

ETSI EN 301 908-1 & ETSI EN 301 908-2

Radio Test Report

Project No. : 2207C142
Equipment : AX1800 Wi-Fi 6 5G NR Router
Brand Name : Tenda
Test Model : 5G03
Series Model : N/A
Applicant : SHENZHEN TENDA TECHNOLOGY CO.,LTD.
Address : 6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
Manufacturer : SHENZHEN TENDA TECHNOLOGY CO.,LTD.
Address : 6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
Date of Receipt : Jul. 29, 2022
Date of Test : Aug. 02, 2022 ~ Aug. 31, 2022
Issued Date : Sep. 14, 2022
Report Version : R01
Test Sample : Engineering Sample No.: DG2022072964
Standard(s) : ETSI EN 301 908-1 V15.1.1 (2021-09)
ETSI EN 301 908-2 V13.1.1 (2020-06)
ETSI TS 134 121-1 V12.1.0 (2015-10)

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Edward Li

Prepared by : Edward Li

Steven Lu

Approved by : Steven Lu



TESTING CERT #5123.02

BTL Inc.

No. 3 Jinshagang 1st Rd. Shixia, Dalang Town Dongguan City, Guangdong 523792 People's Republic of China.

Tel: +86-769-8318-3000 Web: www.newbtl.com Service mail: btl_qa@newbtl.com

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

Table of Contents	Page
REPORT ISSUED HISTORY	4
1 . TEST SUMMARY	5
2 . TEST ENVIRONMENT AND DESCRIPTION	7
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
3 . GENERAL INFORMATION	8
3.1 GENERAL DESCRIPTION OF EUT	8
3.2 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	9
3.3 DESCRIPTION OF SUPPORT UNITS	9
4 . RADIATED EMISSIONS (UE)	10
4.1 TEST REQUIREMENTS	10
4.2 CONFORMANCE	10
4.3 TEST CONDITION	11
4.4 TEST PROCEDURE	12
4.5 RADIATED EMISSIONS TRAFFIC MODE MEASUREMENT (UE)	13
4.6 RADIATED EMISSIONS IDLE MODE MEASUREMENT (UE)	13
5 . MEASUREMENT INSTRUMENTS LIST	14
6 . EUT TEST PHOTO	15

REPORT ISSUED HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-ETSP-7-2207C142	R00	Original Report.	Sep. 09, 2022	Invalid
BTL-ETSP-7-2207C142	R01	Updated the antenna gain.	Sep. 14, 2022	Valid

1. TEST SUMMARY

ETSI EN 301 908-1 V15.1.1 (2021-09) & ETSI EN 301 908-2 V13.1.1 (2020-06) (See Note 2)			
Subclause	Description of Test	Verdict	Note
4.2.2	Transmitter Maximum Output Power	Pass	(1)
4.2.3	Transmitter Spectrum Emission Mask	Pass	(1)
4.2.4	Transmitter Spurious Emissions	Pass	(1)
4.2.5	Transmitter Minimum Output Power	Pass	(1)
4.2.6	Receiver Adjacent Channel Selectivity (ACS)	Pass	(1)
4.2.7	Receiver Blocking Characteristics	Pass	(1)
4.2.8	Receiver Spurious Response	Pass	(1)
4.2.9	Receiver Intermodulation Characteristics	Pass	(1)
4.2.10	Receiver Spurious Emissions	Pass	(1)
4.2.11	Out-Of-Synchronization Handling Of Output Power	Pass	(1)
4.2.12	Transmitter Adjacent Channel Leakage Power Ratio(ACLR)	Pass	(1)
4.2.13	Receiver Reference Sensitivity Level	Pass	(1)
4.2.14	Receiver Total Radiated Sensitivity (TRS)	N/A	3
4.2.15	Total Radiated Power (TRP)	N/A	3
4.2.2	Radiated Emissions(UE)	Pass	-
4.2.4	Control And Monitoring Functions (UE)	Pass	(1)

Note:

1. EUT Orthogonal Axis:

“X” - denotes Laid on Table; “Y” - denotes Vertical Stand; “Z” - denotes Side Stand.

