EMC TEST REPORT

(Certification of Compliance)

CFR 47 Part 15 Subpart B

Test Report File No.	12-IST-0520	■ Basic	☐ Alternate
Date of Receipt	May 25, 2012	**Begin of test date**	Aug. 21, 2012
Date of Issue	Aug. 28, 2012	**End of test date**	Aug. 25, 2012

Kind of Product	Serialgate
Basic Model(s)	SG-1020W/ALL
Buyer Model(s)	-

Applicant / Manufacturer	SystemBase Co., Ltd.
Address	16F, Daerung Post Tower-1, 212-8, Guro-dong, Seoul, Korea

Standard	**Section 15.207, Section 15.209 [Class B Equipment]**

Test Result ■ **Positive** ☐ **Negative**

Tested By

J.H.CHOI

Reviewed By

S.J.CHO

Comment(s)

- Investigations requested : Measurement to the relevant clauses of FCC rules and regulations Part 15 Subpart C - Intentional Radiators, Class B.
- The test report with appendix consists of 22 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4 2003.

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Note:

INFORMATIONS OF TEST LABORATORY

IST Co., Ltd.

400-19, Singal-dong, Giheung-gu, Yongin-si,

Kyonggi-Do, 446-599, Korea

TEL : +82 31 326 6700 FAX : +82 31 326 6797

KOLAS Testing No. : 118
RRA & FCC(DoC) Designation No. : KR0018
FCC Registration No. : 400603
VCCI Member No. : 1739

POWER SUPPLY SYSTEM USED

Power supply system AC 120 V, 60 Hz

(Refer to the product information)

Measurement Uncertainty

Conducted Emissions	U = 2.98 [dB] (Confidence level approximately 95 %, k = 2)
Radiated Emissions (Antenna - Horizontal)	U = 3.83 [dB] (Confidence level approximately 95 %, k = 2)
Radiated Emissions (Antenna - Verical)	U = 4.50 [dB] (Confidence level approximately 95 %, k = 2)

PRODUCT INFORMATION

Adapter Power	IN PUT : 220~240 (Vac) 50/60 (Hz) 0.5 A OUT PUT : 12 V 1.0 VA
LAN Port	10/100 Mbps RJ-45 Port * 1EA
Number of serial port	2 port (RS232/RS422RS485)
serial Max Speed	Max 921.6 Kbps
Signal	Port1 : TX, RX, DTR, DSR, RTS, CTS, DCD Port2 : TX, RX, RTS, CTS
Size	80.9(W)*110.5(L)*24.3(H)mm
Weight	256 g
Clock Freq.	Max. 400 MHz

- EMC suppression device is not used during the test.
- Please refer to user's manual.

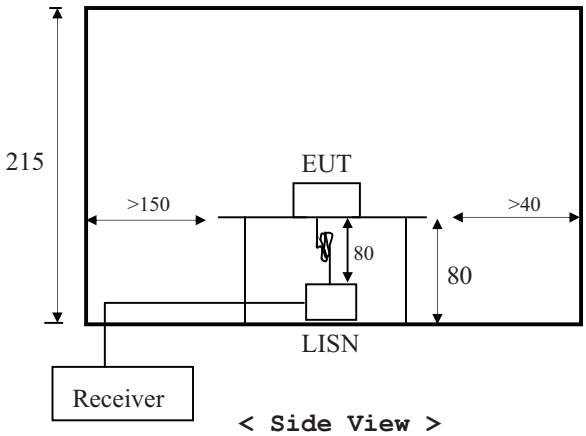
DESCRIPTIONS OF TEST

Conducted Emissions:

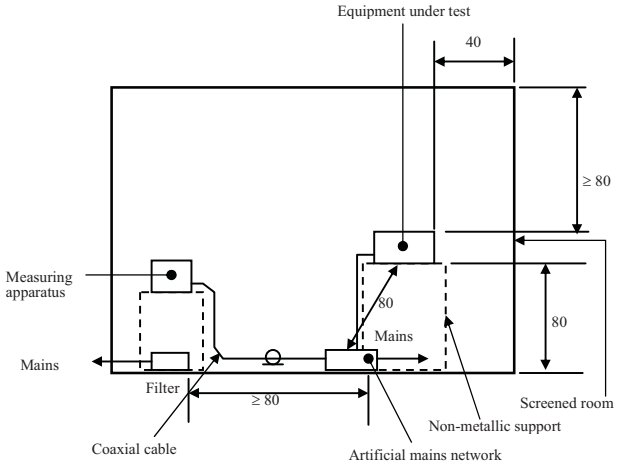
The measurement were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" & "Average" within a bandwidth of 9 KHz.

-Procedure of Test

The line-conducted facility is located inside a shielded room No.1. A 1 m X 1.5 m wooden table 80 cm height is placed 40 cm away from the vertical wall and 1.5 m away from the other wall of the shielded room. The R/S ESH3-Z5 and Hyup-Rip KNW-407 LISN are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80 cm from the LISN and powered from the Hyup-Rip LISN. The peripheral equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the Hyup-Rip LISN. All interconnected cables more than 1 m were shortened by non-inductive bundling to a 1 m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using Quasi-Peak mode by manual measurement, after scanned by automatic Peak mode for frequency range from 0.15 to 30 MHz. The bandwidth of the receiver was set to 10 kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.



