

EMC TEST REPORT

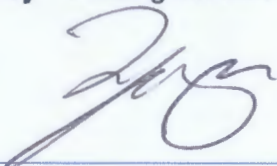
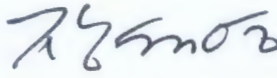
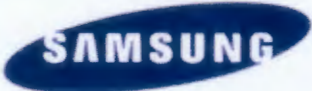
Project No.	LBE20154179	Issue No.	0
Applicant	Name of organization	Samsung Electronics Co., Ltd.	
	Address	19 Chapin Rd., Building D, Pine Brook, New Jersey, United States 07058	
	Date of application	July 8, 2015	
EUT	Kind of product	Printer	
	Type of device	Class B personal computers and peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3LSLC430	
	Model No.	Xpress C430	
		Variant Model No.	SL-C430
	Manufacturer	Samsung Electronics Co., Ltd. (Maetan-dong) 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742, Korea	
Applied Standards		47 CFR Part 15, Subpart B / ANSI C63.4-2009	
		ICES-003 Issue 5	
Test Period	July 9, 2015 ~ July 10, 2015		
Issue date	July 20, 2015		
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 Centre.			
			
Samsung Electronics Co Ltd, CS & Environment Center (Maetan dong) 129, Samsung-ro, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742, 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.

1.2 Sample calculation

1.2.1 Conducted disturbance (at 10 MHz)

- Limit = 60 dB μ V (Quasi-peak limit)
- Level (50 dB μ V) = Meter Reading (40.2 dB μ V) + Factor (9.8 dB = AMN factor 9.7 dB + Cable loss 0.1 dB)
- Margin (10 dB) = Limit (60 dB μ V) - Level (50 dB μ V) = 10 dB below limit

1.2.2 Radiated disturbance (at 100 MHz)

- Limit = 30 dB μ V/m at 10 m
- Level (20 dB μ V/m)
= Meter Reading (40 dB μ V) + Factor (- 20 dB (1/m) = antenna factor + cable loss – amplifier gain)
- Margin (10 dB) = Limit (30 dB μ V/m) - Level (20 dB μ V/m) = 10 dB below limit

2. Summary of test results

2.1 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 A, ☒ Class B)	Complied
☒	Radiated Disturbance		Complied

- Note : These results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference – Causing Equipment Regulations

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 443-742 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 configuration

4.1.1 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.

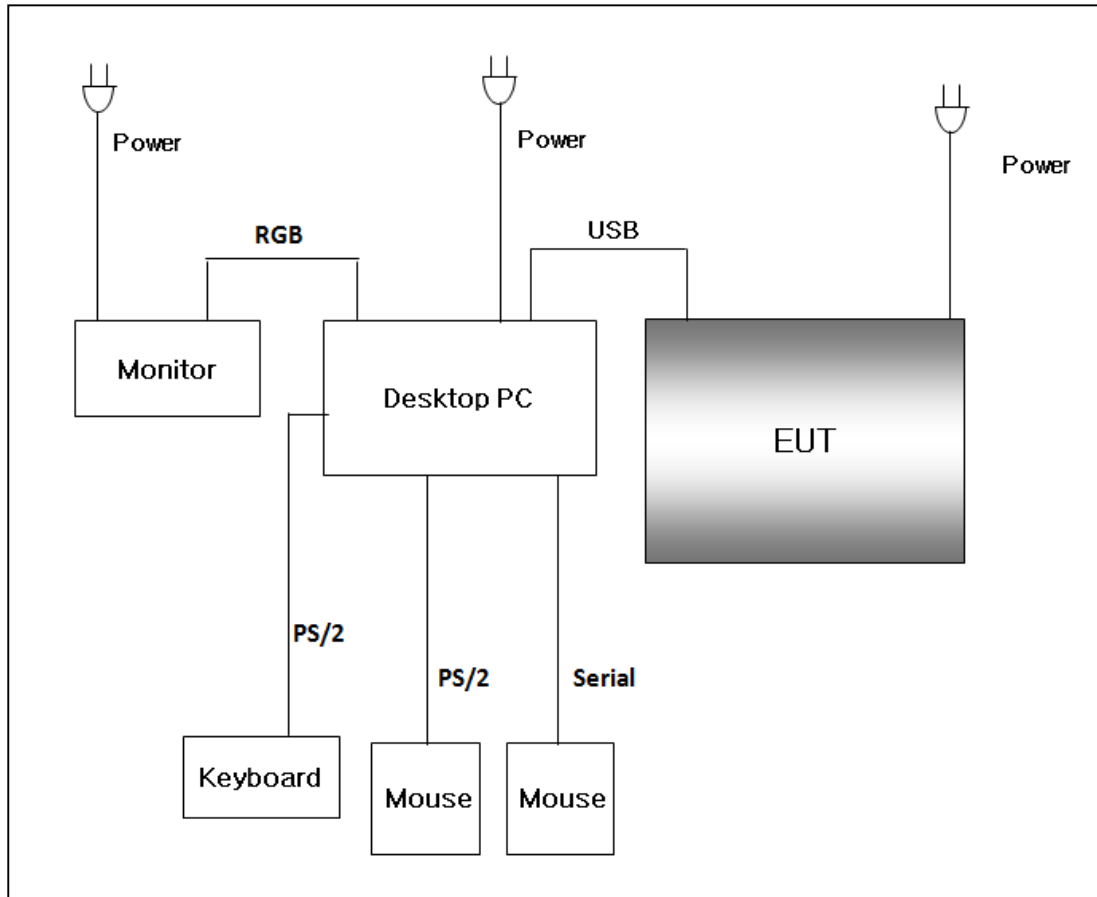
The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Description	Model No.	Serial No.	Manufacturer	Fcc ID / DoC
Printer	Xpress C430	-	SAMSUNG	A3LSLC430
D/T PC	ZCP30	Z41698DY700026X	SAMSUNG	DoC
LCD Monitor	UE19D4000	PV421101103020F	SAMSUNG	DoC
PS/2 Keyboard	K6723	CN13BA5903224AGP53DCK0596	MONTEREY	DoC
PS/2 Mouse	M-S48a	LZA00153189	Logitech	DoC
Serial Mouse	-	-	RadioShack	DoC
Toner Cartridge	CLT-*404*	-	SAMSUNG	DoC
Imaging unit	CLT-R406	-	SAMSUNG	DoC

