

FCC Part 15B

Measurement and Test Report

For

Hyundai Corporation

25, Yulgok-ro 2-Gil, Jongno-gu, Seoul, South Korea

FCC ID: RQQHLT-E50FSL

Test Rule(s):	<u>FCC Part 15 Subpart B</u>
Product Description:	<u>Smart Phone</u>
Tested Model:	<u>E500</u>
Report No.:	<u>STR16088242I-5</u>
Tested Date:	<u>2016-08-23 to 2016-09-18</u>
Issued Date:	<u>2016-09-18</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Hyundai Corporation
Address of applicant: 25, Yulgok-ro 2-Gil, Jongno-gu, Seoul, South Korea

Manufacturer: Shenzhen Fortuneship Technology Co., Ltd.
Address of manufacturer: Room 701-716, 7th Floor, Kanghesheng Building, No.1 ChuangSheng Road, Nanshan District, Shenzhen, Guangdong, P. R. China

General Description of EUT:	
Product Name:	Smart Phone
Brand Name:	/
Model No.:	E500
Adding Model(s):	/
Hardware version:	WW816 V8.5
Software version:	Android 6.0
Rated Voltage:	DC 3.7V
Battery:	2200mAh
Device Category:	Portable Device
Note: The test data is gathered from a production sample provided by the manufacturer.	

Technical Characteristics of EUT	
Rated Voltage:	DC 3.7V
Rated Current:	/
Rated Power:	/
Power Adapter Model:	/
Lowest Internal Frequency:	32.768kHz
Highest Internal Frequency:	1.3GHz

1.2 Test Standards

The following report is prepared on behalf of the Hyundai Corporation in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart B, and section 15.205, 15.107, and 15.109 rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, 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 40 GHz.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory 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 and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List:

Test Mode	Description	Remark
TM1	Charging + Playing	/
TM2	Downloading	/
TM3	Charging + Camera	/

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
USB Cable	1.0	Shielded	Without Ferrite
Earphone	1.2	Unshielded	Without Ferrite

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	E10	LR-63C8R

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2016-06-04	2017-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
SEMT-1121	Horn Antenna	ETS	3116B	00088203	2016-06-04	2017-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2016-06-04	2017-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2016-06-04	2017-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2016-06-04	2017-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2016-06-04	2017-06-03

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.107 (a)	Conducted Emissions	Compliant
§ 15.109 (a)	Radiated Emissions	Compliant

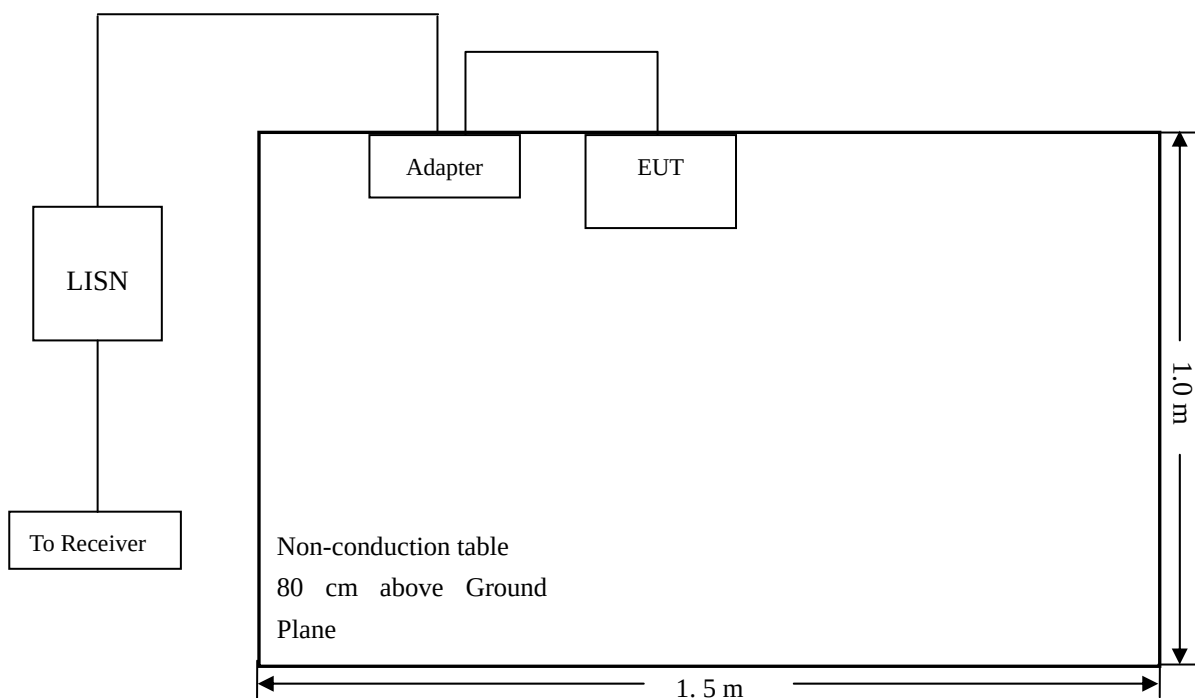
N/A: not applicable

3. Conducted Emissions

3.1 Test Procedure

Test is conducting under the description of ANSI C63.4-2014, 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 40 GHz.

