

EMC TEST REPORT

Project No.	LBE20124734	Issue No.	1
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	September 21, 2012	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LEKGC100	
	Kind of product	Mobile Imaging Device with WCDMA, WLAN, BT	
	Model No.	EK-GC100	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	TSTC Samsung Telecommunication Co., Ltd. 300385 China Tianjin No.9 WeiWu Rd. Micro Electronic Industrial Park Xiqing Dist, Tianjin, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2003	
Test Period		September 21, 2012 ~ September 22, 2012	
Issue date		September 24, 2012	
Test result : Complied The equipment under test has found to be compliant with the applied standards. (Refer to the attached test result for more detail.)			
Tested by : Young-Jin Kim 		Reviewed by : Tae-Young Jang 	
The test results in this report only apply to the tested sample. This report must not be reproduced, except in full, without written permission from CS & Environment center.			
			
(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea Tel: 82 31 279 1750, Fax: 82 31 279 1745			

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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	- LBE20124414 (SAMSUNG)
Issue 1	- LBE20124734 (SAMSUNG) : USB Communication + HDMI Display mode was tested.

2. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result
☒	Conducted Disturbance (Mains port)	FCC Part 15 Subpart B / ANSI C63.4-2003 (Class B)	Complied
☒	Radiated Disturbance		Complied

3. General Information

3.1 Test facility

The CS & Environment center is located on Samsung Electronics Co., Ltd. at (Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea.

All testing are performed in Semi-anechoic chambers conforming to the site attenuation characteristics defined by ANSI C63.4, CISPR 22, 16-1 and 16-2. and Shielded rooms.

The CS & Environment center is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:2005.

4. Test Setup configuration

4.1 Test Peripherals

The cables used for these peripherals are either permanently attached by the peripheral manufacturer or coupled with an assigned cable as defined below.

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Mark	Description	Model No.	Serial No.	Manufacturer / Trademark	FCC ID / DoC
A	Mobile Imaging Device with WCDMA, WLAN, BT	EK-GC100	-	SAMSUNG	A3LEKGC100
B	Battery	EB-F1A2GBU	AA1C410CS/5-B	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	Data Cable	CB5MU10E	75252300325 1	SAMSUNG	-
E	microSD Card	16GB	-	SANDISK	-
F	Desk-Top Computer	DCME	8JBVSBX	DELL	DoC
G	LED TV Monitor	UN22C4000P	ZOBY31KZ700003F	SAMSUNG	DoC
H	Mouse	MOARUO	MS-S5-AR03-01	SAMSUNG	DoC
I	Keyboard	GP-K5000U	15000099	SAMSUNG	DoC
J	Router	3CGS U08	AB/ 9XRQAC0024825	3COM	DoC
K	Power Supply	PW150	KA1203N03	AULT	DoC

4.2 EUT operating mode

To achieve compliance applied standard specification, the following mode(s) were made during compliance testing:

Operating Mode 1	USB (Data Communication) + HDMI Display (MP4 Play)
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4.3 Details of Sampling

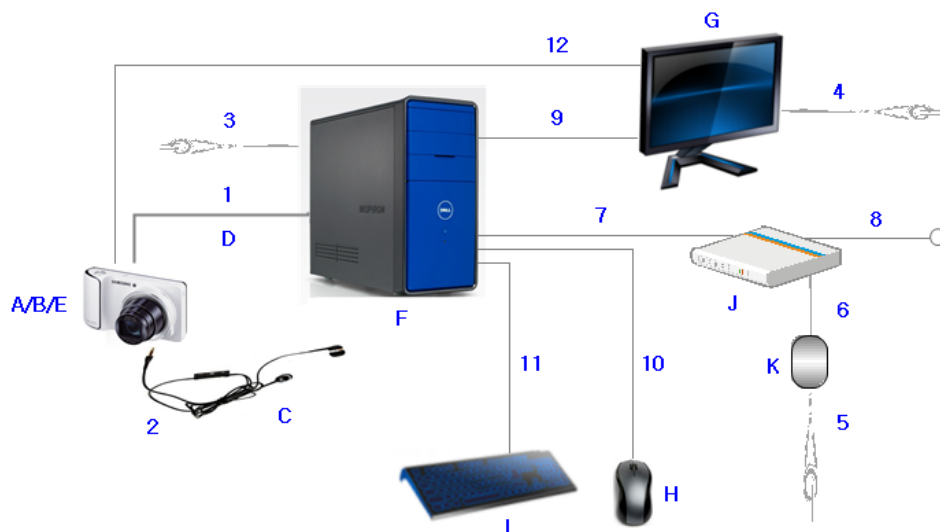
Customer selected, single unit.

