

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: February 24, 2016**Date of Issue: March 15, 2016****Test Report No. HCT-E-1603-F025****HCT FRN: 0005866421****FCC ID :****ZNFR105**

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: 360 Camera

IC: 2703C-R105

Model Name: LG-R105

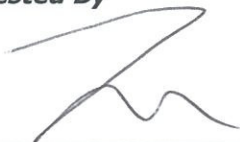
Test Port: USB Port

Date of Test: March 14, 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 denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

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DOCUMENT HISTORY

The revision history for this document is shown in table.

Version	Date	Description
HCT-E-1603-F025	March 15, 2016	Initial Release



TABLE OF CONTENTS

	PAGE
1. GENERAL INFORMATION	4
1.1 Description of EUT	4
1.2 Related Submittal(s) / Grant(s).....	4
1.3 Test Facility	5
1.4 Tested System Details.....	6
1.5 Cable Description	7
1.6 Noise Suppression Parts on Cable. (I/O Cable)	7
2. DESCRIPTION OF TEST	8
3. PRELIMINARY TEST	11
3.1 Conducted Emission Test	11
3. 2 Radiated Emission Test	11
4. CONDUCTED AND RADIATED EMISSION TEST SUMMARY	12
4.1 Conducted Emission Test	12
4.2 Radiated Emission Test	19
5. LIST OF TEST EQUIPMENT	21
6. CONCLUSION	22

ATTACHMENT: TEST SETUP PHOTOGRAPHS



1. GENERAL INFORMATION

1.1 Description of EUT

The 360 Camera is a smart device that allows you to easily take high quality photos and videos with dynamic audio.

Model	LG-R105
FCC ID	ZNFR105
IC	2703C-R105
EUT Type	360 Camera
Bluetooth Specification	V4.0
WLAN Specification	802.11 b/g/n
USB Type	Micro USB 2.0
Battery	1200 mAh
Optics	13 M, 200° x 2 (Dual Fisheye Lens)
Max. Video Res	2560 x 1280 (30fps)
Max. Photo Res	5660 x 2830 (13M)
Image / Video File Format	Still Image : JPEG Video : MP4 (MPEG-4 AVC/H.264, Audio : AAC 5.1Ch)
Capturing	Spherical / Half-spherical image & video
Sound	3 Mic
External SD Card	Up to 2 TB
Dimensions / Weight	40 mm x 97 mm x 25 mm / 72 g
Manufacturer	LG Electronics Inc. LG Twin Towers 20, Yeouido-dong, Yeongdeungpo-gu, Seoul, Korea

***NOTE.** It is recommended to use a UHS-1 (U3) read/write 10MB/s or higher SD memory card.
(Class 10 or higher)



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-R105	LG Electronics	ZNFR105 2703C-R105	Notebook PC, USB cable
USB cable	EAD63849202	CRESYN	-	EUT, Notebook PC
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	MB-MP32D	Samsung	-	EUT



1.5 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	USB	Y	Y	(P,D)1.0
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	USB	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 ($\mu\text{V/m}$)	Quasi-Peak ($\text{dB}(\mu\text{V})/\text{m}$)
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 ($\text{dB}(\mu\text{V})/\text{m}$)	Average ($\text{dB}(\mu\text{V})/\text{m}$)
Above 1 000	3	74	54

