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# TEST REPORT

FCC ID: 2AXYP-OSW-812

**Product: Smart Watch** 

Model No.: OSW-812

Trade Mark: oraimo

Report No.: WSCT-A2LA-R&E240500025A-BT

Issued Date: 05 June 2024

Issued for:

FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG

Issued By:

World Standardization Certification & Testing Group(Shenzhen) Co.,Ltd.
Building A-B, Baoshi Science & Technology Park, Baoshi Road,
Bao'an District, Shenzhen, Guangdong, China

TEL: +86-755-26996192 FAX: +86-755-86376605

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Note: The results contained in this report pertain only to the tested sample. This report shall not be reproduced, except in full, without written approval of World Standardization Certification & Testing Group(Shenzhen) Co., Ltd. This report must not be used by the client to claim product certification, approval, or any agency of the U.S. Government.

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Certificate #5768.01

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### 1. Test Certification

Product:

Smart Watch

Model No .:

OSW-812

Additional

Model:

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Applicant:

ORAIMO TECHNOLOGY LIMITED

Address:

FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25

SHAN MEI STREET FOTAN NT HONGKONG

Manufacturer:

ORAIMO TECHNOLOGY LIMITED

Address:

FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25

SHAN MEI STREET FOTAN NT HONGKONG

Date of Test:

17 May 2024 to 04 June 2024

Applicable Standards:

FCC CFR Title 47 Part 15 Subpart C Section 15.247

The above equipment has been tested by World Standardization Certification & Testing Group(Shenzhen)Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By: Wary Kiary

Checked By:

(Ma Painum)

(Wang Xiang)

(Mo Peiyun)

Approved By:

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World Standard Ization Certification Testin

(Liu Fuxin)

Date:

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# 2. Test Result Summary

	/		/ 1 L T H H
	Requirement	CFR 47 Section	Result
	Antenna Requirement	§15.203/§15.247 (c)	PASS
6	Conducted Peak Output Power	§15.247 (b)(1) §2.1046	PASS
	20dB Occupied Bandwidth	§15.247 (a)(1) §2.1049	PASS
0	Carrier Frequencies Separation	§15.247 (a)(1)	PASS
	Hopping Channel Number	§15.247 (a)(1)	PASS
	Dwell Time	§15.247 (a)(1)	PASS
7	Radiated Emission	§15.205/§15.209 §2.1053, §2.1057	PASS
	Band Edge	§15.247(d) §2.1051, §2.1057	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.

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3.





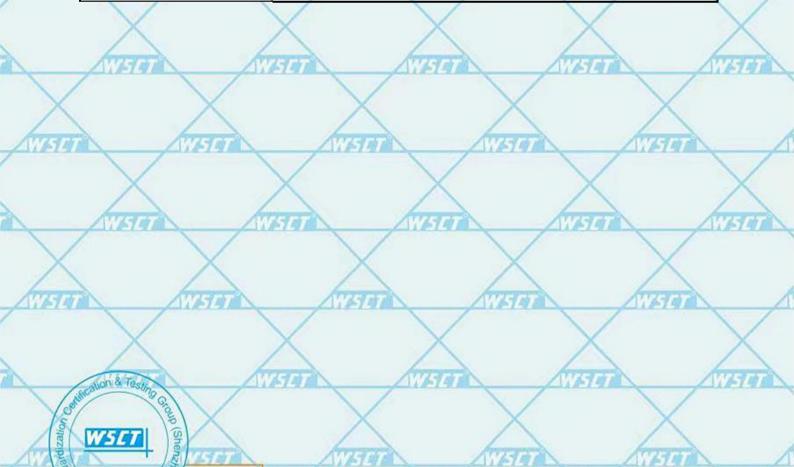


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#### For Question, Please Contact with WSCT **EUT Description** www.wsct-cert.com

	Product Name:	Smart Watch	414
	Model:	OSW-812	
	Trade Mark:	oraimo	
2.4	Operation Frequency:	2402MHz~2480MHz	
	Channel Separation:	1MHz	X
	Number of Channel:	797 W5747 W5747	214
	Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK	
1	Modulation Technology:	FHSS	
	Antenna Type:	Wire Antenna	X
	Antenna Gain:	-8.3dBi	1271
/	Rechargeable Li-Polymer Battery:	Li-ion Battery : 592127 Rated Voltage: 3.8V Rated Capacity: 340mAh 1.292Wh	A. A. A.
	Remark:	N/A. W54	



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#### Operation Frequency each of channel for GFSK, π/4-DQPSK, 8DPSK

					· ·		WWW
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
					$\wedge$		
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
X		X		X		X	
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz	17-79	
		0 0 70 1		1 1 6 0	FOLK // DO		DOIC

Remark: Channel 0, 39 &78 have been tested for GFSK, π/4-DQPSK, 8DPSK modulation mode.

NYSTET	WSGT	N7594	175197	WHI	1
ATTA-					700
WESTER	WSG	WEIGH	WEIGH	Wister	
	W.S				740
WEID	WSD1	WESTER	W5101	W/519	
	LY AVE				790
WETATI	WATER	WEIGH	NV-STATE OF	WETGE	
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### 4. Genera Information

#### 4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting
August Augus	by select channel and modulations with Fully-charged battery

The sample was placed 0.8m & 1.5m for the measurement below & 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.

### 4.2. 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.

1	Equipment	Model No.	Serial No.	FCC ID	Trade Name
		1	1	1	/ /

#### Note:

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
- 3. For conducted measurements (Output Power, 20dB Occupied Bandwidth, Carrier Frequencies Separation, Hopping Channel Number, Dwell Time, 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.











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### 5. Facilities and Accreditations

#### 5.1. Facilities

All measurement facilities used to collect the measurement data are located at Building A-B, Baoshi Science & Technology Park, Baoshi Road, Bao'an District, Shenzhen, Guangdong, China of the World Standardization Certification & Testing Group(Shenzhen) CO., LTD

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 32. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

#### 5.2. ACCREDITATIONS

**CNAS - Registration Number: L3732** 

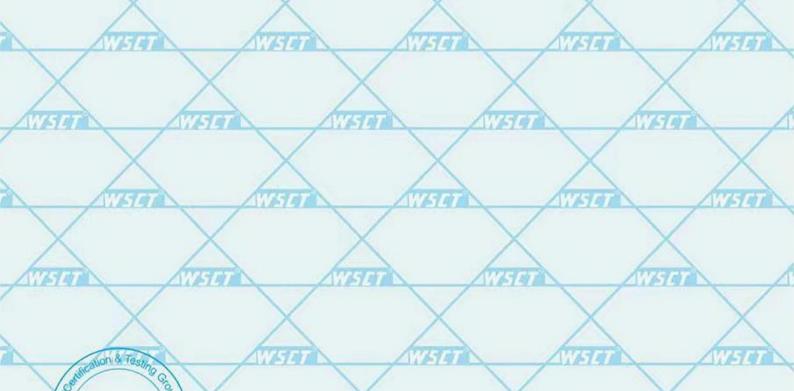
China National Accreditation Service for Conformity Assessment, The test firm Registration Number: L3732

FCC - Designation Number: CN1303

World Standardization Certification & Testing Group(Shenzhen) CO., LTD. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Designation Number: CN1303.

