

EMC TEST REPORT

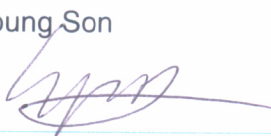
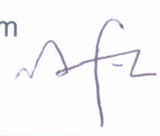
Project No.	LBE20146007	Issue No.	0
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	December 8, 2014	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMA7000	
	Kind of product	Mobile Phone	
	Model No.	SM-A7000	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	SAMSUNG ELECTRONICS HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
Applied Standards		FCC Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		December 8, 2014 ~ December 11, 2014	
Issue date		December 16, 2014	
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 : Su Young Son 		Reviewed by : Min-Gon Kim 	
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.			
		CS & Environment Center of Samsung Electronics Co., Ltd. (Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	

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1. Report Information

1.1 Revision history

No.	Revised detailed information
Issue 0	There are no revisions and this version is basic test report.

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 C63.4-2009 (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 Phone	SM-A7000	-	SAMSUNG	A3LSMA7000
B	Li-ion Battery	EB-BA700ABE	-	SAMSUNG	-
C	Headset	EHS64AVFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU4AWE	KD1F813DS E	SAMSUNG	-
E	Micro SD Card	16GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD TV Monitor	SP2208WFPt	CN-OPK977-71618-838-106S	Dell	DoC
		LS-XL2370HDKF	ZPXNH1KZ500017L	SAMSUNG	DoC
H	Mouse	M-S48a	LZA00153189	SAMSUNG	DoC
I	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
J	Gigabit Switch Hub	H3008	10070100009	EFM Networks	DoC
K	Power Supply	HB12B-050200SPA	HBK520201025	Shen Zhen City Hong Ben	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 Mode (Data Communication)
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4.3 Details of Sampling

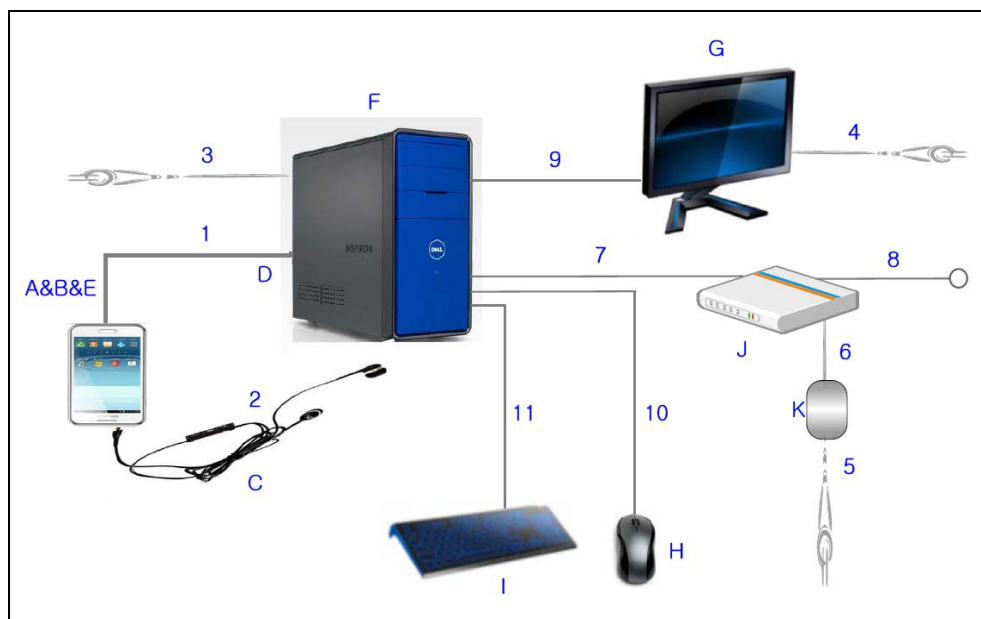
Customer selected, single unit.

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	USB	1.2	Yes	From EUT to Desk-Top Computer
2	Headset	1.2	No	For EUT
3	Power	1.8	No	For Desk-Top Computer
4	Power	1.8	No	For LCD TV Monitor
5	Power	1.8	No	For Power Supply
6	Power	1.8	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 LCD TV Monitor
10	PS/2	1.8	Yes	From Desk-Top Computer to Mouse
11	PS/2	1.8	Yes	From Desk-Top Computer to Keyboard

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)	+5 ~ +35	
Operating Humidity (%)	0 ~ 95	
Frequency Range	GSM 850	TX : 824.2 ~ 849.2 MHz RX : 869.2 ~ 894.2 MHz
	GSM 1 900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	WCDMA B2	TX : 1 850.2 ~ 1909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	WCDMA B5	TX : 824.2 ~ 849.2 MHz RX : 869.2 ~ 894.2 MHz
	LTE B41	TX : 2 555 ~ 2 635 MHz RX : 2 555 ~ 2 635 MHz

4.6.2 The variant models

- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]
CPU	1 500

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	3.12 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.90 dB
	Vertical	4.65 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.45 dB
	Vertical	5.43 dB

5. Results of individual test

5.1 Conducted disturbance

The EUT was connected to the Desk-Top Computer which was powered from one LISN for the measurements. The support equipment power cables were connected to a second LISN.