4.1.2 Test cables

Connected cable	Length [m]	Shielded [Y/N]	Number of Ferrite Core	Note
Power	1.8	No	-	For EUT
Power	1.8	No	-	For PC
Power	1.8	No	-	For Monitor
RGB	1.8	Yes	-	From PC to Monitor
USB	1.8	Yes	-	From EUT to PC
Serial	1.8	Yes	-	From PC to Mouse
PS/2	1.8	Yes	-	From PC to Keyboard
PS/2	1.8	Yes	-	From PC to Mouse

4.1.3 Test arrangement



4.2 EUT operating mode

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

Operating Mode 1 (Test mode)	Standby
Operating Mode 2 (Test mode)	USB Printing

4.3 Details of Sampling

Customer selected, single unit.

4.4 Clock Frequencies

Kind of Clocks	Frequency[MHz]	Kind of Clocks	Frequency[MHz]
Main CPU	400	-	-

4.5 EUT Description

The following features describe EUT represented by this report:

Item	Specification and Description
Processor	400 MHz CPU
Standard System memory	64 MB
Resolution	True 600x600dpi (Addressible 1200dpi support)
Speed	Color 4ppm/A4, Mono 18ppm/A4
Power Rating	110 VAC ~ 127 VAC, 5 A, 50/60 Hz
Power Consumption	Power Save : 1.4 Watts Standby : 60 Watts Printing : 290 Watts
Interfaces	Hi-Speed USB 2.0
Modes of Operation	Standby, USB Printing

4.6 Test configuration and condition

The system was configured for testing in typical fashion use. Cables were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O cables.

The mode of operation utilized for testing was selected to best simulate typical EUT use.

The EUT was connected to a remote PC through the Ethernet port with Unshielded Twisted Pair Ethernet cable.

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

- Test Voltage : AC 120 V, 60 Hz

4.7 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.)

4.7.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	Main terminal (ENV216)	± 3.16 dB
Radiated Disturbance (Below 1 GHz)	Horizontal	± 4.90 dB
	Vertical	± 4.68 dB
Radiated Disturbance (Above 1 GHz)	Horizontal	± 5.51 dB
	Vertical	± 5.50 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

Frequency range Limits(MHz)	Resolution Bandwidth(kHz)	Limits of Class A, dB(μV)		Limits of Class B, dB(μV)	
		Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.50	9	79	66	66 ~ 56	56 ~ 46
0.50 ~ 5	9	73	60	56	46
5 ~ 30	9			60	50
NOTE 1 The lower limit shall apply at the transition frequency					
NOTE 2 The Class B limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.					

If the reading on the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 seconds at each measurement frequency, the highest reading shall be recorded, with the exception of any brief isolated high reading (which shall be ignored).

5.1.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
EMI Test Receiver	ESIB-26	R&S	100291	2014-12-08	12
Two-Line V-Network	ENV216	R&S	101369	2014-11-17	12
Two-Line V-Network	ESH3-Z5	R&S	100260	2015-01-12	12
Test Software	EMC32	R&S	Ver 8.53.0	-	-

5.1.2 Temperature and humidity condition

Test date	2015-07-10	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	24.0 °C	Limit (15.0 to 35.0) °C
	Relative humidity	38.0 % 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 Photograph of Test Setup



