

FCC TEST REPORT

47 CFR FCC Part 15 Subpart B

Report Reference No.....: MWR150600106

FCC ID.....: RQQHLT-E435

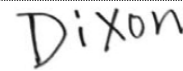
Compiled by
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(position+printed name+signature)..: Test Engineer Martin Ao



Approved by
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Date of issue.....: Jun 17, 2015

Representative Laboratory Name.: Maxwell International Co., Ltd.

Address.....: Room 509,Hongfacenter building, Baoan District, Shenzhen, Guangdong, China

Testing Laboratory Name.....: Shenzhen CTL Testing Technology Co., Ltd.

Address.....: Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan,Shenzhen,China

Applicant's name.....: HYUNDAI CORPORATION

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

Test specification.....:

Standard.....: **47 CFR FCC Part 15 Subpart B - Unintentional Radiators**
ANSI C63.4: 2009

TRF Originator.....: Maxwell International Co., Ltd.

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Test item description.....: Mobile Phone

Trade Mark.....: HYUNDAI

Manufacturer.....: WASAM TECHNOLOGY (SHEN ZHEN) CO.,LTD.

Model/Type reference.....: E435

Listed Models: N/A

Rating.....: DC 3.80V

Adppter Information..... Model: E435
INPUT:100-240V 50/60Hz 0.15A
OUTPUT: DC 5.0V,500mAh

Hardware version.....: T6461 - V2.0

Software version: T6461_MUSO_V1_20150529.rar

Result.....: **PASS**

TEST REPORT

Test Report No. :	MWR150600106	Jun 17, 2015
		Date of issue

Equipment under Test : Mobile Phone

Model /Type : E435

Listed Models : N/A

Applicant : **HYUNDAI CORPORATION**

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

Manufacturer **WASAM TECHNOLOGY (SHEN ZHEN) CO.,LTD.**

Address : B,F Building, (Hengqiang Industrial Park), Bogang Taifeng
Industrial Zone, Shajing Town, Bao' an District,
Shenzhen, China

Test Result:	PASS
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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.

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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	:	May 04, 2015
Testing commenced on	:	May 05,2015
Testing concluded on	:	Jun 16, 2015

2.2. Product Description

The **HYUNDAI CORPORATION** 's Model: E435 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	E435
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 7
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
WCDMA Release Version	R99
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, π /4DQPSK(BT 3.0+EDR)
Hardware version	T6461 - V2.0
Software version	T6461_MUSO_V1_20150529.rar
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	GSM850:Power Class 4/PCS1900:Power Class 1
GSM/EDGE/GPRS Operation Frequency	GSM850 :824.2MHz-848.8MHz PCS1900:1852.4MHz-907.6MHz
GSM/EDGE/GPRS Operation Frequency Band	GSM850/PCS1900/GPRS850/ GPRS1900/EDGE850/EDGE1900
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	3.50VDC to 4.35VDC (nominal: 3.80VDC)
GPRS operation mode	Class B
EGPRS operation mode	Class B
The highest operating frequency	2480MHz

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 3.80V

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

2.4.1 General Description

E435 is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band II, Band V; The GSM/GPRS/EDGE frequency and 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 and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, AGPS 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	3.8VDC	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-E435** 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	

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:

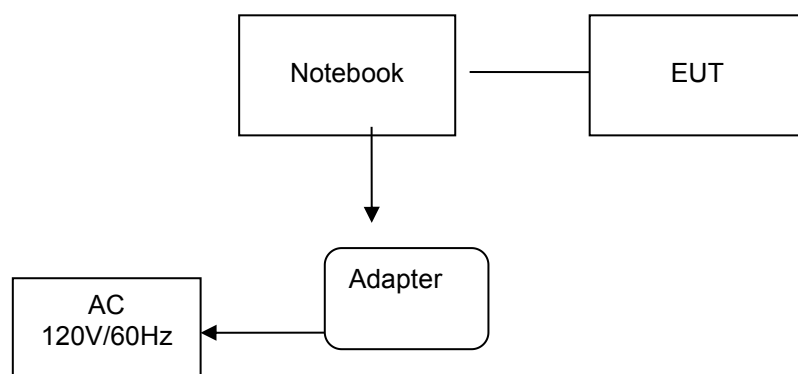
● - supplied by the manufacturer

○ - 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	DELL	INS14MD-1328S	1RNN42X	/	/	DOC
5	USB Cable (EUT to PC)	Genshuo	USB 2.0	N/A	0.60m	unshielded	N/A
7	Power line	/	/	N/A	1.00m	unshielded	N/A
8	Adapter	HIPRO	DELL-A0904A3	F1120709016S404	1.50m	unshielded	DOC

