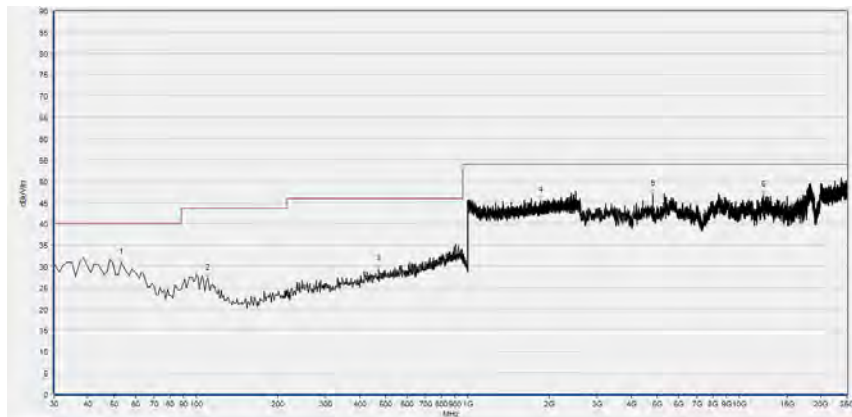


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.343	28.96	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
294.656	27.21	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
560.526	31.31	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2480.272	49.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3813.893	45.25	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10938.389	46.90	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 25GHz, 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
89.487	28.05	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
242.453	26.17	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
511.965	29.94	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1578.151	45.55	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5716.203	46.49	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10278.487	46.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

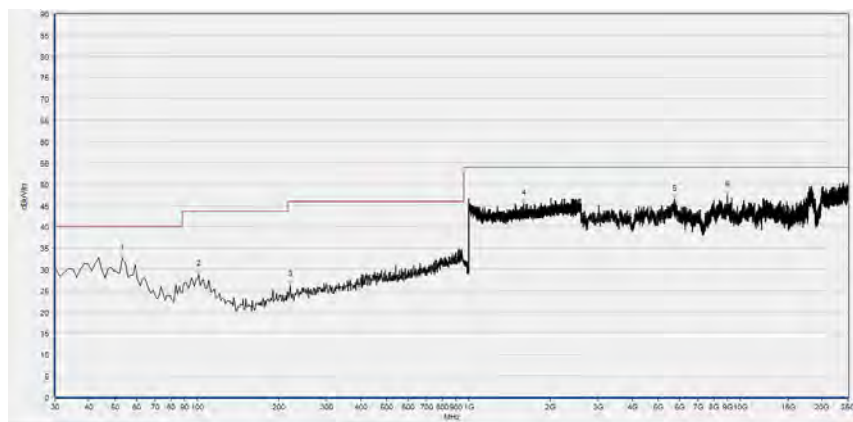
(30MHz to 25GHz, Antenna Horizontal, $\pi/4$ -DQPSK, channel 0)

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
53.066	30.83	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
110.125	27.11	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
470.688	29.33	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1860.504	45.40	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4803.746	46.99	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12335.588	46.80	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

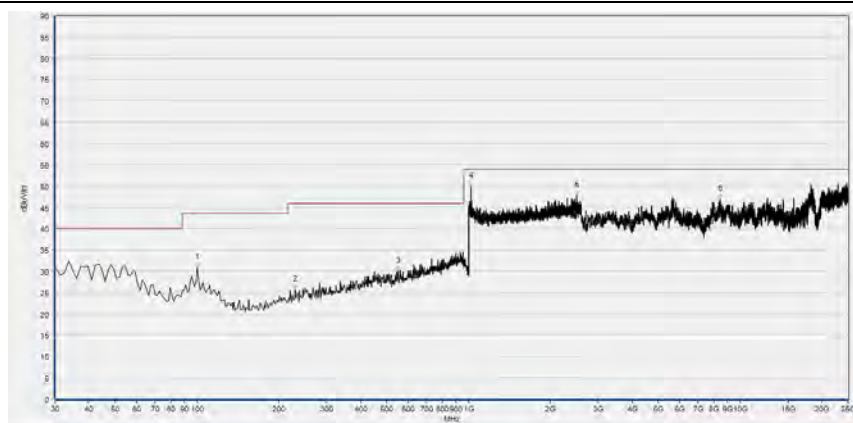
(30MHz to 25GHz, Antenna Vertical, $\pi/4$ -DQPSK, channel 0)



