

TEST REPORT

EMI Test for FCC Certification of LM-X320AA

APPLICANT

LG Electronics USA, Inc.

REPORT NO.

HCT-EM-1906-FC007

DATE OF ISSUE

June 04, 2019

HCT Co., Ltd.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 Fax. +82 31 645 6401



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74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 Fax. +82 31 645 6401

TEST REPORT EMI Test for FCC Certification	REPORT NO. HCT-EM-1906-FC007
	DATE OF ISSUE June 04, 2019
	FCC ID. ZNFX320AA

Applicant	LG Electronics USA, Inc. 1000 Sylvan Avenue, Englewood Cliffs NJ 07632 United States
Product Name	Multi-band GSM/EDGE/WCDMA/LTE Phone with WLAN, Bluetooth and NFC
Model Name	LM-X320AA
Series Model Name	Refer to the clause 1.1 Description of EUT
Travel Adaptor Information	Model name: MCS-V01WA Manufacturer: AOHAI
Date of Test	May 23, 2019 to June 03, 2019
Test Standard Used	FCC CFR 47 PART 15 Subpart B Class B ANSI C63.4-2014
Test Results	Refer to the present document
Manufacturer	LG Electronics Inc.

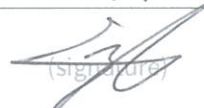
The result shown in this test report refer only to the sample(s) tested unless otherwise stated.

Tested by
Na-Eun Song



(signature)

Technical Manager
Jeong-Hyun Choi



(signature)

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	June 04, 2019	Initial Release

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

Its basic purpose is used for communications.

FCC ID	ZNFX320AA
Model	LM-X320AA
Series Model Name	LMX320AA, X320AA
EUT Type	Multi-band GSM/EDGE/WCDMA/LTE Phone with WLAN, Bluetooth and NFC
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) 788 MHz to 798 MHz (LTE B14) 2 402 MHz to 2 480 MHz (Bluetooth) 2 412 MHz to 2 462 MHz (WiFi 2.4 GHz) 13.56 MHz (NFC)
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) 758 MHz to 768 MHz (LTE B14) 2 402 MHz to 2 480 MHz (Bluetooth) 2 412 MHz to 2 462 MHz (WiFi 2.4 GHz) 13.56 MHz (NFC)

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-X320AA	-	LG
Data cable	EAD62377921	-	Leagtech
Earphone	EAB64468444	-	CRESYN
TA	MCS-V01WA	-	AOHAI
Micro SD card	Extreme Micro SDHC UHS-1 CLASS 10 (32 GB)	-	SanDisk

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 (Version : 2006).

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)	1.82 dB
Radiated Emissions (30 MHz to 1 GHz)	5.20 dB
Radiated Emissions (1 GHz to 18 GHz)	5.24 dB
Radiated Emissions (18 GHz to 40 GHz)	5.40 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

- a. 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.
- b. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. 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.
- f. 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.
- g. 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

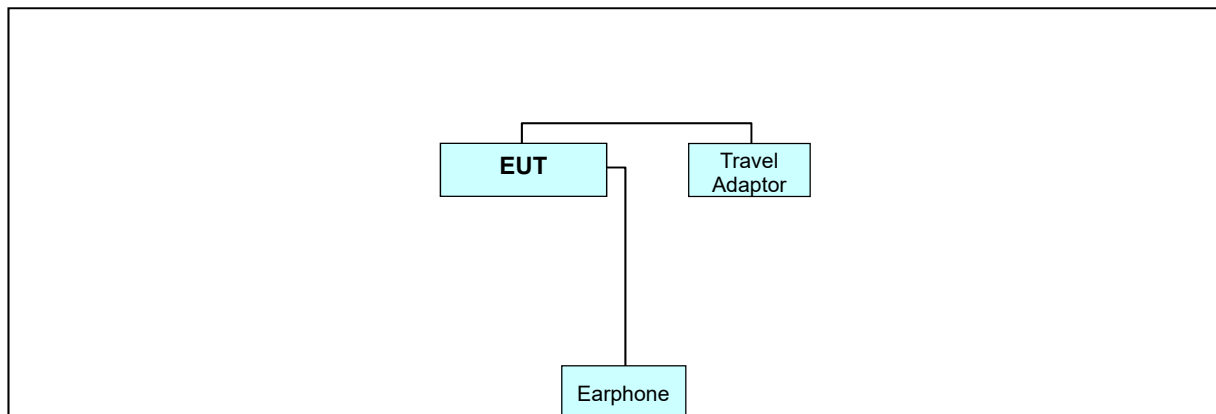
Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/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
Below 1.705	30