< Side View >



< Concept Drawing >

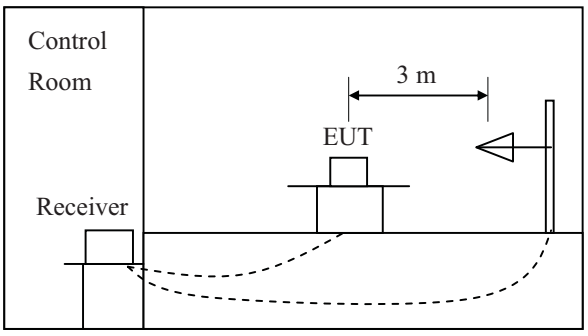
DESCRIPTION OF TEST

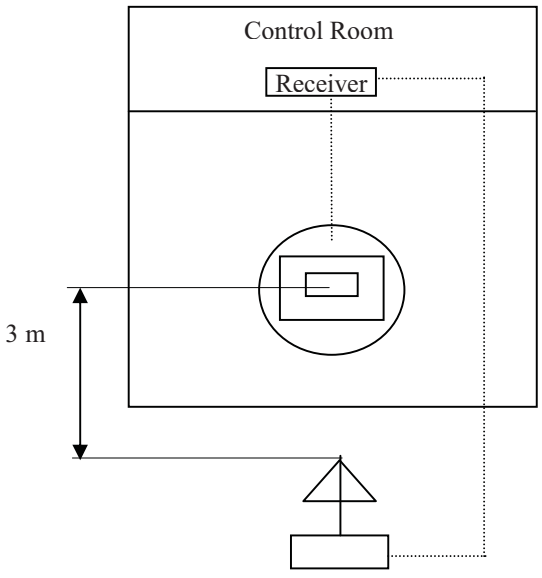
Radiated Emissions:

The measurement was performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurement was made with the detector set for "quasi-peak" within a bandwidth of 120 KHz.

-Procedure of Test

Preliminary measurements were made at 3 meter using bi-log antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1000 MHz using S/B bi-log antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3-meters test distance using S/B bi-log antenna. The OATS have been verified in regular for its normalized site attenuation. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, peripheral equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or peripheral equipment and changing the polarity of the antenna, whichever determined the worst-case emission.





Equipment Under Test

EUT Type :

■ Table-Top. ☐ Floor-Standing.
☐ Table-Top and Floor-Standing(Combination).

Operation - mode of the E.U.T. :

The equipment under test was operated during the measurement under following conditions :

☐ Standby Mode
■ Operational Condition : ■ Serialgate Test Program

Configuration of the equipment under test :

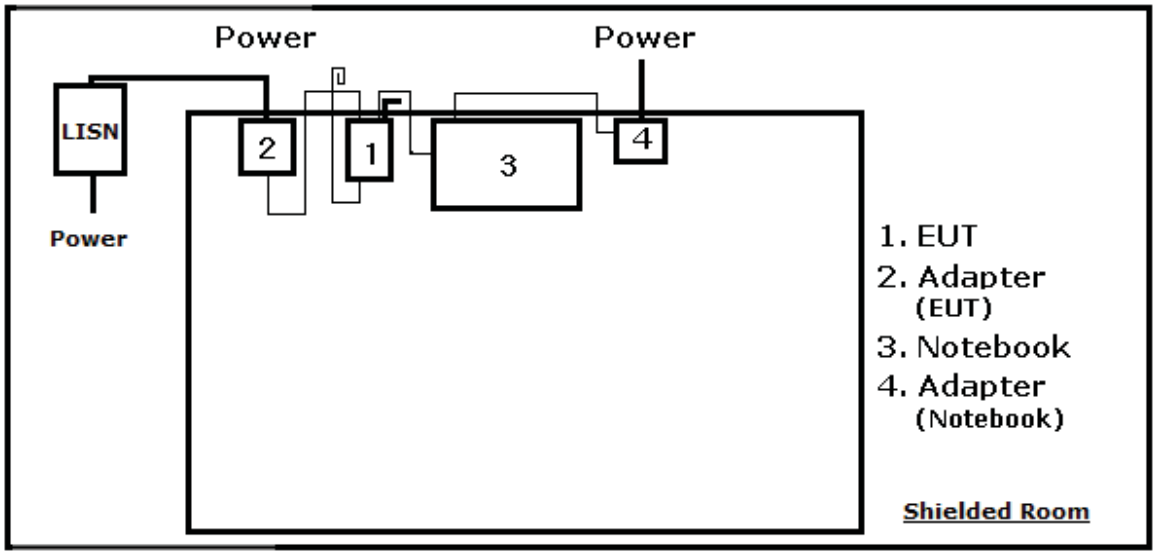
Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
Notebook	R510	LG	903QTAF020768
Adapter	PA-1900-08	DONGGUANG LITE POWER 2nd PLANT	9202316402

