



FCC RF Test Report

Product Name: Smart Phone

Model Number: VOG-L0J

Report No.: SYBH(Z-RF)20190115011001-2005

FCC ID : QISVOG-L0J

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DATE	2019-03-01	2019-03-01

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MODIFICATION RECORD

No.	Report No	Modification Description
1	SYBH(Z-RF)2019011 5011001-2005	First release.

DECLARATION

Type	Description
Multiple Models Applications	<input checked="" type="checkbox"/> The present report applies to single model. <input type="checkbox"/> The present report applies to several models. The practical measurements are performed with the model. The present report only presents the worst test case of all modes, see relevant test results for detailed.

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2 General Information

2.1 Test standard/s

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 :	FCC KDB 789033 D02 General UNII Test Procedures New Rules v02 FCC KDB 558074 D01 DTS Meas Guidance v05r01 FCC KDB 662911 D01 Multiple Transmitter Output v02r01 ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices

2.2 Test Environment

Temperature :	TN	15 to 30	°C during room temperature tests
Ambient Relative Humidity:	20 to 85 %		
Atmospheric Pressure:	Not applicable		
Power supply :	VL	3.6	V
	VN	3.82	V DC by Battery
	VH	4.35	V

NOTE 1: 1) VN= nominal voltage, VL= low extreme test voltage, VH= High extreme test voltage;

TN= normal temperature, TL= low extreme test temperature, TH= High extreme test temperature.

NOTE 2: The values used in the test report may be stringent than the declared.

2.3 Test Laboratories

Test Location 1 :	RELIABILITY LABORATORY OF HUAWEI TECHNOLOGIES CO., LTD.
Address of Test Location 1 :	No.2, New City Avenue, Songshan Lake Sci. & Tech. Industry Park, Dongguan, 523808, P.R.C

2.4 Applicant and Manufacturer

Company Name :	HUAWEI TECHNOLOGIES CO., LTD
Address :	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

2.5 Application details

Date of Receipt Sample:	2019-01-26
Start of test:	2019-01-27
End of test:	2019-02-28

3 Test Summary

3.1 Measurement Technical Requirements

3.1.1 U-NII (5150-5250, 5250-5350, 5470-5725 MHz, 5725-5850)

Test Item	Band	FCC Rule No.	Requirements	Test Result	Verdict
Emission Bandwidth	5150-5250	15.403(i) 15.407(a)(1)	No limit.	Appendix A1&A2	Pass
	5250-5350	15.403(i) 15.407(a)(2)			
	5470-5725	15.403(i) 15.407(a)(2)			
	5725-5850	15.403(i) 15.407(e)	≥ 500 kHz.		
Occupied Bandwidth	5150-5250	KDB 789033 D02 § D	No limit.	Appendix B	Pass
	5250-5350				
	5470-5725				
	5725-5850				
Duty Cycle	5150-5850	KDB 789033 D02 § B	No limit.	Appendix C	
Maximum Output Power	5150-5250	15.407(a)(1) 15.407(a)(4)	FCC: conducted < 250mW (avg during transmission)	Appendix D	Pass
	5250-5350	15.407(a)(2) 15.407(a)(4)	FCC: conducted <MIN{250mW, 11dBm+10*lg(EBW)} (avg during transmission)		
	5470-5725	15.407(a)(2) 15.407(a)(4)	FCC: conducted <MIN{250mW, 11dBm+10*lg(EBW)} (avg during transmission)		
	5725-5850	15.407(a)(3)	conducted < 1W (avg during transmission)		

Test Item	Band	FCC Rule No.	Requirements	Test Result	Verdict
maximum Power Spectral Density	5150-5250	15.407(a)(1) 15.407(a)(4)	FCC conducted <11dBm/MHz (avg during transmission)	Appendix E	
	5250-5350	15.407(a)(2) 15.407(a)(4)	conducted <11dBm/MHz (avg during transmission)		
	5470-5725	15.407(a)(2) 15.407(a)(4)	conducted <11dBm/MHz (avg during transmission)		
	5725-5850	15.407(a)(3) 15.407(a)(4)	conducted <30dBm/500KHz (avg during transmission)		
Frequency Stability	5150-5250 5250-5350 5470-5725 5725-5850	15.407(g)	FCC Part 15.407(g)	Appendix H	Pass
NOTE: The transmitter has an integral PCB loop antenna that is enclosed within the housing of the EUT and meets the requirements of FCC 15.203					

4 Description of the Equipment under Test (EUT)

4.1 General Description

VOG-L0J is a subscriber equipment in the GSM/WCDMA/LTE system. The GSM frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. The UMTS frequency band is B1 and B2 and B4 and B5 and B6 and B8 and B19. The LTE frequency band is B1 and B2 and B3 and B4 and B5 and B6 and B7 and B8 and B9 and B12 and B17 and B18 and B19 and B20 and B21 and B26 and B28 and B34 and B38 and B39 and B40 and B41 and B42. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, Bluetooth, NFC, Wi-Fi and Wirelessly Charging etc. VOG-L0J provides one SIM card interface and one HUAWEI Nano memory card interface. Externally it provides type C USB charging port, and the port could be used as the earphone port or data-transfer port.

