

## FCC TEST REPORT

### 47 CFR FCC Part 15 Subpart B

<b>Report Reference No.</b> .....:	MWR150900606	
<b>FCC ID</b> .....:	RQQHLT-L40SCL	
Compiled by ( position+printed name+signature)..:	File administrators Martin Ao	
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Date of issue.....:	Sep 22, 2015	

<b>Representative Laboratory Name</b> ..:	Maxwell International Co., Ltd.
Address .....	Room 509, Hongfa center building, Baoan District, Shenzhen, Guangdong, China

<b>Testing Laboratory Name</b> .....	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.
Address .....	Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China

<b>Applicant's name</b> .....:	HYUNDAI CORPORATION
Address .....	140-2, Kye-dong, Chongro-ku, Seoul, South Korea

<b>Test specification</b> .....	
Standard .....	<b>47 CFR FCC Part 15 Subpart B - Unintentional Radiators</b> <b>ANSI C63.4: 2009</b>
TRF Originator.....:	Maxwell International Co., Ltd.

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<b>Test item description</b> .....	Mobile Phone
Trade Mark .....	HYUNDAI
<b>Manufacturer</b> .....:	<b>Skycom Telecommunications Co., Limited</b>
Model/Type reference.....:	L445
Listed Models .....	N/A
Rating .....	DC 3.70V
Hardware version .....	5096SF_MM1_V01
Software version .....	HYUNDAI_L445_V5.0.2_20150907
Result.....:	<b>PASS</b>

**TEST REPORT**

<b>Test Report No. :</b>	<b>MWR150900606</b>	Sep 22, 2015
		Date of issue

Equipment under Test : Mobile Phone

Model /Type : L445

Listed Models : N/A

**Applicant** : **HYUNDAI CORPORATION**

Address : 140-2, Kye-dong, Chongro-ku, Seoul, South Korea

**Manufacturer** : **Skycom Telecommunications Co., Limited**

Address : Rm604, East Block, Shengtang Bldg., No.1, Tairan 9 Rd.,  
Chegongmiao, Futian District, Shenzhen, China

<b>Test Result:</b>	<b>PASS</b>
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## Contents

<b>1.</b>	<b><u>TEST STANDARDS</u></b> .....	<b>4</b>
<b>2.</b>	<b><u>SUMMARY</u></b> .....	<b>5</b>
2.1.	General Remarks	5
2.2.	Product Description	5
2.3.	Equipment under Test	6
2.4.	Short description of the Equipment under Test (EUT)	6
2.5.	EUT operation mode	6
2.6.	Related Submittal(s) / Grant (s)	6
2.7.	Internal Identification of AE used during the test	6
2.8.	Modifications	6
2.9.	EUT configuration	6
2.10.	Configuration of Tested System	7
<b>3.</b>	<b><u>TEST ENVIRONMENT</u></b> .....	<b>8</b>
3.1.	Address of the test laboratory	8
3.2.	Test Facility	8
3.3.	Environmental conditions	8
3.4.	Statement of the measurement uncertainty	8
3.5.	Equipments Used during the Test	9
<b>4.</b>	<b><u>TEST CONDITIONS AND RESULTS</u></b> .....	<b>10</b>
4.1.	Conducted Emissions Test	10
4.2.	Radiated Emission Test	12
<b>5.</b>	<b><u>TEST SETUP PHOTOS OF THE EUT</u></b> .....	<b>16</b>
<b>6.</b>	<b><u>EXTERNAL PHOTOS OF THE EUT</u></b> .....	<b>16</b>
<b>7.</b>	<b><u>INTERNAL PHOTOS OF THE EUT</u></b> .....	<b>16</b>

## 1. TEST STANDARDS

The tests were performed according to following standards:

[47 CFR FCC Part 15 Subpart B](#) - Unintentional Radiators

[ANSI C63.4: 2009](#) – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40GHz

## 2. SUMMARY

### 2.1. General Remarks

Date of receipt of test sample	:	Aug 20, 2015
Testing commenced on	:	Aug 21, 2015
Testing concluded on	:	Sep 22, 2015