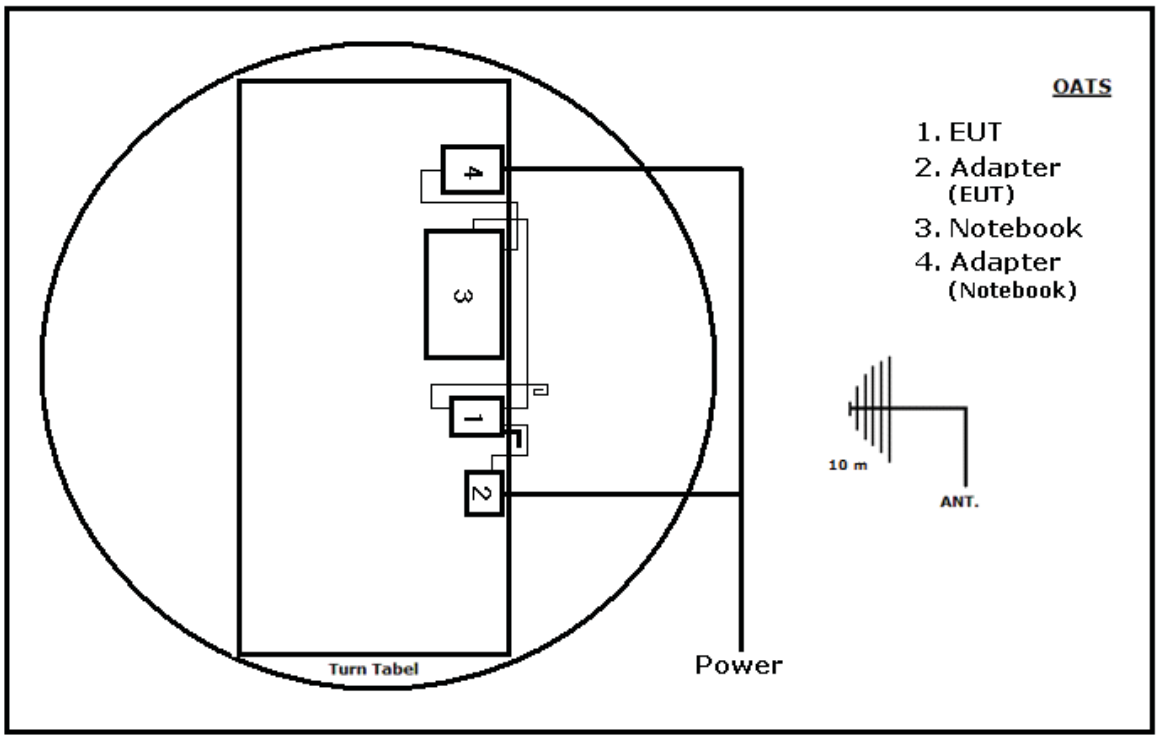
Connecting Interface Cables :
- Unshielded LAN Cable : 4.0 m
- Unshielded Serial Cable : 4.0 m

Note :

Test Set-Up



Conducted Emissions



Radiated Emissions

SUMMARY

Emissions

■ Conducted Emission

The requirements are ● MET ○ Not MET
Minimum limit margin 11.37 dB at 0.510 MHz
Maximum limit exceeding
Remarks : Limits are kept with more than 3 dB margin.

■ Radiated Emission(Limits Below 1 GHz)

The requirements are ● MET ○ Not MET
Minimum limit margin 4.06 dB at 661.466 MHz
Maximum limit exceeding
Remarks : Limits are kept with more than 3 dB margin.

■ Radiated Emissions(Limits above 1 GHz)

The requirements are ● MET ○ Not MET
Minimum limit margin 14.89 dB at 5.984 GHz
Maximum limit exceeding
Remarks : Limits are kept with more than 3 dB margin

Sample Calculation

Conducted Emission

Sample Signal Strength Calculation

S(Result) = Measurement + IL + CL
Margin = Limit - S(Result)

S(Result) = Signal Strength
Measurement = Voltage at the Receiver
IL = LISN Insertion Loss
CL = Cable Loss

For example at 15.402 MHz if the measured voltage is 45.35 dBuV, the Cable loss is 0.15 dB, the insertion loss is 0.74 dB, the signal strength would be calculated:

S(Result) = 45.35 + 0.15 + 0.74 = 46.24 dBuV
Margin = 60 dBuV - 46.24 dBuV = 13.76 dB

Radiated Emission

Sample Field Strength Calculation

FS(Result) = Reading + AF + CL
Margin = Limit - FS(Result)

FS(Result) = Field Strength
Reading = Measured Voltage at the Receiver
AF = Antenna Factor
CL = Cable Loss

For example at 240.000 MHz if the measured voltage is 21.70 dBuV with an antenna Distance of 3 meters, the field intensity would be calculated:

Limit[dBuV/m] = 200[uV/m] = 20log(200) = 46.00 dBuV/m

FS(Result) = 21.70 + 10.71 + 2.28 = 34.69 dBuV/m
Margin = 46.00 dBuV/m - 34.69 dBuV/m = 11.31 dB

TEST CONDITIONS AND DATA

Conducted Emissions

[Applicable]

◆ Test Equipment Used

Model Name	Description	Manufacture	Due Calibration	Serial No.
ESCI	Test Receiver	Rohde & Schwarz	May 11, 2013	100374
ESH2-Z5	LISN	Rohde & Schwarz	May 11, 2013	842966/007
ESH3-Z2	Pulse Limiter	Rohde & Schwarz	May 11, 2013	357.8810.52

◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

◆ Environmental Conditions

Temperature	(24.8 ± 0.3)℃
Humidity	(55.7 ± 0.2) % R.H.
Atmosphere pressure	1000 mbar

