

W5CT"

# **TEST REPORT**

WSCT

FCC ID: 2ADYY-BD04

**Product: TWS Earphone** 

Model No.: BD04

WSET

**Trade Mark: TECNO** 

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

Issued Date: 05 September 2024

WSCT"

Issued for:

**TECNO MOBILE LIMITED** 

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

Issued By:

WSET

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.

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W5 CT

W5C1

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W5 CT

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

#### 1. **Test Certification**

**Product:** TWS Earphone

WSET

Model No.:

**BD04** 

**Trade Mark:** 

**TECNO** 

**Applicant:** 

**TECNO MOBILE LIMITED** 

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

MEI STREET FOTAN NT HONGKONG

Manufacturer:

**TECNO MOBILE LIMITED** 

FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN W5/

MEI STREET FOTAN NT HONGKONG

Date of receipt:

15 August 2024

W5CT Date of Test:

16 August 2024 ~ 04 September 2024 / W5 [7]

**Applicable** Standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

KDB 558074 D01 DTS Meas Guidance v04

The above equipment has been tested by World Standardization Certification & 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:

WSCT

Checked By:

(Wang Xiang)

( Qin Shuiquan)

WSET

Approved By:

Date: O

(Li Huaibi)

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#### **Test Result Summary** 2.

			A	A
	Requirement	CFR 47 Section	Result	(WSCT)
X	Antenna requirement	§15.203/§15.247 (c)	PASS	
W5 CT	AC Power Line Conducted Emission	W5 ET §15,207 W5 ET	N/AW5 [T	
	Maximum conducted output power	§15.247 (b)(3) §2.1046 7	PASS W 5 C I	WSET
	6dB Emission Bandwidth	§15.247 (a)(2) §2.1049	PASS	
W5 CT	Power Spectral Density	§15.247 (e)	PASS	
	Band Edge	1§5.247(d) §2.1051, §2.1057	PASS WS ET	W5CT
X	Spurious Emission	§15.205/§15.209 §2.1053, §2.1057	PASS	
WSCT I	Note: W5	WS ET WS ET	WAST	

- 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.

W5 CT	WSET	WS CT	WSET	WS C1	
	W5 CT"	W5 CT°	WSET	W5 CT	W5 ET

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#### **EUT Description** 3.

,			
	Product Name:	TWS Earphone W5 CT W5 CT	N5 CT
$\times$	Model:	BD04	
	Trade Mark:	TECNO	
W5 C7	Software version:	1.0.0 W5 ET W5 ET	
	Hardware version:	V1	X
	Operation Frequency:	1M:2402MHz~2480MHz 2M:2402MHz~2480MHz	NS ET
$\times$	Channel Separation:	2MHz	
WSET	Number of Channel:	40 WSCT WSCT	
W-L	Modulation Technology:	GFSK	$ egthinspace{1.5em} olimits $
	Antenna Type:	Chip Antenna	
	Antenna Gain:	2.36dBi	W5 CT
WSET	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	W5CT
	Remark:	N/A.	
X	Note: 1 N/A stands for no ar	onlicable A	

Note: 1. N/A stands for no applicable.

2. Antenna gain provided by the customer.

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**Operation Frequency each of channel** 

	Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
/	0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
	1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
CT .		WELT		WISCT		W5 CT		WELT.
	8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
	9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz
	Remark: Channel 0, 19 & 39 have been tested.							

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WSE WSE W5C WS CT WS ET W5 E7 W5 E1 W5 E1 WS CT W5E1 W5 C1 W5 CI W5C W5C1 WS ET W5ET WS CT W5 CT ation& Test W5 C1

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#### **Genera Information** 4.

#### 4.1. Test environment and mode

	Operating Environment:	
	Temperature:	25.0 °C
3	Humidity: W54	56 % RH
	Atmospheric Pressure:	1010 mbar
	Test Mode:	Í
6	Engineering mode:  WSET*  WSET	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%) with Fully-charged battery.

The sample was placed (0.1m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

### **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.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
<u> </u>		/	1	/

#### 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, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

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#### Facilities and Accreditations 5.

#### 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 1/5 [ 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

	NS ET®	W5 ET°	W5 ET	WSET	W5 ET
WSCT	WSCI	W5E	7 WS		500
	WSET	WSET	WSET	WSCT	WSET
WSCT	WSET		$\langle \ \rangle$		SET
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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 %.

	No.	Item	ми	
W5CT°	1	Power Spectral Density W5	±3.2dB 5 5 7	
	2	Duty Cycle and Tx-Sequence and Tx-Gap	±1%	X
	3 <sub>W5</sub> [	Medium Utilisation Factor	±1.3%	W5C1
	4	Occupied Channel Bandwidth	±2.4%	
	5	Transmitter Unwanted Emission in the out-of Band	±1.3%	
AWS CT°	6	Transmitter Unwanted Emissions in the Spurious Domain	±2.5%	
	7	Receiver Spurious Emissions	±2.5%	X
	8 <sub>W5</sub> L	Conducted Emission Test W5 [7]	±3.2dB	WSCI
	9	RF power, conducted	±0.16dB	
	10	Spurious emissions, conducted	±0.21dB	
WS CT	11	All emissions, radiated(<1GHz)	±4.7dB	
	12	All emissions, radiated(>1GHz)	±4.7dB	X
	13/5/	Temperature WSCT WSCT WS	±0.5°C	WSCI
	14	Humidity	±2.0%	
				_

WSF	WSCT	WSCT	W5CT	WSCT
, FE	WE G	NE GA	1756	

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## **5.4.MEASUREMENT INSTRUMENTS**

	NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	Calibration Date	Calibration Due.	/5 C1
$\langle$	Test software	-	EZ-EMC	CON-03A	-	X-	
_	Test software	-	MTS8310	WELT	- /	VECT	
7	EMI Test Receiver	R&S	ESCI	100005	11/05/2023	11/04/2024	
	LISN	AFJ	LS16	16010222119	11/05/2023	11/04/2024	$\times$
	LISN(EUT)	Mestec	AN3016	04/10040	11/05/2023	11/04/2024	15 E T
	Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	11/05/2023	11/04/2024	
7	Coaxial cable	Megalon	LMR400	N/A	11/05/2023	11/04/2024	
	GPIB cable	Megalon	GPIB	N/A	11/05/2023	11/04/2024	
	Spectrum Analyzer	R&S	FSU	100114	11/05/2023	11/04/2024	$\times$
	Pre Amplifier	H.B.CT	HP8447E	2945A02715	11/05/2023	11/04/2024	V5 E1
	Pre-Amplifier	CDSI	PAP-1G18-38	-	11/05/2023	11/04/2024	
	Bi-log Antenna	SCHWARZBECK	VULB9168	01488	7/29/2024	7/28/2025	
<u></u>	9*6*6 Anechoic	<i>ET</i> -	VSET"	WSET	11/05/2023	11/04/2024	
	Horn Antenna	COMPLIANCE ENGINEERING	CE18000	<u>-</u>	11/05/2023	11/04/2024	X
	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	11/05/2023	11/04/2024	77-37-3
	Cable	TIME MICROWAVE	LMR-400	N-TYPE04	11/05/2023	11/04/2024	V 5 C 1
$\langle$	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	-	11/05/2023	11/04/2024	X
	Loop Antenna	EMCO	6502 W 5 A	00042960	11/05/2023	11/04/2024	V5 C1
1	Horn Antenna	SCHWARZBECK	BBHA 9170	1123	11/05/2023	11/04/2024	
1	Power meter	Anritsu	ML2487A	6K00003613	11/05/2023	11/04/2024	
	Power sensor	Anritsu	MX248XD	WSET	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

*W5 [T* ]

W5 CT

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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:

W5CT°

W5 C7

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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t, Bao'an District, Shenzhen City, Guangdong Province, China

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# 6.2. Conducted Emission

W5 E1

$\rightarrow$	6.2.1. Test Specification 5	T WSCT WSCT	W5CT <sup>®</sup>
X	Test Requirement:	FCC Part15 C Section 15.207	
W5CT	Test Method:	ANSI C63.10:2014 W5 [7] W5 [7]	
	Frequency Range:	150 kHz to 30 MHz	$\vee$
	Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto	West
WSET	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	WS ET*
		Reference Plane	
	WSET WSE	40cm LISN	W5 ET
WSET	Test Setup:	E.U.T Adapter  Test table/Insulation plane  Remark	$\overline{}$
	WSET WSE	E.U.T: Equipment Under Test	W5 CT
	Test Mode:	Charging + Transmitting Mode	
WSET	WSET	1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This	
	WSET WSE	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 50ohm/50uH	WSLT
X	Test Procedure:	coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).	W2/5/
AWS ET®	WSET	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	Testing G.
	Tool Nooull.		

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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 W5 [7] worst.

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.

	<b>Test data</b> Note: EUT powered	by battery not applica	ble W5[7]	WSET	WSCT
WS	CT WS	WSL	$\langle \ \ \ \rangle$	CT WS	
	WSET	W5 CT°	W5 ET°	WS ET*	WSET
WS	$\langle \hspace{0.1cm} \rangle$	$\langle \hspace{0.1cm} \rangle$	T WS	LT WS	r T
	WSET	W5ET*	WSET	WSCT	WSET
WS	$\langle \hspace{0.1cm} \rangle$	$\langle \hspace{0.1cm} \rangle$	$\langle \hspace{0.1cm} \rangle$	$\langle \hspace{0.1cm} \rangle$	
	WSET	WSET	WSET	WSCT	WSET
WS	$\langle \hspace{0.1cm} \rangle$	$\langle \hspace{0.2cm} \rangle$		$\langle \hspace{0.1cm} \rangle$	

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W5E7

# 6.3. Conducted Output Power

6.3.1. Test Specification
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W5CT

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W5 C7

\ /			
X	Test Requirement:	FCC Part15 C Section 15.247 (b)(3)	
W5 CT	Test Method:	KDB558074 W5 [T]	
	Limit:	30dBm	/
X	Test Setup:	Spectrum Analyzer EUT	CT
W5 CT	Test Mode:	Refer to item 4.1	
WSET	Test Procedure:	<ol> <li>The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04.</li> <li>Set spectrum analyzer as following:         <ul> <li>a) Set the RBW ≥ DTS bandwidth.</li> <li>b) Set VBW ≥ 3 x RBW.</li> <li>c) Set span ≥ 3 x RBW</li> <li>d) Sweep time = auto couple.</li> <li>e) Detector = peak.</li> <li>f) Trace mode = max hold.</li> <li>g) Allow trace to fully stabilize.</li> <li>h) Use peak marker function to determine the peak amplitude level.</li> </ul> </li> </ol>	<u></u>
X	Test Result:	PASS	

W5E1 W5 C1 W5 C1 W5C1 W5E7 W5 C1

W5 C1

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W5 E7

#### 6.3.2. Test Data

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W5 E1

	BLE 1N	Л	
Test channel	Maximum conducted output power (dBm)	Limit (dBm)	Result
Lowest	-0.38	30.00	PASS
Middle	0.52	30.00	PASS
Highest	0.94	30.00	PASS

		BLE 2N	Л	
	Test channel	Maximum conducted output power (dBm)	Limit (dBm)	Result
0	Lowest	-0.37 <sub>5 [T</sub>	30.00	PASS
	Middle	0.40	30.00	PASS
	Highest	-0.06	30.00	PASS