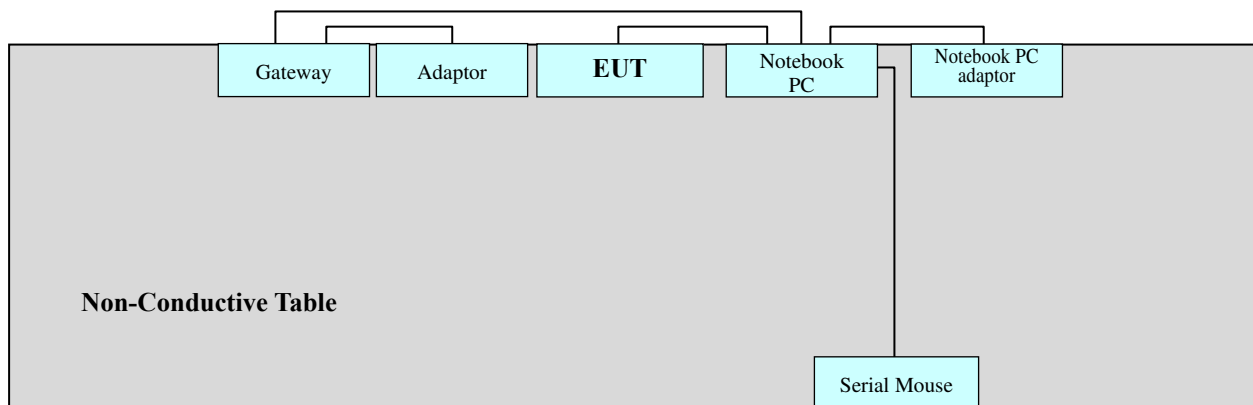


2.2.1 Frequency Range of Radiated Measurements

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	5 th harmonic of the highest frequency or 40 GHz, 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

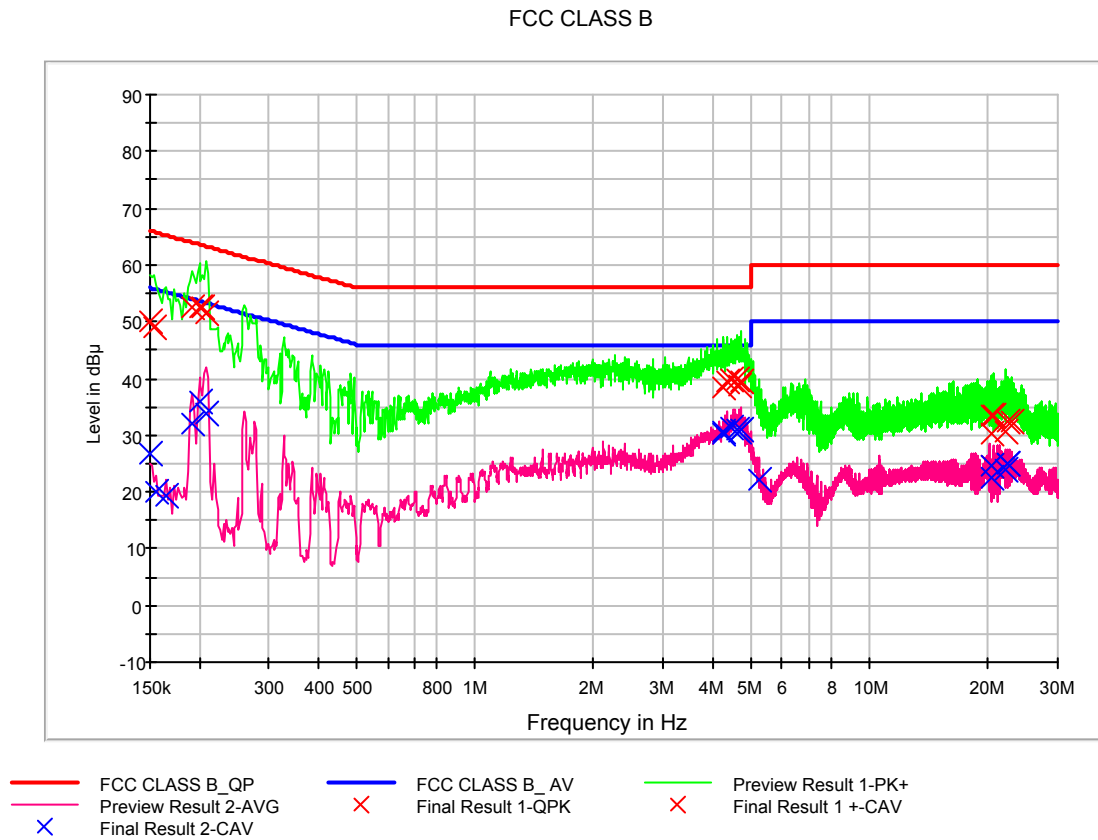
4.1 Conducted Emission Test

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	20.5 °C
Relative Humidity	28.8 %
Test Date	March 14, 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)**



