EMC TEST REPORT

Project No.	LBE20150481	**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	2014-12-26	
EUT	**Type of device**	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMG360FY	
	Kind of product	Mobile Phone	
	Model No.	SM-G360FY/DS	
	Variant Model No.	Refer to clause 4.6	
	Manufacturer	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		2014-12-26	
Issue date		2015-01-19	

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.

SAMSUNG

CS & Environment Center of Samsung Electronics Co., Ltd.
(Maetan dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-so, 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)	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.

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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-G360FY/DS	R38FB0V552W	SAMSUNG	A3LSMG 360FY
B	Battery	EB-BG360CBE	THaFB27AS/2-B	SAMSUNG	DoC
C	Headset	EHS61ASFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU28WE	RT1F609AS E	SAMSUNG	-
E	SD Card	16GB	-	SANDISK	DoC
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD TV Monitor	SP2208WFPt	CN-OPK977-71618-838-106S	Dell	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	-

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]	Core	Note
1	Data Cable	0.8	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	2	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

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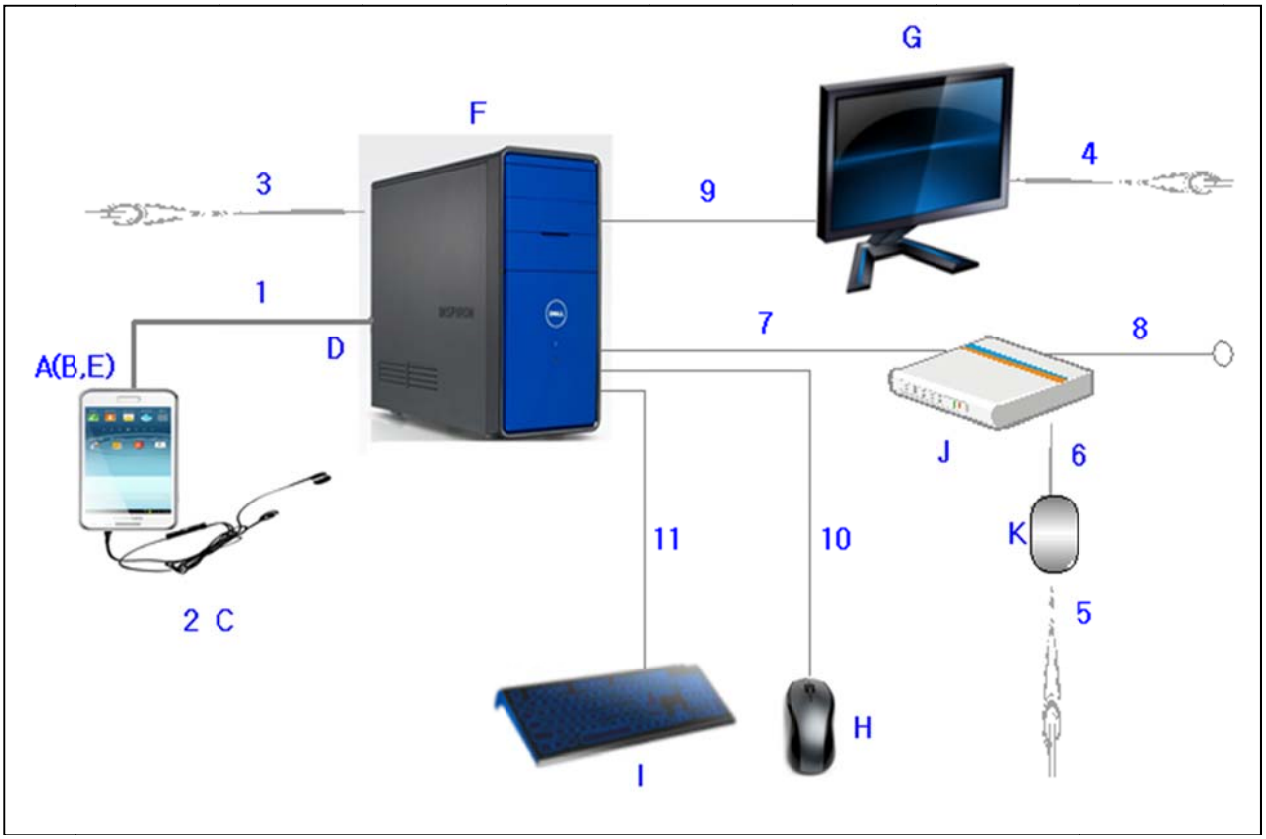
4.5 Test arrangement