2. Normative References:

ETSI TS 134 108 V12.1.0 (2015-10)

ETSI TS 134 109 V12.0.0 (2014-09)

ETSI TS 125 101 V11.11.0 (2015-10)

ETSI TS 125 214 V11.12.0 (2015-07)

ETSI TS 145 004 V11.0.0 (2012-10)

Note: The standards in note 2 are the reference standards for the standards shown on page 1, and all of them are not listed in the A2LA scope.

3. The present requirement applies to handheld phones/DUTs that are narrower than 72 mm.

4. The RF module of this 5G03 has been tested and certified. Please refer to the module report as listed in the below table for the test results of the RF module.

RF Module Model	Module Function	Report Number	Standard
RG500L-EU	WCDMA	SHR/2021/A001106	ETSI EN 301 908-1 V13.1.1 ETSI EN 301 908-2 V13.1.1 ETSI TS 134 121-1 V12.1.0
	LTE	SHR/2021/A001107	ETSI EN 301 908-1 V13.1.1 ETSI EN 301 908-13 V13.1.1 ETSI TS 136 521-1 V15.2.0
	5G NR	SHR/2021/A001108	{Draft}ETSI EN 301 908-25 V15.1.1 _15.0.3 (2020-10) ETSI TS 138 521-1 V16.6.0 (2020-12) ETSI TS 138 521-3 V16.6.0 (2020-12)

Based on the RF module the antennas for this 5G03 were updated as below table:

Ant. Model Name	Type	Antenna Brand	Antenna Gain(dBi)	Note
N/A	PCB	N/A	1.50	Band V

- (1) Thus, only the radiated spurious emissions was evaluated and recorded in this report. For the test results of all other test items please refer to above module test report.
- (2) The antenna gain is provided by the manufacturer.

2. TEST ENVIRONMENT AND DESCRIPTION

2.1 TEST FACILITY

The test facilities used to collect the test data of radiated in this report is **CB12** at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town, Dongguan City, Guangdong, People's Republic of China.

2.2 MEASUREMENT UNCERTAINTY

Measurement Uncertainty for a Level of Confidence of 95 %, $U=2xUc(y)$

Parameter	Uncertainty
Spurious Emissions, Radiated $30 \text{ MHz} \leq f \leq 1000 \text{ MHz}$	$\pm 3.58 \text{ dB}$
Spurious Emissions, Radiated $1 \text{ GHz} < f \leq 18 \text{ GHz}$	$\pm 3.78 \text{ dB}$

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	AX1800 Wi-Fi 6 5G NR Router		
Brand Name	Tenda		
Test Model	5G03		
Series Mode	N/A		
Model Difference(s)	N/A		
RF Module Model	RG500L-EU		
Power Source	DC Voltage supplied from AC adapter. 1# Model: BN026-A24012E (EU) 2# Model: BN026-A24012B (UK) Only differ in plug.		
Power Rating	I/P: 100-240V~ 50/60Hz 0.7A O/P: 12.0V  2.0A 24W		
Operation Frequency Band	TX: 824 MHz ~ 849 MHz, RX: 869 MHz ~ 894 MHz		
Modulation Type	UL: QPSK DL: QPSK; 16QAM		
Power Class	3		
IMEI NO.	Radiated	869263050070535	

