



FCC

RF Test Report

Product Name: Smart Phone

Model Number: MAR-LX1A

Report No.: SYBH(Z-RF) 20190219030002-2004

FCC ID: QISMAR-LX1A

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DATE	2019-03-15	2019-03-15

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MODIFICATION RECORD

No.	Report No	Modification Description
1	SYBH(Z-RF) 20190219030002-2004	First release.

DECLARATION

Type	Description
Multiple Models Applications	☒ The present report applies to single model. ☐ 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
Test Method :	FCC KDB 558074 D01 DTS Meas Guidance v05r01 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	3.8	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:	2019-03-04
Start of test:	2019-03-04
End of test:	2019-03-15

3 Test Summary

Test Item	FCC Rule No.	Requirements	Test Result	Verdict
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	Appendix A	Pass
Occupied Bandwidth	---	No limit	Appendix B	Pass
Duty Cycle	KDB 558074 D01 (6.0)	No limit	Appendix C	Pass
Maximum Average Output Power	15.247(b)(3)	FCC: For directional gain: Conducted < 30 dBm – (G[dBi] – 6 [dB]); Otherwise: Conducted < 30 dBm,	Appendix D	Pass
Maximum Power Spectral Density Level	15.247(e)	Conducted < 8 dBm/3 kHz.	Appendix E	Pass
Band Edges Compliance	15.247(d)	< -30 dBr/100 kHz if total average power ≤ power limit.	Appendix F	Pass
Unwanted Emissions into Non-Restricted Frequency Bands			Appendix G	Pass
Note1: 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

MAR-LX1A is 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 B8. The LTE frequency band is B1 and B3 and B4 and B7 and B8 and B20 and B38. The Mobile Phone implements such functions as RF signal receiving/transmitting, GSM/WCDMA/LTE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides one micro SD card interface (it can also used as SIM card interface), earphone port (to provide voice service) and one SIM card interface. MAR-LX1A are dual SIM and single SIM smart phones, Single SIM delete SIM only by software. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

Note: Only 2.4G WIFI 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	9.0.1.118(SP1C900E118R1P6)	HL3MARLM

4.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HW-090200EH0	Huawei Technologies Co., Ltd.	Input voltage: 100-240V ~50/60Hz 0.5A Output voltage: 5V  2A OR 9V  2A
Adapter	HW-090200BH0	Huawei Technologies Co., Ltd.	Input voltage: 100-240V ~50/60Hz 0.5A Output voltage: 5V  2A OR 9V  2A
Adapter	HW-090200UH0	Huawei Technologies Co., Ltd.	Input voltage: 100-240V ~50/60Hz 0.5A Output voltage: 5V  2A OR 9V  2A

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HW-059200EHQ	Huawei Technologies Co., Ltd.	Input voltage: 100-240V ~50/60Hz 0.5A Output voltage: 5V ☒ 2A OR 9V ☒ 2A
Adapter	HW-090200UH1	Huawei Technologies Co., Ltd.	Input voltage: 100-240V ~50/60Hz 0.5A Output voltage: 5V ☒ 2A OR 9V ☒ 2A
Battery	HB356687ECW	Huawei Technologies Co., Ltd.	Rated capacity: 3240mAh Nominal Voltage: ☒ +3.82V Charging Voltage: ☒ +4.40V

4.3 Technical Description

NOTE: For the detailed technical descriptions, see the applicant/manufacturer's specifications or user manual.

Characteristics	Description	
IEEE 802.11 WLAN Mode Supported	☒ 802.11b (20 MHz channel bandwidth), ☒ 802.11g (20 MHz channel bandwidth) ☒ 802.11n (20 MHz channel bandwidth), ☒ 802.11n (40 MHz channel bandwidth)	
TX/RX Operating Range	2412-2462 MHz band	$f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Data Rate	802.11b	1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps
	802.11g	6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps
	802.11n (SISO)	MCS 0 to MCS 7
Modulation Type	DBPSK/DQPSK/CCK (DSSS), BPSK/QPSK/16QAM/64QAM (OFDM).	
Emission Designator	8M25G7D (for 802.11b mode), 16M4G7D (for 802.11g mod), 17M6G7D (for 802.11n20 mode), 35M8G7D (for 802.11n40 mode)	
TX Power Control	☐ Supported, ☒ Not Supported	
Standby Mode	☐ Supported, ☒ Not Supported	
Equipment Type	☒ Stand-alone equipment, ☐ Plug-in radio device, ☐ Combined equipment	
Antenna	Description	Isotropic Antenna
	Type	☒ Integral ☐ External ☐ Dedicated

Characteristics	Description	
	Ports	☒ Ant 1, ☐ Ant 2, ☐ Ant 3
	Smart System	☒ SISO (for 802.11b/g/n), ☐ CDD (for 802.11g), 2 Tx & 2 Rx, ☐ MIMO (for 802.11n), 2 Tx & 2 Rx, ☐ Diversity (for 802.11b/g) : Tx & Rx
	Gain	Ant 1: -2.4 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	☐ External DC mains, ☒ Battery, ☐ AC/DC Adapter, ☐ Powered over Ethernet (PoE). ☐ 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
11B	IEEE 802.11b with data rate of 1 Mbps using SISO mode.
11G	IEEE 802.11g 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.
11N40	IEEE 802.11n with data rate of MCS0 and bandwidth of 40 MHz using SISO mode.