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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
	GSM1 900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	WCDMA850	TX : 824.2 ~ 848.8 MHz RX : 869.2 ~ 893.8 MHz
	LTE B5	TX : 829 ~ 844 MHz RX : 874 ~ 889 MHz
Operating Temperature (℃)	-20 ~ +60	
Operating Humidity (%)	0 ~ 95	

4.6.2 The variant models

- Nones

4.7 Clock Frequencies

Kind of Clocks	Frequency [MHz]	Kind of Clocks	Frequency [MHz]
CPU	1 200	USB	24

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

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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

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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)
E4I-B-006	EMI Test Receiver	ESIB-26	R&S	100147	2014-04-16	12
E3I-259	LISN	ENV216	R&S	101369	2014-11-17	12
E3I-049	LISN	ESH3-Z5	R&S	100260	2014-01-15	12

5.1.2 Temperature and humidity condition

Test date	2014-12-26	**Test engineer**	Su-Young Son
Climate condition	Ambient temperature	23.0 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	37.0% R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.9 kPa	Limit (86.0 to 106.0) kPa
Test place	Shield Room (SR8)		

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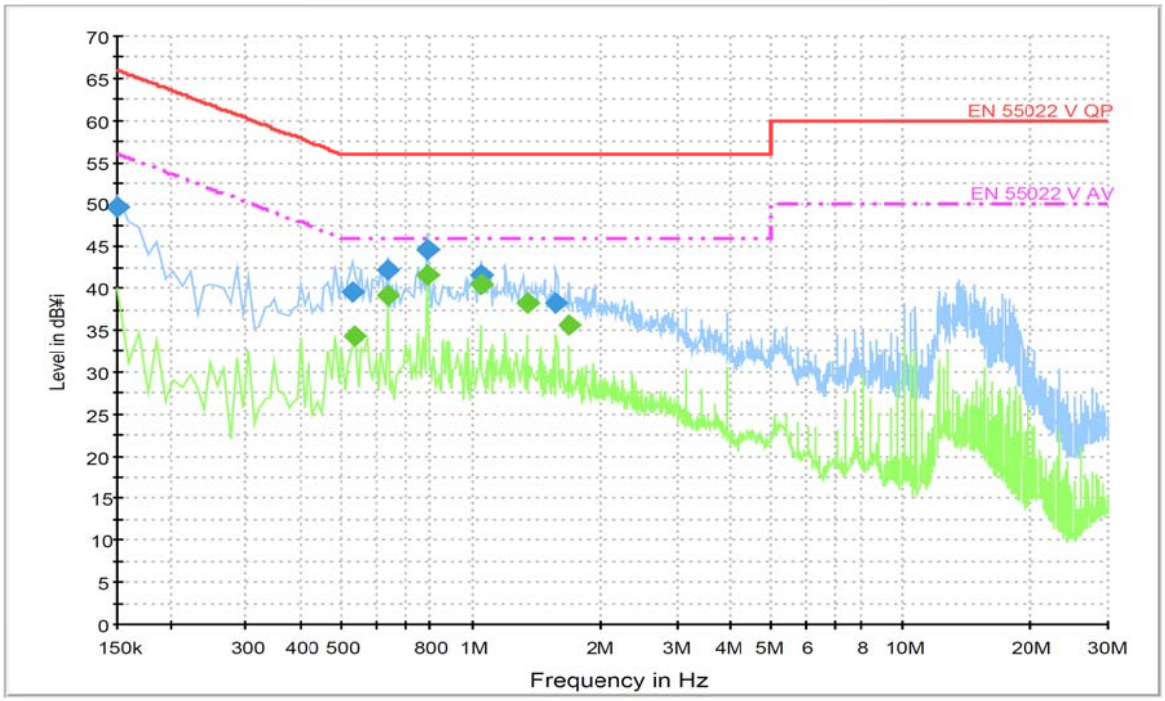
5.1.3 Test results

☐ Operating Mode 1: AC Mains



Final Result 1

Frequency (MHz)	QuasiPeak (dB¥i V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB¥i V)
0.150000	49.8	5000.0	9.000	L1	9.9	16.20	66.00
0.528000	39.5	5000.0	9.000	L1	9.9	16.50	56.00
0.636000	42.2	5000.0	9.000	L1	9.9	13.80	56.00
0.789000	44.6	5000.0	9.000	N	9.9	11.40	56.00
1.050000	41.6	5000.0	9.000	N	9.8	14.40	56.00
1.572000	38.4	5000.0	9.000	L1	9.8	17.60	56.00

Final Result 2

Frequency (MHz)	CAverage (dB¥i V)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB¥i V)
0.537000	34.4	5000.0	9.000	N	9.9	11.60	46.00
0.636000	39.2	5000.0	9.000	L1	9.9	6.80	46.00
0.789000	41.5	5000.0	9.000	N	9.9	4.50	46.00
1.050000	40.6	5000.0	9.000	N	9.8	5.40	46.00
1.338000	38.2	5000.0	9.000	L1	9.8	7.80	46.00
1.689000	35.6	5000.0	9.000	N	9.7	10.40	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 CISPR-Average 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) Factor = LISN Insertion Loss + Cable Loss

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

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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 [μV/m]	3 m [dB(μV/m)]	10 m [dB(μV/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.