A2LA - Certificate Number: 5768.01

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number: 5768.01



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### 5.3. Measurement Uncertainty

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The reported uncertainty of measurement  $y \pm U$ , where expended 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
100	1	Conducted Emission Test	±3.2dB
	2	RF power, conducted	±0.16dB
	3	Spurious emissions, conducted	±0.21dB
7	4	All emissions, radiated(<1GHz)	±4.7dB
	5	All emissions, radiated(>1GHz)	±4.7dB
Comment	6	Temperature W507	±0.5°C
	7	Humidity	±2.0%

	NATE OF THE PARTY	NYSTOT	AVI-14T	175197	17574
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	NV-14	N. 1-1-1-1	NVF14	Wester	WETER
AV.	WEST AVES				14
	NV5191	Wester	WET OF	WESTER	WESTER
ATT.	THE WAS				700
	X	W65141	WEIGH	Wister	WEIGH
	Seylification & Testing Grates				X

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### **5.4. MEASUREMENT INSTRUMENTS**

					www.wsc	7-0
NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.	Z
Test software		EZ-EMC	CON-03A	-	X-	
Test software	/	MTS8310	(7274)	- /	2746	
EMI Test Receiver	R&S	ESCI	100005	2023-11-05	2024-11-04	
LISN	AFJ	LS16	16010222119	2023-11-05	2024-11-04	1
LISN(EUT)	Mestec	AN3016	04/10040	2023-11-05	2024-11-04	Z
Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	2023-11-05	2024-11-04	
Coaxial cable	Megalon	LMR400	N/A	2023-11-05	2024-11-04	
GPIB cable	Megalon	GPIB	N/A	2023-11-05	2024-11-04	
Spectrum Analyzer	R&S	FSU	100114	2023-11-05	2024-11-04	/
Pre Amplifier	HP	HP8447E	2945A02715	2023-11-05	2024-11-04	Z
Pre-Amplifier	CDSI	PAP-1G18-38		2023-11-05	2024-11-04	
Bi-log Antenna	SUNOL Sciences	JB3	A021907	2023-11-05	2024-11-04	
9*6*6 Anechoic	A	IST A	THEFT	2023-11-05	2024-11-04	L
Horn Antenna	COMPLIANCE ENGINEERING	CE18000		2023-11-05	2024-11-04	
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	2023-11-05	2024-11-04	
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	2023-11-05	2024-11-04	ě
System-Controller	ccs	N/A	N/A	N.C.R	N.C.R	
Turn Table	ccs	N/A	N/A	N.C.R	N.C.R	
Antenna Tower	ccs	N/A	N/A	N.C.R	N.C.R	
RF cable	Murata	MXHQ87WA300 0	-	2023-11-05	2024-11-04	
Loop Antenna	EMCO	6502	00042960	2023-11-05	2024-11-04	2
Horn Antenna	SCHWARZBECK	BBHA 9170	1123	2023-11-05	2024-11-04	
Power meter	Anritsu	ML2487A	6K00003613	2023-11-05	2024-11-04	
Power sensor	Anritsu	MX248XD	ATTE	2023-11-05	2024-11-04	
Spectrum Analyzer	Keysight	N9010B	MY60241089	2023-11-05	2024-11-04	1
	_		A-series			



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### 6. Test Results and Measurement Data

### 6.1. Antenna requirement

#### Standard requirement:

FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

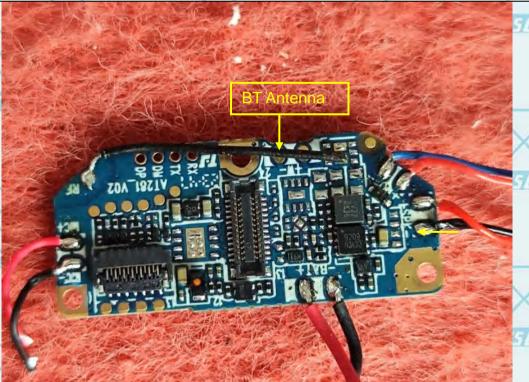
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

#### **E.U.T Antenna:**

The Bluetooth antenna is a Wire Antenna. it meets the standards, and the best case gain of the antenna is -8.3dBi.





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# 6.2. Conducted Output Power

### 6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2014
Limit:	Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	Use the following spectrum analyzer settings:  Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission.
Test Result:	PASS











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### 6.2.2. Test Data

GFSK mode				
	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
	Lowest	7.24	20.97	PASS
4	Middle	7.37	20.97	PASS
	Highest	5.72	20.97	PASS

	ATTIGUES ATT				
7		Pi/4DQPSK	mode		
	Test channel	Peak Output Power (dBm)	Limit (dBm)	Result	
0	Lowest	7.59	20.97	PASS	
	Middle	7.77	20.97	PASS	
	Highest	6.13	20.97	PASS	

Ī	8DPSK mode					
	Test channel Peak Output Power (dBm)  Lowest 7.76		Limit (dBm)	Result		
Ī			20.97	PASS		
	Middle	7.89	20.97	PASS		
Ī	Highest	6.3	20.97	PASS		

Test plots as follows:

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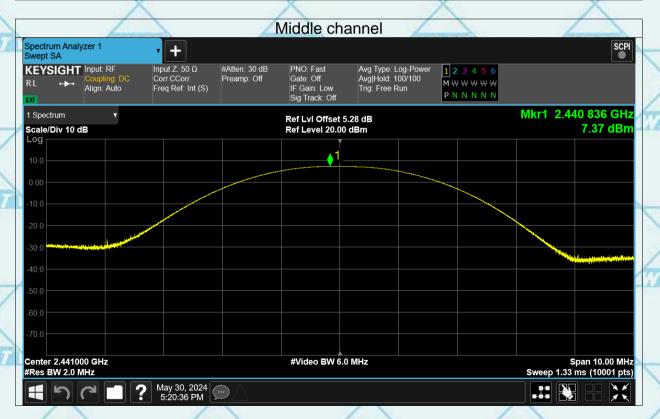
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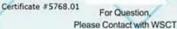
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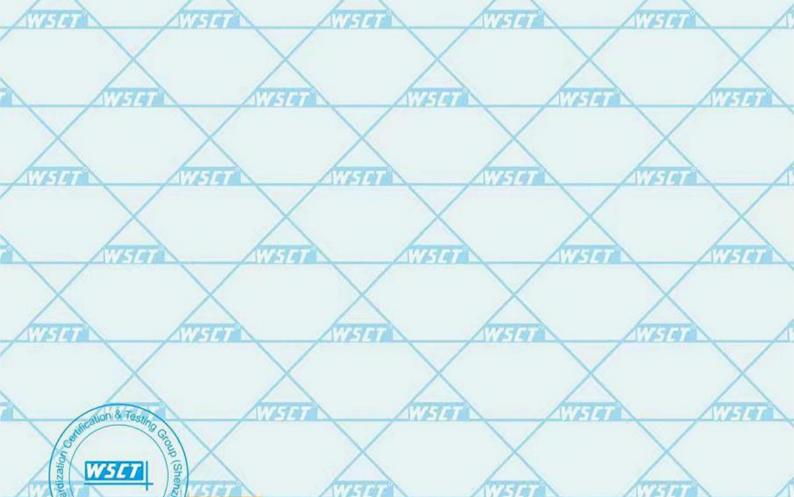




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Pi/4DQPSK Modulation

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#### 8DPSKModulation











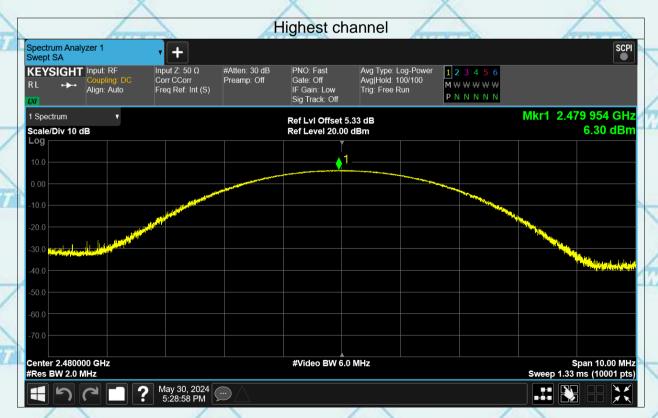


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# 6.3. 20dB Occupy Bandwidth

