

FCC Test Report

Test Report
On Behalf of
Shenzhen Brands World Technology Co., Ltd.
For
HTC Wireless Headphones 12
Model No.: HTC HP12
FCC ID: 2BPQF-HTCHP12

Prepared For: **Shenzhen Brands World Technology Co., Ltd.**
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Date of Test: **Jun. 10, 2026 ~ Jun. 25, 2026**

Date of Report: **Jun. 25, 2026**

Report Number: **HK2606100618-2E**

Test Result Certification

Applicant's Name.....: Shenzhen Brands World Technology Co., Ltd.

Address: Room A, 20/F, Building 5, Lehui Science and Technology Innovation Center, No. 489 Jihua Road, Bantian, Longgang District, Shenzhen, Guangdong, China

Manufacturer's Name: Shenzhen Micro Blue Valley Technology Co., LTD

Address: West of B1701, Building B1, Nanchang Second Industrial Zone, Nanchang Community, Xixiang Street, Baoan District, Shenzhen, China

Product Description

Trade Mark: HTC

Product Name.....: HTC Wireless Headphones 12

Model and/or Type Reference : HTC HP12

Standards: **47 CFR FCC Part 15 Subpart C 15.247**

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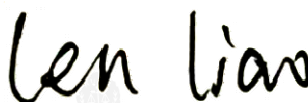
Date of Test:

Date (s) of Performance of Tests: **Jun. 10, 2026 ~ Jun. 25, 2026**

Date of Issue.....: **Jun. 25, 2026**

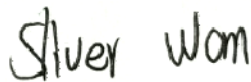
Test Result.....: **Pass**

Testing Engineer



Len Liao

Technical Manager



Sliver Wan

Authorized Signatory



Jason Zhou



The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 15 days only. The document is issued by Shenzhen HUAK Testing Technology Co., Ltd., this document cannot be reproduced except in full with our prior written permission.

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**** Issued History ****

Revision	Description	Issued Date	Remark
Revision 1.0	Initial Test Report Release	Jun. 25, 2026	Jason Zhou

1. Summary

1.1 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10: 2020: American National Standard for Testing Unlicensed Wireless Devices

1.2 Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.215	20dB Bandwidth& 99% Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247 (a) (1)	Pseudorandom Frequency Hopping Sequence	PASS
FCC Part 15.247(a)(1)(iii)	Number of Hopping Frequency& Time of Occupancy	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.205/15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

1.3 Information of the Test Laboratory

Shenzhen HUAKE Testing Technology Co., Ltd.

Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

1.4 Statement of the Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission 0.15~30MHz	$\pm 2.71\text{dB}$
2	All Emissions, Radiated(<1G)	$\pm 3.90\text{dB}$
3	All Emissions, Radiated(>1G)	$\pm 4.28\text{dB}$
4	Transmitter Power Conducted	$\pm 0.37\text{dB}$
5	Conducted Spurious Emission	$\pm 2.20\text{dB}$
6	Occupied Bandwidth	$\pm 1.5\%$
7	Temperature	$\pm 0.1^{\circ}\text{C}$
8	Humidity	$\pm 1.0\%$

2. General Information

2.1 Environmental Conditions

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

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2 General Description of EUT

Product Name:	HTC Wireless Headphones 12
Model/Type Reference:	HTC HP12
Series Model(s):	N/A
Model Difference:	N/A
Power Supply:	DC5V from Type-C or DC3.7V from Battery
Version:	Supported EDR
Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Operation Frequency:	2402MHz~2480MHz
Channel Number:	79
Channel Separation:	1MHz
Antenna Type:	PCB Antenna
Antenna Gain:	1.68dBi
Hardware Version:	V2.0
Software Version:	V1.6
Note: 1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2. Antenna gain Refer to the antenna specifications. 3. The cable loss data is obtained from the supplier. 4. The test results in the report only apply to the tested sample.	

2.3 Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.

There are 79 channels provided to the EUT and Channel 00/39/78 was selected for testing.

Operation Frequency:

Channel	Frequency (MHz)
00	2402
01	2403
:	:
38	2440
39	2441
40	2442
:	:
77	2479
78	2480

Note: The line display in grey were the channel selected for testing

Preliminary tests were performed in each mode and packet length of BT, and found worst case as bellow, finally test were conducted at those mode and recorded in this report.

Test Items	Worst case
AC Conducted Emissions	Charging mode
Radiated Emissions and Band Edge	DH5 Low channel
Maximum Conducted Output Power	DH5/2DH5/3DH5
20dB Bandwidth & 99% Bandwidth	DH5/2DH5/3DH5
Frequency Separation	DH5/2DH5/3DH5 Middle channel
Number of Hopping Frequency	DH5/2DH5/3DH5
Time of Occupancy (Dwell Time)	DH1/DH3/DH5 Middle channel 2DH1/2DH3/2DH5 Middle channel 3DH1/3DH3/3DH5 Middle channel
Out-of-Band Emissions	DH5/2DH5/3DH5



2.4 Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N.	R&S	ENV216	HKE-002	2026/02/11	1 Year
2	L.I.S.N.	R&S	ENV216	HKE-059	2026/02/04	1 Year
3	EMI Test Receiver	R&S	ESR-7	HKE-005	2026/02/06	1 Year
4	Spectrum analyzer	Agilent	N9020A	HKE-025	2026/02/06	1 Year
5	Spectrum analyzer	KEYSIGHT	N9020A	HKE-117	2026/02/06	1 Year
6	Spectrum analyzer	R&S	FSV3044	HKE-126	2026/02/06	1 Year
7	Preamplifier	Schwarzbeck	EMC051845SE	HKE-006	2026/02/04	1 Year
8	Preamplifier	Agilent	83051A	HKE-016	2026/02/04	1 Year
9	Preamplifier	QJD	QJD18-40-50	HKE-030	2026/02/05	1 Year
10	6dB Attenuator	Pasternack	6dB	HKE-152	2026/02/06	1 Year
11	EMI Test Receiver	R&S	ESR-7	HKE-010	2026/02/06	1 Year
12	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	2026/02/06	2 Year
13	Loop Antenna	COM-POWER	AL-130R	HKE-014	2026/02/06	2 Year
14	Horn Antenna	Schwarzbeck	9120D	HKE-013	2026/02/06	2 Year
15	Broadband Horn Antenna	A-INFO	LB-180400-KF	HKE-031	2026/02/06	2 Year
16	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	/	/
17	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
18	RF Automatic control unit	Tonscend	JS0806-2	HKE-060	2026/02/06	1 Year
19	High pass filter unit	Tonscend	JS0806-F	HKE-055	2026/02/06	1 Year
20	Wireless Communication Test Set	R&S	CMW500	HKE-027	2026/02/06	1 Year
21	High-low temperature chamber	Guangke	HT-80L	HKE-118	2026/02/06	1 Year
22	Temperature and humidity meter	Boyang	HTC-1	HKE-075	2026/03/06	1 Year
23	RF Test Software	Tonscend	JS1120-3 Version 3.5.39	HKE-083	/	/
24	10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	2026/02/04	1 Year
25	RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	/	/

2.5 Related Submittal(s) / Grant(s)

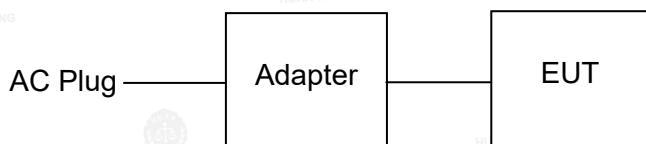
This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.6 Modifications

No modifications were implemented to meet testing criteria.

2.7 Description of Test Setup

Operation of EUT during AC Conducted and Radiation below 1GHz testing:



Operation of EUT during Radiation Above 1GHz testing:



Operation of EUT during RF Conducted testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position

2.8 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Trade Mark	Model/Type No.	Specification	Note
1	HTC Wireless Headphones 12	HTC	HTC HP12	N/A	EUT
2	Adapter	N/A	MDY-10-EH	Input: AC100-240V, 50/60Hz, 0.7A Output: DC5V/3A, 9V/3A, 12V/2.25A, 20V/1.35A	

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 20dB Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

2.9 The Worse Case Power Setting Parameter

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Test Software Version		FCC_assist_1.0.2.2
Modulation Type	Transmit Antenna Number	Test Software setting value
GFSK, $\pi/4$ DQPSK, 8DPSK	1	default

3. Test Conditions and Results

3.1 AC Conducted Emissions Test

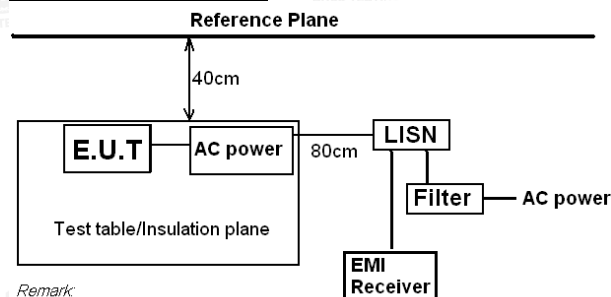
Limit

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207, AC Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Configuration



