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EMI TEST REPORT
FCC CERTIFICATION / INDUSTRY CANADA

Applicant: **LG Electronics MobileComm U.S.A., Inc.** **1000 Sylvan Avenue, Englewood Cliffs NJ 07632**	**Date of Receipt: March 18, 2016** **Date of Issue: April 01, 2016** **Test Report No. HCT-E-1604-F003** **HCT FRN: 0005866421**

FCC ID : **ZNFVS500**

Rule Part(s) / Standard(s):	FCC CFR 47 PART 15 Subpart B Class B ICES-003 Issue 5 Class B
FCC Classification:	JBP (Part 15 B – Class B Computing Device Peripheral)
EUT Type:	Multi-band CDMA/EVDO/GSM/EDGE/WCDMA/LTE phone with WLAN and Bluetooth
IC:	2703C-VS500
Model Name:	LG-VS500
Additional Model Name(s):	LGVS500, VS500, LG-RS500, LGRS500, RS500
Test Port:	Micro USB / Earphone Port
Date of Test:	March 31, 2016 - April 01, 2016

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 C63.4-2003. (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 denial the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

Yoon Hyun Park
Test Engineer
EMC Team
Certification Division

Reviewed By

Jin-Pyo Hong
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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1604-F003	April 01, 2016	Initial Release

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ATTACHMENT: TEST SETUP PHOTOGRAPHS

1. GENERAL INFORMATION

1.1 Description of EUT

The EUT is manufactured by **LG Electronics MobileComm U.S.A., Inc.**
Its basic purpose is used for communications.

Model	LG-VS500
FCC ID	ZNFVS500
IC	2703C-VS500
Additional Model(s)	LGVS500, VS500, LG-RS500, LGRS500, RS500
EUT Type	Multi-band CDMA/EVDO/GSM/EDGE/WCDMA/LTE phone with WLAN and Bluetooth
TX Frequency	824.70 MHz to 848.31 MHz (CDMA BC0) 1 851.25 MHz to 1 908.75 MHz (CDMA BC1) 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) 826.40 MHz to 846.60 MHz (WCDMA B5) 1 850.7 MHz to 1 909.3 MHz (LTE B2) 1 710 MHz to 1 755 MHz (LTE B4) 824 MHz to 849 MHz (LTE B5) 777 MHz to 787 MHz (LTE B13)
RX Frequency	869.70 MHz to 893.31 MHz (CDMA BC0) 1 931.25 MHz to 1 988.75 MHz (CDMA BC1) 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) 871.40 MHz to 891.60 MHz (WCDMA B5) 1 930.00 MHz to 1 990.00MHz (LTE B2) 2 110 MHz to 2 155 MHz (LTE B4) 869 MHz to 894 MHz (LTE B5) 746 MHz to 756 MHz (LTE B13)

1.2 Related Submittal(s) / Grant(s)

Original submittal only.

1.3 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 C63.4-2003.

Measurement Facilities	Reg. No.
HCT FRN: 0005866421 Radiated Field strength measurement facility (3 m)	90661 (February 28, 2014)
HCT FRN: 0005866421 Radiated Field strength measurement facility (10 m)	90661 (February 28, 2014)
COMPANY CODE: 5944A Filing the EMI Measurement Facility (3 m Semi Anechoic Chamber and Shielded Room)	IC 5944A-4 (August 20, 2014)
COMPANY CODE: 5944A Radiated Field Strength Measurement Facility (10 m Semi-Anechoic Chamber)	IC 5944A-2 (August 20, 2015)