### 6.3.1. Test Specification

100	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
	Test Method:	ANSI C63.10:2014
	Limit:	N/A
	Test Setup:	Spectrum Analyzer EUT
	Test Mode:	Transmitting mode with modulation
	Test Procedure:	<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Use the following spectrum analyzer settings for 20dB Bandwidth measurement.         Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel; 1%≤ RBW≤5% of the 20 dB bandwidth; VBW≥3RBW; Sweep = auto; Detector function = peak; Trace = max hold.     </li> <li>Measure and record the results in the test report.</li> </ol>
	Test Result:	PASS



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### 6.3.2. Test data

		1 10 1 10 10 10 10 10 10 10 10 10 10 10				
	Test channel	-20dB Occupy Bandwidth (MHz)				
		GFSK	π/4-DQPSK	8DPSK	Conclusion	
	Lowest	0.945	1.314	1.314	PASS	
	Middle	0.954	1.339	1.301	PASS	
1	Highest	0.936	1.315	1.300	PASS	

Test plots as follows:

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WHITE	WETGE	Wister	VISIT	WEIGH	
NV.				139	VE144
WETER A	WESTER	WHITE	WEIGH	NV-514 A	
			$\times$	2-14	7,619
Wester	Wister	WEIGH	WSI	WEIGH	
				2514	Wester
WHITE	WESTER	WEIGH	WESTER	WEIGH	
				2514	WEIGH
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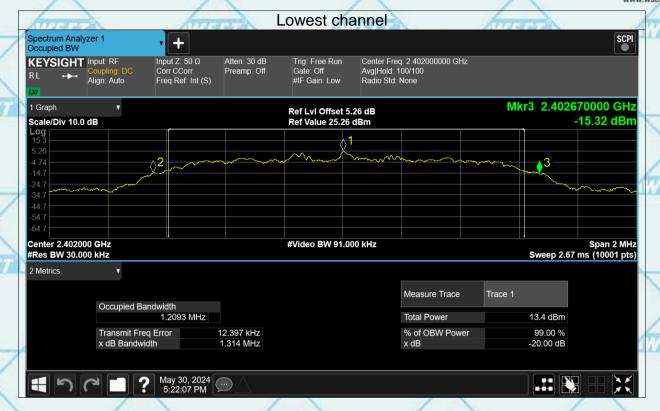


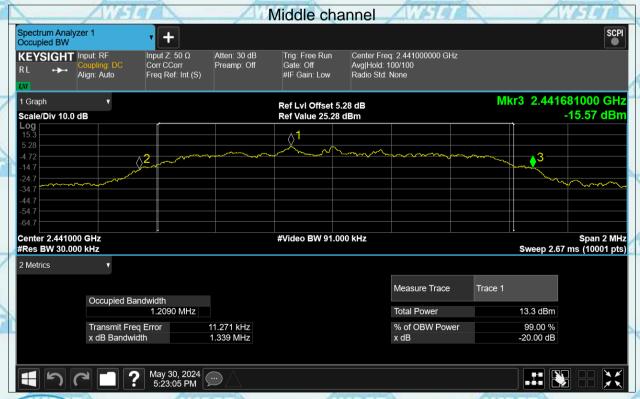


#### Pi/4DQPSK Modulation

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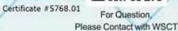








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Report No.: WSCT-A2LA-R&E240500025A-BT 8DPSKModulation

Certificate #5768.01

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# 6.4. Carrier Frequencies Separation

# 6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2014
Limit:	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.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>Use the following spectrum analyzer settings:         <ul> <li>Span = wide enough to capture the peaks of two adjacent channels; RBW is set to approximately 30% of the channel spacing, adjust as necessary to best identify the center of each individual channel; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.</li> </ul> </li> </ol>
Test Result:	PASS



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#### 6.4.2. Test data

GFSK mode					
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result		
Lowest 1		0.63	PASS		
Middle	0.956	0.636	PASS		
Highest	1 /	0.624	PASS		

	Pi/4 DQPSK mode				
	Test channel Carrier Frequencies Separation (MHz)		Limit (MHz)	Result	
	Lowest	1.012	0.876	PASS	
	Middle	0.992	0.893	PASS	
	Highest	1.172	0.877	PASS	

8DPSK mode				
Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result	
Lowest	0.99	0.876	PASS	
Middle	1.002	0.867	PASS	
Highest	1.008	0.867	PASS	
	Lowest Middle	Test channel  Carrier Frequencies Separation (MHz)  Lowest  0.99  Middle  1.002	Test channel Carrier Frequencies Separation (MHz) Limit (MHz)  Lowest 0.99 0.876  Middle 1.002 0.867	

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Certificate #5768.01 **GFSK Modulation** Please Contact with WSCT Lowest channel















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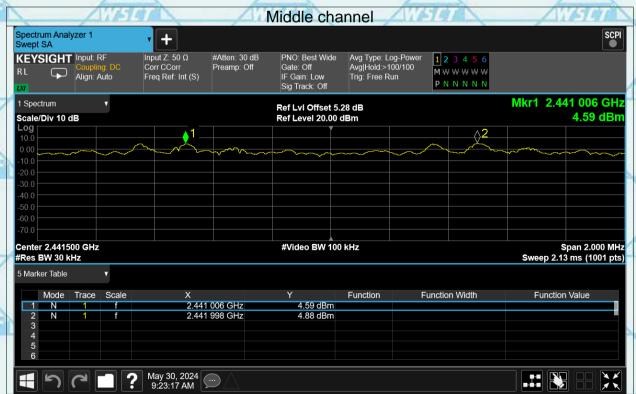


#### Pi/4DQPSK Modulation

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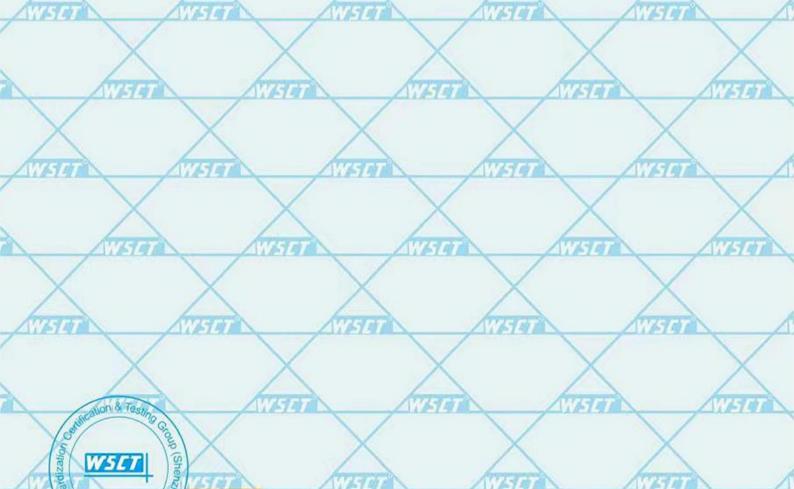