4.4 Used cable description

The EUT is configured, installed, arranged and operated in a manner consistent with typical applications. Interface cables/loads/devices are connected to at least one of each type of interface port of the EUT, and where practical, each cable shall be terminated in a device typical of actual usage. The type(s) of interconnecting cables to be used and the interface port (of the EUT) to which these were connected:

No.	Connected cable	Length [m]	Shielded [Y/N]	Note
1	Data Cable	1.0	Yes	From EUT to Desk-Top Computer
2	Headset	1.5	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LED TV Monitor
5	Power	1.8	No	For Power Supply
6	Power	3.9	No	From Router to Power Supply
7	LAN	1.5	No	From Desk-Top Computer to Router
8	LAN	1.5	No	From Router to Local Area Network
9	RGB	1.8	Yes	From Desk-Top Computer to LED TV Monitor
10	USB	1.8	Yes	From Desk-Top Computer to Mouse
11	USB	1.5	Yes	From Desk-Top Computer to Keyboard
12	HDMI	1.5	Yes	From EUT to LED TV Monitor

4.5 Test arrangement



4.6 EUT Description

4.6.1 The following features describe EUT represented by this report:

Item	Specification
Operating Temperature (°C)	-20 ~ +60
Operating Humidity (%)	0 ~ 95
Bluetooth	2 402 ~ 2 480 MHz
WLAN	802.11 b/g/n : 2 412 ~ 2 472 MHz
	802.11 a/n : 5 180 ~ 5 805 MHz

4.6.2 The variant models

- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	1 400

4.8 Test configuration and condition

- ☐ The EUT exercise program which is the samsung standardized emission test program for Windows was used during all EMC measurements were tested. This program was contained on the PC hard disk drive. Once loaded, the program sequentially exercises each system component in turn.
- ☒ The EUT was exercised during the testing by data read and write cycles repeated with internal storage devices. At the end of the test, the copied back data was compared with original.
- ☐ The EUT was connected to the PC by using USB data cable to charge.
- ☒ The system was configured for testing in a typical fashion that a customer would normally use, and was tested while in an automated non-attendant mode.

Power source for the EUT operating was supplied by CVCF made by the Pacific Power Source Corp.

- Test Voltage : AC 120 V, 60 Hz

4.9 Measurement uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus: (According to CISPR 16-4 and UKAS Lab 34.)

4.9.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	AC Mains	± 3.24 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	± 4.59 dB
	Vertical	± 4.75 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	± 4.18 dB
	Vertical	± 4.15 dB

5. Results of individual test

5.1 Conducted disturbance

Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration. The EUT measured in accordance with the methods described in standards.

Limits for conducted disturbance at the mains ports of Class B ITE

Frequency range Limits [MHz]	Resolution Bandwidth [kHz]	Limits [dB(μV)]	
		Quasi-peak	Average
0,15 to 0,50	9	66 to 56	56 to 46
0,50 to 5	9	56	46
5 to 30	9	60	50

NOTE 1 The lower limit shall apply at the transition frequency.
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.1.1 Test instrumentation

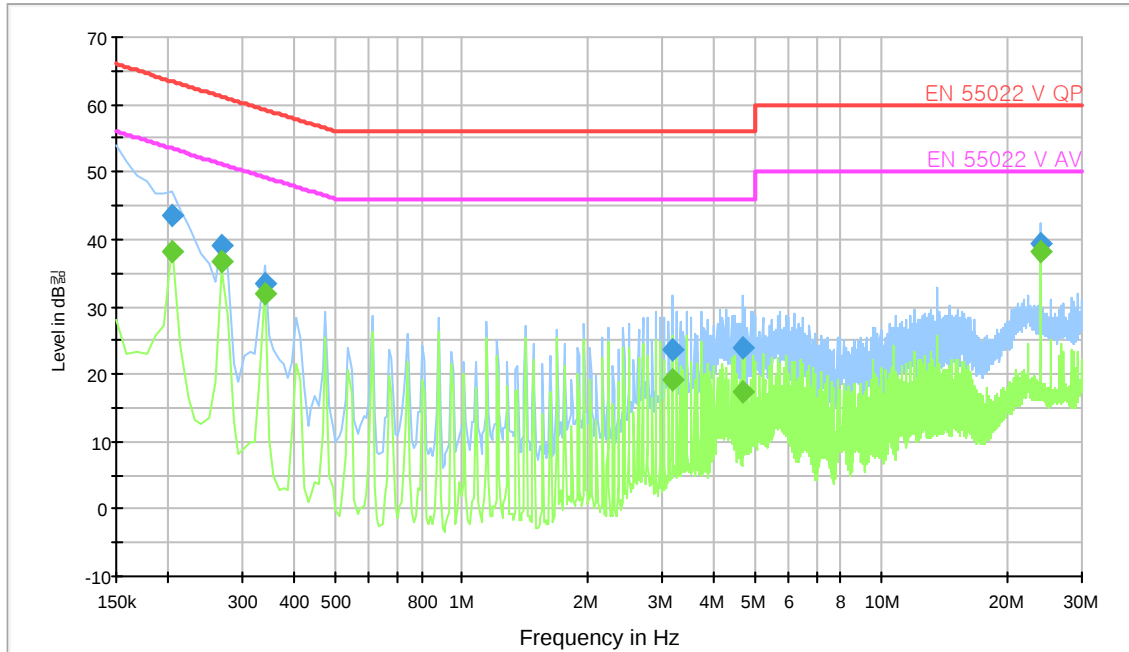
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E4I-093	Test Receiver	ESCI	R&S	100086	2011-11-11	12
E3I-050	LISN	ESH3-Z5	R&S	100263	2011-10-12	12
E3I-259	LISN	ENV216	R&S	101369	2011-10-11	12

