

EMC TEST REPORT

Project No.	LBE20140688	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	February 5, 2014	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LGTI9515L	
	Kind of product	Mobile Phone	
	Model No.	GT-I9515L	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	F1: SAMSUNG ELECTRONICS CO., LTD. 94-1, Imsu-dong, Gumi-si, Gyengsangbuk-do, 730-722, Republic of Korea F2: SAMSUNG ELECTRONICS HUIZHOU CO.,LTD. 516229, Chenjiang Town, HuiZhou City, Guangdong Province, China	
Applied Standards		47 CFR Part 15, Subpart B, Class B / ANSI C63.4-2009	
Test Period		February 5, 2014 ~ February 7, 2014	
Issue date		February 21 , 2014	

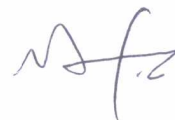
Test result : Complied

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



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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)	47 CFR 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	GT-I9515L	-	SAMSUNG	A3LGTI9515L
B	Battery	B650AE	AA1D514nS/2-B	SAMSUNG SDI	DoC
C	Headset	EO-HS3303WE	-	Youngbo Engineering	-
D	Data Cable	ECB-DU4ABE	-	Cresyn	-
E	SD Card	16GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD TV Monitor	LX-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	-

This tablet device does not contain the minimum number of ports required for personal computer testing per ANSI C63.4, but the EUT is attached to a computer through its only available port, which represents worst case emissions. All other aspects of C63.4 testing requirements were maintained.

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
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4.3 Details of Sampling

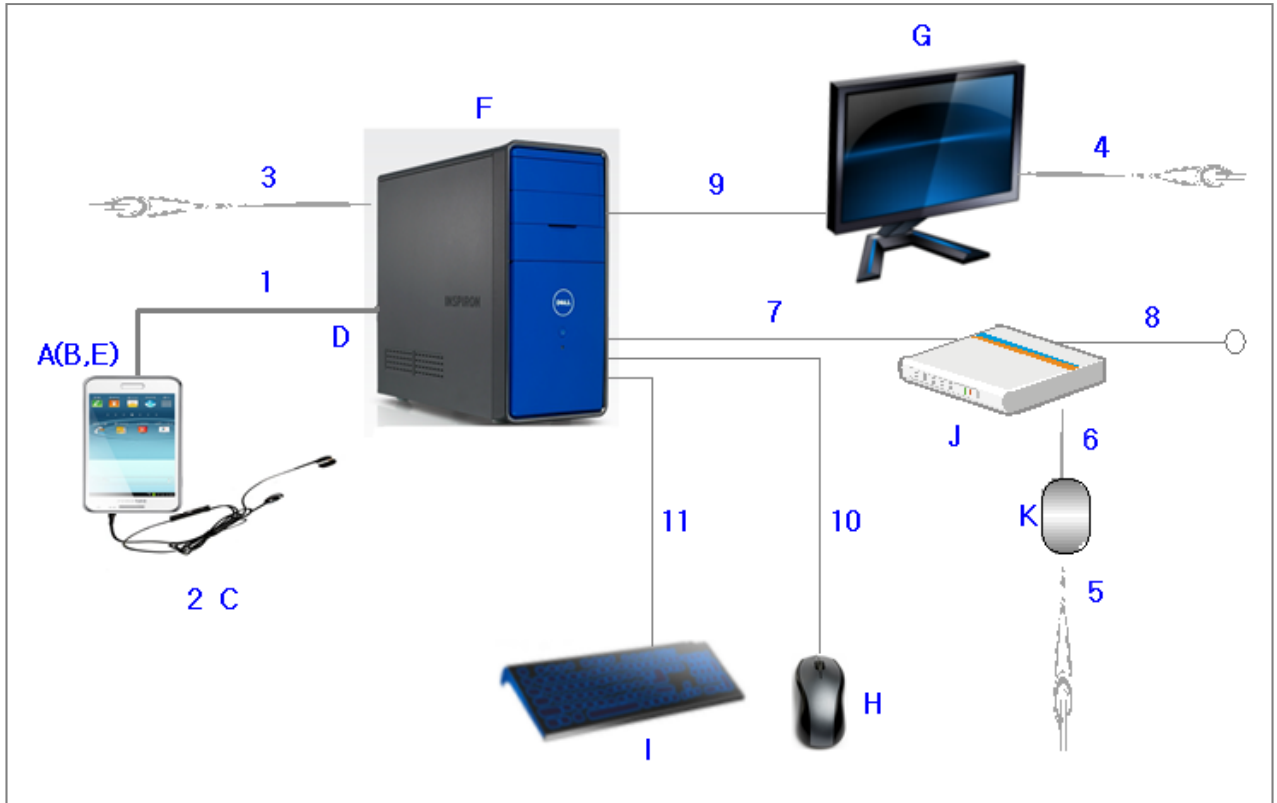
Customer selected, single unit.