2.3 Configuration of Tested System



Non-Conductive Table
 Power Line: 120 VAC, 60 Hz

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
<input checked="" type="checkbox"/> EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.25.2018
<input checked="" type="checkbox"/> LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32 VER8.54.0	-	-	-

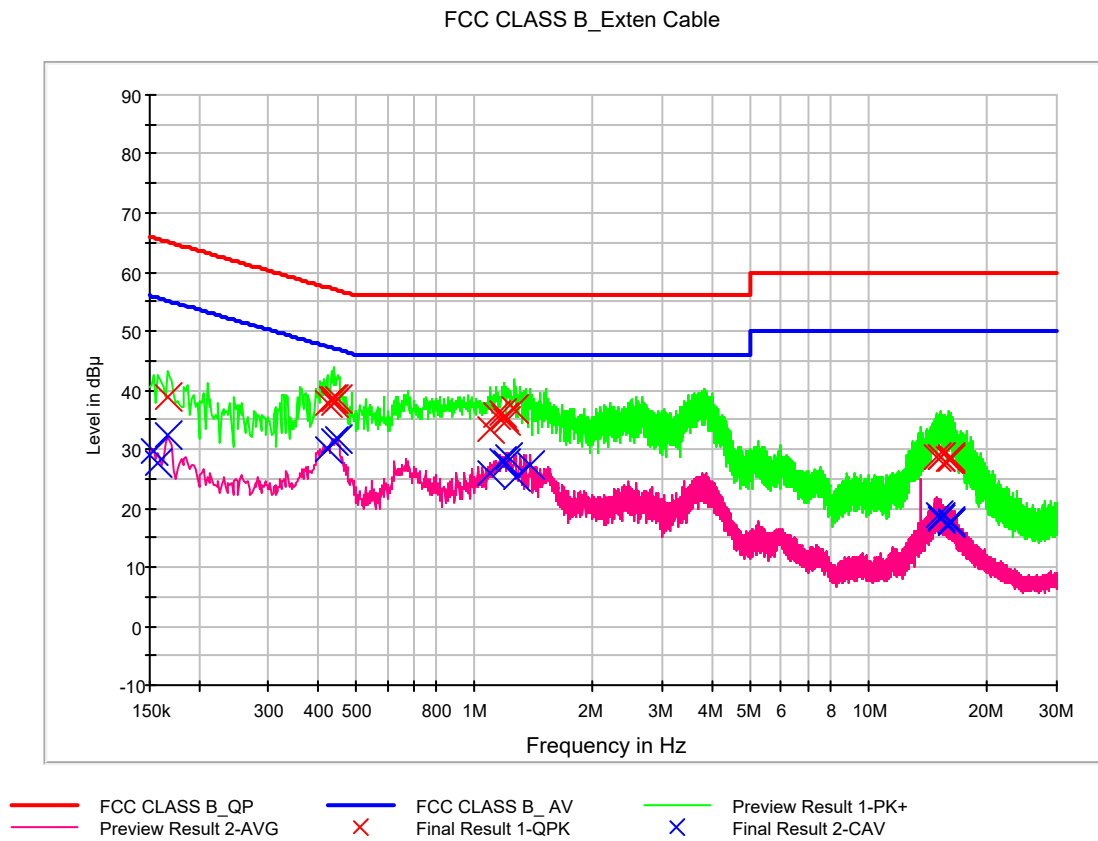
4.1.2 Operating Condition

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 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	23.7 °C
Relative Humidity	41.2 %
Test Date	May 23, 2019

