



中国认可  
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检测  
TESTING  
CNAS L0310



# FCC

# RF Test Report

**Product Name: 1200Mbps Wireless Router**

**Model Number: WS5200**

**Report No.: SYBH(Z-RF)20180202009001-2002**

**FCC ID: QISWS5200**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

**(Global Compliance and Testing Center of Huawei Technologies Co., Ltd)**

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## Notice

1. The laboratory has passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been recognized by the US Federal Communications Commission (FCC) to perform compliance testing subject to the Commission's Certification rules. The Designation Number is CN1173, and the Test Firm Registration Number is 294140.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-1.
5. The laboratory (Reliability Lab of Huawei Technologies Co., Ltd) is also named "Global Compliance and Testing Center of Huawei Technologies Co., Ltd", the both names have coexisted since 2009.
6. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
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8. The test report is only valid for the test samples.
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**Applicant:** Huawei Technologies Co., Ltd.  
**Address:** Administration Building, Headquarters of Huawei Technologies Co., Ltd.,  
Bantian, Longgang District, Shenzhen, 518129, P.R.C

**Date of Receipt Sample:** 2018-02-12  
**Start Date of Test:** 2018-03-01  
**End Date of Test:** 2018-04-08

**Test Result:** Pass

<b>Approved by Senior Engineer:</b>	2018-04-10	Roger zhang	<i>Roger Zhang</i>
	Date	Name	Signature

<b>Prepared by:</b>	2018-04-10	You Songhua	<i>You Songhua</i>
	Date	Name	Signature



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## 1 General Information

### 1.1 **Applied Standard**

Applied Rules:           47 CFR FCC Part 2, Subpart J  
                                  47 CFR FCC Part 15, Subpart C  
                                  47 CFR FCC Part 15, Subpart E

Test Method:            KDB 789033 D02 General UNII Test Procedures New Rules v02  
                                  FCC KDB 558074 D01 DTS Meas Guidance v04  
                                  FCC KDB 662911 D01 Multiple Transmitter Output v02r01  
                                  ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices

### 1.2 **Test Location**

Test Location 1:        Reliability Laboratory of Huawei Technologies Co., Ltd.  
Address:                 Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang  
                                  District, Shenzhen, 518129, P.R.C

### 1.3 **Test Environment Condition**

Temperature:            15 to 30 °C (Ambient)  
Relative Humidity:     20 to 85 % (Ambient)  
Atmospheric Pressure: Not applicable



## 2 Test Summary

### 2.1 Measurement Technical Requirements

#### 2.1.1 U-NII (5150-5250, 5725-5850)

Test Item	Band	FCC Rule	Requirements	Test Result	Verdict
Emission Bandwidth	5150-5250	15.403(i) 15.407(a)(1)	No limit.	Appendix A	Pass
	5725-5850	15.403(i) 15.407(e)	≥ 500 kHz.		
Occupied Bandwidth	5150-5250	KDB 789033 D02	No limit.	Appendix B	Pass
	5725-5850	§ D			
Duty Cycle	5150-5850	--	No limit.	Appendix C	Pass
Maximum Conducted Output Power	5150-5250	15.407(a)(1) 15.407(a)(4)	FCC < 1W (avg during transmission)	Appendix D	
	5725-5850	15.407(a)(3)	< 1W (avg during transmission)		
maximum Power Spectral Density	5150-5250	15.407(a)(1) 15.407(a)(4)	<17dBm/MHz (avg during transmission)	Appendix E	
	5725-5850	15.407(a)(3) 15.407(a)(4)	<30dBm/500KHz (avg during transmission)		
Frequency Stability	5150-5250 5725-5850	15.407(g)	FCC Part 15.407(g)	Appendix F	



### 3 Description of the Equipment under Test (EUT)

#### 3.1 General Description

The WS5200 is a high-speed wireless router designed for homes and small offices. Complies with 802.11b/g/n/ac multiple-input multiple-output (MIMO) technology and provides 4 external high-gain antennas. This enhances wireless performance, improves wireless signal stability, increases wireless network range, provide a transmission rate of up to 1200 Mbps.