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	Y	From EUT to Desk-Top Computer
2	Headset	1.6	Y	For EUT
3	Power	1.8	N	For Desk-Top Computer
4	Power	1.8	N	For LCD TV Monitor
5	Power	1.8	N	For Gigabit Switch Hub
6	Power	1.8	N	From Gigabit Switch Hub to Power Supply
7	LAN	1.5	N	From Desk-Top Computer to Gigabit Switch Hub
8	LAN	1.5	N	From Gigabit Switch Hub to Local Area Network
9	RGB	1.8	Y	From Desk-Top Computer to LCD TV Monitor
10	PS/2	1.8	Y	From Desk-Top Computer to Mouse
11	PS/2	1.8	Y	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	
Frequency Range	GSM850	TX : 824.2 ~ 848.8 MHz RX : 869.2 ~ 893.8 MHz
	GSM1900	TX : 1 850.2 ~ 1909.8 MHz RX : 1 930.2 ~ 1989.8 MHz
	WCDMA FDDII	TX : 1852.4 ~ 1907.6 MHz RX : 1932.4 ~ 1987.6 MHz
	WCDMA FDDV	TX : 826.4 ~ 846.6 MHz RX : 871.4 ~ 891.6 MHz
	LTE FDD5	TX : 824 ~ 848.9 MHz RX : 869 ~ 893.9 MHz
Operating Temperature (°C)	-20 ~ +60	
Operating Humidity (%)	0 ~ 95	

4.6.2 The variant models

- None

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]	Kind of Clocks	Frequency [MHz]
CPU	1890	MHL	75

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.

- 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	2.95 dB
Radiated Disturbance (30 MHz ~ 1 GHz)	Horizontal	4.69 dB
	Vertical	4.83 dB
Radiated Disturbance (1 GHz ~ 6 GHz)	Horizontal	5.47 dB
	Vertical	5.45 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

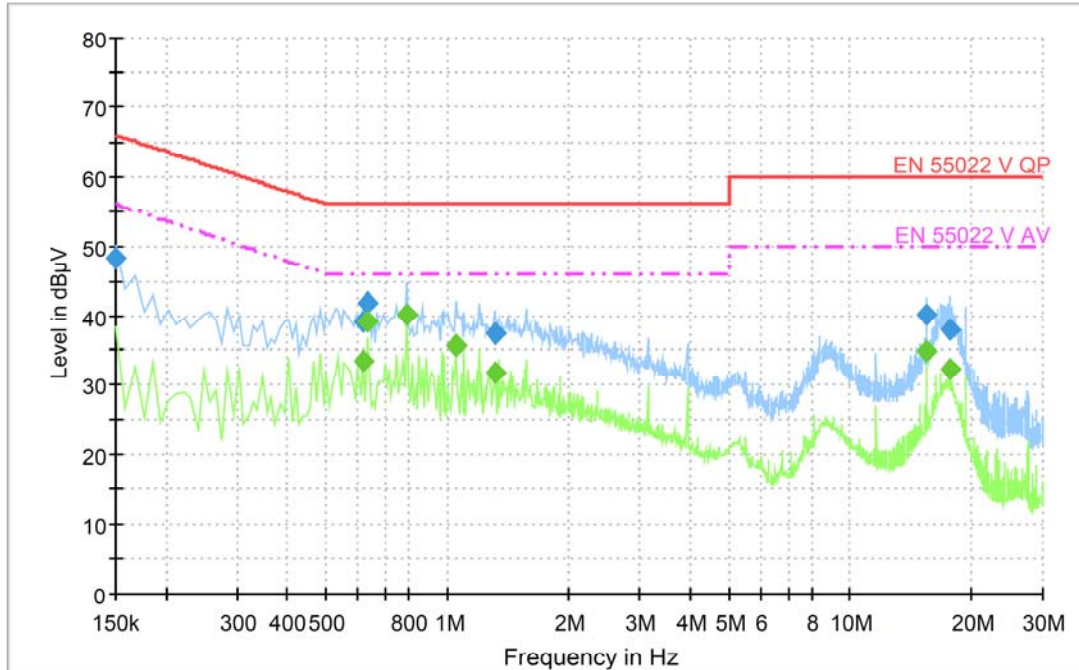
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E5I-016	EMI TEST RECEIVER	ESU	R&S	100482	2013-08-29	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2013-11-17	12
E3I-047	Artificial Mains Network	ESH3-Z5	R&S	831886/006	2014-01-15	12