Plot for Channel = 39



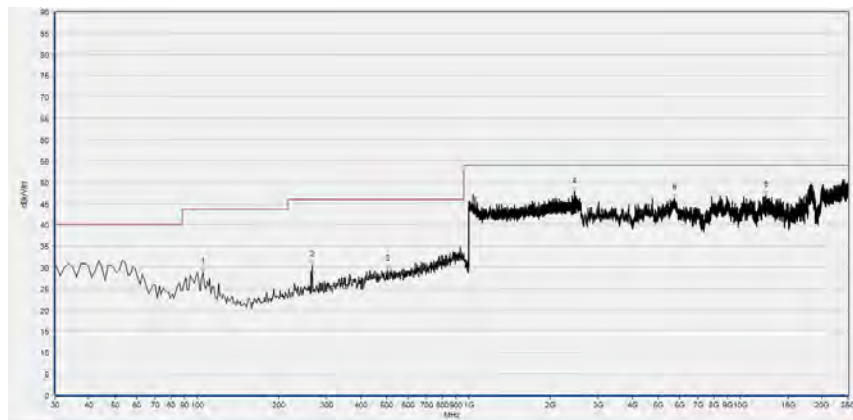
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
53.066	32.60	N/A	N/A	N/A	40.00	N/A	Horizontal	PASS
101.627	28.87	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
220.601	26.26	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1599.920	45.43	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5720.276	46.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8987.198	47.38	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal, $\pi/4$ -DQPSK, channel 39)

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
100.413	30.83	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
229.099	25.65	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
548.385	30.08	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1020.488	49.92	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
2496.279	47.82	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8437.280	46.88	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

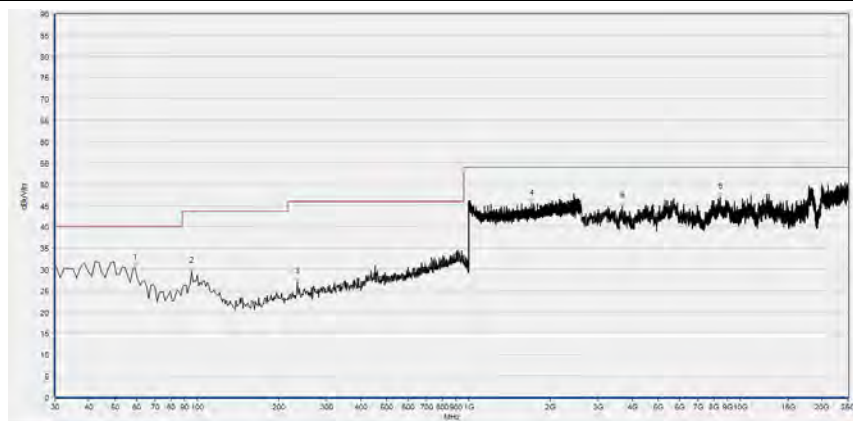
(30MHz to 25GHz, Antenna Vertical, $\pi/4$ -DQPSK, channel 39)

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
105.269	28.79	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
265.519	30.51	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
503.467	29.50	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2455.302	47.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5740.644	46.24	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12474.086	46.85	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal, $\pi/4$ -DQPSK, channel 78)

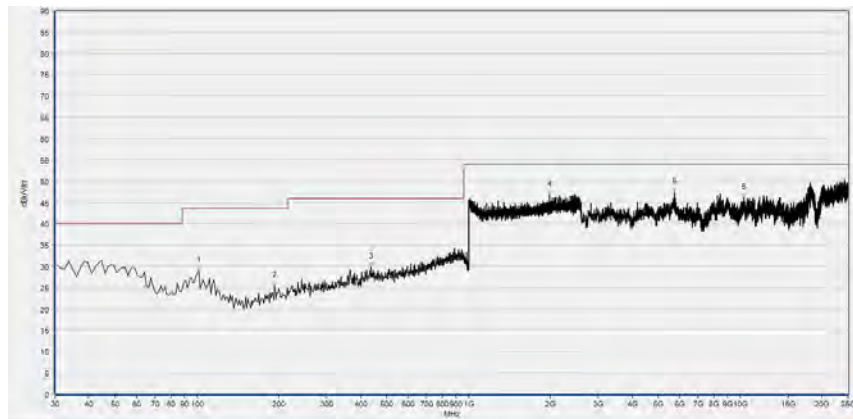


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
59.136	30.29	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
95.557	29.42	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
233.955	26.91	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1703.001	45.45	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
3687.616	44.82	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8457.647	46.90	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 25GHz, Antenna Vertical, $\pi/4$ -DQPSK, channel 78)

