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World Standardization Certification & Testing Group (Shenzhen) Co., Itd.

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# **TEST REPORT**

FCC ID: 2ADYY-BD04 Product: TWS Earphone Model No.: BD04 Trade Mark: TECNO Report No.: WSCT-ANAB-R&E240800041A-BT Issued Date: 05 September 2024

Issued for:

TECNO MOBILE LIMITED 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,Baoli'an Industrial Park,No.58 and 60,Tangtou Avenue, Shiyan Street, Bao'an District, Shenzhen, Guangdong, China. TEL: +86-755-26996192

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# 1. Test Certification

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	Product:	TWS Earphone WSCI WSCI WSC	1
	Model No.:	BD04	
	Additional Model:	TECNO WSCT WSCT WSCT	
	Applicant:	TECNO MOBILE LIMITED FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG	5
	WSET	TECNO MOBILE LIMITED	-
	Manufacturer:	FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG	
Ì	Date of receipt:	15 August 2024 WSET WSET WSET	
	Date of Test:	16 August 2024 ~ 04 September 2024	<
	Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247	ET

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.

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Tested By:

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(Wang Xiang)

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Checked By:

( Qin Shuiquan)

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Approved By:

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( Li Huaibi)

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Date: 05 Septer

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# 2. Test Result Summary

	WISTER WIST	TWST	WSCT	WSET
V	Requirement	CFR 47 Section	Result	
$\wedge$	Antenna Requirement	§15.203/§15.247 (c)	PASS	
WSET	AC Power Line Conducted Emission	§15.207	N/A	$\checkmark$
	Maximum conducted output power	§15.247 (b)(1) §2.1046	PASS	wser
WSET	20dB Occupied Bandwidth	§15.247 (a)(1) §2.1049	PASS	
	Carrier Frequencies Separation	§15.247 (a)(1)	PASS	X
	Hopping Channel Number	§15.247 (a)(1)	PASS	WSET
X	Dwell Time	§15.247 (a)(1)	PASS	
wser	Radiated Emission	§15.205/§15.209 §2.1053, §2.1057	PASS	
	Band Edge	§15.247(d) §2.1051, §2.1057	PASS	WSET

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1. PASS: Test item meets the requirement.

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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. EUT Description

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	Product Name:	TWS Earphone WSCT WSCT	WSET
(	Model :	BD04	
-	Trade Mark:	TECNO	/
1	Software version:	1.0.0	$\checkmark$
	Hardware version:	V1	$\wedge$
	<b>Operation Frequency:</b>	2402MHz~2480MHz	WSET \
(	Channel Separation:	1MHz	
7	Number of Channel:		1
	Modulation Type:	GFSK, π/4-DQPSK, 8-DPSK	
	Antenna Type:	Chip Antenna	
7	Antenna Gain:	2.36dBi	- Elga
1	Operating Voltage:	Li-ion Polymer Battery: 451012 Voltage: 3.7V Rated Capacity: 37mAh/0.1369Wh Charging Box: 851448	
		Input: 5V1A output: 5.0V0.12A Capacity:500mAh/3.7V/1.85Wh	WSET
(	Remark:	N/A.	

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Note: 1. N/A stands for no applicable. 2. Antenna gain provided by the customer.

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

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-	Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
(	0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
CT'		WISET		WSET		WISET	<b>\</b>	WSET
	10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
	11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
	1		1000		1000	<u>,</u>	1	····
7	18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
1	19	2421MHz	39	2441MHz	59	2461MHz		- ×
		Channel 0, 3	9 &78 ha	ve been tes	ted for G	FSK, π/4-D0	QPSK, 8E	DPSK
CT .	modulatic	on mode.		WISCT		WISCT		WISICT

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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 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.

2	Equipment	Model No.	Serial No.	FCC ID	Trade Name
	$\times$	X	X	1	Χ /
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#### Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. For conducted measurements (Output Power, 20dB 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 World Standardization Certification & Testing Group (Shenzhen) Co., Ltd. Building A-B,Baoli'an Industrial Park,No.58 and 60,Tangtou Avenue, Shiyan Street, Bao'an District, Shenzhen, Guangdong, China.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. 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.

#### ANAB - Certificate Number: AT-3951

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (ANAB).Certification Number: AT-3951

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#### 5.3. Measurement Uncertainty

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 %.

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$\wedge$	No.	Item	MU
WSET	1	Duty Cycle and Tx-Sequence and Tx-Gap	±1%557
	2	Dwell Time and Minimum Frequency Occupation	±1.2%
	3	Medium Utilisation Factor	±1.3%
$\bigvee$	4	Occupied Channel Bandwidth	±2.4%
$\wedge$	5	Transmitter Unwanted Emission in the out-of Band	±1.3%
WSCT	6	Transmitter Unwanted Emissions in the Spurious Domain	±2.5%
	7 🗙	Receiver Spurious Emissions	±2.5%
	8 W 5 C	Conducted Emission Test	±3.2dB
$\mathbf{\nabla}$	9	RF power, conducted	±0.16dB
	10	Spurious emissions, conducted	±0.21dB
WSET	11	All emissions, radiated(<1GHz)	±4.7dB
	12	All emissions, radiated(>1GHz)	±4.7dB
	13751	Temperature WSCT WSCT	±0.5°C
X	14	Humidity	±2.0%

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### 5.4. MEASUREMENT INSTRUMENTS

					1		
	NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.	<b>15</b> []
5	Test software	-	EZ-EMC	CON-03A	-	X	
ł	Test software		MTS8310	WISET	- /	VSET	
	EMI Test Receiver	R&S	ESCI	100005	11/05/2023	11/04/2024	
	LISN	AFJ	LS16	16010222119	11/05/2023	11/04/2024	$\wedge$
	LISN(EUT)	Mestec	AN3016	04/10040	11/05/2023	11/04/2024	(S C )
	Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	11/05/2023	11/04/2024	
ž	Coaxial cable	Megalon	LMR400	N/A CT	11/05/2023	11/04/2024	
	GPIB cable	Megalon	GPIB	N/A	11/05/2023	11/04/2024	$\checkmark$
	Spectrum Analyzer	R&S	FSU	100114	11/05/2023	11/04/2024	$\wedge$
	Pre Amplifier	H.P.CT	HP8447E	2945A02715	11/05/2023	11/04/2024	rs C
1	Pre-Amplifier	CDSI	PAP-1G18-38	X	11/05/2023	11/04/2024	
	Bi-log Antenna	SCHWARZBECK	VULB9168	01488	7/29/2024	7/28/2025	
Ż	9*6*6 Anechoic		FIGE	WHAT	11/05/2023	11/04/2024	
	Horn Antenna	COMPLIANCE ENGINEERING	CE18000	-	11/05/2023	11/04/2024	$\times$
	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	11/05/2023	11/04/2024	V5C
/	Cable	TIME MICROWAVE	LMR-400	N-TYPE04	11/05/2023	11/04/2024	
-	System-Controller	ccs	N/A	N/A	N.C.R	N.C.R	
ł	Turn Table	ccs	V5 C1N/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	-	11/05/2023	11/04/2024	$\wedge$
	Loop Antenna	EMCO	6502	00042960	11/05/2023	11/04/2024	75 CI
(	Horn Antenna	SCHWARZBECK	BBHA 9170	1123	11/05/2023	11/04/2024	
1	Power meter	Anritsu	ML2487A	6K00003613	11/05/2023	11/04/2024	
2	Power sensor	Anritsu	MX248XD	/ WSLI	11/05/2023	11/04/2024	
	Spectrum Analyzer	Keysight	N9010B	MY60241089	11/05/2023	11/04/2024	X
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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 Chip Antenna. it meets the standards, and the best case gain of the antenna is 2.36dBi.

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### 6.2. Conducted Emission

6.2.1. Test Specification

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       Limit (dBuV)         Quasi-peak       Average         0.15-0.5       66 to 56*       56 to 46*         0.55       56       46         0.55       56       46         0.50       60       50         Reference Plane         Forage:         Reference Plane         Forage:         Forage:         Forage:         Forage:         Forage:         Forage:         Forage:         Forage:         Forage:         Fora
Frequency Range:       150 kHz to 30 MHz         Receiver setup:       RBW=9 kHz, VBW=30 kHz, Sweep time=auto         Limits:       Frequency range       Limit (dBuV)         0.15-0.5       66 to 56*       56 to 46*         0.5-5       56       46         5-30       60       50         Reference Plane         Filter Luct         Limit 'docm #0cm #0cm #0cm #0cm #0cm #0cm #0cm #0
Receiver setup:       RBW=9 kHz, VBW=30 kHz, Sweep time=auto         Limits:       Frequency range       Limit (dBuV)         Quasi-peak       Average         0.15-0.5       66 to 56*         0.5-5       56         46       5-30         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       60         5-30       56         40cm       #0cm         Feterence Plane       Immediation plane         Fernark       E.U.T         E.U.T       Execence         Fetrait       Interpreteit         I.The E.U.T       Execence         Test Mode:
Limits:       Frequency range       Limit (dBuV)         Quasi-peak       Average         0.15-0.5       66 to 56*       56 to 46*         0.5-5       56       46         5-30       60       50         Reference Plane         Image: Colspan="2">EMI         Test Setup:         Test Setup:         Test table/Insulation plane         Remark:         EUT Equipment Under Test         LIMI Test table/Insulation plane         Remark:         EUT Equipment Under Test         LIMI Test table/Insulation plane         Remark:         EUT Equipment Under Test         LIMI Test table/Insulation plane         Remark:         EUT Equipment Under Test         LISE Mode:         Test Mode:         Test Mode:         Refer to item 4.1         1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 500hm/50UH coupling impedance for the measuring equipment.         2. The peripheral devices are also connected to the main
Limits:       Image: Construct of the second s
Test Setup:       Image: Control of the second
Test Setup:       Image: Constrained a constra
Test table/Insulation plane       Receiver         Remark:       E.U.T. Equipment Under Test         LISN: Line Impedence Stabilization Network         Test Mode:       Refer to item 4.1         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.         2. The peripheral devices are also connected to the main
EUT: Equipment Under Test         LISN: Line Impedence Stabilization Network         Test Mode:       Refer to item 4.1         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.         2. The peripheral devices are also connected to the main
Image: Construction of the stability of the
impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main
provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main
power through a LISN that provides a 500hm/50uH
Test Procedure:coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
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 ANSI C63.10:2014 on conducted measurement.
Test Result: N/A
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#### 6.2.2. EUT OPERATING CONDITIONS

