

# **SPECTRUM REPORT**

## **(UMTS)**

**Applicant:** Nebra LTD.

**Address of Applicant:** Unit 4 Bells Yew Green Business Court, Bells Yew Green,  
Tunbridge Wells TN3 9BJ United Kingdom

**Equipment Under Test (EUT)**

Product Name: Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor  
Hotspot Miner

Model No.: HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+,  
HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868

Trade mark: Nebra

**Applicable standards:** ETSI EN 301 908-1 V13.1.1 (2019-11)  
ETSI EN 301 908-2 V11.1.2 (2017-08)

**Date of sample receipt:** 31 May, 2021

**Date of Test:** 31 May, to 08 Jul., 2021

**Date of report issued:** 09 Jul., 2021

**Test Result:** PASS\*

\*In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.



Bruce Zhang  
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

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## 2 Version

Version No.	Date	Description
00	09 Jul., 2021	Original

**Tested by:**

**Date:**

09 Jul., 2021

\_\_\_\_\_  
**Test Engineer**

**Reviewed by:**

**Date:**

09 Jul., 2021

\_\_\_\_\_  
**Project Engineer**

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## 4 Test Summary

Test Item	Test Requirement	Test method	Result
Transmitter maximum output power	ETSI EN 301 908-2 section 4.2.2	ETSI EN 301 908-2 section 5.3.1	Pass*
Transmitter spectrum emission mask	ETSI EN 301 908-2 section 4.2.3	ETSI EN 301 908-2 section 5.3.2	Pass*
Transmitter spurious emissions	ETSI EN 301 908-2 section 4.2.4	ETSI EN 301 908-2 section 5.3.3	Pass*
Transmitter minimum output power	ETSI EN 301 908-2 section 4.2.5	ETSI EN 301 908-2 section 5.3.4	Pass*
Transmitter Adjacent Channel Leakage Power Ratio (ACLR)	ETSI EN 301 908-2 section 4.2.12	ETSI EN 301 908-2 section 5.3.11	Pass*
Out-of-synchronization handling of output power	ETSI EN 301 908-2 section 4.2.11	ETSI EN 301 908-2 section 5.3.10	Pass*
Receiver adjacent channel selectivity (ACS)	ETSI EN 301 908-2 section 4.2.6	ETSI EN 301 908-2 section 5.3.5	Pass*
Receiver blocking characteristics	ETSI EN 301 908-2 section 4.2.7	ETSI EN 301 908-2 section 5.3.6	Pass*
Receiver spurious response	ETSI EN 301 908-2 section 4.2.8	ETSI EN 301 908-2 section 5.3.7	Pass*
Receiver intermodulation characteristics	ETSI EN 301 908-2 section 4.2.9	ETSI EN 301 908-2 section 5.3.8	Pass*
Receiver spurious emissions	ETSI EN 301 908-2 section 4.2.10	ETSI EN 301 908-2 section 5.3.9	Pass*
Receiver Reference Sensitivity level	ETSI EN 301 908-2 section 4.2.13	ETSI EN 301 908-2 section 5.3.12	Pass*
Radiated emissions	ETSI EN 301 908-1 Section 4.2.2	ETSI EN 301 908-1 Section 5.3.1	Pass
Control and monitoring functions	ETSI EN 301 908-1 Section 4.2.4	ETSI EN 301 908-1 Section 5.3.3	Pass*
<p><i>Remark:</i></p> <p><i>Pass: The EUT complies with the essential requirements in the standard.</i></p> <p><i>PASS*: Refer to the Report No.: Refer to the Report No.: HR/2019/1001402</i></p>			

## 5 General Information

### 5.1 Client Information

Applicant:	Nebra LTD.
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells TN3 9BJ United Kingdom
Manufacturer:	Nebra LTD.
Address:	Unit 4 Bells Yew Green Business Court, Bells Yew Green, Tunbridge Wells TN3 9BJ United Kingdom
Factory:	SUNSOAR TECH CO., LIMITED
Address:	4/F, Block E, Fengze Building, Huafeng No.2 Industrial Park, Hangkong Road, XiXiang Town, BaoAn District, Shenzhen, China

