

EMC TEST REPORT

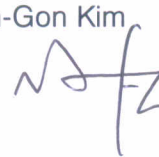
Project No.	LBE20145787	Issue No.	0
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	(Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Republic of Korea	
	Date of application	November 17, 2014	
EUT	Type of device	☒ Class B personal computers and peripherals ☐ All other devices	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSMG360HU	
	Kind of product	Mobile Phone	
	Model No.	SM-G360HU/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		November 19, 2014 ~ November 25, 2014	
Issue date		December 6, 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 : Young Hun Cheong 		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-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.

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-G360HU/DS	-	SAMSUNG	A3LSMG360HU
B	Battery	EB-BG360CBC	R37F8002J9DET3	SAMSUNG	-
C	Headset	EHS61ASFWE	-	SAMSUNG	-
D	Data Cable	ECB-DU28BE	-	SAMSUNG	-
E	Micro SD Card	32GB	-	SANDISK	-
F	Desk-Top Computer	HP Compaq dx2200 Microtower	CNG7060LW0	HP	DoC
G	LCD Monitor	U2713HMT	CN-0GK0KD-74445-332-106L	Dell	DoC
H	Mouse	M-SBF96	LZ949BG0D9Y	Logitech	DoC
I	Keyboard	SKG-2000PB	CNBA5902830AGP53Z5A3485	SAMSUNG	DoC
J	Router	T3004	T300475G00563	EFM Networks	DoC
K	Power Supply	FS0D0900800K	FW121030770D13041902138	FAIRONE	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

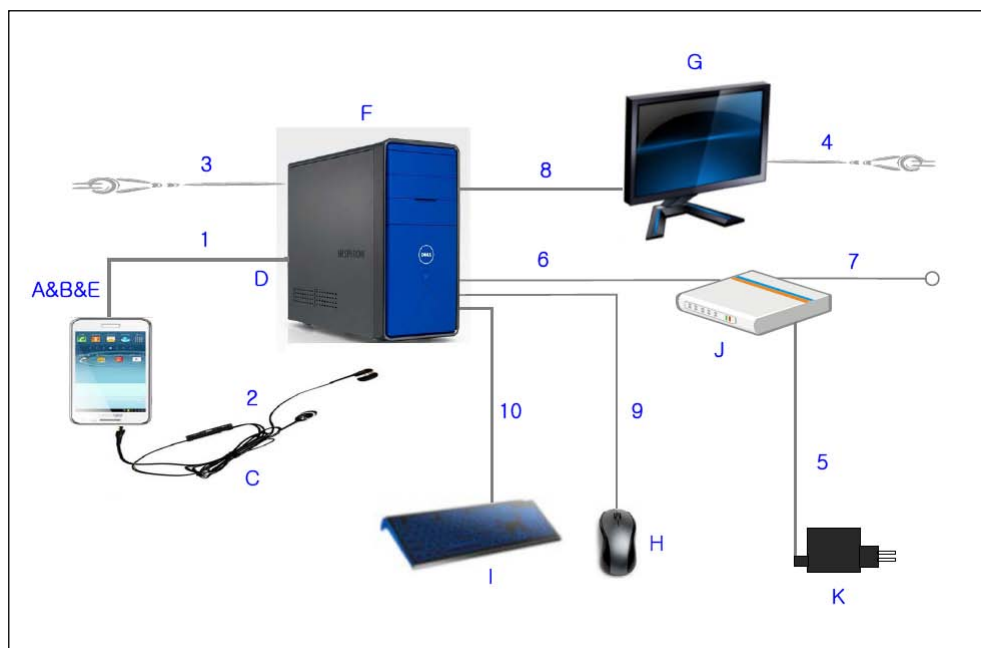
Customer selected, single unit.

