



Test Report

FCC ID: APIMLNO5909

Applicant: Harman International Industries, Inc

Address: 8500 Balboa Boulevard, Northridge, CA 91329, United States of America

Manufacturer: Harman International Industries, Inc

Address: 8500 Balboa Boulevard, Northridge, CA 91329, United States of America

Product: Bluetooth and ANC Headphone

Brand: Mark Levinson

Test Model(s): No5909

Series Model(s): N/A

Test Date: Apr.19, 2021 ~ Jul. 02, 2021

Issued By: Hwa-Hsing (Dongguan) Testing Co., Ltd.

Address: No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park, HuangJiang Town, Dongguan, China

FCC Designation No.: CN1255

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Hwa-Hsing (Dongguan) Testing Co., Ltd.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :

SIDER He

Date: Sep

Sep. 25, 2021

Scott He/ Project Engineer

Angli

Date: Sep. 27, 2021

Approved by :

Harry Li/ Technical Director

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the test sequested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into the account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

Page 1 of 60



Table of Contents

Release Control Record 4				
1	Sun	nmary of Test Results	. 5	
	1.1	Measurement Uncertainty	. 5	
	1.2	Modification Record	. 5	
2	Gen	neral Information	. 6	
	2.1	General Description of EUT	. 6	
		Description of Test Modes		
		2.2.1 Test Mode Applicability and Tested Channel Detail		
	2.3	Description of Support Units		
		2.3.1 Configuration of System under Test	10	
3	Tes	t Types and Results	11	
	31	Radiated Emission and Bandedge Measurement	11	
	0	3.1.1 Limits of Radiated Emission and Bandedge Measurement		
		3.1.2 Test Instruments		
		3.1.3 Test Procedures		
		3.1.4 Deviation from Test Standard	14	
		3.1.5 Test Setup	14	
		3.1.6 EUT Operating Conditions	15	
		3.1.7 Test Results		
	3.2	Conducted Emission Measurement	28	
		3.2.1 Limits of Conducted Emission Measurement		
		3.2.2 Test Instruments		
		3.2.3 Test Procedures		
		3.2.4 Test Setup		
		3.2.5 EUT Operating Condition		
		3.2.6 Deviation from Test Standard		
	<u>.</u>	3.2.7 Test Results		
	3.3	Number of Hopping Frequency Used		
		3.3.1 Limits of Hopping Frequency Used Measurement3.3.2 Test Setup		
		3.3.3 Test Instruments		
		3.3.4 Test Procedure		
		3.3.5 Deviation fromTest Standard		
		3.3.6 Test Results		
	3.4	Dwell Time on Each Channel		
	-	3.4.1 Limits of Dwell Time on Each Channel Measurement		
		3.4.2 Test Setup	34	
		3.4.3 Test Instruments		
		3.4.4 Test Procedures	34	
		3.4.5 Deviation from Test Standard	34	
		3.4.6 Test Results	35	
	3.5	Channel Bandwidth		
		3.5.1 Limits of Channel Bandwidth Measurement		
		3.5.2 Test Setup		
		3.5.3 Test Instruments		
		3.5.4 Test Procedure		
		3.5.5 Deviation from Test Standard		
		3.5.6 EUT Operating Condition		
		3.5.7 Test Results	39	

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

47

HWA-HSING Test Report No.:210128EL19-RF-US-02

	3.6	Occupied Bandwidth Measurement	.42
		3.6.1 Test Setup	.42
		3.6.2 Test Instruments	.42
		3.6.3 Test Procedure	.42
		3.6.4 Deviation from Test Standard	.42
		3.6.5 EUT Operating Conditions	.42
		3.6.6 Test Results	.43
	3.7	Hopping Channel Separation	.46
		3.7.1 Limits of Hopping Channel Separation Measurement	.46
		3.7.2 Test Setup	.46
		3.7.3 Test Instruments	46
		3.7.4 Test Procedure	
		3.7.5 Deviation from Test Standard	.46
		3.7.6 Test Results	47
	3.8	Maximum Output Power	
		3.8.1 Limits of Maximum Output Power Measurement	48
		3.8.2 Test Setup	
		3.8.3 Test Instruments	48
		3.8.4 Test Procedure	
		3.8.5 Deviation fromTest Standard	
		3.8.6 EUT Operating Condition	
		3.8.7 Test Results	
	3.9	Conducted Out of Band Emission Measurement	
		3.9.1 Limits of Conducted Out of Band Emission Measurement	
		3.9.2 Test Instruments	52
		3.9.3 Test Procedure	
		3.9.4 Deviation from Test Standard	
		3.9.5 EUT Operating Condition	
		3.9.6 Test Results	53
4	Pict	tures of Test Arrangements	59
		4.1.2 Test Instruments	59
Ap	pen	dix – Information on the Testing Laboratories	.60





Release Control Record

Issue No.	Description	Date Issued
210128EL19-RF-US-02	Original Release	Sep. 27, 2021

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: <u>0769-83078199</u> Web.: <u>www.hwa-hsing.com</u> E-Mail: <u>customerservice.dg@hwa-hsing.com</u>

Release Ver. 1.1



1 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013;

ANSI C63.10.2013,						
FCCClause	Test Item	Result	Remarks			
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit.			
15.247(a)(1) (iii)	Number of Hopping Frequency Used	Pass	Meet the requirement of limit.			
15.247(a)(1) (iii)	Dwell Time on Each Channel	Pass	Meet the requirement of limit.			
15.247(a)(1)	 Hopping Channel Separation Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System 	Pass	Meet the requirement of limit.			
15.247(b)	Maximum Peak Output Power	Pass	Meet the requirement of limit.			
	Occupied Bandwidth Measurement	Pass	Reference only			
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit.			
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.			
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.			
15.203	Antenna Requirement	Pass	No antenna connector is used.			

Note1: If the Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

Note2:The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (sDoC). The test report has been issued separately.

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUTas specified in CISPR 16-4-2:

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.66 dB
Redicted Emissions up to 1 CHz	9KHz ~ 30MHz	2.90dB
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	3.47 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	4.84 dB
Radiated Emissions above 1 GHz	18GHz ~ 40GHz	4.62 dB

Note:This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

1.2 Modification Record

There were no modifications required for compliance.

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

Page 5 of 60



General Information 2

2.1 **General Description of EUT**

Product	Bluetooth and ANC Headphone
Brand	Mark Levinson
Test Model(s)	No5909
Series Model(s)	N/A
FCC ID:	APIMLNO5909
Status of EUT	Engineeringprototype
Power Supply Rating	DC5V from USB or DC 3.7V from battery
Modulation Type	GFSK, π/4DQPSK,8DPSK
Transfer Rate	1/2/3Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	79
Output Power	14.256mW
Antenna Type	PFCB Antenna
Antenna Gain	1.47dBi Maximum peak Gain
Antenna Connector	I-PEX
Radio HW	V2.3
Radio FW	V1208
Accessory Device	Aux in Line: 125 cm; DC Line: 132cm Please see Note 1
Cable Supplied	N/A

Note:

1. Please refer to the EUT photo document (Reference No.:210128EL19) for detailed product photo.

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.





120EL19-RF-U

2.2 Description of Test Modes

79 channels are provided to this EUT:

Channel	Freq. (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		

Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com





EUT Configure Mode Applicable test items X-Axis Y-Axis Z-Axis Voltage Supply AC Power Conducted Emission N/A Radiated N/A N/A √* $\sqrt{}$ Radiated **Radiated Emissions** $\sqrt{}$ Number of Hopping Frequency N/A N/A N/A Used **Dwell Time on Each Channel** N/A N/A N/A 1. Hopping Channel Separation DC3.7V from 2. Spectrum Bandwidth of a Antenna Port battery N/A N/A N/A Frequency Hopping Sequence Conducted Spread Spectrum System Measurement Maximum Peak Output Power N/A N/A N/A Occupied Bandwidth N/A N/A N/A Measurement N/A N/A N/A Band Edge Measurement *: The EUT had been pre-tested on the positioned of each 3 Axis. The worst case was found when positioned on 1. Z-plane.

2.2.1 Test Mode Applicability and Tested Channel Detail

Test Condition:

"N/A" means no effect.

2.

Applicable test items	Environmental Conditions	Power supply	Tested by
AC Power Conducted Emission	25deg. C, 65%RH	DC5V from USB	Banson
Radiated Emissions	25deg. C, 65%RH	DC3.7V from battery	Jim Xu
Antenna Port Conducted Measurement	25deg. C, 65%RH	DC3.7V from battery	Dragonlong

Radiated Emission Test (Above 1 GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com





Radiated Emission Test (Below 1 GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	78	FHSS	GFSK	DH5

Power Line Conducted Emission Test:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	78	FHSS	GFSK	DH5

Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
 Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5



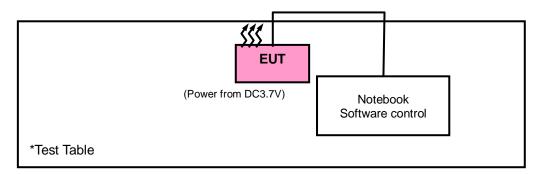
2.3 Description of Support Units

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.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook	Lenovo	E430	MP-0DN27	N/A

No.	Signal Cable Description Of The Above Support Units
1.	AC Line: Un-shieldin 2.0m
2.	/
3.	/

2.3.1 Configuration of System under Test





3 Test Typesand Results

3.1 Radiated Emission and Bandedge Measurement

3.1.1 Limits of Radiated Emission and Bandedge Measurement

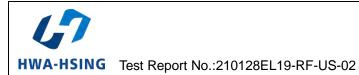
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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. The lower limit shall apply at the transition frequencies.
- 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.