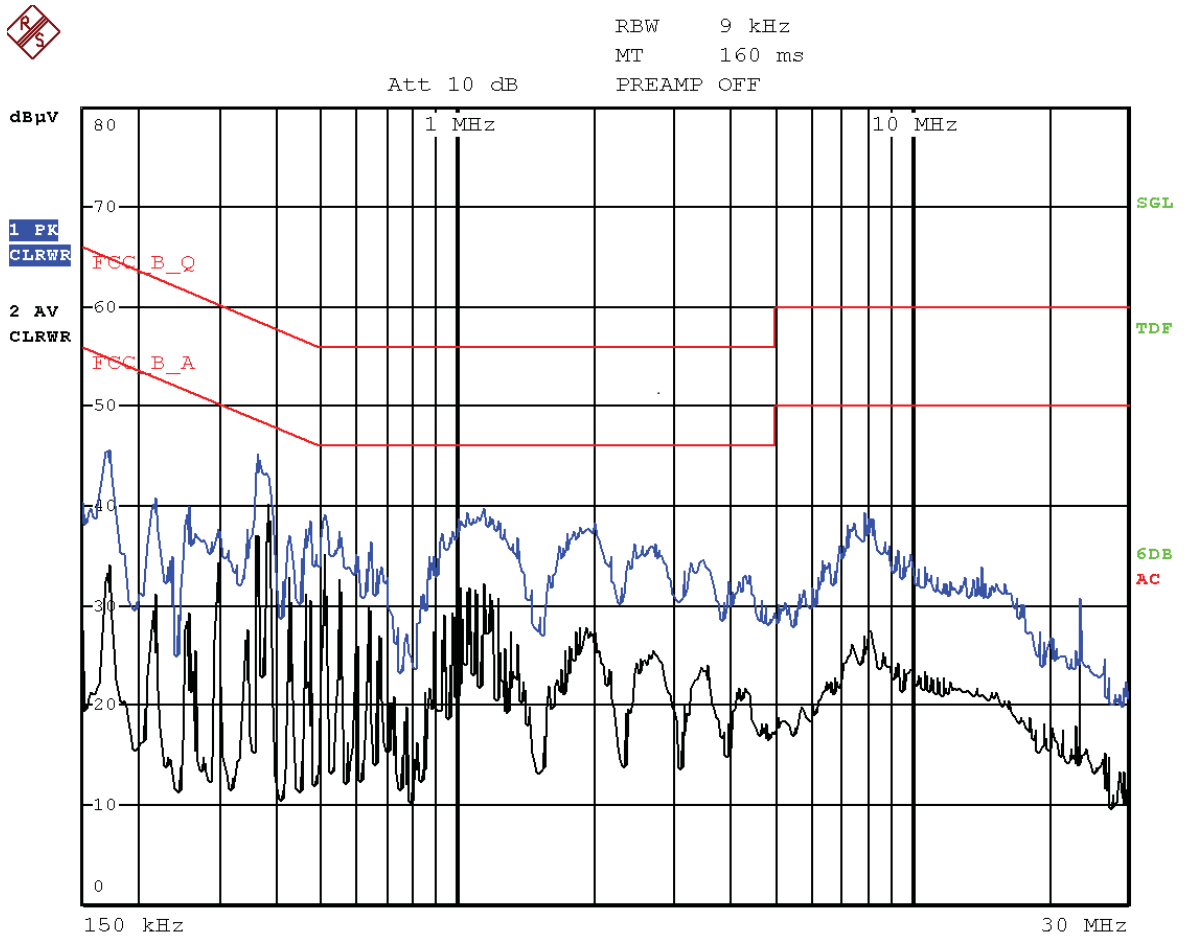
◆ Test Program — See the operation mode on page 6

◆ Test Area — Conducted Room #2

◆ Test Date — Aug. 21, 2012

Note :