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	Data Cable	0.8	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 Monitor
5	Power	1.8	No	From Router to Power Supply
6	LAN	1.5	No	From Desk-Top Computer to Router
7	LAN	1.5	No	From Router to Local Area Network
8	RGB	1.8	Yes	From Desk-Top Computer to LCD Monitor
9	PS/2	1.8	Yes	From Desk-Top Computer to Mouse
10	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	
Frequency Range	GSM850	TX : 824.2 ~ 848.8 MHz RX : 869.2 ~ 893.8 MHz
	GSM1900	TX : 1 850.2 ~ 1 909.8 MHz RX : 1 930.2 ~ 1 989.8 MHz
	WCDMA 850	TX : 824 ~ 849 MHz RX : 869 ~ 894 MHz
Operating Temperature (℃)	+5 ~ +35	
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	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.

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 CISPR-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	C/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

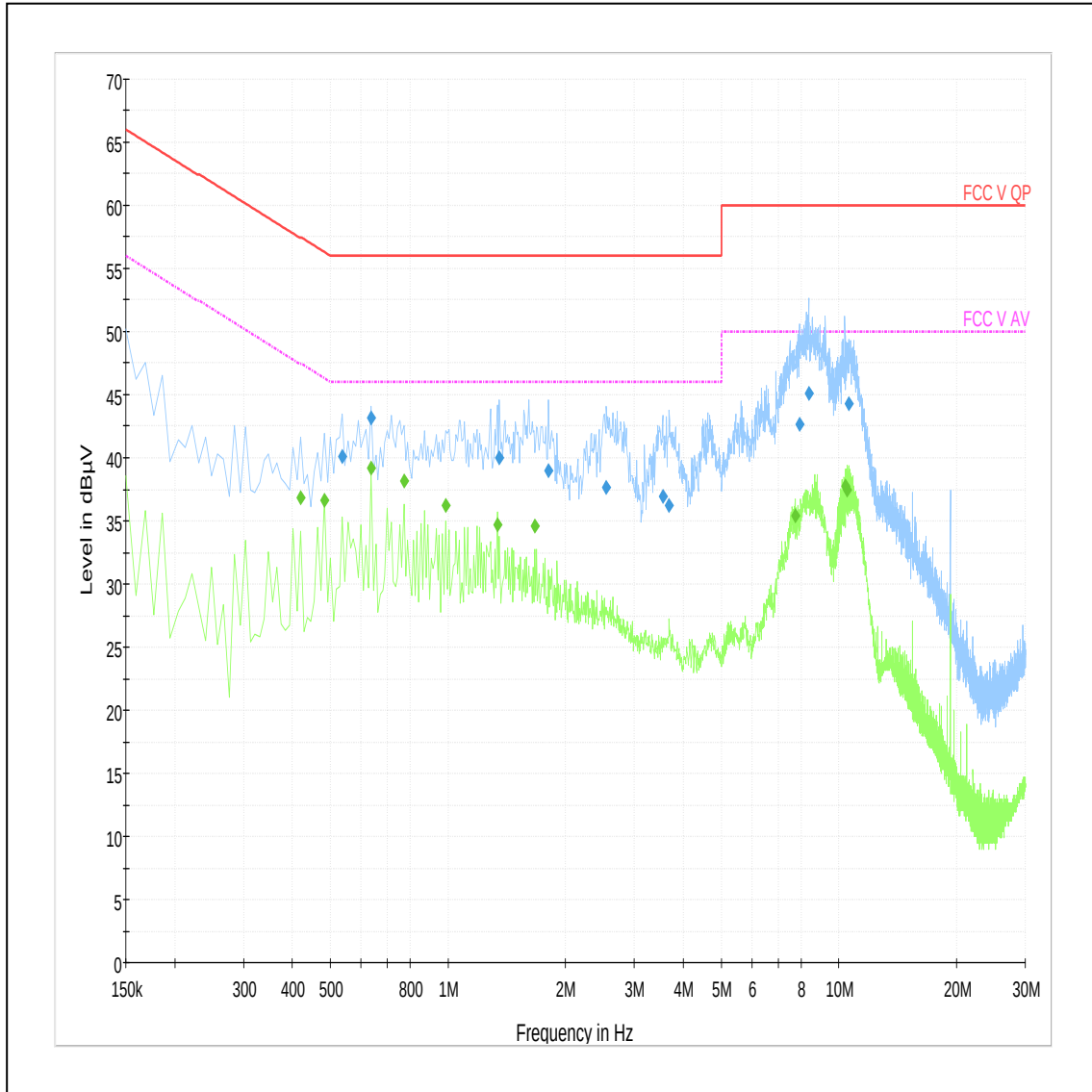
EMC No.	Test Instrument	Model name	Manufacturer	Serial No.	Calibration	
					Date	Interval (Month)
E3I-142	EMI Test Receiver	ESI-26	R&S	100019	2014-01-21	12
E3I-259	Two-Line V-Network	ENV216	R&S	101369	2014-11-17	12
E3I-049	Two-Line V-Network	ESH3-Z5	R&S	100260	2014-01-15	12
-	Test Software	EMC32	R&S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