### 5.2 General Description of E.U.T.

Product Name:	Nebra Smart Outdoor LoRa Gateway / Nebra HNT Outdoor Hotspot Miner	
Model No.:	HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868	
Transmitter frequency range:	Band I:	1920 MHz~1980 MHz
	Band VIII:	880 MHz~915 MHz
	Band V:	824 MHz~849 MHz
Receiver frequency range:	Band I:	2110 MHz~2170 MHz
	Band VIII:	925 MHz~960 MHz
	Band V:	869 MHz~894 MHz
Hardware version:	V01-16-2021-1820	
Software version:	4dc8745	
Modulation type:	<input checked="" type="checkbox"/> RMC(QPSK) <input checked="" type="checkbox"/> HSDPA(QPSK,16QAM) <input checked="" type="checkbox"/> HSUPA(QPSK)	
Antenna Type:	External antenna	
Antenna Gain:	Band I:	2.39 dBi (declare by Applicant)
	Band VIII:	1.99 dBi (declare by Applicant)
	Band V:	1.75 dBi (declare by Applicant)
Power supply:	AC: AC 230V / 50Hz POE: DC48V	
AC adapter:	Model No.: HNTOUT-868-G-LT+, HNTOUT-868-G-LT, HNTOUT-868-LT+, HNTOUT-868-G, HNTOUT-868-LT, HNTOUT-868 The difference: we will offer the unit with or without a GPS module included. Models with the GPS Included are indicated with a -G on the end of the model number. For example a unit with model no HNTOUT-868 is 868 Mhz, no GPS. A unit with Model No HNTOUT-868-G, is 915Mhz with GPS. We offer the unit using the Raspberry Pi Compute Module 3+ 32GB by standard (no suffix) but have an -LT variant which uses the Raspberry Pi Compute Module 3 Lite with a 32 GB eMMC to SD adapter card and a -LT+ variant which uses the Raspberry Pi Compute Module 3+ Lite with a 32 GB eMMC to SD adapter card. These suffixes can be applied to the models both with and without GPS as described above. We also provide customers the ability to, optionally, add both cellular connectivity and an additional 8 channel LoRa gateway to any of these models by using an mPCIe module however these come as optional extras.	

### 5.3 Test environment and mode, and test samples plans

Operating Environment:	
Temperature:	Normal: 15°C ~ 35°C, Extreme: -20°C ~ +55°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	POE: Nominal: 48Vdc, Extreme: Low 44Vdc, High 53Vdc
Test mode:	
RMC mode	Keep the EUT communication with simulated station in RMC mode
HSDPA mode	Keep the EUT communication with simulated station in HSDPA mode
HSUPA mode	Keep the EUT communication with simulated station in HSUPA mode
Note:	
1. All the test environments and test modes required following ETSI TS 134 121-1 and ETSI EN 301 908-2.	

### 5.4 Description of Support Units

Test Equipment	Manufacturer	Model No.	Serial No.
Simulated Station	Anritsu	MT8820C	6201026545
Simulated Station	Rohde & Schwarz	CMU200	122477

### 5.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%)
Radio Frequency	$\pm 1.2 \times 10^{-9}$
RF Power, Conducted	$\pm 0.64$ dB
Spurious emission, Conducted	$\pm 1.18$ dB
Temperature	$\pm 0.3$ °C
Voltage	$\pm 0.1$ %
Humidity	$\pm 2$ %
Time	$\pm 10$ %
Radiated Emission (30MHz ~ 1000MHz)	$\pm 4.32$ dB
Radiated Emission (1GHz ~ 18GHz)	$\pm 5.16$ dB

### 5.6 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

● **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

## 5.7 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info-JYTee@lets.com, Website: http://www.ccis-cb.com

## 5.8 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	966	01-19-2021	01-18-2024
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-03-2021	03-02-2022
Biconical Antenna	SCHWARZBECK	VUBA9117	359	06-18-2020	06-17-2021
				06-17-2021	06-16-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-03-2021	03-02-2022
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-18-2020	06-17-2021
				06-17-2021	06-16-2022
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-03-2021	03-02-2022
Pre-amplifier	CD	PAP-1G18	11804	03-03-2021	03-02-2022
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-03-2021	03-02-2022
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-03-2021	03-02-2022
Signal Generator	Rohde & Schwarz	SMX	835454/016	03-03-2021	03-02-2022
Signal Generator	Rohde & Schwarz	SMR20	1008100050	03-03-2021	03-02-2022
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-03-2021	03-02-2022
Cable	MICRO-COAX	MFR64639	K10742-5	03-03-2021	03-02-2022
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-03-2021	03-02-2022
RF Switch Unit	MWRFTTEST	MW200	N/A	N/A	N/A
Test Software	MWRFTTEST	MTS8200	Version: 2.0.0.0		