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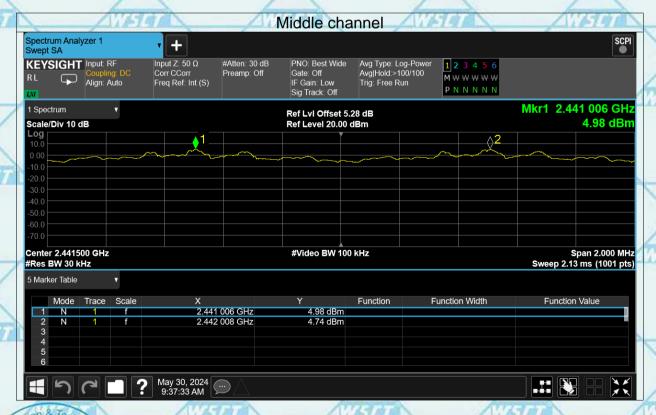


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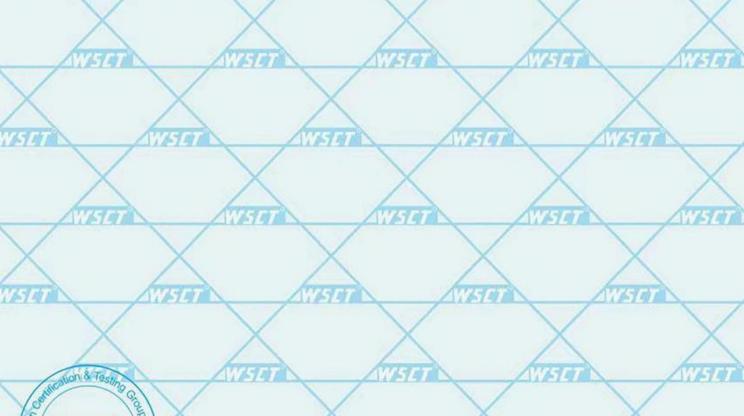
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# 6.5. Hopping Channel Number

## 6.5.1. Test Specification

2	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
	Test Method:	ANSI C63.10:2014
	Limit:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
7	Test Setup:	
Ì		Spectrum Analyzer EUT
	Test Mode:	Hopping mode
		<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the</li> </ol>
	Test Procedure:	<ul> <li>EUT transmit continuously.</li> <li>4. Enable the EUT hopping function.</li> <li>5. Use the following spectrum analyzer settings: Span = the frequency band of operation; set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>6. The number of hopping frequency used is defined as the number of total channel.</li> <li>7. Record the measurement data in report.</li> </ul>
	Test Result:	PASS
	(Approximately)	







Limit





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Mode

### 6.5.2. Test data

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Result

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X	GFSK, P/4-DQPSK, 8DPSK	79	15	PASS	
77574 To	est plots as follows:	11110	WEIGH	11614	/
	WETER	WESTER	N/2-14		410
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Hopping channel

numbers

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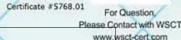


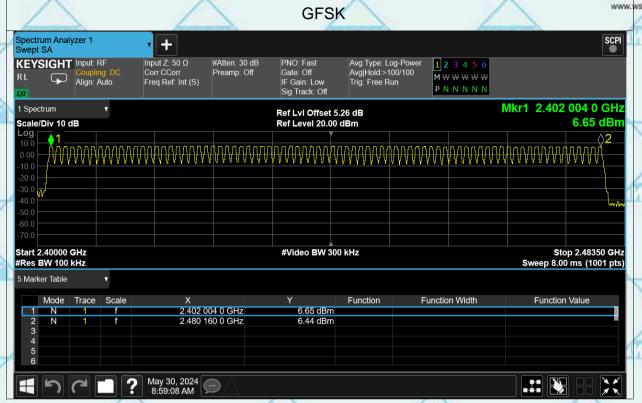


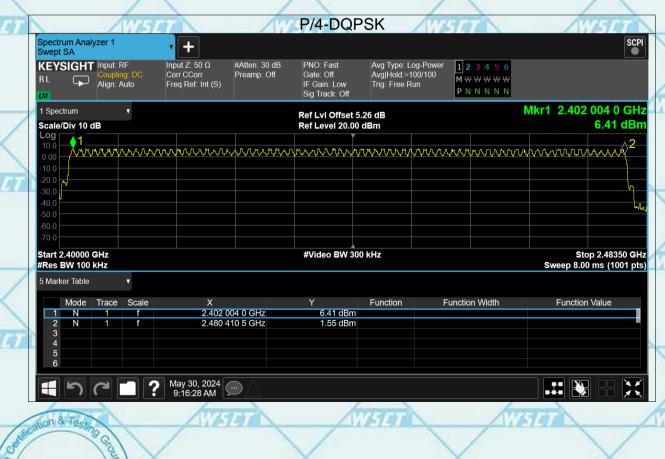




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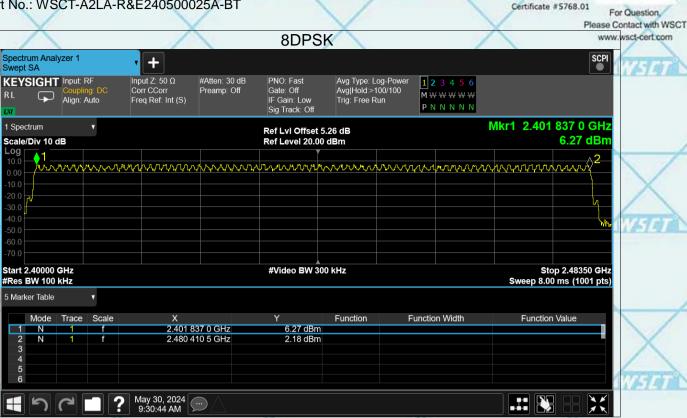
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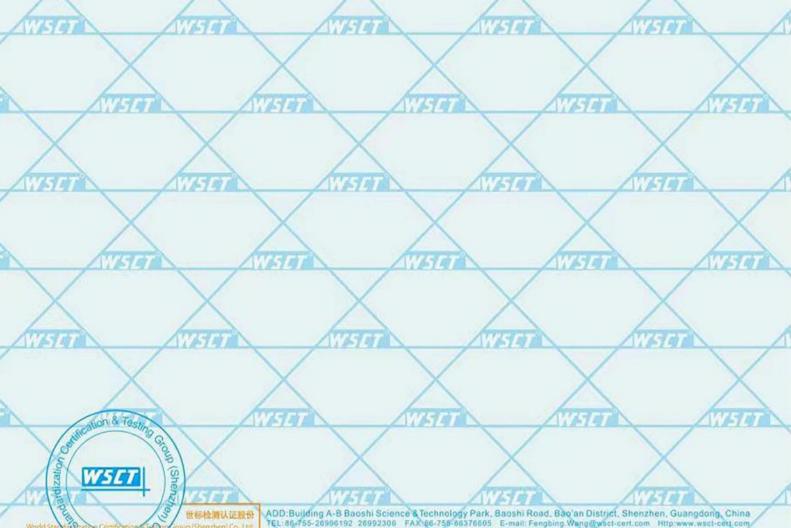
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#### 6.6. Dwell Time

# 6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2014
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 Setup:	Spectrum Analyzer EUT
Test Mode:	Hopping mode
Test Procedure:	<ol> <li>The testing follows ANSI C63.10:2014 Measurement Guidelines.</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Enable the EUT hopping function.</li> <li>Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW shall be ≤ channel spacing and where possible RBW should be set &gt;&gt; 1 / T, where T is the expected dwell time per channel; VBW≥RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.</li> <li>Measure and record the results in the test report.</li> </ol>
Test Result:	PASS
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#### 6.6.2. Test Data

-	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
	1-DH1	2402	0.384	122.496	319	31600	400	Pass
	1-DH1	2441	0.382	121.858	319	31600	400	Pass
A	1-DH1	2480	0.382	121.476	318	31600	400	Pass
	1-DH3	2402	1.639	265.518	162	31600	400	Pass
	1-DH3	2441	1.638	258.804	158	31600	400	Pass
	1-DH3	2480	0.674	105.818	157	31600	400	Pass
	1-DH5	2402	2.887	332.005	115	31600	400	Pass
1	1-DH5	2441	2.887	262.717	91	31600	400	Pass
	1-DH5	2480	2.887	297.361	103	31600	400	Pass

Note: 1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels.