 $\mathsf{X}$   $\mathsf{X}$   $\mathsf{X}$   $\mathsf{X}$   $\mathsf{X}$ 

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

WSCI Test Graphs Power NVNT BLE 1M 2402MHz Ant1 SCPI Spectrum Analyzer 1 Swept SA + Input Z: 50 Ω Avg Type: Log-Power Avg|Hold: 100/100 Trig: Free Run KEYSIGHT Input: RF #Atten: 30 dB PNO: Fast 1 2 3 4 5 6 Corr CCorr Freq Ref: Int (S) Preamp: Off Gate: Off IF Gain: Low Align: Auto M ₩ ₩ ₩ ₩ Sig Track: Off 1 Spectrum Mkr1 2.401 728 GHz Ref LvI Offset 4.26 dB Ref Level 20.00 dBm WS ET Scale/Div 10 dB -0.38 dBm **▲**1 #Video BW 6.0 MHz Center 2.402000 GHz Span 10.00 MHz Sweep 1.33 ms (10001 pts) #Res BW 2.0 MHz Aug 16, 2024 .... Power NVNT BLE 1M 2440MHz Ant1 WS C SCPI Spectrum Analyzer 1 Swept SA + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) #Atten: 30 dB Preamp: Off PNO: Fast Gate: Off KEYSIGHT Input: RF Avg Type: Log-Power Avg|Hold: 100/100 1 2 3 4 5 6 M ₩ ₩ ₩ ₩ Align: Auto IF Gain: Low Sig Track: Off Trig: Free Run Mkr1 2.439 770 GHz 1 Spectrum Ref LvI Offset 4.28 dB Ref Level 20.00 dBm 0.52 dBm Scale/Div 10 dB **V**1 Center 2.440000 GHz #Res BW 2.0 MHz Span 10.00 MHz Sweep 1.33 ms (10001 pts) #Video BW 6.0 MHz

Aug 16, 2024 11:26:53 AM

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## 6.4. Emission Bandwidth

AMAC ATC	O
6.4.1. 1 est	Specification 5

W5CT°

W5ET

W5 CT

\ /			
X	Test Requirement:	FCC Part15 C Section 15.247 (a)(2)	
V5 CT	Test Method:	KDB558074 W5 CT W5 CT	
	Limit:	>500kHz	$\mathbf{X}$
	Test Setup:		WSET
		Spectrum Analyzer EUT	
V5 CT	Test Mode:	Refer to item 4.1	
VS ET	Test Procedure:	<ol> <li>The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04.</li> <li>Set to the maximum power setting and enable the EUT transmit continuously.</li> <li>Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.</li> <li>Measure and record the results in the test report.</li> </ol>	WSCT
	Test Result:	PASS	
	WSCT WSC	T WSET WSET	4W5CT
\			

WSET WSET WSET WSET

WSET WSET WSET WSET

WSET WSET

WSET WSET WSET

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W5 C1

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W5 E1

W5 CT

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6.4.2. Test data

BI	LE 1M		THE CT.	/
	Test channel	6dB Emission Bandwidth (kHz)		
X	rest chamile	BT LE mode	Limit Res	sult
W5CT	Lowest	501.9	>500k	SCT°
	Middle	500.1	>500k PAS	
	Highest	506.2	>500k	

WSCT° WSCT° BLE 2M\_T 6dB Emission Bandwidth (kHz) Test channel BT LE mode Limit Result 845.8 >500k Lowest W5C WSE 849.5 **PASS** Middle >500k 822.9 >500k Highest

Test plots as follows:

WSET®	W5 ET	W5 ET"	W5 CT°	W5CT"

W5CT <sup>®</sup>	W5ET*	W5ET	W5 CT	AW5 CT

WSCT WSCT WSCT WSCT WSCT
--------------------------

WS CT	W5CT	W5 ET	W5 CT	WSCT

					A
W5 ET	The state of the s	V5 CT"	WSCT	W5CT"	

W5CT°	W5 LT°	W5 ET	W5 CT°

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Power Spectral Density

## 6.4.3. Test Specification

	ior root opcomoduon		
Tes	st Requirement:	FCC Part15 C Section 15.247 (e)	W5CT <sup>®</sup>
Tes	st Method:	KDB558074	
Lim	nit:	The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.	<b>\</b>
Tes	st Setup:		WSCT
		Spectrum Analyzer EUT	
Tes	st Mode:	Refer to item 4.1	
Tes	st Procedure:	<ol> <li>The testing follows Measurement Procedure 10.2         Method PKPSD of FCC KDB Publication No.558074         D01 DTS Meas. Guidance v04</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>Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)</li> <li>Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.</li> <li>Measure and record the results in the test report.</li> </ol>	WSCT
Tes	st Result:	PASS	
. 50		, , , , , , , , , , , , , , , , , , ,	X

#### 6.4.4. Test Instruments

_							
7	RF Test Room						
	Equipment	Manufacturer	Model	Serial Number	Calibration Due		
	Spectrum Analyzer	R&S	FSU	200054	Sep. 27, 2018		
	RF cable (9kHz-26.5GHz)	тст	RE-06	N/A	Sep. 27, 2018		
,	Antenna Connector	W-TCT	RFC-015	N/A M	Sep. 27, 2018	& Testing	

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

WSET W

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W5 CT

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W5CT®

W5 C1

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Certificate

Certificate

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

## 6.4.5. Test data

	Test channel	Power Spectral D	ensity (dBm/3kl	Hz)
1	rest charmer	BLE 1M	Limit	Result
	Lowest	-19.08	8 dBm/3kHz	X
	Middle	-18.26	8 dBm/3kHz	PASS
	Highest	-17.82	8 dBm/3kHz	

	Test channel	Power Spectral D	ensity (dBm/3kl	Hz)
	rest channel	BLE 2M	Limit	Result
9	Lowest	-21.31	8 dBm/3kHz	
(8)	Middle	-20.53	8 dBm/3kHz	PASS
	Highest	-21.08	8 dBm/3kHz	

	WSLT	WSET	W5 CT	W5 CT	WSET
WSET	WSC	WS	W.	SET W	SET
	WSET	WSET	WSET	WSET	WSET
WSCT	WSC	$\langle \ \rangle$		$\times$	5.27
	X				X

WSCT	W5CT°	W5ET°	WS CT	W5CT"