3.1.2 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI 7	100962	2021/01/06	2022/01/05
Broadband antenna	Schwarzbeck	VULB 9168	00937	2021/04/16	2022/04/15
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2021/04/15	2022/04/14
Signal Amplifier	Com-power	PAM-103	18020051	2021/03/15	2022/03/14
Attenuator	Rohde&Schwarz	TS2GA-6dB	18101101	N/A	N/A
Test software	FARAD	FARAD	EZ_EMCV1.1.4.2	N/A	N/A
Fixed Attenuator	Mini-Circuits	MDCS18N-10	MDCS18N-10-01	2020/10/18	2021/10/17
Loop Antenna	EMCI	HLA 6121	45745	2020/04/14	2022/04/13
Preamplifier	EMCI	EMC001340	980201	2020/10/18	2021/10/17
Digital Multimete	FLUKE	15B+	43512617WS	2020/09/17	2021/09/16
Horn Antenna	Schwarzbeck	BBHA 9170	01959	2020/04/16	2022/04/15
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2021/03/15	2022/03/14
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	00025	2021/03/15	2022/03/14
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170242	2020/04/16	2022/04/15
Pre-Amplifier	EMCI	EMC 184045	980102	2021/03/15	2022/03/14
Antenna Tower	MF	MFA-440H	NA	NA	NA
Turn Table	MF	MFT-201SS	NA	NA	NA
Antenna Tower&Turn Table Controller	MF	MF-7802	NA	NA	NA
Spectrum	Keysight	N9020A	MY51240612	2020/09/17	2021/09/16
Power Meter 10Hz~18GHz	Tonscend	JS0806-2	188060126	2020/09/17	2021/09/16
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	101783	2020/09/17	2021/09/16
Signal generator	Keysight	N5182A	GB40051020	2020/09/17	2021/09/16
Signal generator	Keysight	N5182A	MY47420944	2020/09/17	2021/09/16
Universal Switch Control Unit	Rohde&Schwarz	CMW500	12010002K50	2020/09/17	2021/09/16
Test Software	Tonscend	JS0806-2	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12/24months and the calibrations are traceable to CEPREI/CHINA.

2. The test was performed in 966.

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



- 3.1.3 Test Procedures
- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for Average (Duty cycle < 98 %) detection at frequency above 1 GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
- 5. Test procedures for measuring FHSS device: The use of a duty cycle correction factor (DCCF) is permitted for calculating average radiated field strength emission levels for an FHSS device in 15.247. This DCCF can be applied when the unwanted emission limit is subject to an average field strength limit (e.g., within a Government Restricted band) and the conditions specified in Section 15.35(c) can be satisfied. The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement. The maximum radiated field strength level as determined through measurement of the emission(s) during continuous transmission (i.e., not including any time intervals during which the transmitter is off or is transmitting at a reduced power level). It is also acceptable to apply the DCCF to a measurement performed with a peak detector instead of the specified RMS power averaging detector. Note that Section 15.35(c) specifies that the DCCF shall represent the worst-case (greatest duty cycle) over any 100 msec transmission period. Subclause 7.5 of ANSI C63.10 provides additional measurement guidance applicable to determination of the DCCF.
- 6. All modes of operation were investigated and the worst-case emissions are reported.

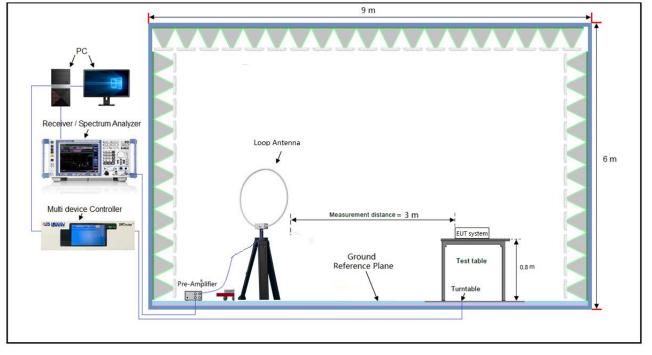


3.1.4 Deviation from Test Standard

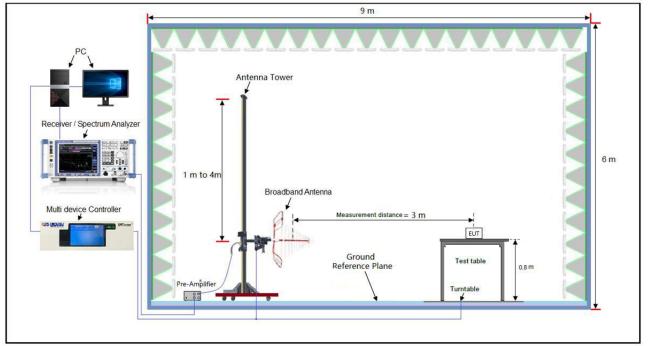
No deviation.

3.1.5 Test Setup

Radiated emission below 30MHz:



Frequency Range below 1GHz:

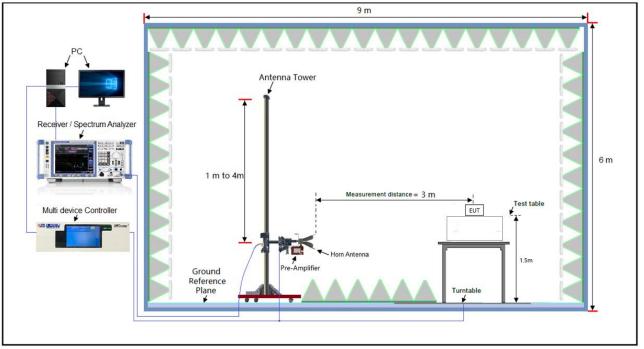


Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

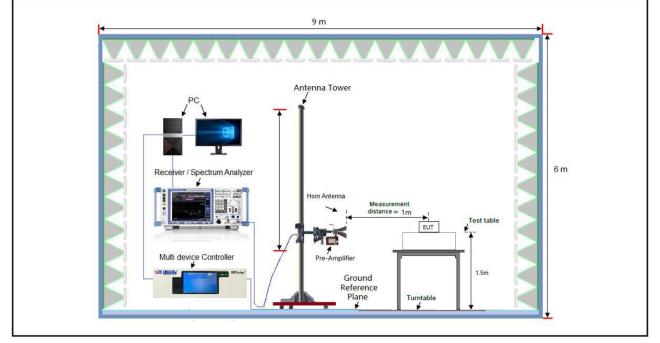
Release Ver. 1.1

Page 14 of 60

Frequency Range above 1GHz:



Frequency Range 18-40GHz:



Directional antenna.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

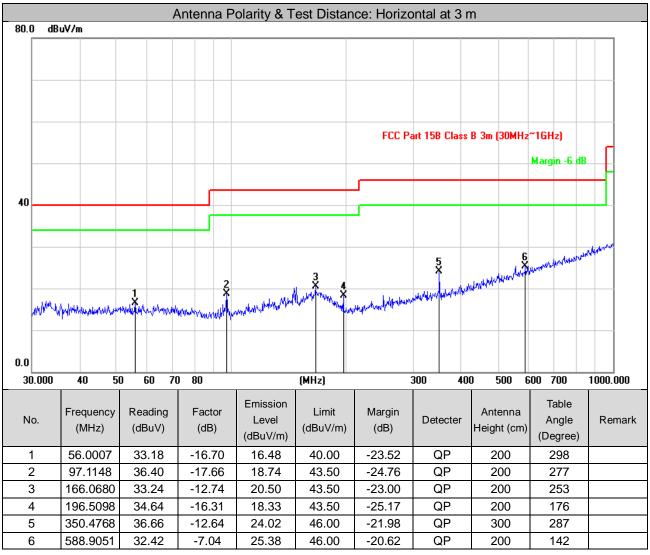
3.1.7 Test Results

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1GHz Worst-Case Data:

Test Channel	Channel 78	Frequency Range	30MHz ~ 1GHz
Detector Function	Peak (PK) Quasi-peak (QP)	Tested By	Jim Xu



Remarks:

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2.Margin value = Emission level - Limit value





		Channel 78			Frequ	uency Range 30MHz			MHz ~ 1GHz		
Detector F	Function		Peak (PK Quasi-pea		Teste	Tested By			Jim Xu		
		·						·			
			Antenna	Polarity & T	est Dista	nce: Verti	cal at 3 m				
80.0 dBu	V/m										
						FCC D		D 2_ (20MU)	~1CU_)		
						FUL Pa	art 15B Class	B 3m (3UMHz	TGHZJ		
									Margin -6 dB		
40											
						1					
									and when	and the first state of the stat	
1						5	hallow and what	6 martin	hadden service a		
Ă.	2 X		3	4 X	month all.	×.	I he shad what	State and A Martin			
- W M	Ampinations	Hope And an American Advertis	Aredon se va Are	Windown half first front		Willer and with and	AMAGAMATIN				
			an a	/*							
0.0											
30.000	40 50) 60 70) 80	(MHz)		300 400) 500 6	500 700	1000.000	
				Emission					Table		
No.	Frequency	Reading	Factor	Level	Limit	Margin	Detecter	Antenna	Angle	Remark	
INO.	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Delecter	Height (cm)	(Degree)	Remark	
1	33.9174	37.57	-16.60	20.97	40.00	-19.03	poak	200	178		
2	42.0066	34.09	-16.58	17.51	40.00	-19.03	peak peak	100	178		
3	96.0986	35.73	-17.77	17.96	43.50	-25.54	peak	100	130		
4	90.0900 132.6850	34.14	-15.44	18.70	43.50	-23.34	peak	200	325		
	239.9874	35.48	-15.47	20.01	46.00	-25.99	peak	300	160		
-	435.5898	31.75	-10.71	21.04	46.00	-24.96	peak	200	158		

1.Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)

2. Margin value = Emission level – Limit value

Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Above 1GHz Data:

1GHz ~ 25GHz Test Channel Channel 0 Frequency Range Peak (PK) Detector Function Tested By Jim Xu Average (AVG) Antenna Polarity & Test Distance: Horizontal at 3 m 120.0 dBuV/m FCC Part 15.247 (Above 1GHz)-PK J 70 FCC Part 15.247 (Above 1GHz)-AVG 20.0 2310.000 2319.50 2329.00 2338.50 2348.00 2357.50 2367.00 2376.50 2386.00 2405.00 MHz Emission Table Frequency Antenna Reading Factor Limit Margin No. Level Detecter Angle Remark Height (cm) (MHz) (dBuV) (dBuV/m) (dB) (dB) (Degree) (dBuV/m) 2388.437 49.04 -1.67 47.37 74.00 1 -26.63 100 236 peak 2 2388.437 18.54 -1.67 16.87 54.00 -37.13 AVG 100 236 2402.335 107.52 -1.65 100 3 105.87 peak 236 4 2402.335 77.02 -1.65 75.37 AVG 100 236 5 4804.000 52.46 4.49 56.95 74.00 -17.05 peak 133 288 6 4804.000 21.96 4.49 26.45 54.00 -27.55 AVG 288 133 7 7206.000 59.94 8.44 68.38 74.00 -5.62 100 126 peak 7206.000 29.44 8.44 37.88 54.00 -16.12 100 126 8 AVG

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor) Margin value = Emission level – Limit value

- 2. #2402MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.