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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-08	R&S	100482	2014-06-16	12
E3I-005	EMI Test Receiver	ESIB-26	R&S	100355	2014-02-17	12
-	Test Software	EP5/RE	TOYO	Ver 3.10.20	-	

5.2.2 Temperature and humidity condition

Test date	2014-12-26	**Test engineer**	Su-Young Son
Climate condition	Ambient temperature	21.0 ℃	Limit (15.0 to 35.0) ℃
	Relative humidity	45.0% R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	100.9 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

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5.2.3 Test results

☐ Operating Mode 1

- Frequencies below 1 GHz

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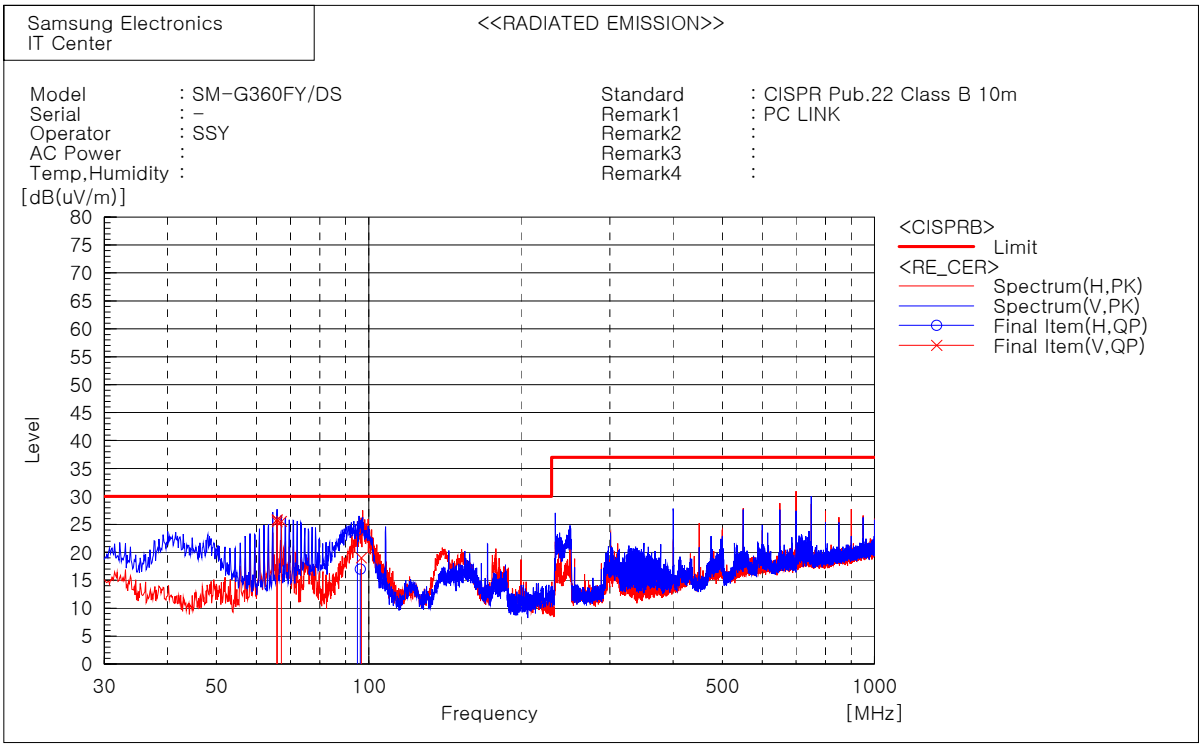

Final Result

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	65.854	V	56.8	-31.4	25.4	30.0	4.6	205.0	322.0	2
2	65.862	V	57.2	-31.4	25.8	30.0	4.2	195.0	325.0	2
3	65.905	V	57.2	-31.4	25.8	30.0	4.2	199.0	320.0	2
4	67.169	V	56.8	-31.3	25.5	30.0	4.5	190.0	321.0	2
5	95.042	H	49.9	-25.9	24.0	30.0	6.0	329.0	331.0	1
6	96.198	H	42.6	-25.6	17.0	30.0	13.0	327.0	302.0	1
7	96.734	V	45.2	-26.2	19.0	30.0	11.0	127.0	233.0	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