1.4 Tested System Details

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

Device Type	Model Name	Manufacturer	FCC ID / IC / DoC	Connected To
EUT	LG-VS500	LG	ZNFVS500 2703C-VS500	Notebook PC, Earphone
USB cable	EAD62377906	Ningbo Broad	-	EUT, Notebook PC
Earphone	EAB62950102	CRESYN	-	EUT
Notebook PC	ProBook6560b	HP	DoC	EUT, Notebook PC adaptor, RJ45 cable, Serial mouse
Notebook PC adaptor	PPP009D	DELTA Electronics (Jiangsu) LTD	-	Notebook PC
Gateway	TL-WR747N	TP-LINK	-	RJ45 cable, Gateway adaptor
Gateway adaptor	T120150-2H1	TP-LINK	-	Gateway
Serial mouse	Serial 2 button mouse	Radio shack	FSUGMZE3	Notebook PC
RJ45 cable	-	-	-	Notebook PC, Gateway
Micro SD card	16 GB	Samsung	-	EUT

1.5 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	Micro USB	Y	Y	(P,D)1.0
	Earphone	N/A	Y	(D)1.2
Notebook PC	RJ 45	N/A	N	(D)2.5
	Serial (Mouse)	N/A	Y	(D)1.8
	DC in	N	N/A	(P)1.8
Gateway	DC in	N	N/A	(P)1.8

* The marked “(D)” means the data cable and “(P)” means the power cable.

1.6 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	Both End
Notebook PC	RJ 45	N	N/A	N	N/A
	Serial (Mouse)	N	N/A	Y	Notebook PC End

2. DESCRIPTION OF TEST

2.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2003

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)	Quasi-Peak (dB(μV))	Average (dB(μV))
0.15 to 0.5	9	66 to 56*	56 to 46*
0.5 to 5	9	56	46
5 to 30	9	60	50

**Decreases with the logarithm of the frequency.*

2.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2003, Clause 8

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. The antenna height scans apply for both horizontal and vertical polarizations, except that for vertical polarization, the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the lowest antenna element clears the site reference ground plane by at least 25 cm. (below 1 GHz)

[Radiated Emission Limits]

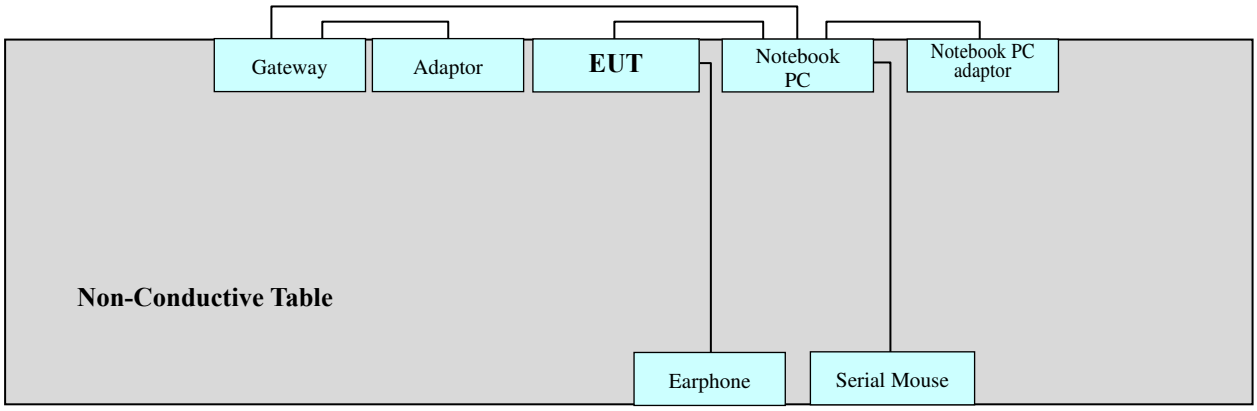
Frequency (MHz)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dB(μV)/m)
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0
Frequency (MHz)	**Antenna Distance (m)**	**Peak (dB(μV)/m)**	**Average (dB(μV)/m)**
Above 1 000	3	74	54

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 ㎓, whichever is lower

2.3 Configuration of Tested System



Power Line: 120 VAC, 60 Hz

3. PRELIMINARY TEST

3.1 Conducted Emission Test

It was tested Data Communication mode, after connecting all peripheral devices.