Test Cl	hannel	Channel 0 Freq			Frequ	iency Rar	nge	1GHz ~	1GHz ~ 25GHz		
Detect	or Function		Peak (PK Average (Teste	d By		Jim Xu			
			Antenna	Polarity &	Test Dista	nce: Vert	ical at 3 m				
110.0	dBuV/m										
60							FCC Part 15.24	17 (Above 16)	1z)-AVG		
10.0											
2310	.000 2319.50	2329.00	2338.50	2348.00	2357.50	2367.00	2376.50	2386.00	2405	.00 MHz	
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)	Remark	
1	2389.769	50.89	-1.65	49.24	74.00	-24.76	peak	365	226		
2	2389.769	20.39	-1.65	18.74	54.00	-35.26	AVG	365	226		
3	2401.954	102.71	-1.66	101.05			peak	365	226		
4	2401.954	72.21	-1.66	70.55			AVG	365	226		
5	4804.000	58.00	4.49	62.49	74.00	-11.51	peak	220	276		
6	4804.000	27.50	4.49	31.99	54.00	-22.01	AVG	220	276		
7	7206.000	61.74	8.44	70.18	74.00	-3.82	peak	100	254		
8	7206.000	31.24	8.44	39.68	54.00	-14.32	AVG	100	254		

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor) Margin value = Emission level – Limit value

- 2. #2402MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

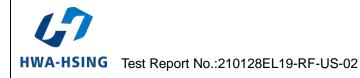


Test Cha	est Channel		Channel 3	39	Frequ	Frequency Range		1GHz ~	1GHz ~ 25GHz	
Detector	Detector Function		Peak (PK Average (,	Teste	Tested By		Jim Xu	Jim Xu	
		1	Antenna P	olarity & T	est Distan	ce: Horizc	ontal at 3 n	n		
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)	Remark

				(ubu v/m)					(Degree)	
1	2441.000	107.81	-1.61	106.20			peak	233	155	
2	2441.000	77.31	-1.61	75.70			AVG	233	155	
3	4882.000	52.36	4.66	57.02	74.00	-16.98	peak	133	201	
4	4882.000	21.86	4.66	26.52	54.00	-27.48	AVG	133	201	
5	7323.000	59.13	8.73	67.86	74.00	-6.14	peak	100	145	
6	7323.000	31.83	8.73	40.56	54.00	-13.44	AVG	100	145	
			Antenna	Polarity &	Test Dista	nce: Verti	cal at 3 m			
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2441.000	103.81	-1.61	102.20			peak	155	135	
2	2441.000	73.31	-1.61	71.70			AVG	155	135	
3	4882.000	57.17	4.66	61.83	74.00	-12.17	peak	120	236	
4	4882.000	26.67	4.66	31.33	54.00	-22.67	AVG	120	236	
5	7323.000	62.33	8.73	71.06	74.00	-2.94	peak	238	73	
6	7323.000	31.83	8.73	40.56	54.00	-13.44	AVG	238	73	

 Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor) Margin value = Emission level – Limit value

- 2. #2441MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.



Test Cha	annel		Channel		Frequ	ency Ran	ige	1GHz ~	25GHz	
Detector	r Function		Peak (PK Average	,	Teste	d By		Jim Xu	Jim Xu	
		A	Antenna P	olarity & T	est Distan	ce: Horizo	ontal at 3 r	n		
120.0 d	lBuV/m									
70	2						FCC Part 15.	247 (Above 16	îHz)-PK	
			3	m north	5 MM	F	СС Part 15.2	47 (Above 1G)	tz]-AVG	~~~~
20.0			*		\$	****	www		Award	
	000 2480.20 Frequency (MHz)	2482.40 Reading (dBuV)	2484.60 Factor (dB)		- hann	2491.20 Margin (dB)	2493.40	47 (Above 1GI	Award	0.00 MHz Remark
2478.00 No.	Frequency	2482.40 Reading	4 4 2484.60 Factor	2486.80 Emission Level (dBuV/m) 105.63	2489.00	2491.20 Margin	2493.40	2495.60 Antenna	2500 Table Angle	
2478.00 No. 1 2	Frequency (MHz)	2482.40 Reading (dBuV)	4 2484.60 Factor (dB)	2486.80 Emission Level (dBuV/m)	2489.00	2491.20 Margin	2493.40 Detecter	2495.60 Antenna Height (cm)	Table Angle (Degree)	
2478.00 No. 1 2 3	Frequency (MHz) 2479.852 2479.852 2483.555	2482.40 Reading (dBuV) 107.18 76.68 56.86	2484.60 Factor (dB) -1.55 -1.55 -1.56	2486.80 Emission Level (dBuV/m) 105.63 75.13 55.30	2489.00 Limit (dBuV/m) 74.00	2491.20 Margin (dB) -18.70	2493.40 Detecter peak AVG peak	2495.60 Antenna Height (cm) 149 149 149	2500 Table Angle (Degree) 273 273 273	
2478.00 No. 1 2 3 4	Frequency (MHz) 2479.852 2479.852 2483.555 2483.555	2482.40 Reading (dBuV) 107.18 76.68 56.86 26.36	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 105.63 75.13 55.30 24.80	2489.00 Limit (dBuV/m) 74.00 54.00	2491.20 Margin (dB) -18.70 -29.20	2493.40 Detecter peak AVG peak AVG	2495.60 Antenna Height (cm) 149 149 149 149	2500 Table Angle (Degree) 273 273 273 273	
2478.00 No. 1 2 3 4 5	Frequency (MHz) 2479.852 2479.852 2483.555 2483.555 2488.008	2482.40 Reading (dBuV) 107.18 76.68 56.86 26.36 56.18	4 2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 105.63 75.13 55.30 24.80 54.62	2489.00 Limit (dBuV/m) 74.00 54.00 74.00	2491.20 Margin (dB) -18.70 -29.20 -19.38	2493.40 Detecter peak AVG peak AVG peak	2495.60 Antenna Height (cm) 149 149 149 149 149 149	2500 Table Angle (Degree) 273 273 273 273 273 273	
2478.00 No. 1 2 3 4 5 6	Frequency (MHz) 2479.852 2479.852 2483.555 2483.555 2488.008 2488.008	2482.40 Reading (dBuV) 107.18 76.68 56.86 26.36 56.18 25.68	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 105.63 75.13 55.30 24.80 54.62 24.12	2489.00 Limit (dBuV/m) 74.00 54.00 74.00 54.00	2491.20 Margin (dB) -18.70 -29.20 -19.38 -29.88	2493.40 Detecter peak AVG peak AVG peak AVG	2495.60 Antenna Height (cm) 149 149 149 149 149 149 149 149	2500 Table Angle (Degree) 273 273 273 273 273 273 273 273	
2478.00 No. 1 2 3 4 5 6 7	Frequency (MHz) 2479.852 2479.852 2483.555 2483.555 2488.008 2488.008 4960.000	2482.40 Reading (dBuV) 107.18 76.68 56.86 26.36 56.18 25.68 54.44	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56 -1.56 4.83	2486.80 Emission Level (dBuV/m) 105.63 75.13 55.30 24.80 54.62 24.12 59.27	2489.00 Limit (dBuV/m) 74.00 54.00 74.00 54.00 74.00	2491.20 Margin (dB) -18.70 -29.20 -19.38 -29.88 -14.73	2493.40 Detecter peak AVG peak AVG peak AVG peak	2495.60 Antenna Height (cm) 149 149 149 149 149 149 149 149 149 149	2500 Table Angle (Degree) 273 273 273 273 273 273 273 273 273 273	
2478.00 No. 1 2 3 4 5 6	Frequency (MHz) 2479.852 2479.852 2483.555 2483.555 2488.008 2488.008	2482.40 Reading (dBuV) 107.18 76.68 56.86 26.36 56.18 25.68	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 105.63 75.13 55.30 24.80 54.62 24.12	2489.00 Limit (dBuV/m) 74.00 54.00 74.00 54.00	2491.20 Margin (dB) -18.70 -29.20 -19.38 -29.88	2493.40 Detecter peak AVG peak AVG peak AVG	2495.60 Antenna Height (cm) 149 149 149 149 149 149 149 149	2500 Table Angle (Degree) 273 273 273 273 273 273 273 273	

- Emission Level = Read Level + Factor (Antenna Factor + Cable Loss Preamp Factor) Margin value = Emission level – Limit value
- 2. #2480MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.