3.2 Basic Test Setup Block Diagram



3.3 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

3.4 Summary of Test Results/Plots

According to the data in section 3.6, the EUT complied with the FCC Part 15.107(a) Conducted margin for a Class B device, with the *worst* margin reading of:

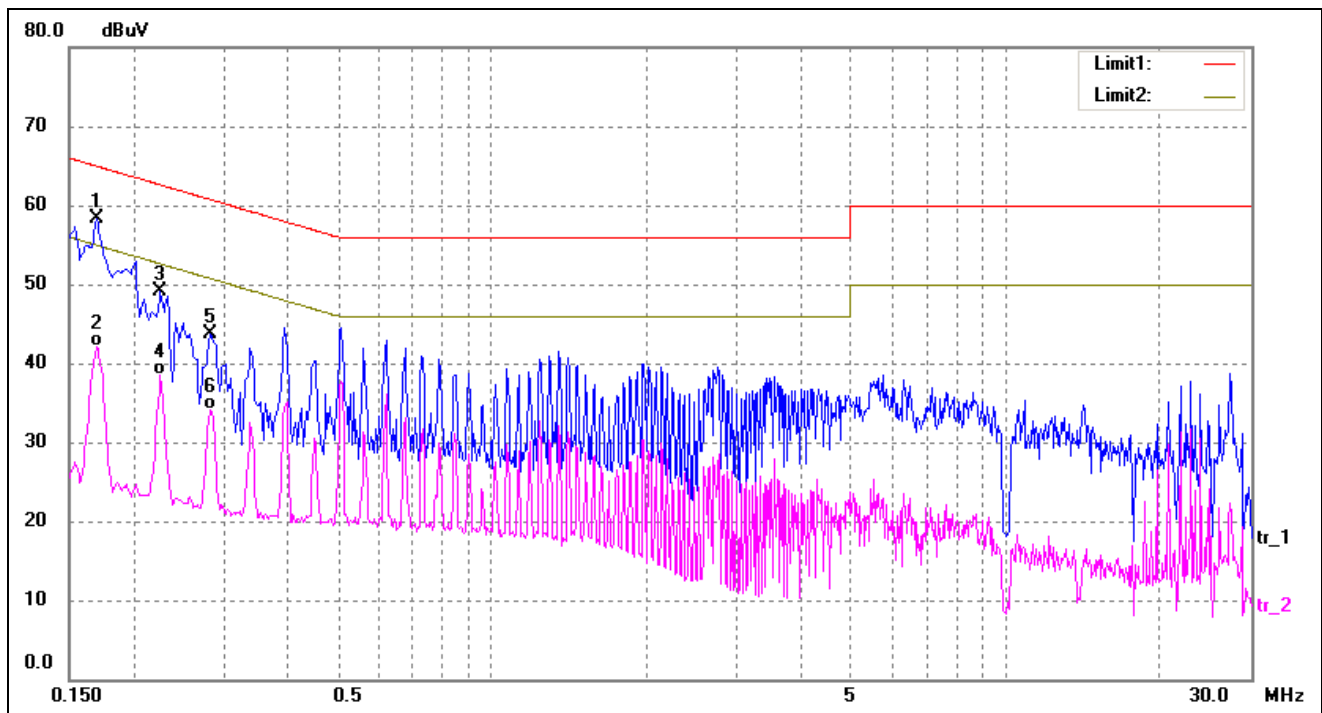
-1.75 dB at 0.5060 MHz in the Line, TM1 Mode, Average detector, 0.15-30MHz

3.5 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

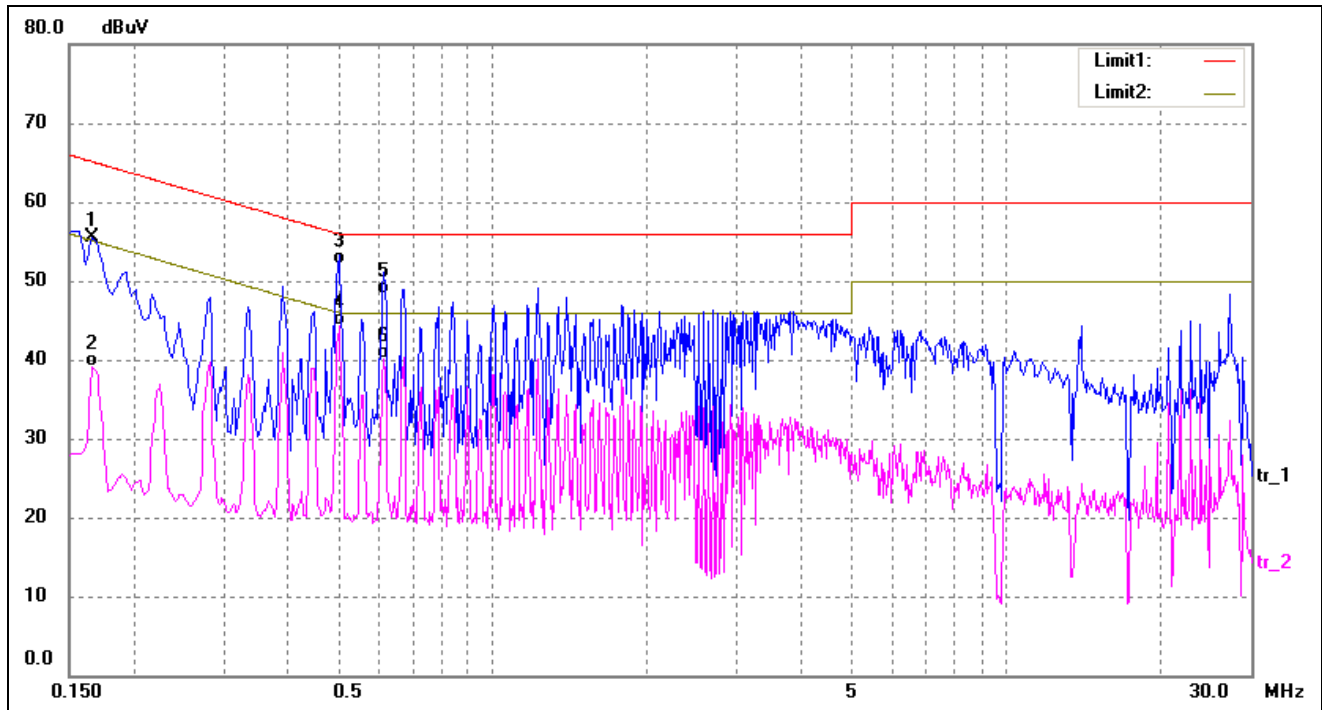
EUT: Smart Phone
Tested Model: E500
Operating Condition: TM1
Comment: AC 120V/60Hz; Adapter DC 5V