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



4.2 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.

4.2.1 Board

Board		
Description	Software Version	Hardware Version
Main Board	9.1.0.22(C341E22R1P1)	HL3VOGUEM

4.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Battery	HB486486ECW	Huawei Technologies Co., Ltd.	Rated capacity: 4100mAh Nominal Voltage:  +3.82V Charging Voltage:  +4.4V

4.3 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), <input checked="" type="checkbox"/> 802.11ac (160 MHz channel bandwidth),	
TX/RX Operating Range	All	$fc = 5000 \text{ MHz} + N * 5 \text{ MHz}$, where: - fc = "Operating Frequency" in MHz, - N = "Channel Number".
	5150-5250 MHz (U-NII)	$N = 36$ to 48 with step of 4 for the 20 MHz channel bandwidth. $N = 38$ to 46 with step of 8 for the 40 MHz channel bandwidth. $N = 42$ for the 80 MHz channel bandwidth. $N = 50$ for the 160 MHz channel bandwidth
	5250-5350 MHz (U-NII)	$N = 52$ to 64 with step of 4 for the 20 MHz channel bandwidth. $N = 54$ to 62 with step of 8 for the 40 MHz channel bandwidth. $N = 58$ for the 80 MHz channel bandwidth.
	5470-5650 MHz (U-NII) (for FCC)	$N = 100$ to 128 with step of 4 for the 20 MHz channel bandwidth. $N = 102$ to 126 with step of 8 for the 40 MHz channel bandwidth. $N = 106$ to 122 with step of 16 for the 80 MHz channel bandwidth. $N = 114$ for the 160 MHz channel bandwidth.
	5650-5725 MHz (U-NII)	$N = 132$ to 140 with step of 4 for the 20 MHz channel bandwidth. $N = 134$ to 134 with step of 8 for the 40 MHz channel bandwidth.
	5725-5850MHz (U-NII)	$N = 149$ to 165 with step of 4 for the 20 MHz channel bandwidth. $N = 151$ to 159 with step of 8 for the 40 MHz channel bandwidth. $N = 155$ for the 80 MHz channel bandwidth.
Modulation Type	802.11a: BPSK/QPSK/16QAM/64QAM (OFDM).	
	802.11n: BPSK/QPSK/16QAM/64QAM (OFDM).	
	802.11ac: BPSK/QPSK/16QAM/64QAM/256QAM (OFDM).	
Emission Designator	U-NII(5150-5250, 5250-5350, 5470-5725, 5725-5850)	20M9G7D (for 802.11a mod), 23M1G7D (for 802.11n 20 MHz mode), 42M2G7D (for 802.11n 40 MHz mode), 25M5G7D (for 802.11ac 20 MHz mode) 43M9G7D (for 802.11ac 40 MHz mode) 84M7G7D (for 802.11ac 80 MHz mode) 172MG7D (for 802.11ac 160 MHz mode)
TX Power Control (TPC)	<input type="checkbox"/> Supported, <input checked="" type="checkbox"/> Not Supported	
Equipment Type	<input checked="" type="checkbox"/> Stand-alone equipment, <input type="checkbox"/> Plug-in radio device, <input type="checkbox"/> Combined equipment	
Antenna	Description	Isotropic Antenna
	Type	<input checked="" type="checkbox"/> Integral <input type="checkbox"/> External

Characteristics	Description	
		<input type="checkbox"/> Dedicated
	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"/> CDD (for 802.11a), 2 Tx & 2 Rx, <input checked="" type="checkbox"/> MIMO (for 802.11a/ac), 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11a/n/ac) : Tx & Rx
	Gain	Ant 1: -2.9 dBi (per antenna port, max.) Ant 2: -1.2 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 type="checkbox"/> External DC mains, <input checked="" type="checkbox"/> Battery, <input type="checkbox"/> AC/DC Adapter, <input type="checkbox"/> Powered over Ethernet (PoE). <input type="checkbox"/> Other

5 General Test Conditions / Configurations

5.1 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.
11A CDD	IEEE 802.11a with data rate of 6 Mbps using CDD 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.
11AC160	IEEE 802.11ac with data rate of MCS0 and bandwidth of 160 MHz using SISO mode.
11AC160m	IEEE 802.11ac with data rate of MCS8 and bandwidth of 160 MHz using MIMO mode.