The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

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Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

Test data Note: EUT powered by battery not applicable

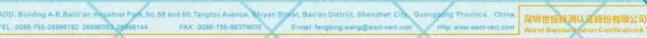
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# 6.3. Conducted Output Power

#### 6.3.1. Test Specification

	A					
	Test Requirement:	FCC Part15 C Section 15.247 (b)(3)				
	Test Method:	ANSI C63.10:2014	1			
	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.				
7	Test Setup:	Spectrum Analyzer	2			
1	Test Mode:	Transmitting mode with modulation				
7	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	4			
	Test Result:	PASS	4			

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#### 6.3.2. Test Data

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	Test channel	Maximum conducted output power (dBm)	Limit (dBm)	Result
	Lowest	6.14	21	PASS
1	Middle	6.61	21	PASS
	Highest	6.12	21	PASS
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Pi/4DQPSK mode					
Test channel	Maximum conducted output power (dBm)	Limit (dBm)	Result		
Lowest	6.765	215	PASS		
Middle	7.6	21	PASS		
Highest	7.12	21	PASS		
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8DPSK mode			
Test channel	Maximum conducted output power (dBm)	Limit (dBm)	Result
Lowest	6.02	21	PASS
Middle	6.76	21	PASS
Highest	WSET 6.29	ISCT 21	ISET PASS

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Test plots as follows:

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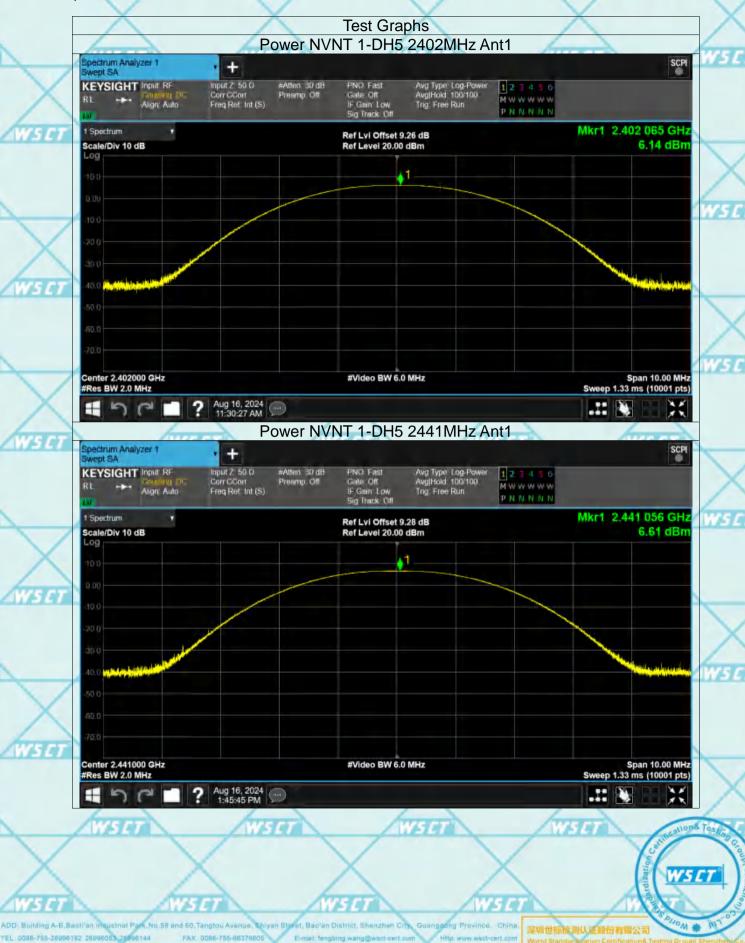


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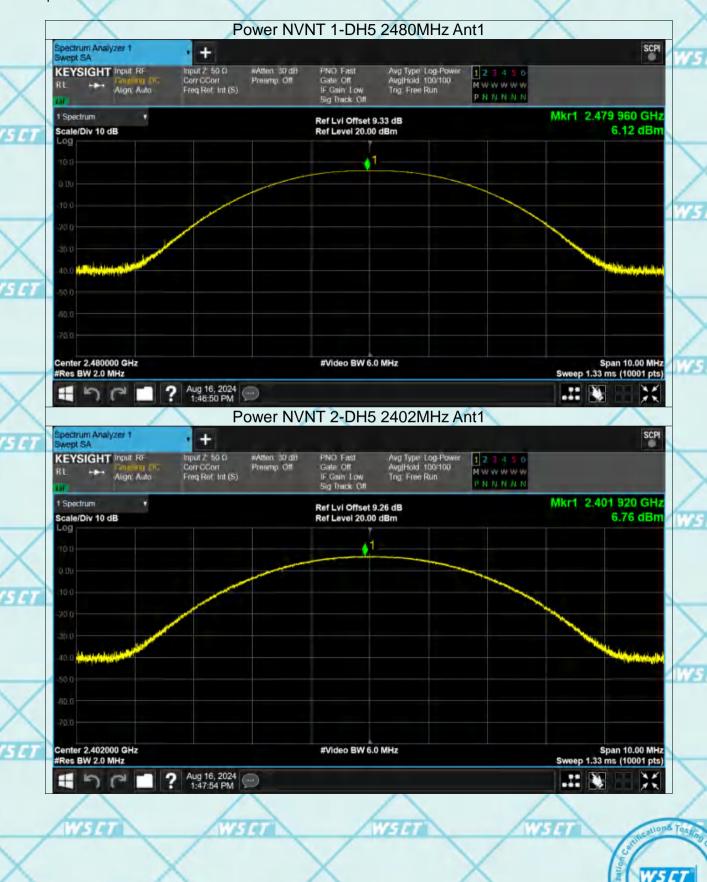
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### 6.4. 20dB Occupy Bandwidth

6.4.1. Test Specification

X	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
WSET	Test Method:	ANSI C63.10:2014 WSCT WSCT
	Limit:	N/A
$\overline{}$	Test Setup:	
$\wedge$		Spectrum Analyzer EUT
WSET	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;</li> </ol>
WSET	Test Result:	Sweep = auto; Detector function = peak; Trace = max hold. 5. Measure and record the results in the test report. PASS

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6.4.2. Test data

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Toot obonnol	20dB Occupy Bandwidth (MHz)			
Test channel	GFSK	π/4-DQPSK	8DPSK	Conclusion
Lowest	1.032	1.307	1.292	PASS
Middle	1 W5	1.312	w.1.315	PASS
Highest	1.016	1.301	1.277	PASS
	Middle	Test channelGFSKLowest1.032Middle1	Test channelGFSKπ/4-DQPSKLowest1.0321.307Middle11.312	Test channel         GFSK         π/4-DQPSK         8DPSK           Lowest         1.032         1.307         1.292           Middle         1         1.312         1.315

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Test plots as follows:



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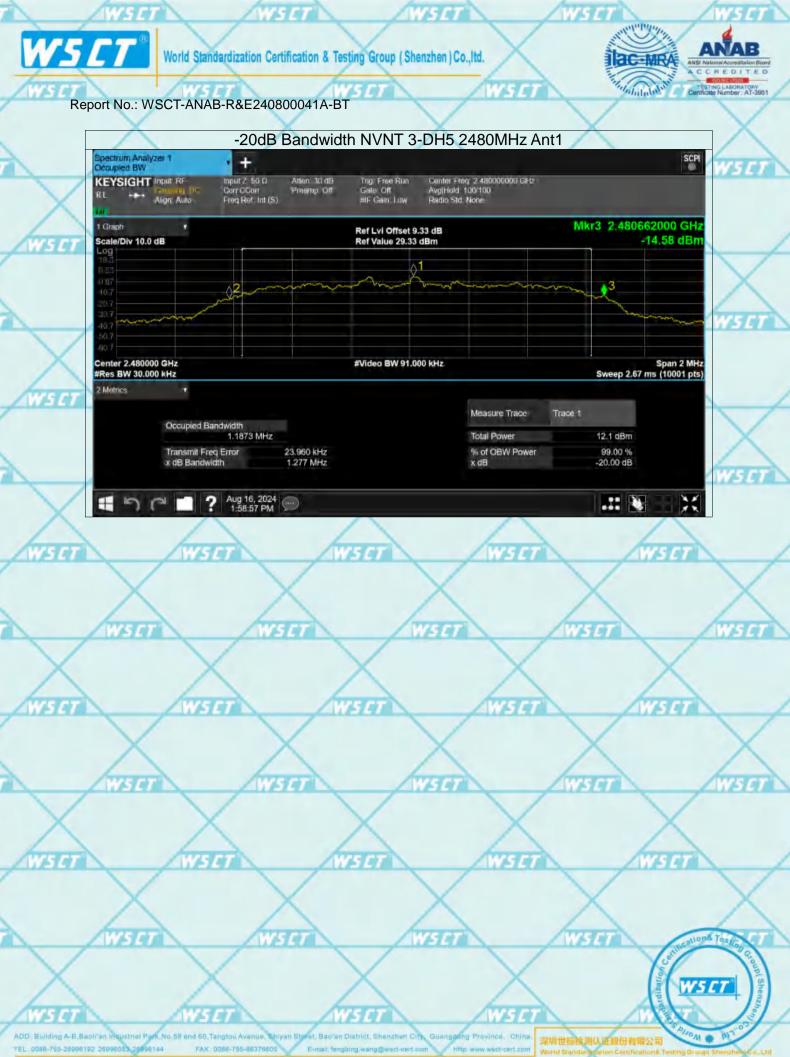
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#### 6.5. Carrier Frequencies Separation

6.5.1. 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	1
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 = 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</li> </ol>	A V
Test Result:	<ul> <li>each individual channel; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold.</li> <li>6. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Record the value in report.</li> <li>PASS</li> </ul>	

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### 6.5.2. Test data

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1	Test channel	Carrier Frequencies Separation (MHz)	Limit (2/3*20dB BW MHz)	Result
4	Lowest	0.996	0.688	PASS
	Middle	1.006	0.667	PASS
	Highest		0.677	PASS

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1	Test channel	Carrier Frequencies Separation (MHz)	Limit (2/3*20dB BW MHz)	Result
	Lowest	0.996	0.871	PASS
	Middle	0.998	0.875	PASS
-	Highest	WSLT1.002	0.867 M	SET PASS