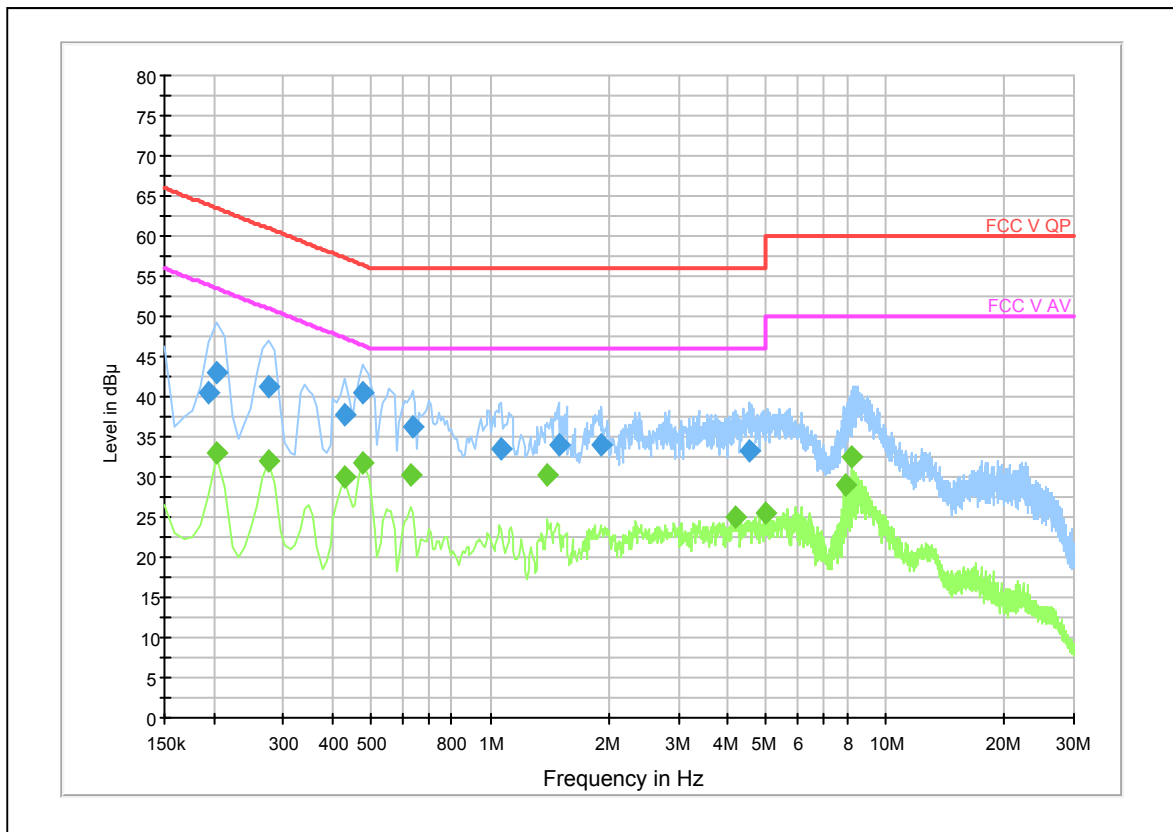
Front



Rear

5.1.4 Test results (mains port)

- Operating Mode : 1



Note1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Test Results (Quasi-Peak and C/Average)

Quasi-peak final measurement results table

Frequency (MHz)	Level ¹⁾ Quasi-Peak (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.195	40.4	L1	10.0	23.40	63.80
0.204	43.1	L1	10.0	20.30	63.40
0.276	41.2	N	9.7	19.80	60.90
0.429	37.7	L1	9.9	19.50	57.30
0.474	40.6	N	9.9	15.80	56.40
0.636	36.3	N	9.9	19.70	56.00
1.068	33.4	L1	9.8	22.60	56.00
1.491	34.0	N	9.8	22.00	56.00
1.914	33.9	L1	9.7	22.10	56.00
4.515	33.4	N	9.8	22.60	56.00

C/Average final measurement results table

Frequency (MHz)	Level ¹⁾ C/Average (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.204	33.0	N	10.0	20.50	53.40
0.276	32.0	N	9.7	18.90	50.90
0.429	30.0	L1	9.9	17.30	47.30
0.474	31.8	L1	9.9	14.60	46.40
0.627	30.4	N	9.9	15.60	46.00
1.401	30.3	L1	9.8	15.70	46.00
4.164	25.1	L1	9.8	20.90	46.00
4.956	25.5	L1	9.8	20.50	46.00
7.926	29.0	L1	9.8	21.00	50.00
8.214	32.5	L1	9.8	17.50	50.00

Note1) Level (Quasi-Peak and/or C/Average) = Meter Reading + Factor

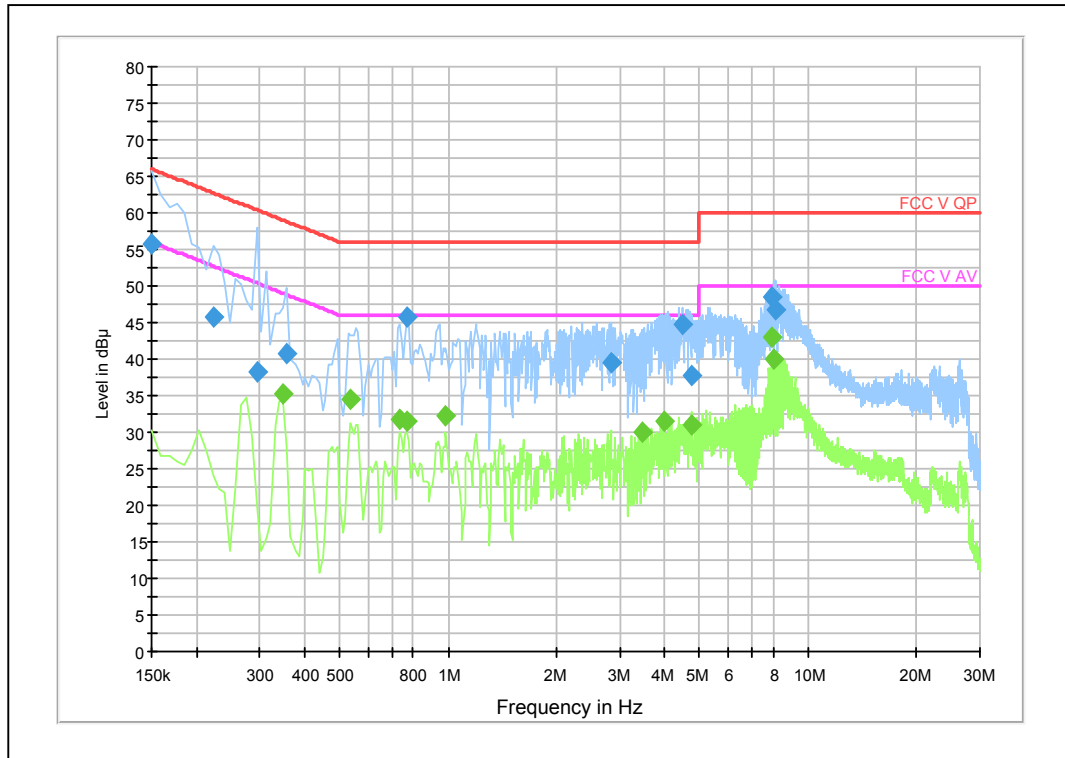
Note2) Line = Polarity of input power (Live or Neutral)

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

Note3) Factor = LISN Insertion Loss + Cable Loss

Note4) Margin = Limit – Level (Quasi-Peak and/or C/Average)

Note5) C/Average = CISPR-Average

- Operating Mode : 2

Note1) Two graphs measured for both Live(L1) and Neutral(N) of the LISN are combined into one graph.