Note: Only 5G WIFI test data included in this report.


#### 3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

##### 3.2.1 Board

Board		
Description	Hardware Version	Software Version
Main Board	AMEWS5200M	8.0.0.1

##### 3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HW-120100U01	Huawei Technologies Co.,Ltd.	Input Voltage :100-240V ~50/60Hz, 0.5 A Output Voltage:  12 V 1 A Rated Power: 12 W



### 3.3 Technical Description

Characteristics	Description		
IEEE 802.11 WLAN Mode Supported	<input checked="" type="checkbox"/> 802.11a (20 MHz channel bandwidth) , <input checked="" type="checkbox"/> 802.11n (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11n (40 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11ac (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11ac (40 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11ac (80 MHz channel bandwidth),		
TX/RX Operating Range	All	$f_c = 5000 \text{ MHz} + N * 5 \text{ MHz}$ , where: - $f_c$ = "Operating Frequency" in MHz, - $N$ = "Channel Number".	
	5150-5250 MHz (U-NII)	$N = 36$ to $48$ with step of $4$ for the $20 \text{ MHz}$ channel bandwidth. $N = 38$ to $46$ with step of $8$ for the $40 \text{ MHz}$ channel bandwidth. $N = 42$ for the $80 \text{ MHz}$ channel bandwidth.	
	5725-5850MHz(U-NII)	$N = 149$ to $165$ with step of $4$ for the $20 \text{ MHz}$ channel bandwidth. $N = 151$ to $159$ with step of $8$ for the $40 \text{ MHz}$ channel bandwidth. $N = 155$ for the $80 \text{ MHz}$ channel bandwidth.	
Modulation Type	BPSK/QPSK/16QAM/64QAM (OFDM).		
Emission Designator	U-NII(5150-5250)	29M5G7D (for 802.11a mod), 36M0G7D (for 802.11n 20 MHz mode), 78M0G7D (for 802.11n 40 MHz mode), 36M8G7D (for 802.11ac 20 MHz mode) 72M0G7D (for 802.11ac 40 MHz mode) 83M2G7D (for 802.11ac 80 MHz mode)	
	U-NII(5725-5850)	16M4G7D (for 802.11a mod), 17M4G7D (for 802.11n 20 MHz mode), 36M0G7D (for 802.11n 40 MHz mode), 17M6G7D (for 802.11ac 20 MHz mode) 36M3G7D (for 802.11ac 40 MHz mode) 75M5G7D (for 802.11ac 80 MHz mode)	
TPC	<input checked="" type="checkbox"/> Supported, <input type="checkbox"/> Not Supported		
Antenna	Type	<input checked="" type="checkbox"/> External, <input type="checkbox"/> Integrated	
	Ports	<input checked="" type="checkbox"/> Ant 1, <input checked="" type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3, <input type="checkbox"/> Ant 4	
	Smart System	<input checked="" type="checkbox"/> SISO (for 802.11a/n/ac), <input checked="" type="checkbox"/> MIMO (for 802.11n/ac), <input type="checkbox"/> Diversity (for 802.11a) :           Tx            Rx	
	Gain	ANT1: 5150-5250 MHz : 4.2 dBi (per antenna port, max.) 5725-5850 MHz : 5.3 dBi (per antenna port, max.) ANT2: 5150-5250 MHz : 4.2 dBi (per antenna port, max.) 5725-5850 MHz : 5.3 dBi (per antenna port, max.)	
	Remark	When the EUT is put into service, the practical maximum antenna gain should NOT exceed the value as described above.	
Power Supply	Type	<input checked="" type="checkbox"/> AC/DC Adapter	<input type="checkbox"/> PoE: <input type="checkbox"/> Other:





## 4 General Test Conditions / Configurations

### 4.1 Test Modes

NOTE: Worst cases for each IEEE 802.11 mode are selected to perform tests.