Test Specification: Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1*	0.1700	48.88	9.50	58.38	64.96	-6.58	peak
2	0.1700	32.65	9.50	42.15	54.96	-12.81	AVG
3	0.2260	39.64	9.50	49.14	62.60	-13.46	peak
4	0.2260	29.07	9.50	38.57	52.60	-14.03	AVG
5	0.2820	34.25	9.50	43.75	60.76	-17.01	peak
6	0.2820	24.51	9.50	34.01	50.76	-16.75	AVG

Test Specification: Line

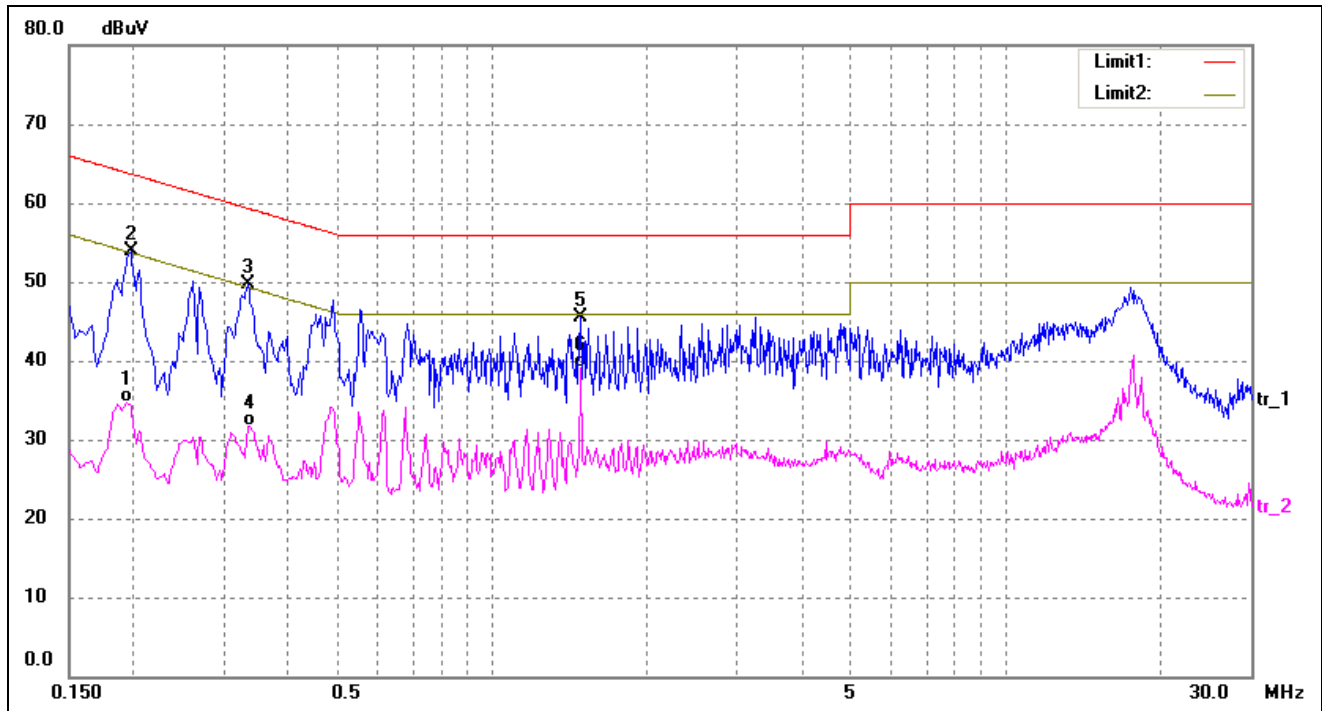


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1660	46.02	9.50	55.52	65.16	-9.64	peak
2	0.1660	29.63	9.50	39.13	55.16	-16.03	AVG
3	0.5020	42.63	9.56	52.19	56.00	-3.81	QP
4*	0.5060	34.69	9.56	44.25	46.00	-1.75	AVG
5	0.6140	38.70	9.59	48.29	56.00	-7.71	QP
6	0.6140	30.61	9.59	40.20	46.00	-5.80	AVG