### 2.2. Product Description

The **HYUNDAI CORPORATION**'s Model: L445 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Mobile Phone
Model Number	L445
Modulation Type	GMSK for GSM/GPRS/EDGE, 8-PSK for EDGE only Downlink,QPSK for UMTS
Antenna Type	Internal
UMTS Operation Frequency Band	Device supported UMTS FDD Band II and FDD Band V
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
BT FCC Operation frequency	2402MHz-2480MHz
HSDPA Release Version	Release 10
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
WCDMA Release Version	R99
LTE Release Version	R8
UMTS Operation Frequency Band	Device supported FDD band 2, FDD band 4, FDD band 5, FDD band V 7, FDD band V 17
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
BT Modulation Type	GFSK (BT 4.0)/GFSK,8DPSK, $\pi$ /4DQPSK(BT 3.0+EDR)
Hardware version	5096SF_MM1_V01
Software version	HYUNDAI_L445_V5.0.2_20150907
Android version	Android 4.4.2
GPS function	Supported
WLAN	Supported 802.11b/802.11g/802.11n
Bluetooth	Supported BT 4.0/BT 3.0+EDR
GSM/EDGE/GPRS	Supported GSM/GPRS/EDGE
GSM/EDGE/GPRS Power Class	GSM900:Power Class 4/DCS1800:Power Class 1
GSM/EDGE/GPRS Operation Frequency	GSM900 :880MHz-915MHz/DCS1800:1710MHz-1785MHz
GSM/EDGE/GPRS Operation Frequency Band	GSM900/DCS1800/GPRS900/ GPRS 1800/EDGE900/EDGE1800
GSM Release Version	R99
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.40VDC to 4.20VDC (nominal: 3.70VDC)
GPRS operation mode	Class B

## 2.3. Equipment under Test

### Power supply system utilised

Power supply voltage	:	<input type="radio"/>	120V / 60 Hz	<input type="radio"/>	115V / 60Hz
		<input type="radio"/>	12 V DC	<input type="radio"/>	24 V DC
		<input checked="" type="radio"/>	Other (specified in blank below)		

DC 3.70V

## 2.4. Short description of the Equipment under Test (EUT)

### 2.4.1 General Description

L445 is subscriber equipment in the WCDMA/GSM /LTE system. The HSPA/UMTS frequency band is Band II, Band IV and Band V, LTE frequency band is band 2,band 4,band 5,band 7,band 17; The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II and Band V and GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS ,LTE and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. 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: 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.

### 2.4.2 Test Environments

NOTE: The values used in the test report maybe stringent than the declared.

Environment Parameter	Selected Values During Tests		
NTNV	Temperature	Voltage	Relative Humidity
	Ambient	3.7VDC	Ambient

## 2.5. EUT operation mode

The EUT has been tested under typical operating condition.

## 2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: RQQLT-L40SCL** filing to comply with the FCC Part 15, Subpart B Rules.

## 2.7. Internal Identification of AE used during the test

AE ID*	Description
AE1	Charger

AE1  
 Model: TPA-5950100UU  
 INPUT: 100-240V 50/60Hz 0.2A  
 OUTPUT: DC 5.0V,1000mAh

\*AE ID: is used to identify the test sample in the lab internally.  
 We not used AE2 when for FCC Part 15B test.

## 2.8. Modifications

No modifications were implemented to meet testing criteria.

## 2.9. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

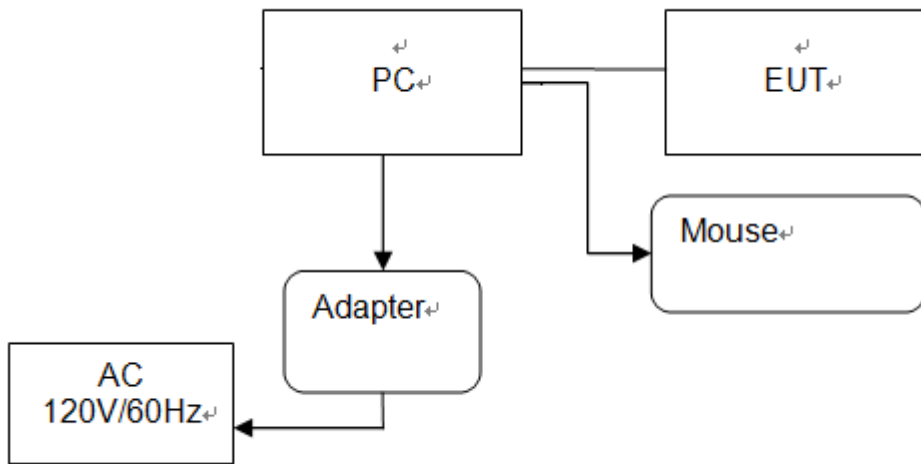
● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