WSET WSET WSET WSET

WSCT WSCT WSCT WSCT

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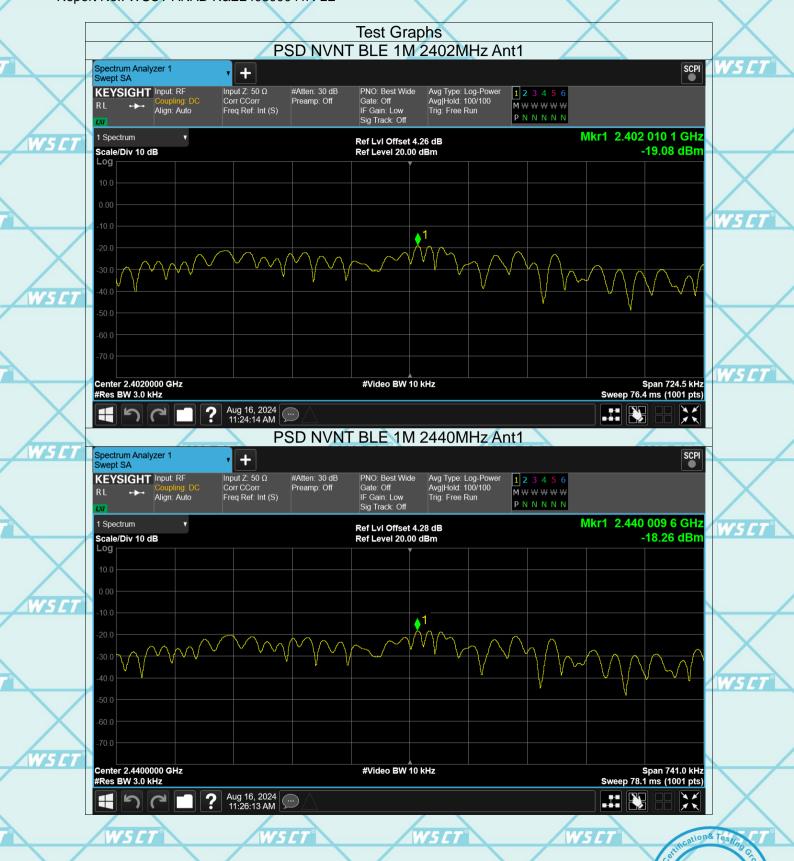
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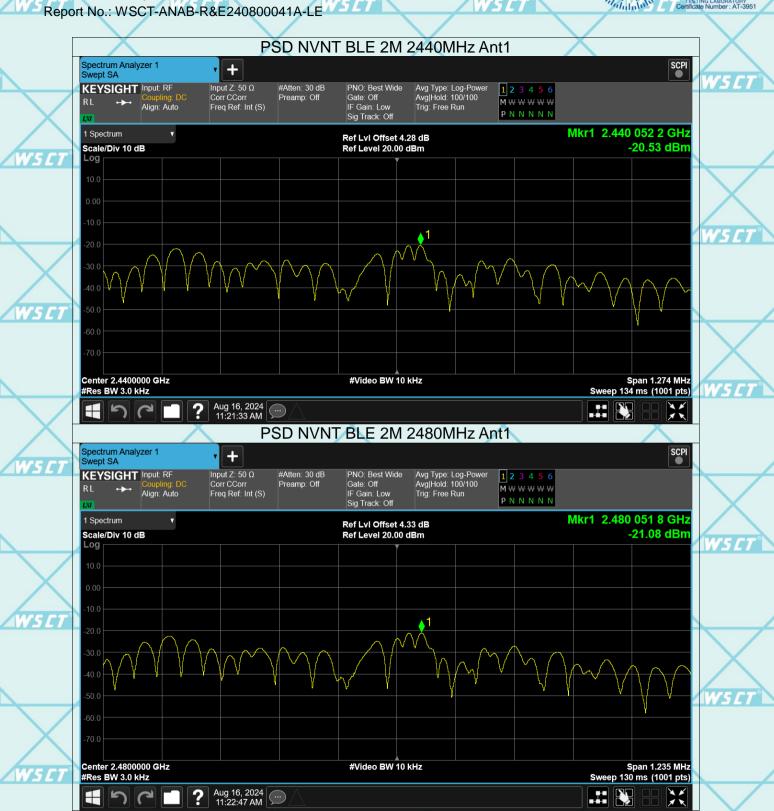
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# 6.5. Conducted Band Edge and Spurious Emission Measurement

	6.5.1. Test Specification	T WSET WSET	W5CT°
	Test Requirement:	FCC Part15 C Section 15.247 (d)	
	Test Method:	KDB558074	
WSET	Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).	WSET
WS ET	Test Setup:	Spectrum Analyzer EUT	WSET
	Test Mode:	Refer to item 4.1	
WS ET	Test Procedure:	<ol> <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=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).</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>	WSET
	Test Result:	PASS	X

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Test Data
Band Edge

Test Graphs





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W5CT® World Standardization Certification & Testing Group (Shenzhen)Co.,ltd. ILAC-MRA WSCI Report No.: WSCT-ANAB-R&E240800041A-LE Conducted RF Spurious Emission Test Graphs Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref Spectrum Analyzer 1 Swept SA SCPI + Input Z: 50 Ω Corr CCorr Freq Ref: Int (S) #Atten: 30 dB Preamp: Off PNO: Best Wide Gate: Off Avg Type: Log-Power Avg|Hold: 100/100 Trig: Free Run KEYSIGHT Input: RF M ₩ ₩ ₩ ₩ Align: Auto PNNNNN Mkr1 2.401 772 0 GHz Ref LvI Offset 4.26 dB Ref Level 20.00 dBm WS CI -0.48 dBm Scale/Div 10 dB Center 2.4020000 GHz #Res BW 100 kHz #Video BW 300 kHz Span 1.500 MHz Sweep 1.00 ms (1001 pts) Aug 16, 2024 .... 5 6 Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission WS C SCPI Spectrum Analyzer 1 + wept SA KEYSIGHT Input: RF Input Z: 50 Ω #Atten: 30 dB PNO: Fast Avg Type: Log-Power Avg|Hold: 10/10 1 2 3 4 5 6 Corr CCorr Freq Ref: Int (S) Preamp: Off \_\_\_ M ₩ ₩ ₩ ₩ ₩ Align: Auto IF Gain: Low Sig Track: Off Trig: Free Run Mkr1 2.401 7 GHz Ref Lvl Offset 4.26 dB -2.18 dBm Ref Level 20.00 dBm Start 30 MHz #Res BW 100 kHz Stop 26.50 GHz Sweep ~2.53 s (30001 pts) #Video BW 300 kHz 5 Marker Table Function Width Trace Scale Function Function Value Mode 2.401 7 GHz -2.18 dBm 26.137 4 GHz 4.800 8 GHz 7.392 2 GHz 9.733 0 GHz -47.94 dBm -51.51 dBm -52.54 dBm N N N N ation& Test \* Mor ADD: Building A-B, Baoli'an Industrial Park, No. 58 and 60, Tangtou Avenue 深圳世标检测认证股份有限公司