2.11. NOTE

- The EUT is a Mobile Phone with WCDMA/GSM/GPRS/EDGE, WiFi and Bluetooth function, The functions of the EUT listed as below:

	Test Standards	Reference Report
GSM/GPRS/EDGE	FCC Part 22/FCC Part 24	MWR150600101
WCDMA	FCC Part 22/FCC Part 24	MWR150600102
Bluetooth	FCC Part 15 C 15.247	MWR150600103
BLE	FCC Part 15 C 15.247	MWR150600104
WiFi	FCC Part 15 C 15.247	MWR150600105
USB Port	FCC Part 15 B	MWR150600106
SAR	FCC Part 2 §2.1093	MWR150600107

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen, China
The sites are constructed in conformance with the requirements of ANSI C63.7, 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 No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, Dec 19, 2013

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 Shenzhen CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center 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 Shenzhen CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.24 dB	(1)
Radiated Emission	1~18GHz	5.16 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.39 dB	(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

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ENV216	101316	2014/07/02
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	103710	2014/07/02
3	Pulse Limiter	Com-Power	LIT-153	53226	2014/07/01
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
5	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2014/10/19

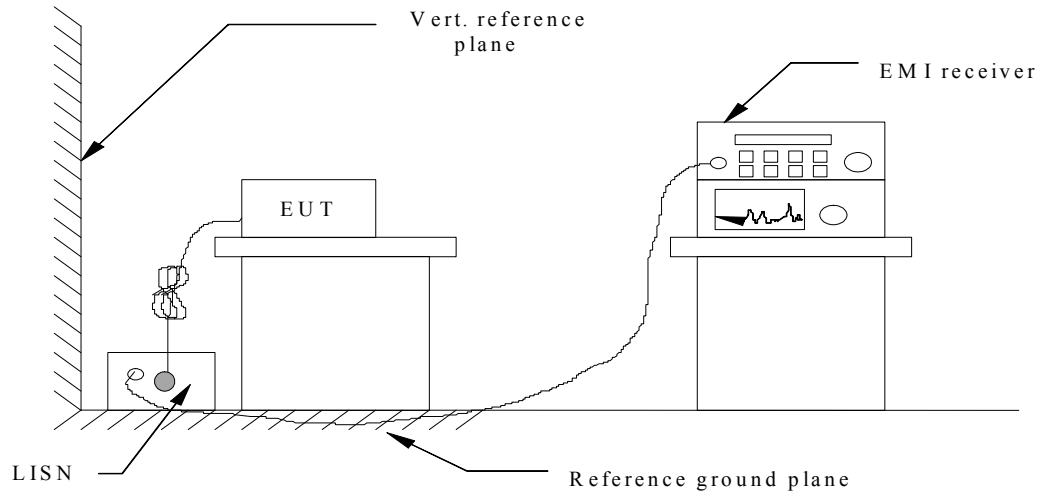
Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/12
2	EMI TEST Receivcer	Rohde&Schwarz	ESCI3	103710	2014/07/02
3	EMI TEST Software	Audix	E3	N/A	N/A
4	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A
5	HORN ANTENNA	Sunol Sciences Corp.	DRH-118	A062013	2014/07/12
6	Amplifer	HP	8447D	3113A07663	2014/10/22
7	Preamplifier	HP	8349B	3155A00882	2014/07/03
8	Amplifer	Compliance Direction systems	PAP1-4060	129	2014/07/03
9	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2014/06/29
10	TURNTABLE	MATURO	TT2.0	----	N/A
11	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
12	Horn Antenna	SCHWARZBECK	BBHA9170	25849	2014/06/21
13	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2014/07/02
14	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2014/10/19
15	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2014/10/19
16	Spectrum Analyzer	Agilent	E4407B	MY45108355	2015/05/21