	annel				Frequ	Frequency Range 1GHz ~			Hz ~ 25GHz	
Detecto	or Function		Peak (PK Average		Teste	d By		Jim Xu		
			Antenna	Polarity &	Test Dista	nce: Vert	ical at 3 m			
120.0	dBuV/m									
	1									
	$/ \mid $									
	/ '									
1							FCC Part 15.	247 (Above 16	iHz)-PK	
70										
		$\langle \rangle$								
		· · · ·				F	-CC Part 15.24	47 (Above 1GH	iz)-AVG	
		h	3		5		-UU Part 15.24	47 (Above 1GF	lz)-AVG	
		h		an war well	5 M	mana		47 (Above 1GF	iz)-AVG	
		h	N. Marine Marine	an a	M	-			1z]-AVG	*~~
			-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	**************************************	maan			12)-AVG	**~
20.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			12)-A¥G	
	000 2480.20	2482.40	4 2484.60	2486.80	5 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1	2491.20				.00 MHz
	000 2480.20 Frequency (MHz)		4		5	m	n n n n n n n n n n n n n n n n n n n	******		
2478.0	Frequency (MHz) 2480.116	2482.40 Reading	4 2484.60 Factor	2486.80 Emission Level	6 2489.00 Limit	2491.20 Margin	2493.40	2495.60	2500. Table Angle	.00 MHz Remark
2478.0 No.	Frequency (MHz) 2480.116 2480.116	2482.40 Reading (dBuV) 101.93 71.43	4 2484.60 Factor (dB) -1.55 -1.55	2486.80 Emission Level (dBuV/m) 100.38 69.88	2489.00 Limit (dBuV/m)	2491.20 Margin (dB)	2493.40 Detecter peak AVG	2495.60 Antenna Height (cm) 341 341	2500. Table Angle (Degree) 277 227	
2478.0 No. 1 2 3	Frequency (MHz) 2480.116 2480.116 2483.952	2482.40 Reading (dBuV) 101.93 71.43 51.54	4 2484.60 Factor (dB) -1.55 -1.55 -1.56	2486.80 Emission Level (dBuV/m) 100.38 69.88 49.98	2489.00 Limit (dBuV/m) 74.00	2491.20 Margin (dB)	2493.40 Detecter peak AVG peak	2495.60 Antenna Height (cm) 341 341 341	2500. Table Angle (Degree) 277 227 227	
2478.0 No. 1 2 3 4	Frequency (MHz) 2480.116 2483.952 2483.952	2482.40 Reading (dBuV) 101.93 71.43 51.54 21.04	4 2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 100.38 69.88 49.98 19.48	5 2489.00 Limit (dBuV/m) 74.00 54.00	2491.20 Margin (dB) -24.02 -34.52	2493.40 Detecter peak AVG peak AVG	2495.60 Antenna Height (cm) 341 341 341 341	2500. Table Angle (Degree) 277 227 227 227 227	
2478.1 No. 1 2 3 4 5	Frequency (MHz) 2480.116 2483.952 2483.952 2483.952 2488.361	2482.40 Reading (dBuV) 101.93 71.43 51.54 21.04 51.28	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 100.38 69.88 49.98 19.48 49.72	\$ 2489.00 Limit (dBuV/m) 74.00 54.00 74.00	2491.20 Margin (dB) -24.02 -34.52 -24.28	2493.40 Detecter peak AVG peak AVG peak	2495.60 Antenna Height (cm) 341 341 341 341 341 341	2500. Table Angle (Degree) 277 227 227 227 227 227 227	
2478.0 No. 1 2 3 4 5 6	Frequency (MHz) 2480.116 2480.116 2483.952 2483.952 2488.361 2488.361	2482.40 Reading (dBuV) 101.93 71.43 51.54 21.04 51.28 20.78	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 100.38 69.88 49.98 19.48 49.72 19.22	2489.00 Limit (dBuV/m) 74.00 54.00 74.00	2491.20 Margin (dB) -24.02 -34.52 -24.28 -34.78	2493.40 Detecter peak AVG peak AVG peak AVG	2495.60 Antenna Height (cm) 341 341 341 341 341 341 341	2500. Table Angle (Degree) 277 227 227 227 227 227 227 227 227	
2478.1 No. 1 2 3 4 5	Frequency (MHz) 2480.116 2483.952 2483.952 2483.952 2488.361	2482.40 Reading (dBuV) 101.93 71.43 51.54 21.04 51.28	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 100.38 69.88 49.98 19.48 49.72	\$ 2489.00 Limit (dBuV/m) 74.00 54.00 74.00	2491.20 Margin (dB) -24.02 -34.52 -24.28	2493.40 Detecter peak AVG peak AVG peak	2495.60 Antenna Height (cm) 341 341 341 341 341 341	2500. Table Angle (Degree) 277 227 227 227 227 227 227	
2478.1 No. 1 2 3 4 5 6 7	Frequency (MHz) 2480.116 2480.116 2483.952 2483.952 2488.361 2488.361 4960.000	2482.40 Reading (dBuV) 101.93 71.43 51.54 21.04 51.28 20.78 58.37	Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56 4.83	2486.80 Emission Level (dBuV/m) 100.38 69.88 49.98 19.48 49.72 19.22 63.20	2489.00 Limit (dBuV/m) 74.00 54.00 74.00 54.00 74.00	2491.20 Margin (dB) -24.02 -34.52 -24.28 -34.78 -10.80	2493.40 Detecter peak AVG peak AVG peak AVG peak	2495.60 Antenna Height (cm) 341 341 341 341 341 341 341 341 341 341	2500. Table Angle (Degree) 277 227 227 227 227 227 227 227 227 22	

- 1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss Preamp Factor) Margin value = Emission level – Limit value
- 2. #2480MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

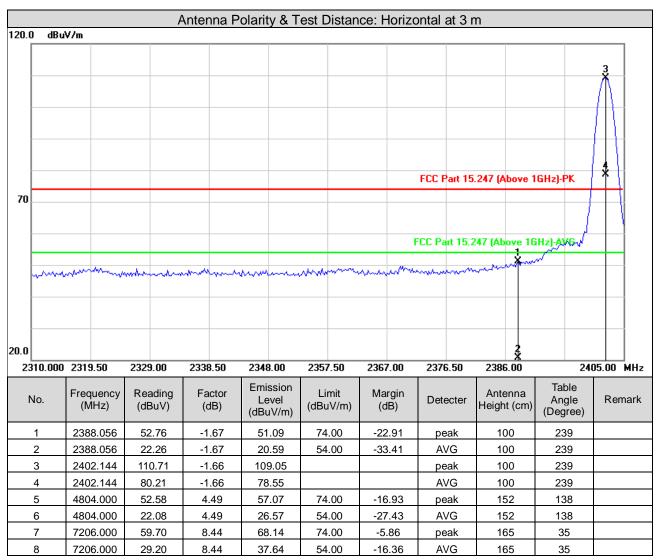
Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1



8DPSK

Test Channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Detector Function	Peak (PK) Average (AVG)	Tested By	Jim Xu



Remarks:

- Emission Level = Read Level + Factor (Antenna Factor + Cable Loss Preamp Factor) Margin value = Emission level – Limit value
- 2. #2402MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.



Test Ch	hannel		Channel	0	Frequ	iency Ran	ige	1GHz ~		
Detecto	or Function		Peak (PK Average	Peak (PK) Average (AVG)		d By		Jim Xu		
_			Antenna	Polarity &	Test Dista	nce: Verti	cal at 3 m			
120.0	dBu¥/m				1					
70						F	FCC Part 15.24	17 (Above 1GI	Hz]-AVG	3X
20.0										
20.0								2		
	.000 2319.50	2329.00	2338.50	2348.00	2357.50	2367.00	2376.50	2 2386.00	2405	.00 MHz
	.000 2319.50 Frequency (MHz)	2329.00 Reading (dBuV)	2338.50 Factor (dB)	2348.00 Emission Level (dBuV/m)	2357.50 Limit (dBuV/m)	2367.00 Margin (dB)	2376.50 Detecter	2386.00 Antenna Height (cm)	2405 Table Angle (Degree)	.00 MHz Remark
2310.	Frequency	Reading	Factor	Emission Level	Limit	Margin		Antenna	Table Angle	
2310. No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)	
2310. No. 1	Frequency (MHz) 2389.769 2389.769 2402.144	Reading (dBuV) 51.90	Factor (dB) -1.65	Emission Level (dBuV/m) 50.25	Limit (dBuV/m) 74.00	Margin (dB) -23.75	Detecter peak	Antenna Height (cm) 332 332 332	Table Angle (Degree) 225	
2310. No. 1 2	Frequency (MHz) 2389.769 2389.769	Reading (dBuV) 51.90 21.40 106.44 75.94	Factor (dB) -1.65 -1.65	Emission Level (dBuV/m) 50.25 19.75	Limit (dBuV/m) 74.00	Margin (dB) -23.75	Detecter peak AVG	Antenna Height (cm) 332 332	Table Angle (Degree) 225 225	
2310. No. 1 2 3	Frequency (MHz) 2389.769 2389.769 2402.144 2402.144 4804.000	Reading (dBuV) 51.90 21.40 106.44 75.94 57.86	Factor (dB) -1.65 -1.65 -1.66 -1.66 4.49	Emission Level (dBuV/m) 50.25 19.75 104.78	Limit (dBuV/m) 74.00 54.00 74.00	Margin (dB) -23.75 -34.25 -11.65	Detecter peak AVG peak AVG peak	Antenna Height (cm) 332 332 332	Table Angle (Degree) 225 225 225 225 225 225 225 225 225 225 225 225 276	
2310. No. 1 2 3 4	Frequency (MHz) 2389.769 2389.769 2402.144 2402.144 4804.000 4804.000	Reading (dBuV) 51.90 21.40 106.44 75.94 57.86 27.36	Factor (dB) -1.65 -1.65 -1.66 -1.66	Emission Level (dBuV/m) 50.25 19.75 104.78 74.28	Limit (dBuV/m) 74.00 54.00 74.00 54.00	Margin (dB) -23.75 -34.25 -11.65 -22.15	Detecter peak AVG peak AVG	Antenna Height (cm) 332 332 332 332 332	Table Angle (Degree) 225 225 225 225 225 225 225 225 225 276 276	
2310. No. 1 2 3 4 5	Frequency (MHz) 2389.769 2389.769 2402.144 2402.144 4804.000	Reading (dBuV) 51.90 21.40 106.44 75.94 57.86	Factor (dB) -1.65 -1.65 -1.66 -1.66 4.49	Emission Level (dBuV/m) 50.25 19.75 104.78 74.28 62.35	Limit (dBuV/m) 74.00 54.00 74.00	Margin (dB) -23.75 -34.25 -11.65	Detecter peak AVG peak AVG peak	Antenna Height (cm) 332 332 332 332 250	Table Angle (Degree) 225 225 225 225 225 225 225 225 225 225 225 225 276	

- Emission Level = Read Level + Factor (Antenna Factor + Cable Loss Preamp Factor) Margin value = Emission level – Limit value
- 2. #2402MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.



Test Channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Detector Eurotion	Peak (PK)	Tested Dy	Jim Xu
Detector Function	Average (AVG)	Tested By	JIII Au

	Antenna Polarity & Test Distance: Horizontal at 3 m										
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)	Remark	
1	2441.000	111.11	-1.61	109.50			peak	120	322		
2	2441.000	80.61	-1.61	79.00			AVG	120	322		
3	4882.000	51.88	4.66	56.54	74.00	-17.46	peak	210	165		
4	4882.000	21.38	4.66	26.04	54.00	-27.96	AVG	210	165		
5	7323.000	59.74	8.73	68.47	74.00	-5.53	peak	101	34		
6	7323.000	29.24	8.73	37.97	54.00	-16.03	AVG	101	34		
			Antenna	Polarity &	Test Dista	nce: Verti	cal at 3 m				
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detecter	Antenna Height (cm)	Table Angle (Degree)	Remark	
1	2441.000	110.51	-1.61	108.90			peak	135	266		
2	2441.000	80.01	-1.61	78.40			AVG	135	266		
3	4882.000	57.55	4.66	62.21	74.00	-11.79	peak	142	272		
4	4882.000	27.05	4.66	31.71	54.00	-22.29	AVG	142	272		
5	7323.000	60.34	8.73	69.07	74.00	-4.93	peak	130	163		
6	7323.000	29.84	8.73	38.57	54.00	-15.43	AVG	130	163		

 Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor) Margin value = Emission level – Limit value

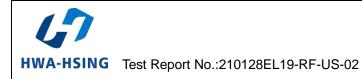
- 2. #2441MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.