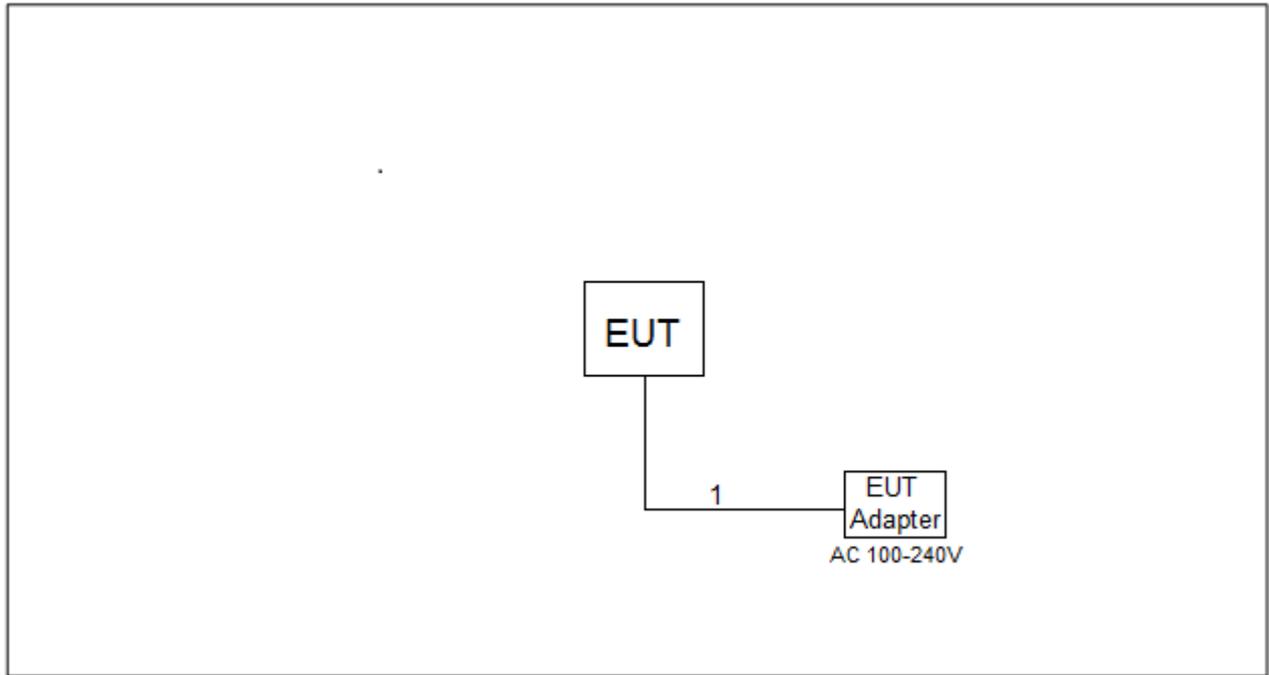
Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

Bands	Sub-test	Channel	Frequency (MHz)	
WCDMA Band V	---	4133	Low	826.6
		4175	Mid	835.0
		4232	High	846.4

3.2 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.3 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Brand	Model No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m

4. RADIATED EMISSIONS (UE)

4.1 TEST REQUIREMENTS

The frequency boundary and reference bandwidths for the detailed transitions of the limits between the requirements for out-of-band emissions and spurious emissions are based on Recommendations ITU-R SM.329-12 [1] and SM.1539-1 [i.6].

The requirements shown in table 4.2.2.2-1 are only applicable for frequencies in the spurious domain.

Table 4.2.2.2-1: Radiated spurious emissions requirements (UE)