Conducted Emissions

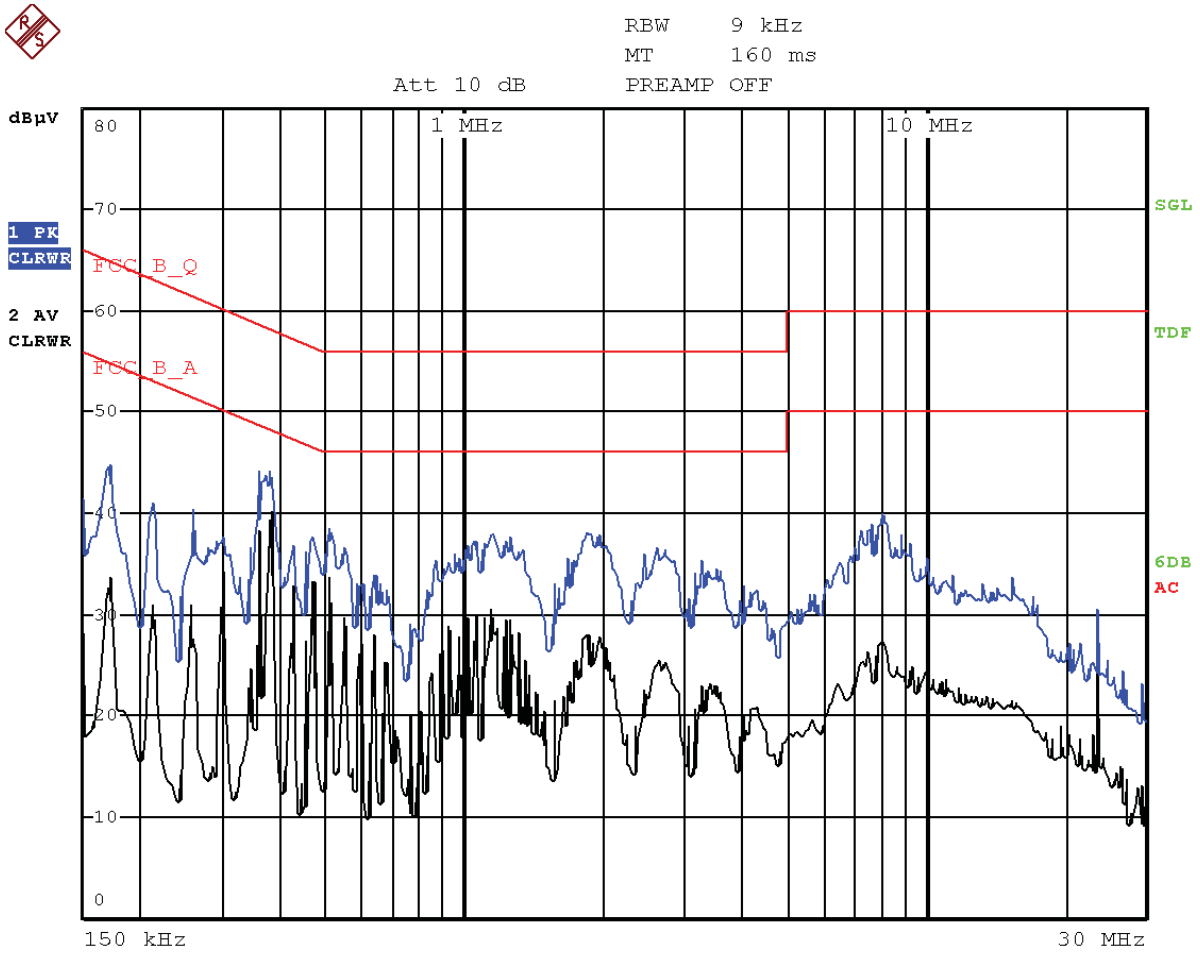


Model Name : SG-1020W/ALL 220 Vac 60 Hz Phase : Live

Freq. [MHz]	Measurement [dB µV]		Limit [dB µV]		Insertion Loss	Cable Loss	Result [dB µV]		Margin [dB]	
	Q-peak	Average	Q-peak	Average	[dB]	[dB]	Q-peak	Average	Q-peak	Average
0.150	35.17	28.69	66.00	56.00	0.15	0.03	35.35	28.87	30.65	27.13
0.170	43.97	34.18	64.96	54.96	0.15	0.03	44.15	34.36	20.81	20.60
0.214	43.98	34.17	63.05	53.05	0.16	0.02	44.16	34.35	18.89	18.70
0.362	40.69	31.28	58.68	48.68	0.16	0.04	40.89	31.48	17.79	17.20
1.142	37.48	31.87	56.00	46.00	0.20	0.07	37.75	32.14	18.26	13.87
7.990	32.59	26.96	60.00	50.00	0.45	0.13	33.17	27.54	26.84	22.47

Note :

Conducted Emissions



Model Name : SG-1020W/ALL 220 Vac 60 Hz Phase : Neutral

Freq. [MHz]	Measurement [dB µV]		Limit [dB µV]		Insertion Loss	Cable Loss	Result [dB µV]		Margin [dB]	
	Q-peak	Average	Q-peak	Average	[dB]	[dB]	Q-peak	Average	Q-peak	Average
0.150	36.67	28.84	66.00	56.00	0.12	0.03	36.82	28.99	29.18	27.01
0.170	43.58	33.97	64.96	54.96	0.12	0.03	43.73	34.12	21.24	20.85
0.258	36.69	32.48	61.50	51.50	0.12	0.03	36.84	32.63	24.66	18.87
0.358	37.97	30.00	58.77	48.77	0.13	0.04	38.14	30.17	20.63	18.61
0.510	36.98	34.47	56.00	46.00	0.14	0.02	37.14	34.63	18.86	11.37
8.054	33.87	26.69	60.00	50.00	0.42	0.13	34.42	27.24	25.58	22.76

Note :

TEST CONDITIONS AND DATA

Radiated Emissions(Limits below 1 GHz)

[Applicable]

◆ Test Equipment Used

Model Name	Description	Manufacture	Due Calibration	Serial No.
ESCS30	Test Receiver	Rohde & Schwarz	May 10, 2013	100171
VULB 9160	Antenna	Schwarzbeck	July 19, 2013	3071

◆ Test Accessories Used

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

◆ Environmental Conditions

Temperature	(24.2± 0.2) ℃
Humidity	(56.1 ± 0.2) % R.H.
Atmosphere pressure	997 mbar

◆ Test Program See the operational condition page 6..

◆ Test Area Open Area Test Site #2(3 m)

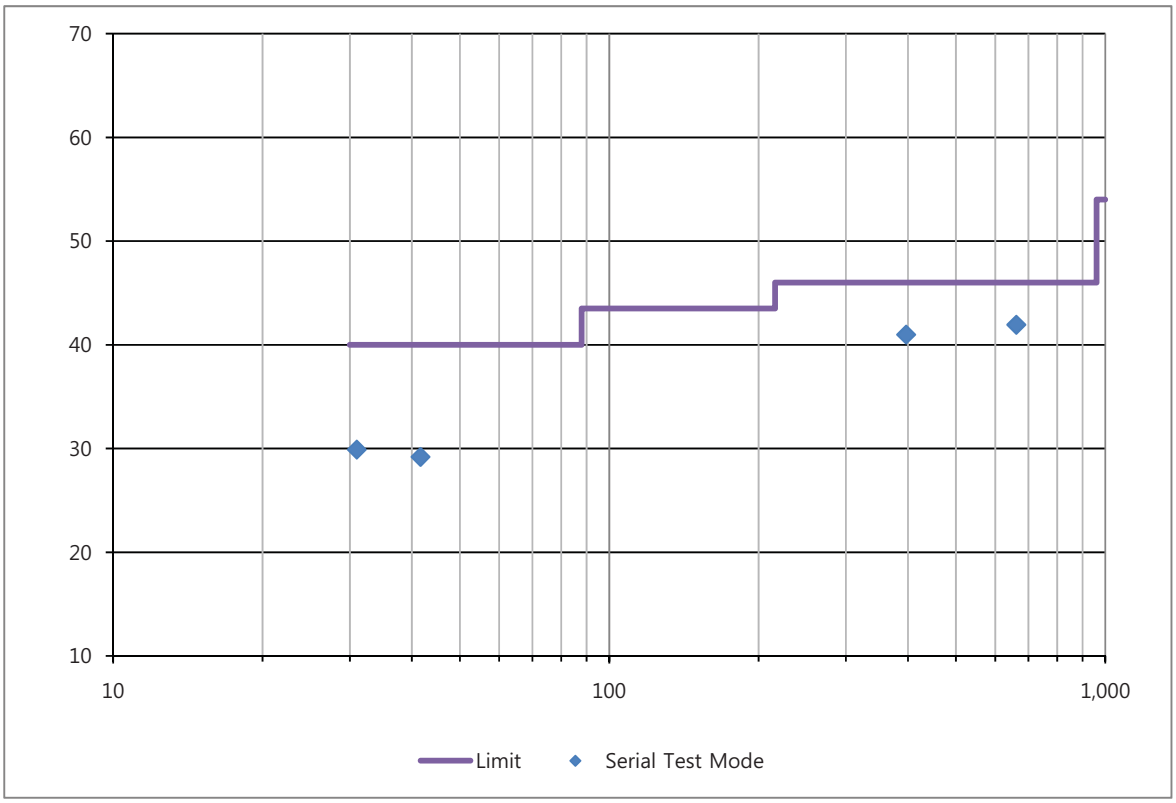
◆ Test Date Aug. 22, 2012

Note :