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 C63.4-2009.
2. Support equipment, if needed, was placed as per ANSI C63.4-2009.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009.
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 μ 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

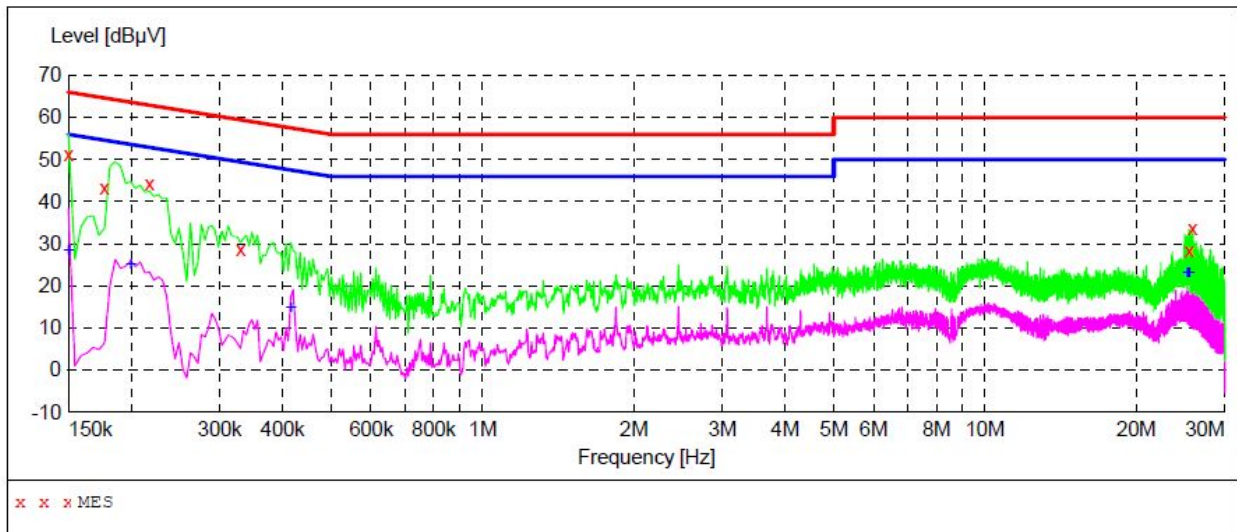
* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

Note: Mode: Data transmission (connected PC)

SCAN TABLE: "Voltage (9K-30M) FIN"

Short Description: 150K-30M Voltage



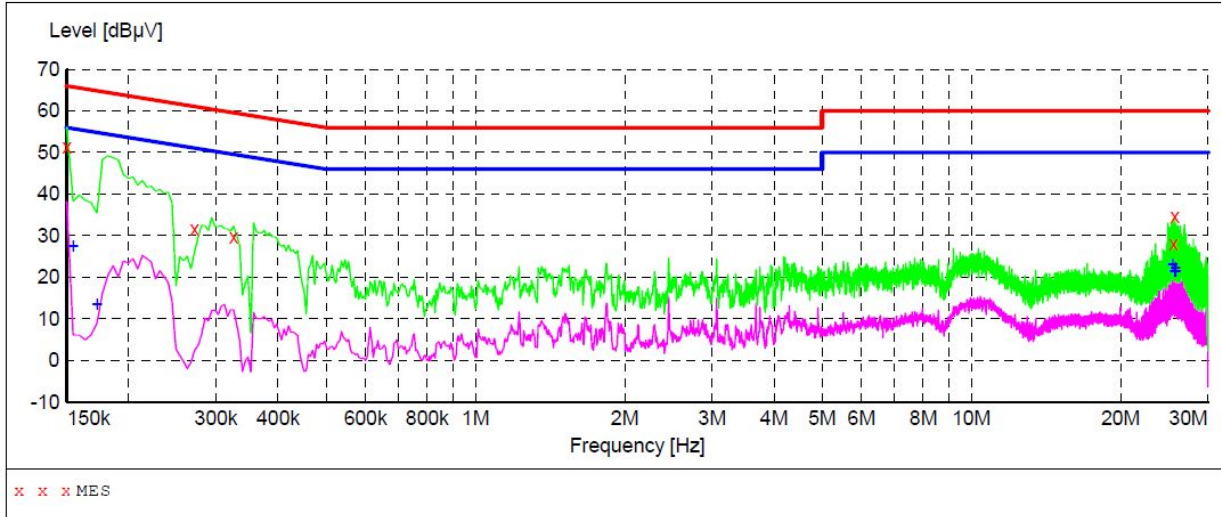
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	51.20	10.2	66	14.8	QP	N	GND
0.177000	43.40	10.2	65	21.2	QP	N	GND
0.217500	44.30	10.2	63	18.6	QP	N	GND
0.330000	28.50	10.2	60	31.0	QP	N	GND
25.453500	28.20	11.1	60	31.8	QP	N	GND
25.872000	33.70	11.1	60	26.3	QP	N	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	28.40	10.2	56	27.6	AV	N	GND
0.199500	24.90	10.2	54	28.7	AV	N	GND
0.415500	14.60	10.2	48	32.9	AV	N	GND
25.269000	23.10	11.1	50	26.9	AV	N	GND
25.449000	23.10	11.1	50	26.9	AV	N	GND
25.512000	22.90	11.1	50	27.1	AV	N	GND

