

TEST REPORT

EMI Test for FCC Certification / ISED of LM-X120WM Model

APPLICANT

LG Electronics USA, Inc.

REPORT NO.

HCT-EM-1907-FI004-R1

DATE OF ISSUE

August 22, 2019

HCT Co., Ltd.

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FCC ID / IC

ZNFX120WM / 2703C-X120WM

Applicant LG Electronics USA, Inc.
1000 Sylvan Avenue, Englewood Cliffs NJ 07632 United States

Product Name Multi-band GSM/WCDMA/LTE Mobile Phone with BT and WiFi
Model Name LM-X120WM
Series Model Name Refer to the clause 1.1 Description of EUT

Travel Adaptor Information Model name: MCS-V01WA
Manufacturer: AOHA1

Date of Test July 10, 2019 to July 15, 2019

Test Standard Used FCC CFR 47 PART 15 Subpart B Class B / ICES-003 Issue 6 Class B
ANSI C63.4-2014

Test Results Refer to the present document

Manufacturer LG Electronics Inc.

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

Tested by
Na-Eun Song

(signature)

Technical Manager
Gu-Cheol Yoon

(signature)

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REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	July 26, 2019	Initial Release
1	August 22, 2019	Corrected Misspelled Words.

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

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1. GENERAL INFORMATION

1.1 Description of EUT

FCC ID	ZNFX120WM
IC	2703C-X120WM
Model Name	LM-X120WM
Series Model Name	LMX120WM, X120WM
Product Name	Multi-band GSM/WCDMA/LTE Mobile Phone with BT and WiFi
TX Frequency	824.20 MHz to 848.80 MHz (GSM 850) 1 850.20 MHz to 1 909.80 MHz (GSM 1 900) 1 852.4 MHz to 1 907.6 MHz (WCDMA B2) 1712.4 MHz to 1752.6 MHz (WCDMA B4) 826.40 MHz to 846.60 MHz (WCDMA B5) 1 850 MHz to 1 910 MHz (LTE B2) 1 710 MHz to 1 755 MHz (LTE B4) 824 MHz to 849 MHz (LTE B5) 699 MHz to 716 MHz (LTE B12) 777 MHz to 787 MHz (LTE B13) 704 MHz to 716 MHz (LTE B17) 1 710 MHz to 1 780 MHz (LTE B66) 2 402 MHz to 2 480 MHz (Bluetooth) 2 412 MHz to 2 462 MHz (WiFi 2.4 GHz)
RX Frequency	869.20 MHz to 893.80 MHz (GSM 850) 1 930.20 MHz to 1 989.80 MHz (GSM 1 900) 1 932.4 MHz to 1 987.6 MHz (WCDMA B2) 2 112.4 MHz to 2 152.6 MHz (WCDMA B4) 871.40 MHz to 891.60 MHz (WCDMA B5) 1 930 MHz to 1 990 MHz (LTE B2) 2 110 MHz to 2 155 MHz (LTE B4) 869 MHz to 894 MHz (LTE B5) 729 MHz to 746 MHz (LTE B12) 746 MHz to 756 MHz (LTE B13) 734 MHz to 746 MHz (LTE B17) 2 110 MHz to 2 200 MHz (LTE B66) 2 402 MHz to 2 480 MHz (Bluetooth) 2 412 MHz to 2 462 MHz (WiFi 2.4 GHz)

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1.2 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Device Type	Model Name	Serial Number	Manufacturer
EUT	LM-X120WM	-	LG
Data Cable	EAD62377922	-	KSD
Earphone	EAB64468445	-	BUJEON
TA	MCS-V01WA	-	AOHAI
Micro SD card	SAMSUNG EVO+ microSDXC CLASS10 UHS- I (256 GB)	-	SAMSUNG

1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	Micro USB	Y	N/A	(P)1.0
	Earphone	N/A	N	(D)1.2

NOTE. The marked "(D)" means the data cable and "(P)" means the power cable.

1.4 Noise Suppression Parts on Cable (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	Micro USB	N	N/A	Y	Both End
	Earphone	N	N/A	Y	EUT End

1.5 Test Facility

Test site is located at 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, South Korea. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1 GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Designation No.
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	KR0032
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #1	
Radiated Field strength measurement facility 10 m Semi Anechoic chamber #2	

1.6 Calibration of Measuring Instrument

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5:2017

1.7 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty
Conducted Emission (0.15 MHz to 30 MHz)	1.80 dB
3 m Radiated Emissions (30 MHz to 1 GHz)	4.80 dB
3 m Radiated Emissions (1 GHz to 18 GHz)	4.78 dB
3 m Radiated Emissions (18 GHz to 40 GHz)	4.94 dB

2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 7.3

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

Conducted Emission Limits

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dBμV)	Average (dBμV)	Quasi-Peak (dBμV)	Average (dBμV)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

NOTE. Decreases with the logarithm of the frequency.