	8DPSK mode			
1	Test channel	Carrier Frequencies Separation (MHz)	Limit (2/3*20dB BW MHz)	Result
	Lowest	0.998	0.861	PASS
	Middle	1.008	0.877	PASS
1	Highest	0.928	0.851	PASS

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Test plots as follows:

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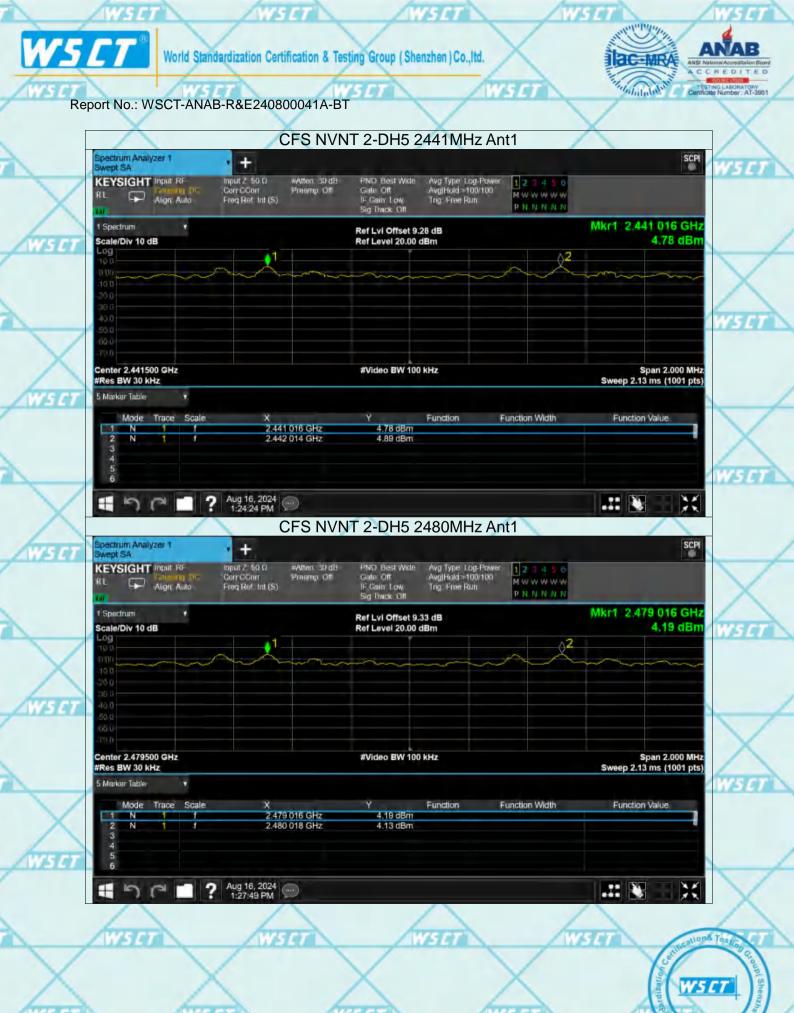


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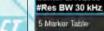
#Video BW 100 kHz

4.58 dBm

4.21 dBm

Function

Function Width



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Center 2.402500 GHz

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2.403 012 GHz

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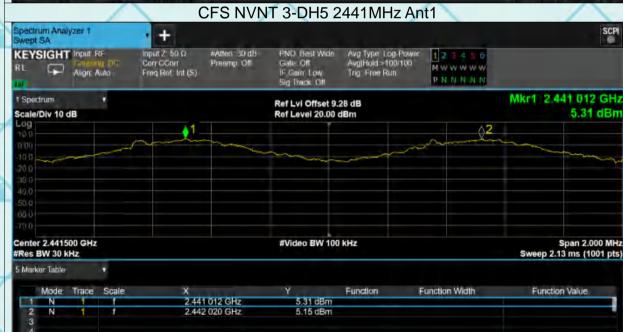
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Span 2.000 MHz

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Sweep 2.13 ms (1001 pts)

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# 6.6. Hopping Channel Number

### 6.6.1. Test Specification

7	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)	
	Test Method:	ANSI C63.10:2014	1
	Limit:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.	4
	Test Setup:	Spectrum Analyzer EUT	
1	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 = 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>The number of hopping frequency used is defined as the number of total channel.</li> <li>Record the measurement data in report.</li> </ol>	A BY A BY
	Test Result:	PASS	4
	CUE128 CUE12		17

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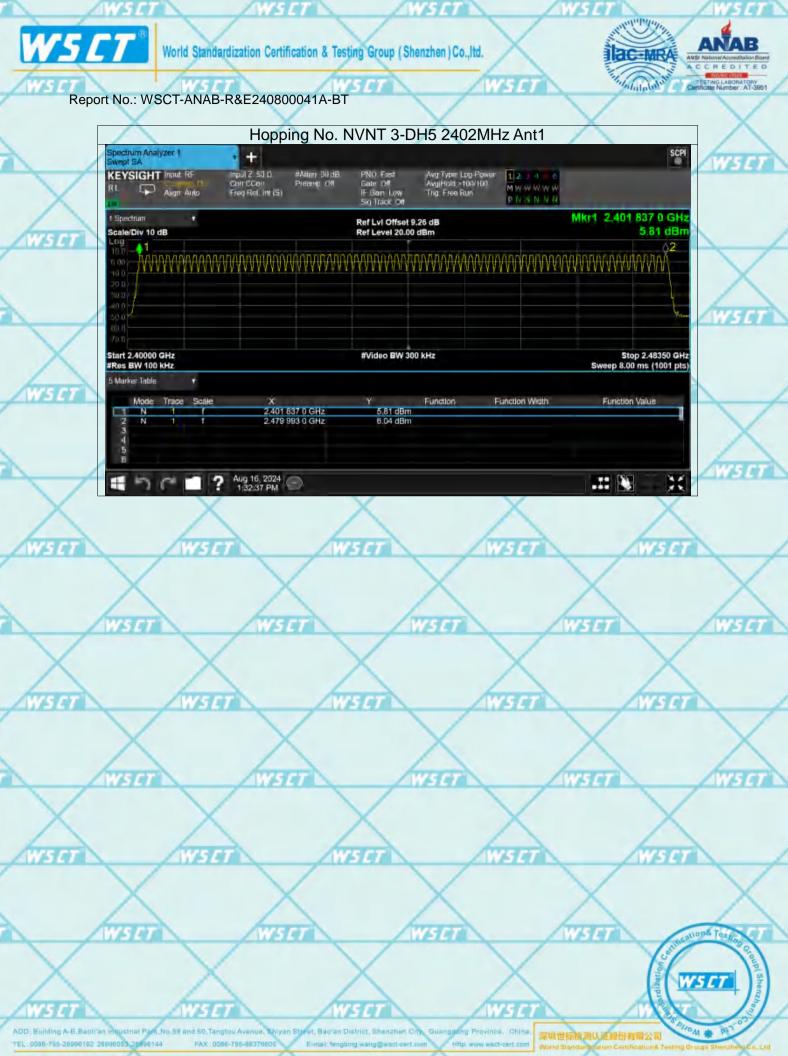
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## 6.7. Dwell Time

6.7.1. Test Specification

X	Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
WSET	Test Method:	ANSI C63.10:2014 WSCT WSCT
	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.
X	Test Setup:	Spectrum Analyzer EUT
WSET	Test Mode:	Hopping mode WSCT WSCT
WISIT	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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## 6.7.2. Test Data

	1							
1	Mode	Frequency (MHz)	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
1	1-DH1	2402	0.383	121,411	317	31600	400	Pass
7		2402	0.363	121.411	317	31600	400	Pass
	1-DH1	2441	0.383	121.794	318	31600	400	Pass
	1-DH1	2480	0.382	121.858	319	31600	400	Pass
	1-DH3	2402	1.639	258.962	158	31600	400	Pass
1	1-DH3	2441	1.639	252.406	154	31600	400	Pass
	1-DH3	2480	1.639	255.684	156	31600	400	Pass
-	1-DH5	2402	2.887	326.231	113	31600	400	Pass
	1-DH5	2441	2.887	297.361	103	31600	400	Pass
	1-DH5	2480	2.886	271.284	94	31600	400	Pass

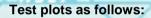
Note: 1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. For DH1, With channel hopping rate (1600 / 2 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 2 / 79) x (0.4 x 79) = 320 hops

For DH3, With channel hopping rate (1600 / 4 / 79) in Occupancy Time Limit (0.4 x 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 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops

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

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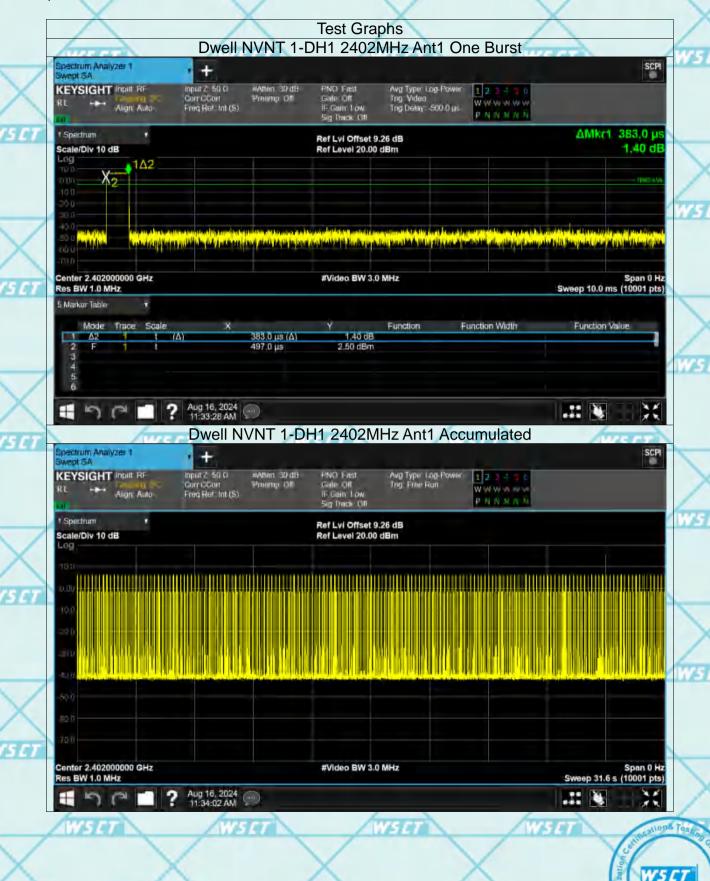
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Report No.: WSCT-ANAB-R&E240800041A-BT