Plot of Conducted Emissions Test Data

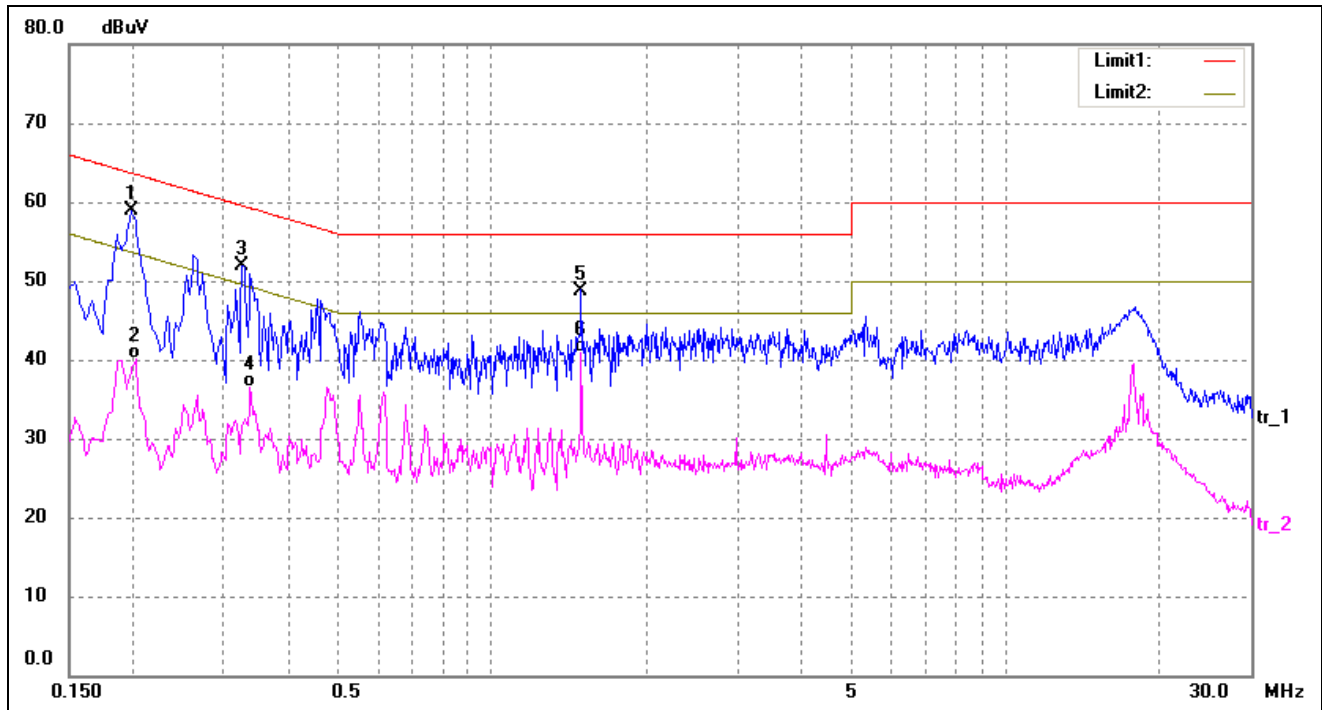
EUT: Smart Phone
Tested Model: E500
Operating Condition: TM2
Comment: AC 120V/60Hz, USB 5V

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1940	22.24	12.50	34.74	53.86	-19.12	AVG
2	0.1980	41.50	12.50	54.00	63.69	-9.69	peak
3	0.3340	37.25	12.50	49.75	59.35	-9.60	peak
4	0.3380	19.27	12.50	31.77	49.25	-17.48	AVG
5	1.4900	32.43	13.00	45.43	56.00	-10.57	peak
6*	1.4900	26.17	13.00	39.17	46.00	-6.83	AVG

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1980	46.38	12.50	58.88	63.69	-4.81	peak
2	0.2020	27.51	12.50	40.01	53.53	-13.52	AVG
3	0.3260	39.36	12.50	51.86	59.55	-7.69	peak
4	0.3380	24.09	12.50	36.59	49.25	-12.66	AVG
5	1.4940	35.80	13.00	48.80	56.00	-7.20	peak
6	1.4940	27.88	13.00	40.88	46.00	-5.12	AVG