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

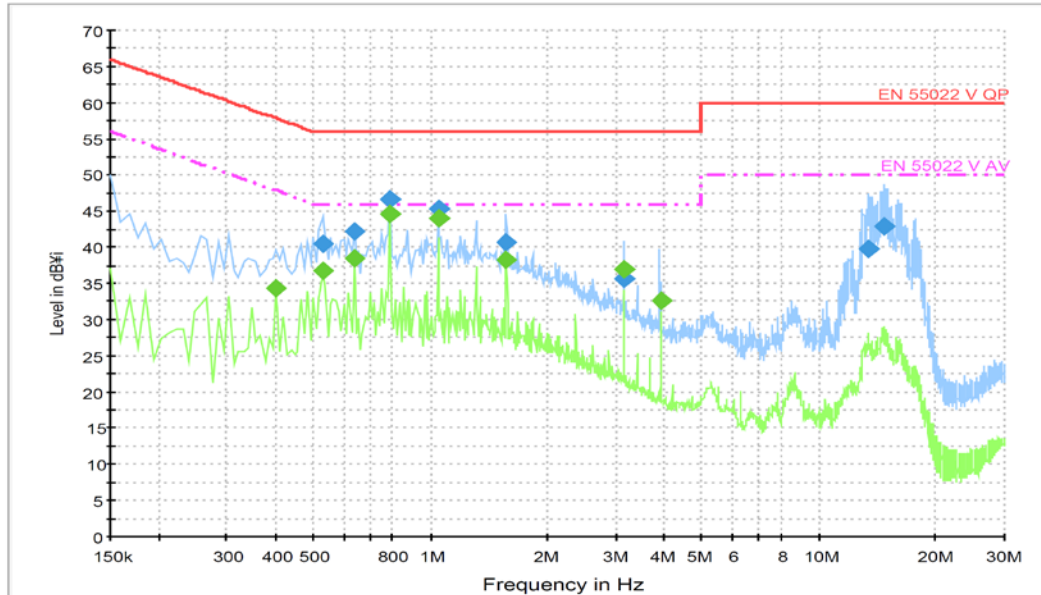
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-142	EMI Test Receiver	ESI-26	R&S	100019	2014-01-21	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2014-11-17	12
E3I-049	Two-Line V-Network	ESH3-Z5	R&S	100260	2014-01-15	12
	Test Software	EMC32	R&S	Ver 8.53.0	-	-

5.1.2 Temperature and humidity condition

Test date	2014-12-11	Test engineer	Su Young Son
Climate condition	Ambient temperature	(22.2 ~ 23.1) °C	Limit (15.0 to 35.0) °C
	☐ Relative humidity	(35.6 ~ 38.3) % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	(101.0 ~ 101.1) kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR14)		

5.1.3 Test results

□ Operating Mode 1: AC Mains



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.528000	40.5	5000.0	9.000	N	10.0	15.50	56.00
0.636000	42.2	5000.0	9.000	L1	9.9	13.80	56.00
0.789000	46.5	5000.0	9.000	L1	9.8	9.50	56.00
1.050000	45.3	5000.0	9.000	N	9.8	10.70	56.00
1.572000	40.8	5000.0	9.000	L1	9.8	15.20	56.00
3.147000	35.7	5000.0	9.000	L1	9.7	20.30	56.00
13.407000	39.8	5000.0	9.000	N	9.8	20.20	60.00
14.739000	42.9	5000.0	9.000	N	9.8	17.10	60.00

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.402000	34.3	5000.0	9.000	N	10.0	13.50	47.80
0.528000	36.8	5000.0	9.000	L1	9.9	9.20	46.00
0.636000	38.5	5000.0	9.000	L1	9.9	7.50	46.00
0.789000	44.6	5000.0	9.000	N	9.9	1.40	46.00
1.050000	44.0	5000.0	9.000	N	9.8	2.00	46.00
1.572000	38.2	5000.0	9.000	L1	9.8	7.80	46.00
3.147000	36.9	5000.0	9.000	L1	9.7	9.10	46.00
3.939000	32.6	5000.0	9.000	N	9.7	13.40	46.00

Note1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph. 'Final Result 1' is Quasi-peak final measurement results table and 'Final Result 2' is CAverage final measurement results table.