SCAN TABLE: "Voltage (9K-30M) FIN"
 Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	51.20	10.2	66	14.8	QP	L1	GND
0.271500	31.70	10.2	61	29.4	QP	L1	GND
0.325500	29.50	10.2	60	30.1	QP	L1	GND
25.570500	28.10	11.1	60	31.9	QP	L1	GND
25.692000	34.70	11.1	60	25.3	QP	L1	GND

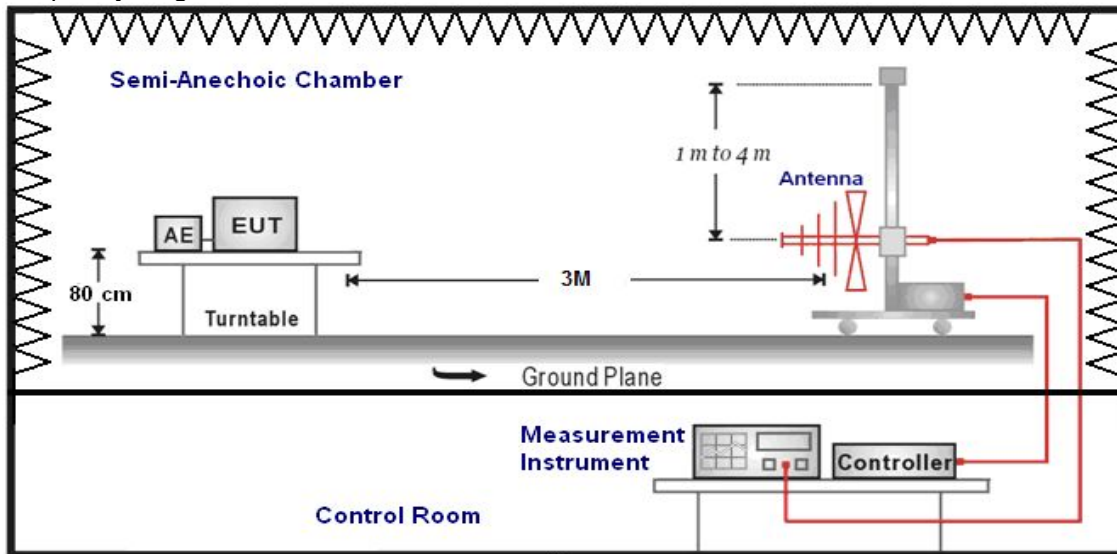
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154500	27.50	10.2	56	28.3	AV	L1	GND
0.172500	13.40	10.2	55	41.4	AV	L1	GND
25.449000	23.10	11.1	50	26.9	AV	L1	GND
25.692000	21.50	11.1	50	28.5	AV	L1	GND
25.750500	22.10	11.1	50	27.9	AV	L1	GND
25.813500	21.40	11.1	50	28.6	AV	L1	GND