Test Results (Quasi-Peak and C/Average)

Quasi-peak final measurement results table

Frequency (MHz)	Level ¹⁾ Quasi-Peak (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.150	55.8	L1	9.9	10.20	66.00
0.222	45.7	L1	9.8	17.00	62.70
0.294	38.2	L1	9.8	22.20	60.40
0.357	40.8	L1	9.9	18.00	58.80
0.771	45.8	N	9.9	10.20	56.00
2.832	39.5	L1	9.7	16.50	56.00
4.479	44.8	N	9.8	11.20	56.00
4.740	37.8	N	9.8	18.20	56.00
7.926	48.4	N	9.8	11.60	60.00
8.133	46.8	N	9.8	13.20	60.00

C/Average final measurement results table

Frequency (MHz)	Level ¹⁾ C/Average (dBμV)	Line ²⁾	Factor ³⁾ (dB)	Margin ⁴⁾ (dB)	Limit (dBμV)
0.348	35.3	N	9.9	13.70	49.00
0.537	34.4	N	9.9	11.60	46.00
0.735	31.8	N	9.9	14.20	46.00
0.771	31.6	N	9.9	14.40	46.00
0.987	32.3	N	9.8	13.70	46.00
3.471	30.0	L1	9.7	16.00	46.00
3.966	31.6	N	9.8	14.40	46.00
4.758	31.1	N	9.8	14.90	46.00
7.926	43.0	N	9.8	7.00	50.00
7.998	39.9	N	9.8	10.10	50.00

Note1) Level (Quasi-Peak and/or C/Average) = Meter Reading + Factor

Note2) Line = Polarity of input power (Live or Neutral)

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

Note3) Factor = LISN Insertion Loss + Cable Loss

Note4) Margin = Limit – Level (Quasi-Peak and/or C/Average)

Note5) C/Average = CISPR-Average

5.2 Radiated disturbance

Of those disturbances above ($L - 20$ dB), where L is the limit level in logarithmic units, record at least the disturbance levels and the frequencies of the six highest disturbances.

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. All measurements were taken utilizing quasi-peak detection unless stated otherwise.

Measurements were performed at an antenna to EUT distance of 10 meters and elevated between 1 and 4 meters. Both vertical and horizontal antenna polarizations were measured.

Below 1 GHz, peak detector function mode for prescan was used with resolution bandwidth of 120 kHz and a video bandwidth of 300 kHz and sweep method.

The sweep time for prescan set below 200 ms up and final measurement with quasi-peak detector evaluated for suspected frequencies points, which are detected from prescan measurement.

Final measurements consisted of 3 steps.

First step, frequency fine tuning to find exact disturbance frequency.

Second step, rechecking to search for maximum height and azimuth for interference from EUT

In final step, there are conducted measuring with quasi-peak detector for points which are detected from 1st step & 2nd step.

Limits of Radiated Emission

Frequency range Limits MHz	Resolution Bandwidth	Limit values dB(μ V/m)	
		Class A (a distance of 10 meters)	Class B (a distance of 3 meters)
30 to 88	120 kHz	39	40
88 to 216	120 kHz	43.5	43.5
216 to 960	120 kHz	46	46
Above 960	120 kHz	49.5	54

Peak measurements were made over the changeable frequency range 1 GHz to 6 GHz in accordance with internal maximum operating frequency at a measurement distance of 3 m for the following antenna and turntable arrangements:

Antenna Height(m)	Antenna Polarisation	Turntable position (degrees)
1.0 ~ 4.0	Horizontal, Vertical	Continuous

Limits above 1 GHz at a measurement distance of 3 m

Frequency range Limits (GHz)	Resolution Bandwidth (MHz)	Limits of Class A, dB(μ V/m)		Limits of Class B, dB(μ V/m)	
		Peak	Average	Peak	Average
1 ~ 5	1	80	60	74	54
NOTE The lower limit shall apply at the transition frequency					

Measurements within 20 dB of the limit were then maximized by adjusting turntable position. Final measurements were made using an average detector.