Radiated Emissions

[Applicable]

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB/m]	Cable Loss [dB]	Polar. [H/V]	Limit [dBuV/m]	Result [dBuV/m]	Margin [dB]
30.970	18.50	10.46	0.94	H	40.00	29.90	10.10
41.640	16.60	11.50	1.10	H	40.00	29.20	10.80
396.660	22.54	15.14	3.31	V	46.00	40.99	5.01
661.466	17.43	19.98	4.53	V	46.00	42.94	4.06



Note : Limits Below 1 GHz (3 m method)

TEST CONDITIONS AND DATA

Radiated Emissions(Limits above 1 GHz)

[Applicable]

◆ Test Equipment Used

The test equipment used is calibrated in regular for every year.

Model Name	Description	Manufacture	Due Calibration	Serial No.
ESCI7	Test Receiver	Rohde & Schwarz	July 16, 2013	100872
3115	Horn Ant.	EMCO	Nov. 21, 2013	9012-3602
8449B OPT H02	Pre Amplifier	HP	Oct. 11, 2012	3008A0530

◆ Environmental Conditions

Temperature	(24.8 ± 0.3)℃
Humidity	(55.7 ± 0.2) % R.H.
Atmosphere pressure	1000 mbar

◆ Test Program — See the operation mode on page 6.

◆ Test Area — Full-Anechoic Room (3 m)

◆ Test Date — Aug. 22, 2012

Note :

Radiated Emissions

(Disturbance Radiation)

[Run normal data during test]

Freq. (GHz)	Reading (dBuV/m)		Pol. (H/V)	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1.321	49.50	32.19	H	74.00	54.00	24.50	21.81
1.457	50.67	35.14	H	74.00	54.00	23.33	18.86
1.714	54.92	38.26	H	74.00	54.00	19.08	15.74
1.463	50.35	33.60	V	74.00	54.00	23.65	20.40
1.534	57.12	34.08	V	74.00	54.00	16.88	19.92
5.874	49.74	38.19	V	74.00	54.00	24.26	15.81

[RX at 2.412GHz]

Freq. (GHz)	Reading (dBuV/m)		Pol. (H/V)	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1.197	47.68	30.51	H	74.00	54.00	26.32	23.49
1.454	49.69	33.75	H	74.00	54.00	24.31	20.25
5.733	50.15	38.01	H	74.00	54.00	23.85	15.99
1.447	50.75	29.23	V	74.00	54.00	23.25	24.77
1.654	47.90	31.15	V	74.00	54.00	26.10	22.85
5.974	49.47	38.31	V	74.00	54.00	24.53	15.69

Radiated Emissions

(Disturbance Radiation)

[RX at 2.442GHz]

Freq. (GHz)	Reading (dBuV/m)		Pol. (H/V)	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1.384	47.32	31.55	H	74.00	54.00	26.68	22.45
1.457	53.12	36.14	H	74.00	54.00	20.88	17.86
3.234	46.76	35.24	H	74.00	54.00	27.24	18.76
1.454	49.20	33.71	V	74.00	54.00	24.80	20.29
1.658	49.47	33.11	V	74.00	54.00	24.53	20.89
1.664	49.48	34.90	V	74.00	54.00	24.52	19.10

[RX at 2.462GHz]

Freq. (GHz)	Reading (dBuV/m)		Pol. (H/V)	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1.184	46.51	30.84	H	74.00	54.00	27.49	23.16
1.372	46.60	32.31	H	74.00	54.00	27.40	21.69
5.984	49.95	39.11	H	74.00	54.00	24.05	14.89
1.225	45.59	31.35	V	74.00	54.00	28.41	22.65
1.605	45.87	32.80	V	74.00	54.00	28.13	21.20
5.746	48.84	38.45	V	74.00	54.00	25.16	15.55

End of Data

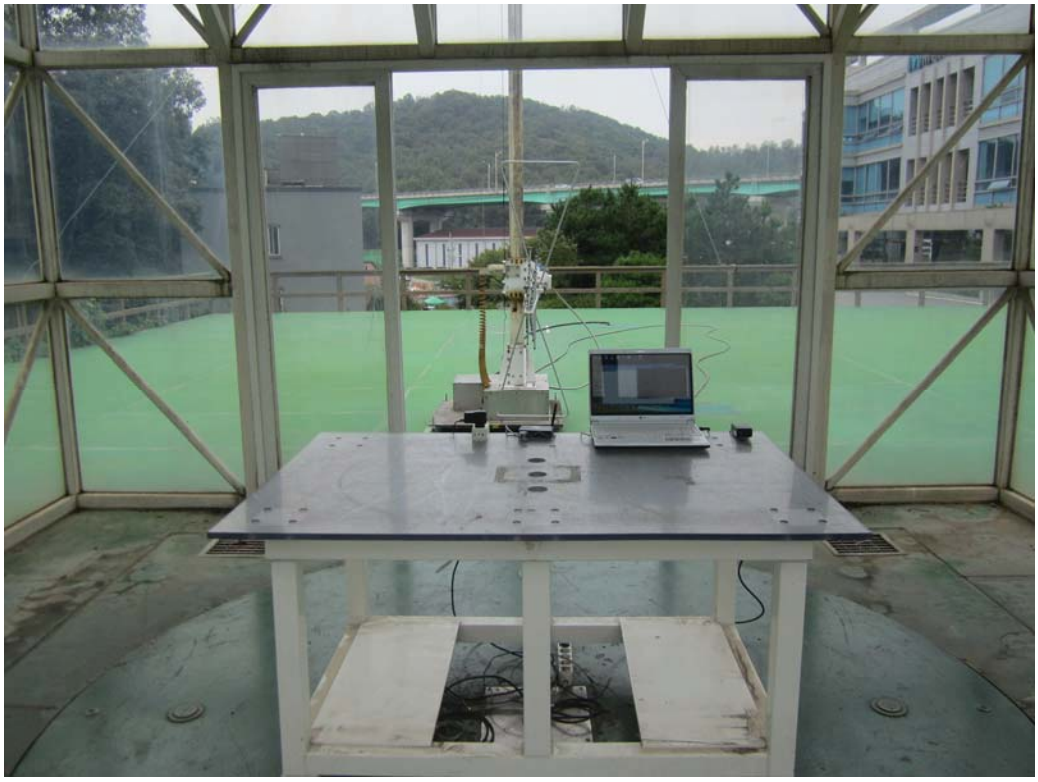
Note :