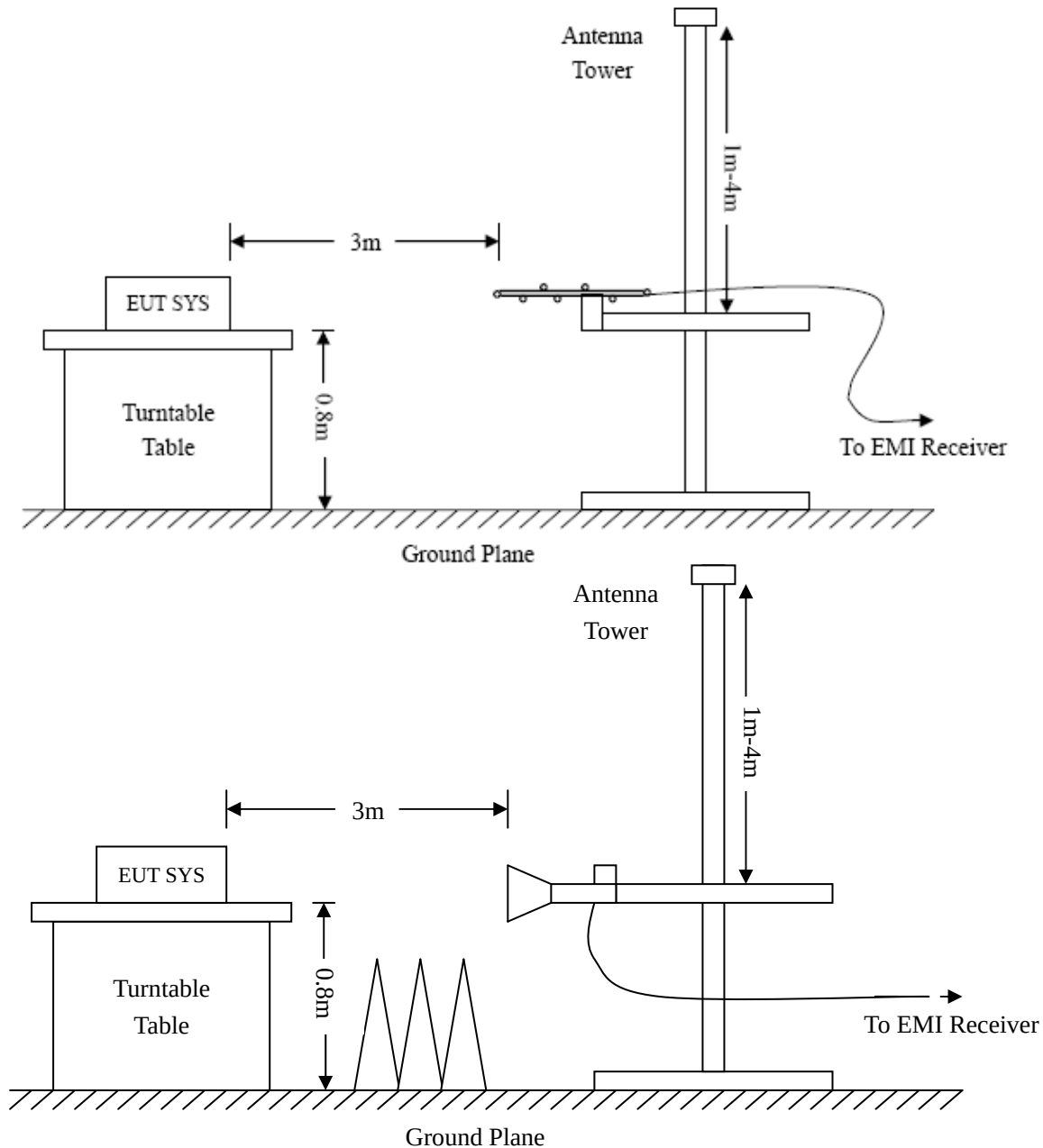
4. Radiated Emissions

4.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.109 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



4.2 Test Receiver Setup

Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit for a Class B device. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.109(a) Limit}$$

4.4 Environmental Conditions

Temperature:	23 °C
Relative Humidity:	55 %
ATM Pressure:	1011 mbar

4.5 Summary of Test Results/Plots

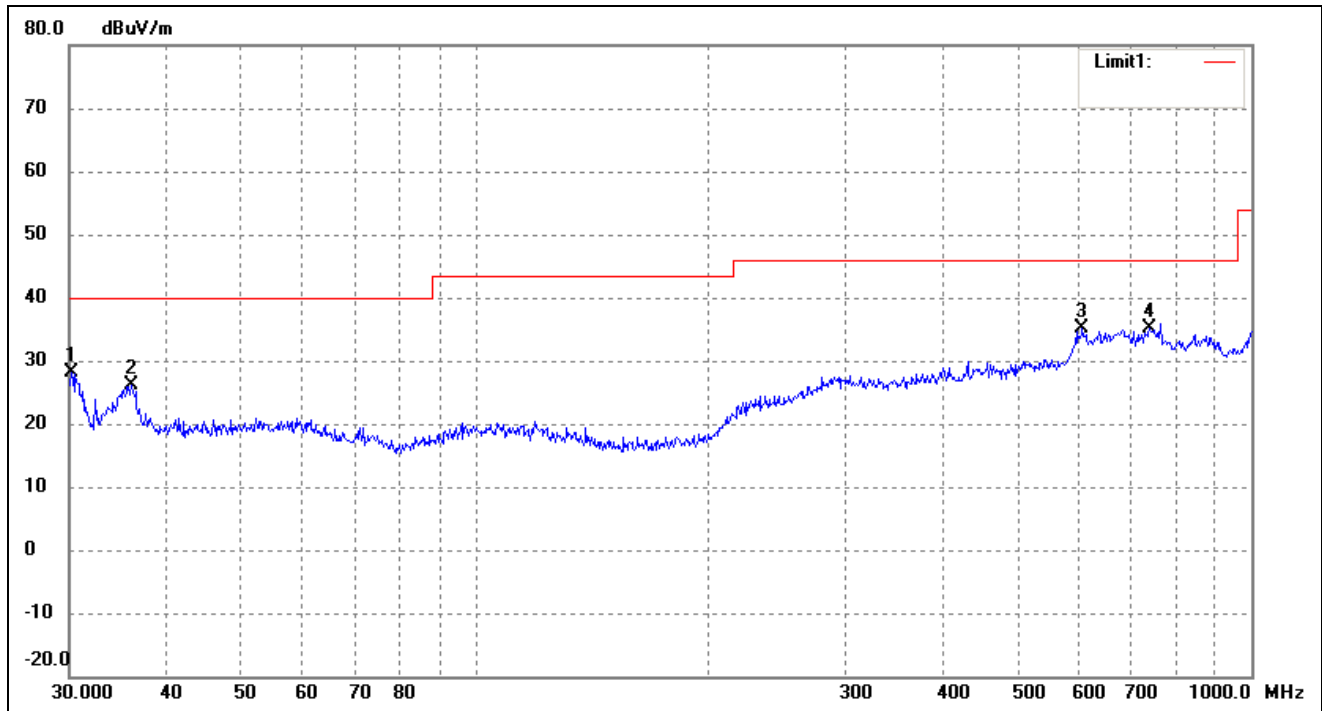
According to the data, the EUT complied with the FCC Part 15.109(a) rule, and had the worst margin of:

-2.81 dB at 71.8320 MHz in the Vertical polarization, TM3 Mode, 30MHz to 6.5GHz, 3Meters

Plot of Radiated Emissions Test Data

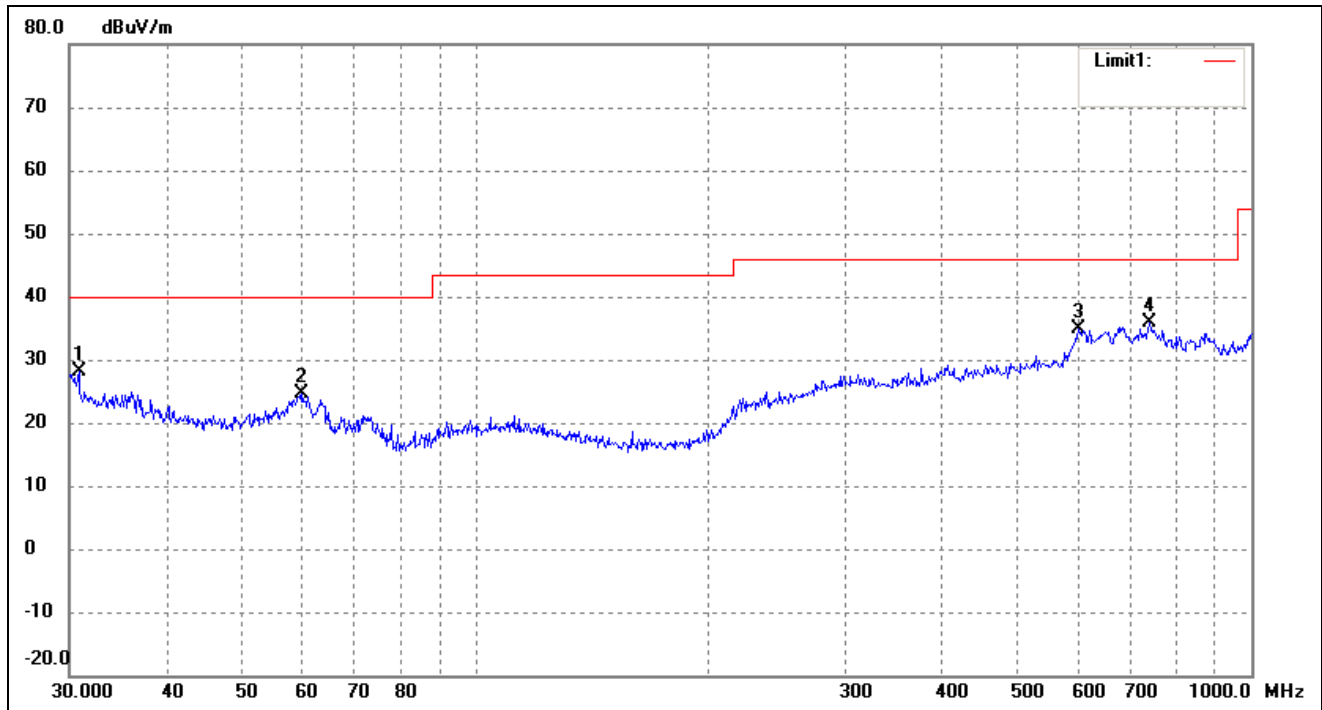
EUT: Smart Phone
Tested Model: E500
Operating Condition: TM1
Comment: AC 120V/60Hz; Adapter DC 5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	30.2111	24.49	3.67	28.16	40.00	-11.84	0	100	peak
2	36.0007	21.58	4.56	26.14	40.00	-13.86	0	100	peak
3	605.6592	16.09	18.92	35.01	46.00	-10.99	0	100	peak
4	739.6605	15.67	19.53	35.20	46.00	-10.80	0	100	peak