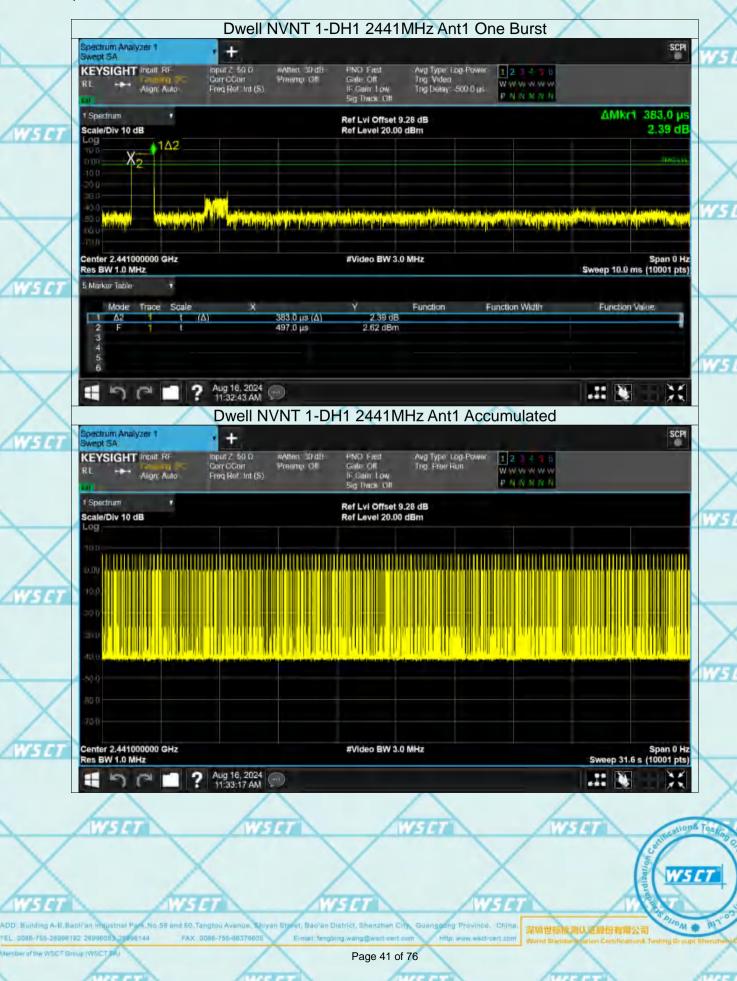
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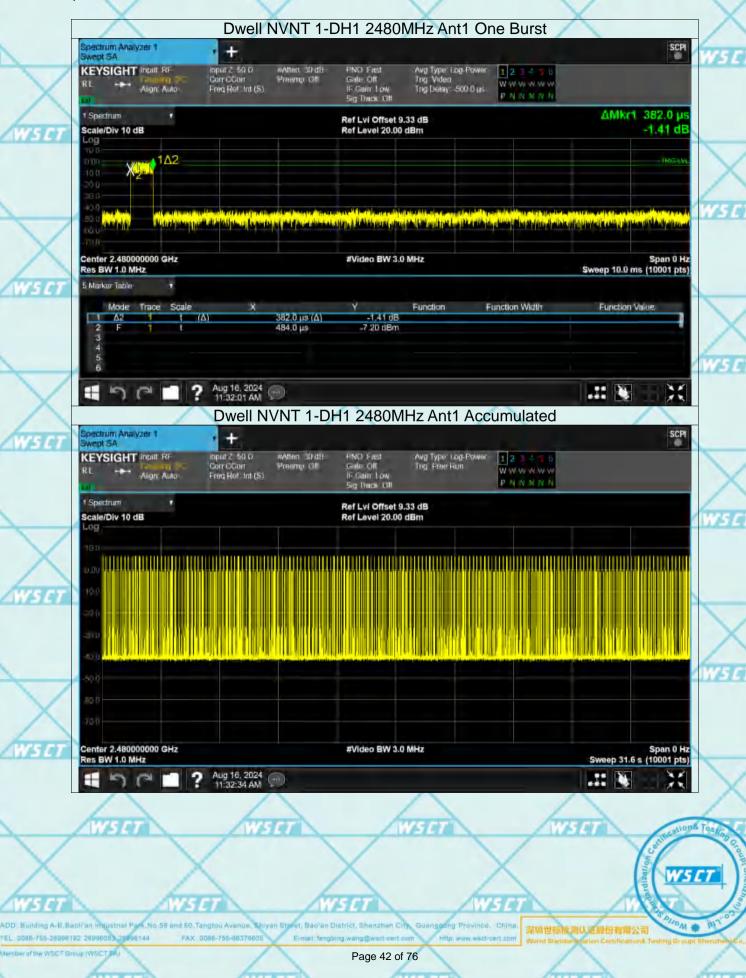






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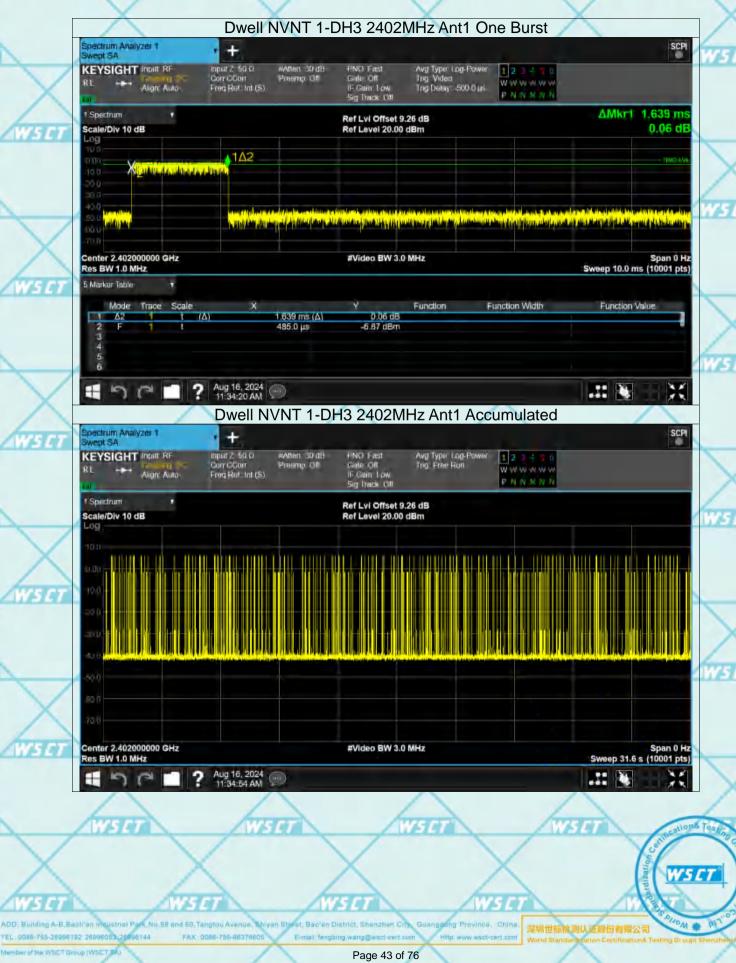


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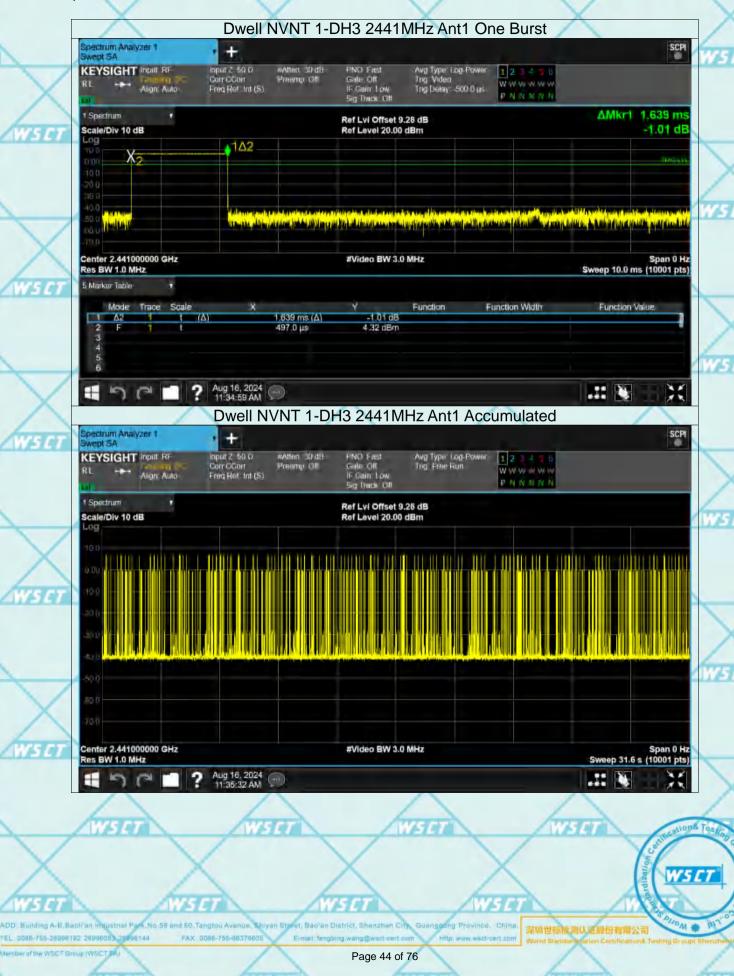