Remark
E.U.T: Equipment Under Test
LISN: Line Impedance Stabilization Network
Test table height=0.8m

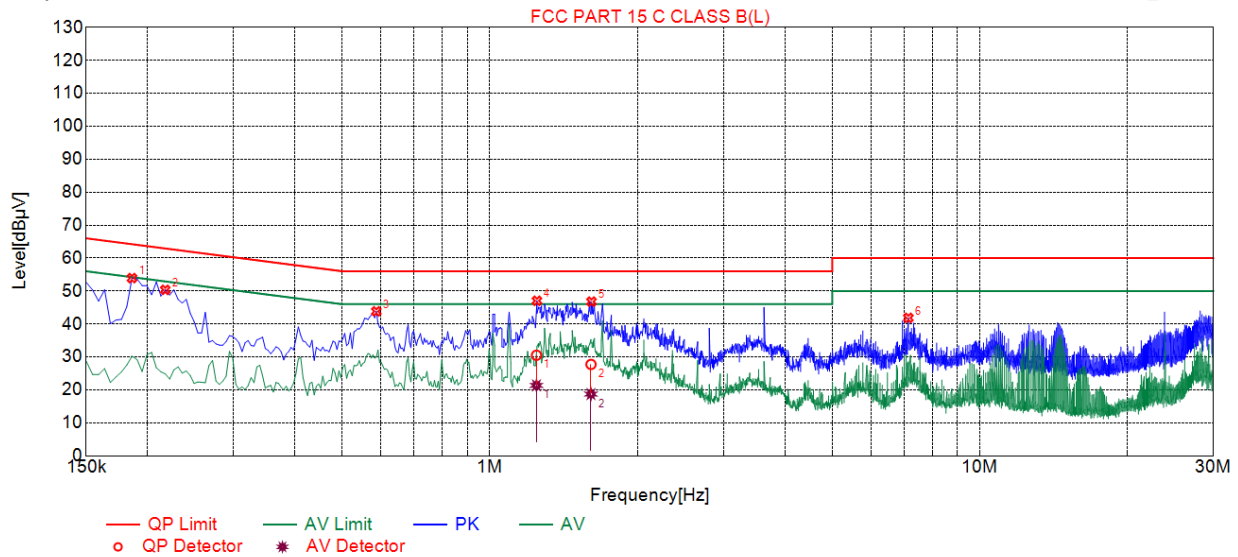
Test Procedure

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2. Support equipment, if needed, was placed as per ANSI C63.10.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

Test Results

All the test modes completed for test. Only the worst result was reported as below:

Test Specification: Line



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1860	53.92	19.78	64.21	10.29	34.14	PK	L
2	0.2175	50.36	19.76	62.91	12.55	30.60	PK	L
3	0.5865	43.83	19.89	56.00	12.17	23.94	PK	L
4	1.2480	47.04	19.92	56.00	8.96	27.12	PK	L
5	1.6125	46.78	19.99	56.00	9.22	26.79	PK	L
6	7.1520	41.85	20.36	60.00	18.15	21.49	PK	L

Final Data List

NO.	Freq. [MHz]	Correction factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	QP Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	AV Reading [dBμV]	Type
1	1.2449	19.92	30.52	56.00	25.48	10.60	21.36	46.00	24.64	1.44	L
2	1.6085	19.99	27.74	56.00	28.26	7.75	18.73	46.00	27.27	-1.26	L

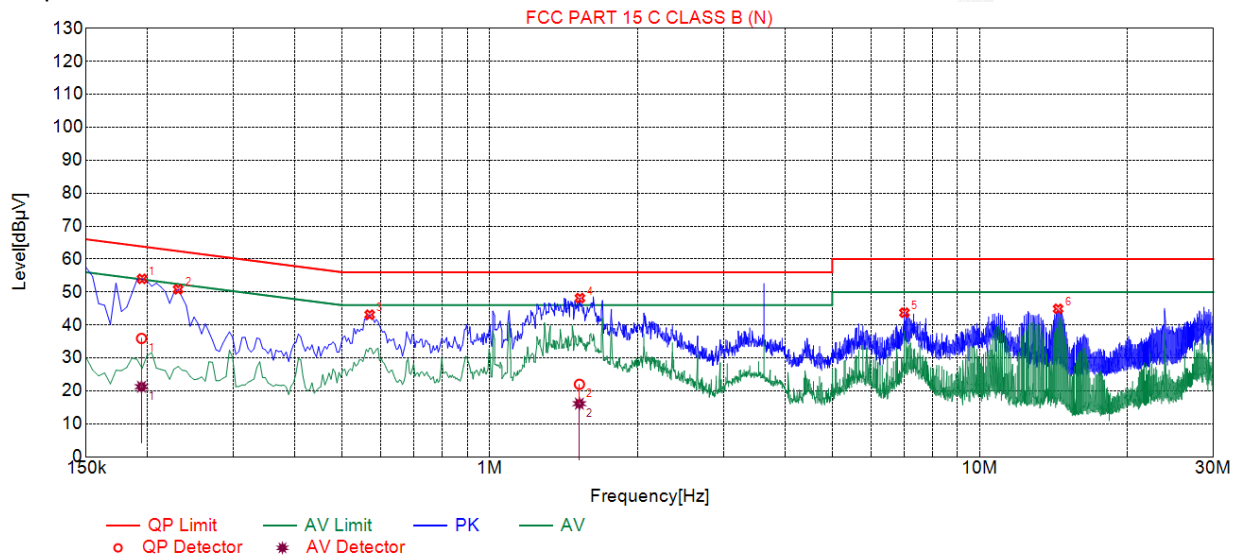
Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor



Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.1950	54.00	19.77	63.82	9.82	34.23	PK	N
2	0.2310	50.82	19.77	62.41	11.59	31.05	PK	N
3	0.5685	43.12	19.95	56.00	12.88	23.17	PK	N
4	1.5270	48.15	20.08	56.00	7.85	28.07	PK	N
5	7.0215	43.72	20.71	60.00	16.28	23.01	PK	N
6	14.4555	44.91	21.85	60.00	15.09	23.06	PK	N

Final Data List

NO.	Freq. [MHz]	Correction factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	QP Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	AV Reading [dBμV]	Type
1	0.1945	19.77	35.92	63.84	27.92	16.15	21.26	53.84	32.58	1.49	N
2	1.5232	20.07	21.99	56.00	34.01	1.92	16.12	46.00	29.88	-3.95	N

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor

3.2 Radiated Emissions

Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

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)

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in table below.

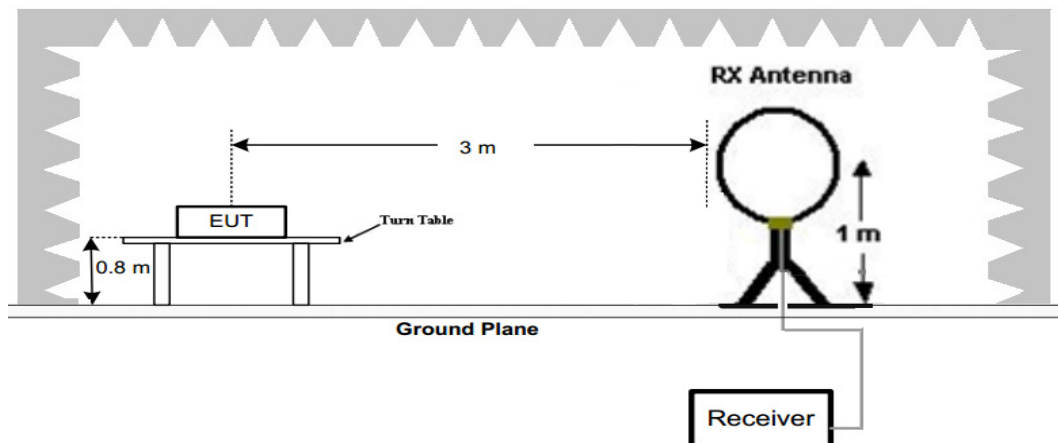
Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission

Radiated emission limits

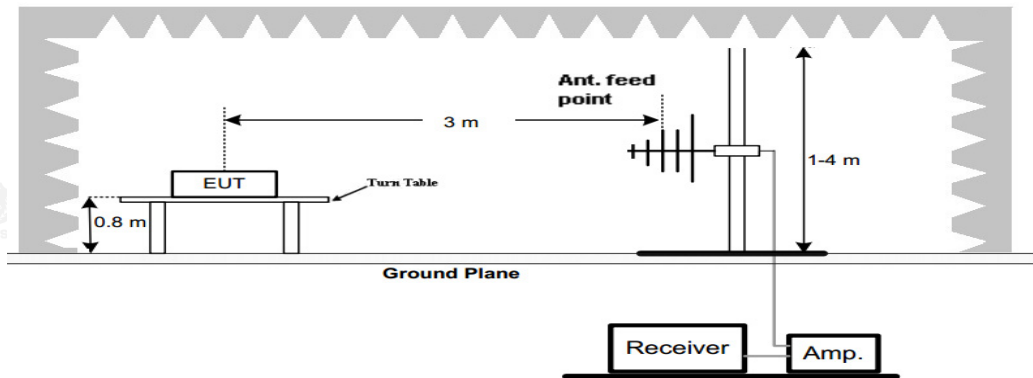
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