5.1.2 Temperature and humidity condition

Test date	2014-02-07	Test engineer	Su-Young Son
Climate condition	Ambient temperature	22.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	37.0% R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.0 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

5.1.3 Test results

□ Operating Mode 1: AC Mains



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	48.2	5000.0	9.000	On	L1	9.9	17.80	66.00
0.618000	39.0	5000.0	9.000	On	L1	10.0	17.00	56.00
0.636000	41.9	5000.0	9.000	On	L1	10.0	14.10	56.00
1.311000	37.3	5000.0	9.000	On	L1	9.8	18.70	56.00
15.450000	40.2	5000.0	9.000	On	N	9.9	19.80	60.00
17.646000	38.0	5000.0	9.000	On	N	10.0	22.00	60.00

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.618000	33.6	5000.0	9.000	On	N	10.0	12.40	46.00
0.636000	39.1	5000.0	9.000	On	L1	10.0	6.90	46.00
0.789000	40.1	5000.0	9.000	On	N	9.9	5.90	46.00
1.050000	35.8	5000.0	9.000	On	N	9.8	10.20	46.00
1.320000	31.9	5000.0	9.000	On	L1	9.8	14.10	46.00
15.450000	34.8	5000.0	9.000	On	N	9.9	15.20	50.00
17.646000	32.3	5000.0	9.000	On	N	10.0	17.70	50.00

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 CISPR-Average final measurement results table.

Note 2) Level (QP and/or CAV) = Meter Reading (QP and/or CAV) + Corr. (LISN Insertion Loss + Cable Loss)

Margin (QP and/or CAV) = Limit – Level (QP and/or CAV)

QP = Quasi-Peak, CAV = CISPR-Average, Corr. = Correction Factor

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 3 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 detector.

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	Continuous

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-007	Turn Table	DT430	HD	430/691/01	-	-
E3I-211	Antenna Mast	AM 4.0	Maturo	AM4.0/061/2410908	-	-
E3I-210	Antenna Mast	AM 4.0	Maturo	AM4.0/060/2410908	-	-
E3I-209	Controller	MCU	Maturo	MCU/100/2410908	-	-
E3I-010	Controller	HD100	HD	100/723	-	-
E3I-273	Preamplifier	317	SONOMA	312701	2013-03-30	12
E3I-274	Preamplifier	317	SONOMA	312702	2013-03-30	12
E3I-003	BILOG Antenna	CBL6112B	Schaffner	2805	2012-04-19	24
E3I-130	BILOG Antenna	CBL6112D	TESEQ	25513	2013-08-01	24
E3I-268	Horn Antenna	HF906	R&S	100291	2012-12-27	24
E3I-233	EMI Test Receiver	ESU-26	R&S	100364	2013-07-25	12
E5I-019	EMI Test Receiver	ESU-08	R&S	100485	2013-07-25	12
E3I-132	EMI Test Receiver	ESIB-26	R&S	100291	2013-11-28	12
-	Test Software	EP5/RE	TOYO	Ver 3.10.20	-	