5.2 EUT Configurations

5.2.1 General Configurations

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

5.2.2 Customized Configurations

Test Mode	Antenna Port	Power Conf.,	Duty cycle [%]
11A	Ant 1	CH36/64/100:9 CH140:9.5 CH165: 13.5 Others: 14.5	99.19
	Ant 2	CH36/64/100:9 CH140:9.5 CH165: 13.5	99.19

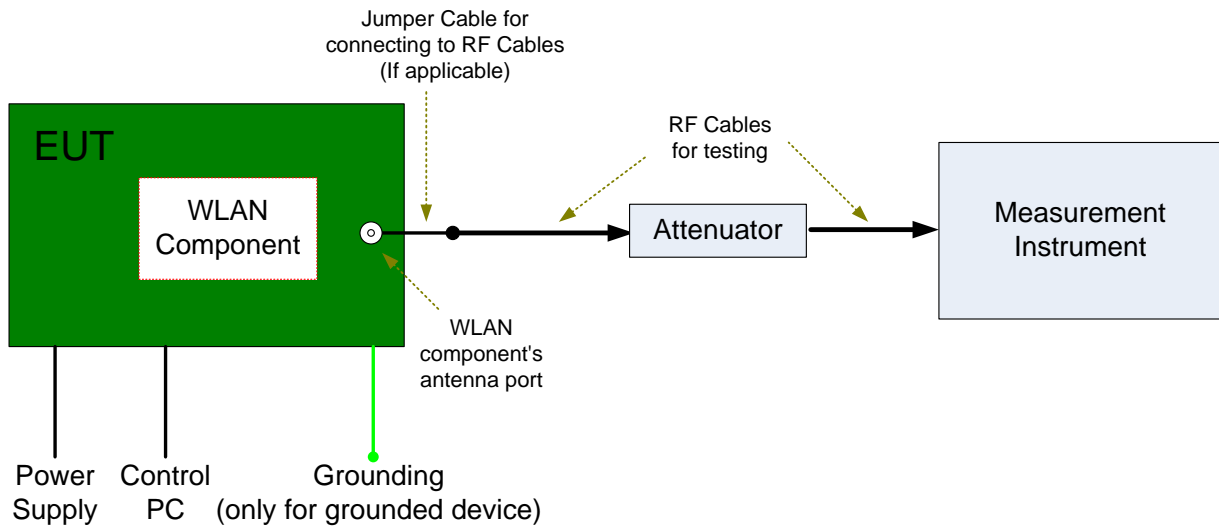
		Others: 14.0	
11A CDD	Ant 1	ANT1+ANT2 Total CH36/64/100:12.0 CH140:12.5	99.19
	Ant 2	CH165: 16.5 Others: 17.3	99.19
11N20	Ant 1	CH36/64/100:9.0 CH140:9.5 CH165: 13.5 Others: 14.5	99.12
	Ant 2	CH36/64/100:9 CH140:9.5 CH165: 13.5 Others: 14.0	99.12
11N20M	Ant 1	ANT1+ANT2 Total CH36/64/100:12.0 CH140:12.5	98.38
	Ant 2	CH165: 16.5 Others: 17.3	98.38
11N40	Ant 1	CH38/102/134:8.0 CH62:7.5 CH159:13.0 Others: 14.0	97.98
	Ant 2	CH38/102/134:8.0 CH62:7.5 CH159:13.0 Others: 13.5	97.98
11N40M	Ant 1	ANT1+ANT2 Total CH38/102/134:11.0 CH62:10.5	96.03
	Ant 2	CH159:16.0 Others: 16.8	96.03
11AC20	Ant 1	CH36/64/100:9.0 CH140:9.5 CH165: 13.5 Others: 14.5	99.13
	Ant 2	CH36/64/100:9.0 CH140:9.5 CH165: 13.5 Others: 14.0	99.13
11AC20M	Ant 1	ANT1+ANT2 Total CH36/64/100:12.0 CH140:12.5	99.13
	Ant 2		99.13

		CH165: 16.5 Others: 17.3	
11AC40	Ant 1	CH38/102/134:8.0 CH62:7.5 CH159:13.0 Others: 14.0	97.99
	Ant 2	CH38/102/134:8.0 CH62:7.5 CH159:13.0 Others: 13.5	97.99
11AC40M	Ant 1	ANT1+ANT2 Total CH38/102/134:11 CH62:10.5	97.91
	Ant 2	CH159:16.0 Others: 16.8	97.91
11AC80	Ant 1	CH155: 10.0 Others: 5.0	96.24
	Ant 2	CH155: 10.0 Others: 5.0	96.24
11AC80M	Ant 1	ANT1+ANT2 Total CH155: 13.0	96.24
	Ant 2	Others: 8.0	96.24
11AC160	Ant 1	5.0	93.19
	Ant 2	5.0	93.19
11AC160M	Ant 1	ANT1+ANT2 Total	92.9
	Ant 2	8.0	92.9

5.3 Test Setups

5.3.1 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.