5.1.2 Temperature and humidity condition

Test date	2012-09-22	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	24.1 °C	Limit (15.0 to 35.0) °C
	relative humidity	41.1 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.2 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

5.1.3 Test results

□ Operating Mode 1: AC Mains



Note 1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Quasi-peak final measurement results table:

Frequency (MHz)	Level (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.204	43.4	L1	10.0	20.0	63.4
0.267	39.1	N	10.0	22.1	61.2
0.339	33.4	N	10.0	25.9	59.2
3.174	23.7	N	9.7	32.3	56.0
4.659	23.9	N	9.8	32.1	56.0
23.901	39.3	N	10.1	20.7	60.0

Average final measurement results table:

Frequency (MHz)	Level (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.204	38.3	L1	10.0	15.1	53.4
0.267	36.6	N	10.0	14.6	51.2
0.339	31.8	N	10.0	17.4	49.2
3.174	19.2	N	9.7	26.8	46.0
4.659	17.3	N	9.8	28.7	46.0
23.901	38.1	N	10.1	11.9	50.0

Note 2) Level (QP and/or AV) = Meter Reading (QP and/or AV) + Corr. (LISN Insertion Loss + Cable Loss)
 Margin (QP and/or AV) = Limit – Level (QP and/or AV)
 QP = Quasi-Peak, AV = Average

5.2 Radiated disturbance

The following data lists the significant emission frequencies, measured levels, correction factors (for antenna and cables), orientation of table, polarization and height of antenna, the corrected reading, the limit, and the amount of margin.

Peak measurements were made over the changeable frequency range 30 MHz to 1 GHz at a measurement distance of 10 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	Resolution Bandwidth [kHz]	Video Bandwidth [kHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	120	300	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using quasi-peak detectors.

Peak/Average measurements were made over the changeable frequency range 1 GHz to 40 GHz or 5th harmonics of the highest frequency in accordance with internal maximum operating frequency at a measurement distance of 3 m for the following antenna and turntable arrangements:

Antenna Height [cm]	Antenna Polarisation	Resolution Bandwidth [MHz]	Video Bandwidth [MHz]	Turntable position [degrees]
100 ~ 400	Horizontal, Vertical	1 (PK / AV)	3 (PK) 10 Hz (AV)	Continuous

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and average detectors.

Limits for radiated disturbance of Class B ITE at a measuring distance of 3 m and 10 m

Frequency range Limits [MHz]	Field Strength		
	3 m [$\mu\text{V/m}$]	3 m [dB($\mu\text{V/m}$)]	10 m [dB($\mu\text{V/m}$)]
30 to 88	100	40.0	29.5
88 to 216	150	43.5	33.0
216 to 960	200	46.0	35.5
Above 960	500	54.0	43.5

Results checked manually; and points close to the limit line were re-measured.