For DH1, With channel hopping rate (1600/2/79) in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600/2/79) \times (0.4 \times 79) = 320$  hops

For DH3, With channel hopping rate (1600/4/79) in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600/4/79) \times (0.4 \times 79) = 160$  hops

For DH5, With channel hopping rate (1600/6/79) in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600/6/79) \times (0.4 \times 79) = 106.67$  hops

2. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

Test plots as follows:

79 W579 W579 W579 W579

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Center 2.402000000 GHz

May 30, 2024 8:53:14 AM

Res BW 1.0 MHz

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#Video BW 3.0 MHz

Span 0 Hz

Sweep 31.6 s (10001 pts)









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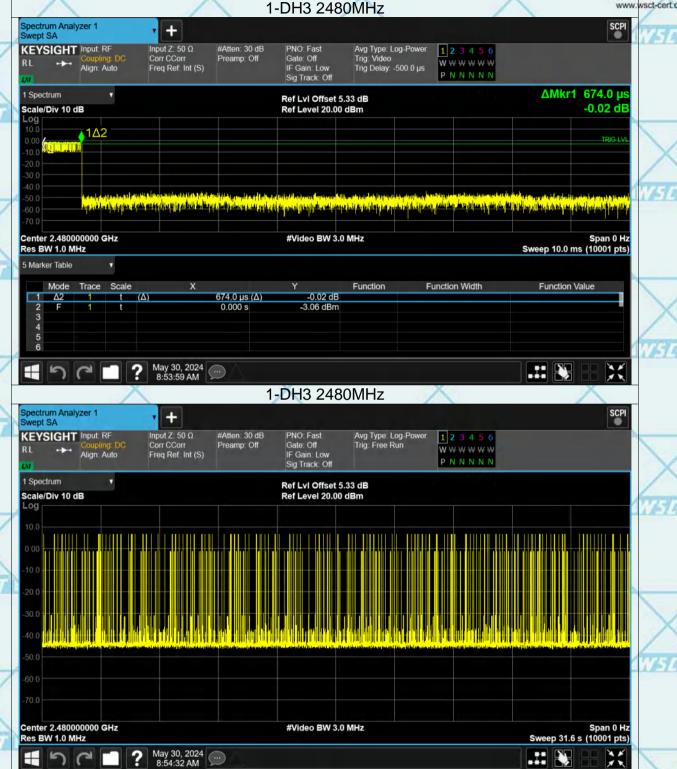






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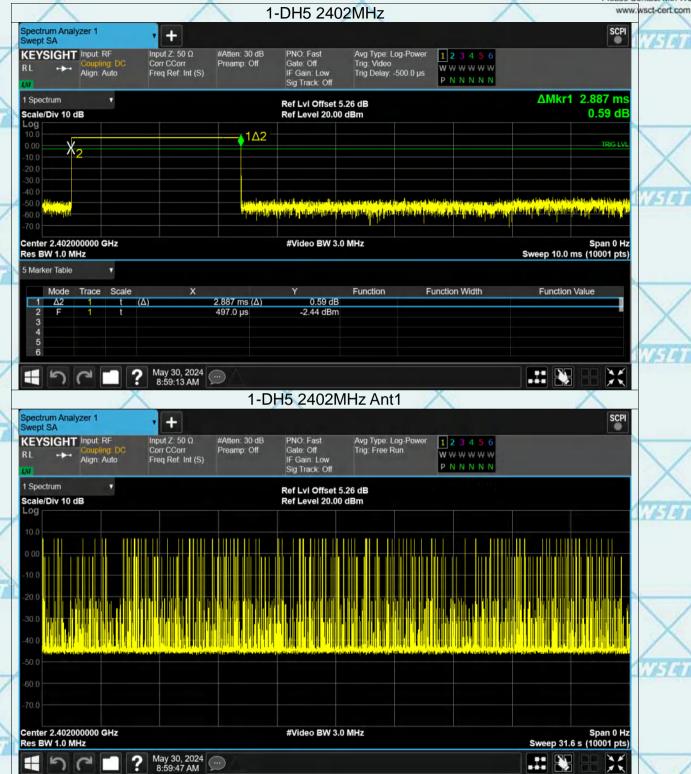






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Certificate #5768.01 For Question, Please Contact with WSCT 1-DH5 2441MHz www.wsct-cert.com Spectrum Analyzer 1 SCPI + Input Z: 50 Ω #Atten: 30 dB PNO: Fast Gate: Off KEYSIGHT Input: RF Avg Type: Log-Power 1 2 3 4 5 6 Preamp: Off w w w w w Align: Auto IF Gain: Low Sig Track: Off Trig Delay: -500.0 µs Freq Ref: Int (S) PNNNNN 1 Spectrum ΔMkr1 2.887 ms Ref LvI Offset 5.28 dB -6.07 dB Scale/Div 10 dB Ref Level 20.00 dBm 1Δ2 المهارية والمرافة والمرافظة والمتعاولة والمتعاول والمترافعة Center 2.441000000 GHz Span 0 Hz #Video BW 3.0 MHz Sweep 10.0 ms (10001 pts) Res BW 1.0 MHz 5 Marker Table **Function Width** Function Value Mode Function 2.887 ms (Δ) 6.80 dBm May 30, 2024 9:03:16 AM 1-DH5 2441MHz Spectrum Analyzer 1 Swept SA SCPI + Avg Type: Log-Power Trig: Free Run Input Z: 50 Ω #Atten: 30 dB PNO: Fast KEYSIGHT Input: RF 1 2 3 4 5 6 Corr CCorr Freq Ref: Int (S) Gate: Off IF Gain: Low Sig Track: Off WWWWW Align: Auto PNNNNN Ref LvI Offset 5.28 dB Scale/Div 10 dB Ref Level 20.00 dBm Center 2.441000000 GHz #Video BW 3.0 MHz Span 0 Hz



Res BW 1.0 MHz

May 30, 2024 9:03:50 AM

Sweep 31.6 s (10001 pts)









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## 6.7. Pseudorandom Frequency Hopping Sequence

# Test Requirement: FCC Part15 C Section 15.247 (a)(1) requirement:

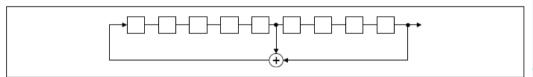
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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.

#### **EUT Pseudorandom Frequency Hopping Sequence**

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

- Number of shift register stages: 9
- Length of pseudo-random sequence: 29-1 = 511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

0	2	4	6	62	64	78	1	73	75	77
								 П	Г	
									ı	ш
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Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.