5.2 EUT Configurations

5.2.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, - 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	RF Ch.	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]	Power Conf., per Port	Duty cycle [%]
11B	L	Ch No. 1 / 2412 MHz	---	20	17	99.52
	M	Ch No. 6 / 2437 MHz	---	20	16	99.52
	H	Ch No. 11 / 2462 MHz	---	20	16	99.52
11G	L	Ch No. 1 / 2412 MHz	---	20	13	98.35
	L	Ch No. 2 / 2417 MHz	---	20	13.5	98.35
	M	Ch No. 6 / 2437 MHz	---	20	13	98.38
	H	Ch No. 10 / 2457 MHz	---	20	13	98.38
	H	Ch No. 11 / 2462 MHz	---	20	12	98.38
11N20	L	Ch No. 1 / 2412 MHz	---	20	12	98.26
	L	Ch No. 2 / 2417 MHz	---	20	12.5	98.22
	M	Ch No. 6 / 2437 MHz	---	20	12	98.22
	H	Ch No. 10 / 2457 MHz	---	20	12	98.22
	H	Ch No. 11 / 2462 MHz	---	20	11	98.26
11N40	L	Ch No. 3 / 2422 MHz	---	40	10	96.59
	L	Ch No. 4 / 2427 MHz	---	40	12.5	96.59
	M	Ch No. 6 / 2437 MHz	---	40	12.5	96.59
	H	Ch No. 8 / 2447MHz	---	40	12.5	96.59
	H	Ch No. 9 / 2452 MHz	---	40	10	96.59

5.3 Antenna requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 shall be considered sufficient to comply with the provisions of this section.”

The antennas of the MAR-LX1A are permanently attached.

There are no provisions for connection to an external antenna.

Conclusion:

The EUT FCC ID: QISMAR-LX1A unit complies with the requirement of §15.203.

Ch. Frequency (MHz)

Ch.	Frequency (MHz)
01	2412
.	.
.	.
06	2437
.	.
.	.
11	2462

Frequency/ Channel Operations

5.4 Description of tests

5.4.1 Bandwidth measurement

- (a) Connect EUT test port to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz, then set the measured frequency number and test the bandwidth with spectrum analyzer.

5.4.2 Average output power

- (a) Connect EUT test port to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted output power separately.

5.4.3 Band edge spurious emission

- (a) Connect EUT test port to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, low frequency and measure the conducted band edge spurious separately.

5.4.4 Conducted RF spurious

- (a) Connect EUT test port to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted spurious separately.

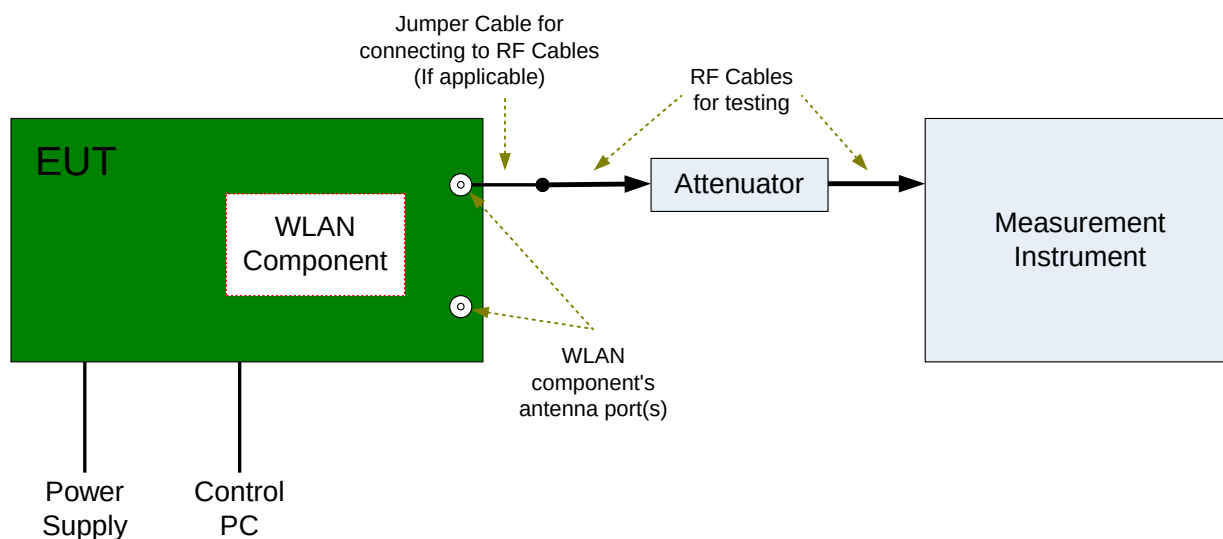
5.4.5 Power spectral density

- (a) Connect EUT test port to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted power spectral density.