5.2.1 Test instrumentation

EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-003	BILOG Antenna	Schaffner	CBL6112B	2805	2012-04-19	24
E3I-190	BILOG Antenna	Schaffner	CBL6112B	2804	2011-06-22	24
E3I-213	Preamplifier	317	SONOMA	282424	2011-12-06	12
E3I-214	Preamplifier	317	SONOMA	282425	2011-12-06	12
E3I-231	Horn Antenna	3115	ETS Lindgren	00101620	2012-01-12	24
E3I-228	EMI Test Receiver	ESU8	R&S	100084	2011-10-10	12
E3I-233	EMI Test Receiver	ESU26	R&S	100364	2011-10-24	12

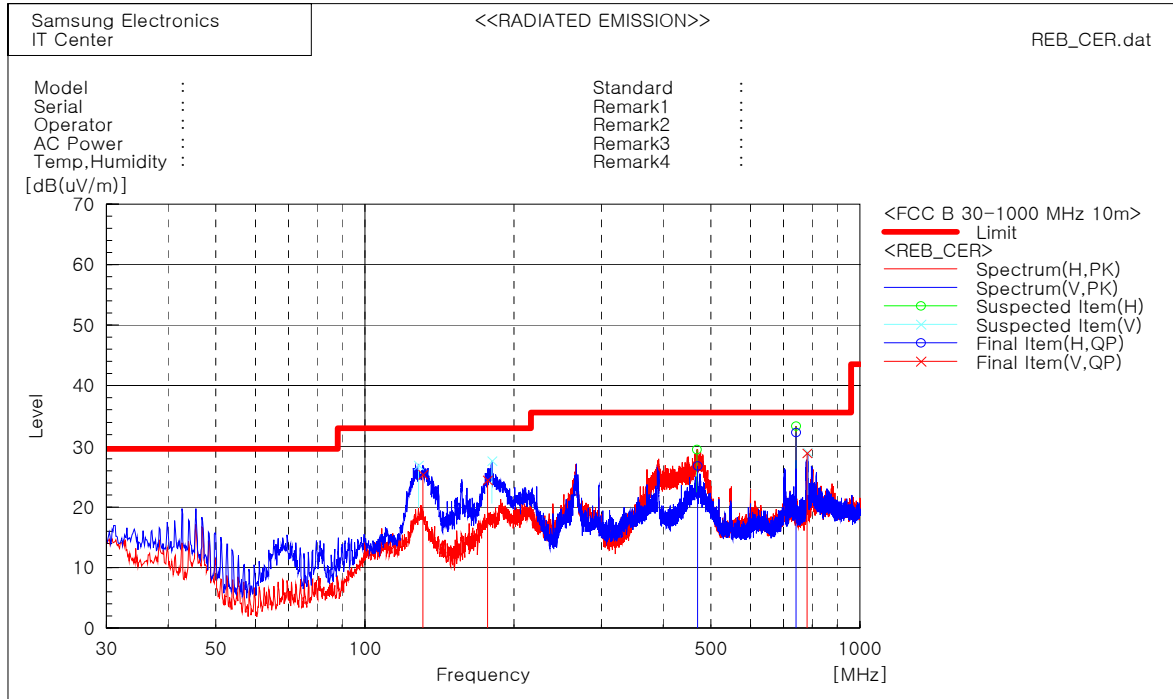
5.2.2 Temperature and humidity condition

Test date	2012-09-21	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	23.4 °C	Limit (15.0 to 35.0) °C
	Relative humidity	45.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.3 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 30 ~ 1 000 MHz



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	System
1	130.815	V	50.1	-24.8	25.3	33.0	7.7	101.0	204.0	2
2	176.944	V	51.1	-26.7	24.4	33.0	8.6	101.0	173.0	2
3	469.320	H	42.4	-15.6	26.8	35.5	8.7	203.0	323.0	1
4	741.770	H	43.9	-11.6	32.3	35.5	3.2	100.0	69.0	1
5	781.765	V	42.3	-13.4	28.9	35.5	6.6	187.0	3.0	2