Conducted method:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Agilent	N9020A	MY50510123	11-16-2020	11-15-2021
Vector Signal Generator	Agilent	N5182A	MY49060014	11-16-2020	11-15-2021
Signal Generator	Rohde & Schwarz	SMR20	1008100050	03-03-2021	03-02-2022
Simulated Station	Rohde & Schwarz	CMW500	140493	06-18-2020	06-17-2021
				06-18-2021	06-17-2022
RF Control Box	MWRF-test	MW200-RFCB	MW201013JYT	N/A	N/A
Automatic Filter Box	MWRF-test	MW200-SFCB	MW201019JYT	N/A	N/A
Test Software	MWRF-test	MTS8200	Version: 2.0.0.0		
DC Power Supply	XinNuoEr	WYK-10020K	1409050110020	09-23-2020	09-22-2021
Temperature Humidity Chamber	Zhongzhi	CZ-C-150D	ZH16491	09-23-2020	09-22-2021

## 6 Radio Technical Requirements Specification in ETSI EN 301 908-1/-2

### 6.1 Justification

The EUT and test equipment were configured for testing according to ETSI EN 301 908-2 V11.1.1 (2016-07) and ETSI TS 134 121-1.

The EUT was tested in the normal operating mode to represent worst-case results during the final qualification test.

The EUT was tested with a dummy battery.

### 6.2 Test Configuration of EUT

WCDMA Band I			WCDMA Band VIII		
Channel Number		Frequency (MHz)	Channel Number		Frequency (MHz)
Low channel	9612	1922.4	Low channel	2712	882.4
Middle channel	9750	1950.0	Middle channel	2788	897.6
High channel	9888	1977.6	High channel	2863	912.6

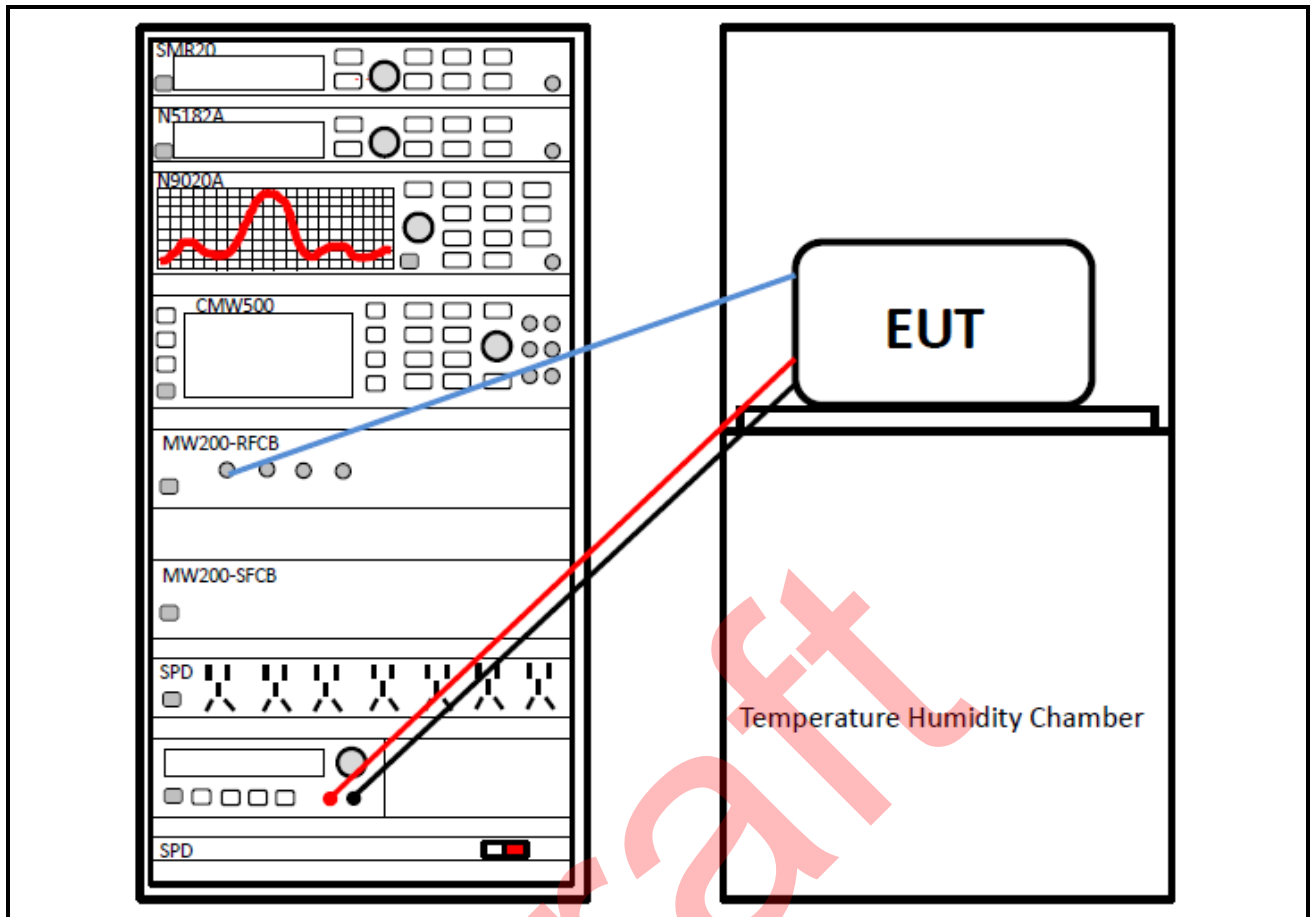
Clause No.	Test Conditions					Test Channel			Test Modes		
	NTNV	LTLV	LTHV	HTLV	HTHV	Low	Middle	High	RMC	HSDPA	HSUPA
4.2.2	√	√	√	√	√	√	√	√	√	√	√
4.2.3	√					√	√	√	√	√	√
4.2.4	√					√	√	√	√		
4.2.5	√	√	√	√	√		√		√		
4.2.6	√						√		√		
4.2.7	√						√		√		
4.2.8	√						√		√		
4.2.9	√						√		√		
4.2.10	√						√		√		
4.2.11	√						√		√		
4.2.12	√	√	√	√	√	√	√	√	√	√	√
4.2.13	√	√	√	√	√	√	√	√	√		