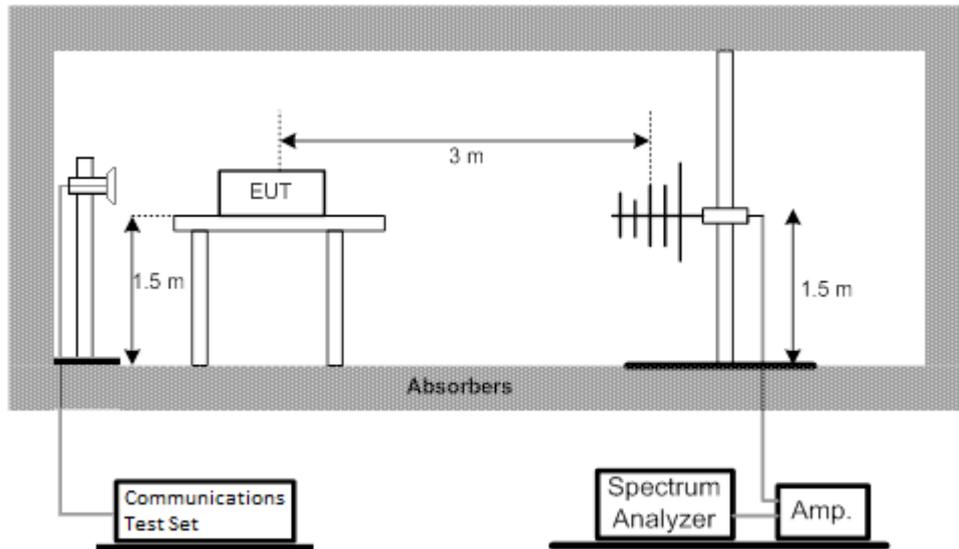
Frequency	Minimum requirement (e.r.p.)/ reference bandwidth idle mode	Minimum requirement (e.r.p.)/ reference bandwidth traffic mode	Applicability
$30 \text{ MHz} \leq f < 1 \text{ 000 MHz}$	-57 dBm/100 kHz	-36 dBm/100 kHz	All
$1 \text{ GHz} \leq f < 12,75 \text{ GHz}$	-47 dBm/1 MHz	-30 dBm/1 MHz	All
$12,75 \text{ GHz} \leq f < 5^{\text{th}}$ harmonic of the upper frequency edge of the Uplink operating band in GHz	-47 dBm/1 MHz	-30 dBm/1 MHz	All (note 3)
$12,75 \text{ GHz} < f < 26 \text{ GHz}$	-47 dBm/1 MHz	-30 dBm/1 MHz	All (note 4)
$f_c - 2,5 \times 5 \text{ MHz} < f < f_c + 2,5 \times 5 \text{ MHz}$ (note 1 and note 2)	Not defined	Not defined	UTRA FDD, UTRA TDD, 3,84 Mcps option, cdma2000, spreading rate 3
$f_c - 2,5 \times \text{BW}_{\text{Channel}} \text{ MHz} < f < f_c + 2,5 \times \text{BW}_{\text{Channel}} \text{ MHz}$ (note 1 and note 2)	Not defined	Not defined	E-UTRA FDD, E-UTRA TDD, Mobile WiMAX™
$f_c - (1,5 \times \text{BW}_{\text{Channel}} + 5) \text{ MHz} < f < f_c + (1,5 \times \text{BW}_{\text{Channel}} + 5) \text{ MHz}$ (note 1)	Not defined	Not defined	NR operating in FR1
$f_c - 2,5 \times 10 \text{ MHz} < f < f_c + 2,5 \times 10 \text{ MHz}$ (note 1 and note 2)	Not defined	Not defined	UTRA TDD, 7,68 Mcps option
$f_c - 4 \text{ MHz} < f < f_c + 4 \text{ MHz}$ (note 1 and note 2)	Not defined	Not defined	UTRA TDD, 1,28 Mcps option cdma2000, spreading rate 1
NOTE 1: f_c is the UE transmit centre frequency.			
NOTE 2: This frequency range is not in the spurious domain, no requirement is then defined for this frequency range.			
NOTE 3: Applies for Band that the upper frequency edge of the Uplink Band more than 2,69 GHz.			
NOTE 4: Applies for Band that the upper frequency edge of the Uplink Band more than 5,2 GHz.			