### 2.10. Configuration of Tested System

Configuration of Tested System



Equipment Used in Tested System

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/unshielded	Notes
1	Notebook	ThinkPad	E430C	A131101550	/	/	DOC
2	Mouse	DELL	MO56UO A	G0E02SY7	1.00m	unshielded	DOC
3	USB Cable (EUT to PC)	Genshuo	USB 2.0	N/A	0.60m	unshielded	N/A
4	Power line	/	/	N/A	1.00m	unshielded	N/A

### 3. TEST ENVIRONMENT

#### 3.1. Address of the test laboratory

**CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.**

Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China  
The sites are constructed in conformance with the requirements of ANSI C63.4 (2003) and CISPR Publication 22.

#### 3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

##### **FCC-Registration information:**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.  
Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China  
Test Firm FCC Registration number: 806614

#### 3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

#### 3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. National Digital Electronic Product Testing Center is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.18dB	(1)
Radiated Emission	1~18GHz	5.26dB	(1)
Conducted Disturbance	0.009~30MHz	3.02dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



### 3.5. Equipments Used during the Test

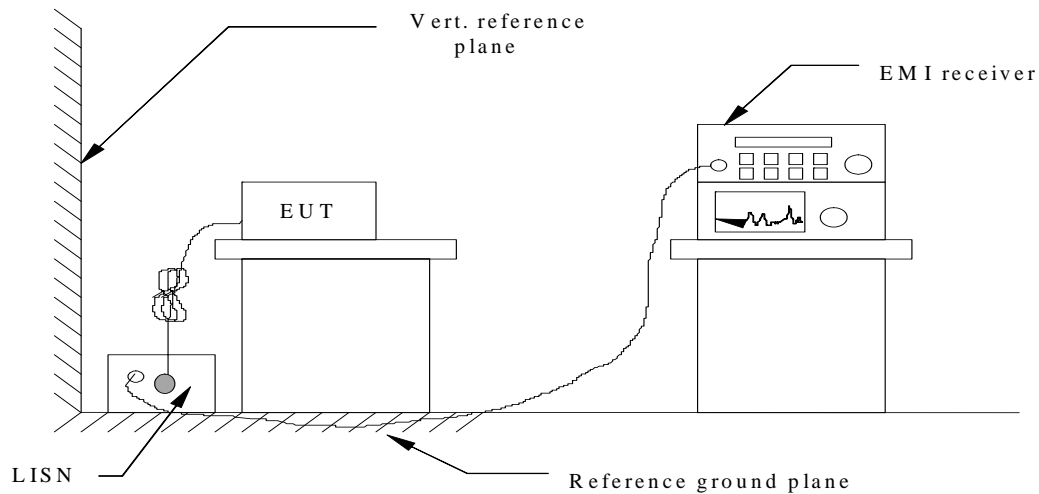
Description	Manufacturer	Model	Serial No.	Test Date	Due Date
EMI Test Receiver	R&S	ESIB26	A0304218	2015.06.02	2016.06.01
Full-Anechoic Chamber	Albatross	12.8m*6.8m*6.4m	A0412372	2015.01.05	2016.01.04
Loop Antenna	Schwarzbeck	HFH2-Z2	100047	2015.06.02	2016.06.01
Bilog Antenna	Schwarzbeck	VULB 9163	9163-274	2015.06.02	2016.06.01
Bilog Antenna	Schwarzbeck	VULB 9163	9163-276	2015.06.02	2016.06.01
Double ridge horn antenna	R&S	HF960	100150	2015.06.02	2016.06.01
Double ridge horn antenna	R&S	HF960	100155	2015.06.02	2016.06.01
Ultra-wideband antenna	R&S	HL562	100089	2015.06.02	2016.06.01
Ultra-wideband antenna	R&S	HL562	100090	2015.06.02	2016.06.01
Test Antenna – Horn (18-25GHz)	ETS	UG-596A/U	A0902607	2015.06.02	2016.06.01
Test Antenna – Horn (18-25GHz)	ETS	UG-596A/U	A0902611	2015.06.02	2016.06.01
Amplifier 20M~3GHz	R&S	PAP-0203H	22018	2015.06.02	2016.06.01
Ampilier 1G~18GHz	R&S	MITEQ AFS42-00101800	25-S-42	2015.06.02	2016.06.01
Ampilier 18G~40GHz	R&S	JS42-18002600-28-5A	12111.0980.00	2015.06.02	2016.06.01
System Simulator	R&S	CMW500	A130101034	2015.06.010	2016.06.09
Signal Analyzzer	Agilent	N9030A	MY49430428	2015.06.010	2016.06.09
Power Sensor	R&S	NRP-Z4	823.3618.03	2015.06.02	2016.06.01
Power Meter	R&S	NRVS	1020.1809.02	2015.06.02	2016.06.01
LISN	R&S	ESRV26	A0304221	2015.06.02	2016.06.01
EMI Test Receiver	R&S	ESCS	A0304260	2015.06.02	2016.06.01