2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014, Clause 8.3

- The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
(1 GHz to 40 GHz)

Radiated Emission Limits

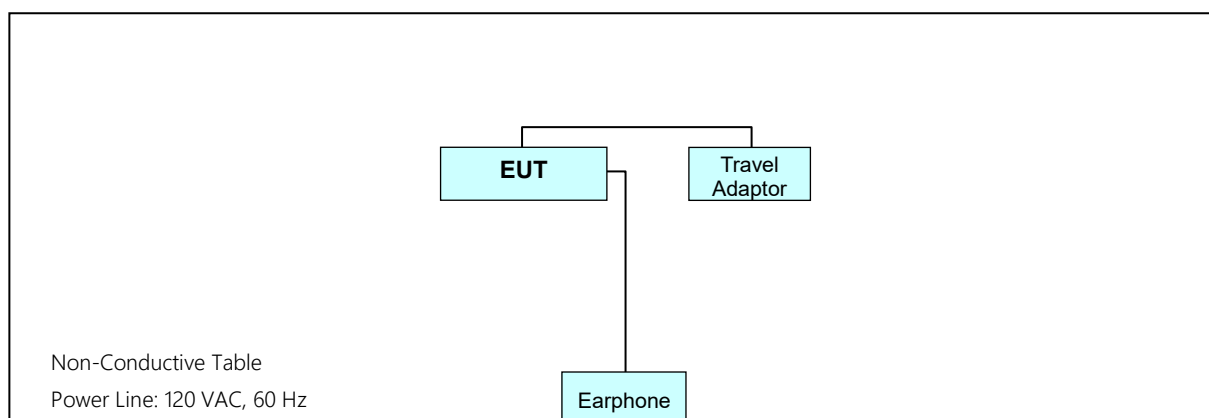
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	
Above 1 000	3	80	60	74	54	

2.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

2.3 Configuration of Tested System



3. PRELIMINARY TEST

3.1 Conducted Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes: FRONT CAMERA & MP3 mode

REAR CAMERA & FM RADIO mode

IDLE mode

NOTE. The worst-case emissions are reported.

3.2 Radiated Emission

It was tested the following operating mode, after connecting all peripheral devices.

Operating Modes: FRONT CAMERA & MP3 mode

REAR CAMERA & FM RADIO mode

IDLE mode

NOTE. The worst-case emissions are reported.

4. CONDUCTED EMISSION AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission

4.1.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.18.2019
☒	LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
☒	Software	Rohde & Schwarz	EMC32	-	-	-