4.1.3 Measuring Data

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



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QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.166000	38.7	9.000	L1	9.7	26.4	65.2
0.424000	37.7	9.000	L1	9.7	19.7	57.4
0.434000	38.6	9.000	L1	9.7	18.6	57.2
0.438000	38.6	9.000	L1	9.7	18.5	57.1
0.442000	37.8	9.000	L1	9.7	19.3	57.0
0.450000	38.5	9.000	L1	9.8	18.4	56.9
1.100000	33.5	9.000	L1	9.8	22.5	56.0
1.132000	35.6	9.000	L1	9.8	20.4	56.0
1.178000	36.1	9.000	L1	9.8	19.9	56.0
1.188000	35.6	9.000	L1	9.8	20.4	56.0
1.208000	34.6	9.000	L1	9.8	21.4	56.0
1.266000	36.7	9.000	L1	9.9	19.3	56.0
14.958000	28.7	9.000	L1	10.4	31.3	60.0
15.240000	28.6	9.000	L1	10.4	31.4	60.0
15.258000	28.5	9.000	L1	10.4	31.5	60.0
16.026000	28.4	9.000	L1	10.4	31.6	60.0
16.062000	28.7	9.000	L1	10.5	31.3	60.0
16.178000	28.2	9.000	L1	10.5	31.8	60.0

Calculation Formula:

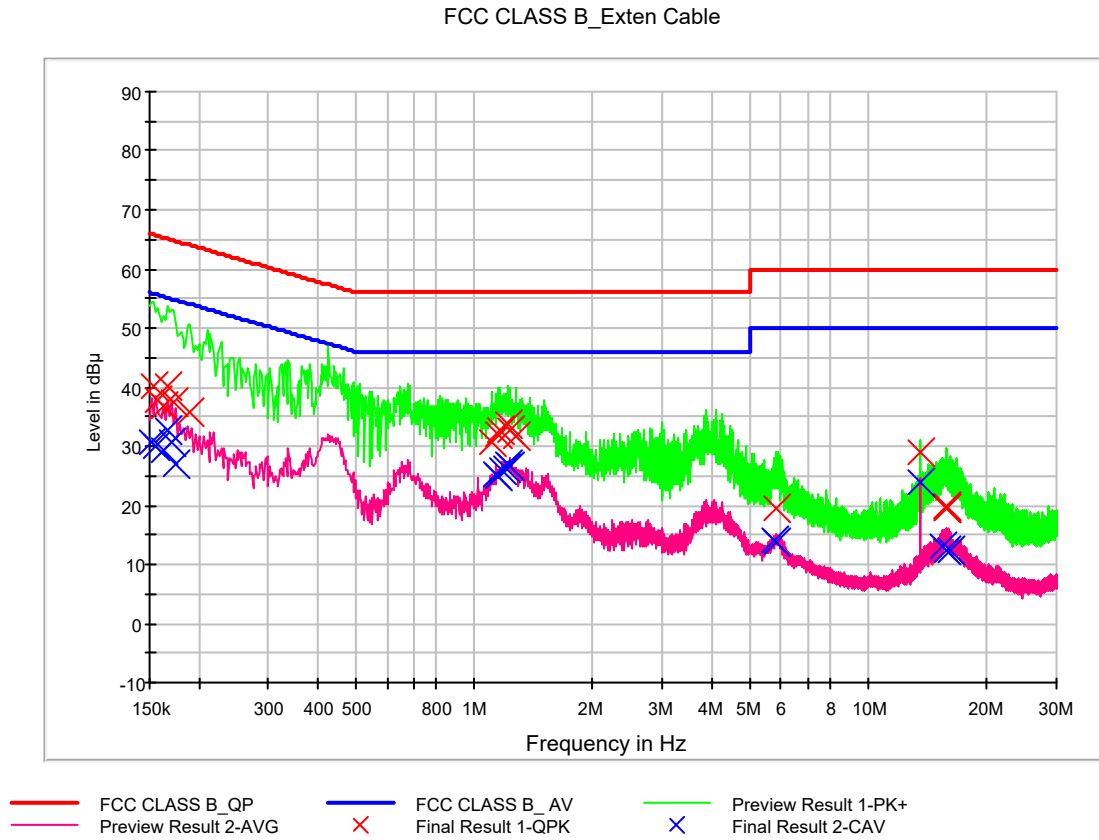
1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154000	29.5	9.000	L1	9.7	26.2	55.8
0.158000	27.8	9.000	L1	9.7	27.8	55.6
0.166000	32.2	9.000	L1	9.7	22.9	55.2
0.424000	29.9	9.000	L1	9.7	17.4	47.4
0.438000	31.3	9.000	L1	9.7	15.8	47.1
0.448000	31.6	9.000	L1	9.7	15.3	46.9
1.100000	26.0	9.000	L1	9.8	20.0	46.0
1.176000	28.0	9.000	L1	9.8	18.0	46.0
1.208000	27.5	9.000	L1	9.8	18.5	46.0
1.224000	28.6	9.000	L1	9.8	17.4	46.0
1.282000	25.2	9.000	L1	9.9	20.8	46.0
1.382000	27.4	9.000	L1	9.9	18.6	46.0
15.036000	18.8	9.000	L1	10.4	31.2	50.0
15.240000	18.5	9.000	L1	10.4	31.5	50.0
15.258000	18.2	9.000	L1	10.4	31.8	50.0
16.062000	17.6	9.000	L1	10.5	32.4	50.0
16.088000	17.7	9.000	L1	10.5	32.3	50.0
16.110000	17.4	9.000	L1	10.5	32.6	50.0