The Cal. Interval was one year

## 4. TEST CONDITIONS AND RESULTS

### 4.1. Conducted Emissions Test

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2014.
2. Support equipment, if needed, was placed as per ANSI C63.4-2014.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2014.
4. The EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

#### CONDUCTED POWER LINE EMISSION LIMIT

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following :

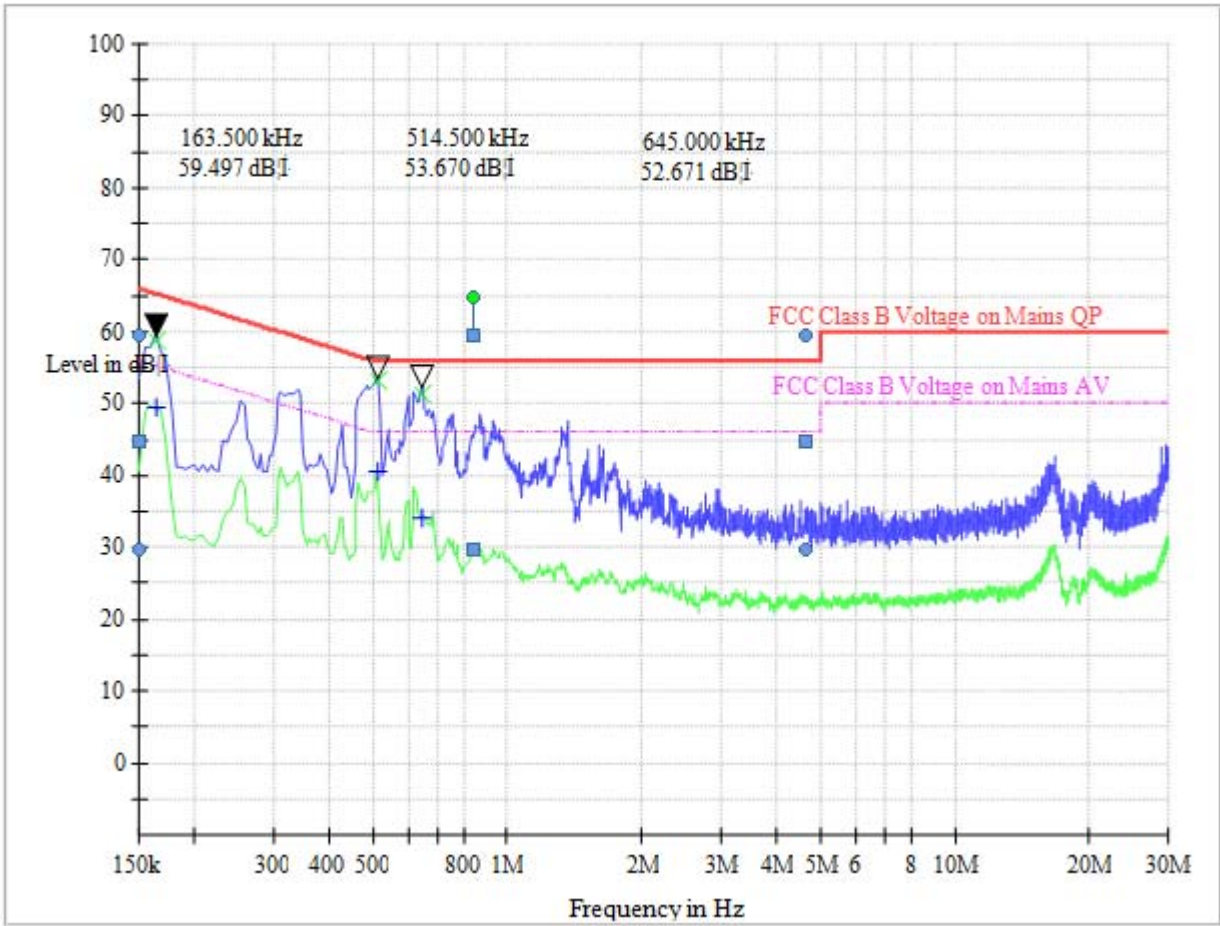
Frequency (MHz)	Maximum RF Line Voltage (dB $\mu$ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