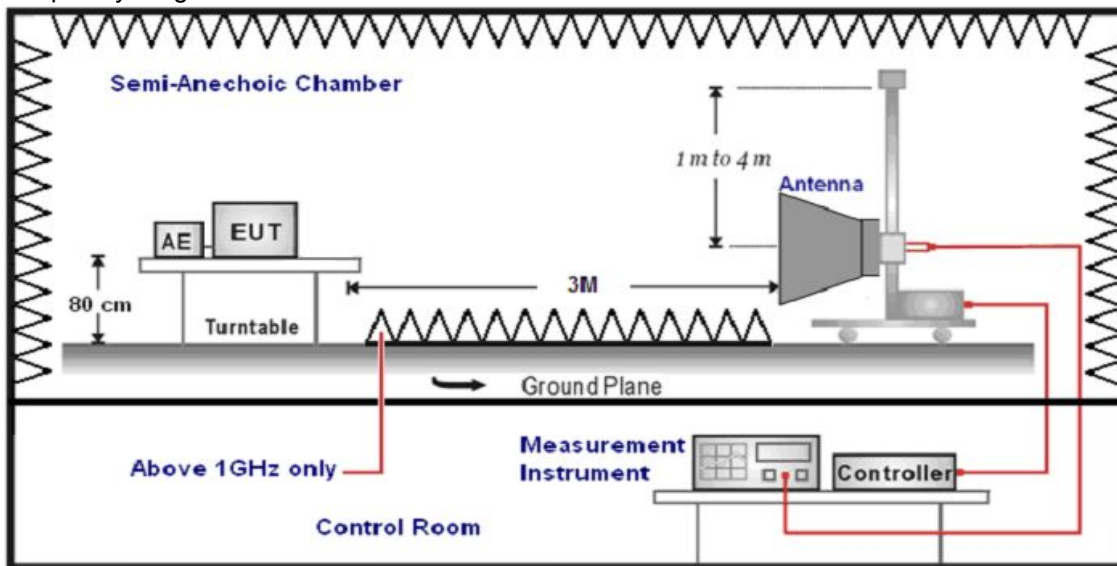
4.2. Radiated Emission Test

TEST CONFIGURATION

Frequency range: 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The maximum operation frequency was 512MHz, the radiated emission test frequency from 30 MHz to 6GHz.
8. 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

9. 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 μ V/m)	RA (dB μ 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 μ V/m)	Radiated (μ 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