5.1.2 Temperature and humidity condition

Test date	2014-11-25	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	21.1 °C	Limit (15.0 to 35.0) °C
	Relative humidity	48.6 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.2 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)
0.537	40.1	N	10.0	15.9	56.0
0.636	43.1	N	9.9	12.9	56.0
1.356	40.0	N	9.8	16.0	56.0
1.806	38.9	N	9.8	17.1	56.0
2.544	37.6	L1	9.7	18.4	56.0
3.543	37.0	N	9.7	19.0	56.0
3.678	36.2	N	9.7	19.8	56.0
7.926	42.7	L1	9.7	17.3	60.0
8.367	45.1	L1	9.8	14.9	60.0
10.581	44.2	N	9.7	15.8	60.0

CAV final measurement results table

Frequency (MHz)	Level (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.420	36.8	N	10.0	10.6	47.4
0.483	36.6	N	10.0	9.7	46.3
0.636	39.2	N	9.9	6.8	46.0
0.771	38.2	N	9.9	7.8	46.0
0.987	36.3	N	9.9	9.7	46.0
1.338	34.7	L1	9.8	11.3	46.0
1.671	34.6	N	9.8	11.4	46.0
7.728	35.4	N	9.8	14.6	50.0
10.383	37.7	N	9.7	12.3	50.0
10.518	37.5	L1	9.8	12.5	50.0

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 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 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-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	-	-