5.4 Test Conditions

Test Case	Test Conditions	
	Configuration	Description
Emission Bandwidth (EBW)	Meas. Method	FCC KDB 789033 D02 §C).
	Test Env.	TN/VN
	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.	TN/VN
	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.	TN/VN
	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.	TN/VN
	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) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.
	Test Setup	Test Setup 1
	EUT Conf.	Ch.36,Ch.165

6 Main Test Instruments

This table gives a complete overview of the RF measurement equipment.

Devices used during the test described are marked

<input checked="" type="checkbox"/> Main Test Equipment(BT/WIFI test system)						
Marked	Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal-Due
<input type="checkbox"/>	JS1120-3 BT/WIFI test system	JS Tonscend	JS0806-2	188060102	2018/05/30	2019/05/30
<input type="checkbox"/>	Power Detecting & Samplig Unit	R&S	OSP-B157	101429	2018/07/23	2019/07/23
<input type="checkbox"/>	Power Sensor	R&S	NRP2	103085/106211	2018/05/17	2019/05/17
<input checked="" type="checkbox"/>	DC Power Supply	KEITHLEY	2303	1342889	2018/10/24	2019/10/24
<input type="checkbox"/>	DC Power Supply	KEITHLEY	2303	000500E	2018/05/21	2019/05/21
<input type="checkbox"/>	DC Power Supply	KEITHLEY	2303	000381E	2018/05/21	2019/05/21
<input type="checkbox"/>	DC Power Supply	KEITHLEY	2303	000510E	2018/05/21	2019/05/21
<input checked="" type="checkbox"/>	Temperature Chamber	WEISS	WKL64	56246002940010	2018/12/13	2019/12/13
<input type="checkbox"/>	Spectrum Analyzer	Agilent	N9030A	MY51380032	2018/07/23	2019/07/23
<input type="checkbox"/>	Spectrum Analyzer	Agilent	N9030A	MY49431698	2018/07/23	2019/07/23
<input checked="" type="checkbox"/>	Spectrum Analyzer	Keysight	N9040B	MY57212529	2018/06/28	2019/06/28
<input type="checkbox"/>	Signal Analyzer	R&S	FSQ31	200021	2018/07/23	2019/07/23
<input type="checkbox"/>	Signal Analyzer	R&S	FSU26	201069	2018/11/2	2019/11/2
<input type="checkbox"/>	Universal Radio Communication Tester	R&S	CMW500	164699	2018/03/15	2019/03/15
<input type="checkbox"/>	Universal Radio Communication Tester	R&S	CMW500	159302	2018/07/23	2019/07/23
<input type="checkbox"/>	Wireless Communication Test set	Agilent	N4010A	MY49081592	2018/07/23	2019/07/23
<input type="checkbox"/>	Signal generator	Agilent	E8257D	MY51500314	2018/04/27	2019/04/27
<input checked="" type="checkbox"/>	Signal generator	Agilent	E8257D	MY49281095	2018/07/23	2019/07/23
<input type="checkbox"/>	Vector Signal Generator	R&S	SMW200A	103447	2018/05/31	2019/05/31
<input type="checkbox"/>	Vector Signal Generator	R&S	SMU200A	104162	2018/07/23	2019/07/23

7 Measurement Uncertainty

For a 95% confidence level ($k = 2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmit Output Power Data	Power [dBm]	U = 0.58 dB
RF Power Density, Conducted	Power [dBm]	U = 0.64 dB
Bandwidth	Magnitude [kHz]	20MHz: U=41.78kHz 40MHz: U=82.12kHz 80MHz: U=163.5kHz
Spurious Emissions, Conducted	Disturbance Power [dBm]	20MHz~3.6GHz: U=0.88dB 3.6GHz~8.4GHz: U=1.08dB 8.4GHz~13.6GHz: U=1.24dB 13.6GHz~22GHz: U=1.34dB 22GHz~26.5GHz: U=1.36dB
Frequency Stability	Frequency Accuracy [Hz]	U=82.24Hz
Duty Cycle	Duty Cycle [%]	U=±2.06 %

8 Appendixes

Appendix No.	Description
SYBH(Z-RF)20190115011001-2005-A	Appendix_for_5G_WLAN

END