4.2 CONFORMANCE

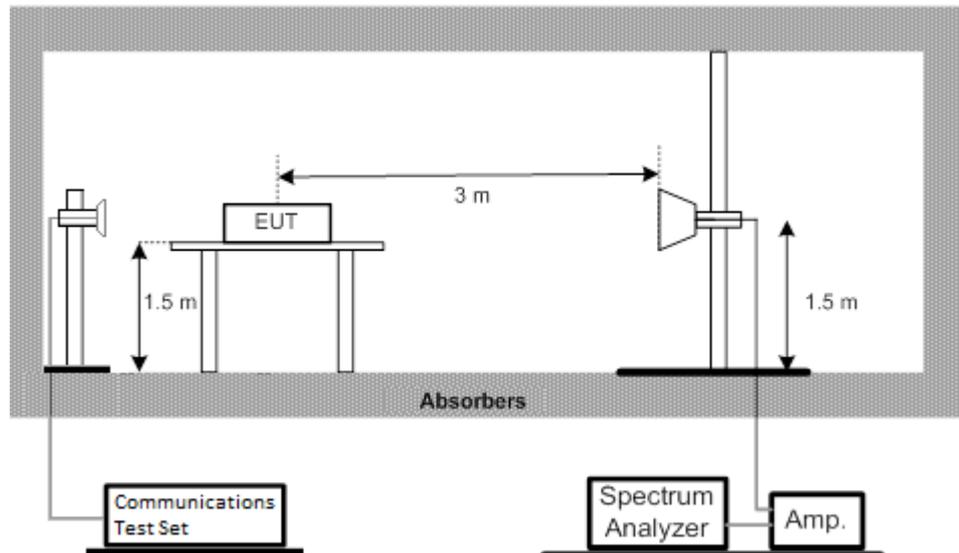
Conformance tests described in EN 301 908-1 clause 5.3.1 shall be carried out.

4.3 TEST CONDITION

Radiated Emission Test Set-Up Frequency 30 MHz ~ 1 GHz



Radiated Emission Test Set-Up Frequency Above 1 GHz



4.4 TEST PROCEDURE

Step 1:

The measurement is carried out in the fully anechoic chamber. EUT was placed on a 1.50 meter high nonconductive table at a 3 meter test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The height of receiving antenna is 1.50 m and varies in certain range to find the maximum power value. Connect the EUT to the BTS simulator via the air interface. The measurement is carried out using a spectrum analyzer or receiver. Then the antenna height and turn table rotation is adjusted till the maximum power value is founded on spectrum analyzer or receiver. A filter is necessary in the band near to the carrier frequency. A filter is needed to avoid the distortion of the testing equipment in the band above the carrier frequency.

Step 2:

A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT.

The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

Calculation procedure:

The data of cable loss, antenna gain and air loss has been calibrated in full testing frequency range before the testing.

The power of the Radiated Spurious Emissions is calculated by adding the cable loss, antenna gain and air loss. The basic equation with a sample calculation is as followed:

$$P=PR+LC+LA-G$$

Where

P: Power of the Radiated Spurious Emissions (dBm)

PR: reading of the receiver (dBm)

LC: Cable Lose and power amilifer gain and filter cable loss (dB)

LA: Air loss (dB)

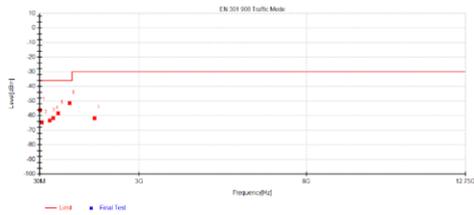
G: Antenna Gain (dBi)

4.5 RADIATED EMISSIONS TRAFFIC MODE MEASUREMENT (UE)

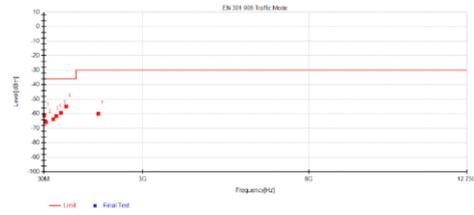
Test Mode : WCDMA_Traffic Mode_Mid CH_Band V