5.2.2 Temperature and humidity condition

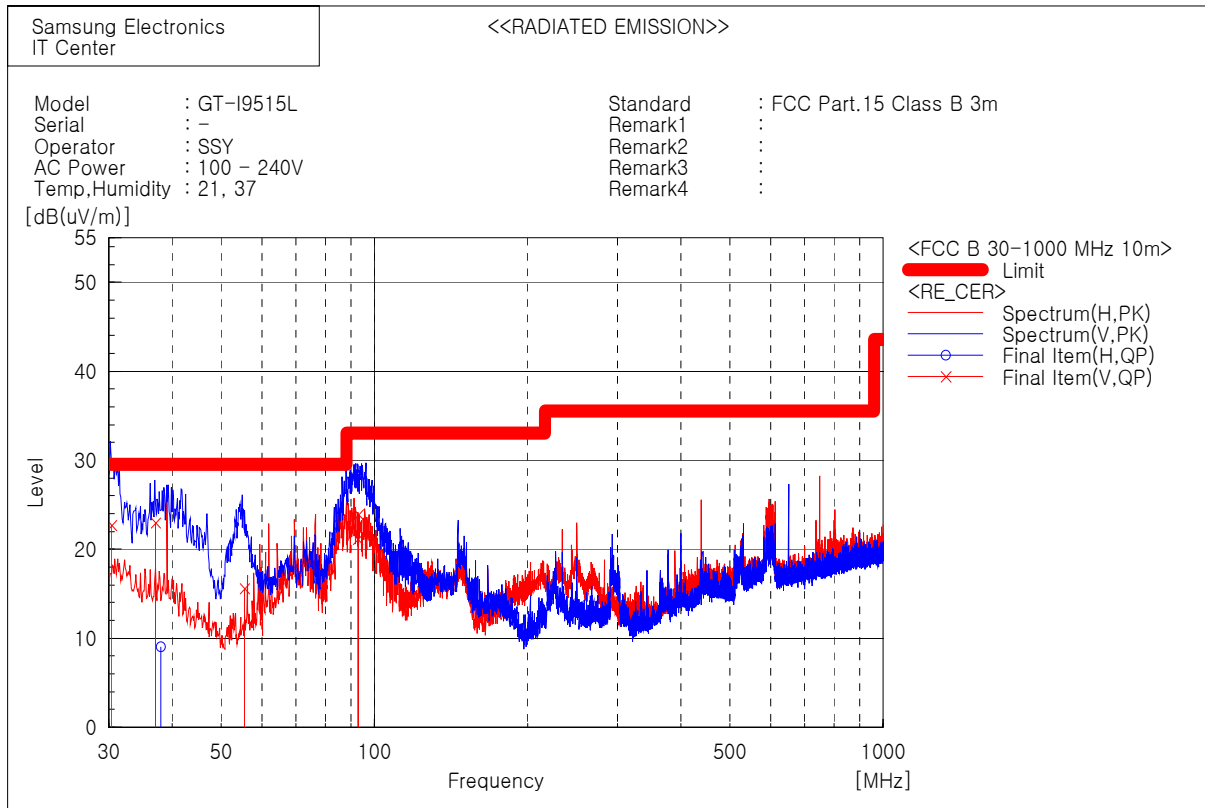
Test date	2014-02-05	Test engineer	Su-Young Son
Climate condition	Ambient temperature	21.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	37.0% R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.0 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC7)		

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(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	30.385	V	42.1	-19.4	22.7	29.5	6.8	222.0	355.0	2
2	37.046	V	46.0	-23.0	23.0	29.5	6.5	193.0	269.0	2
3	37.947	H	30.2	-21.1	9.1	29.5	20.4	300.0	1.0	1
4	55.510	V	46.1	-30.5	15.6	29.5	13.9	299.0	1.0	2
5	92.583	V	48.0	-26.8	21.2	33.0	11.8	200.0	310.0	2
6	92.908	V	50.6	-26.7	23.9	33.0	9.1	178.0	1.0	2