\* Decreasing linearly with the logarithm of the frequency

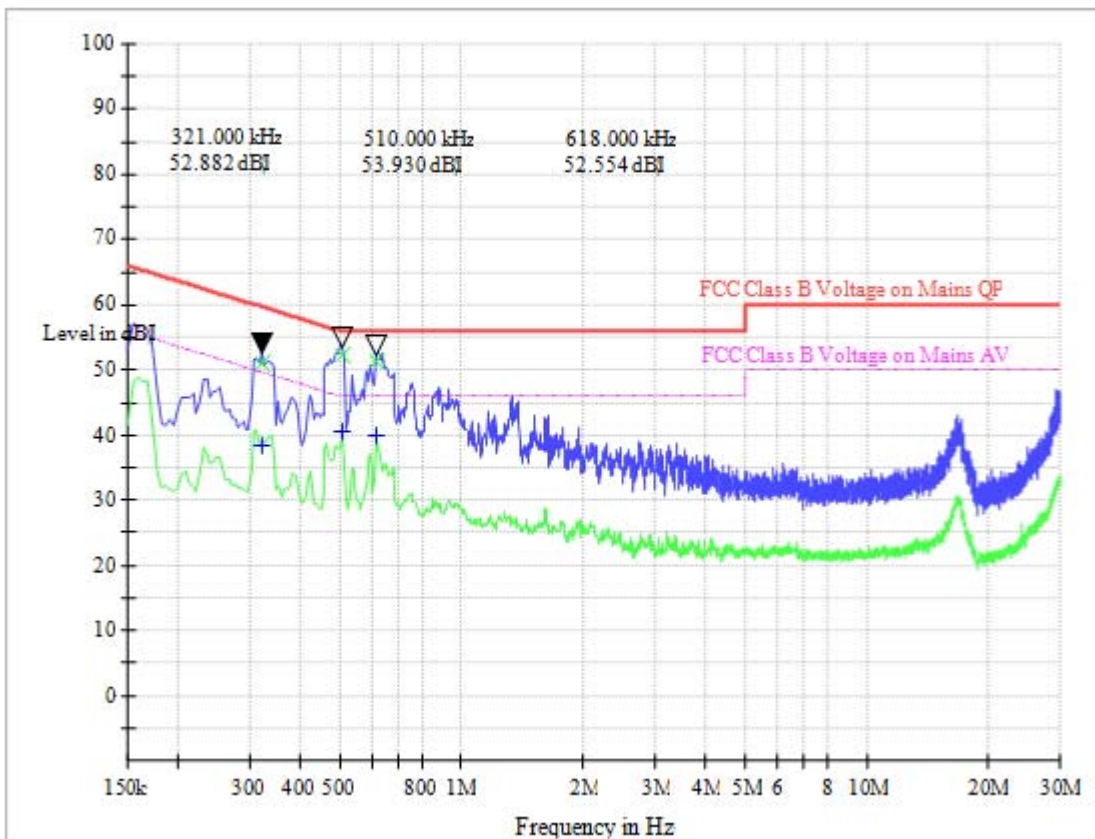
#### TEST RESULTS

*Note: We tested the playing video Mode, Data transmission (connected PC) Mode, camera Mode and so on, and recorded the worst case at the playing video Mode.*