Note2) Level (Quasi-Peak and/or CAverage) = Meter Reading + Factor(Corr.)

Note3) Line = Polarity of input power (Live or Neutral)

N : Abbreviation of Neutral Polarity, L1 : Abbreviation of Live Polarity

Note4) Corr. = Factor = ISN Insertion Loss + Cable Loss

Note5) Margin = Limit – Level (Quasi-Peak and/or CAverage)

Note6) CAverage = CISPR-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/CISPR-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	3	0 ~ 345 (Step size: 15 degrees)

Measurements within 6 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using peak and CISPR-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-273	Preamplifier	317	SONOMA	312701	2014-03-24	12
E3I-274	Preamplifier	317	SONOMA	312702	2014-03-24	12
E3I-284	Preamplifier	ESV-Z3	R&S	815111	2014-04-10	12
E3I-291	BILOG Antenna	CBL6112D	TESEQ	36997	2013-11-06	24
E3I-190	BILOG Antenna	CBL6112B	Schaffner	2804	2014-05-14	24
E3I-004	Double-Ridged Waveguide Horn Antenna	HF906	R&S	100027	2013-05-31	24
E3I-233	EMI Test Receiver	ESU-26	R&S	100364	2014-05-15	12
E3I-290	EMI Test Receiver	ESU	R&S	100482	2014-06-16	12
E3I-005	EMI Test Receiver	ESIB-26	R&S	100355	2014-02-17	12

5.2.2 Temperature and humidity condition

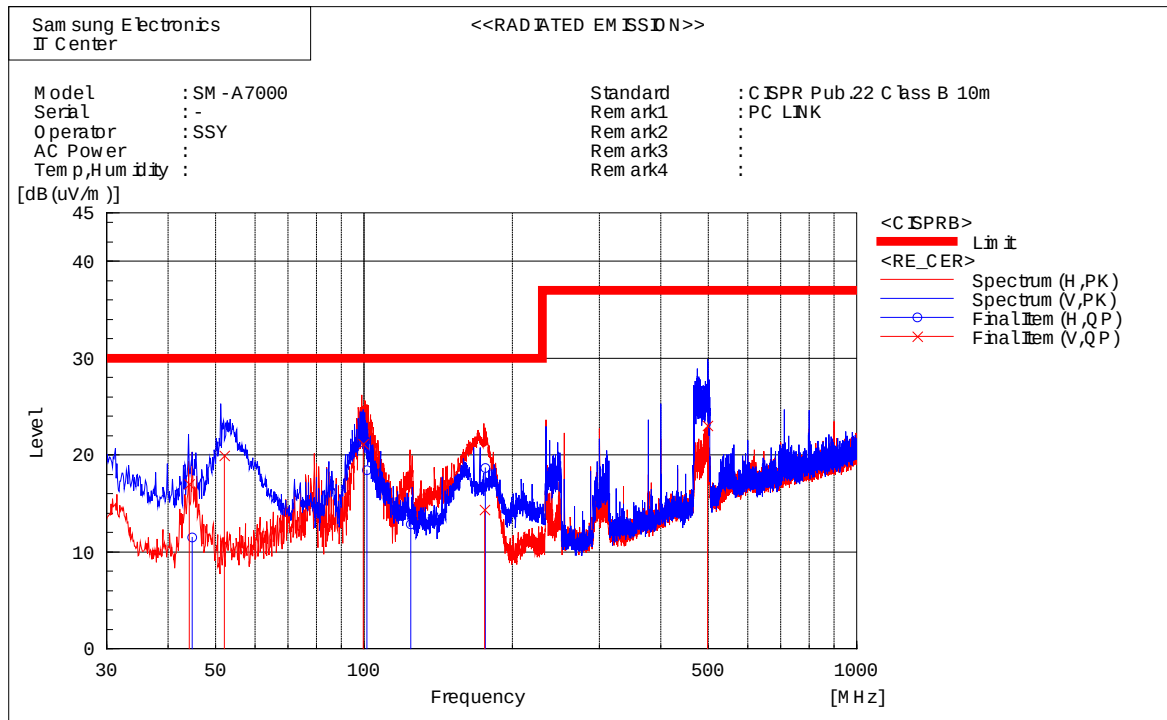
Test date	2014-12-08	Test engineer	Su Young Son
Climate condition	Ambient temperature	(21.0 ~ 22.1) °C	Limit (15.0 to 35.0) °C
	Relative humidity	(40.0 ~ 45.8) % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	(101.1 ~ 101.2) kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC8)		