Test Configuration

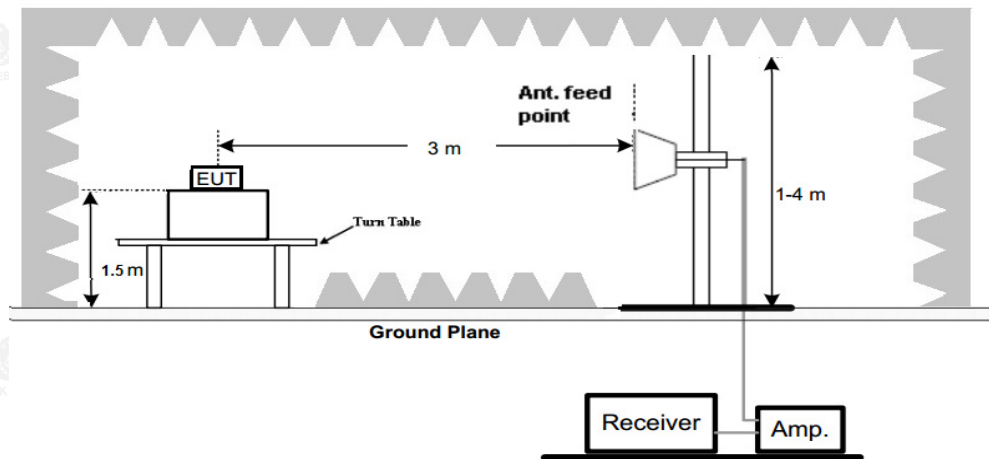
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



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



Test Procedure

1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0 degrees to 360 degrees to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

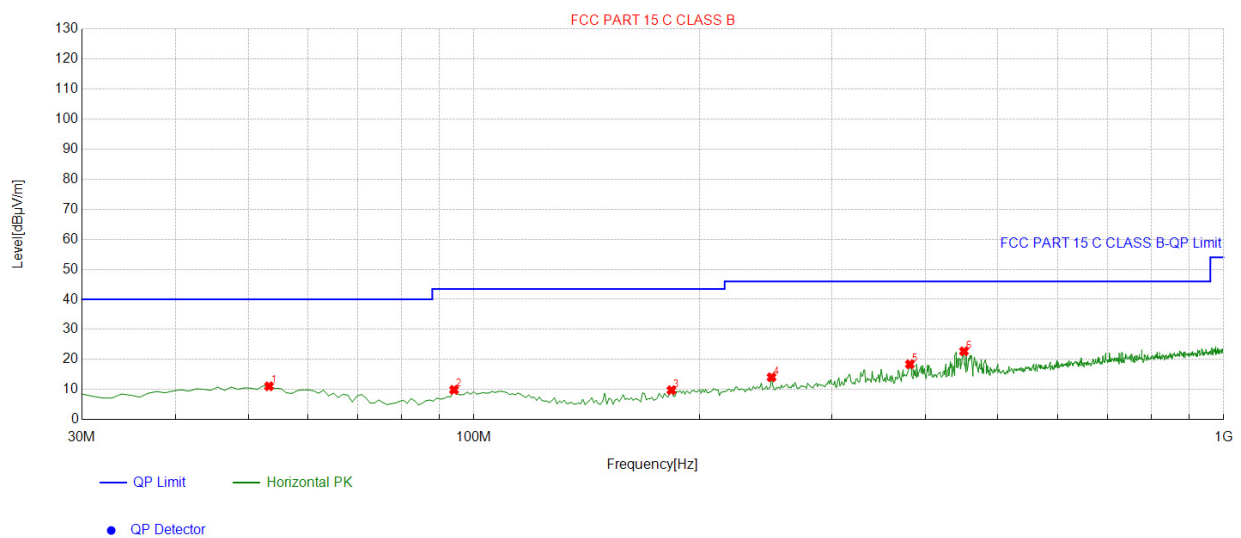
Test Results

Remark:

1. Radiated Emission measured at GFSK, $\pi/4$ DQPSK and 8DPSK mode from 9 KHz to 10th harmonic of fundamental and recorded worst case at GFSK DH5 mode.
2. There is no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.
3. All modes have been tested, only the worst mode of GFSK DH5 low channel TX is reflected.

Below 1GHz Test Results

Antenna polarity: Horizontal

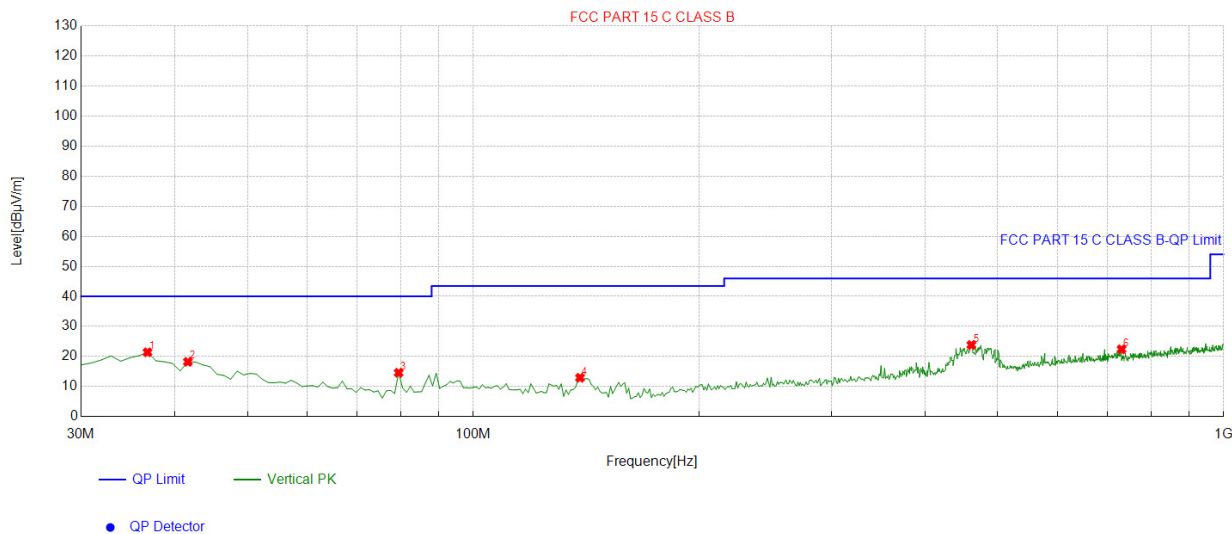


Suspected List

NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	53.303	-12.97	24.08	11.11	40.00	28.89	100	96	Horizontal
2	94.084	-15.49	25.42	9.93	43.50	33.57	100	344	Horizontal
3	183.413	-16.15	25.95	9.80	43.50	33.70	100	30	Horizontal
4	249.439	-13.15	27.26	14.11	46.00	31.89	100	52	Horizontal
5	381.491	-10.25	28.69	18.44	46.00	27.56	100	124	Horizontal
6	450.430	-8.80	31.55	22.75	46.00	23.25	100	117	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

Antenna polarity: Vertical



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.797	-14.57	35.98	21.41	40.00	18.59	100	258	Vertical
2	41.652	-13.21	31.45	18.24	40.00	21.76	100	355	Vertical
3	79.520	-18.65	33.26	14.61	40.00	25.39	100	34	Vertical
4	138.749	-18.31	31.25	12.94	43.50	30.56	100	157	Vertical
5	461.111	-8.73	32.57	23.84	46.00	22.16	100	16	Vertical
6	731.041	-3.65	26.06	22.41	46.00	23.59	100	316	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

Harmonics and Spurious Emissions

Frequency Range (9kHz-30MHz)

Frequency (MHz)	Level@3m (dBμV/m)	Limit@3m (dBμV/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: 1. Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor.