L



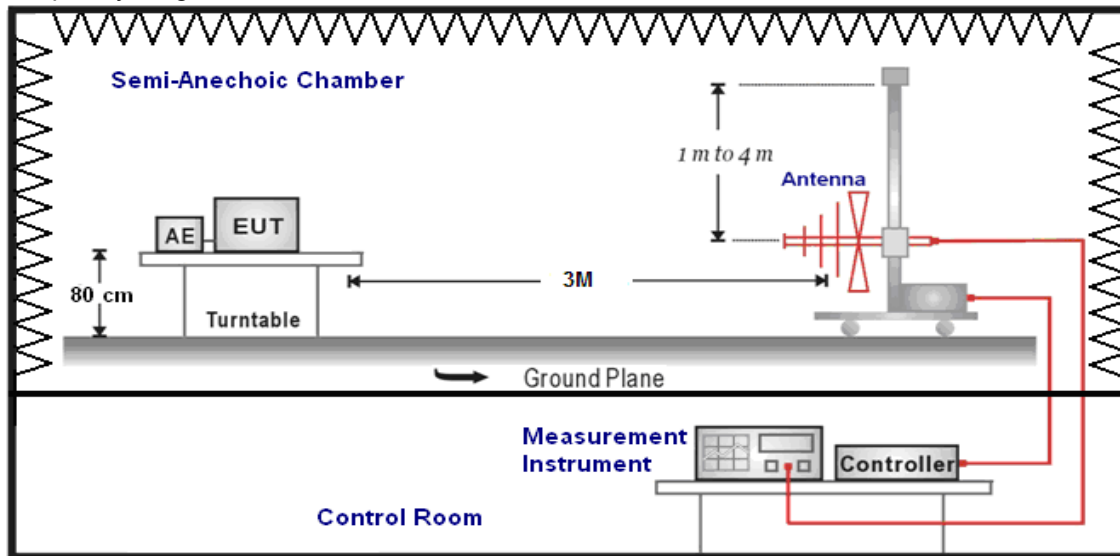
N



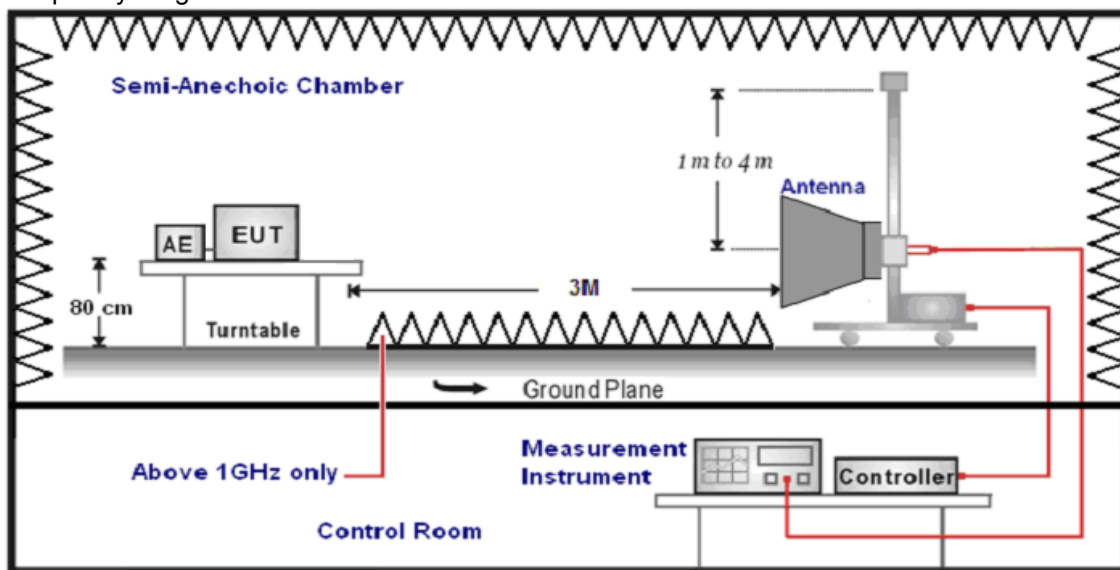
## 4.2. Radiated Emission Test

### TEST CONFIGURATION

Frequency range: 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



### TEST PROCEDURE

- The EUT is placed on a turntable, which is 0.8m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until the measurements for all frequencies are complete.
- The maximum operation frequency was 512MHz, the radiated emission test frequency from 30 MHz to 6GHz.
- The distance between test antenna and EUT as following table states:
 

Test Frequency range	Test Antenna Type	Test Distance
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-6GHz	Double Ridged Horn Antenna	3
- Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-6GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak (Receiver)
	Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Average (Receiver)

### **FIELD STRENGTH CALCULATION**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dB $\mu$ V/m)	RA (dB $\mu$ V/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