Operation Mode: ☒ Data Communication mode

3. 2 Radiated Emission Test

It was tested Data Communication mode, after connecting all peripheral devices.

Operation Mode: ☒ Data Communication mode

4. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

4.1 Conducted Emission Test

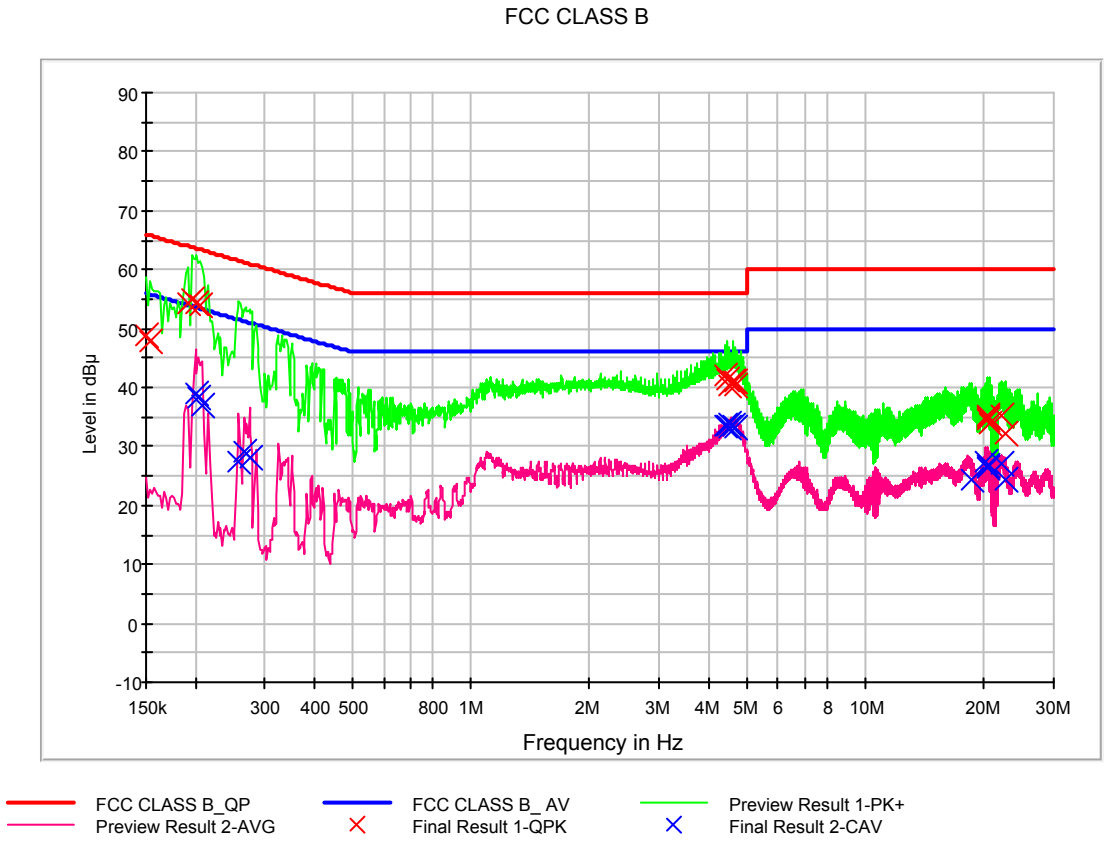
The test results of conducted emission at mains ports provide the following information:

Rule Part / Standard	FCC PART 15 Subpart B Class B ICES-003 Issue 5 Class B
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	Shielded Room
Temperature	23.3 °C
Relative Humidity	24.9 %
Test Date	March 31, 2016