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

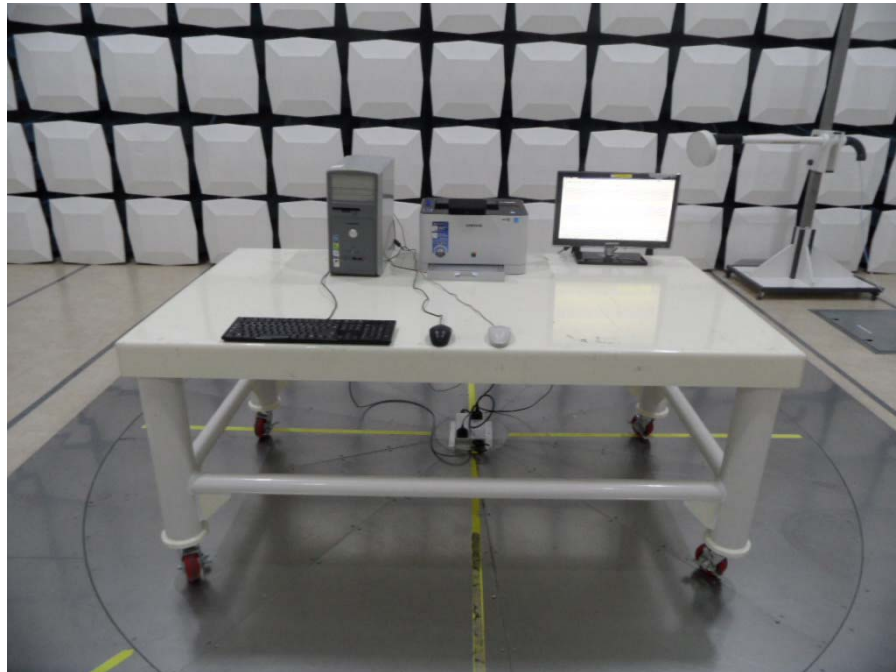
5.2.1 Test instrumentation

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Antenna Mast	AM 4.0	Maturo	AM4.0/061/2410908	-	-
Antenna Mast	AM 4.0	Maturo	AM4.0/060/2410908	-	-
Controller	MCU	Maturo	MCU/100/2410908	-	-
Controller	HD100	HD	100/723	-	-
Controller	CO2000	Innco	CO2000/212/9700305/L	-	-
Preamplifier	317	SONOMA	282424	2014-11-10	12
Preamplifier	317	SONOMA	282425	2014-11-10	12
Preamplifier	ESV-Z3	R&S	815111	2015-04-16	12
BILOG Antenna	CBL6112D	TESEQ	25513	2014-10-21	24
BILOG Antenna	CBL6112B	Schaffner	2804	2014-05-14	24
Horn Antenna	HF906	R&S	100028	2014-10-20	24
EMI Test Receiver	ESU-26	R&S	100364	2015-03-31	12
EMI Test Receiver	ESU-08	R&S	100481	2015-05-13	12
EMI Test Receiver	ESI-26	R&S	100010	2014-09-29	12
Test Software	EP5/RE	TOYO	Ver 5.7.1	-	-

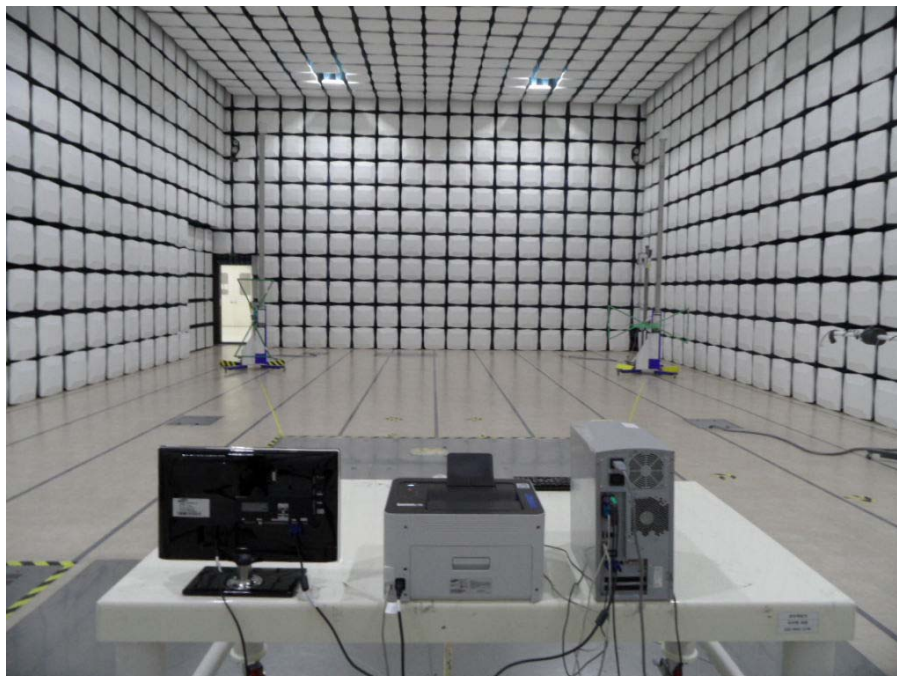
5.2.2 Temperature and humidity condition

Test date	2015-07-09	Test engineer	Young-Jin Kim
Climate condition	Ambient temperature	23.5 °C	Limit (15.0 to 35.0) °C
	Relative humidity	42.0 % R.H.	Limit (25.0 to 75.0) % R.H.
	Atmospheric pressure	101.1 kPa	Limit (86.0 to 106.0) kPa
Test place	Semi-Anechoic Chamber (SAC4)		