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Certificate Number: AT-3951



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WSCT

W5 CT

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# 6.6. Radiated Spurious Emission Measurement

	6.6.1. Test Specification 5		W5C		W5	ET°		W5 C
$\times$	Test Requirement:	FCC Part15	C Sectio	n 15.209	<u> </u>		X	
WSCT	Test Method:	ANSI C63.10	0:2014	WSC		-	VS CT	
ZV2151	Frequency Range:	9 kHz to 25 (	GHz	/ 11-13		/		
	Measurement Distance:	3 m	X					X
	Antenna Polarization:	Horizontal &	Vertical		W5			W5C
	Operation mode:	Refer to item	4.1					
		Frequency	Detector		VBW		mark	
W5CT"	W5 CT°	9kHz- 150kHz 150kHz-	Quasi-pea Quasi-pea		1kHz 30kHz		eak Value eak Value	
	Receiver Setup:	30MHz 30MHz-1GHz	Quasi-pea	ak 100KHz	300KHz	Quasi-pe	eak Value	$\times$
		Above 1GHz	Peak	1MHz	3MHz	Peak	Value	
	W5CT W5C	7.10070 10112	Peak	1MHz	10Hz	Average	e Value	W5C
$\times$	$\times$	Frequen	су	Field Stre (microvolts		Measur Distance		
		0.009-0.4		2400/F(I		30	00	
WS CT	WS ET*	0.490-1.7		24000/F(	KHz)	30		
		1.705-3 30-88		30 100		30		
	X	88-216		150		3		
	Limit:	216-96		200		3		/
	WSET WSET	Above 9	60 13 1	500	L W S	3		W5C
			Fie	eld Strength	Measure			
A CONTRACTOR OF THE PARTY OF TH	Wee ex	Frequency		rovolts/meter)	Distand (meter		Detector	
W5CT°	WSET			500	3		verage	
	$\times$	Above 1GHz	<sup>'</sup> \	5000	3		Peak	$\times$
		For radiated	emission	s below 30	MHz			
	WS CT WS CT				MVG	and all	7	AWS C
$\times$		Di	stance = 3m			Computer	」	
		Ţ	1		Pre -	-Amplifier		
AWSET"	Test setup: W5 FT	EUT	· ·	$\bigvee$			71	
	$\times$	LO1	□ Turn table					X
			1		<b>-</b> 4	Receiver		
	WSET* WSET		Grou	and Plane			cottication	& Testing G

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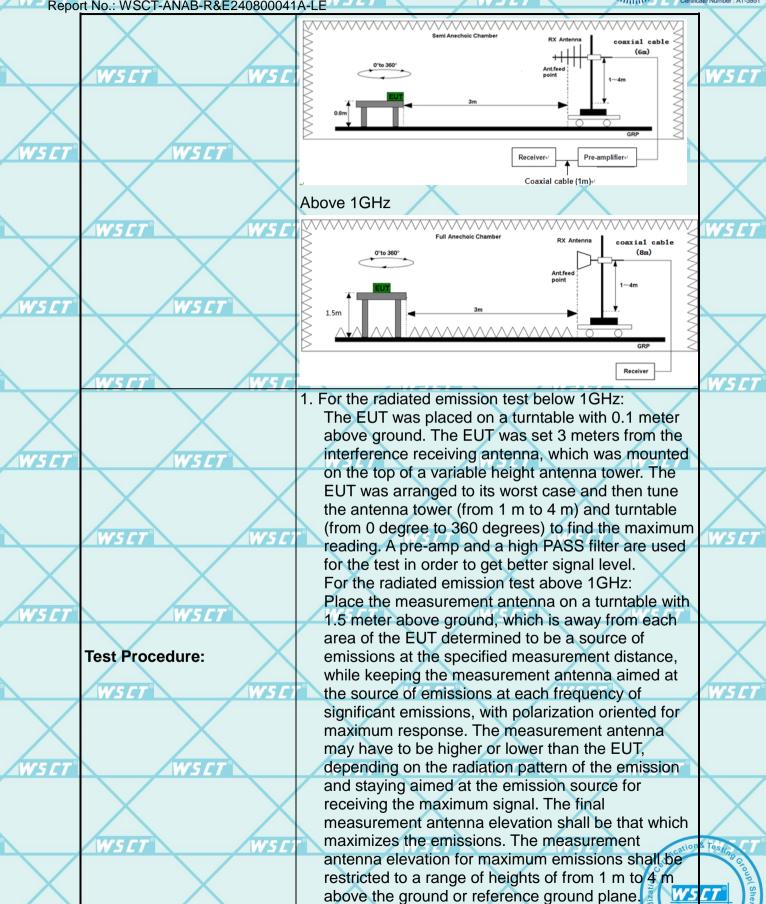
30MHz to 1GHz