Test Mode	Test Modes Description
11A	IEEE 802.11a with data rate of 6 Mbps using SISO mode.
11N20	IEEE 802.11n with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.
11N20m	IEEE 802.11n with data rate of MCS8 and bandwidth of 20 MHz using MIMO mode.
11N40	IEEE 802.11n with data rate of MCS0 and bandwidth of 40 MHz using SISO mode.
11N40m	IEEE 802.11n with data rate of MCS8 and bandwidth of 40 MHz using MIMO mode.
11AC20	IEEE 802.11ac with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.
11AC20m	IEEE 802.11ac with data rate of MCS8 and bandwidth of 20 MHz using SISO mode.
11AC40	IEEE 802.11ac with data rate of MCS0 and bandwidth of 40 MHz using SISO mode.
11AC40m	IEEE 802.11ac with data rate of MCS8 and bandwidth of 40 MHz using MIMO mode.
11AC80	IEEE 802.11ac with data rate of MCS0 and bandwidth of 80 MHz using SISO mode.
11AC80m	IEEE 802.11ac with data rate of MCS8 and bandwidth of 80 MHz using MIMO mode.

### 4.2 EUT Configurations

#### 4.2.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, <ul style="list-style-type: none"> <li>All TX tests are performed at all TX antenna ports of the EUT, and</li> <li>All RX tests are performed at all RX antenna ports of the EUT.</li> </ul>
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

#### 4.2.2 Customized Configurations

##### 4.2.2.1 U-NII

Test Mode	Test Channel	Antenna Port	Power Conf., per Port	Duty cycle [%]
11A	36	Ant 1	15	94.64
	40		19	
	others		21	
	36	Ant 2	15	94.71
	40		19	
	others		21	



11N20	36	Ant 1	15	94.27
	40		19	
	others		21	
	36	Ant 2	15	94.34
	40		19	
	others		21	
11N20M	36	Ant 1	15	93.39
	40		19	
	others		21	
	36	Ant 2	15	93.82
	40		19	
	others		21	
11N40	38	Ant 1	12	89.97
	151		20	
	others		20	
	38	Ant 2	12	89.59
	151		20	
	others		20	
11N40M	38	Ant 1	12	88.34
	151		20	
	others		21	
	38	Ant 2	12	88.24
	151		20	
	others		21	
11AC20	36	Ant 1	15	94.74
	40		19	
	others		21	
	36	Ant 2	15	94.84
	40		19	
	others		21	
11AC20M	36	Ant 1	15	92
	40		19	
	others		21	
	36	Ant 2	15	92
	40		19	
	others		21	
11AC40	38	Ant 1	12	90.06
	151		20	
	others		21	
	38	Ant 2	12	90.05
	151		20	
	others		21	



11AC40M	38	Ant 1	12	87.61
	151		20	
	others		21	
	38	Ant 2	12	87.11
	151		20	
	others		21	
11AC80	42	Ant 1	13	79.64
	155		20	
	42	Ant 2	13	79.73
	155		20	
11AC80M	42	Ant 1	13	73.52
	155		20	
	42	Ant 2	13	73.52
	155		20	