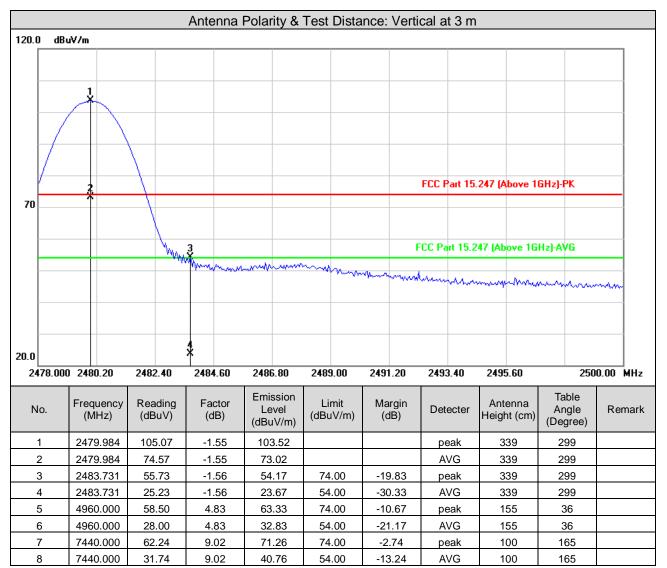
lest Ch	annel	nnel Channel 78		78	Frequ	Frequency Range			1GHz ~ 25GHz		
Detecto	or Function		Peak (PK) Average (AVG)				ed By Jim Xu				
		ŀ	Antenna P	olarity & T	est Distan	ce: Horizo	ontal at 3 r	n			
120.0 d	BuV/m										
70	2						FCC Part 15.	247 (Above 1)	GHz)-PK		
			×~~~			F Arrichenne	FCC Part 15.2	47 (Above 16)	Hz]- ΑVG {\}γγγγ-/γ/	www	
20.0			**************************************			l hradadynawys	FCC Part 15.2	47 (Above 1Gi	Hz]-ΑVG Ψγγγγ~∿~	mhr	
	00 2480.20	2482.40			and the state of t	2491.20	2493.40	47 (Above 16)	Mar Marine	/γ/\/ 0.00 MHz	
	00 2480.20 Frequency (MHz)		*			han har	www	mpumuhh	Mar Marine		
2478.0	Frequency	2482.40 Reading	2484.60 Factor	2486.80 Emission Level	2489.00 Limit	2491.20 Margin	2493.40	2495.60	250 Table Angle	0.00 MHz	
2478.0 No.	Frequency (MHz)	2482.40 Reading (dBuV)	2484.60 Factor (dB)	2486.80 Emission Level (dBuV/m)	2489.00 Limit	2491.20 Margin	2493.40 Detecter	2495.60 Antenna Height (cm)	250 Table Angle (Degree)	0.00 MHz	
2478.0 No.	Frequency (MHz) 2479.984	2482.40 Reading (dBuV) 109.63	2484.60 Factor (dB) -1.55	2486.80 Emission Level (dBuV/m) 108.08	2489.00 Limit	2491.20 Margin	2493.40 Detecter peak	2495.60 Antenna Height (cm) 133	250 Table Angle (Degree) 268	0.00 MHz	
2478.0 No.	Frequency (MHz) 2479.984 2479.984	2482.40 Reading (dBuV) 109.63 79.13	2484.60 Factor (dB) -1.55 -1.55	2486.80 Emission Level (dBuV/m) 108.08 77.58	2489.00 Limit (dBuV/m)	2491.20 Margin (dB)	2493.40 Detecter peak AVG	2495.60 Antenna Height (cm) 133 133	250 Table Angle (Degree) 268 268	0.00 MHz	
2478.0 No.	Frequency (MHz) 2479.984 2479.984 2483.731	2482.40 Reading (dBuV) 109.63 79.13 58.56	2484.60 Factor (dB) -1.55 -1.55 -1.56	2486.80 Emission Level (dBuV/m) 108.08 77.58 57.00	2489.00 Limit (dBuV/m) 74.00	2491.20 Margin (dB) -17.00	2493.40 Detecter peak AVG peak	2495.60 Antenna Height (cm) 133 133 133	250 Table Angle (Degree) 268 268 268	0.00 MHz	
2478.0 No. 1 2 3 4	Frequency (MHz) 2479.984 2479.984 2483.731 2483.731	2482.40 Reading (dBuV) 109.63 79.13 58.56 28.06	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 108.08 77.58 57.00 26.50	2489.00 Limit (dBuV/m) 74.00 54.00	2491.20 Margin (dB) -17.00 -27.50	2493.40 Detecter peak AVG peak AVG	2495.60 Antenna Height (cm) 133 133 133 133	250 Table Angle (Degree) 268 268 268 268	0.00 MHz	
2478.0 No. 1 2 3 4 5	Frequency (MHz) 2479.984 2479.984 2483.731 2483.731 2483.008	2482.40 Reading (dBuV) 109.63 79.13 58.56 28.06 57.59	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 108.08 77.58 57.00 26.50 56.03	2489.00 Limit (dBuV/m) 74.00 54.00 74.00	2491.20 Margin (dB) -17.00 -27.50 -17.97	2493.40 Detecter peak AVG peak AVG peak	2495.60 Antenna Height (cm) 133 133 133 133 133	250 Table Angle (Degree) 268 268 268 268 268 268	0.00 MHz	
2478.0 No. 1 2 3 4 5 6	Frequency (MHz) 2479.984 2479.984 2483.731 2483.731 2488.008	2482.40 Reading (dBuV) 109.63 79.13 58.56 28.06 57.59 27.09	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56	2486.80 Emission Level (dBuV/m) 108.08 77.58 57.00 26.50 56.03 25.53	2489.00 Limit (dBuV/m) 74.00 54.00 74.00	2491.20 Margin (dB) -17.00 -27.50 -17.97 -28.47	2493.40 Detecter peak AVG peak AVG peak AVG	2495.60 Antenna Height (cm) 133 133 133 133 133 133 133	250 Table Angle (Degree) 268 268 268 268 268 268 268 268	0.00 MHz	
2478.0 No. 1 2 3 4 5 6 7	Frequency (MHz) 2479.984 2479.984 2483.731 2483.731 2488.008 2488.008 4960.000	2482.40 Reading (dBuV) 109.63 79.13 58.56 28.06 57.59 27.09 54.88	2484.60 Factor (dB) -1.55 -1.55 -1.56 -1.56 -1.56 -1.56 -1.56 4.83	2486.80 Emission Level (dBuV/m) 108.08 77.58 57.00 26.50 56.03 25.53 59.71	2489.00 Limit (dBuV/m) 74.00 54.00 74.00 54.00 74.00	2491.20 Margin (dB) -17.00 -27.50 -17.97 -28.47 -14.29	2493.40 Detecter peak AVG peak AVG peak AVG peak	2495.60 Antenna Height (cm) 133 133 133 133 133 133 133 133 133	250 Table Angle (Degree) 268 268 268 268 268 268 268 268 268 268	0.00 MHz	

- 1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss Preamp Factor) Margin value = Emission level – Limit value
- 2. #2480MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.





Test Channel	Channel 78	Frequency Range	1GHz ~ 25GHz
Detector Eurotian	Peak (PK)	Tested Dv	lim Vu
Detector Function	Average (AVG)	Tested By	Jim Xu



- 1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss Preamp Factor) Margin value = Emission level – Limit value
- 2. #2480MHz: Fundamental frequency.
- 3. The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.



3.2 Conducted Emission Measurement

3.2.1 Limits of Conducted Emission Measurement

	Conducted L	imit (dBuV)
Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.2.2 Test Instruments

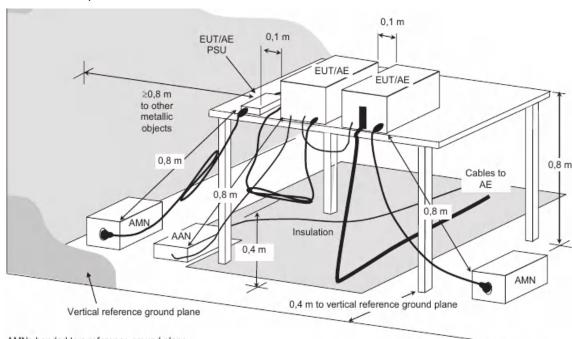
Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
EMI Test Receiver Rohde&Schwarz	ESCI3	101418	2021/09/05
Artificial Mains Network Rohde&Schwarz	ENV216	3560.6550.15	2021/09/16
Test software FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Hygrothermograph Yuhuaze	HTC-1	NA	2021/09/16
Digital Multimeter FLUKE	15B+	43512617WS	2021/09/16

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

2. The test was performed in Shielded Room 1.

- 3.2.3 Test Procedures
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit 20dB)was not recorded.

Note: All modes of operation were investigated and the worst-case emissions are reported.



3.2.4 Test Setup

AMNs bonded to a reference ground plane

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.2.5 EUT Operating Condition

Set the EUT under transmission condition continuously at specific channel frequency.

3.2.6 Deviation from Test Standard

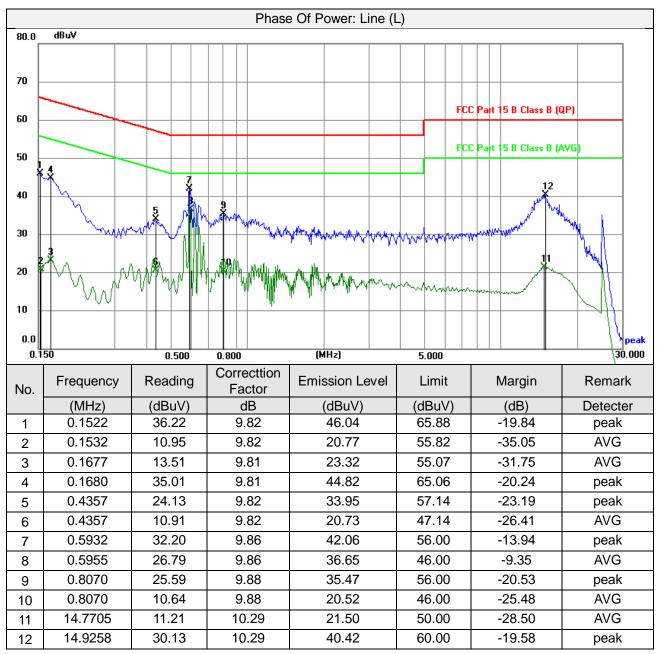
No deviation.



3.2.7 Test Results

Conducted Worst-Case Data:

Frequency Range	150kHz ~ 30MHz		Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	DC5V from USB Adapter input AC120V/60Hz	Tested by	Jim Xu



Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. The emission levels of other frequencies were very low against the limit.