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



Corrected Reading: Antenna Factor + Cable Loss +





Repo	rt No.: WSCT-ANAB-R&E240800041	A-LET-	ate Number: A1-3951
	X	Read Level - Preamp Factor = Level	$\times$
	WSET WSE	3. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB	W5LT
$\rightarrow$	WEIGHT WEIG	is it is a position in the pos	WEIGH
X	X	level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak	
	(NATIONAL PROPERTY OF THE PROP	detector and reported.	
AW5 CT	W5 CT"	4. Use the following spectrum analyzer settings:	
	$\times$	<ol><li>Span shall wide enough to fully capture the emission being measured;</li></ol>	X
	WSET WSE	(2) Set RBW=100 kHz for f < 1 GHz; VBW ≥RBW;	W5CT*
		Sweep = auto; Detector function = peak; Trace = max hold;	
		(3) Set RBW = 1 MHz, VBW= 3MHz for f 1 GHz for peak measurement.	
W5CT"	WS CT"	For average measurement: VBW = 10 Hz, when	
		duty cycle is no less than 98 percent. VBW ≥ 1/T,	
		when duty cycle is less than 98 percent where T is the minimum transmission duration over which the	
$\overline{}$	WS CT WS C	transmitter is on and is transmitting at its maximum	AWS ET
		power control level for the tested mode of operation.	
	Test mode:	Refer to section 4.1 for details	
W5 CT	Test results://5/77	PASS5CT WSCT WSCT	

- Note 1: The symbol of "-" in the table which means not application.
- Note 2: 5 For the test data above 1 GHz, According the ANSI C63.10-2013, where limits are specified for both average 15 LT and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
- Note 3: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.
  - Note 4: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and normal link mode is worst.

W5CT	W5CT°	W5ET°	W5 ET	W5 CT

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W5 CT

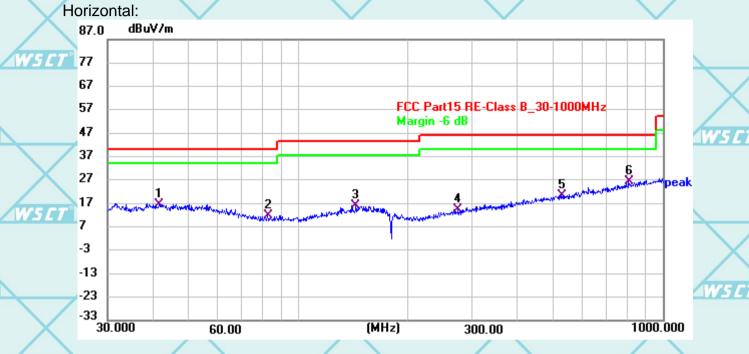
## 6.6.2. Test Data

W5 C1

Please refer to following diagram for individual

**Below 1GHz** 

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WS C1

Ĩ	No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
	1	41.6765	35.58	-18.90	16.68	40.00	-23.32	QP
4	2	82.6482	35.68	-24.03	11.65	40.00	-28.35	QP
	3	144.2083	35.95	-19.88	16.07	43.50	-27.43	QP
	4	274.5547	35.66	-21.21	14.45	46.00	-31.55	QP
1	5	527.7829	35.18	-14.93	20.25	46.00	-25.75	QP
	6 *	807.4291	37.03	-10.77	26.26	46.00	-19.74	QP

W5E

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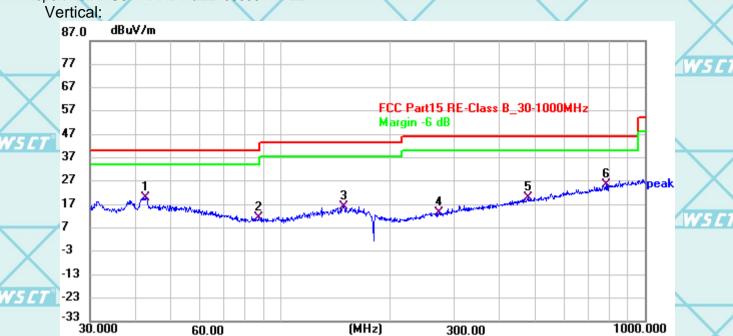
ANSI National Accreditation Board

A C C R E D I T E D

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

(W5 CT)



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1 *	42.6934	38.78	-18.85	19.93	40.00	-20.07	QP	
2	87.6478	35.11	-23.96	11.15	40.00	-28.85	QP	
3	149.6824	35.48	-19.50	15.98	43.50	-27.52	QP	
4	272.9947	34.91	-21.28	13.63	46.00	-32.37	QP	
5	477.5879	35.74	-15.92	19.82	46.00	-26.18	QP	
6	782.6883	36.57	-11.23	25.34	46.00	-20.66	QP	Г

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Note1:

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 (dBµV) = Limit stated in standard

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

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WS CT

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WSCT







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

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#### **Above 1GHz**

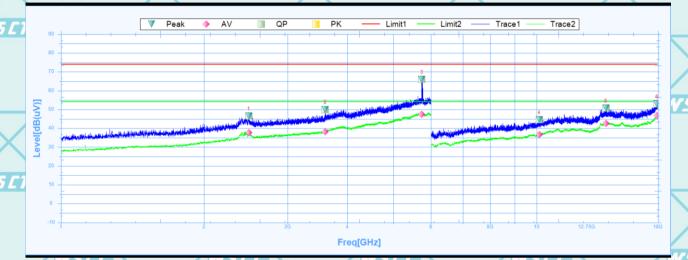
Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious above 18G is noise only, do not show on the report.

Note 3 BLE 1M and 2M both tested the report and only recorded the worst-case scenario 1M:

Low channel: 2402MHz

Horizontal:



Susputed Data List Reading **Factor** Level Limit Margin NO. **Polarity** Trace Verdict [dB(uV)] [MHz] [dB(uV)] [dB] [dB] [dB] [°] 2482.5000 46.59 27.54 19.05 74 -27.41 204.9 Horizontal PΚ Pass 27.54 54 2482.5000 37.62 10.08 -16.38 204.9 ΑV Pass Horizontal 3597.5000 49.97 28.73 21.24 74 -24.03 117.7 Horizontal Pass 2 54 -15.79 3597.5000 38.21 28.73 9.48 117.7 Horizontal ΑV Pass 3 5740.6250 66.05 32.38 74 -7.95 PK Pass 33.67 234.8 Horizontal 3 5740.6250 47.44 32.38 15.06 54 -6.56234.8 Horizontal ΑV Pass 4 10129.5000 74 -29.5 PΚ 44.5 12.75 31.75 0 Horizontal Pass 4 10129.5000 36.72 12.75 23.97 54 -17.28 0 Horizontal ΑV Pass 13989.0000 50.65 19.09 31.56 74 -23.35 134.8 Horizontal PK Pass 5 13989.0000 42.57 19.09 23.48 54 -11.43 134.8 Horizontal ΑV Pass Pass 6 17922.0000 52.93 23.4 29.53 74 -21.07 171.9 Horizontal PK 17922.0000 46.73 23.4 23.33 54 -7.27 171.9 Horizontal ΑV Pass