### 4.3 Test Environments

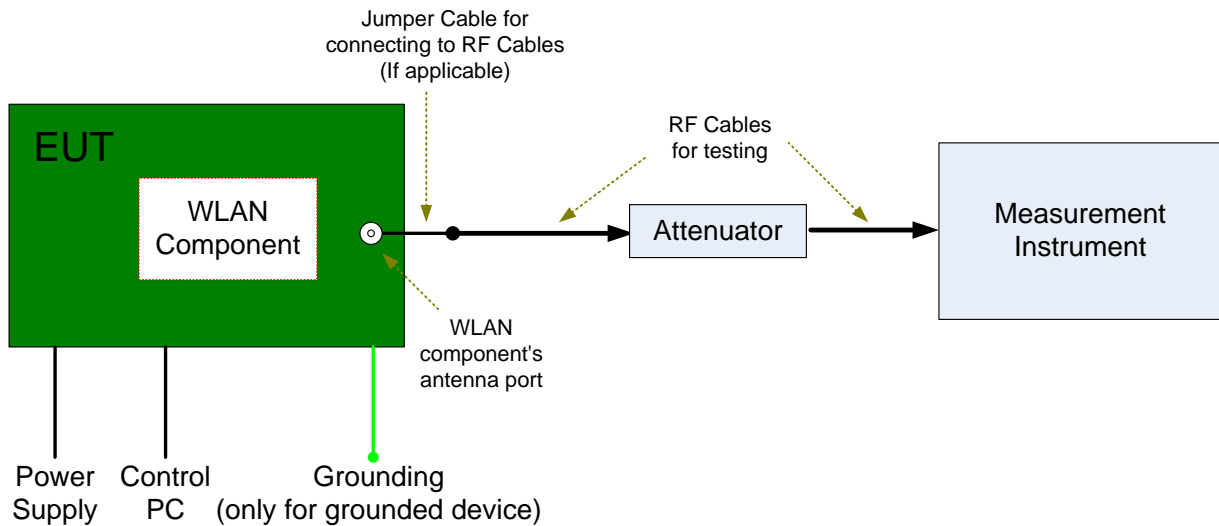
Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	10.8V
	VN	12V
	VH	13.2V

NOTE: VL= lower extreme test voltage  
VN= nominal voltage  
VH= upper extreme test voltage  
TN= normal temperature

## 4.4 Test Setups

### 4.4.1 Test Setup 1

The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.





## 4.5 Test Conditions

### 4.5.1 U-NII

Test Case	Test Conditions	
	Configuration	Description
Emission Bandwidth (EBW)	Meas. Method	FCC KDB 789033 D02 §C).
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Occupied Bandwidth (OBW)	Meas. Method	FCC KDB 789033 D02 §D).
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Maximum Conducted Output Power	Meas. Method	FCC KDB 789033 D02 §E)2)b) Method SA-1 and d) Method SA-2.
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Maximum Power Spectral Density	Meas. Method	FCC KDB 789033 D02 §F).
	Test Env.	NTNV
	Test Setup	Test Setup 1
	EUT Conf.	All EUT conf. with Tx modes.
Frequency Stability	Meas. Method	15.407(g) Frequency Stability
	Test Env.	(1)VL, VN and VH of Rated Voltage at Ambient Climate. (2) -5 °C,5°C,15°C,25°C,35°C,45°C,50°C
	Test Setup	Test Setup 1
	EUT Conf.	Ch.36,Ch.165



## 5 Main Test Instruments

NOTE: Unless otherwise specified, the calibration intervals for test instruments were Annual (per year). The other intervals, if applicable, are marked with (##y), which denotes ## years calibration interval.

Main Test Equipments					
Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal- Due
Power supply	KEITHLEY	2303	000500E	2017/5/31	2018/5/30
Wireless Communication Test set	Agilent	N4010A	MY49081592	2017/7/31	2018/7/30
Universal Radio Communication Tester	R&S	CMU200	110932	2017/5/2	2018/5/1
Spectrum Analyzer	Agilent	N9020A	MY52090652	2017/7/10	2018/7/9
Universal Radio Communication Tester	R & S	CMW500	126854	2017/10/19	2018/10/18
Signal Analyzer	R&S	FSQ31	200021	2017/7/31	2018/7/30
Spectrum Analyzer	Agilent	N9030A	MY49431698	2017/7/31	2018/7/30
Temperature Chamber	WEISS	WKL64	56246002940010	2017/12/13	2018/12/12
Signal generator	Agilent	E8257D	MY49281095	2017/7/31	2018/7/30
Vector Signal Generator	R&S	SMU200A	104162	2017/7/31	2018/7/30
Power Detecting & Sampling Unit	R&S	OSP-B157	100914	2017/7/31	2018/7/30

## 6 Appendixes

Appendix No.	Description
SYBH(Z-RF)20180202009001-2002-A	Appendix for 5G WLAN

END