Note:

- “√” means that this configuration is chosen for test.
- “NTNV” means Normal Temperature Normal Voltage, “LTLV” means Low Temperature Low Voltage, “LTHV” means Low Temperature High Voltage, “HTLV” means High Temperature Low Voltage, “HTHV” means High Temperature High Voltage.



### 6.3 Test Setup Block



## 6.4 Test Results

### 6.4.1 Test Result Summary

Clause No.	Test Mode	Test Condition	Test Band	
			WCDMA Band I, VIII, V	
			Test Data	Verdict
Requirements in EN 301 908-2				
4.2.2	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
		LTLV		Pass
		LTHV		Pass
		HTLV		Pass
		HTHV		Pass
4.2.3	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
	HSDPA	NTNV		Pass
	HSUPA	NTNV		Pass
4.2.4	RMC	NTNV		Pass
4.2.5	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
		LTLV		Pass
		LTHV		Pass
		HTLV		Pass
		HTHV		Pass
4.2.6	RMC	NTNV		Pass
4.2.7	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
4.2.8	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
4.2.9	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
4.2.10	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
4.2.11	RMC	NTNV	See Section 6.4.4	Pass
4.2.12	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
		LTLV		Pass
		LTHV		Pass
		HTLV		Pass
		HTHV		Pass
	HSDPA	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
		LTLV		Pass
		LTHV		Pass
		HTLV		Pass
		HTHV		Pass
	HSUPA	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
		LTLV		Pass
		LTHV		Pass
		HTLV		Pass
		HTHV		Pass
4.2.13	RMC	NTNV	Refer to the Report No.: Refer to the Report No.: HR/2019/1001402	Pass
		LTLV		Pass
		LTHV		Pass
		HTLV		Pass
		HTHV		Pass
Requirements in EN 301 908-1				
4.2.2	RMC	NTNV	See Section 6.4.5	Pass
4.2.4	RMC	NTNV	See Section 6.4.6	Pass
Note: “NTNV” means Normal Temperature Normal Voltage, “LTLV” means Low Temperature Low Voltage, “LTHV” means Low Temperature High Voltage, “HTLV” means High Temperature Low Voltage, “HTHV” means High Temperature High Voltage.				

#### 6.4.2 Radiated spurious emissions

The Middle channel-WCDMA 2100 mode-Traffic mode				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
623.93	Vertical	-58.35	-36 dBm below 1GHz,  -30 dBm above 1GHz.	Pass
720.16	V	-57.92		
3900.00	V	-62.32		
5850.00	V	-56.37		
320.03	Horizontal	-58.48		
660.99	H	-58.40		
3900.00	H	-62.85		
5850.00	H	-56.57		
The Middle channel-WCDMA 2100 mode-Idle mode				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
623.93	Vertical	-58.10	-57dBm below 1GHz,  -47dBm above 1GHz.	Pass
720.16	V	-58.88		
3900.00	V	-60.94		
5850.00	V	-61.95		
320.03	Horizontal	-58.67		
660.99	H	-58.56		
3900.00	H	-62.48		
5850.00	H	-63.65		