Note) Receiving antenna polarization : Horizontal, Vertical

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

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

Margin (QP) = Limit - Result (QP)

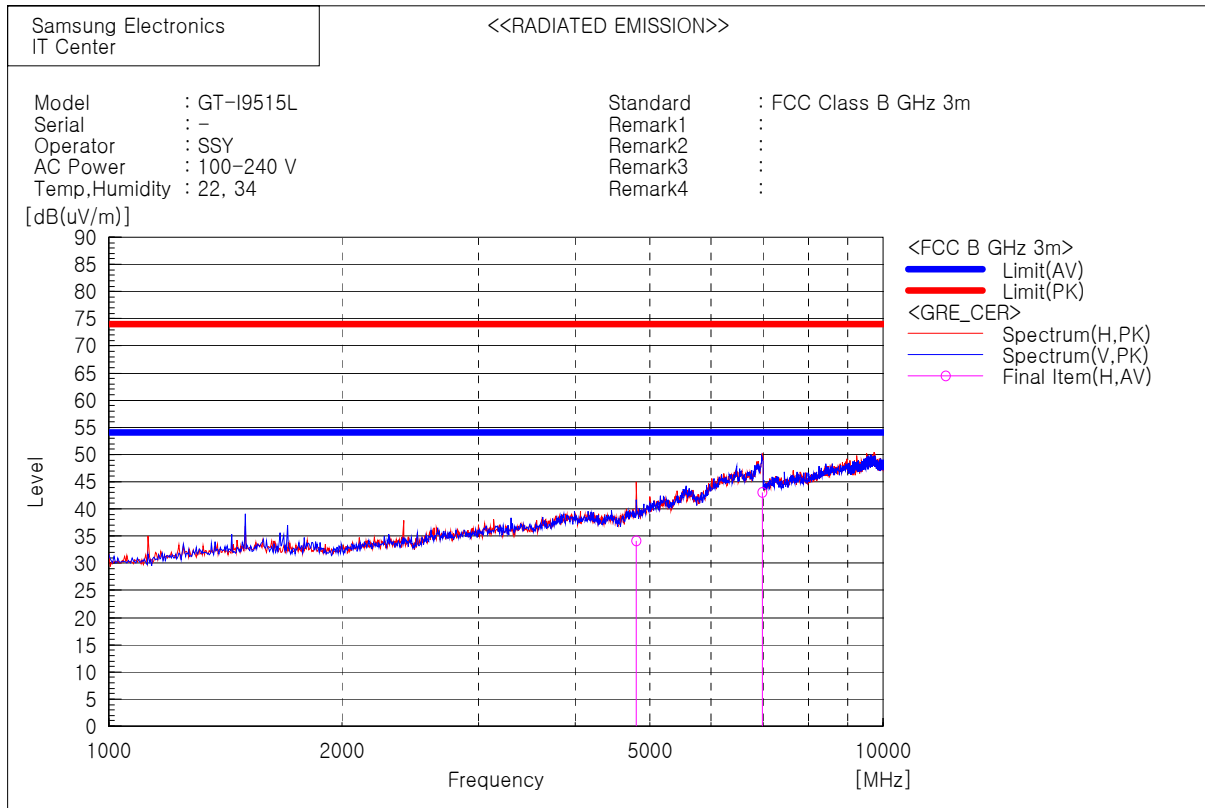
QP = Quasi-Peak, c.f = Correction Factor

5.2.3 Test results

☐ Operating Mode 1

- Frequencies above 1 GHz

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Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(uV)]	c.f [dB(1/m)]	Result AV [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin AV [dB]	Height [cm]	Angle [deg]
1	4799.669	H	36.6	-2.5	34.1	54.0	19.9	194.0	255.0
2	6979.960	H	40.0	3.1	43.1	54.0	10.9	100.0	126.0

Note) Receiving antenna polarization : Horizontal, Vertical

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

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

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

PK = Peak, CAV = CISPR-Average, Corr. = Correction Factor