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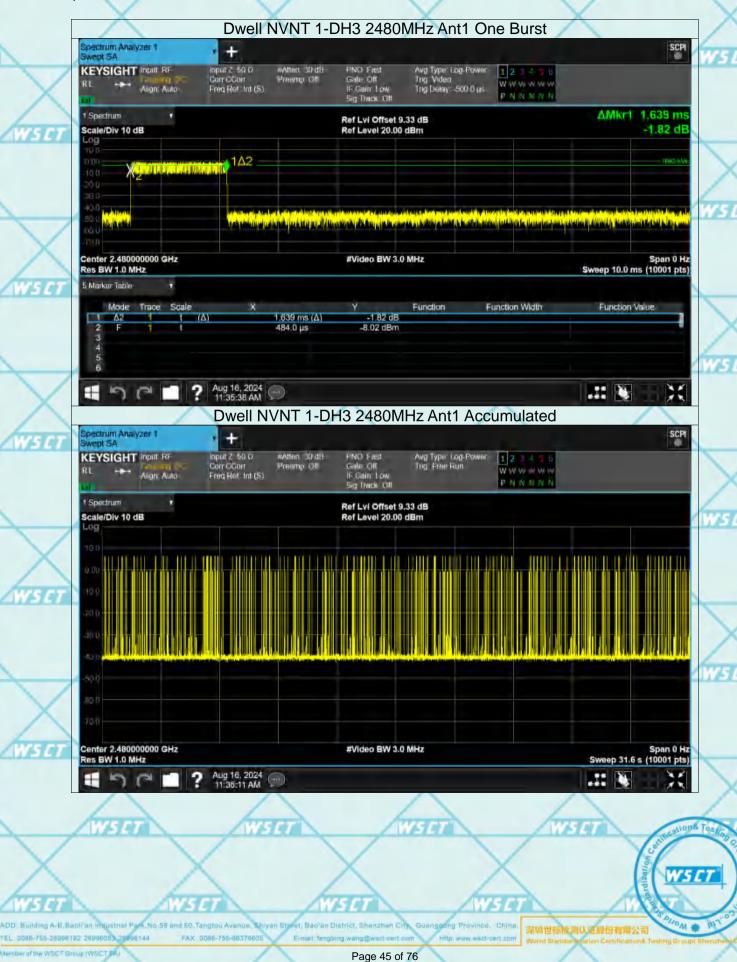
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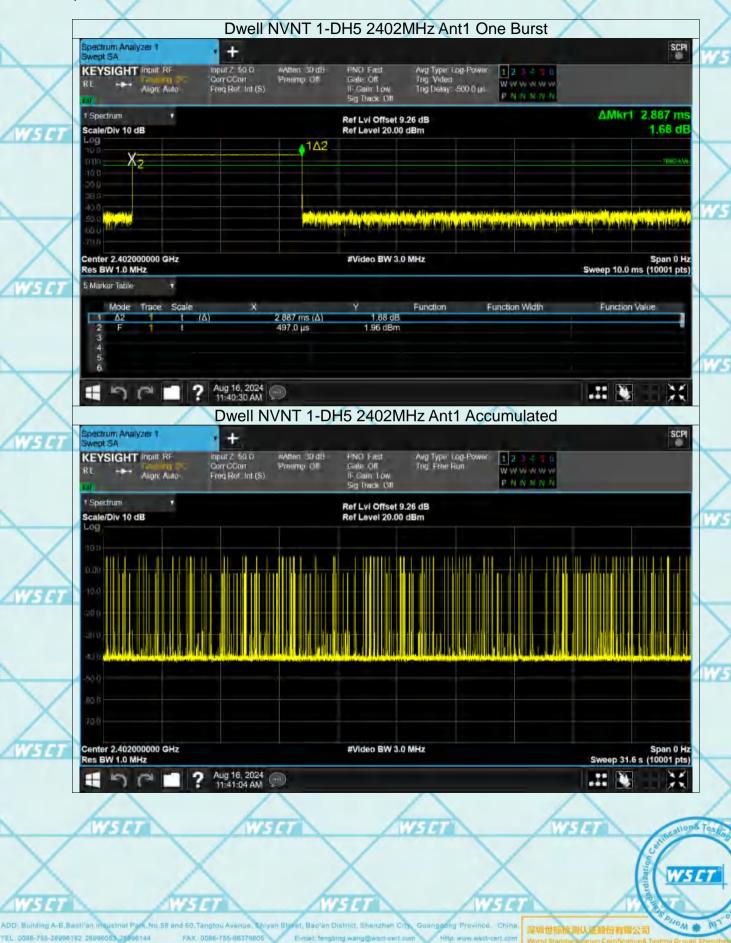




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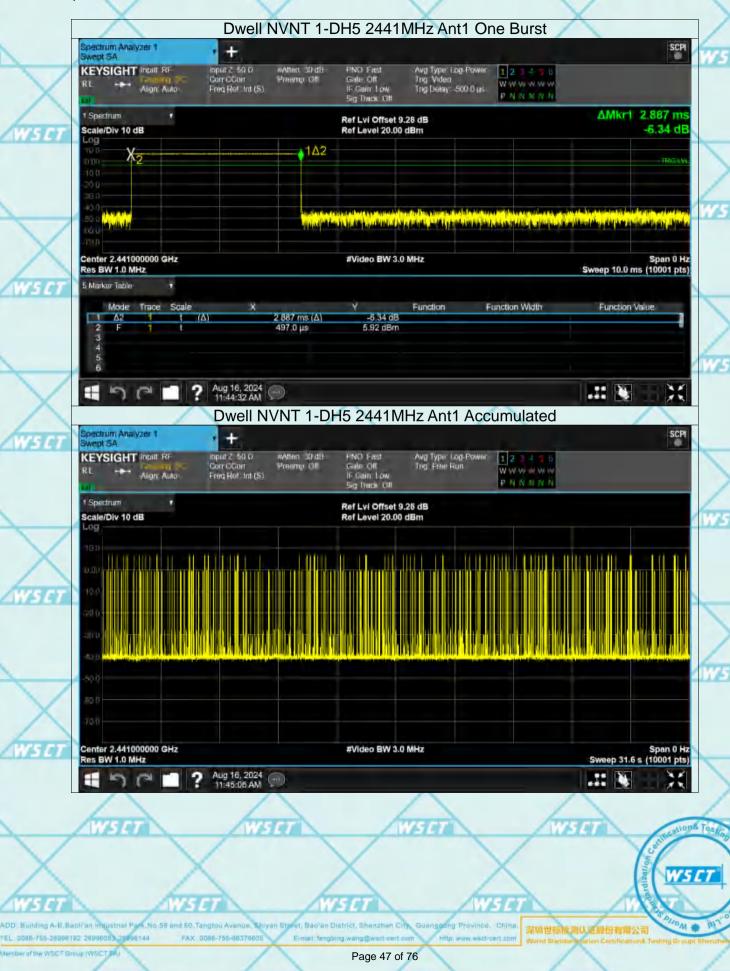
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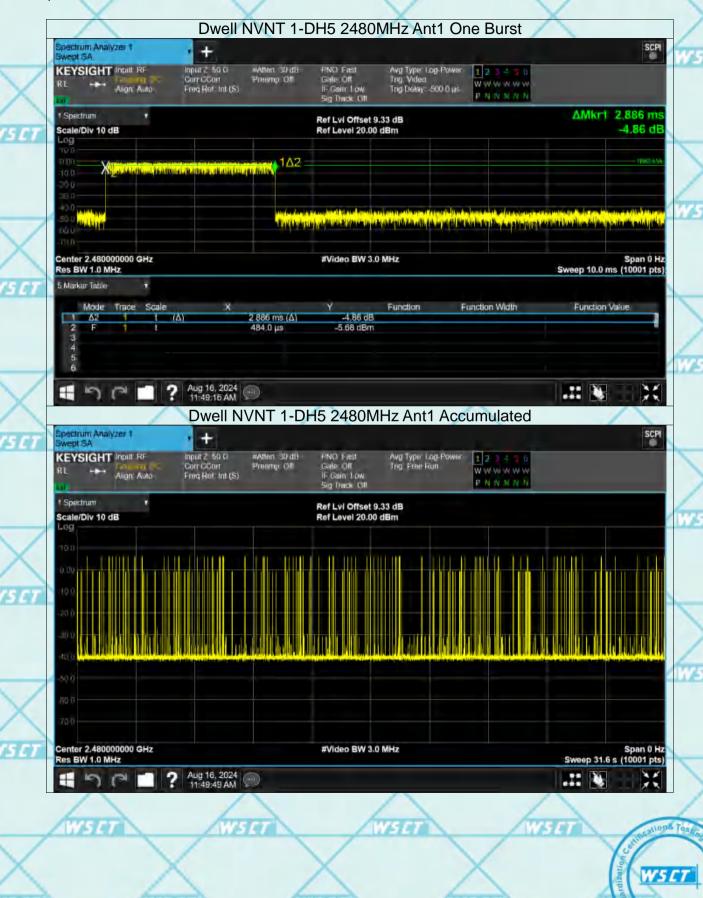
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## 6.8. Pseudorandom Frequency Hopping Sequence

## 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.

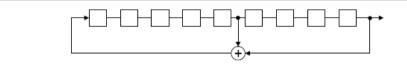
## EUT Pseudorandom Frequency Hopping Sequence

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

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Length of pseudo-random sequence: 2<sup>9</sup> -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:

	1

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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#### **Conducted Band Edge Measurement** 6.9.

6.9.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2014 WSCT WSCT
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.
Test Setup:	Spectrum Analyzer EUT
Test Mode:	Transmitting mode with modulation
Test Procedure:	<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>
Test Result:	PASS
	Test Method: Limit: Test Setup: Test Mode: Test Procedure:

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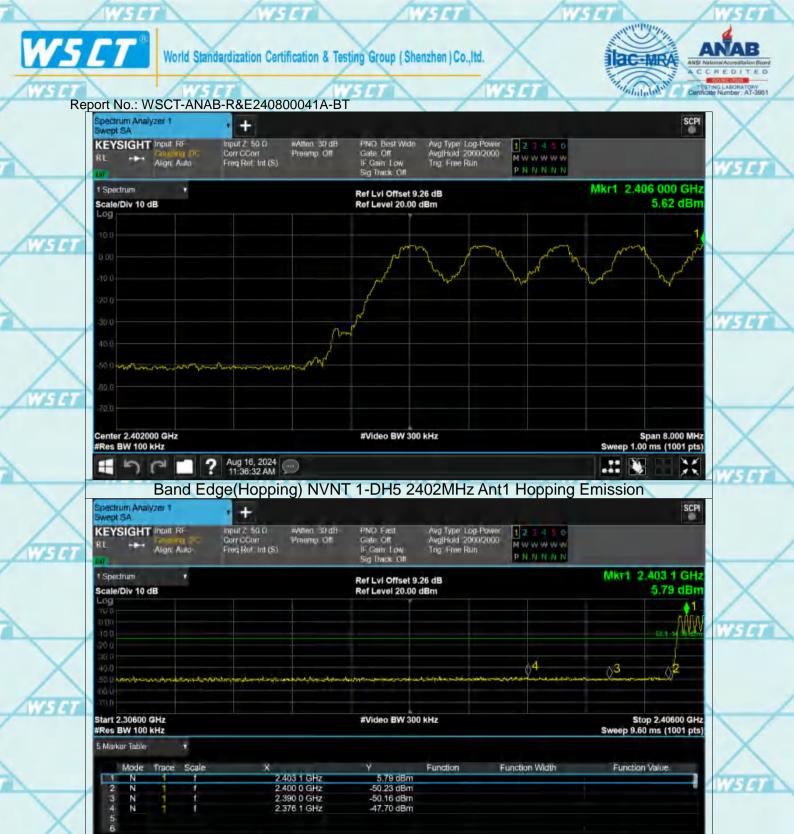