QP : Abbreviation of Quasi-peak

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5.2.3 Test results

☐ Operating Mode 1

- Frequencies above 1 GHz

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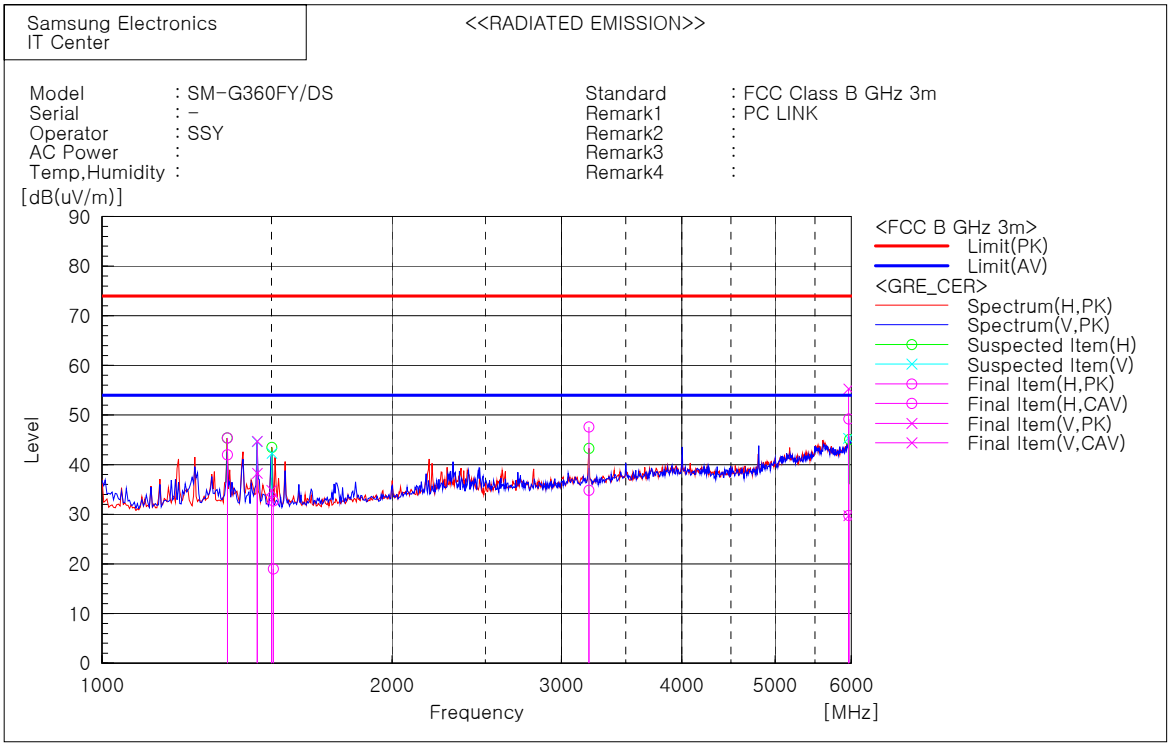

Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]
1	1350.000	H	56.9	53.5	-11.5	45.4	42.0	74.0	54.0	28.6	12.0	113.0	284.0
2	1449.639	V	56.0	49.6	-11.3	44.7	38.3	74.0	54.0	29.3	15.7	101.0	234.0
3	1500.140	V	44.5	46.4	-11.5	33.0	34.9	74.0	54.0	41.0	19.1	101.0	8.0
4	1506.233	H	44.1	30.4	-11.4	32.7	19.0	74.0	54.0	41.3	35.0	101.0	312.0
5	3204.259	H	53.0	40.2	-5.4	47.6	34.8	74.0	54.0	26.4	19.2	101.0	246.0
6	5962.155	V	54.3	28.7	1.0	55.3	29.7	74.0	54.0	18.7	24.3	101.0	126.0
7	5964.379	H	48.2	28.8	1.0	49.2	29.8	74.0	54.0	24.8	24.2	101.0	3.0

Note1) (P) : Abbreviation of Antenna Polarity

Note2) Reading PK : Received raw Peak signal, Reading AV : Received raw Average signal

Note3) c.f = Factor = Antenna factor + Cable loss − Amplifier gain

Note4) Result (PK and/or AV) = Reading (PK and/or AV) + Factor, Real signal (PK and/or AV) level

Note5) Margin (PK and/or AV) = Limit − Level (PK and/or AV)

QP : Abbreviation of Peak, AV : Abbreviation of CISPR-Average

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