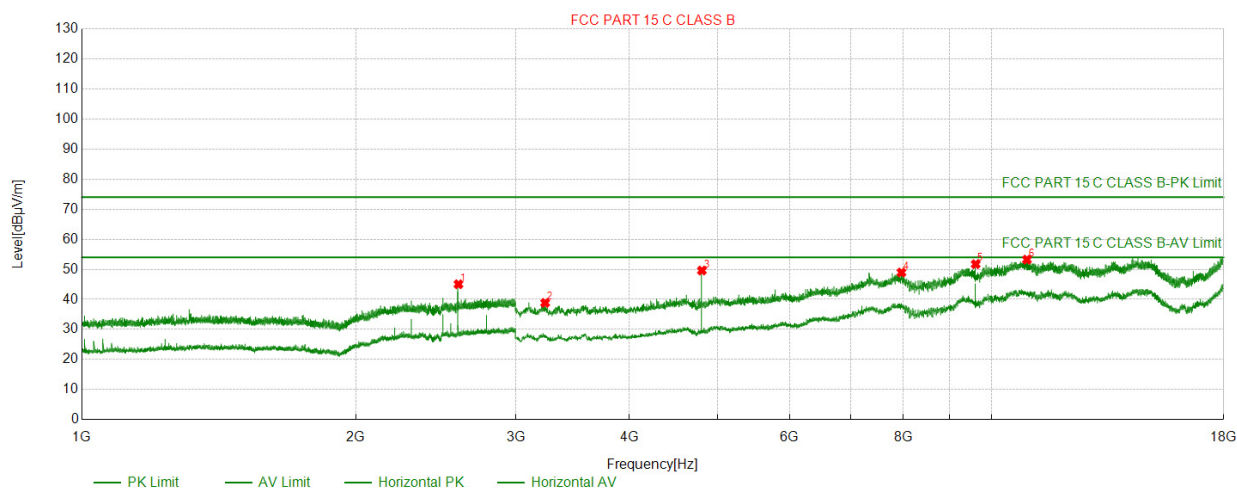
2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

Above 1GHz Test Results

All modes have been tested, only the worst mode of GFSK DH5 low channel TX is reflected.

For 1GHz to 18GHz

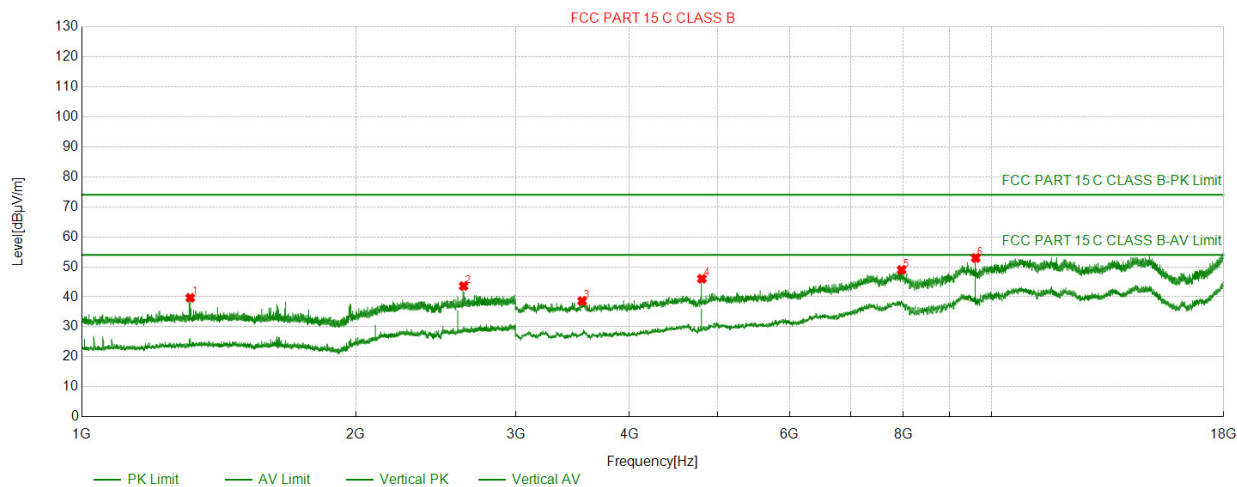
Antenna polarity: Horizontal



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	2594.159	59.12	45.05	-14.07	74.00	28.95	150	38	Horizontal
2	3231.023	54.03	38.85	-15.18	74.00	35.15	150	316	Horizontal
3	4804.680	60.36	49.61	-10.75	74.00	24.39	150	225	Horizontal
4	7962.496	51.28	48.95	-2.33	74.00	25.05	150	60	Horizontal
5	9608.161	50.86	51.72	0.86	74.00	22.28	150	112	Horizontal
6	10938.794	50.27	53.24	2.97	74.00	20.76	150	237	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

Antenna polarity: Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	1315.632	58.35	39.68	-18.67	74.00	34.32	150	248	Vertical
2	2628.163	57.52	43.60	-13.92	74.00	30.40	150	38	Vertical
3	3547.555	53.15	38.60	-14.55	74.00	35.40	150	21	Vertical
4	4804.680	56.79	46.04	-10.75	74.00	27.96	150	135	Vertical
5	7965.497	51.29	48.98	-2.31	74.00	25.02	150	238	Vertical
6	9608.161	52.07	52.93	0.86	74.00	21.07	150	107	Vertical

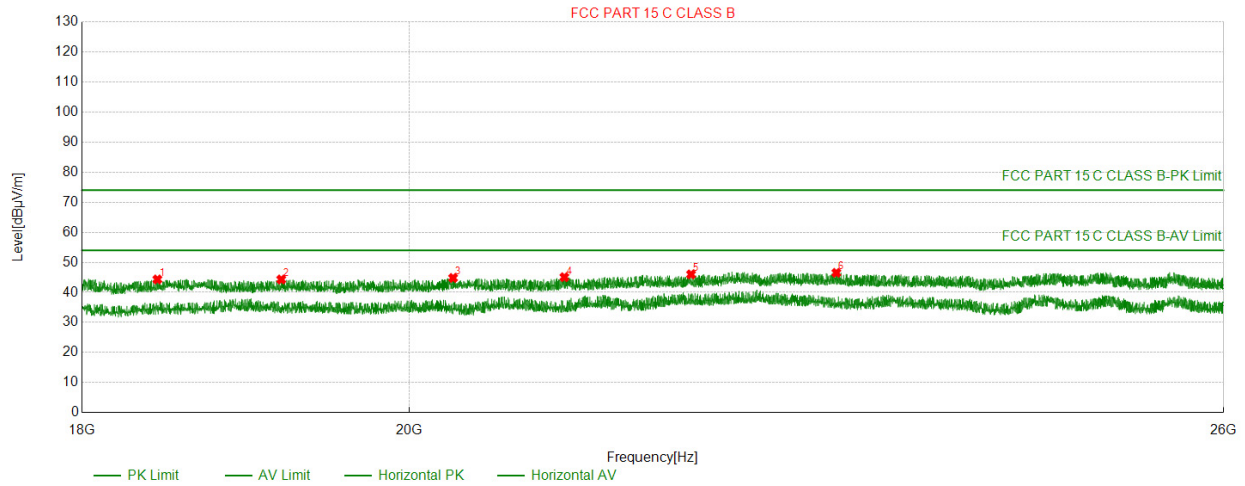
Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



HUAKE TESTING

For 18GHz to 26GHz

Antenna polarity: Horizontal



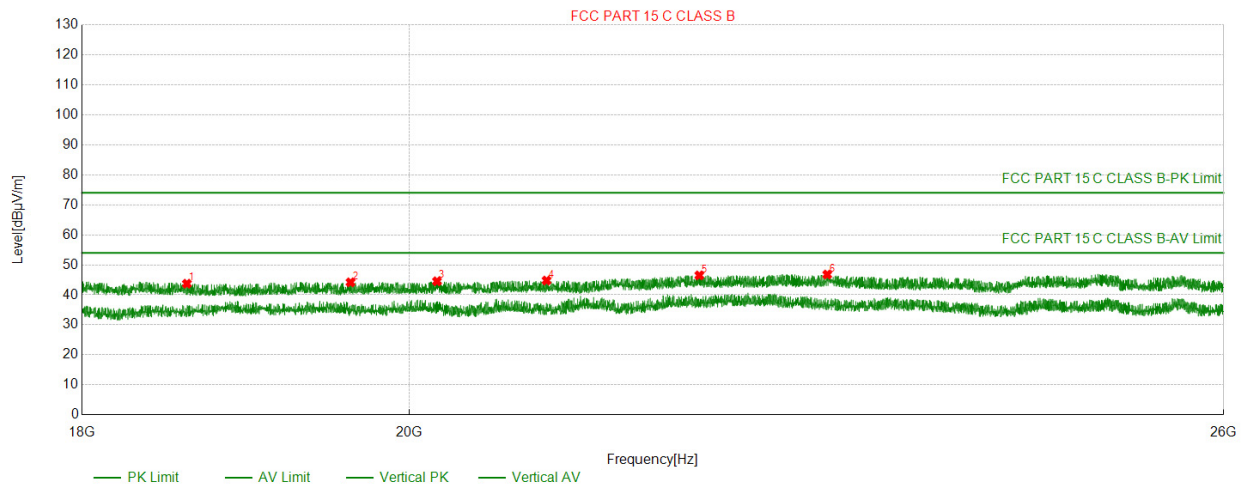
Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18443.244	38.91	44.33	5.42	74.00	29.67	150	30	Horizontal
2	19193.719	38.39	44.31	5.92	74.00	29.69	150	320	Horizontal
3	20285.829	38.79	44.82	6.03	74.00	29.18	150	60	Horizontal
4	21025.903	39.73	45.07	5.34	74.00	28.93	150	140	Horizontal
5	21901.990	40.35	46.00	5.65	74.00	28.00	150	170	Horizontal
6	22950.895	40.99	46.53	5.54	74.00	27.47	150	330	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level