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# Conducted RF Spurious Emission

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	Condition	Mode	Frequency	Antenna	Max Value	Limit	Verdict	SET
			(MHz)		(dBc)	(dBc)		
X	NVNT	1-DH5	2402	Ant1	-48.32	-20	Pass	
	NVNT	1-DH5	2441	Ant1	-49.21	-20	Pass	
57	NVNT	1-DH5	2480	Ant1	-47.05	-20	Pass	
	NVNT	2-DH5	2402	Ant1	-46.44	-20	Pass	/
	NVNT	2-DH5	2441	Ant1	-42.54	-20	Pass	$\mathbf{X}$
	NVNT	2-DH5	2480	Ant1	-31.67	-20	Pass	
	NVNT	3-DH5	2402	Ant1	-39.69	-20	Pass	rert
-	NVNT	3-DH5	2441	Ant1	-52.46	-20	Pass	261
~	NVNT	3-DH5	2480	Ant1	-48.06	-20	Pass	
		1			~		~	-

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WESTER	WISTER	$\rightarrow$	$\langle \rangle$	$\langle \rangle$	SET
	WESTER	WISTER	WISET	WSET	WISET
WISET	WISTER	$\sim$	$\langle \rangle$	$\langle \rangle$	511
	WISLET	WISET	WISIT	WSET	WEIT
			/	1	/

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# 6.10. Radiated Spurious Emission Measurement

6.10.1. Test Specification

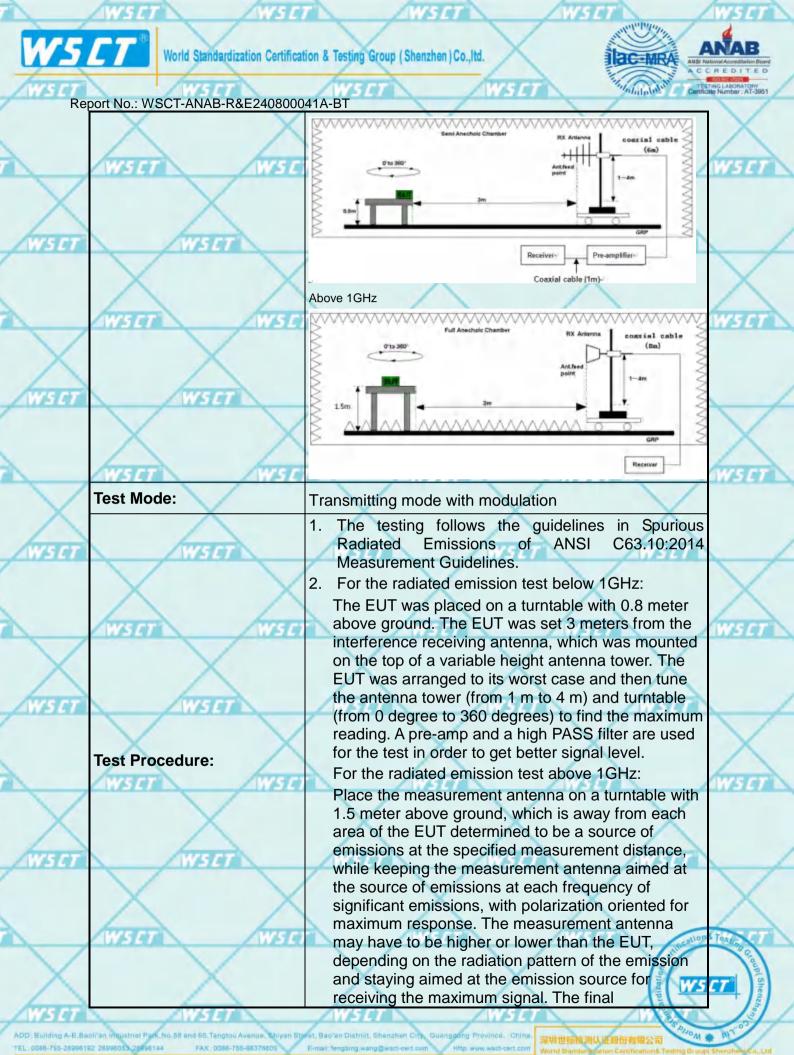
1	o.ro.r. rest specification			1/		1	
X	Test Requirement:	FCC Part15	C Section	15.209		/	X
WSET	Test Method: 507	ANSI C63.10	):2014	WSET		1	SET
	Frequency Range:	9 kHz to 25 0	GHz		/	/	
	Measurement Distance:	3 m	$\wedge$		/		
	Antenna Polarization: VSC	Horizontal &	Vertical	-	WS	T	1
$\sim$	$\sim$	Frequency	Detector	RBW	VBW	Rema	ark
$\wedge$	$\wedge$	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-pea	
hand		150kHz-	Quasi-peak	9kHz	30kHz	Quasi-pea	k Value
WSCT	Receiver Setup:	30MHz	Quesi pack		300KHz	Ouesi pes	k Value
	$\vee$ $\vee$	30MHz-1GHz	Quasi-peak Peak	100KHz 1MHz	300KHZ 3MHz	Quasi-pea Peak V	
	$\wedge$ $\wedge$	Above 1GHz	Peak	1MHz	10Hz	Average	
	Anna Anna				1000	-	~
	WSCT WSU	Frequen	су	Field Stre (microvolts		Measure Distance (r	
$\sim$	$\sim$	0.009-0.4	90	2400/F(F	,	300	
$\wedge$	$\wedge$	0.490-1.7		24000/F(		30	
WSET	WSET	1.705-3		30	A.	30	
	1 meret	30-88		100		3	
	Limit:	88-216 216-96		150 200		3	
		Above 9		500		3	
	WEIGT		WSIT		WS		1
$\mathbf{X}$	X	Frequency		Strength olts/meter)	Measurer Distan (meter	ce De	etector
wscr	WSET	Above 1GHz		500 000	3		verage Peak
	XX	For radiated emis	ssions below 3	0MHz	>		
	WHAT WHAT	Dis	stance = 3m			Computer	-
V		†			Pre -/	Amplifier	/
X	Test setup:		4	- Γ			
WSET	WSLT	EUT					
		-	Turn table				
	XX		1		R	eceiver	-
	$\wedge$		Ground P	lanc			
	WSET WSE	30MHz to 1GHz	WSET		/WIS	T	neations 7
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X	X	X		X			WSC
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WSET	WSET	WSET		WSE			As an

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/WSLT	WSET	WSET WSET	Certificate Number: AT-3861
Report No.:	WSCT-ANAB-R&E2408000		
X	X	measurement antenna elevation shall t	
		maximizes the emissions. The measure	
WS	T WSC	antenna elevation for maximum emissi	
		restricted to a range of heights of from	
X	X	above the ground or reference ground	
		3. Set to the maximum power setting ar	nd enable the
WSET	WSET	EUT transmit continuously.	WISIT
1		4. Use the following spectrum analyzer s	ettings:
X	X	(1) Span shall wide enough to fully ca	pture the
		emission being measured;	
WSI	T WST	(2) Set RBW=100 kHz for f < 1 GHz, I	RBW=1MHz
	1	for f>1GHz ; VBW≥RBW;	
X	X	Sweep = auto; Detector function :	= peak; Trace
		= max hold for peak	
WSET	WSET	(3) For average measurement: use d	uty cycle
1		correction factor method per	
X	X	15.35(c). Duty cycle = On time/100	) milliseconds
		On time =N1*L1+N2*L2++Nn-1*	LNn-1+Nn*Ln
WSL	TWSE	Where N1 is number of type 1 pu	
		length of type 1 pulses, etc.	
X	X	Average Emission Level = Peak I	mission
		Level + 20*log(Duty cycle)	
WSLT	WSET	WSCT WSCT	WISET
		Corrected Reading: Antenna Facto	
X	X	Loss + Read Level - Preamp Factor	or = Level
Test re	esults:	PASS	
/WSL	T WSG	WSGT /WSG	WSLT
Note 1:	The symbol of "-" in the table v	vhich means not application.	$\sim$
~		According the ANSI C63.10-2013, where limits are spec	ified for both average
		ctor functions, if the peak (or quasi-peak) measured value	
	/	/ to perform an average measurement.	
X	X	XXX	X
Note 3:	The low frequency, which start	ed from 9 kHz to 30 MHz, was pre-scanned and the resul	t which was 20 dB
WIST	lower than the limit line per 15	.31(o) was not reported.	WSCT
Note 4:	The EUT is working in the Nor	mal link mode below 1 GHz. All modes have been tested	and normal link mode