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



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QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.154000	40.1	9.000	N	9.8	25.7	65.8
0.158000	37.9	9.000	N	9.8	27.7	65.6
0.162000	36.7	9.000	N	9.8	28.6	65.4
0.166000	40.2	9.000	N	9.8	25.0	65.2
0.172000	37.4	9.000	N	9.8	27.4	64.9
0.190000	35.9	9.000	N	9.8	28.2	64.0
1.106000	30.7	9.000	N	10.0	25.3	56.0
1.150000	31.9	9.000	N	10.0	24.1	56.0
1.164000	32.8	9.000	N	10.0	23.2	56.0
1.216000	33.6	9.000	N	10.0	22.4	56.0
1.228000	32.6	9.000	N	10.0	23.4	56.0
1.278000	31.8	9.000	N	10.0	24.2	56.0
5.818000	19.3	9.000	N	10.3	40.7	60.0
13.560000	28.9	9.000	N	10.6	31.1	60.0
15.740000	19.7	9.000	N	10.7	40.3	60.0
15.766000	19.6	9.000	N	10.7	40.4	60.0
15.774000	19.7	9.000	N	10.7	40.3	60.0
15.782000	19.6	9.000	N	10.7	40.4	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.152000	30.6	9.000	N	9.8	25.2	55.9
0.156000	30.1	9.000	N	9.8	25.5	55.7
0.162000	29.5	9.000	N	9.8	25.9	55.4
0.166000	32.8	9.000	N	9.8	22.3	55.2
0.170000	30.6	9.000	N	9.8	24.4	55.0
0.174000	27.0	9.000	N	9.8	27.8	54.8
1.138000	25.1	9.000	N	10.0	20.9	46.0
1.150000	25.0	9.000	N	10.0	21.0	46.0
1.182000	25.9	9.000	N	10.0	20.1	46.0
1.208000	26.4	9.000	N	10.0	19.6	46.0
1.216000	27.1	9.000	N	10.0	18.9	46.0
1.228000	26.5	9.000	N	10.0	19.5	46.0
5.782000	14.0	9.000	N	10.3	36.0	50.0
5.818000	13.7	9.000	N	10.3	36.3	50.0
13.560000	23.9	9.000	N	10.6	26.1	50.0
15.348000	13.1	9.000	N	10.7	36.9	50.0
15.782000	12.4	9.000	N	10.7	37.6	50.0
16.148000	12.3	9.000	N	10.7	37.7	50.0