5.2.3.1 Photograph of Test Setup (30 MHz ~ 1 000 MHz)

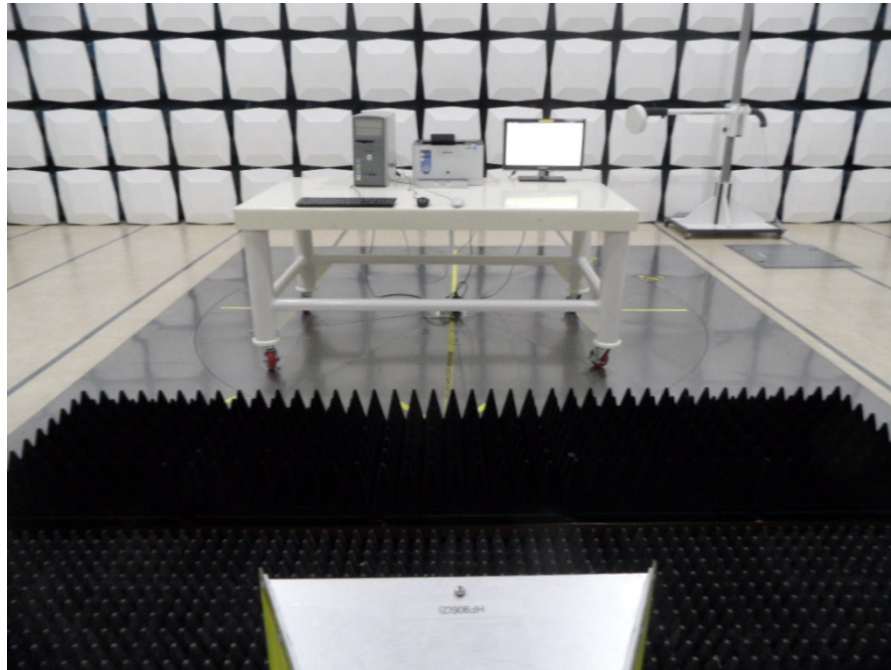


Front



Rear

5.2.3.2 Photograph of Test Setup (Above 1 GHz)



Front

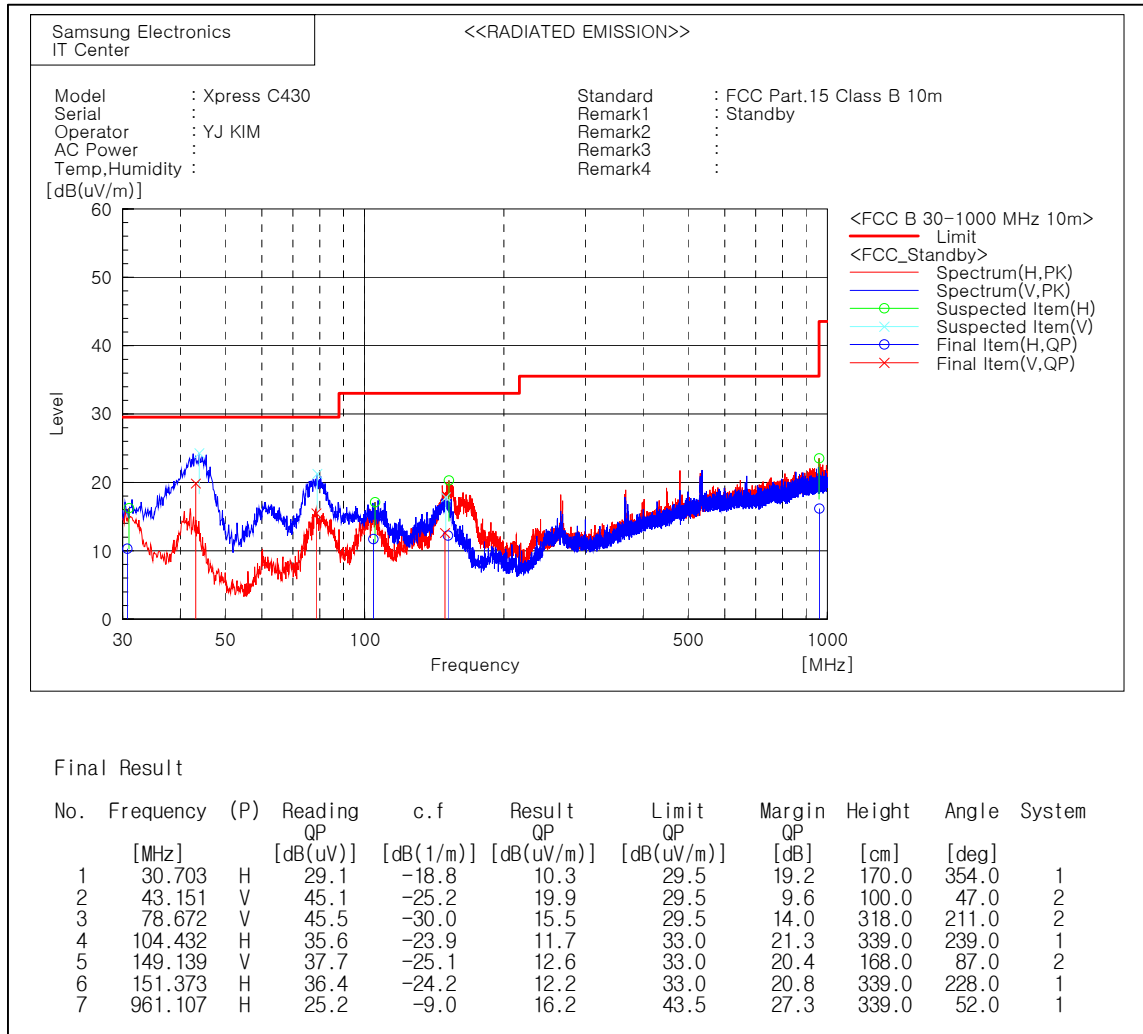


Rear

5.2.4 Test results

5.2.4.1 30 MHz ~ 1 000 MHz results

- Operating Mode : 1



Note1) (P) : Abbreviation of Antenna Polarity

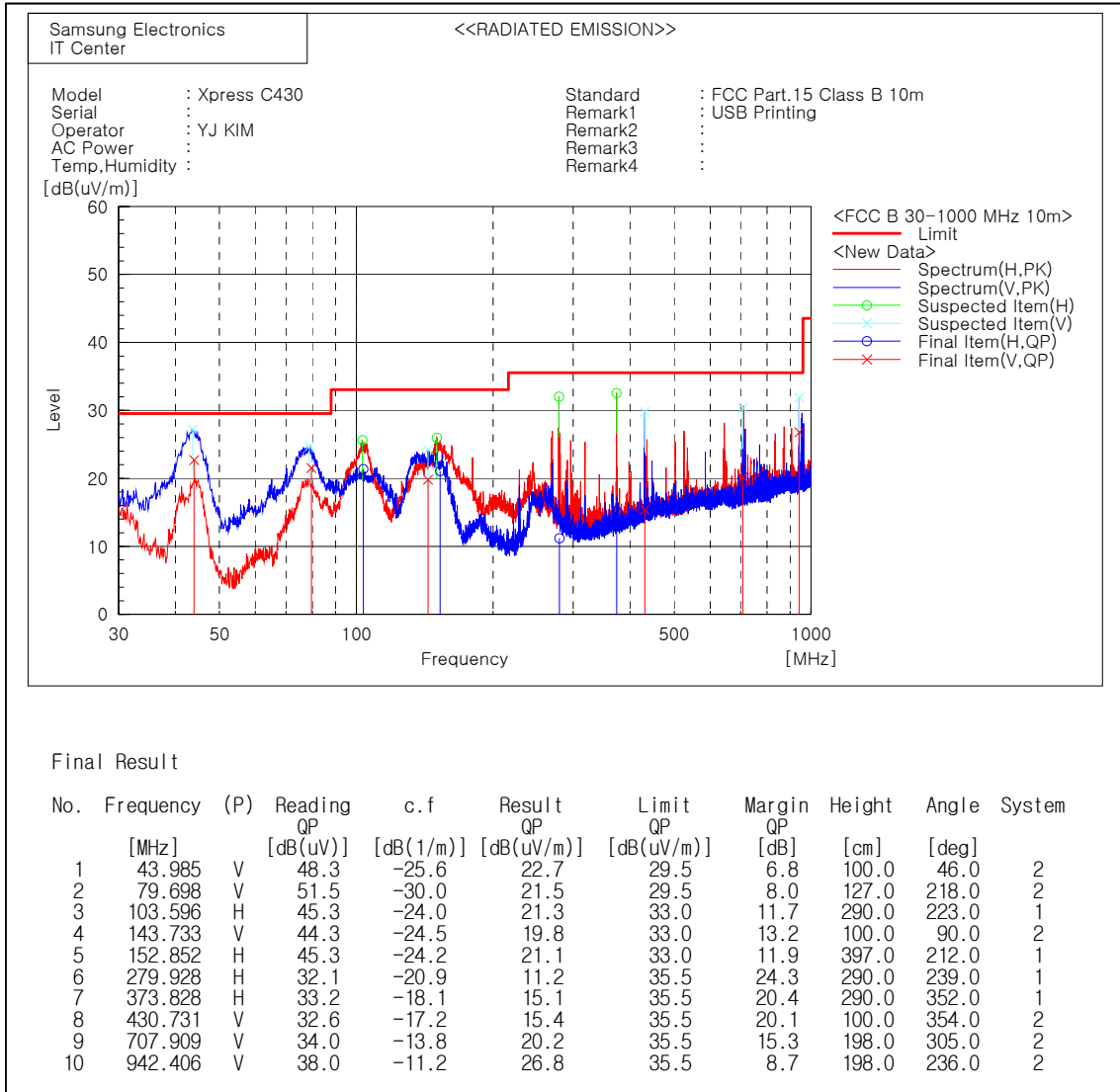
Note2) Reading QP : Received raw Quasi-peak signal