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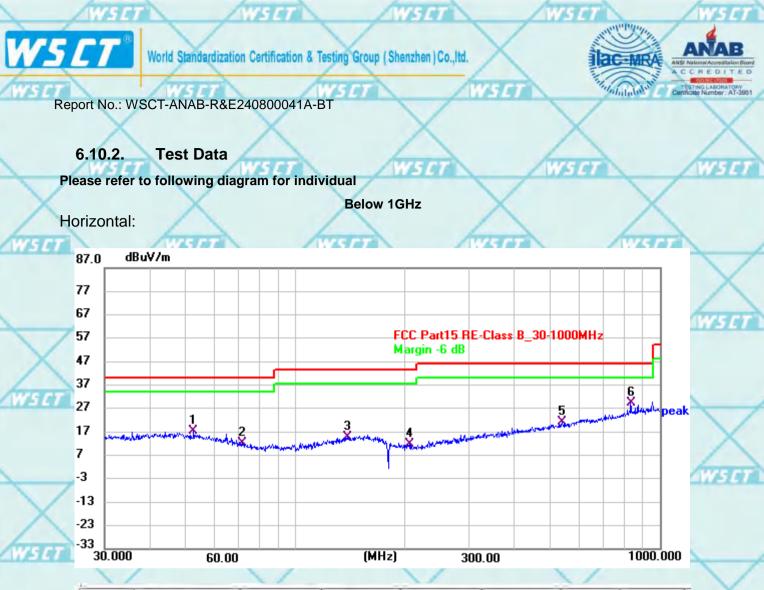
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	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Lîmît (dBüV/m)	Margin (dB)	Detector	6
F	1	52.7138	36.13	-18,95	17,18	40.00	-22.82	QP	
ľ	2	71.9581	34.74	-22.57	12.17	40.00	-27.83	QP	
ľ	3	138.9343	34.86	- 19.97	14.89	43.50	-28.61	QP	~
ľ	4	206.2167	35.79	-24.00	11.79	43.50	-31.71	OP	
ĺ	5	540.1874	36.19	-15.02	21.17	46.00	-24.83	QP	
l	6 *	832.5869	39.73	- 10.55	29.18	46.00	-16.82	OP	11

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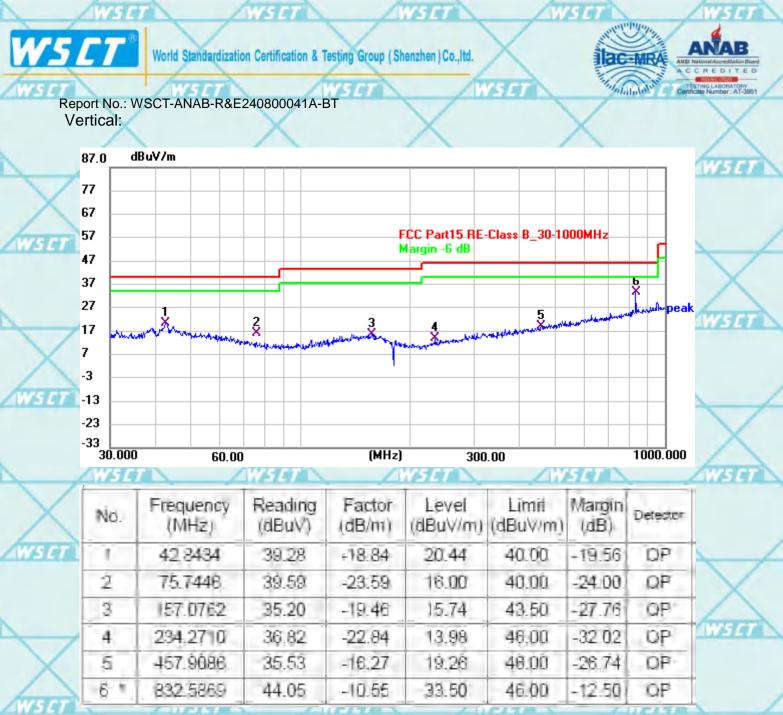
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### Note1:

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Freq. = Emission frequency in MHz Reading level  $(dB\mu V)$  = Receiver reading Corr. Factor (dB) = Antenna factor + Cable loss - Amplifier factor. Measurement  $(dB\mu V)$  = Reading level  $(dB\mu V)$  + Corr. Factor (dB)Limit  $(dB\mu V)$  = Limit stated in standard Margin (dB) = Measurement  $(dB\mu V)$  – Limits  $(dB\mu V)$ 

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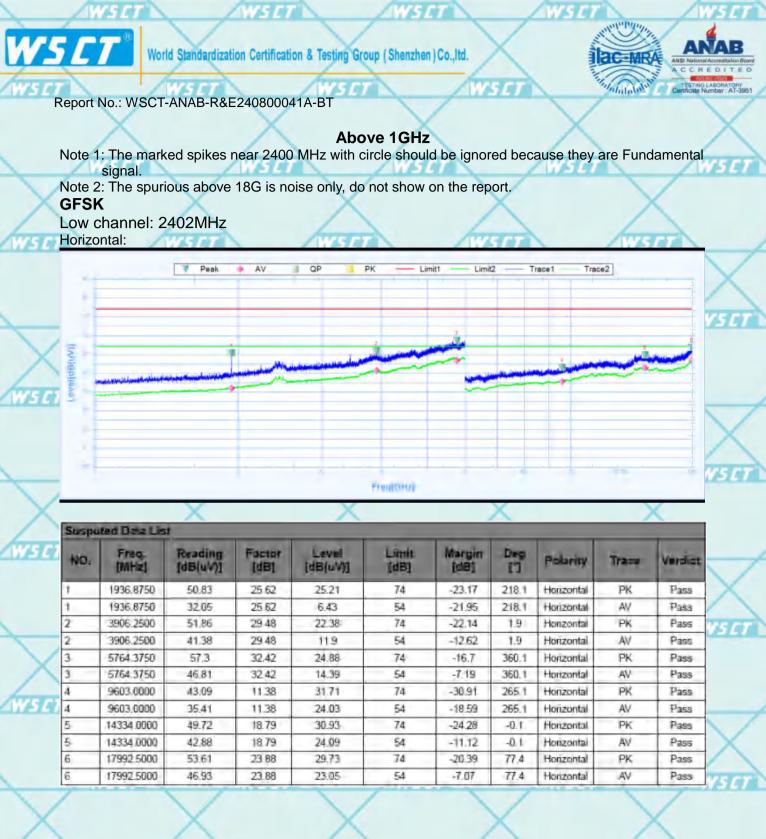
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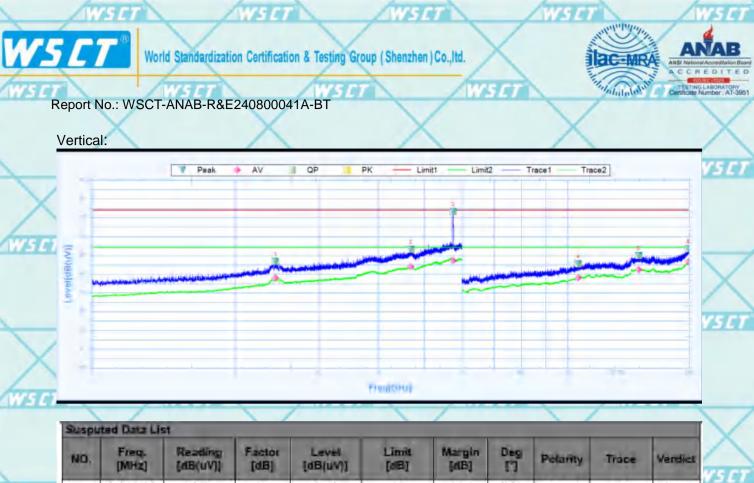
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NO.	Freq. [MHz]	Reating (dB(uV))	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [*]	Pelanty	Trace	Vendica
1	2428.7500	46.71	27,36	19.35	74	-27.29	355.2	Vertical	PK	Pass
1	2428.7500	37 67	27 36	10.51	54	-16.13	355.2	Vertical	AV	Pass
2	4686.8750	53.21	30,97	22.24	74	-20.79	220.5	Vertical	PK	Pass
2	4686.8750	44 02	30.97	13.05	54	-9.98	220.5	Vertical	AV	Pass
3	5750.0000	73.2	32.4	40.8	74	-0.8	304.2	Vertical	PK	Pasa
3	5750,0000	47.21	32.4	14.81	54	-6.79	304.2	Vertical	AV	Pass
4	10530.0000	45.48	14.05	31.43	74	-28.52	15.6	Vertical	PK	Pass
4	10530.0000	37.96	14.05	23.91	54	-16.04	15.6	Vertical	AV	Pass
5	14104 5000	49.87	19.02	30.85	74	-24.13	238	Vertical	PK	Pass
5	14104 5000	42.28	19.02	23.26	54	-11.72	238	Vertical	AV	Pass
6	17946.0000	53.33	23.55	29.78	74	-20.67	289,4	Vertical	PK	Pass
6	17946.0000	46.48	23.55	22.93	54	-7.52	289.4	Vertical	AV	Pass

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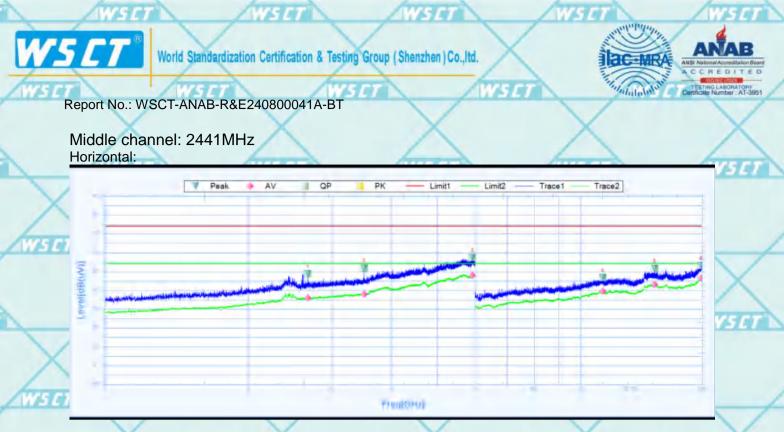
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NO,	Fiveq. [MHz]	Reading (dB(uV))	Factor [dB]	Level [dB[uV]]	Limir (dB)	Margin [dB]	Deg [1]	Polarity	Trace	Verdic
(	2671 8750	48.67	27,81	20.86	74	-25.33	8.6	Horizontal	PK.	Pass
1	2671.8750	36.04	27.81	8.23	54	-17.96	8.6	Horizontal	AV	Pass
2	3507.5000	51,91	28.52	23.39	74	-22.09	215.7	Horizontal	PK	Pass
2	3507 5000	37.99	28.52	9 47	54	-16.01	215.7	Horizontal	AV	Pass
3	5923.7500	57.29	32.68	24.61	74	-16.71	231.3	Horizontal	PK	Pass
3	5923.7500	47.91	32.68	15.23	54	-6.09	231.3	Horizontal	AV	Pass
4	11137.5000	46.78	15.83	30.95	74	-27.22	-0.1	Horizontal	PK	Pass
4	11137.5000	39.51	15 83	23.68	54	-14.49	-0.1	Horizontal	AV	Pass
5	14308.5000	51.69	18.81	32.88	74	-22.31	45	Horizontal	PK.	Pass
5	14308.5000	42.94	18.81	24.13	54	+11.06	45	Horizontal	AV	Pass
6	17935.5000	53.28	23.49	29.79	74	-20.72	322.4	Horizontal	PK.	Pass
6	17935.5000	46.65	23.49	23.16	54	-7.35	322.4	Horizontal	AV	Pass