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W5 CT



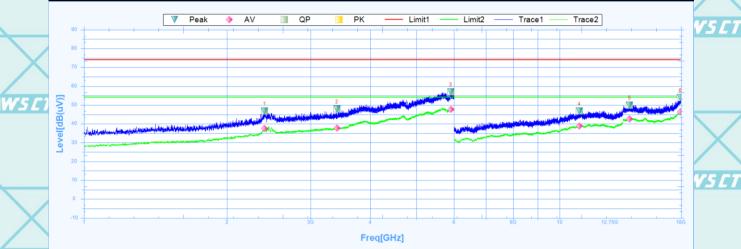


Report No.: WSCT-ANAB-R&E240800041A-LE

W5 CT

### Vertical:

W5 L



W5 CT°

	Suspu	ited Data Lis	st									
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict	/
	1	2397.5000	46.75	27.25	19.5	74	-27.25	151.1	Vertical	PK	Pass	V
,	1	2397.5000	37.56	27.25	10.31	54	-16.44	151.1	Vertical	AV	Pass	
	2	3404.3750	47.95	28.44	19.51	74	-26.05	1.4	Vertical	PK	Pass	
1	2	3404.3750	37.65	28.44	9.21	54	-16.35	1.4	Vertical	AV	Pass	
Ţ	3	5906.8750	56.86	32.65	24.21	74	-17.14	194.2	Vertical	PK	Pass	
L	3	5906.8750	47.64	32.65	14.99	54	-6.36	194.2	Vertical	AV	Pass	
	4	11005.5000	46.87	15.64	31.23	74	-27.13	146.8	Vertical	PK	Pass	
	4	11005.5000	38.73	15.64	23.09	54	-15.27	146.8	Vertical	AV	Pass	
	5	14038.5000	49.87	19.09	30.78	74	-24.13	262.7	Vertical	PK	Pass	
	5	14038.5000	42.59	19.09	23.5	54	-11.41	262.7	Vertical	AV	Pass	V
	6	17956.5000	53.81	23.62	30.19	74	-20.19	64.2	Vertical	PK	Pass	
	6	17956.5000	46.4	23.62	22.78	54	-7.6	64.2	Vertical	AV	Pass	

W5 ET W5E1 W5 C W5 C1

W5 C7 W5 C1 W5 C1

W5E

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W5 C1





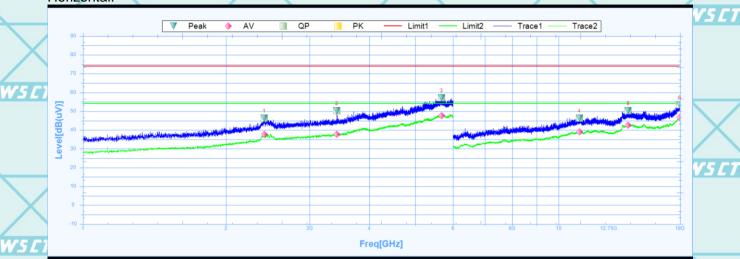


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Middle channel: 2440MHz

Horizontal:



	Suspu	ited Data Lis	st								
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
,	1	2405.6250	46.37	27.28	19.09	74	-27.63	41.2	Horizontal	PK	Pass
	1	2405.6250	37.72	27.28	10.44	54	-16.28	41.2	Horizontal	AV	Pass
1	2	3419.3750	50.33	28.45	21.88	74	-23.67	232.5	Horizontal	PK	Pass
7	2	3419.3750	37.72	28.45	9.27	54	-16.28	232.5	Horizontal	AV	Pass
7	3	5679.3750	57.07	32.29	24.78	74	-16.93	334.1	Horizontal	PK	Pass
	3	5679.3750	47.64	32.29	15.35	54	-6.36	334.1	Horizontal	AV	Pass
	4	11065.5000	46.27	15.83	30.44	74	-27.73	358.7	Horizontal	PK	Pass
	4	11065.5000	39.16	15.83	23.33	54	-14.84	358.7	Horizontal	AV	Pass
	5	14013.0000	50.36	19.11	31.25	74	-23.64	299.8	Horizontal	PK	Pass
	5	14013.0000	42.6	19.11	23.49	54	-11.4	299.8	Horizontal	AV	Pass
	6	17997.0000	53.36	23.91	29.45	74	-20.64	359.1	Horizontal	PK	Pass
1	6	17997.0000	46.77	23.91	22.86	54	-7.23	359.1	Horizontal	AV	Pass

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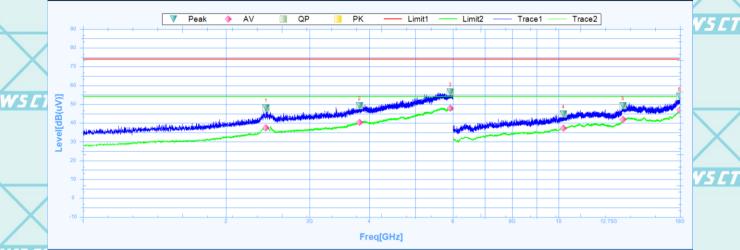