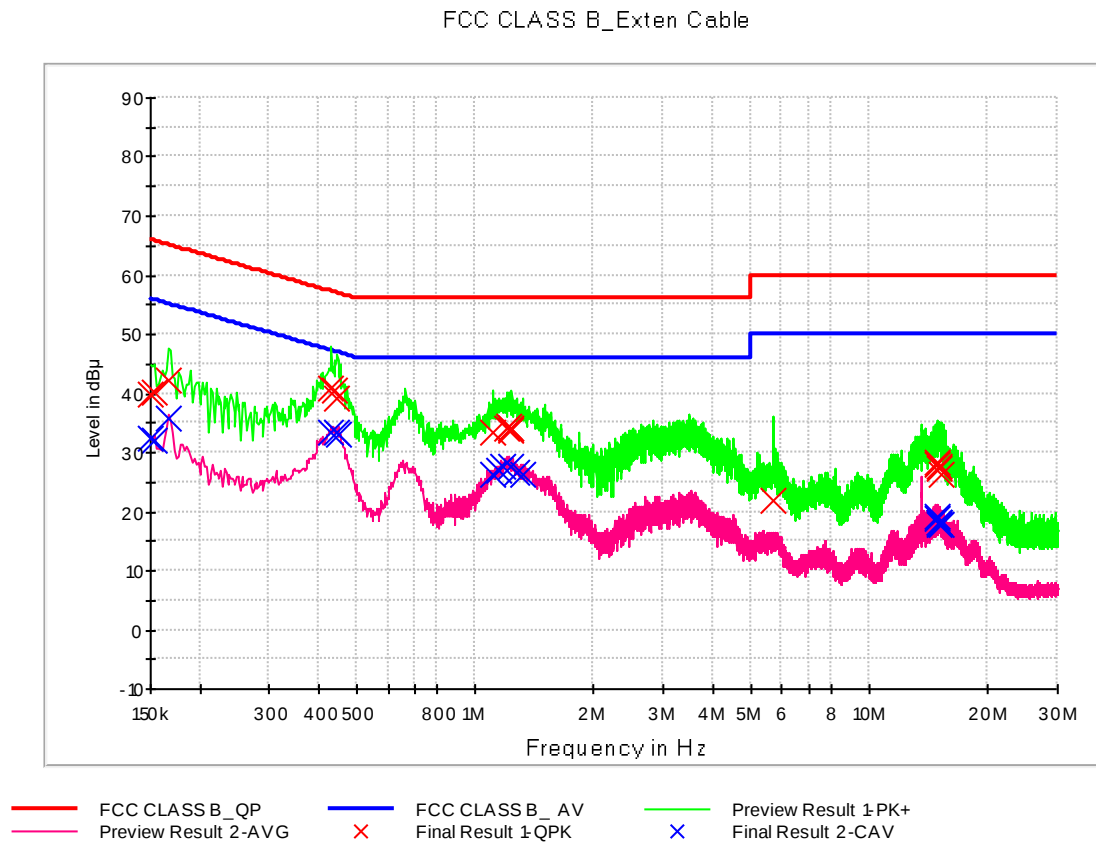
4.1.2 Operating Condition

The test results of conducted emission at mains ports provide the following information:

Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operating Mode	FRONT CAMERA & MP3 mode
Kind of Test Site	Shielded Room
Temperature	21.7 °C
Relative Humidity	44.3 %
Test Date	July 10, 2019

4.1.3 Measuring Data

Figure 1: Conducted Emission, AC Main Port, Line (L1)



QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	39.9	9.000	L1	9.7	26.1	66.0
0.154000	40.3	9.000	L1	9.7	25.5	65.8
0.166000	42.3	9.000	L1	9.7	22.9	65.2
0.432000	40.9	9.000	L1	9.7	16.3	57.2
0.440000	40.4	9.000	L1	9.7	16.6	57.1
0.446000	39.3	9.000	L1	9.7	17.6	56.9
1.112000	33.4	9.000	L1	9.8	22.6	56.0
1.208000	34.1	9.000	L1	9.8	21.9	56.0
1.218000	34.4	9.000	L1	9.8	21.6	56.0
1.226000	34.1	9.000	L1	9.8	21.9	56.0
1.232000	34.0	9.000	L1	9.8	22.0	56.0
1.238000	33.7	9.000	L1	9.9	22.3	56.0
5.730000	21.9	9.000	L1	10.1	38.1	60.0
14.932000	28.4	9.000	L1	10.4	31.6	60.0
14.936000	28.0	9.000	L1	10.4	32.0	60.0
15.010000	27.5	9.000	L1	10.4	32.5	60.0
15.038000	27.4	9.000	L1	10.4	32.6	60.0
15.196000	26.4	9.000	L1	10.4	33.6	60.0

Calculation Formula:

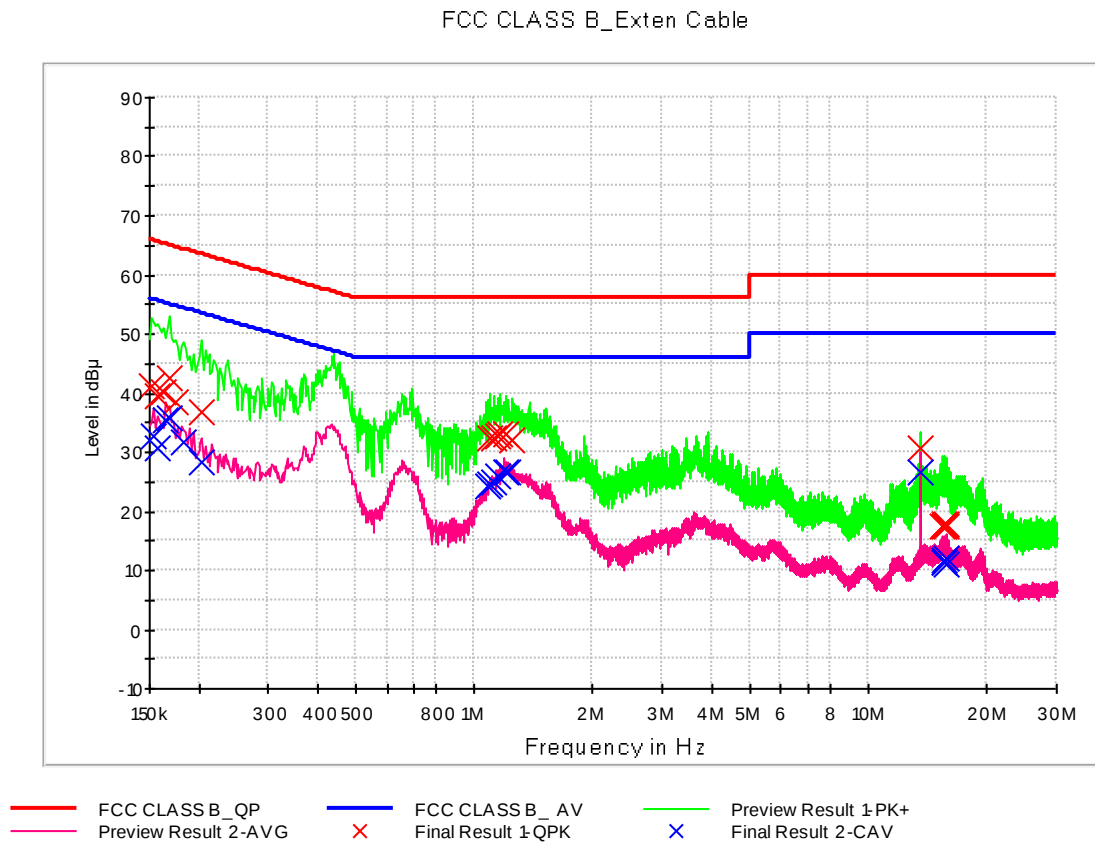
1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	32.2	9.000	L1	9.7	23.8	56.0
0.154000	32.1	9.000	L1	9.7	23.6	55.8
0.166000	35.7	9.000	L1	9.7	19.4	55.2
0.432000	33.5	9.000	L1	9.7	13.7	47.2
0.444000	33.4	9.000	L1	9.7	13.6	47.0
0.448000	33.1	9.000	L1	9.7	13.8	46.9
1.112000	26.3	9.000	L1	9.8	19.7	46.0
1.148000	26.8	9.000	L1	9.8	19.2	46.0
1.174000	27.5	9.000	L1	9.8	18.5	46.0
1.232000	27.6	9.000	L1	9.8	18.4	46.0
1.276000	26.7	9.000	L1	9.9	19.3	46.0
1.320000	26.3	9.000	L1	9.9	19.7	46.0
14.932000	19.0	9.000	L1	10.4	31.0	50.0
14.936000	18.7	9.000	L1	10.4	31.3	50.0
15.010000	18.0	9.000	L1	10.4	32.0	50.0
15.038000	18.0	9.000	L1	10.4	32.0	50.0
15.098000	17.8	9.000	L1	10.4	32.2	50.0
15.196000	17.7	9.000	L1	10.4	32.3	50.0

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Figure 2: Conducted Emission, AC Main Port, Line (N)



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.152000	41.0	9.000	N	9.8	24.9	65.9
0.158000	39.4	9.000	N	9.8	26.1	65.6
0.162000	40.2	9.000	N	9.8	25.2	65.4
0.168000	42.5	9.000	N	9.8	22.6	65.1
0.174000	38.6	9.000	N	9.8	26.2	64.8
0.204000	36.7	9.000	N	9.9	26.7	63.4
1.098000	32.3	9.000	N	10.0	23.7	56.0
1.124000	32.3	9.000	N	10.0	23.7	56.0
1.146000	32.6	9.000	N	10.0	23.4	56.0
1.162000	33.1	9.000	N	10.0	22.9	56.0
1.202000	32.9	9.000	N	10.0	23.1	56.0
1.252000	32.0	9.000	N	10.0	24.0	56.0
13.558000	30.5	9.000	N	10.6	29.5	60.0
15.362000	17.4	9.000	N	10.7	42.6	60.0
15.502000	17.7	9.000	N	10.7	42.3	60.0
15.668000	17.6	9.000	N	10.7	42.4	60.0
15.682000	17.8	9.000	N	10.7	42.2	60.0
15.740000	17.6	9.000	N	10.7	42.4	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.154000	32.6	9.000	N	9.8	23.2	55.8
0.158000	30.7	9.000	N	9.8	24.8	55.6
0.164000	35.3	9.000	N	9.8	20.0	55.3
0.168000	35.7	9.000	N	9.8	19.4	55.1
0.184000	31.9	9.000	N	9.8	22.4	54.3
0.204000	28.5	9.000	N	9.9	25.0	53.4
1.086000	24.1	9.000	N	10.0	21.9	46.0
1.098000	24.6	9.000	N	10.0	21.4	46.0
1.124000	25.0	9.000	N	10.0	21.0	46.0
1.146000	25.9	9.000	N	10.0	20.1	46.0
1.202000	26.6	9.000	N	10.0	19.4	46.0
1.220000	26.8	9.000	N	10.0	19.2	46.0
13.560000	26.7	9.000	N	10.6	23.3	50.0
15.566000	11.2	9.000	N	10.7	38.8	50.0
15.664000	11.3	9.000	N	10.7	38.7	50.0
15.668000	11.6	9.000	N	10.7	38.4	50.0
15.682000	12.1	9.000	N	10.7	37.9	50.0
15.740000	11.1	9.000	N	10.7	38.9	50.0