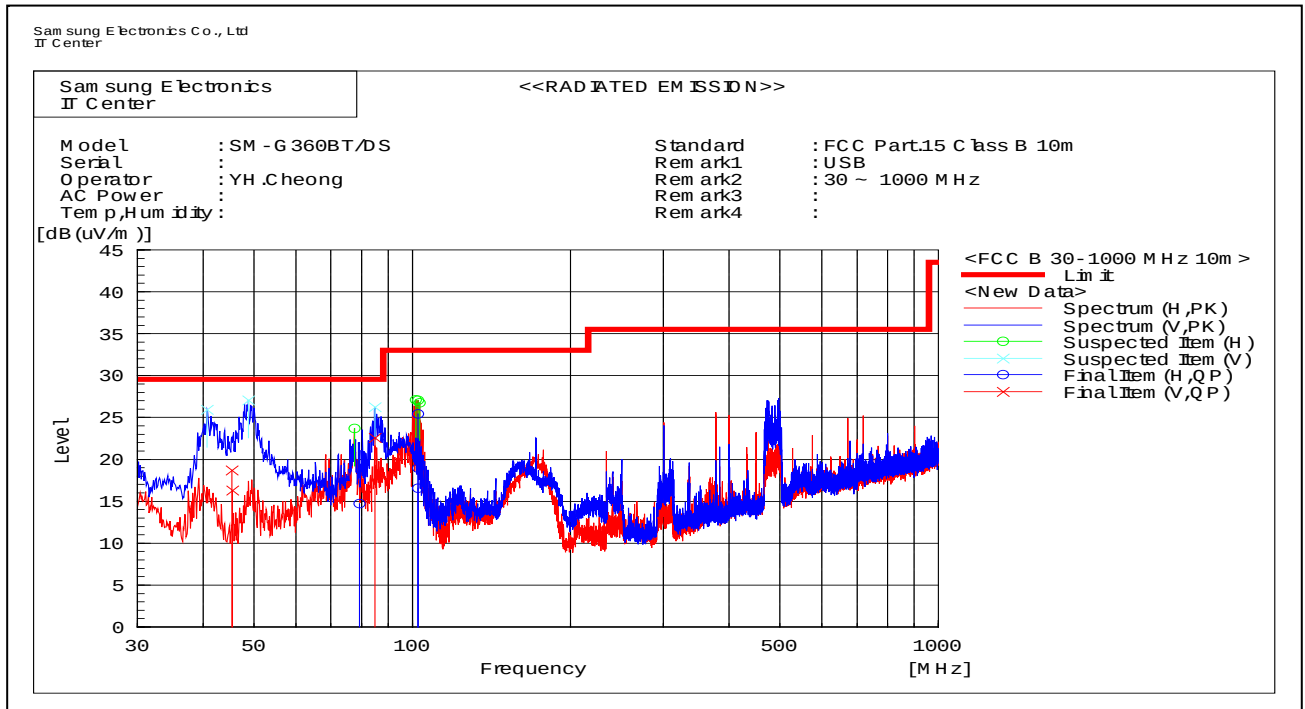
5.2.2 Temperature and humidity condition

Test date	2014-11-19 ~ 2014-11-21	Test engineer	Young Hun Cheong
Climate condition	Ambient temperature	21.1 / 20.6 °C	Limit (15.0 to 35.0) °C
	Relative humidity	48.6 / 49.5 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 / 100.5 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



Frequency [MHz]	(P) ¹⁾	Reading QP ²⁾ [dB(μV)]	Factor ³⁾ [dB(1/m)]	Level QP ⁴⁾ [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP ⁵⁾ [dB]	Height [cm]	Angle [deg]
45.399	V	45.4	-26.7	18.7	29.5	10.8	100.0	253.0
45.474	V	43.1	-26.8	16.3	29.5	13.2	285.0	315.0
79.218	H	43.6	-28.9	14.7	29.5	14.8	399.0	125.0
84.792	V	51.0	-28.4	22.6	29.5	6.9	381.0	233.0
102.409	H	49.7	-24.3	25.4	33.0	7.6	310.0	288.0
102.462	H	43.3	-24.3	19.0	33.0	14.0	317.0	286.0
102.488	H	40.8	-24.3	16.5	33.0	16.5	310.0	287.0