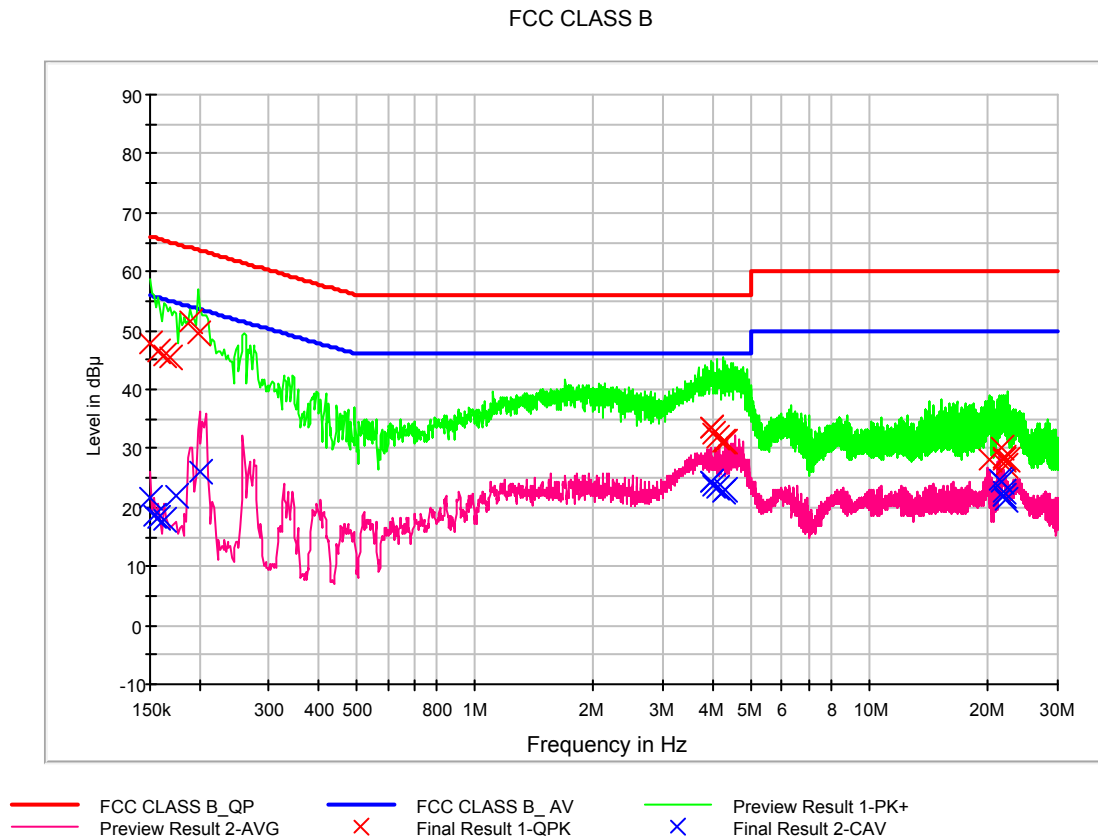
QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	50.2	9.000	L1	9.7	15.8	66.0
0.154000	49.1	9.000	L1	9.6	16.6	65.8
0.192000	52.6	9.000	L1	9.6	11.4	63.9
0.200000	52.6	9.000	L1	9.6	11.0	63.6
0.204000	52.4	9.000	L1	9.6	11.0	63.4
0.208000	51.5	9.000	L1	9.6	11.8	63.3
4.250000	38.6	9.000	L1	9.8	17.4	56.0
4.360000	39.5	9.000	L1	9.8	16.5	56.0
4.458000	39.7	9.000	L1	9.8	16.3	56.0
4.598000	39.8	9.000	L1	9.9	16.2	56.0
4.674000	38.9	9.000	L1	9.9	17.1	56.0
4.740000	39.4	9.000	L1	9.9	16.6	56.0
20.388000	33.4	9.000	L1	10.3	26.6	60.0
20.424000	30.3	9.000	L1	10.3	29.7	60.0
20.662000	33.3	9.000	L1	10.3	26.7	60.0
22.146000	30.8	9.000	L1	10.3	29.2	60.0
22.486000	32.3	9.000	L1	10.3	27.7	60.0
22.856000	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)
0.150000	26.7	9.000	L1	9.7	29.3	56.0
0.156000	20.2	9.000	L1	9.6	35.5	55.7
0.164000	19.2	9.000	L1	9.6	36.0	55.3
0.192000	32.0	9.000	L1	9.6	21.9	53.9
0.200000	36.1	9.000	L1	9.6	17.5	53.6
0.208000	34.0	9.000	L1	9.6	19.3	53.3
4.234000	30.7	9.000	L1	9.8	15.3	46.0
4.250000	30.3	9.000	L1	9.8	15.7	46.0
4.458000	31.2	9.000	L1	9.8	14.8	46.0
4.598000	30.8	9.000	L1	9.9	15.2	46.0
4.674000	30.7	9.000	L1	9.9	15.3	46.0
4.740000	30.9	9.000	L1	9.9	15.1	46.0
5.238000	22.2	9.000	L1	9.9	27.8	50.0
20.388000	24.7	9.000	L1	10.3	25.3	50.0
20.424000	22.6	9.000	L1	10.3	27.4	50.0
22.146000	23.9	9.000	L1	10.3	26.1	50.0
22.358000	25.0	9.000	L1	10.3	25.0	50.0
22.486000	24.9	9.000	L1	10.3	25.1	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)
0.150000	47.9	9.000	N	9.6	18.1	66.0
0.158000	46.5	9.000	N	9.6	19.1	65.6
0.162000	45.8	9.000	N	9.6	19.6	65.4
0.168000	45.3	9.000	N	9.6	19.8	65.1
0.190000	51.6	9.000	N	9.6	12.5	64.0
0.198000	49.4	9.000	N	9.6	14.3	63.7
3.960000	33.5	9.000	N	9.8	22.5	56.0
3.976000	33.6	9.000	N	9.8	22.4	56.0
4.032000	32.5	9.000	N	9.8	23.5	56.0
4.106000	32.0	9.000	N	9.8	24.0	56.0
4.246000	31.2	9.000	N	9.8	24.8	56.0
4.314000	31.3	9.000	N	9.8	24.7	56.0
20.226000	28.0	9.000	N	10.3	32.0	60.0
21.574000	30.0	9.000	N	10.3	30.0	60.0
21.896000	28.4	9.000	N	10.3	31.6	60.0
21.928000	28.3	9.000	N	10.3	31.7	60.0
22.062000	27.2	9.000	N	10.3	32.8	60.0
22.496000	28.0	9.000	N	10.3	32.0	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	21.5	9.000	N	9.6	34.5	56.0
0.154000	18.6	9.000	N	9.6	37.2	55.8
0.158000	18.2	9.000	N	9.6	37.4	55.6
0.162000	17.9	9.000	N	9.6	37.4	55.4
0.174000	22.0	9.000	N	9.6	32.8	54.8
0.200000	26.0	9.000	N	9.6	27.6	53.6
3.960000	24.3	9.000	N	9.8	21.7	46.0
3.976000	24.2	9.000	N	9.8	21.8	46.0
4.032000	23.8	9.000	N	9.8	22.2	46.0
4.106000	23.4	9.000	N	9.8	22.6	46.0
4.246000	22.7	9.000	N	9.8	23.3	46.0
4.314000	22.9	9.000	N	9.8	23.1	46.0
21.484000	24.8	9.000	N	10.3	25.2	50.0
21.574000	24.4	9.000	N	10.3	25.6	50.0
21.840000	22.8	9.000	N	10.3	27.2	50.0
21.896000	22.1	9.000	N	10.3	27.9	50.0
21.928000	22.0	9.000	N	10.3	28.0	50.0
22.062000	21.1	9.000	N	10.3	28.9	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	22.1 °C
Relative Humidity	28.2 %
Test Date	March 14, 2016