Appendix A. The Photos of Test Setup

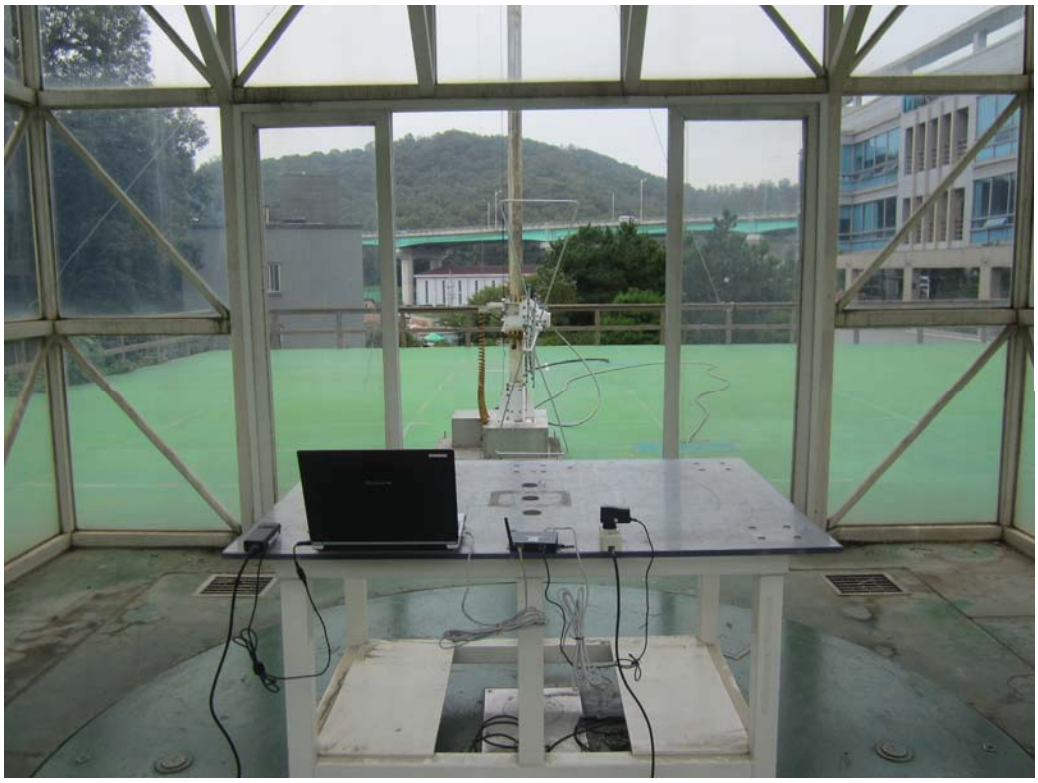
Conducted Emissions - Front View

Conducted Emissions - Rear View

Appendix A. The Photos of Test Setup

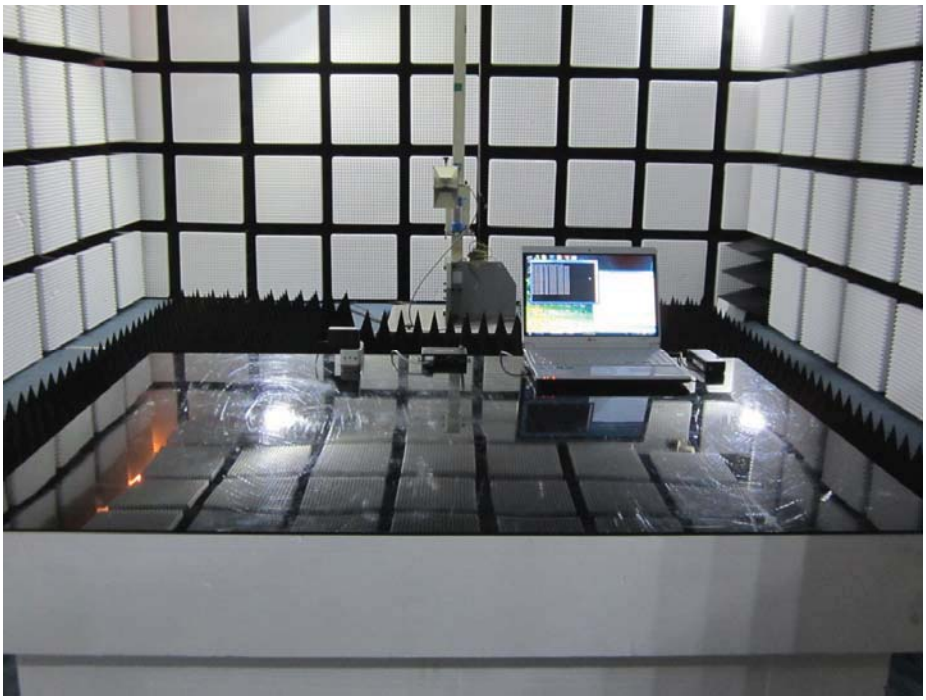


Radiated Emissions below 1 GHz- Front View

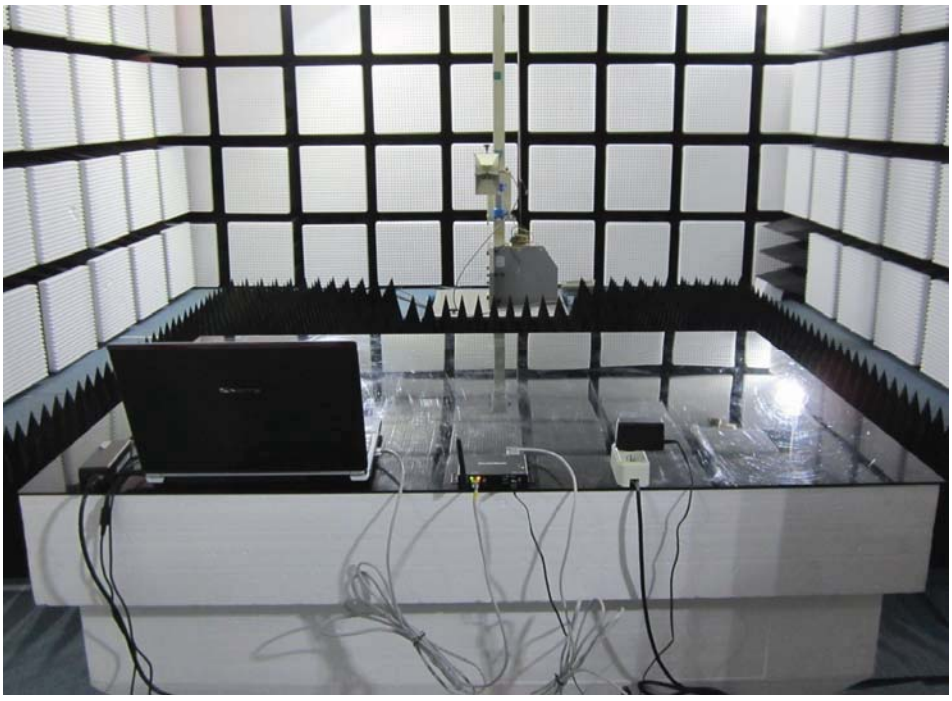


Radiated Emissions below 1 GHz - Rear View