HUAKE TESTING

Antenna polarity: Vertical



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBμV/m]	PK Level [dBμV/m]	Factor [dB]	PK Limit [dBμV/m]	PK Margin [dB]	Height [cm]	Angle [°]	Polarity
1	18619.262	38.32	43.73	5.41	74.00	30.27	150	30	Vertical
2	19626.563	38.08	44.18	6.10	74.00	29.82	150	190	Vertical
3	20181.018	38.44	44.53	6.09	74.00	29.47	150	220	Vertical
4	20905.891	39.29	44.78	5.49	74.00	29.22	150	210	Vertical
5	21960.396	40.80	46.50	5.70	74.00	27.50	150	190	Vertical
6	22883.688	41.24	46.78	5.54	74.00	27.22	150	220	Vertical

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

3.3 Maximum Peak Conducted Output Power

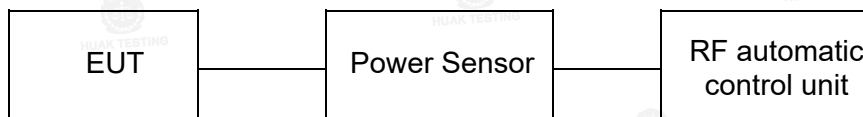
Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

Type	Channel	Maximum Peak Conducted Output Power (dBm)	Limit (dBm)	Result
GFSK	CH00	2.52	21.00	Pass
	CH39	3.43		
	CH78	3.86		
$\pi/4$ DQPSK	CH00	3.16	21.00	Pass
	CH39	4.03		
	CH78	4.51		
8DPSK	CH00	1.37	21.00	Pass
	CH39	2.25		
	CH78	2.47		

Note: The test results including the cable loss.

3.4 20dB Bandwidth

Limit

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

RBW=1% to 5% of the OBW
VBW=approximately 3 X RBW
Detector=Peak
Trace Mode: Max Hold

Use the 99% power bandwidth function of the instrument to measure the Occupied Bandwidth and recorded.

Test Configuration



Test Results

Modulation	Channel	20dB bandwidth (MHz)	Result
GFSK	CH00	0.957	Pass
	CH39	0.936	
	CH78	0.963	
$\pi/4$ DQPSK	CH00	1.284	
	CH39	1.287	
	CH78	1.365	
8DPSK	CH00	1.332	
	CH39	1.305	
	CH78	1.302	

Test plot as follows:

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20dB Bandwidth:

GFSK Modulation



CH00



CH39



CH78

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$\pi/4$ DQPSK Modulation



CH00



CH39



CH78

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8DPSK Modulation



CH00



CH39



CH78

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3.5 Frequency Separation

Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300 KHz RBW and 1000 KHz VBW.

Test Configuration



Test Results

Modulation	Channel	Channel Separation (MHz)	Limit(MHz)	Result
GFSK	CH39	1.002	0.642	Pass
	CH40			
$\pi/4$ DQPSK	CH39	1.004	0.910	Pass
	CH40			
8DPSK	CH39	1.006	0.888	Pass
	CH40			

Note: We have tested all mode at high, middle and low channel, and recorded worst case at middle

Test plot as follows:



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3.6 Number of Hopping Frequency

Limit

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

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz.

Test Configuration

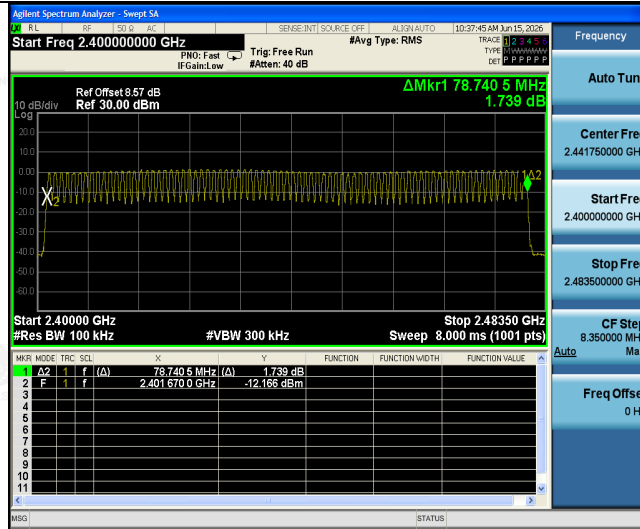


Test Results

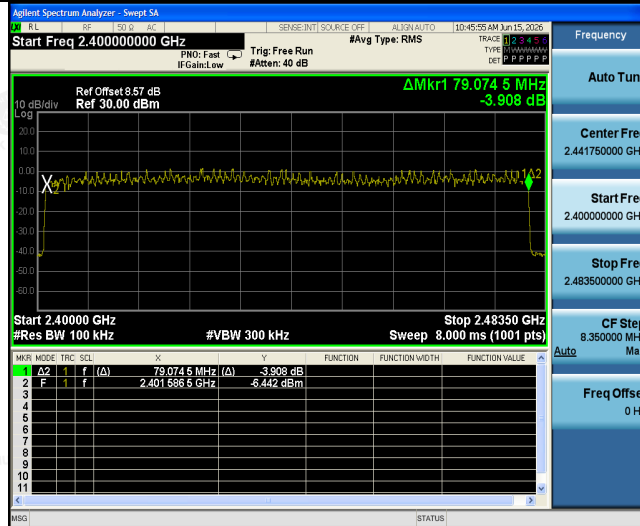
Modulation	Number of Hopping Channel	Limit	Result
GFSK	79	≥15	Pass
$\pi/4$ DQPSK	79		
8DPSK	79		

Test plot as follows:

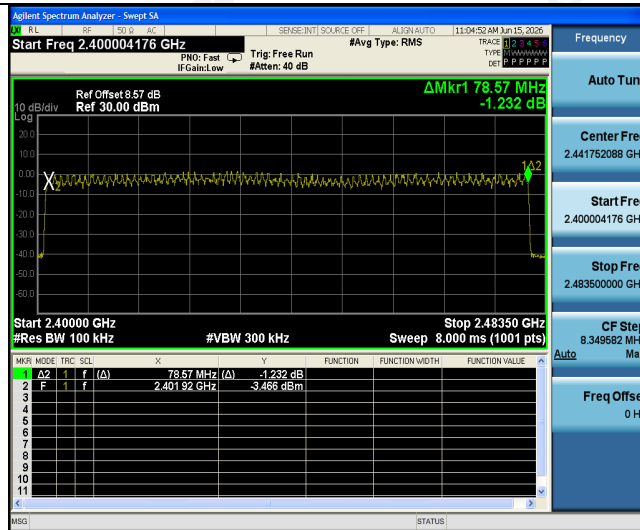
GFSK Modulation



$\pi/4$ DQPSK Modulation



8DPSK Modulation



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3.7 Time of Occupancy (Dwell Time)

Limit

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.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 3MHz VBW, Span 0Hz.

Test Configuration



Test Results

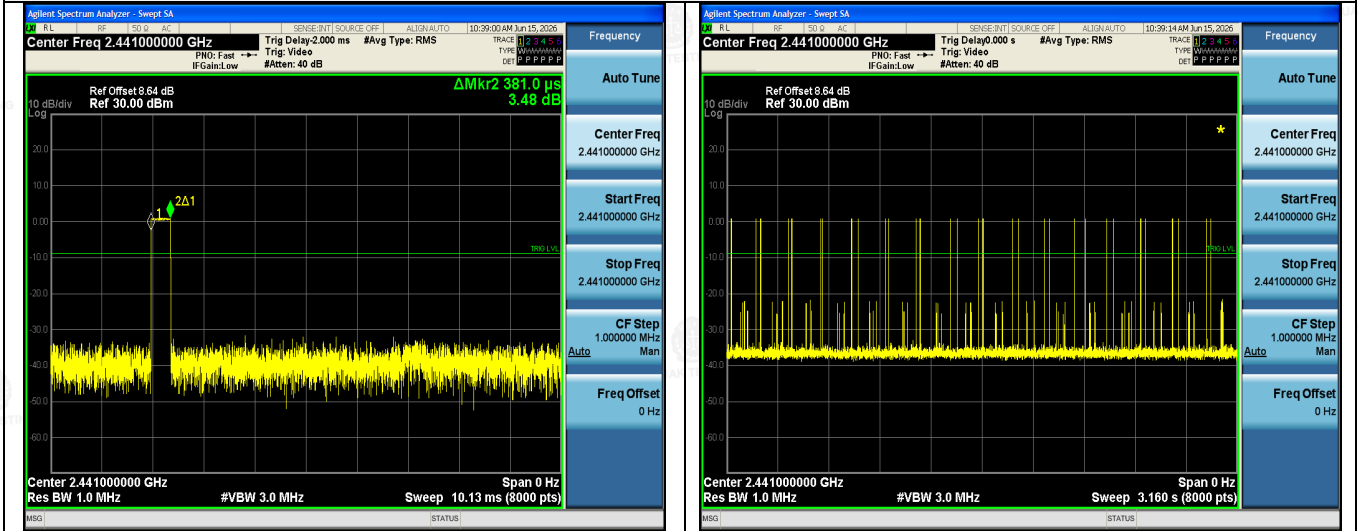
Modulation	Packet	Pulse time (ms)	Number of transmission in 31.6s (79 Hopping*0.4)= Burst Count	Dwell time (second)	Limit (second)	Result
GFSK	DH1	0.381	31 (pulses) *10 = 310	0.118	0.40	PASS
	DH3	1.638	16 (pulses) *10 = 160	0.262		
	DH5	2.885	11 (pulses) *10 = 110	0.317		
π/4DQPSK	2-DH1	0.391	32 (pulses) *10 = 320	0.125	0.40	PASS
	2-DH3	1.642	15 (pulses) *10 = 150	0.246		
	2-DH5	2.891	11 (pulses) *10 = 110	0.318		
8DPSK	3-DH1	0.390	31 (pulses) *10 = 310	0.121	0.40	PASS
	3-DH3	1.642	15 (pulses) *10 = 150	0.246		
	3-DH5	2.893	12 (pulses) *10 = 120	0.347		