4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	Trilog antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn Table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Software	Rohde & Schwarz	EMC32	-	-	-

4.2.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Operating Mode	FRONT CAMERA & MP3 mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	22.4 °C
Relative Humidity	41.6 %
Test Date	July 15, 2019

4.2.3 Measuring Data

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
39.481600	16.9	191.8	V	68.0	18.9	23.1	40.0
46.189600	18.6	100.0	V	26.0	19.5	21.4	40.0
97.167200	21.4	274.9	H	113.0	14.9	22.1	43.5
250.012800	21.6	174.7	V	169.0	18.8	24.4	46.0
680.500000	28.4	274.8	V	276.0	28.5	17.6	46.0
956.521600	32.2	174.8	H	340.0	32.0	13.8	46.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak

4.3 Radiated Emission Above 1 GHz

4.3.1 Measuring instruments

	Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
☒	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
☒	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
☒	Turn table	INNCO Systems	1060	-	N/A	-
☒	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
☒	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
☒	Horn antenna	Schwarzbeck	BBHA 9120D	01836	1 year	07.20.2018
☐	Power Amplifier	TK-PA1840H	TESTEK	170030-L	1 year	12.17.2018
☐	Horn Antenna	BBHA 9170	Schwarzbeck	BBHA9170 #786	2 year	12.05.2017
☒	Software	Rohde & Schwarz	EMC32	-	-	-

4.3.2 Operating Condition

The test results of radiated emission provide the following information:

Used Test Standard	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 6 Class B ANSI C63.4-2014
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Frequency	2 480 MHz
Tested Frequency Range	1 GHz to 18 GHz
Operation Mode	FRONT CAMERA & MP3 mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	21.9 °C
Relative Humidity	43.3 %
Test Date	July 12, 2019

4.3.3 Measuring Data

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3029.530000	35.2	350.0	V	29.0	-21.0	38.8	74.0
4957.200000	39.2	298.4	V	38.0	-15.9	34.8	74.0
7381.615000	45.5	218.4	V	0.0	-9.6	28.5	74.0
9644.720000	48.3	149.5	V	18.0	-5.1	25.7	74.0
10871.190000	49.2	141.6	V	356.0	-2.7	24.8	74.0
14757.325000	50.4	111.6	V	30.0	1.1	23.6	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3029.530000	22.3	350.0	V	29.0	-21.0	31.7	54.0
4957.200000	26.2	298.4	V	38.0	-15.9	27.8	54.0
7381.615000	31.7	218.4	V	0.0	-9.6	22.3	54.0
9644.720000	35.4	149.5	V	18.0	-5.1	18.6	54.0
10871.190000	36.0	141.6	V	356.0	-2.7	18.0	54.0
14757.325000	36.9	111.6	V	30.0	1.1	17.1	54.0

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage

5. CONCLUSION

The data collected shows that the **EUT Type: Multi-band GSM/WCDMA/LTE Mobile Phone with BT and WiFi,**
Model: LM-X120WM complies with §15.107 and §15.109 of the FCC rules and ICES-003 Issue 6 of the IC rules.

6. APPENDIX A. TEST SETUP PHOTO

Please refer to Appendix. A and test setup photo file no. as follows;

File No.	Date of Issue	Description
HCT-EM-1907-FI004-P	July 26, 2019	Initial Release

End of report