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

- Operating Mode : 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

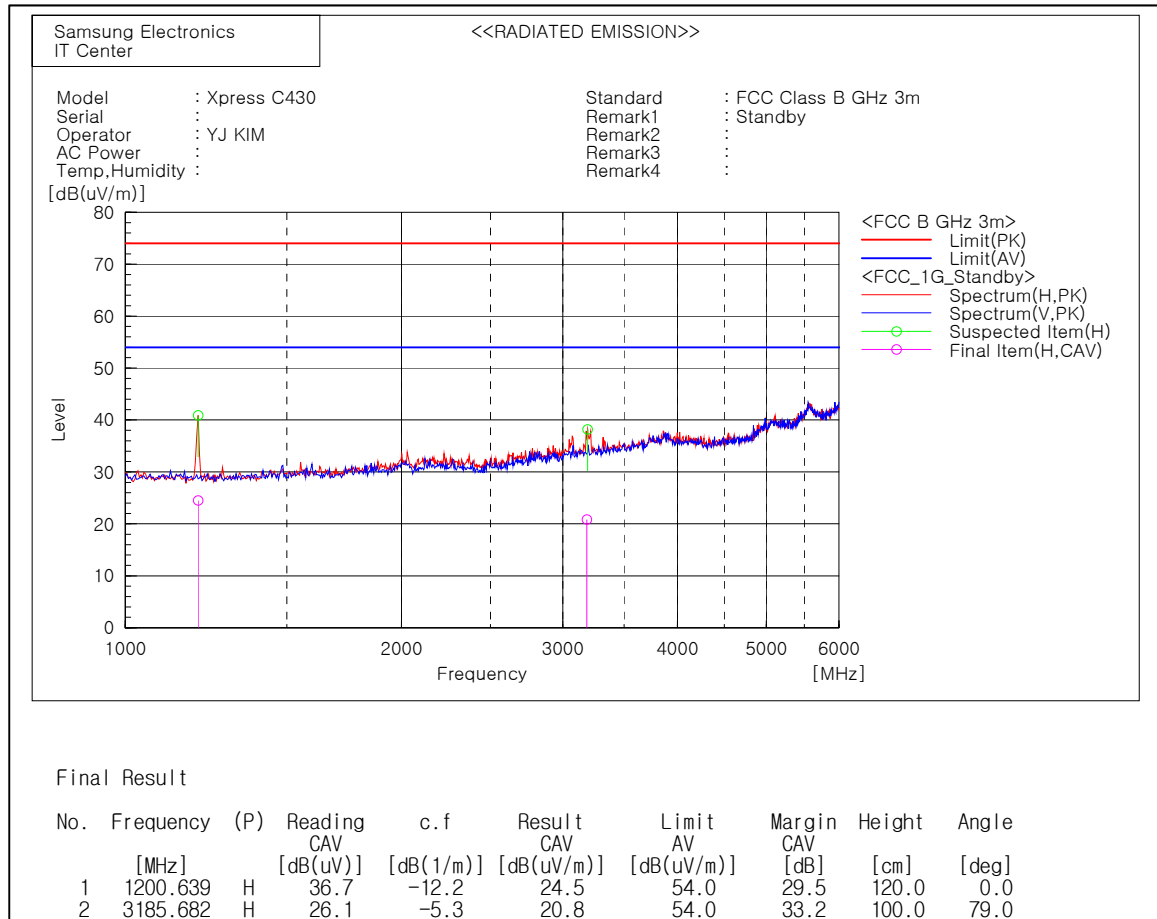
Note5) Margin QP = Limit – Level QP

QP : Abbreviation of Quasi-peak

5.2.4.2 Above 1 GHz results

- Operating Mode : 1

Test Graph and Results



Note1) Receiving antenna polarization : Horizontal and Vertical

Result PK(Peak) = Reading PK(Peak) + c.f(Antenna Factor + Cable Loss - Amp. Gain)