Note:

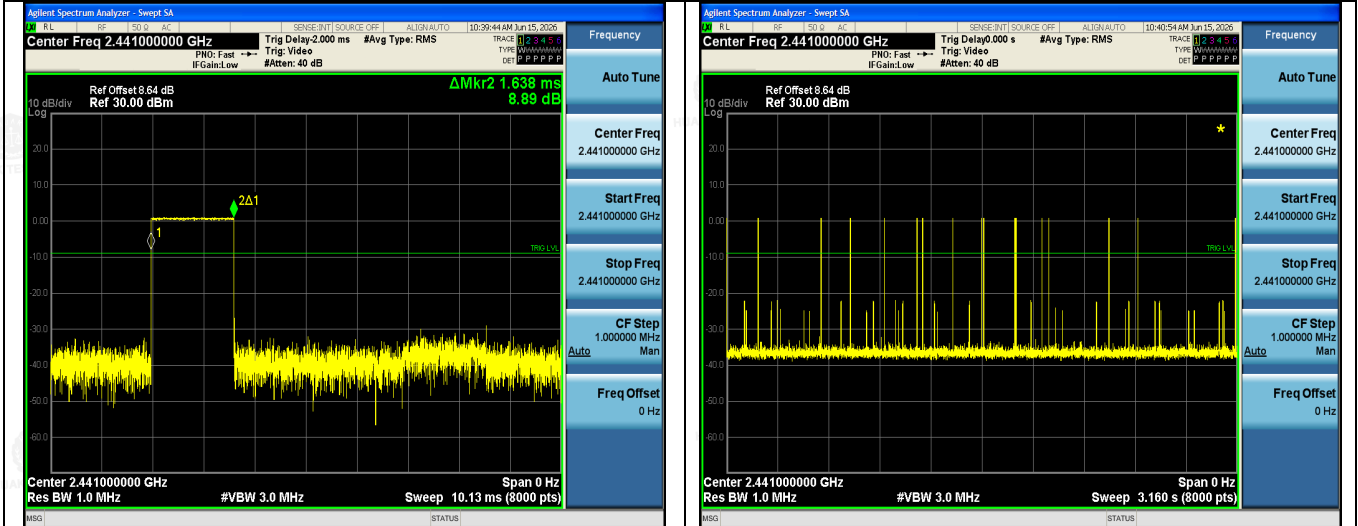
1. We have tested all mode at high,middle and low channel,and recoreded worst case at middle channel.
2. Dwell time =[Pulse time (ms) /1000] x Burst Count

Test plot as follows:

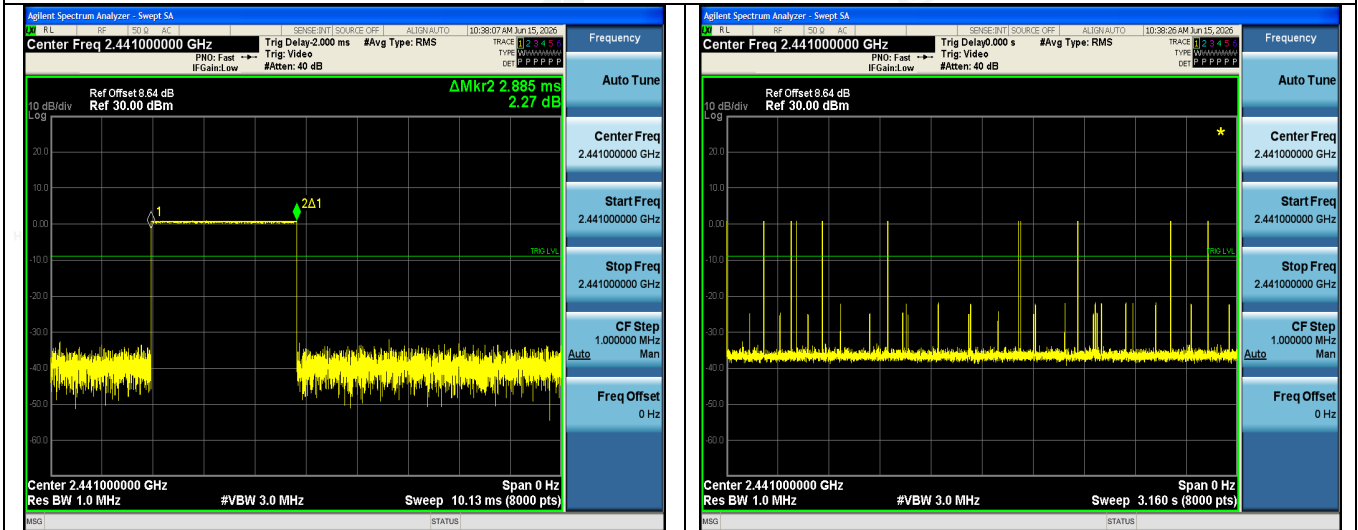
GFSK Modulation



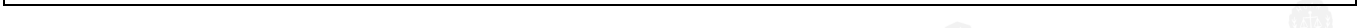
DH1



DH3

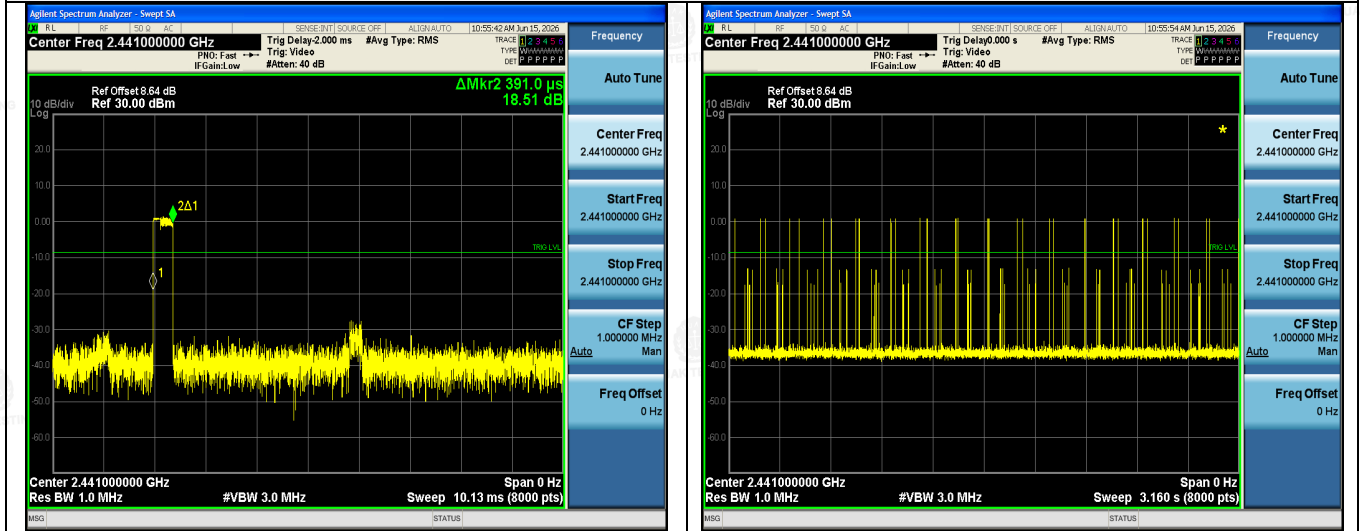


DH5

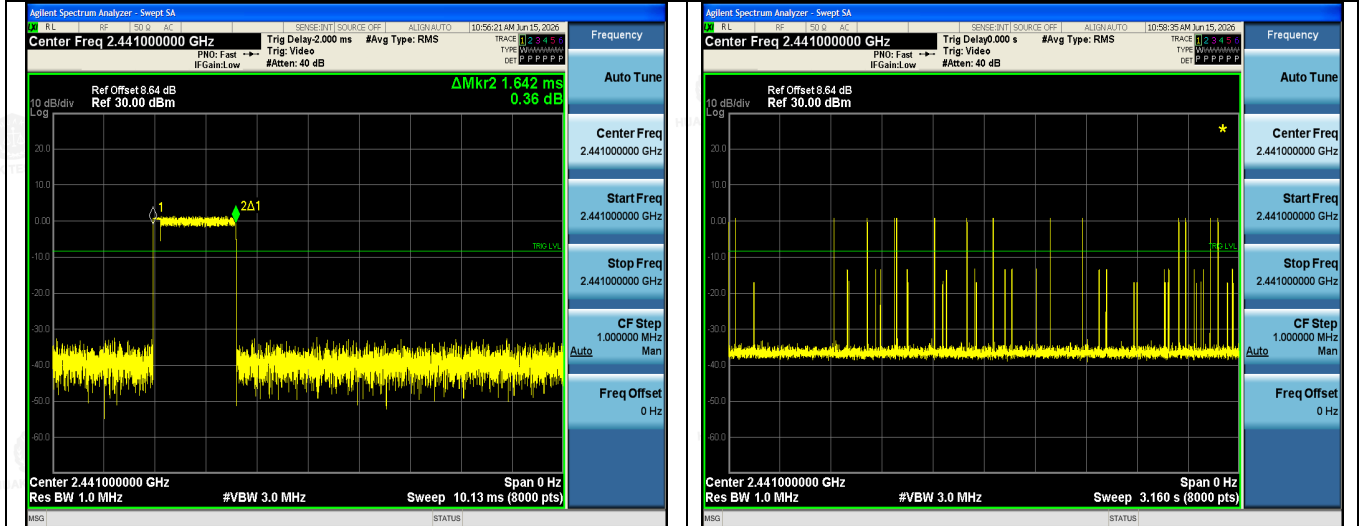


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$\pi/4$ DQPSK Modulation



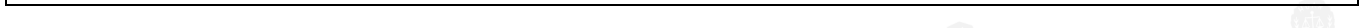
2-DH1



2-DH3

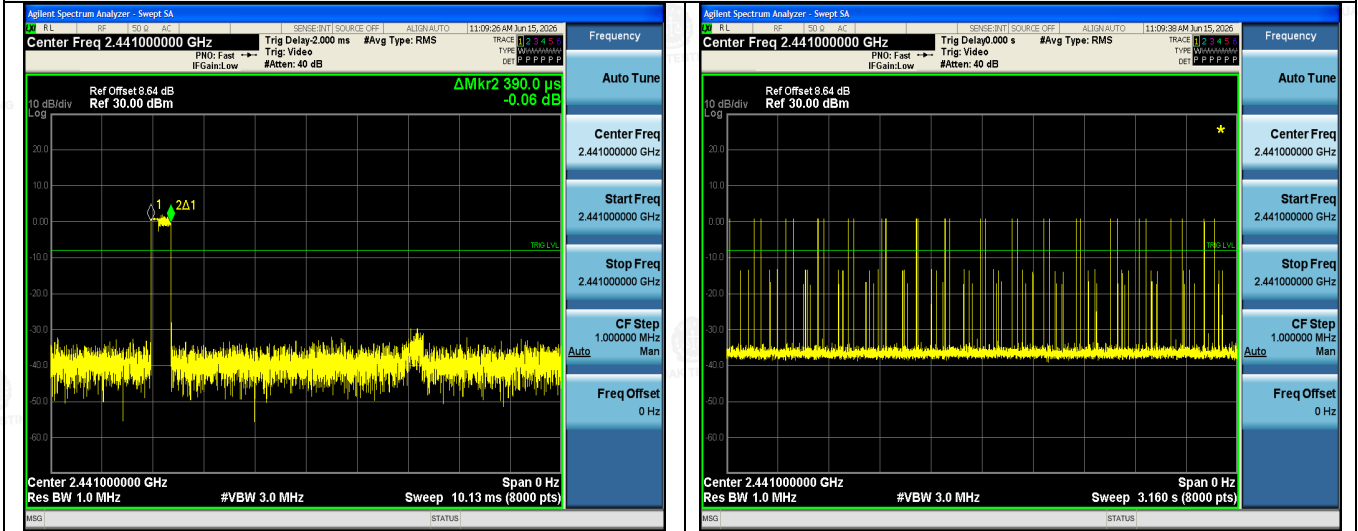


2-DH5



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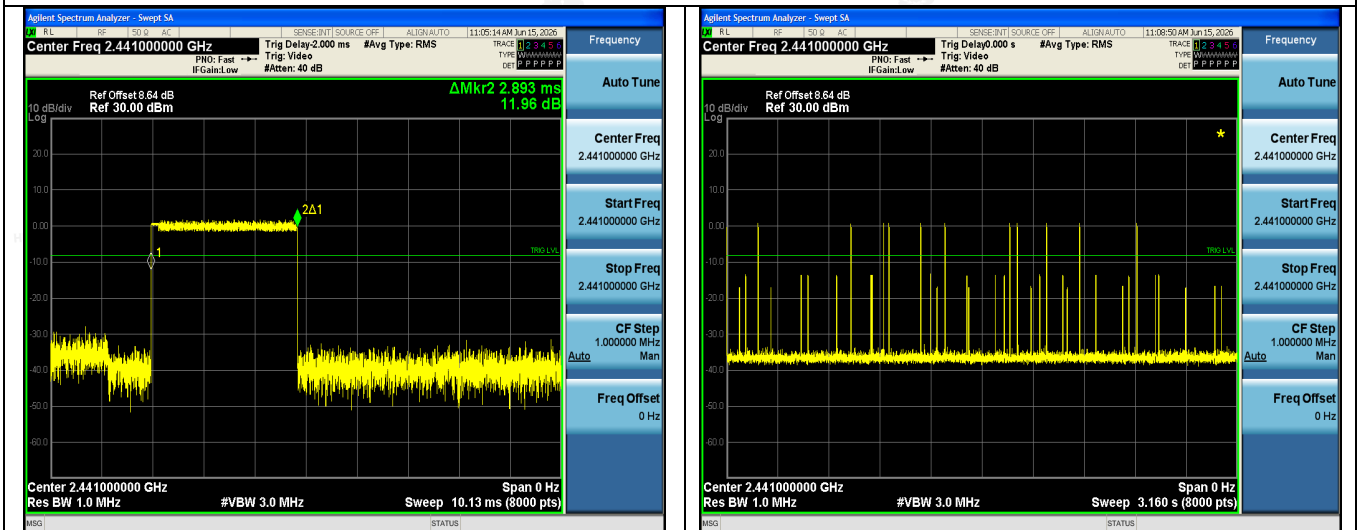
8DPSK Modulation



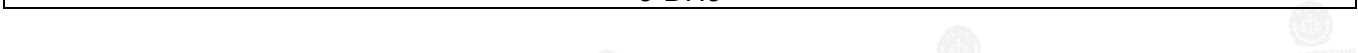
3-DH1



3-DH3



3-DH5



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3.8 Out-of-Band Emissions

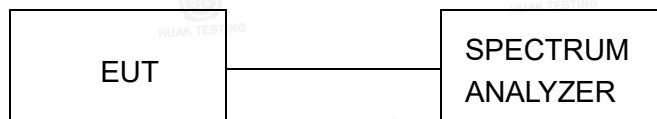
Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, band edge and out-of-band emissions.