### **RADIATION LIMIT**

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

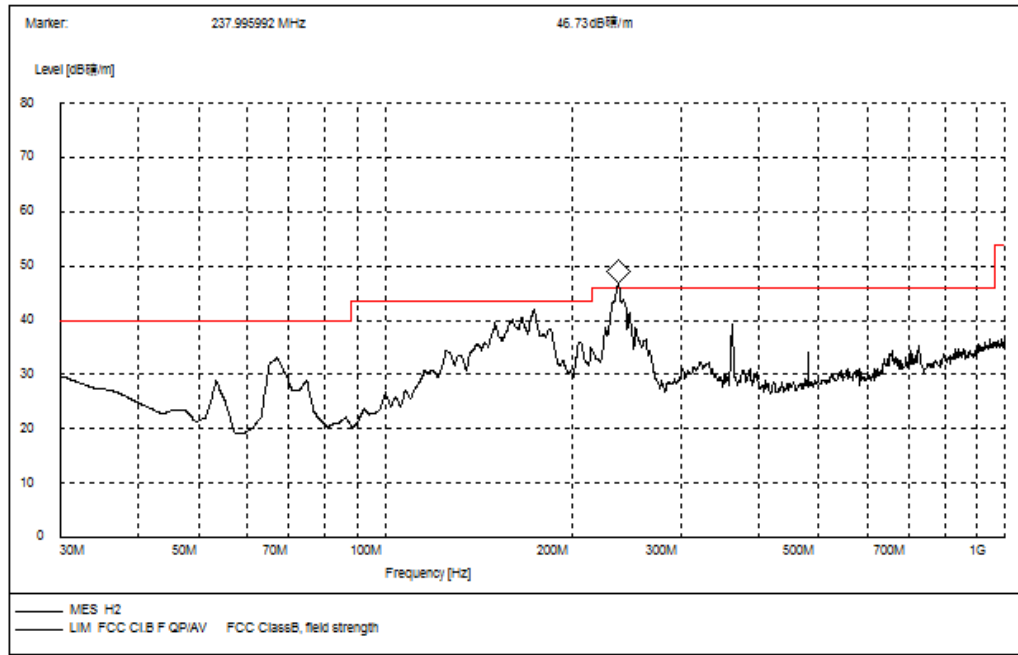
Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.49	300	$20\log(2400/F(\text{KHz}))+80$	$2400/F(\text{KHz})$
0.49-1.705	30	$20\log(24000/F(\text{KHz}))+40$	$24000/F(\text{KHz})$
1.705-30	30	$20\log(30)+40$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