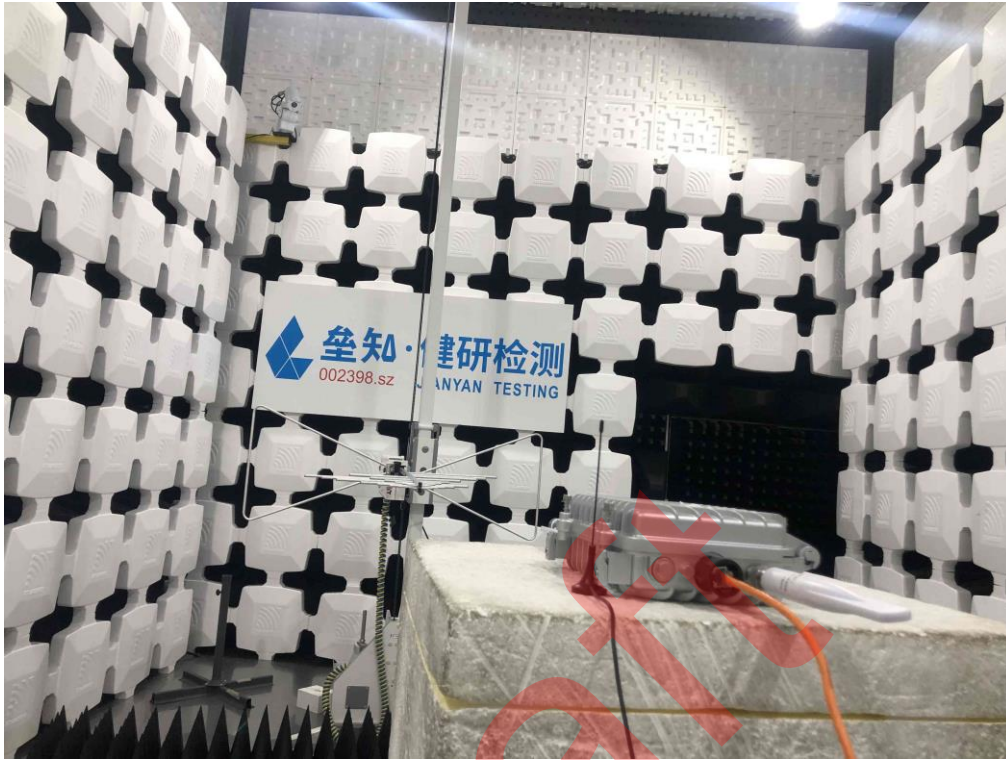
The Middle channel- WCDMA 900 mode- Traffic mode				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
623.93	Vertical	-58.13	-36 dBm below 1GHz,  -30 dBm above 1GHz.	Pass
720.16	V	-58.32		
1795.20	V	-62.69		
2692.80	V	-56.82		
320.03	Horizontal	-58.69		
660.99	H	-58.12		
1795.20	H	-63.04		
2692.80	H	-56.86		
The Middle channel- WCDMA 900 mode - Idle mode				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
623.93	Vertical	-58.19	-57Bm below 1GHz,  -47Bm above 1GHz.	Pass
720.16	V	-58.80		
1795.20	V	-61.33		
2692.80	V	-62.41		
320.03	Horizontal	-59.14		
660.99	H	-58.54		
1795.20	H	-62.43		
2692.80	H	-63.75		

The Middle channel- WCDMA 850 mode- Traffic mode				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
623.93	Vertical	-58.80	-36 dBm below 1GHz,  -30 dBm above 1GHz.	Pass
720.16	V	-58.41		
1673.30	V	-61.94		
2509.50	V	-55.89		
320.03	Horizontal	-58.10		
660.99	H	-57.97		
1673.30	H	-63.05		
2509.50	H	-56.61		
The Middle channel- WCDMA 850 mode - Idle mode				
Frequency (MHz)	Spurious Emission		Limit (dBm)	Test Result
	polarization	Level(dBm)		
623.93	Vertical	-58.75	-57Bm below 1GHz,  -47Bm above 1GHz.	Pass
720.16	V	-58.39		
1673.30	V	-62.07		
2509.50	V	-56.07		
320.03	Horizontal	-58.05		
660.99	H	-58.39		
1673.30	H	-63.01		
2509.50	H	-56.20		

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## 7 Test Setup Photo

Radiated Spurious Emission  
Below 1GHz



Above 1GHz



## **8 EUT Constructional Details**

Reference to the test report No. JYTSZB-R01-2100336

----- End of report -----

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