5.2.3 Test results

□ Operating Mode 1

- Frequencies below 1 GHz

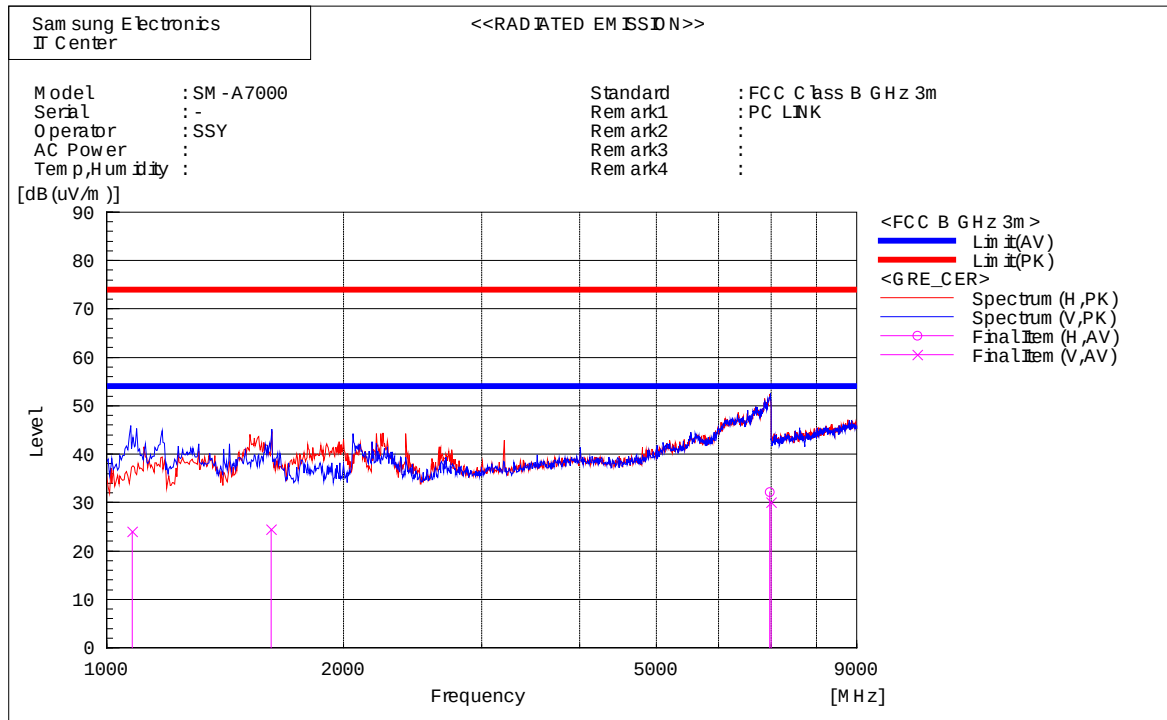
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Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	System
1	44.126	V	43.1	-26.1	17.0	30.0	13.0	102.0	66.0	2
2	44.674	H	37.2	-25.8	11.4	30.0	18.6	370.0	66.0	1
3	51.992	V	49.7	-29.7	20.0	30.0	10.0	100.0	17.0	2
4	99.499	V	47.0	-25.8	21.2	30.0	8.8	399.0	322.0	2
5	101.419	H	43.0	-24.5	18.5	30.0	11.5	306.0	298.0	1
6	124.491	H	35.9	-23.1	12.8	30.0	17.2	372.0	355.0	1
7	175.800	V	41.2	-26.8	14.4	30.0	15.6	100.0	302.0	2
8	175.949	H	44.2	-25.6	18.6	30.0	11.4	400.0	6.0	1
9	498.687	V	39.6	-16.6	23.0	37.0	14.0	297.0	359.0	2

- Note1) (P) : Abbreviation of Antenna Polarity
- Note2) Reading QP : Received raw Quasi-peak signal
- Note3) c.f = Factor = Antenna factor + Cable loss - Amplifier gain
- Note4) Result QP = Level QP = Reading QP + Factor, Real signal Quasi-peak level
- Note5) Margin QP = Limit - Level QP
- Note6) QP : Abbreviation of Quasi-peak

- Frequencies above 1 GHzSam sung Electronics Co., Ltd
IT Center**Final Result**

No.	Frequency [MHz]	(P)	Reading AV [dB(μV)]	c.f [dB(1/m)]	Result AV [dB(μV/m)]	Limit AV [dB(μV/m)]	Margin AV [dB]	Height [cm]	Angle [deg]
1	1077.054	V	35.9	-11.9	24.0	54.0	30.0	100.0	191.0
2	1618.658	V	34.8	-10.3	24.5	54.0	29.5	100.0	188.0
3	6971.093	H	29.1	3.1	32.2	54.0	21.8	100.0	356.0
4	7005.121	V	26.7	3.3	30.0	54.0	24.0	100.0	250.0

Note) 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 = CISPR-Average, Corr. = Correction Factor