Note1) Receiving antenna polarization : Horizontal, Vertical

Note2) Test Distance : 10 m, Antenna Height : 1 to 4 meters

Note3) (P) : Abbreviation of Antenna Polarity

Note4) Reading QP : Received raw Quasi-peak signal

Note5) Factor = Antenna factor + Cable loss – Amplifier gain

Note6) Level QP = Reading QP + Factor, Real signal Quasi-peak level

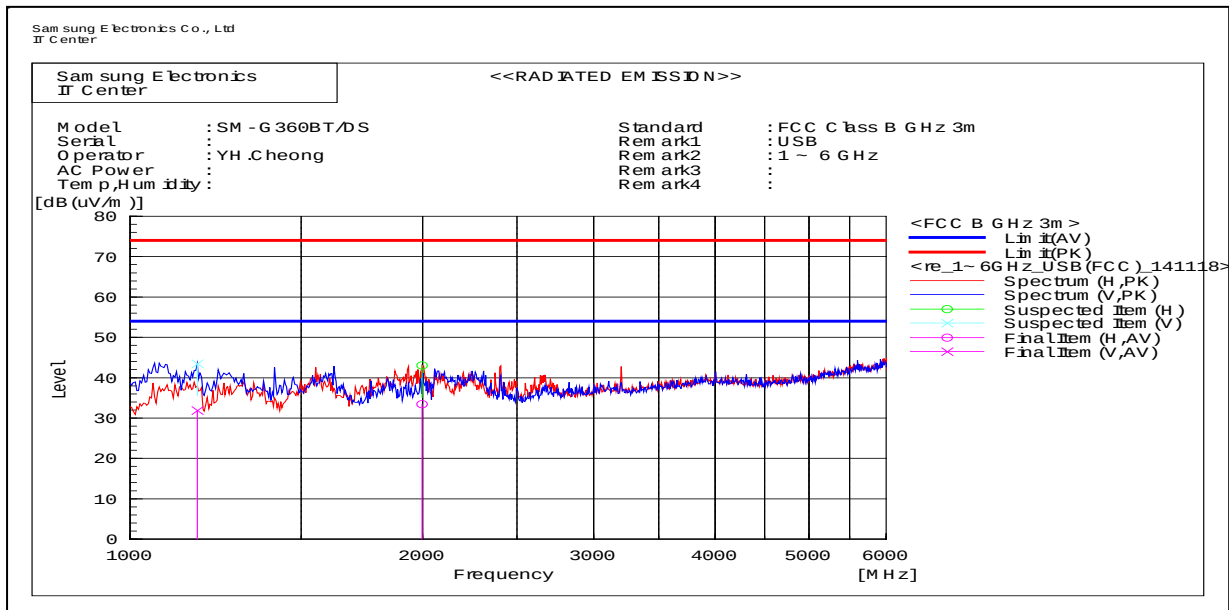
Note7) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

5.2.3 Test results

☐ Operating Mode 1

- Frequency range: 1 000 ~ 6 000 MHz



Peak Measurement

Frequency [MHz]	(P) ¹⁾	Reading PK ²⁾ [dB(uV)]	Factor ³⁾ [dB(1/m)]	Level PK ⁴⁾ [dB(uV/m)]	Limit [dB(uV/m)]	Margin PK ⁵⁾ [dB]	Height [cm]	Angle [deg]
1 172.345	V	55.1	-11.6	43.5	74.0	30.5	101.0	166.0
1 997.996	H	52.8	-9.7	43.1	74.0	30.9	102.0	224.0

Note1) Receiving antenna polarization : Horizontal, Vertical

Note2) Test Distance : 10 m, Antenna Height : 1 to 4 meters

Note3) (P) : Abbreviation of Antenna Polarity

Note4) Reading PK : Received raw Peak signal

Note5) Factor = Antenna factor + Cable loss – Amplifier gain

Note6) Level PK = Reading PK + Factor, Real signal Peak level

Note7) Margin PK = Limit – Level PK

PK : Abbreviation of Peak

C/Average Measurement

Frequency [MHz]	(P) ¹⁾	Reading C/AV ²⁾ [dB(uV)]	Factor ³⁾ [dB(1/m)]	Level C/AV ⁴⁾ [dB(uV/m)]	Limit [dB(uV/m)]	Margin C/AV ⁵⁾ [dB]	Height [cm]	Angle [deg]
1 172.345	V	43.5	-11.6	31.9	54.0	22.1	132.0	166.0
1 997.996	H	43.1	-9.7	33.4	54.0	20.6	199.0	224.0

Note1) Receiving antenna polarization : Horizontal, Vertical

Note2) Test Distance : 10 m, Antenna Height : 1 to 4 meters

Note3) (P) : Abbreviation of Antenna Polarity

Note4) Reading C/AV : Received raw C/Average signal

Note5) Factor = Antenna factor + Cable loss – Amplifier gain

Note6) Level C/AV = Reading C/AV + Factor, Real signal C/Average level

Note7) Margin C/AV = Limit – Level C/AV

C/Average : CISPR Abbreviation of Average