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# 6.8. Conducted Band Edge Measurement

# 6.8.1. Test Specification

FCC Part15 C Section 15.247 (d)
ANSI C63.10:2014
In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
Spectrum Analyzer EUT
Transmitting mode with modulation
<ol> <li>The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of ANSI C63.10:2014 Measurement Guidelines.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Set RBW = 100 kHz (≥1% span=10MHz), VBW = 300 kHz (≥RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.</li> <li>Enable hopping function of the EUT and then repeat step 2 and 3.</li> <li>Measure and record the results in the test report.</li> </ol>
PASS









6.8.2. Test Data

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#### GFSK Modulation (the worst case)





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# 6.9. Conducted Spurious Emission Measurement

# 6.9.1. Test Specification

	Test Requirement:	FCC Part15 C Section 15.247 (d)
0	Test Method:	ANSI C63.10:2014
	Limit:	In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.
100	Test Setup:	Spectrum Analyzer EUT
	Test Mode:	Transmitting mode with modulation
	Test Procedure:	<ol> <li>The testing follows the guidelines in Spurious RF Conducted Emissions of ANSI C63.10:2014         Measurement Guidelines</li> <li>The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.</li> <li>Measure and record the results in the test report.</li> <li>The RF fundamental frequency should be excluded against the limit line in the operating frequency band.</li> </ol>
	Test Result:	PASS











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# Test Data GESK mode





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Report No.: WSCT-A2LA-R&E240500025A-BT Certificate #5768.01 For Question, 8DPSK mode Please Contact with WSCT www.wsct-cert.com 3-DH5 2402MHz SCPI Spectrum Analyzer 1 + wept SA Input Z: 50 Ω #Atten: 20 dB Preamp: Off PNO: Best Wide Gate: Off Avg Type: Log-Power Avg|Hold: 100/100 KEYSIGHT Input: RF 1 2 3 4 5 6 Corr CCorr \_\_\_\_ M ₩ ₩ ₩ ₩ Align: Auto IF Gain: Low Sig Track: Off Freq Ref: Int (S) Trig: Free Run 1 Spectrum Mkr1 2.402 165 0 GHz Ref Lvl Offset 5.26 dB Scale/Div 10 dB Ref Level 15.26 dBm 7.03 dBm Center 2.4020000 GHz #Res BW 100 kHz Span 1.500 MHz Sweep 1.00 ms (1001 pts) #Video BW 300 kHz May 30, 2024 5:26:17 PM 3-DH5 2402MHz Spectrum Analyzer 1 Swept SA SCPI + Avg Type: Log-Power Avg|Hold: 10/10 Trig: Free Run Input Z: 50 Ω #Atten: 20 dB PNO: Fast KEYSIGHT Input: RF 1 2 3 4 5 6 Corr CCorr Freq Ref: Int (S) Gate: Off IF Gain: Low Sig Track: Off MWWWWW Align: Auto PNNNNN Mkr1 2.401 7 GHz 1 Spectrum Ref LvI Offset 5.26 dB 7.14 dBm Scale/Div 10 dB Ref Level 15.26 dBm DL1 -12.97 d **∆**4 Start 30 MHz #Video BW 300 kHz Stop 26.50 GHz #Res BW 100 kHz Sweep ~2.53 s (30001 pts) 5 Marker Table **Function Width** Function Value Mode Scale Function 2.401 7 GHz 7.14 dBm 2.401 / GHz 2.210 2 GHz 4.803 4 GHz 7.205 1 GHz 9.602 4 GHz 2 3 4 N -40.69 dBm -40.95 dBm -60.07 dBm 5 -53.36 dBm



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1 Spectrum

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## 6.10. Conducted Emission

## 6.10.1. Test Specification

6.10.1. Test Specifica	tion
Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2014
Frequency Range:	150 kHz to 30 MHz
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
Limits:	Frequency range (MHz)         Limit (dBuV)           0.15-0.5         66 to 56*         56 to 46*           0.5-5         56         46           5-30         60         50
X	Reference Plane
WHE	
Test Setup:	E.U.T AC power  Test table/Insulation plane
Tot Modes	Remark: E.U.T: Equipment Under Test LISN: Line Impedence Stabilization Network Test table height=0.8m
Test Mode:	Refer to item 4.1
WISLET	1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
WATER AND	2. The peripheral devices are also connected to the main
Test Procedure:	power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
NISTATE OF THE PROPERTY OF THE	3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to
ation & Testino	ANSI C63.10:2014 on conducted measurement.
Test Result:	PASS

VSET

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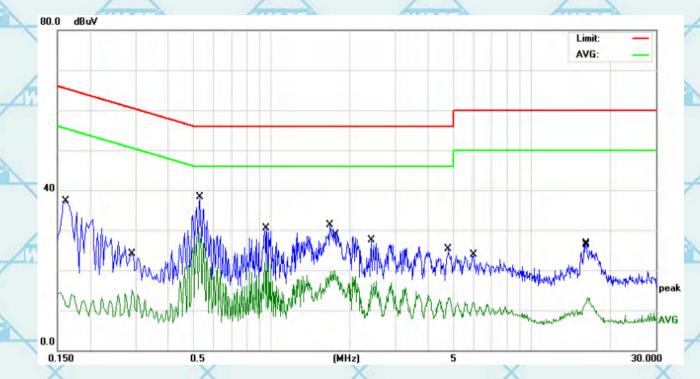
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#### 6.10.2. Test data

### Please refer to following diagram for individual

#### Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector
	0.1620	26.91	10.41	37.32	65.36	-28.04	QP
	0.2900	4.61	10.43	15.04	50.52	-35.48	AVG
	0.5299	27.78	10.47	38.25	56.00	-17.75	QP
A	0.5299	18.94	10.47	29.41	46.00	-16.59	AVG
	0.9580	11.57	10.51	22.08	46.00	-23.92	AVG
	1.6780	20.67	10.61	31.28	56.00	-24.72	QP
	1.7460	9.27	10.62	19.89	46.00	-26.11	AVG
	2.4140	16.77	10.66	27.43	56.00	-28.57	QP
	4.7740	2.41	10.69	13.10	46.00	-32.90	AVG
	5.9860	13.19	10.71	23.90	60.00	-36.10	QP
	16.1740	15.56	11.06	26.62	60.00	-33.38	QP
	16.4020	1.96	11.06	13.02	50.00	-36.98	AVG
	*	MHz 0.1620 0.2900 0.5299 * 0.5299 0.9580 1.6780 1.7460 2.4140 4.7740 5.9860	Mk. Freq. Level  MHz dBuV  0.1620 26.91  0.2900 4.61  0.5299 27.78  * 0.5299 18.94  0.9580 11.57  1.6780 20.67  1.7460 9.27  2.4140 16.77  4.7740 2.41  5.9860 13.19  16.1740 15.56	Mk.         Freq.         Level         Factor           MHz         dBuV         dB           0.1620         26.91         10.41           0.2900         4.61         10.43           0.5299         27.78         10.47           *         0.5299         18.94         10.47           0.9580         11.57         10.51           1.6780         20.67         10.61           1.7460         9.27         10.62           2.4140         16.77         10.66           4.7740         2.41         10.69           5.9860         13.19         10.71           16.1740         15.56         11.06	Mk.         Freq.         Level         Factor ment           MHz         dBuV         dB         dBuV           0.1620         26.91         10.41         37.32           0.2900         4.61         10.43         15.04           0.5299         27.78         10.47         38.25           *         0.5299         18.94         10.47         29.41           0.9580         11.57         10.51         22.08           1.6780         20.67         10.61         31.28           1.7460         9.27         10.62         19.89           2.4140         16.77         10.66         27.43           4.7740         2.41         10.69         13.10           5.9860         13.19         10.71         23.90           16.1740         15.56         11.06         26.62	Mk.         Freq.         Level         Factor         ment         Limit           MHz         dBuV         dB         dBuV         dBuV           0.1620         26.91         10.41         37.32         65.36           0.2900         4.61         10.43         15.04         50.52           0.5299         27.78         10.47         38.25         56.00           *         0.5299         18.94         10.47         29.41         46.00           0.9580         11.57         10.51         22.08         46.00           1.6780         20.67         10.61         31.28         56.00           1.7460         9.27         10.62         19.89         46.00           2.4140         16.77         10.66         27.43         56.00           4.7740         2.41         10.69         13.10         46.00           5.9860         13.19         10.71         23.90         60.00           16.1740         15.56         11.06         26.62         60.00	Mk.         Freq.         Level         Factor         ment         Limit         Over           MHz         dBuV         dB         dBuV         dBuV         dB         dBuV         dB         dBuV         dB         dB         0.8         0.8         0.8         0.8         0.9         0.0 <t< td=""></t<>