Test Configuration

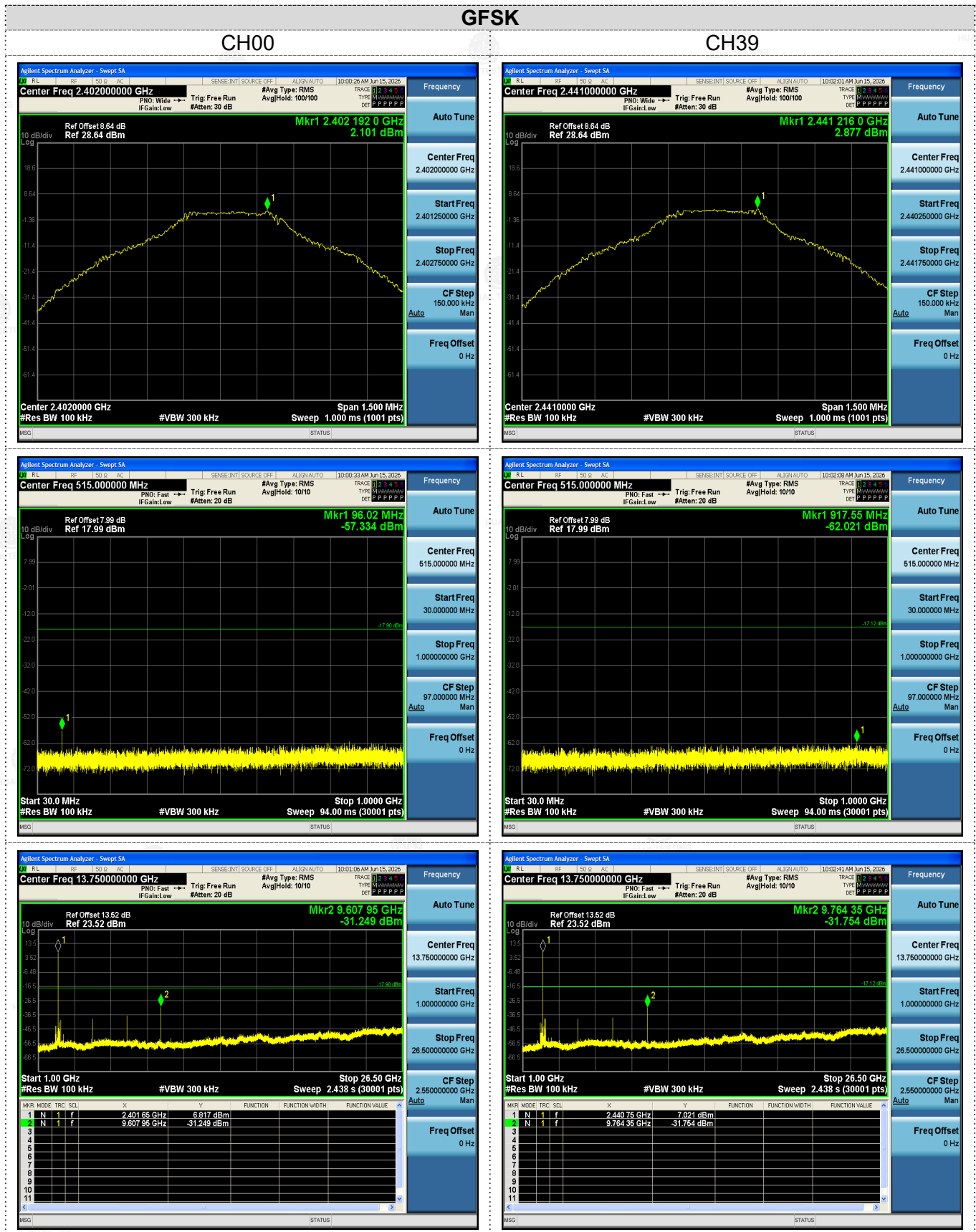


Test Results

Remark: 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 and band edge measurement data.

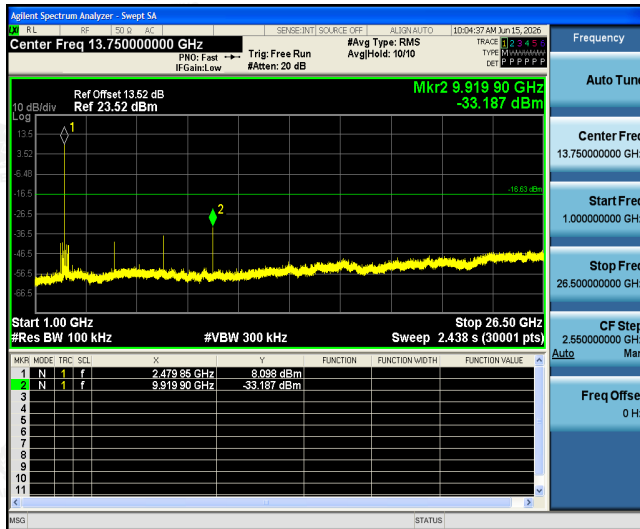
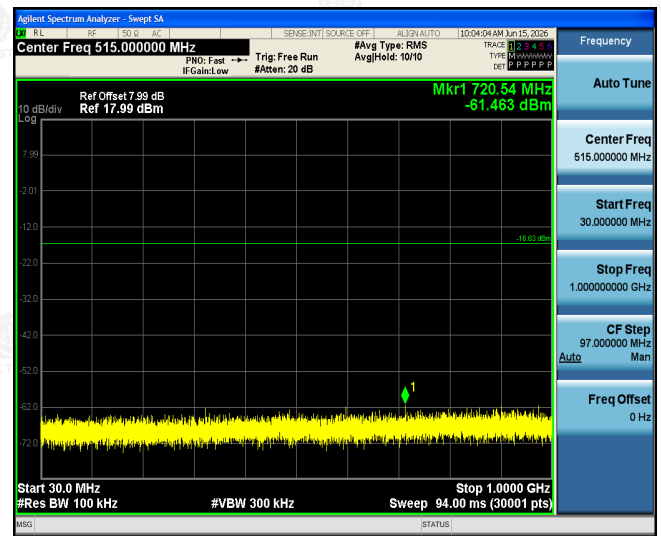
We measured all conditions (DH1, DH3, DH5) and recorded worst case at DH5 and 3DH5

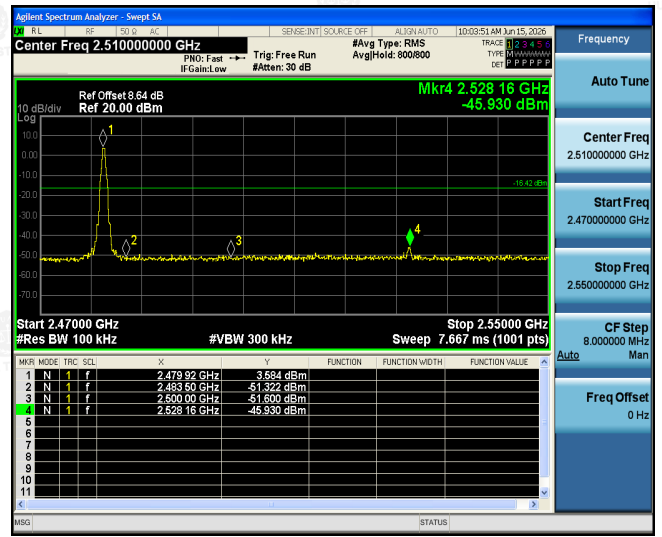
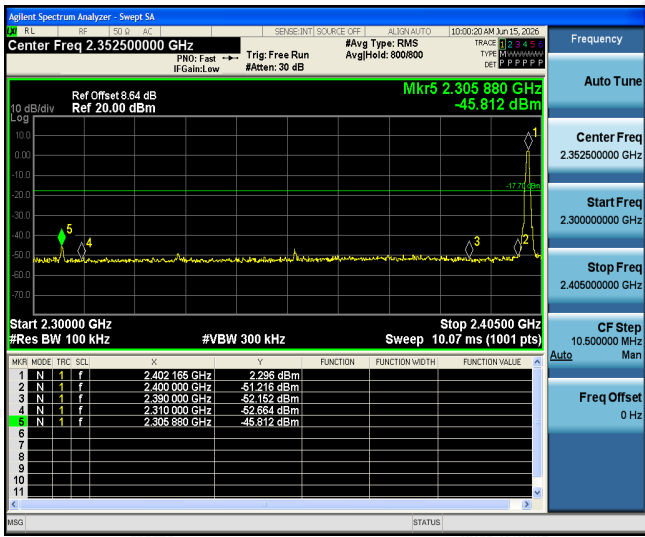
Test plot as follows:



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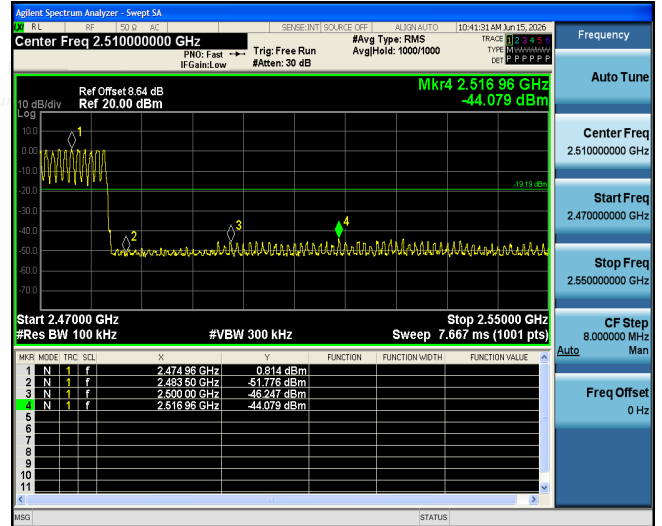
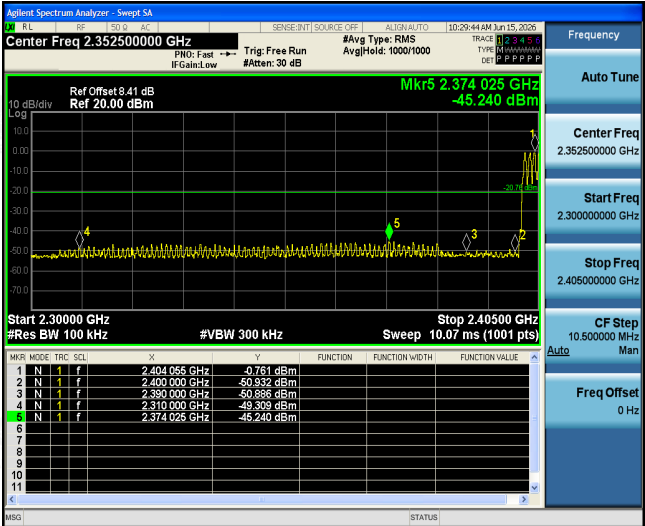
CH78





Left Band edge hopping off

Right Band edge hopping off



Left Band edge hopping on

Right Band edge hopping on