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W5CT

## Vertical:



	Suspu	ited Data Lis	st									
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict	
	1	2426.2500	48.07	27.35	20.72	74	-25.93	189.4	Vertical	PK	Pass	4
	1	2426.2500	37.52	27.35	10.17	54	-16.48	189.4	Vertical	AV	Pass	
	2	3816.8750	49.19	29.26	19.93	74	-24.81	348.2	Vertical	PK	Pass	
1	2	3816.8750	40.34	29.26	11.08	54	-13.66	348.2	Vertical	AV	Pass	
7	3	5925.0000	56.51	32.68	23.83	74	-17.49	301.8	Vertical	PK	Pass	
	3	5925.0000	47.83	32.68	15.15	54	-6.17	301.8	Vertical	AV	Pass	
	4	10237.5000	44.71	13.09	31.62	74	-29.29	144.3	Vertical	PK	Pass	
	4	10237.5000	37.33	13.09	24.24	54	-16.67	144.3	Vertical	AV	Pass	
	5	13659.0000	49.12	18.14	30.98	74	-24.88	219.7	Vertical	PK	Pass	
	5	13659.0000	42.01	18.14	23.87	54	-11.99	219.7	Vertical	AV	Pass	4
/	6	17979.0000	53.99	23.78	30.21	74	-20.01	354.2	Vertical	PK	Pass	
	6	17979.0000	46.99	23.78	23.21	54	-7.01	354.2	Vertical	AV	Pass	

W5CT°	W5ET"	W5CT°	W5 CT	WSCT 1

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W5CT°	W5CT°	WSET	W5CT°

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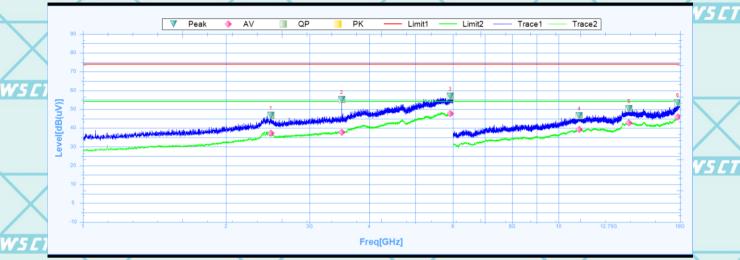


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W5CT"

High channel: 2480MHz

Horizontal:



Susputed Data List											
	NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict
	1	2484.3750	46.76	27.55	19.21	74	-27.24	360	Horizontal	PK	Pass
	1	2484.3750	37.23	27.55	9.68	54	-16.77	360	Horizontal	AV	Pass
	2	3503.1250	55.2	28.51	26.69	74	-18.8	298.1	Horizontal	PK	Pass
¥	2	3503.1250	37.63	28.51	9.12	54	-16.37	298.1	Horizontal	AV	Pass
	3	5924.3750	56.96	32.68	24.28	74	-17.04	188.2	Horizontal	PK	Pass
	3	5924.3750	47.64	32.68	14.96	54	-6.36	188.2	Horizontal	AV	Pass
	4	11061.0000	46.56	15.82	30.74	74	-27.44	194.6	Horizontal	PK	Pass
	4	11061.0000	39.18	15.82	23.36	54	-14.82	194.6	Horizontal	AV	Pass
	5	14065.5000	50.31	19.06	31.25	74	-23.69	211.3	Horizontal	PK	Pass
	5	14065.5000	42.84	19.06	23.78	54	-11.16	211.3	Horizontal	AV	Pass
	6	17814.0000	53.52	22.71	30.81	74	-20.48	328.5	Horizontal	PK	Pass
-	6	17814.0000	45.88	22.71	23.17	54	-8.12	328.5	Horizontal	AV	Pass

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W5 CT°	W5 ET	W5ET°	W5 ET°

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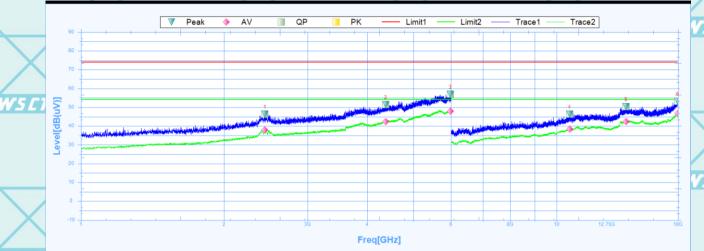




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WSET

#### Vertical:



WSCI WSLI WSLI WSLI WSLI

Suspu	Susputed Data List										
NO.	Freq. [MHz]	Reading [dB(uV)]	Factor [dB]	Level [dB(uV)]	Limit [dB]	Margin [dB]	Deg [°]	Polarity	Trace	Verdict	
1	2436.8750	46.38	27.39	18.99	74	-27.62	0.6	Vertical	PK	Pass	
1	2436.8750	37.87	27.39	10.48	54	-16.13	0.6	Vertical	AV	Pass	
2	4375.6250	51.5	30.38	21.12	74	-22.5	360.1	Vertical	PK	Pass	
2	4375.6250	42.3	30.38	11.92	54	-11.7	360.1	Vertical	AV	Pass	
3	5983.1250	56.94	32.77	24.17	74	-17.06	12.1	Vertical	PK	Pass	
3	5983.1250	47.81	32.77	15.04	54	-6.19	12.1	Vertical	AV	Pass	
4	10657.5000	46.41	14.53	31.88	74	-27.59	359.6	Vertical	PK	Pass	
4	10657.5000	38.4	14.53	23.87	54	-15.6	359.6	Vertical	AV	Pass	
5	14002.5000	50.22	19.12	31.1	74	-23.78	40.3	Vertical	PK	Pass	
5	14002.5000	42.36	19.12	23.24	54	-11.64	40.3	Vertical	AV	Pass	
6	17991.0000	53.22	23.87	29.35	74	-20.78	303.4	Vertical	PK	Pass	
6	17991.0000	46.85	23.87	22.98	54	-7.15	303.4	Vertical	AV	Pass	

#### Note:

- 1. All emissions not reported were more than 20dB below the specified limit or in the noise floor.
  - 2. Emission Level= Reading Level+Probe Factor +Cable Loss.
  - 3. Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
  - 4. EUT has been tested in unfolded states, and the report only reflects data in the unfolded state (worst-case scenario)

	WSET	W5 CT°	W5 C	7	W5 CT	W5 CT
X			X	X		
W5CT	\\\	V5 CT	WSET	WSET	W5 CT	
		X	X		X	X

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