- 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

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



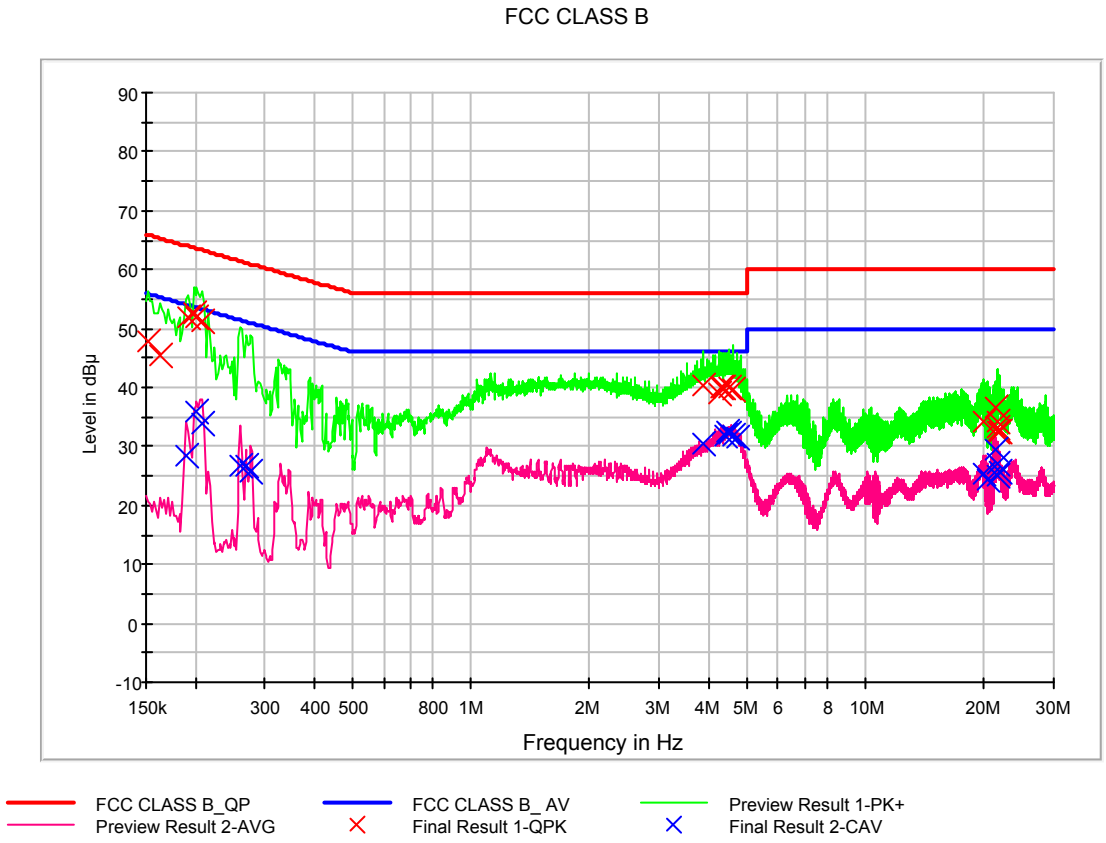
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	48.9	9.000	L1	9.7	17.1	66.0
0.154000	47.7	9.000	L1	9.6	18.1	65.8
0.192000	54.2	9.000	L1	9.6	9.7	63.9
0.196000	55.0	9.000	L1	9.6	8.8	63.8
0.202000	54.4	9.000	L1	9.6	9.2	63.5
0.206000	54.1	9.000	L1	9.6	9.3	63.4
4.388000	41.9	9.000	L1	9.8	14.1	56.0
4.458000	41.5	9.000	L1	9.8	14.5	56.0
4.532000	40.5	9.000	L1	9.9	15.5	56.0
4.602000	40.9	9.000	L1	9.9	15.1	56.0
4.672000	40.9	9.000	L1	9.9	15.1	56.0
4.682000	40.4	9.000	L1	9.9	15.6	56.0
20.386000	35.1	9.000	L1	10.3	24.9	60.0
20.452000	35.0	9.000	L1	10.3	25.0	60.0
20.460000	34.7	9.000	L1	10.3	25.3	60.0
20.670000	33.8	9.000	L1	10.3	26.2	60.0
22.150000	35.3	9.000	L1	10.3	24.7	60.0
22.648000	32.3	9.000	L1	10.3	27.7	60.0

CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.200000	38.8	9.000	L1	9.6	14.8	53.6
0.204000	38.4	9.000	L1	9.6	15.0	53.4
0.208000	36.9	9.000	L1	9.6	16.4	53.3
0.258000	27.4	9.000	L1	9.6	24.1	51.5
0.266000	29.2	9.000	L1	9.6	22.0	51.2
0.274000	28.1	9.000	L1	9.6	22.9	51.0
4.388000	33.4	9.000	L1	9.8	12.6	46.0
4.458000	33.5	9.000	L1	9.8	12.5	46.0
4.530000	33.7	9.000	L1	9.9	12.3	46.0
4.534000	33.0	9.000	L1	9.9	13.0	46.0
4.602000	33.7	9.000	L1	9.9	12.3	46.0
4.674000	33.2	9.000	L1	9.9	12.8	46.0
18.544000	24.5	9.000	L1	10.2	25.5	50.0
20.262000	27.4	9.000	L1	10.3	22.6	50.0
20.452000	26.8	9.000	L1	10.3	23.2	50.0
20.464000	26.4	9.000	L1	10.3	23.6	50.0
22.150000	27.2	9.000	L1	10.3	22.8	50.0
22.648000	24.2	9.000	L1	10.3	25.8	50.0

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



QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	47.7	9.000	N	9.6	18.2	65.9
0.162000	45.3	9.000	N	9.6	20.0	65.4
0.192000	51.8	9.000	N	9.6	12.2	63.9
0.198000	52.6	9.000	N	9.6	11.1	63.7
0.202000	52.0	9.000	N	9.6	11.5	63.5
0.208000	51.3	9.000	N	9.6	12.0	63.3
3.888000	40.2	9.000	N	9.8	15.8	56.0
4.248000	39.1	9.000	N	9.8	16.9	56.0
4.316000	39.8	9.000	N	9.8	16.2	56.0
4.358000	39.9	9.000	N	9.8	16.1	56.0
4.486000	40.0	9.000	N	9.8	16.0	56.0
4.598000	39.7	9.000	N	9.8	16.3	56.0
19.872000	34.3	9.000	N	10.3	25.7	60.0
21.486000	36.4	9.000	N	10.3	23.6	60.0
21.500000	34.1	9.000	N	10.3	25.9	60.0
21.644000	32.4	9.000	N	10.3	27.6	60.0
21.714000	33.2	9.000	N	10.3	26.8	60.0
21.924000	32.6	9.000	N	10.3	27.4	60.0

CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.190000	28.5	9.000	N	9.6	25.5	54.0
0.202000	35.8	9.000	N	9.6	17.7	53.5
0.208000	34.0	9.000	N	9.6	19.2	53.3
0.260000	26.6	9.000	N	9.6	24.9	51.4
0.268000	26.8	9.000	N	9.6	24.4	51.2
0.276000	25.8	9.000	N	9.6	25.2	50.9
3.888000	30.5	9.000	N	9.8	15.5	46.0
4.388000	32.0	9.000	N	9.8	14.0	46.0
4.456000	32.4	9.000	N	9.8	13.6	46.0
4.486000	32.2	9.000	N	9.8	13.8	46.0
4.600000	31.9	9.000	N	9.8	14.1	46.0
4.738000	31.6	9.000	N	9.8	14.4	46.0
19.872000	25.2	9.000	N	10.3	24.8	50.0
20.306000	24.3	9.000	N	10.3	25.7	50.0
21.486000	29.4	9.000	N	10.3	20.6	50.0
21.692000	27.2	9.000	N	10.3	22.8	50.0
21.714000	25.2	9.000	N	10.3	24.8	50.0
21.778000	25.6	9.000	N	10.3	24.4	50.0