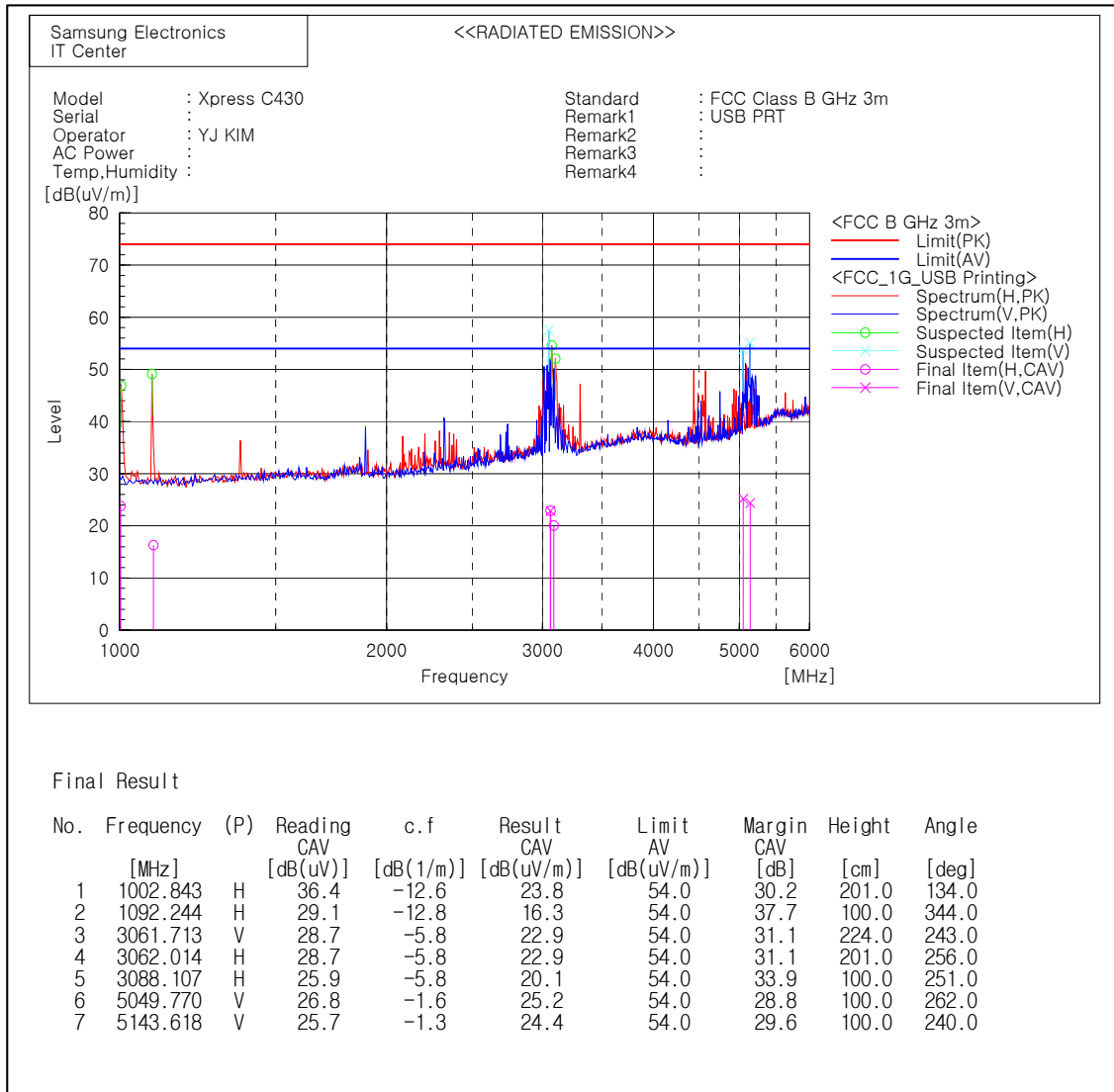
Result AV (C/Average) = Reading AV (C/Average) + c.f(Antenna Factor + Cable Loss - Amp. Gain)

Margin PK (Peak) = Limit - Result PK (Peak)

Margin AV (C/Average) = Limit - Result AV (C/Average)

Note2) c.f = Factor = Antenna factor + Cable loss - Amplifier gain

Note3) C/Average = CISPR-Average

- Operating Mode : 2**Test Graph and Results**

Note1) Receiving antenna polarization : Horizontal and Vertical

Result PK(Peak) = Reading PK(Peak) + c.f(Antenna Factor + Cable Loss - Amp. Gain)

Result AV (C/Average) = Reading AV (C/Average) + c.f(Antenna Factor + Cable Loss - Amp. Gain)

Margin PK (Peak) = Limit - Result PK (Peak)

Margin AV (C/Average) = Limit - Result AV (C/Average)

Note2) c.f = Factor = Antenna factor + Cable loss - Amplifier gain

Note3) C/Average = CISPR-Average

Appendix – EUT photography



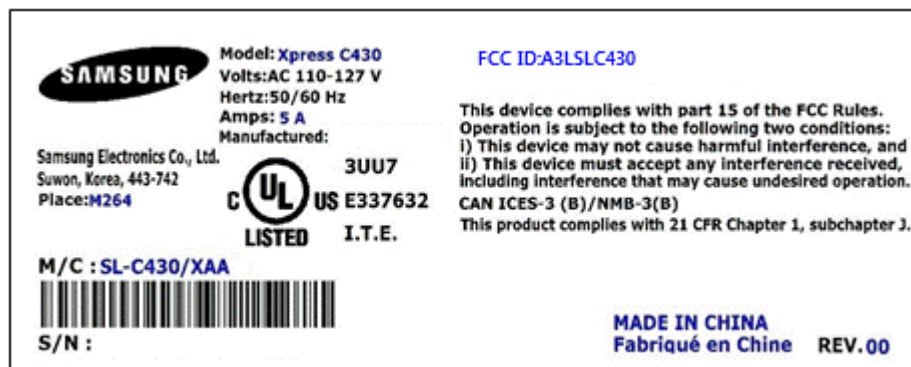
Front View



Rear View & Label Location



Right View (Inside View)



Label