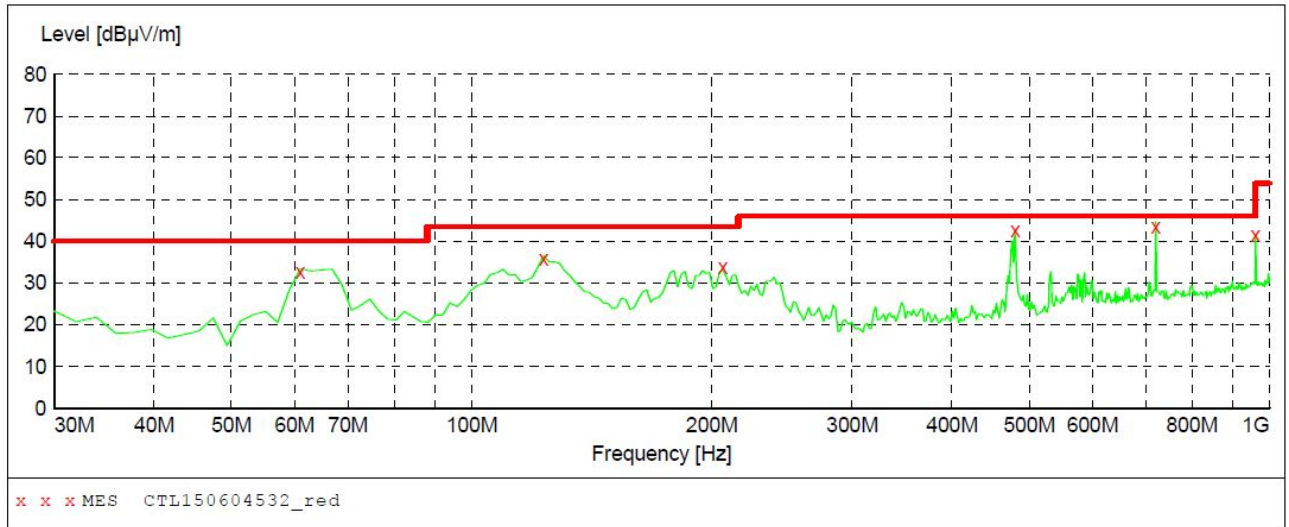
TEST RESULTS

Note: Mode: Data transmission (connected PC)

For 30MHz-1GHz

Polarization

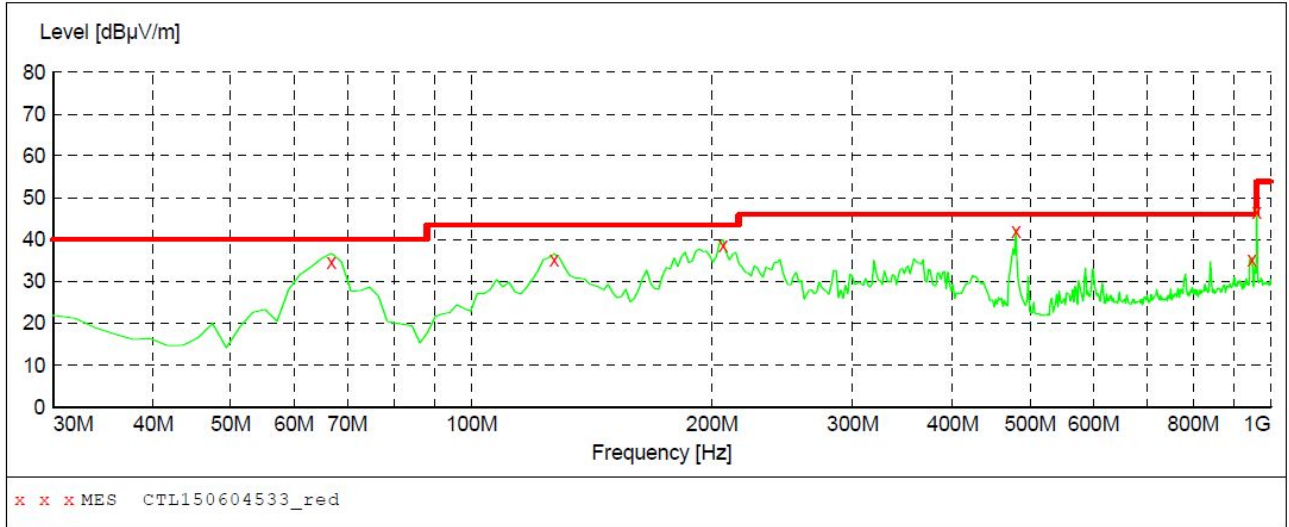
Vertical



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Polarization
61.040000	32.00	8.4	40.0	8.0	Qp	VERTICAL
123.120000	35.20	15.1	43.5	8.3	Qp	VERTICAL
206.540000	31.80	14.3	43.5	11.7	Qp	VERTICAL
480.080000	42.20	20.1	46.0	3.8	Qp	VERTICAL
720.640000	43.40	23.7	46.0	2.6	Qp	VERTICAL
961.200000	40.20	26.8	53.9	13.7	Qp	VERTICAL