Frequency (MHz)	Quasi Peak (dBuV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
31.343888	25.7	100.0	V	267.0	14.9	14.3	40.0
316.071503	34.7	100.0	H	6.0	18.5	11.3	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	1.8 GHz
Testing Frequency Range	1 GHz to 9 GHz
Operation Mode	Data Communication mode
Kind of Test Site	3 m semi anechoic chamber
Temperature	22.1 °C
Relative Humidity	28.2 %
Test Date	March 14, 2016

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1399.949900	48.6	116.0	H	155.0	-9.6	25.4	74.0
2000.050100	49.7	124.0	V	228.0	-8.4	24.3	74.0
2412.575150	41.4	174.0	H	352.0	-7.0	32.6	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1399.949900	45.9	116.0	H	155.0	-9.6	8.1	54.0
2000.050100	29.8	124.0	V	228.0	-8.4	24.2	54.0
2412.575150	28.6	174.0	H	352.0	-7.0	25.4	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

<u>Type</u>	<u>Manufacturer</u>	<u>Model Name</u>	<u>Serial Number</u>	<u>Calibration Cycle</u>	<u>CAL Date</u>
<u>Conducted Emission</u>					
☒ 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	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESI40	831564103	1 year	04.01.2015
☒ 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	04.01.2015
☒ 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: 360 Camera, Model: LG-R105, FCC ID: ZNFR105** complies with §15.107 and §15.109 of the FCC rules and **IC: 2703C-R105** complies with ICES-003 Issue 5 of the IC rules.