4.2 Radiated Emission Test

The test results of radiated emission provide the following information:

-For Measurement Below 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B ICES-003 Issue 5 Class B
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.9 °C
Relative Humidity	26.0 %
Test Date	April 01, 2016

Frequency (MHz)	Quasi Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
30.840000	28.0	100.0	V	63.0	14.8	12.0	40.0
54.086653	33.3	100.0	V	84.0	15.8	6.7	40.0
63.486092	33.2	400.0	H	-1.0	15.0	6.8	40.0
66.413868	27.2	212.0	H	30.0	14.6	12.8	40.0
80.821082	34.1	265.0	H	103.0	11.9	5.9	40.0
266.474309	32.8	125.0	H	69.0	16.9	13.2	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

-For Measurement Above 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B ICES-003 Issue 5 Class B
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Operating Frequency	1.267 GHz
Testing Frequency Range	1 GHz to 6.5 GHz
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.9 °C
Relative Humidity	26.0 %
Test Date	April 01, 2016

Frequency (MHz)	Peak (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1330.110221	48.2	150.0	V	197.0	-9.8	25.8	74.0
1400.150300	49.7	194.0	V	24.0	-9.6	24.3	74.0
1994.739479	54.4	100.0	V	218.0	-8.4	19.6	74.0
2073.997996	50.2	100.0	V	233.0	-8.2	23.8	74.0

Frequency (MHz)	CAverage (dBµV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1330.110221	30.6	150.0	V	197.0	-9.8	23.4	54.0
1400.150300	47.2	194.0	V	24.0	-9.6	6.8	54.0
1994.739479	36.7	100.0	V	218.0	-8.4	17.3	54.0
2073.997996	34.8	100.0	V	233.0	-8.2	19.2	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. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	CAL Date
Conducted Emission					
☒ EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	12.28.2015
☒ LISN	Rohde & Schwarz	ESH3-Z5	100282	1 year	06.11.2015
☒ LISN	Rohde & Schwarz	ENV216	100073	1 year	12.28.2015
☒ Software	Rohde & Schwarz	EMC32	-	-	-
Radiated Emission					
-For measurement below 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
☒ Trilog Antenna	Schwarzbeck	VULB9160	3301	2 year	11.17.2014
☒ Antenna master	HD GmbH	MA240	240/520	N/A	-
☒ Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
☒ Turn Table	EMCO	1060-2M	-	N/A	-
☒ Turn Table controller	EMCO	2090	9702-1224	N/A	-
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.05.2015
☐ Antenna master	INNCO Systems	MA4000-EP	MA4000/283	N/A	-
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-
-For measurement above 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	03.30.2016
☒ Antenna master	HD GmbH	MA240	240/520	N/A	-
☒ Antenna master controller	HD GmbH	HD 100	100/637	N/A	-
☒ Turn Table	EMCO	1060-2M	-	N/A	-
☒ Turn Table controller	EMCO	2090	9702-1224	N/A	-
☐ Power Amplifier	CERNEX	CBLU1183540	21691	1 year	07.06.2015
☒ Power Amplifier	CERNEX	CBLU5183530	24348	1 year	06.15.2015
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	296	2 year	10.07.2014
☐ EMI Test Receiver	Rohde & Schwarz	ESU 26	100241	1 year	06.05.2015
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32	-	-	-

6. CONCLUSION

The data collected shows that the **EUT Type: Multi-band CDMA/EVDO/GSM/EDGE/WCDMA /LTE phone with WLAN and Bluetooth**, **Model: LG-VS500, FCC ID: ZNFVS500** complies with §15.107 and §15.109 of the FCC rules and **IC: 2703C-VS500** complies with ICES-003 Issue 5 of the IC rules.