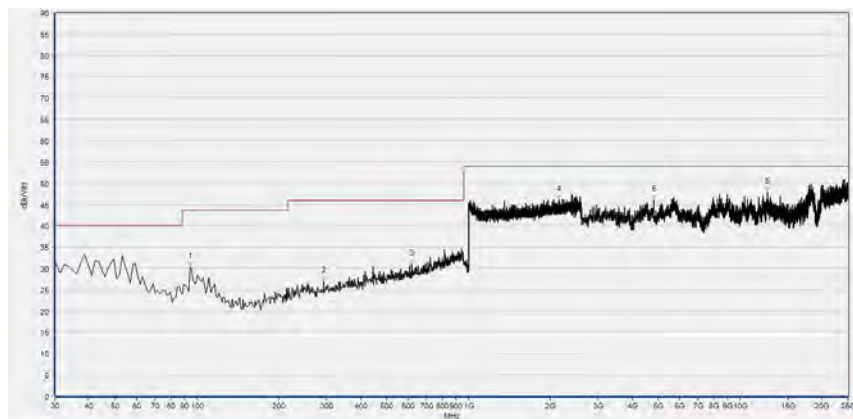
**8-DPSK Mode**

Plots for Channel = 0



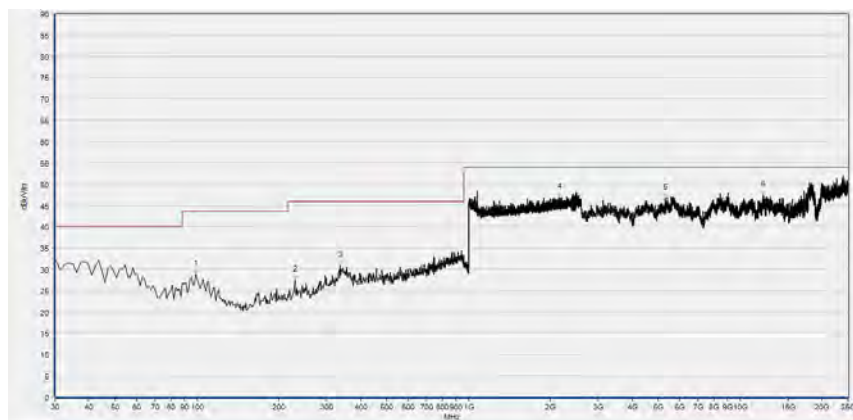
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
101.627	28.95	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
192.678	25.42	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
436.696	29.79	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
1987.915	46.75	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5744.717	47.45	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
10343.662	46.12	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal, 8-DPSK, channel 0)



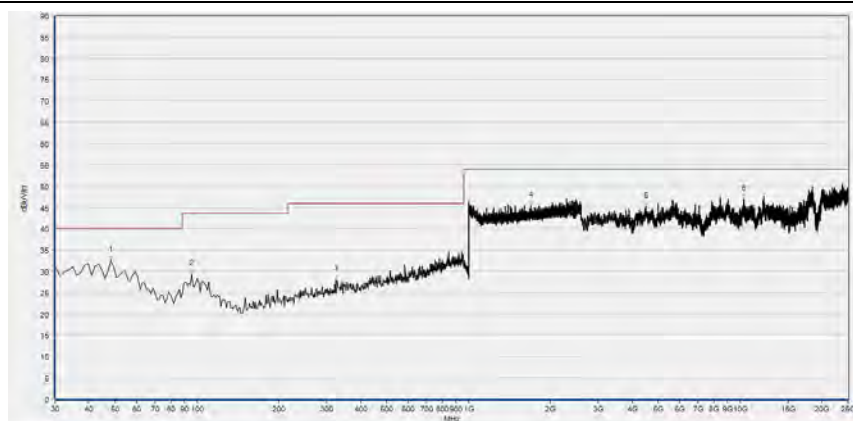
Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
94.343	30.30	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
292.228	26.94	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
616.370	30.99	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
2151.821	46.09	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4803.746	46.05	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
12604.437	47.96	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 25GHz, Antenna Vertical, 8-DPSK, channel 0)

Plot for Channel = 39

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
99.199	28.77	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
229.099	27.51	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
335.932	30.77	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2167.187	46.97	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5304.783	46.80	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
12127.841	47.43	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 25GHz, Antenna Horizontal, 8-DPSK, channel 39)