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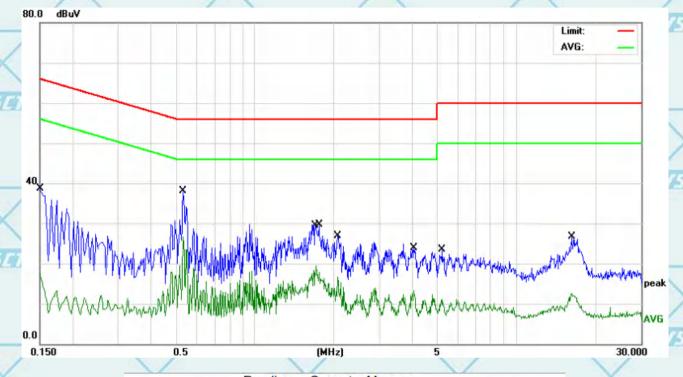




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N	o.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
4			MHz	dBuV	dB	dBuV	dBuV	dB	Detector
	1		0.1500	28.24	10.41	38.65	65.99	-27.34	QP
	2		0.1500	7.12	10.41	17.53	55.99	-38.46	AVG
	3	*	0.5299	27.53	10.47	38.00	56.00	-18.00	QP
7	4		0.5299	16.18	10.47	26.65	46.00	-19.35	AVG
	5		1.7100	8.92	10.62	19.54	46.00	-26.46	AVG
T	6		1.7540	19.16	10.62	29.78	56.00	-26.22	QP
4	7		2.0700	5.98	10.66	16.64	46.00	-29.36	AVG
T	8		4.0580	13.15	10.68	23.83	56.00	-32.17	QP
	9		4.0580	2.66	10.68	13.34	46.00	-32.66	AVG
1	0		5.1940	12.84	10.69	23.53	60.00	-36.47	QP
1	1		16.2060	1.48	11.06	12.54	50.00	-37.46	AVG
1	2		16.2979	15.65	11.06	26.71	60.00	-33.29	QP
	-	-						_	

#### Note:

DUOM \* PT

Freq. = Emission frequency in MHz

Reading level  $(dB\mu V)$  = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement ( $dB\mu V$ ) = Reading level ( $dB\mu V$ ) + Corr. Factor (dB)

Limit (dBµV) = Limit stated in standard

 $Margin (dB) = Measurement (dB\mu V) - Limits (dB\mu V)$ 

Q.P. =Quasi-Peak AVG =average

is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

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#### **Radiated Spurious Emission Measurement** 6.11.

7	6.11.1. Test Specification		J. L. C. C.		THE !	
	Test Requirement:	FCC Part15	C Sectio	n 15.209		X
0	Test Method:	ANSI C63.10	):2014	AVE TO		(VA18)
	Frequency Range:	9 kHz to 25 (	GHz		1	/
	Measurement Distance:	3 m	X		X	
-	Antenna Polarization:	Horizontal &	Vertical		1169	The state of the s
		Frequency	Detecto	r RBW	VBW	Remark
	X	9kHz- 150kHz	Quasi-pea	ak 200Hz	1kHz	Quasi-peak Value
		150kHz-	Quasi-pea	ak 9kHz	30kHz	Quasi-peak Value
9	Receiver Setup:	30MHz		1825/10		MATH
		30MHz-1GHz	Quasi-pea	ak 100KHz	300KHz	Quasi-peak Value
		Ab 21/2 401  -	Peak	1MHz	3MHz	Peak Value
		Above 1GHz	Peak	1MHz	10Hz	Average Value
7	W-10	Frequen	cy /5/47	Field Stre	- 1 A APR E	Measurement Distance (meters)
		0.009-0.4	190	2400/F(I	,	300
	X	0.490-1.7		24000/F(	KHz)	30
		1.705-3	0	30		30
	W547	30-88		100		//35///
		88-216		150		3
	Limit:	216-96	0	200		3
		Above 9	60	500		3
	ATTENDED ATTENDED		ATTE	1	Arrys	
7	CIPITE DIFIE		Fie	eld Strength	Measure	

Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
Above 4CII-	500	3	Average
Above 1GHz	5000	3	Peak

For radiated emissions below 30MHz

Distance = 3m Computer Pre -Amplifier Test setup: EUT Receiver Ground Plane

30MHz to 1GHz



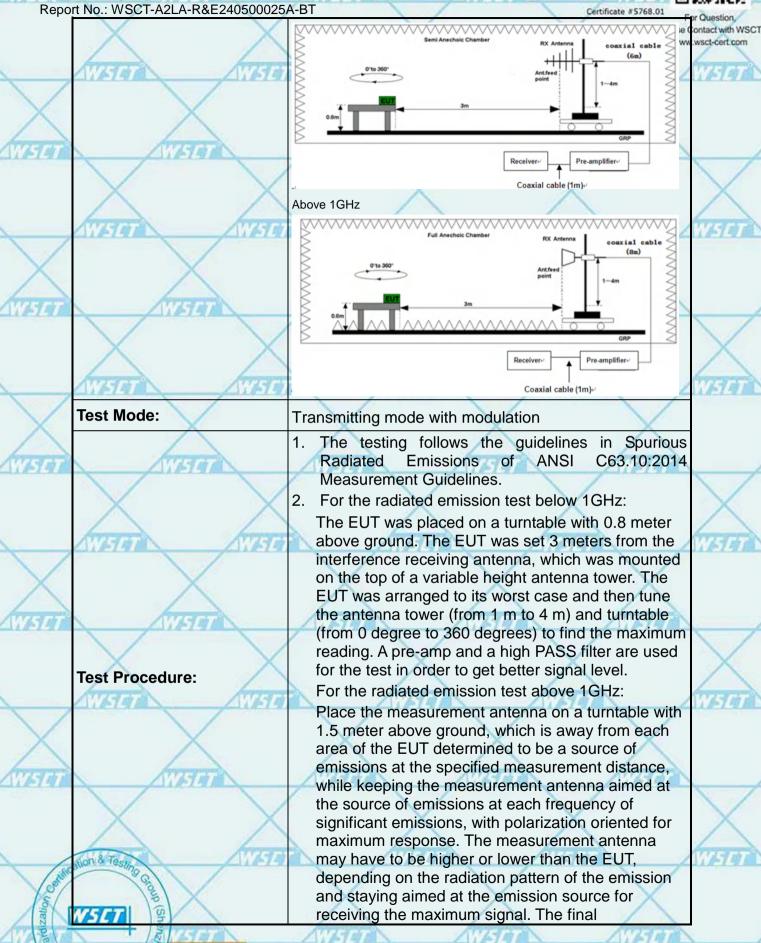
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Repo	rt No.: WSCT-A2LA-R&E240500025	A-BT		Certificate #5768.01	For Question
	X		easurement antenna el	evation shall be that whice	the Contact with WSC www.wsct-cert.com
	Amara Amara			ximum emissions shall be	777323
	11819	re	estricted to a range of he	eights of from 1 m to 4 m	7 1 F 1 7 BL
			pove the ground or refer		
				wer setting and enable the	ne
17274	17279	100 100	UT transmit continuous	9 HB 100 X 17.7 SC 97 HB 4	
17.0			Ise the following spectro		
	X		(1) Span shall wide eno	-	X
			emission being mea		
	AWATET		(2) Set RBW=100 kHz fo for f>1GHz ; VBW≥R	or f < 1 GHz, RBW=1MHz	VVSET
\/				ector function = peak; Trac	20
X	X		= max hold for peak		
ATTENDE	177.70	6	(3) For average measu		
	101310	1	correction factor me		
	$\vee$		15.35(c). Duty cycle	= On time/100 millisecond	ds
			On time = $N1*L1+N2$	*L2++Nn-1*LNn-1+Nn*l	Ln /
	AVESTED AVESTED		Where N1 is number	er of type 1 pulses, L1 is	WETER
/		1	length of type 1 puls	ses, etc.	7
X	X			Level = Peak Emission	
		1	Level + 20*log(Duty	/ cycle)	
AW557	17654	A	Corrected Reading: /	Antenna Factor + Cable	
			Loss + Read Level -	Preamp Factor = Level	\/
	Test results:	PASS	6		X
	NATE AND	1	AVETER	N/ATRI	ATETAL
/		1			
X	X		X	X	
		1			
11/19	AVISTA	1	674 AVE	198 116791	
			\/		//
					X
		7			