Test Specification: Vertical

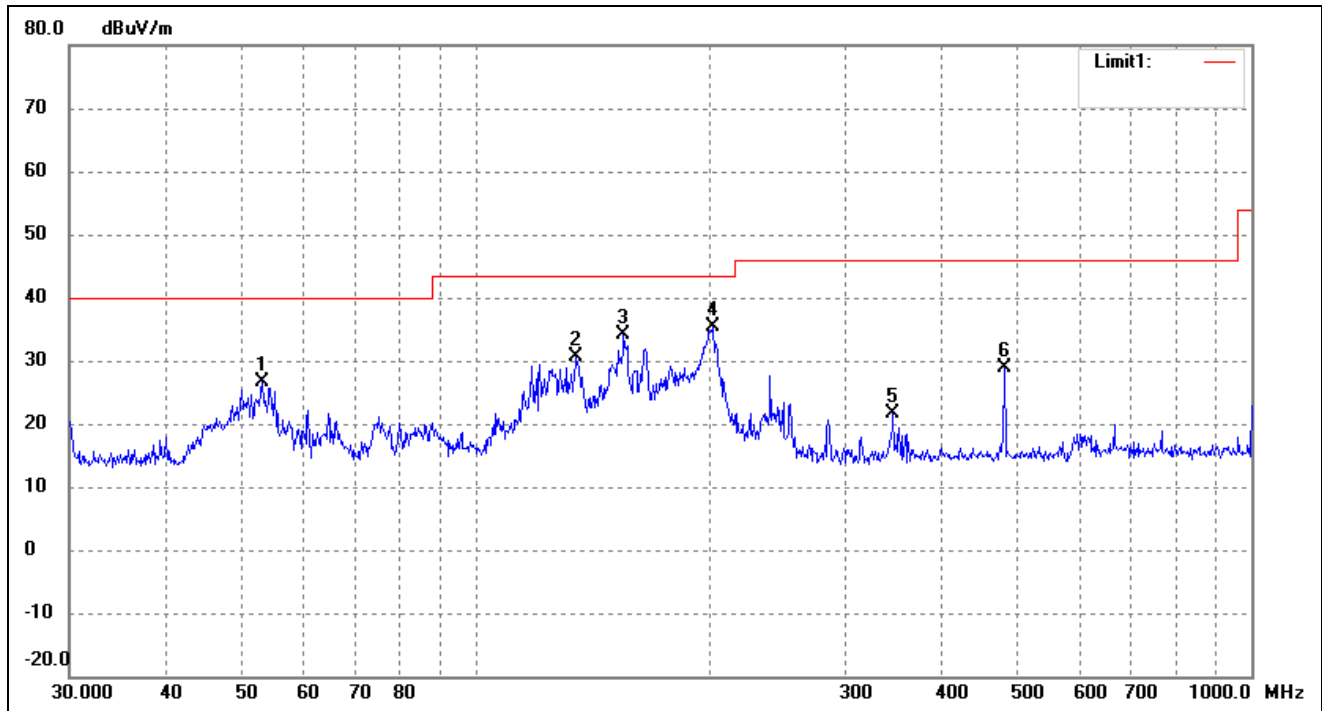


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	30.8535	24.38	3.77	28.15	40.00	-11.85	0	100	peak
2	59.8588	19.19	5.38	24.57	40.00	-15.43	0	100	peak
3	599.3213	15.62	19.19	34.81	46.00	-11.19	0	100	peak
4	739.6605	16.27	19.53	35.80	46.00	-10.20	0	100	peak

Plot of Radiated Emissions Test Data

EUT: Smart Phone
Tested Model: E500
Operating Condition: TM2
Comment: AC 120V/60Hz, USB 5V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	53.1313	21.52	5.06	26.58	40.00	-13.42	0	100	peak
2	135.0319	27.05	3.56	30.61	43.50	-12.89	0	100	peak
3	155.3644	31.60	2.56	34.16	43.50	-9.34	0	100	peak
4	202.8104	31.49	3.97	35.46	43.50	-8.04	0	100	peak
5	345.5952	10.12	11.52	21.64	46.00	-24.36	0	100	peak
6	480.5276	16.39	12.58	28.97	46.00	-17.03	0	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	50.0566	24.53	4.98	29.51	40.00	-10.49	0	100	peak
2	110.5687	28.46	4.87	33.33	43.50	-10.17	0	100	peak
3	134.5592	36.20	3.59	39.79	43.50	-3.71	0	100	QP
4	155.3644	33.82	2.56	36.38	43.50	-7.12	0	100	peak
5	202.8104	29.72	3.97	33.69	43.50	-9.81	0	100	peak
6	593.0497	8.11	17.45	25.56	46.00	-20.44	0	100	peak