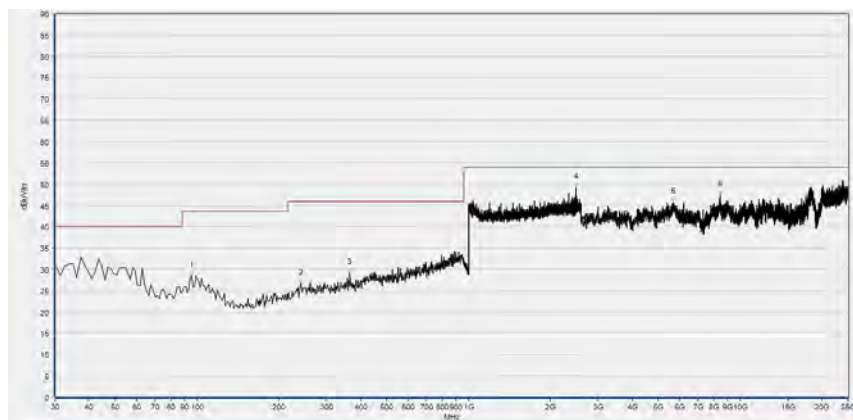


Fre. (MHz)	Pk (dBμV/m)	QP (dBμV/m)	AV (dBμV/m)	Limit-PK (dBμV/m)	Limit-QP (dBμV/m)	Limit-AV (dBμV/m)	Antenna	Verdict
48.210	32.52	N/A	N/A	N/A	40.00	N/A	Vertical	PASS
95.557	29.36	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
323.792	28.15	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1701.080	45.49	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4506.383	45.26	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
10302.928	46.94	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 25GHz, Antenna Vertical, 8-DPSK, channel 39)

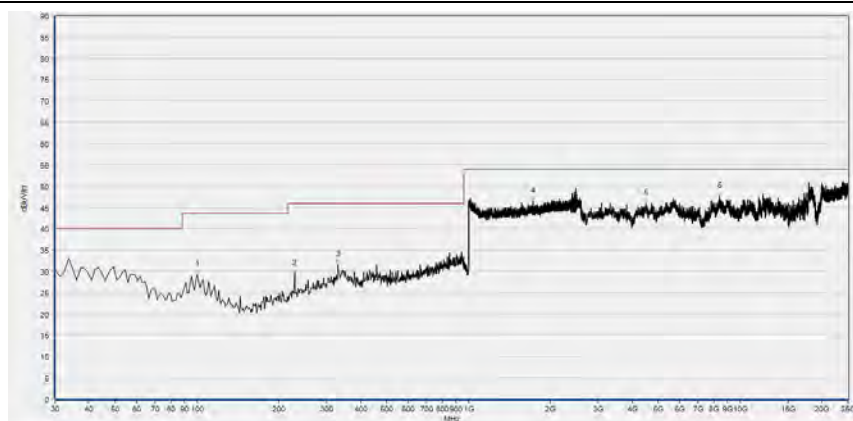


Plot for Channel = 78



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
95.557	28.57	N/A	N/A	N/A	43.50	N/A	Horizontal	PASS
241.239	26.72	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
365.069	29.16	N/A	N/A	N/A	46.00	N/A	Horizontal	PASS
2480.272	49.28	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
5655.101	45.81	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS
8441.353	47.36	N/A	N/A	74.00	N/A	54.00	Horizontal	PASS

(30MHz to 25GHz, 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
100.413	29.08	N/A	N/A	N/A	43.50	N/A	Vertical	PASS
227.885	29.25	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
329.862	31.46	N/A	N/A	N/A	46.00	N/A	Vertical	PASS
1729.252	46.35	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
4494.163	45.92	N/A	N/A	74.00	N/A	54.00	Vertical	PASS
8416.912	47.52	N/A	N/A	74.00	N/A	54.00	Vertical	PASS

(30MHz to 25GHz, 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	$\pm 2.77\text{ dB}$
Restricted Frequency Bands	$\pm 5\%$
Radiated Emission	$\pm 2.95\text{dB}$
Conducted Emission	$\pm 2.44\text{dB}$

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	2018.04.17	2019.04.16
Directional coupler	17041703	DTO-5-30	ShangHai Huaxiang	N/A	N/A
EXA Signal Analyzer	MY53470836	N9010A	Agilent	2018.11.06	2019.11.05
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
USB Wideband Power Sensor	MY54210011	U2021XA	Agilent	2018.04.17	2019.04.16
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2018.05.08	2019.05.07
LISN	812744	NSLK 8127	Schwarzbeck	2018.05.08	2019.05.07
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2018.05.08	2019.05.07
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A
Adapter	N/A	HKC0055 010-3E	ViVo	N/A	N/A

4.3 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V 1.0

**4.4 Radiated Test Equipments**

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2018.08.04	2019.08.03
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.18	2019.05.17
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.15	2020.02.14
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2018.08.06	2019.08.05
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2018.08.02	2019.08.01
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	2018.05.08	2019.05.07
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
Notch Filter	N/A	WRCG-2400-2483.5-60SS	Wainwright	2018.12.01	2019.11.30
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

————— END OF REPORT —————