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4.2 Radiated Emission Below 1 GHz

4.2.1 Measuring instruments

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	Calibration Date
<input checked="" type="checkbox"/> EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
<input checked="" type="checkbox"/> Trilog antenna	Schwarzbeck	VULB 9168	255	2 year	03.26.2019
<input checked="" type="checkbox"/> Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/> Antenna master controller	INNCO Systems	CO 3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/> Turn Table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/> Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/> Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

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 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	24.7 °C
Relative Humidity	45.2 %
Test Date	May 29, 2019

4.2.3 Measuring Data

Frequency (MHz)	Quasi Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
31.806400	18.7	125.3	V	346.0	18.4	21.3	40.0
49.313600	18.2	100.0	V	158.0	19.8	21.8	40.0
114.541600	20.5	174.9	V	217.0	16.8	23.0	43.5
155.974400	18.2	100.0	H	30.0	19.7	25.3	43.5
675.340000	28.4	100.0	V	190.0	28.5	17.6	46.0
932.699200	32.0	100.0	H	260.0	31.8	14.0	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
<input checked="" type="checkbox"/>	EMI test receiver	Rohde & Schwarz	ESU40	100524	1 year	05.17.2019
<input checked="" type="checkbox"/>	Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
<input checked="" type="checkbox"/>	Antenna master controller	INNCO Systems	CO3000	CO3000/870/ 35990515/L	N/A	-
<input checked="" type="checkbox"/>	Turn table	INNCO Systems	1060	-	N/A	-
<input checked="" type="checkbox"/>	Turn table controller	INNCO Systems	CO2000	CO2000/095/ 7590304/L	N/A	-
<input checked="" type="checkbox"/>	Horn antenna	Schwarzbeck	BBHA 9120D	01836	2 year	07.20.2018
<input checked="" type="checkbox"/>	Low Noise amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
<input checked="" type="checkbox"/>	Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-

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 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	22.5 °C
Relative Humidity	43.1 %
Test Date	June 03, 2019

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4.3.3 Measuring Data

Frequency (MHz)	Peak (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
2986.200000	35.2	100.0	V	178.0	-21.1	38.8	74.0
5394.650000	40.7	100.0	H	176.0	-15.3	33.3	74.0
7246.695000	43.7	100.0	V	315.0	-10.0	30.3	74.0
9573.905000	49.8	100.0	V	89.0	-5.1	24.2	74.0
11229.395000	49.3	177.4	V	1.0	-2.4	24.7	74.0
14740.410000	49.4	111.4	V	273.0	1.0	24.6	74.0

Frequency (MHz)	CAverage (dB μ V/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
2986.200000	22.4	100.0	V	178.0	-21.1	31.6	54.0
5394.650000	26.8	100.0	H	176.0	-15.3	27.2	54.0
7246.695000	30.7	100.0	V	315.0	-10.0	23.3	54.0
9573.905000	36.1	100.0	V	89.0	-5.1	18.0	54.0
11229.395000	35.7	177.4	V	1.0	-2.4	18.3	54.0
14740.410000	37.1	111.4	V	273.0	1.0	16.9	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/EDGE/WCDMA/LTE Phone with WLAN, Bluetooth and NFC, Model: LM-X320AA** complies with §15.107 and §15.109 of the FCC 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-1906-FC007-P	June 04, 2019	Initial Release

End of report