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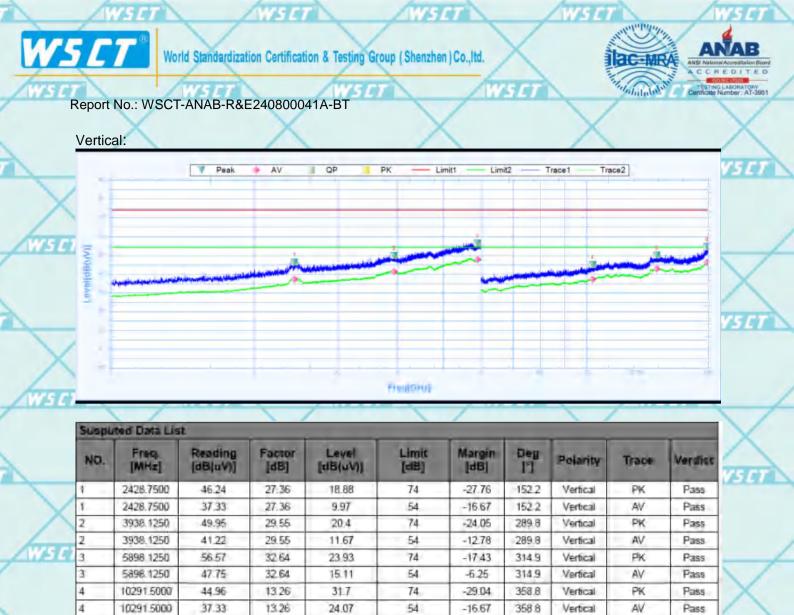
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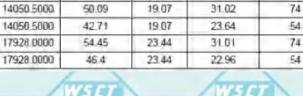
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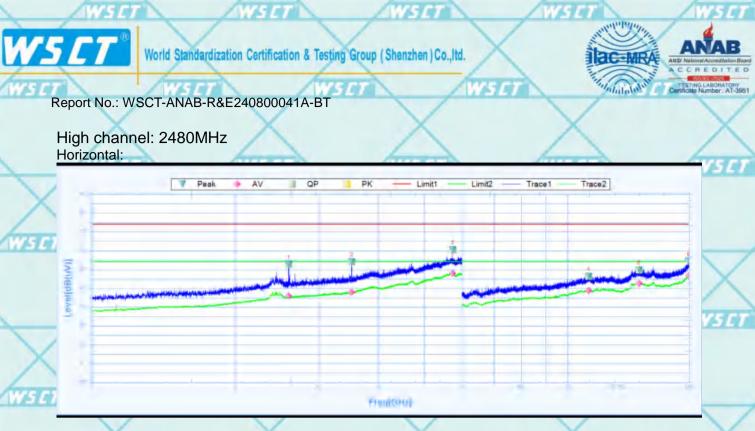
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ADD: Building A-B.Babli'an I dustrial Park, No.58 and 60, Tanotou Ave ot Bac 菜圳世标检测认证股份有 TEL: 0086-755-26996192 26996053 20996144 FAX -0086-755-86376605 E-mail: te

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NO.	Freq. [MHz]	Reading (dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [1]	Polarity	Trace	Verdic
1	2594.3750	52.64	27.71	24.93	74	-21,36	276.6	Honzontal	PK	Pass
1	2594.3750	35.89	27.71	8.18	54	-18.11	276.6	Horizontal	AV	Pass
2	3518,7500	54 14	28 54	25.6	74	-19 86	360	Horizontal	PK	Pass
2	3518.7500	37.95	28.54	9.41	54	-16.05	360	Horizontal	AV	Pass
3	5739.3750	60.46	32.38	28.08	74	-13.54	270.6	Horizontal	PK	Pass
3	5739.3750	47.84	32.38	15.46	54	-6.16	270.6	Horizontal	AV	Pass
4	11073.0000	46.42	15,85	30.57	74	-27.58	200.6	Honzontal	PK	Pass
4	11073.0000	38.93	15.85	23.08	54	-15.07	200.6	Horizontal	AV	Pass
5	14130.0000	49.57	19	30.57	74	-24,43	216.1	Horizontal	PK	Pass
5	14130.0000	42.66	19	23.66	54	-11.34	216.1	Honzontal	AV	Pass
6	17973.0000	54.33	23.74	30.59	74	-19.67	185	Horizontal	PK	Pass
6	17973.0000	46.79	23.74	23.05	54	-7.21	185	Horizontal	AV	Pass

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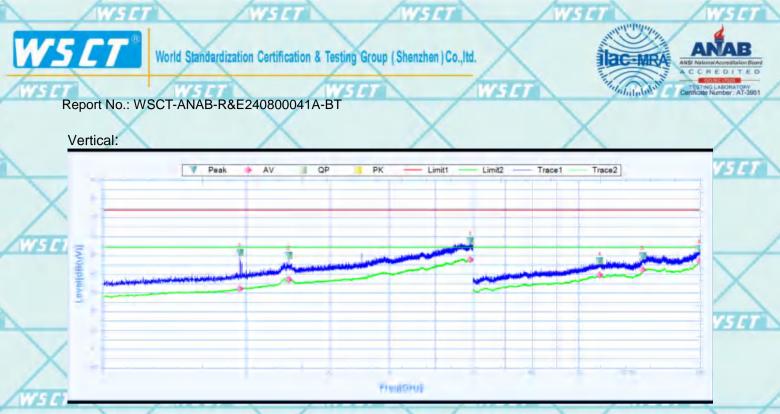
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Susputed Data List										
ND.	Freq. [MHz]	Reading [dB(uVI)	Factor (dB)	Level [dB(uV)]	Lima [dB]	Margin (d8)	Deg	Polarity	Trace	Verdict
1	1941.2500	51.48	25.64	25.84	74	-22.52	136.2	Vertical	PK.	Pass
1	1941.2500	32,28	25.64	5.64	54	-2172	136.2	Vertical	AV	Pass
2	2459.3750	49.88	27.46	22,42	74	-24.12	347.2	Vertical	PK.	Pass
2	2459.3750	37.1	27.46	9.64	54	-16.9	347.2	Vertical	AV	Pass
3	5920,0000	57.7	32.67	25,03	74	-16.3	136.2	Vertical	PK.	Pass
3	5920.0000	47.72	32.67	15.05	54	-6.28	136.2	Vertical	AV	Pass
4	11083.5000	46.94	15.88	31.06	74	-27.06	337.7	Vertical	PK.	Pass
4	11083 5000	39.47	15.88	23,59	54	-14.53	337.7	Vertical	AV	Pass
5	13642.5000	49.76	18.09	31.67	74	-24.24	276.6	Vertical	PK	Pass
5	13642,5000	42.47	18.09	24.38	54	-11.53	276.6	Vertical	AV	Pass
6	17967.0000	53.4	23.7	29.7	74	-20.6	360.1	Vertical	PK.	Pass
6	17967.0000	46.97	23.7	23.27	54	-7 03	360.1	Vertical	AV.	Pass
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### Note:

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- WSC1 The emission levels of other frequencies are very lower than the limit and not show in test report. 1.
- 2. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Data of measurement shown "-"in the above table mean that the reading of emissions is attenuated more than 20 dB З. below the limits or the field strength is too small to be measured. 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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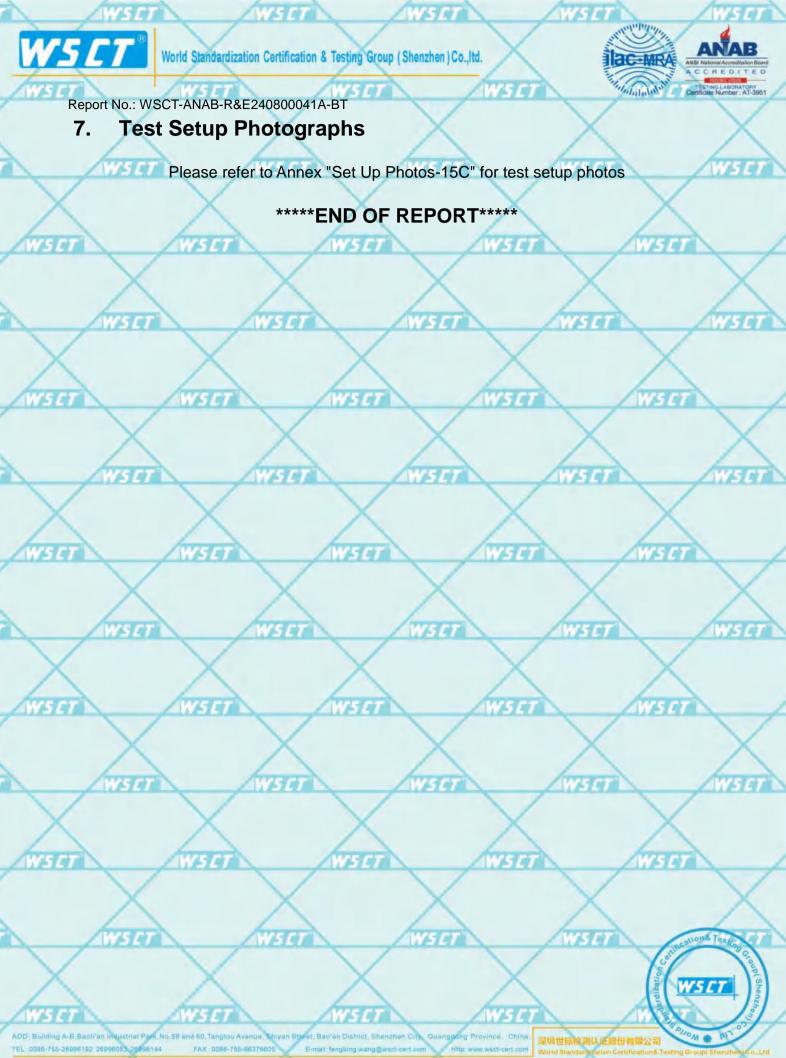
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EUT has been tested in unfolded states, and the report only reflects data in the unfolded state (worst-case scenario) 5.

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