5.5 Test Setups

5.5.1 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.



5.6 Test Conditions

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 D01 §8.2 Option 2.
	Test Environment	TN/VN
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1,11N20_M@Ant1,11N20_H@Ant1 11N40_L@Ant1,11N40_M@Ant1,11N40_H@Ant1
Occupied Bandwidth	Measurement Method	FCC KDB 558074 D01 §8.2 Option 2.
	Test Environment	TN/VN
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1,11N20_M@Ant1,11N20_H@Ant1 11N40_L@Ant1,11N40_M@Ant1,11N40_H@Ant1
Maximum Conducted Average Output Power	Measurement Method	FCC KDB 558074 D01 §8.3.2.2
	Test Environment	TN/VN
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1,11N20_M@Ant1,11N20_H@Ant1 11N40_L@Ant1,11N40_M@Ant1,11N40_H@Ant1
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 D01 §8.4
	Test Environment	TN/VN
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1,11N20_M@Ant1,11N20_H@Ant1 11N40_L@Ant1,11N40_M@Ant1,11N40_H@Ant1
Band Edges Compliance	Measurement Method	FCC KDB 558074 D01 §8.7
	Test Environment	TN/VN
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1,11N20_M@Ant1,11N20_H@Ant1 11N40_L@Ant1,11N40_M@Ant1,11N40_H@Ant1,
Unwanted Emissions into Non-Restricted	Measurement Method	FCC KDB 558074 D01 §8.5
	Test Environment	TN/VN
	Test Setup	Test Setup 1



Test Case	Test Conditions	
	Configuration	Description
Frequency Bands	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1,11N20_M@Ant1,11N20_H@Ant1 11N40_L@Ant1,11N40_M@Ant1,11N40_H@Ant1

5.7 Main Instruments

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

Devices used during the test described are marked ☒

☒ Main Test Equipment(BT/WIFI test system)						
Marked	Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal-Due
☐	JS1120-3 BT/WIFI test system	JS Tonscend	JS0806-2	188060102	2018/05/30	2019/05/30
☐	Power Detecting & Samplig Unit	R&S	OSP-B157	101429	2018/07/23	2019/07/23
☐	Power Sensor	R&S	NRP2	103085/106211	2018/05/17	2019/05/17
☐	DC Power Supply	KEITHLEY	2303	1342889	2018/10/24	2019/10/24
☐	DC Power Supply	KEITHLEY	2303	000500E	2018/05/21	2019/05/21
☐	DC Power Supply	KEITHLEY	2303	1288003	2017/12/21	2018/12/21
☐	DC Power Supply	KEITHLEY	2303	000381E	2018/05/21	2019/05/21
☒	DC Power Supply	KEITHLEY	2303	000510E	2018/05/21	2019/05/21
☐	DC Power Supply	KEITHLEY	2303	1342896	2018/10/24	2019/10/24
☐	Temperature Chamber	WEISS	WKL64	56246002940010	2018/10/24	2019/10/24
☐	Spectrum Analyzer	Agilent	N9030A	MY51380032	2018/07/23	2019/07/23
☒	Spectrum Analyzer	Agilent	N9030A	MY49431698	2018/07/23	2019/07/23
☐	Spectrum Analyzer	Keysight	N9040B	MY57212529	2018/06/28	2019/06/28
☐	Signal Analyzer	R&S	FSQ31	200021	2018/07/23	2019/07/23
☐	Signal Analyzer	R&S	FSU26	201069	2018/11/2	2019/11/2
☐	Universal Radio Communication Tester	R&S	CMW500	164699	2018/03/15	2019/03/15
☐	Universal Radio Communication Tester	R&S	CMW500	159302	2018/07/23	2019/07/23
☐	Wireless Communication Test set	Agilent	N4010A	MY49081592	2018/07/23	2019/07/23
☒	Signal generator	Agilent	E8257D	MY51500314	2018/04/27	2019/04/27
☐	Signal generator	Agilent	E8257D	MY49281095	2018/07/23	2019/07/23
☐	Vector Signal Generator	R&S	SMW200A	103447	2018/05/31	2019/05/31
☐	Vector Signal Generator	R&S	SMU200A	104162	2018/07/23	2019/07/23

6 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 = 0.39 dB
RF Power Density, Conducted	Power [dBm]	U = 0.64 dB
Bandwidth	Magnitude [kHz]	20MHz: U=41.78kHz 40MHz: U=82.12kHz
Band Edge Compliance	Disturbance Power [dBm]	U = 0.9 dB
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=41.58Hz
Duty Cycle	Duty Cycle [%]	U=±2.06 %

7 Appendixes

Appendix No.	Description
SYBH(Z-RF)20190219030002-2004-A	Appendix for 2.4G WLAN

END