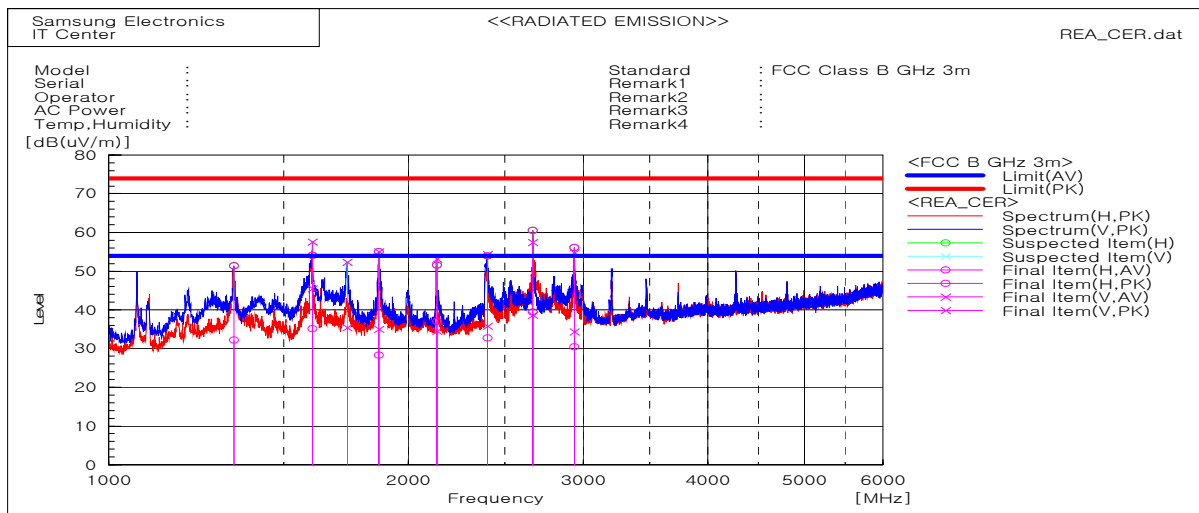
Note) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 10 m, Antenna Height : 1 to 4 meters

Level (QP) = Reading (QP) + c.f (Antenna Factor + Cable Loss - Amp. Gain)

Margin (QP) = Limit - Level (QP)

QP = Quasi-Peak

☐ Operating Mode 1**- Frequency range: 1 000 ~ 7 000 MHz**

Final Result

--- Horizontal Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	1335.494	43.6	-11.4	32.2	54.0	21.8	100.0	111.0
2	1601.250	44.4	-9.2	35.2	54.0	18.8	100.0	107.0
3	1868.750	34.7	-6.4	28.3	54.0	25.7	100.0	109.0
4	2136.250	42.5	-5.5	37.0	54.0	17.0	100.0	63.0
5	2402.500	38.2	-5.5	32.7	54.0	21.3	100.0	69.0
6	2670.600	43.9	-4.5	39.4	54.0	14.6	100.0	16.0
7	2938.750	34.1	-3.6	30.5	54.0	23.5	100.0	74.0

--- Horizontal Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	1335.494	62.8	-11.4	51.4	74.0	22.6	100.0	111.0
2	1601.250	63.3	-9.2	54.1	74.0	19.9	100.0	107.0
3	1868.750	61.4	-6.4	55.0	74.0	19.0	100.0	109.0
4	2136.250	57.1	-5.5	51.6	74.0	22.4	100.0	63.0
5	2402.500	59.4	-5.5	53.9	74.0	20.1	100.0	69.0
6	2670.600	65.0	-4.5	60.5	74.0	13.5	100.0	16.0
7	2938.750	59.7	-3.6	56.1	74.0	17.9	100.0	74.0

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	1601.875	54.7	-9.2	45.5	54.0	8.5	100.0	69.0
2	1736.250	43.5	-8.0	35.5	54.0	18.5	100.0	54.0
3	1868.750	41.5	-6.4	35.1	54.0	18.9	100.0	241.0
4	2136.250	40.0	-5.5	34.5	54.0	19.5	100.0	112.0
5	2403.125	41.4	-5.5	35.9	54.0	18.1	100.0	116.0
6	2670.625	43.2	-4.5	38.7	54.0	15.3	100.0	67.0
7	2939.375	38.0	-3.6	34.4	54.0	19.6	100.0	5.0

--- Vertical Polarization (PK)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Height [cm]	Angle [deg]
1	1601.875	66.8	-9.2	57.6	74.0	16.4	100.0	69.0
2	1736.250	60.4	-8.0	52.4	74.0	21.6	100.0	54.0
3	1868.750	61.4	-6.4	55.0	74.0	19.0	100.0	241.0
4	2136.250	58.7	-5.5	53.2	74.0	20.8	100.0	112.0
5	2403.125	59.9	-5.5	54.4	74.0	19.6	100.0	116.0
6	2670.625	61.9	-4.5	57.4	74.0	16.6	100.0	67.0
7	2939.375	58.3	-3.6	54.7	74.0	19.3	100.0	5.0

Note 1) Representative operating modes were selected by customer.

There were no emissions detected 6 dB under the average limit from 6 GHz to 7 GHz.

Note 2) Receiving antenna polarization : Horizontal, Vertical

Test Distance : 3 m, Antenna Height : 1 to 4 meters

Level (PK and/or AV) = Reading (PK and/or AV) + Corr. (Antenna Factor + Cable Loss - Amp. Gain)

Margin (PK and/or AV) = Limit - Level (PK and/or AV)

PK = Peak, AV = Average