Appendix A. The Photos of Test Setup



Radiated Emissions above 1 GHz- Front View



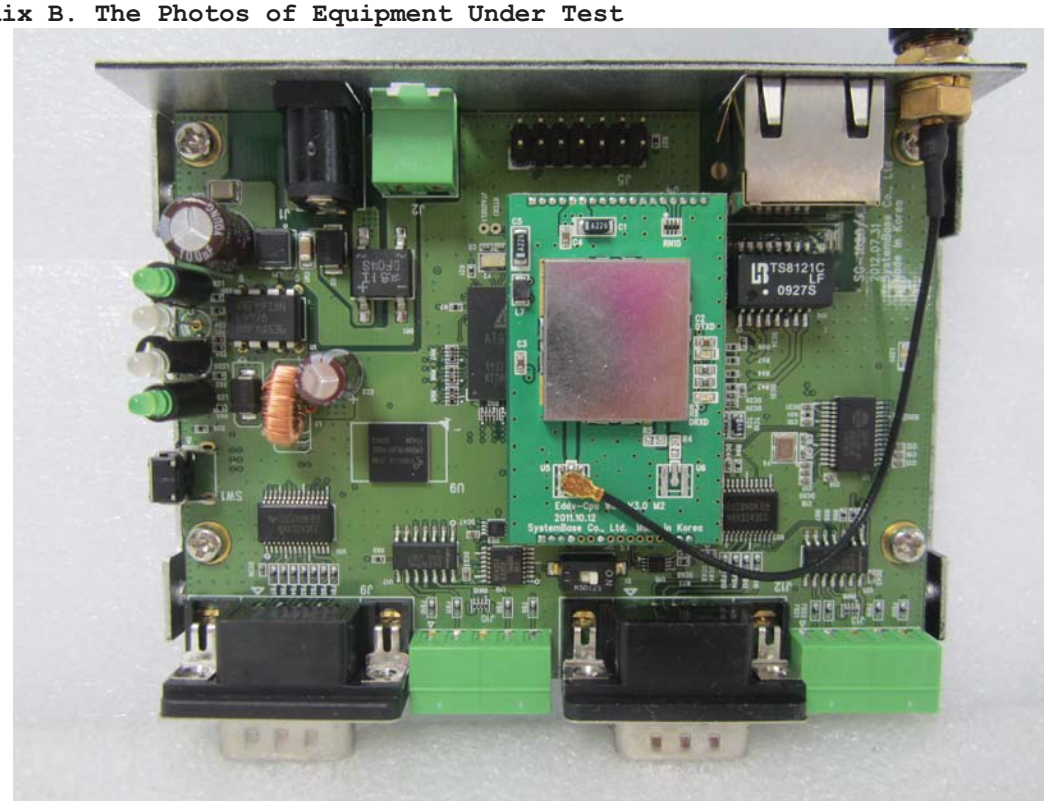
Radiated Emissions above 1 GHz - Rear View

Appendix B. The Photos of Equipment Under Test

Front View

Rear View

Appendix B. The Photos of Equipment Under Test



Installation View

Adapter Label View