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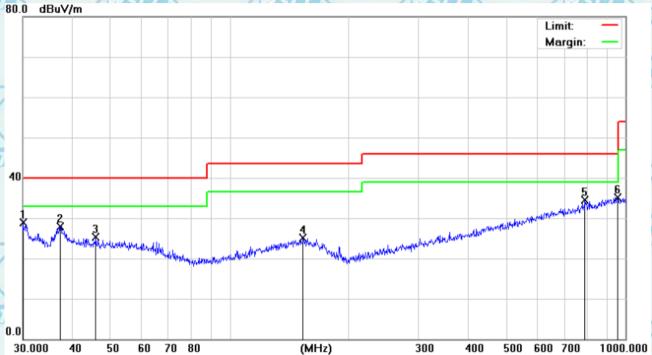
#### 6.11.2. Test Data

Please refer to following diagram for individual

Below 1GHz

(the worst case)





No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	The same
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	1	30.0000	31.44	-2.60	28.84	40.00	-11.16	QP
2	ZII.	37.2855	29.71	-1.83	27.88	40.00	-12.12	QP
3		45.8553	27.25	-2.00	25.25	40.00	-14.75	QP
4		153.2004	26.61	-1.59	25.02	43.50	-18.48	QP
5	De.	790.6188	28.13	6.31	34.44	46.00	-11.56	QP
6	* (	955.4381	26.96	8.12	35.08	46.00	-10.92	QP

WSC1

11/14

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Vertical:

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	No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	(FR)
7			MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
	1		30.6379	32.08	-2.58	29.50	40.00	-10.50	QP
6	2	*	37.4165	34.64	-1.80	32.84	40.00	-7.16	QP
	3		42.3022	30.84	-1.78	29.06	40.00	-10.94	QP
	4		59.2325	27.73	-2.75	24.98	40.00	-15.02	QP
_	5	D.	153.2004	26.61	-1.59	25.02	43.50	-18.48	QP
	6	9	955.4381	26.96	8.12	35.08	46.00	-10.92	QP

#### Note1:

Freq. = Emission frequency in MHz

Reading level (dBµV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss - Amplifier factor.

Measurement  $(dB\mu V)$  = Reading level  $(dB\mu V)$  + Corr. Factor (dB)

Limit (dBµV) = Limit stated in standard

Margin (dB) = Measurement (dB $\mu$ V) - Limits (dB $\mu$ V)

e 150 kHz to 30MHz.



DUOM \* PT









Report No.: WSCT-A2LA-R&E240500025A-BT

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#### **Above 1GHz**

_		e _
$\boldsymbol{\sim}$	CC	~
G	FS	

Frog	Low channel: 2402MHz								
Freq. (MHz)	Ant.Pol	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)			
(IVITZ)	H/V	PK	AV	PK	AV	PK	AV		
4804	V	59.64	41.15	74	54	-14.36	-12.85		
7206	V	58.88	40.76	74	54	-15.12	-13.24		
4804	Н	59.66	39.43	74	54	-14.34	-14.57		
7206	Η	58.58	39.58	74	54	-15.42	-14.42		

	20 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		21 1 1 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1	21		- 41	T J LE LL LEVE		
4	Eroa	Middle channel: 2441MHz							
	Freq. (MHz)	Ant.Pol	Emission I	_evel(dBuV)	Limit 3m(dBuV/m)		Over(dB)		
		H/V	PK	AV	PK	AV	PK	AV	
	4882	V	59.40	41.52	74	54	-14.60	-12.48	
	7323	V	59.20	39.38	74	54	-14.80	-14.62	
	4882	Ι	59.25	40.13	74	54	-14.75	-13.87	
	7323	Τ	59.37	40.37	74	54	-14.63	-13.63	

A Principle of the Parish		A STATE OF THE PARTY OF THE PAR	20	The state of the s		Commence of the Park		
Frog	High channel: 2480MHz							
Freq. (MHz)	Ant.Pol	Emission I	_evel(dBuV)	Limit 3m	(dBuV/m)	Ove	r(dB)	
(IVITIZ)	H/V	PK	AV	PK	AV	PK	AV	
4960	V	58.55	39.45	74	54	-15.45	-14.55	
7440	A	59.91	40.92	74	54	-14.09	-13.08	
4960	Н	59.68	40.50	74	54	-14.32	-13.50	
7440	H	58.72	39.72	74	54	-15.28	-14.28	

#### Note:

- 1. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 2. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
- 3. Data of measurement shown "---"in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.
- 4. Measurements were conducted in all three modulation (GFSK, Pi/4 DQPSK, 8DPSK), and the worst case Mode (GFSK) was submitted only.

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# Report No.: WSCT-A2LA-R&E240500025A-BT Restricted Bands Requirements

Test result for GFSK Mode(the worst case)

Toot Toodie	OI OI OIL IVI	eac(the tr	ordi dado)	1111 to 11 als 1	All L	11112-2	- The Ja
Frequency	Reading	Correct Factor	Emission Level	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
	ATTENDED OF		Low Cha	nnel	Kura	1	Aller
2387	64.15	-8.94	55.21	74	-18.79	F	PK
2387	45.75	-8.94	36.81	54	-17.19	Н	AV
2387	60.04	-8.94	51.10	74	-22.90	V	PK
2387	46.29	-8.94	37.35	54	-16.65	VV5	AV
2390	69.45	-8.73	60.72	74	-13.28	Н	PK
2390	51.79	-8.73	43.06	54	-10.94	Н	AV
2390	68.50	-8.73	59.77	74	-14.23	V	PK
2390	49.99	-8.73	41.26	54	-12.74	V	AV
X		X	High Cha	nnel		X	
2483.5	69.53	-8.17	61.36	74	-12.64	H	PK
2483.5	51.10	-8.17	42.93	54	-11.07	HIFT	AV
2483.5	65.90	-8.17	57.73	74	-16.27	V	PK
2483.5	49.99	-8.17	41.82	54	-12.18	V	AV

Note: Freq. = Emission frequency in MHz Reading level  $(dB\mu V)$  = Receiver reading

Corr. Factor (dB) = Attenuation factor + Cable loss

Level  $(dB\mu V)$  = Reading level  $(dB\mu V)$  + Corr. Factor (dB) Limit  $(dB\mu V)$  = Limit stated in standard

Margin (dB) = Level (dB $\mu$ V) – Limits (dB $\mu$ V)

\*\*\*\*\*END OF REPORT\*\*\*\*\*

Warld Stands Organic Control Stands of Strong ISI

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