Test Mode : WCDMA_Traffic Mode_Mid CH_Band V

Vertical



Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Factor [dB]	Level [dBm]	Limit [dBm]	Margin [dB]	Detector	Polarity
1	44.4530	-67.20	10.97	-56.23	-36.00	20.23	RMS	Vertical
2	99.0640	-73.09	8.41	-64.68	-36.00	28.68	RMS	Vertical
3	331.2820	-71.19	7.89	-63.30	-36.00	27.30	RMS	Vertical
4	437.2060	-71.57	9.85	-61.72	-36.00	25.72	RMS	Vertical
5	586.1010	-71.72	13.31	-58.41	-36.00	22.41	RMS	Vertical
6	927.1530	-70.72	19.27	-51.45	-36.00	15.45	RMS	Vertical
7	1670.925	-57.96	-3.85	-61.81	-30.00	31.81	RMS	Vertical

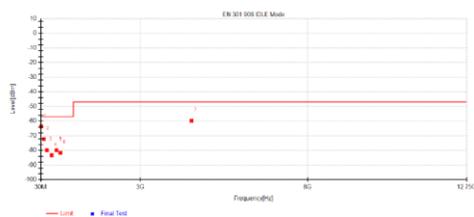
NO.	Freq. [MHz]	Reading [dBm]	Factor [dB]	Level [dBm]	Limit [dBm]	Margin [dB]	Detector	Polarity
1	44.4530	-71.07	9.92	-61.15	-36.00	25.15	RMS	Horizontal
2	99.0640	-72.71	7.03	-65.68	-36.00	29.68	RMS	Horizontal
3	318.2840	-70.93	7.21	-63.72	-36.00	27.72	RMS	Horizontal
4	412.3740	-71.23	9.64	-61.59	-36.00	25.59	RMS	Horizontal
5	550.3080	-71.77	12.37	-59.40	-36.00	23.40	RMS	Horizontal
6	707.3510	-70.56	15.63	-54.93	-36.00	18.93	RMS	Horizontal
7	1670.925	-55.84	-4.14	-59.98	-30.00	29.98	RMS	Horizontal

4.6 RADIATED EMISSIONS IDLE MODE MEASUREMENT (UE)

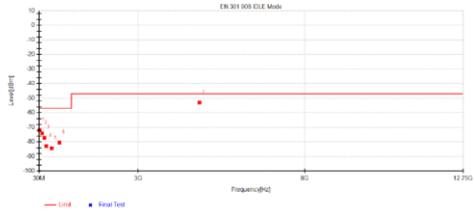
Test Mode : WCDMA_Idle Mode_Mid CH_Band V

Test Mode : WCDMA_Idle Mode_Mid CH_Band V

Vertical



Horizontal



NO.	Freq. [MHz]	Reading [dBm]	Factor [dB]	Level [dBm]	Limit [dBm]	Margin [dB]	Detector	Polarity
1	43.0950	-64.58	1.05	-63.53	-57.00	6.53	RMS	Vertical
2	120.0160	-66.76	-5.54	-72.30	-57.00	15.30	RMS	Vertical
3	212.1660	-74.06	-5.72	-79.78	-57.00	22.78	RMS	Vertical
4	354.0770	-82.04	-1.20	-83.24	-57.00	26.24	RMS	Vertical
5	499.9650	-82.35	2.57	-79.78	-57.00	22.78	RMS	Vertical
6	616.3650	-86.28	4.67	-81.61	-57.00	24.61	RMS	Vertical
7	4530.875	-57.82	-1.92	-59.74	-47.00	12.74	RMS	Vertical