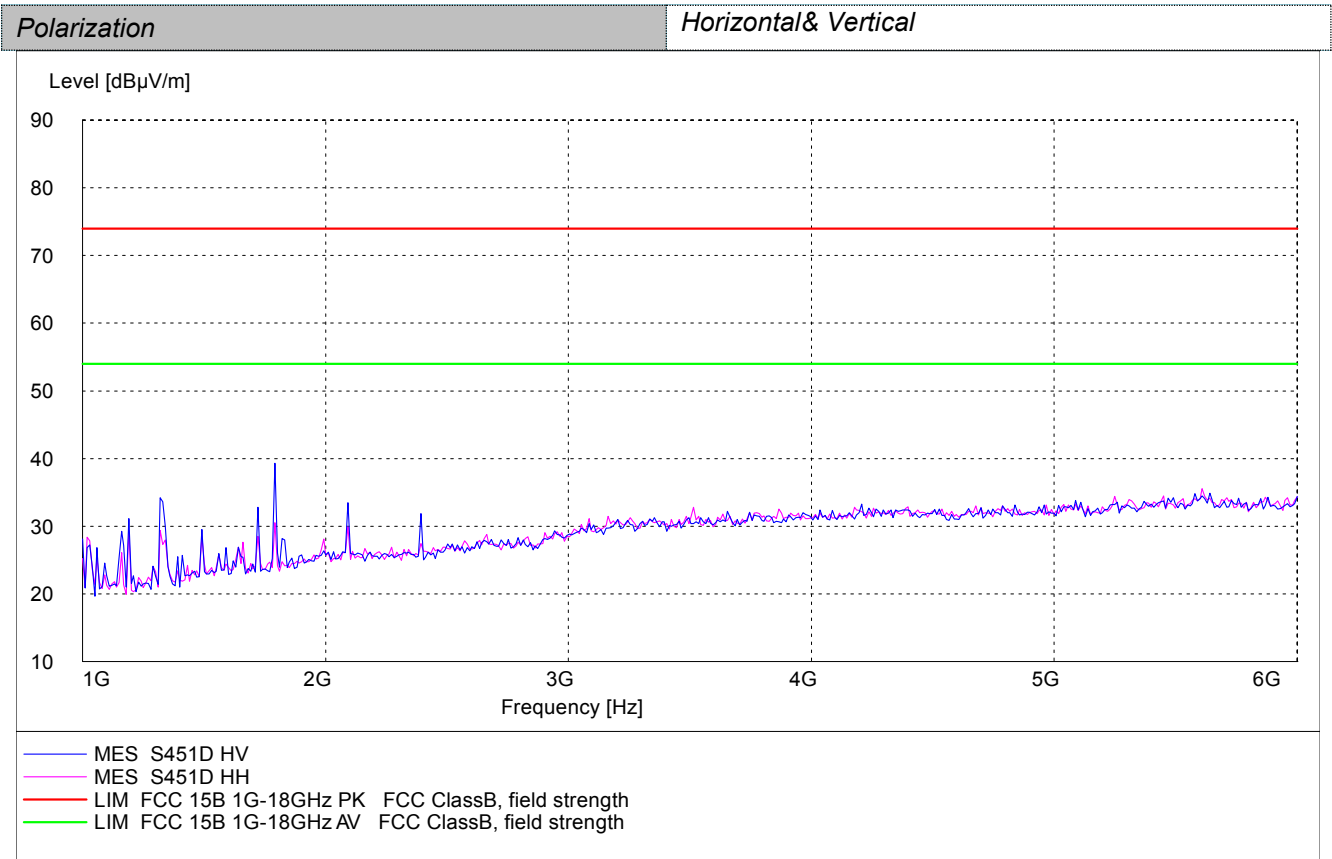
Polarization

Horizontal



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Polarization
66.860000	34.70	8.4	40.0	5.3	Qp	HORIZONTAL
127.000000	34.60	15.0	43.5	8.9	Qp	HORIZONTAL
206.540000	38.00	14.3	43.5	5.5	Qp	HORIZONTAL
480.080000	41.60	20.1	46.0	4.4	Qp	HORIZONTAL
947.620000	34.80	26.6	46.0	11.2	Qp	HORIZONTAL
961.200000	46.20	26.8	53.9	7.7	Qp	HORIZONTAL

For 1GHz-6GHz



Freq (Hz)	factor (dB)	Readings (dBuV/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin	Polarity
1190.038	-16.6	48.5	31.9	74	42.1	Horizontal
1791.583	-13.8	49.0	35.2	74	38.8	Horizontal
2092.184	-11.8	42.4	30.6	74	43.4	Horizontal
1330.661	-16.5	50.0	33.5	74	40.5	Vertical
1721.441	-13.9	46.7	32.8	74	41.2	Vertical
1791.583	-13.8	53.0	39.2	74	34.8	Vertical

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



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