3. Margin value = Emission level - Limit value

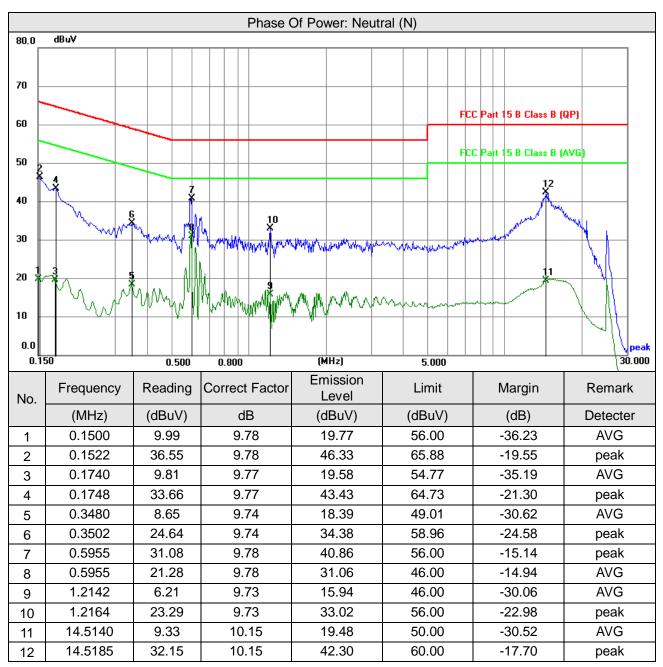
- 4. Correction factor = Insertion loss + Cable loss
- 5. Emission Level = Correction Factor + Reading Value.

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com





Frequency Range	150kHz ~ 30MHz		Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	DC5V from USB Adapter input AC120V/60Hz	Tested by	Jim Xu



1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. The emission levels of other frequencies were very low against the limit.

3. Margin value = Emission level - Limit value

4. Correction factor = Insertion loss + Cable loss

5. Emission Level = Correction Factor + Reading Value.

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

Page 31 of 60



3.3 Number of Hopping Frequency Used

3.3.1 Limits of Hopping Frequency Used Measurement

At least 15 channels frequencies, and should be equally spaced.

3.3.2 Test Setup



3.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

3.3.4 Test Procedure

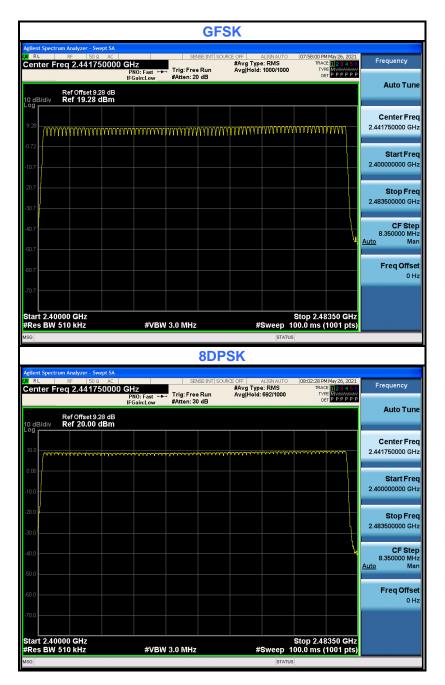
- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were complete.

3.3.5 Deviation fromTest Standard

No deviation.

3.3.6 Test Results

There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

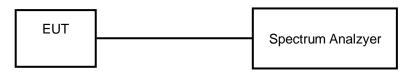


3.4 Dwell Time on Each Channel

3.4.1 Limits of Dwell Time on Each Channel Measurement

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.

3.4.2 Test Setup



3.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

3.4.4 Test Procedures

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- e. Repeat above procedures until all different time-slot modes have been completed.

3.4.5 Deviation from Test Standard

No deviation.

3.4.6 Test Results

GFSK

	Number of		Number of transmision in a period (channel number*0.4 sec)				Result	Limit	Pass /
Mode	Hopping Channel	Period (sec)	Sweep time (sec)	times in a sweep	times in a period	transmission time (msec)	(msec)	(msec)	Fail
DH1	79	31.6	3.16	32	320	0.3851	123.23	400	PASS
DH3	79	31.6	3.16	16	160	1.64	262.4	400	PASS
DH5	79	31.6	3.16	11	110	2.889	317.79	400	PASS

Note: Test plots of the transmitting time slot are shown as below.

8DPSK

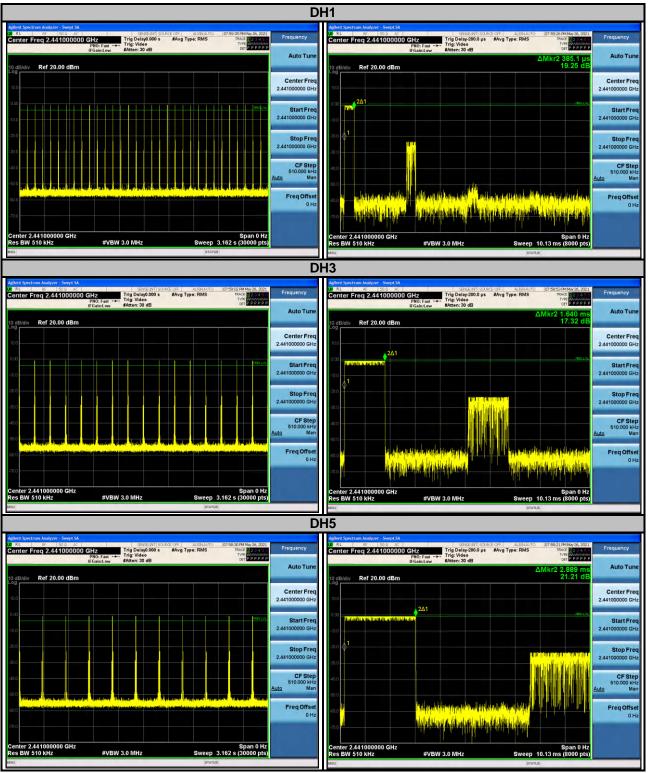
	Number of	Number of transmision in (channel number*0.4				Length of	Result	Limit	Pass /
Mode	Hopping Channel	Period (sec)	Sweep time (sec)	times in a sweep	times in a period	transmission time (msec)	(msec)	(msec)	Fail
3DH1	79	31.6	3.16	32	320	0.3813	122.02	400	PASS
3DH3	79	31.6	3.16	16	160	1.638	262.08	400	PASS
3DH5	79	31.6	3.16	11	110	2.888	317.68	400	PASS

Note: Test plots of the transmitting time slot are shown as below.







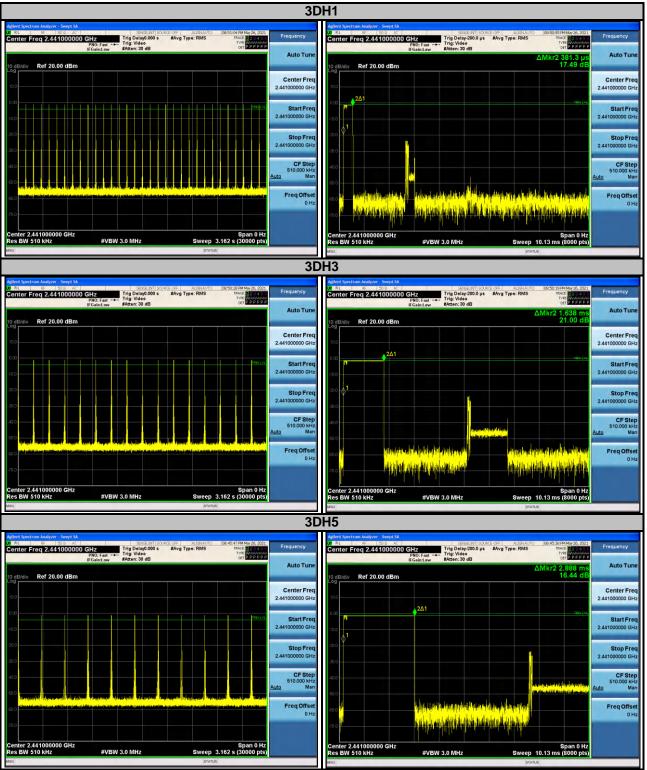


Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1







Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

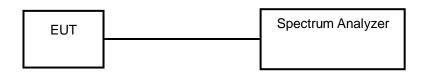


3.5 Channel Bandwidth

3.5.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5 MHz, if the 20 dB bandwidth of hopping channel is greater than 25 kHz, two-thirds 20 dB bandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

3.5.2 Test Setup



3.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

3.5.4 Test Procedure

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

3.5.5 Deviation from Test Standard

No deviation.

3.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



3.5.7 Test Results

Channel	Frequency	20dB Bandwidth (MHz)		
Channel	(MHz)	GFSK	8DPSK	
0	2402	0.963	1.314	
39	2441	0.966	1.311	
78	2480	0.963	1.308	

<u>GFSK</u>



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



8DPSK



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



Page 40 of 60



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

Page 41 of 60



3.6 Occupied Bandwidth Measurement

3.6.1 Test Setup



3.6.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument

3.6.3 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 resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

3.6.4 Deviation from Test Standard

No deviation.

3.6.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

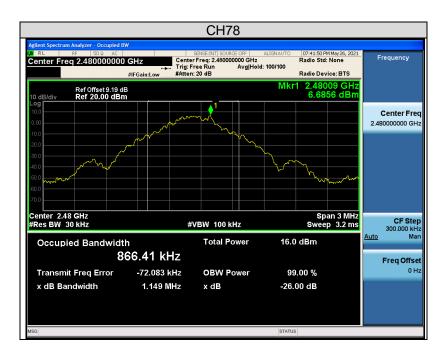
3.6.6 Test Results

Channel	Frequency	OccupiedBa	ndwidth (MHz)
Channel	(MHz)	GFSK	8DPSK
0	2402	0.8745	1.1859
39	2441	0.8789	1.1995
78	2480	0.8664	1.1985

GFSK



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



8DPSK



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com





Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Page 45 of 60

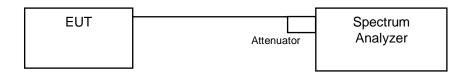


3.7 Hopping Channel Separation

3.7.1 Limits of Hopping Channel Separation Measurement

At least 25 kHz or two-third of 20 dB hopping channel bandwidth (whichever is greater).