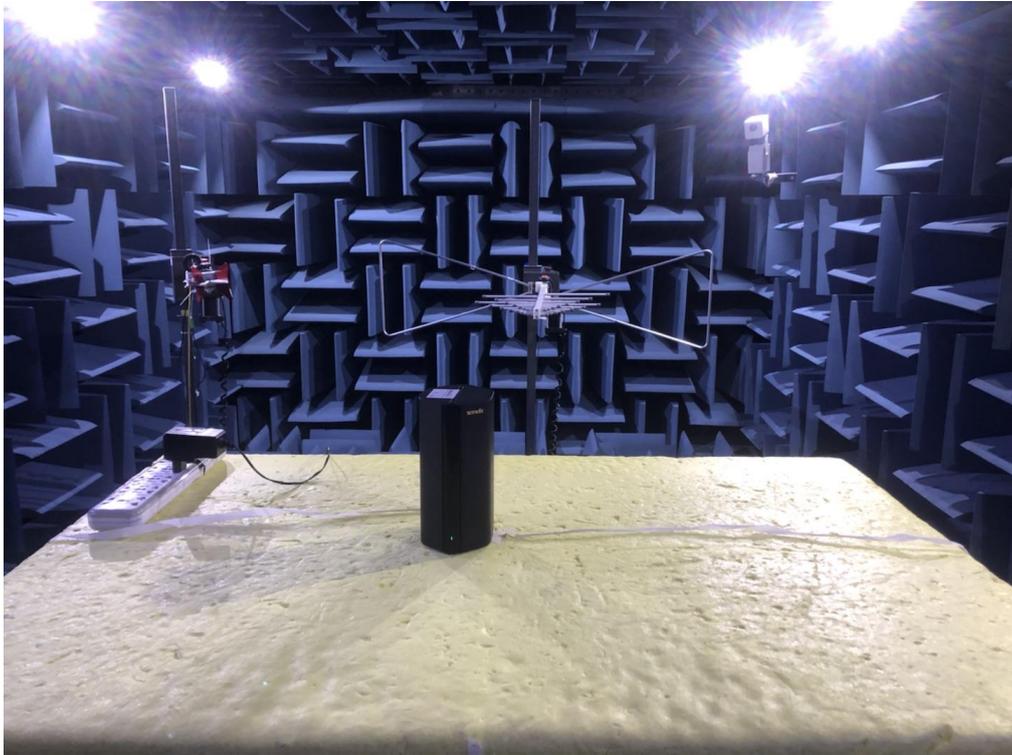
NO.	Freq. [MHz]	Reading [dBm]	Factor [dB]	Level [dBm]	Limit [dBm]	Margin [dB]	Detector	Polarity
1	42.8040	-72.08	0.16	-71.92	-57.00	14.92	RMS	Horizontal
2	122.0530	-68.46	-5.54	-74.00	-57.00	17.00	RMS	Horizontal
3	190.9260	-70.79	-6.33	-77.12	-57.00	20.12	RMS	Horizontal
4	246.7950	-78.63	-4.15	-82.78	-57.00	25.78	RMS	Horizontal
5	409.3670	-83.94	-0.39	-84.33	-57.00	27.33	RMS	Horizontal
6	642.8460	-85.76	5.34	-80.42	-57.00	23.42	RMS	Horizontal
7	4844.012	-51.98	-0.95	-52.93	-47.00	5.93	RMS	Horizontal

5. MEASUREMENT INSTRUMENTS LIST

DETAILS FOR RADIATED EMISSIONS					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3231	Apr. 18, 2023
2	Amplifier	HP	8447D	2944A08908	Jan. 22, 2023
3	Controller	ETS-Lindgren	2090	N/A	N/A
4	Double-Ridged Waveguide Horn Antennas	ETS-LINDGREN	3117-PA	224172	Sep. 18, 2022
5	Preamplifier	ETS-LINDGREN	3117-PA	224172	Jul. 03, 2023
6	Automatic switching unit of high and low frequency line wave device	Tonscend	JS0806-F	20E8060252	N/A
7	FSV Signal Analyzer	R&S	FSV7	101908	Jan. 22, 2023
8	FSV Signal Analyzer	R&S	FSV40	101423	Jul. 03, 2023
9	Measurement Software	Tonscend	JS36-RSE 2.5.1.5	N/A	N/A
10	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Jan. 23, 2023

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

6. EUT TEST PHOTO**Radiated Emissions Test Photos****End of Test Report**