### **TEST RESULTS**

For 30MHz-1GHz

Polarization

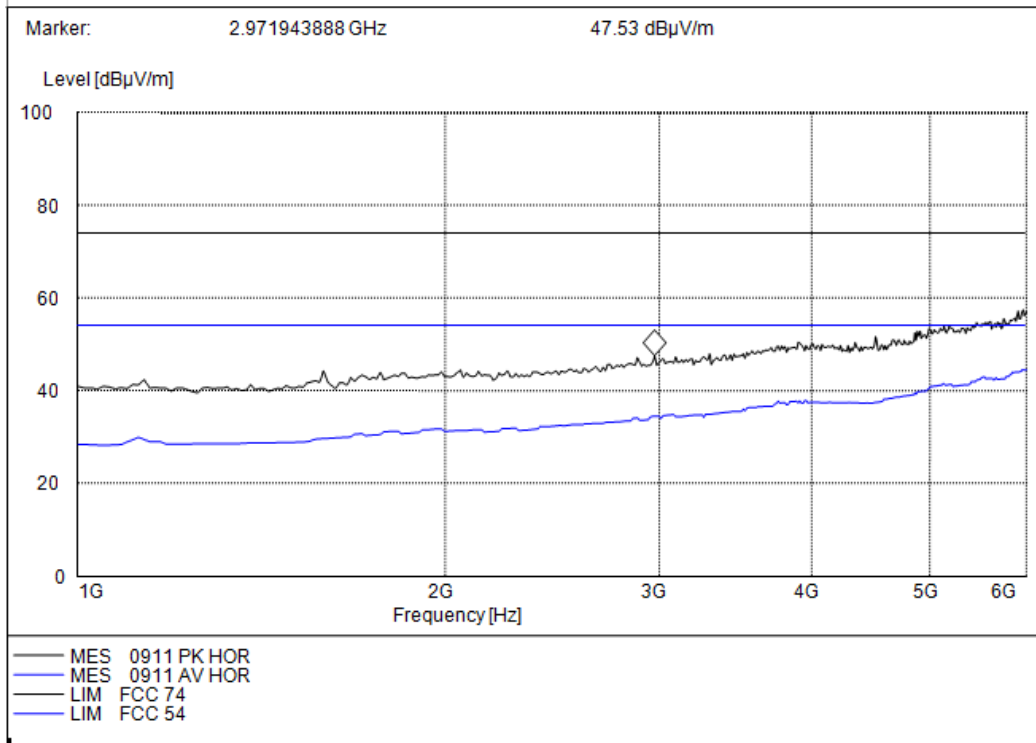
Horizontal



MEASUREMENT RESULT: "QuasiPeak"

2015-9-1 10:31

Frequency MHz	Level dBµV/m	Limit dBµV/m
174.560000	38.49	43.5
237.690000	43.46	46.0



Polarization

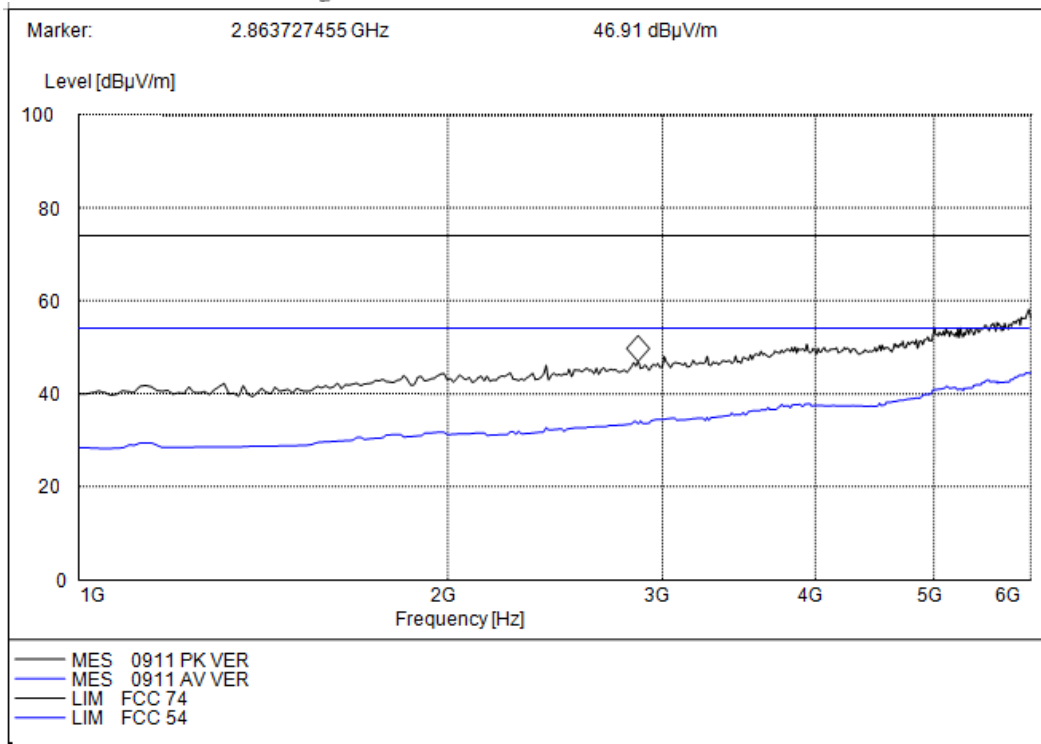
Vertical



MEASUREMENT RESULT: "QuasiPeak"

2015-9-1 10:29

Frequency MHz	Level dBμV/m	Limit dBμV/m
54.520000	36.14	40.0
167.620000	40.41	43.5



Remark:

1. Emission level (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value - Emission level.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. „---“ states at least 20dB lower than limit, not record any values.

**5. Test Setup Photos of the EUT**

Please refer to separated files for Test Setup Photos of the EUT.

**6. External Photos of the EUT**

Please refer to separated files for External Photos of the EUT.

**7. Internal Photos of the EUT**

Please refer to separated files for Internal Photos of the EUT.

.....**End of Report**.....