3.7.2 Test Setup



3.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

3.7.4 Test Procedure

Measurement Procedure REF

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- c. By using the MaxHold function record the separation of two adjacent channels.
- d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were complete.

3.7.5 Deviation from Test Standard

No deviation.



3.7.6	Test Results

Channel Frequency		Adjacent Channel Separation (MHz)		Minimum Limit (MHz)		Pass / Fail	
No.	(MHz)	GFSK	8DPSK	GFSK	8DPSK		
0	2402	0.996	1.002	0.64	0.88	Pass	
39	2441	0.993	0.999	0.65	0.88	Pass	
78	2480	1.005	1.002	0.64	0.88	Pass	

Note:

1. The minimum limit is two-third 20 dB bandwidth.



Page 47 of 60

HuangJiang Town, Dongguan, China

E-Mail: customerservice.dg@hwa-hsing.com

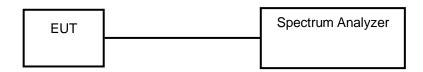


Maximum Output Power 3.8

3.8.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

3.8.2 Test Setup



3.8.3 **Test Instruments**

Refer to section 4.1.2 to get information of above instrument.

3.8.4 Test Procedure

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency b. within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using 1MHz c. RBW and 3 MHz VBW.
- Measure the captured power within the band and recording the plot. d.
- Repeat above procedures until all frequencies required were complete. e.

3.8.5 **Deviation fromTest Standard**

No deviation.

3.8.6 EUT Operating Condition

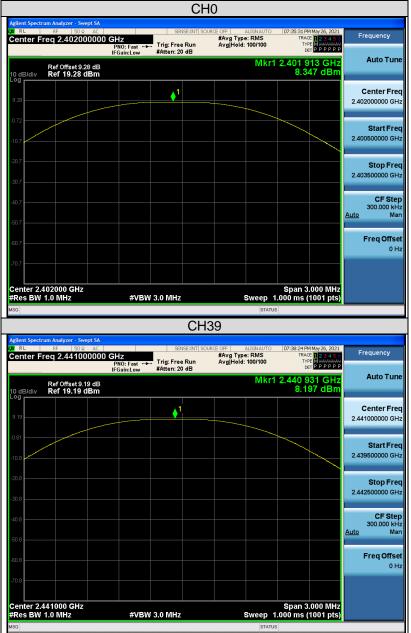
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



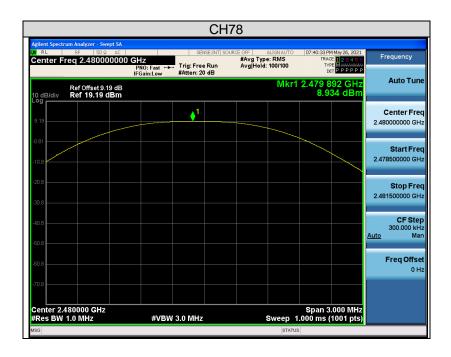
3.8.7 Test Results

Channel	Freq.	Output Power (mW)			ut Power JBm)	Power Limit	Pass / Fail
No.	(MHz)	GFSK	8DPSK	GFSK	8DPSK	(mW)	1 400 / 1 41
0	2402	6.839	12.618	8.35	11.01	125	Pass
39	2441	6.607	12.023	8.20	10.80	125	Pass
78	2480	7.816	14.256	8.93	11.54	125	Pass

GFSK



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



8DPSK

			CH	10		
	um Analyzer - Swept SA					
XIRL	RF 50 Ω AC	311-	SENSE:INT SO	#Avg Type: RMS	07:44:28 PM May 2 TRACE	
Center Fr	eq 2.402000000 (PNO: Fast ↔ IFGain:Low	. Trig: Free Run #Atten: 20 dB	Avg Hold: 100/100	TYPE MW DET P P	PPPP
10 dB/div	Ref Offset 9.28 dB Ref 19.28 dBm			Mkr1	2.401 868 11.011 c	GHz Auto Tune IBm
			↓ 1			Center Free
9.28			and a grant of the second s	and the second s		2.402000000 GH
-0.72	and the second s				- Contraction of the second se	
-10.7						2.400500000 GH;
-10.7						
-20.7						Stop Free
-30.7						2.403500000 GH
-40.7						CF Ste
-40.7						300.000 kH Auto Ma
-50.7						
-60.7						Freq Offse
-70.7						он
-/U./						
Center 2.4 #Res BW 1	.02000 GHz 1.0 MHz	#VBW	3.0 MHz	Sweep	Span 3.000 1.000 ms (1001	MHz pts)
ISG				STATU		

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



Page 50 of 60

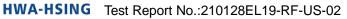
	CH	39		
gilent Spectrum Analyzer - Swept SA R L RF 50 © AC	SENSE:INT SO	DURCE OFF ALIGN AUTO	07:50:53 PM May 26, 2021	-
Center Freq 2.441000000 GHz): Fast ↔ Trig: Free Run in:Low #Atten: 20 dB	#Avg Type: RMS Avg Hold: 100/100	TRACE 123456 TYPE MMMMMM DET PPPPP	Frequency
Ref Offset 9.19 dB 0 dB/div Ref 19.19 dBm		Mkr1	2.440 955 GHz 10.799 dBm	Auto Tu
9.19	1			Center Fr
0.81			- Martine -	2.441000000 G
10.8			and a second sec	Start Fr 2.439500000 G
20.8				Stop Fr
30.8				2.442500000 G
40.8				CF St 300.000 k <u>Auto</u> N
50.8				
60.8				Freq Offs 0
70.8				
Center 2.441000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 1	Span 3.000 MHz .000 ms (1001 pts)	
Center 2.441000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	STATUS	.000 ms (1001 pts)	
Res BW 1.0 MHz so glient Spectrum Analyzer - Swept SA R L	SENSE:INT SC	status 178	.000 ms (1001 pts)	Frequency
Res BW 1.0 MHz so glient Spectrum Analyzer - Swept SA C RL RF SOQ AC Center Freq 2.480000000 GHz PKG BEG Offset 9.19.46	CH SENSE:INT SC	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	07:52:59 PM Msy 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021	
Res BW 1.0 MHz	SBNSE:INT SC	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	000 ms (1001 pts)	Auto Tu Center Fr
Res BW 1.0 MHz sci uglient Spectrum Analyzer - Swept SA RL off center Freq 2.480000000 GHz PHQ Value Ref Offset 9.19 dB og 9	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	07:52:59 PM Msy 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021	Auto Tu Center Fr
Res BW 1.0 MHz	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	07:52:59 PM Msy 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021	Auto Tu Center Fr 2.48000000 G Start Fr
Res BW 1.0 MHz sci glient Spectrum Analyzer - Swept SA RL RF PRC Zenter Freq 2.480000000 GHz PRC If Ga 0 dB/div Ref Offset 9.19 dB 919 919 0 dB/div	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	07:52:59 PM Msy 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G
Res BW 1.0 MHz	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	07:52:59 PM Msy 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021 TRACE 0 2 3 4 5 5 TYPE MSY 26, 2021	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G
Res BW 1.0 MHz sci	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	0.000 ms (1001 pts)	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G Stop Fr 2.481500000 G
Res BW 1.0 MHz sci uglient Spectrum Audyzer - Swert SA. Rt. sci center Freq 2.480000000 GHz PRO 0 dB/dlv Ref Offset 9.19 dB 0 dB/dlv Ref 0ffset 9.19 dB 0.9	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	0.000 ms (1001 pts)	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G Stop Fr 2.481500000 G CF St 300.000 k Auto M
Res BW 1.0 MHz sci	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	0.000 ms (1001 pts)	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G Stop Fr 2.481500000 G CF St 300.000 k Auto
Res BW 1.0 MHz sci	East	STATUS 178 DURCE OFF ALIGNAUTO #Avg Type: RMS Avg Hold: 100/100	0.000 ms (1001 pts)	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G Stop Fr 2.481500000 G CF St 300.000 k Auto
Res BW 1.0 MHz sci sci	East	ITRUS	0.000 ms (1001 pts)	Auto Tu Center Fr 2.48000000 G Start Fr 2.478500000 G Stop Fr 2.481500000 G

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u>

Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Release Ver. 1.1

Page 51 of 60



3.9 Conducted Out of Band Emission Measurement

3.9.1 Limits of Conducted Out of Band Emission Measurement

For average power:

Below –30 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth). **For peak power:**

Below -20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth)

3.9.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

3.9.3 Test Procedure

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

3.9.4 Deviation from Test Standard

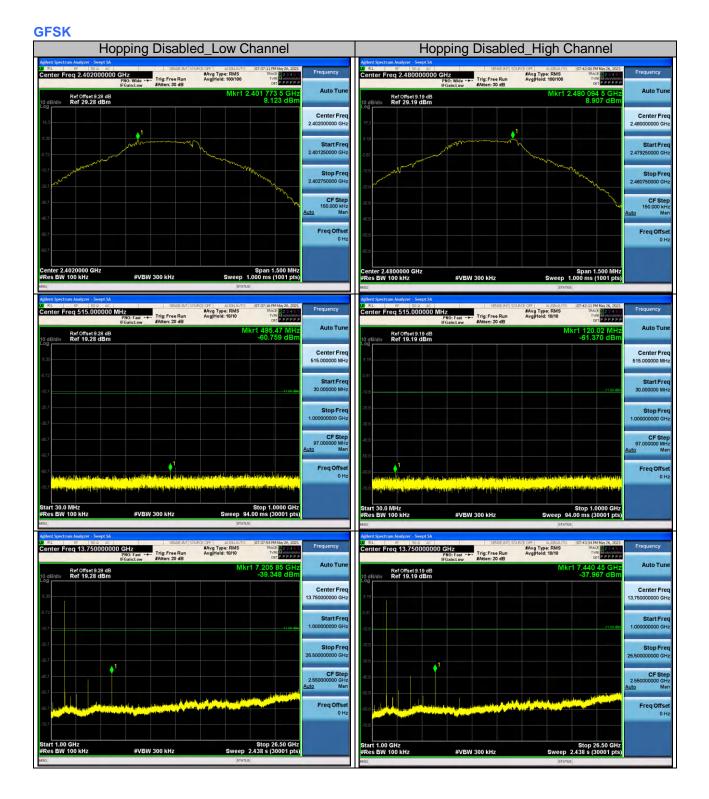
No deviation.