Plot of Radiated Emissions Test Data

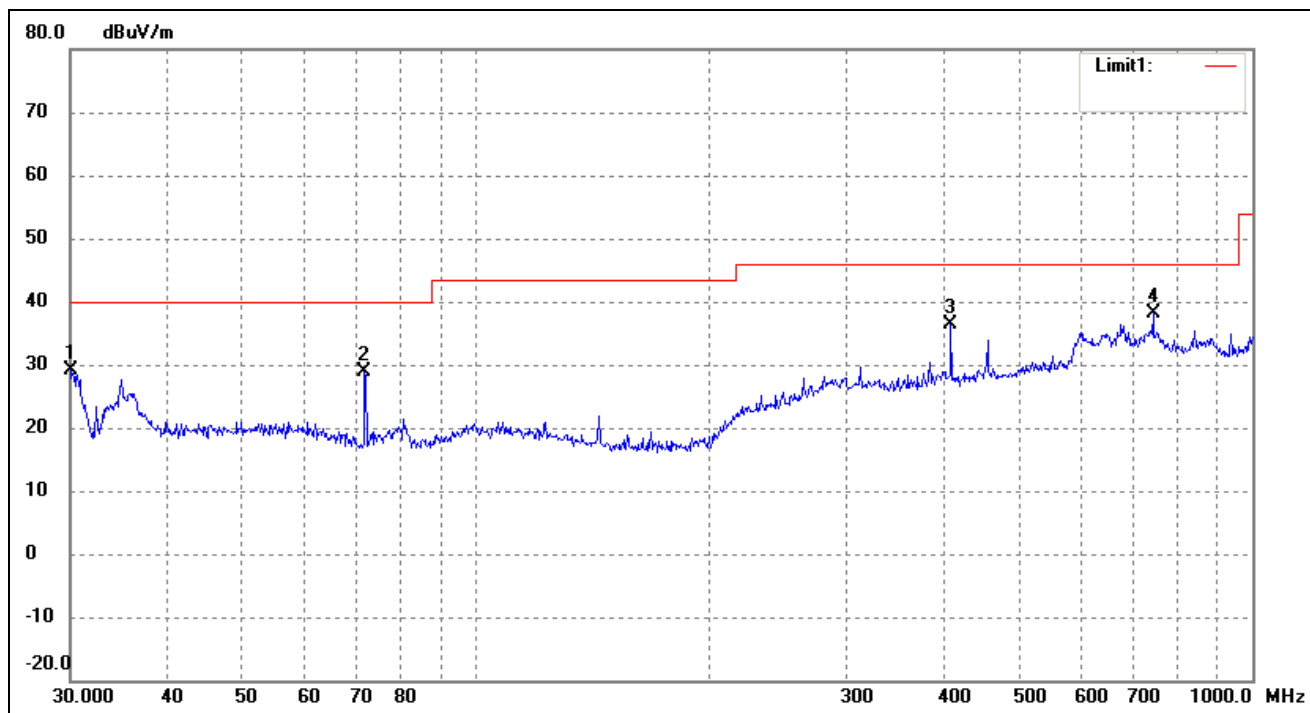
EUT: Smart Phone

Tested Model: E500

Operating Condition: TM3

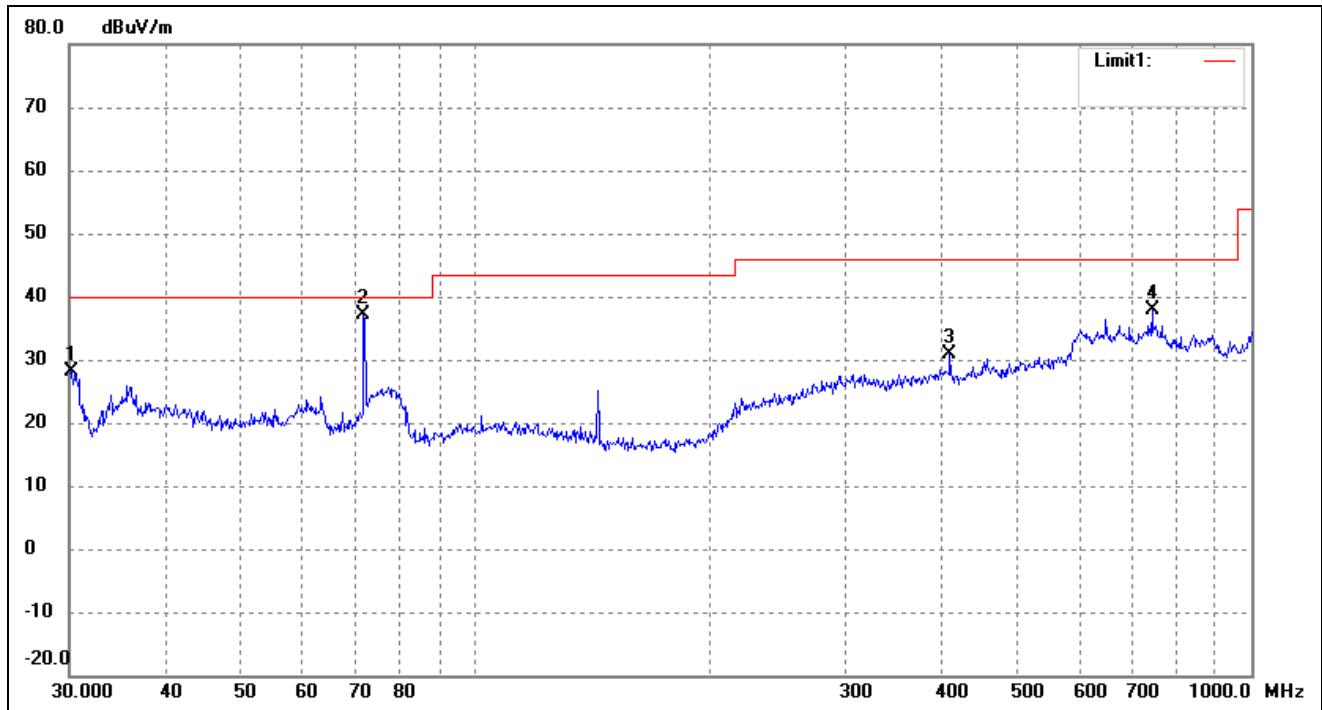
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	30.0000	25.45	3.64	29.09	40.00	-10.91	0	100	peak
2	71.8320	25.87	2.97	28.84	40.00	-11.16	0	100	peak
3	408.9460	23.67	12.80	36.47	46.00	-9.53	0	100	peak
4	744.8661	18.69	19.33	38.02	46.00	-7.98	0	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	30.2111	24.48	3.67	28.15	40.00	-11.85	0	100	peak
2	71.8320	34.22	2.97	37.19	40.00	-2.81	0	100	peak
3	408.9460	18.07	12.80	30.87	46.00	-15.13	0	100	peak
4	744.8661	18.52	19.33	37.85	46.00	-8.15	0	100	peak

Note: Testing is carried out with frequency rang 30MHz to the 6.5GHz, which above 1GHz is close to the noise base even antenna close up to 1meter distance according the measurement of ANSI C63.4.

***** END OF REPORT *****