3.9.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

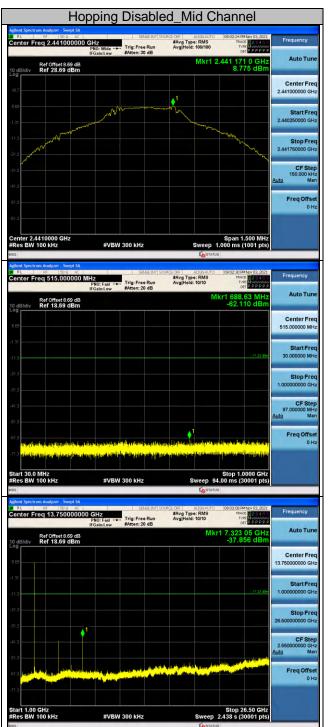
3.9.6 Test Results

The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



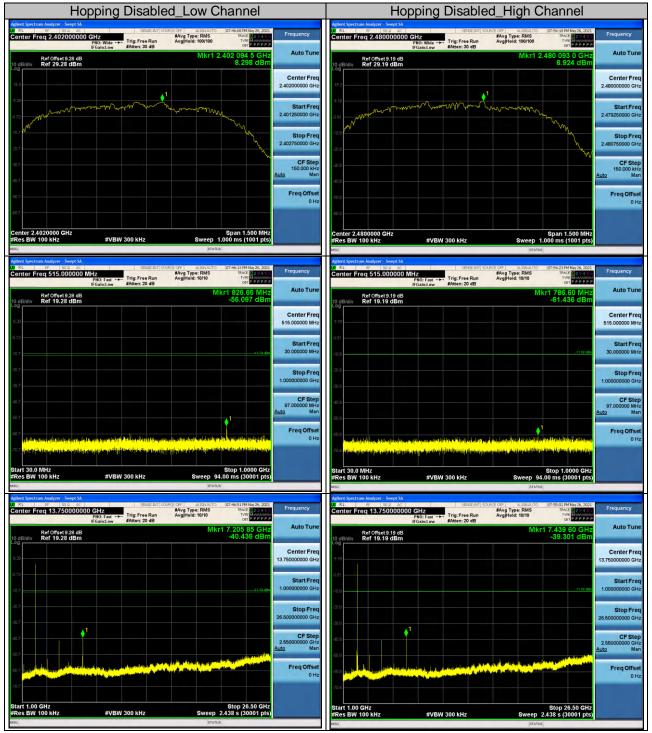
Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



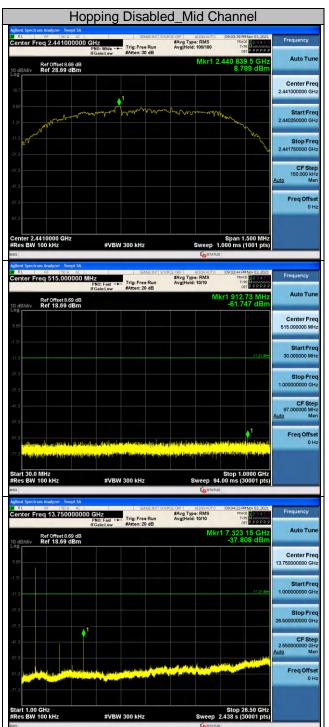


Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

8DPSK

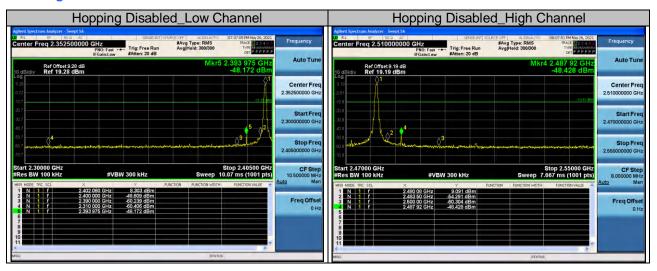


Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com

Bandedge: GFSK



Bandedge: 8DPSK

Hopping Disabled_Low Channel	Hopping Disabled_High Channel
Address Synchrein Audyrer, Swind M. 918.25 million 200.25 cfr ALSOLATIO 0774.00 (FMAMp 26, 2001) Center Freq 2.352500000 CH2 Efforts Fillion 200.25 cfr Alwg Type: RMS Trick R02000 (FMAmp 26, 2001) PRO Fact + + + + + + + + + + + + + + + + + + +	
Ref office(3.22 alb 10 dBJdw Ref 19.28 dBm45,041 dBm -45,041 dBm -23 077	r o deldav Ref 19.19 dBm 19 dBdav Ref 19.19 dBm 1 d dBm
307 307 307 407 407 407 407 407 407 407 407 407 4	q 2001 Start Freq
Stop Fr Stop Fr 327 240000000 GH	2 255000000 GHz
Start 2.30000 GHz Stop 2.40500 GHz CF Ste 10.50000 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.07 ms (1001 pts) Mrs Mode: TR: Sci. x Y Function Function worth Function worth Function worth 1 1 1 2401 745 GHz 8330 dBm Function Function worth Function worth	#Res BW 100 kHz #VBW 300 kHz Sweep 7.667 ms (1001 pts) 8.000000 MHz
2 N 1 f 2.400.000 GHz 45.041 dBm Freq Offs 3 N 1 f 2.300.000 GHz 45.7455 dBm Generalization Generalincontine Generali	et 2 N 1 f 248350 GHz 48321 dBm 3 N 1 f 250000 GHz 60749 dBm Freq Offset
MIG	USQ. STATUS

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u> Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



GFSK

Hopping Enabled_Low Channel	Hopping Enabled_High Channel
PNO: Fast	Advint System Advint System Advint System Advint System Advint System End System Frequency Uency 2.8 U 9.8 U 9.9 A 1.9 A
Cer	nter Freq 25100000 GHz 100 100 100 100 100 100 100 10
	tart Freq 2000 GHz 247000000 GHz 247000000 GHz
	ADD Washington ADD Stop Freq Stop Freq ADD
#Res BW 100 kHz #VBW 300 kHz Sweep 10.07 ms (1001 pts) 10.50 MKR MORE TRC SCL X Y Function vibitity Function vibitity Auto	CF Step b0000 MHz Man Start 2.47000 GHz #Res BW 100 kHz Stop 2.55000 GHz #VBW 300 kHz CF Step Sweep 7.667 ms (1001 pts) writ work work mode fire sol. x y nunction nunction work mode fire sol. Auto
1 N 1 f 2.404 896 0Hz 7.147 dBm 2 N 1 f 2.400 00Hz 5.454 0Bm 3 N 1 f 2.400 0Hz 5.454 0Bm 4 N 1 f 2.210 000 0Hz 5.61 952 dBm 6 N 1 f 2.377 0TO GHz 5.61 952 dBm 6 9 9 9 9 9 9 1 1 1 1.47 9 1.97 1000 0Hz 1.97 1000 0Hz 7 2.377 0TO GHz 5.67 18 dBm 9 9 9 9 9 1 1 1 1.97 1000 0Hz 1.98 10000 0Hz 1.98 100000 0Hz 1.98 100000 0Hz 1.98 100000 0Hz 1.98 100000 0Hz 1.98 1000000 0Hz 1.98 10000000Hz	eq Offset 0 Hz 0
	Yi X uta X uta Status

8DPSK

Hopping Enabled_Low Channel	Hopping Enabled_Low Channel
Addred Systems Andrer State Strip State State State State State State State State State State State State State State State State State State State State State State State State State State State State State State State State State State State	Author Turne Author Turne And System Analyzer: Synght M. Strate Mill Synght Manager, Synght M. Frequency End of Synght Manager, Strate Mill Synght Manager, Strate Mille Syngh Manager, Strate Manager, Strate Mille Synght Manager, S
Log 10.0	Center Freq 0.35250000 GHz 2.51000000 GHz
	Start Freq 300
200 100 100 100 100 100 100 100	Stop Freq 800 Web Stop Freq Stop Freq<
Start 2.30000 GHz Stop 2.40500 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 10.07 ms (1001 pts) MM MODE TRC SCI	MKR MODE, TRC, SCL X Y FUNCTION FUNCTION VALUE A
1 N 1 f 2.403 960 0Ft 7.096 dBm 2 N 1 f 2.400 000 0Ft 4.834 dBm 3 N 1 f 2.290 000 0Ft 4.534 dBm 4 N 1 f 2.390 000 0Ft 4.524 00 dBm N 1 r 2.370 965 0Ft 500 124 dBm 9.0124 0Bm 7 7 7 7 7 7 9 9 9 9 9 9 9 10 1 1 1 1 1 1 1	Freq Offset 1 1 f 2471 92 dHz 9.01 dBm 1 1 2 N 1 f 24830 dHz 9.00 dBm 3 1 1 2 200 dHz 9.00 dBm 3 1 1 2 200 dHz 49.00 dBm 3 1 1 2 200 dBm 3 1 1 2 243 dBm 3 1 <th1< td=""></th1<>
MSG STATUS	UIG STATUS

Lab: <u>Hwa-Hsing (Dongguan) Testing Co., Ltd.</u> Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park,</u> <u>HuangJiang Town, Dongguan, China</u>

Tel: 0769-83078199 Web.: www.hwa-hsing.com E-Mail: customerservice.dg@hwa-hsing.com



4 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

4.1.2Test Instruments

Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
Spectrum Keysight	N9020A	MY51240612	2021/09/16
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2021/09/16
Power Meter 10Hz~18GHz Tonscend	JS0806-2	188060126	2021/09/16
Signal generator Keysight	E4421B	GB40051020	2021/09/16
Signal generator Keysight	N5182A	MY47420944	2021/09/16
Test Software Tonscend	JS0806-2	NA	NA
Hygrothermograph Yuhuaze	HTC-1	NA	2021/09/16

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

2. The test was performed in Chamber 1.



Appendix – Information on the Testing Laboratories

We, <u>Hwa-Hsing (Dongguan) Co., Ltd.</u>, A global provider of TESTING and CERTIFICATION services for consumer products, electronic products and wireless information technology products. Adhering to the core values "HONEST and TRUSTWORTHY, OBJECTIVE and IMPARTIALITY, RIGOROUS and AFFICIENT", commitment to provide professional, perfect and efficient comprehensive ONE-STOP solution of TESTING and CERTIFICATION services for Manufacturers, Buyers, Traders, Brands, Retailers. Assist client to better manage risk, protect their brands, reduce costs and cut time to over 150 markets in global. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lab Address: <u>No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park, HuangJiang Town, Dongguan, China</u> Contact Tel: <u>0769-83078199</u> Email: <u>customerservice.dg@hwa-hsing.com</u> Web Site: <u>www.hwa-hsing.com</u>

The address and road map of all our labs can be found in our web site also.

---- END ----

