EMC TEST REPORT

Samsung Electronics Co., Ltd. 416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si,Gyeonggi-Do, 443-742 Korea (Tel: 82 31 277 7752, Fax: 82 31 277 7753)	Project No. : LBE071056 Page (1)/(21)	KOREA LABORATORY ACCREDITATION SCHEME KOLAS TESTING NO. 124

1. Applicant
   - Name of organization : **Samsung Electronics Co., Ltd.**
   - Address : 416 Maetan 3-Dong, Yeongtong-Gu,Suwon-Si,Gyeonggi-Do 443-742 Korea

2. Purpose for the report : Approval for EMC

3. Kind of product : Notebook Computer
   (Model name : Transport T2500, Brand name : SAMSUNG)

4. Date of test : 2007. 3. 30 ~ 2007. 4. 3

5. Applied standard : FCC Part 15 B, Class B

6. FCC ID : A3L-NP-X65

7. 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	Reviewed by
Name : Sang Kyu, Seo	Name : No Cheon, Park

This report is the test result about the sphere accredited by KOLAS which signed the Mutual Recognition Arrangement of International Laboratory Accreditation Cooperation.

2007. 4. 13

Samsung Electronics Co., Ltd.
Chief of CS Management Center

Table of contents

1. General information

1.1 Basic information related product

Applicant	Samsung Electronics Co., Ltd.
Model name	Transport T2500
Applicant address	416 Maetan 3-Dong, Yeongtong-Gu,Suwon-Si,Gyeonggi-Do 443-742 Korea
Contact person	John SC LEE
Kind of product	Notebook Computer
Variant model	NP-X65
Manufacturer	Samsung Electronics Co., Ltd. 416 Maetan 3-Dong, Yeongtong-Gu,Suwon-Si,Gyeonggi-Do 443-742 Korea
Rated power	AC 120 V, 60 Hz
New / Alternative / Permissive change information	New

1.2 Detail Information related product

1.2.1 Specification

Item	Specification	Remark
CPU	**Intel Core 2 Duo Merom 2.2 GHz L2 Cache 4MB, FSB 800MHz, Intel Merom QS CPU**	-
Chipset	Intel PM965, 800MHz FSB	-
Main Memory	**Samsung, DDR2 PC2-5300S 667Mhz, 1GB(M470T2953CZ3-CE6) * 1**	-
Graphic controller	**Nvidia Geforce 8600M GS Graphic memory 128MB/256MB**	-
LCD DISPLAY	**Samsung, LTN154P1-L03, 15.4”, G, WSXGA+, 1680 x 1050 Pixels**	-
Inverter Board	**Darfon(VK.21209.201)**	-
Modem	Agere systems,DELPHI(D40) S/W Modem, 56KBPS, Fax/Data Azalia MDC,	-
HDD	Fujitsu, SATA type 100GB(MHV2100BH), 2.5”. 100GB, 50G/P, Sata, 9.5MM, FDB, 5400RPM, ROHS Product	-
Turbo Flash Module	**Intel Turbo Memory 1G Module, NVCPEMWR001G1ES**	-
ODD	**TEAC, DV-W28EC, SuperMulti**	-
LAN	Marvell 88E8055 PCI Express Gigabit	-
Wireless LAN	**- Intel, 4965AGN MRW, 802.11agn, 54Mbps, Mini-card MIC No.:INT-4965AGNKR**	-
Bluetooth	Broadcom, BCM92045NMD, USB 2.0 type, Bluetooth Ver 2.0 Foxconn Module, MIC No.:R-LARN-05-0240	-
ADAPTER	**Lite-on, PA-1900-08S, 90W, 19V, 4.74A**	-
Battery	Sanyo(AA-PB2NC6B/5200mAh/11.1V)	
Input Devices	Keyboard, Travel length 2.6mm / Key Pitch 19.05mm Synaptics Touchpad,	
Ports	LAN, Modem,1 X 1394, 3 USB, 1 CRT, HDMI, PCMCIA slot, DC IN, 1 MIC-IN, 1 HP-OUT, 1 LINE-IN, SIO port	

Operating Frequency

2.20GHz(CPU speed), 800MHz(Host Clock), 667MHz(DDR2), 32.768MHz(PCI Clock),
100MHz (PCIE, SATA Clock), 14.318MHz(Ref), 25Mhz (LAN Ref), 10Mhz (MICOM Ref)

1.3 Operating mode and condition

The EUT exercise program used during radiated and conducted emissions testing was the Samsung Stan dardized Emission Test Program for Windows. During the certification test, the LCD panel was open and v ideo signals were simultaneously active on the LCD panel, and the VGA port.
The system was configured for testing in a typical fashion that a customer would normally use, and was te sted while in an automated non-attendant mode.
The program repetitively sends a screen of 'H' to the display, reads and writes to the hard drive.
Musics are played from the CD player which connected externally to the Line-In jack and ported out to the earphones.
A hard drive from the remote PC was mapped to the EUT and a data file was read and written over the net work connection to provide continuous activity. The EUT was connected to a remote PC through the Ether net port with Unshielded Twisted Pair Ethernet cable. Ethernet testing was performed at 1Gbps operation.
Cables were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O cables.
The EUT was tested with the WLAN communicating during the radiated immunity testing. The hopping channels of the Bluetooth hopped and operated in the 2400-2483.5 MHz band, with 79 channels

- Test Voltage : AC 120 V, 60 Hz

1.4 Equipment modifications

This section provide details of the equipment under test(EUT)and the peripheral assemblies attached during radiated and conducted emission testing.
The AC adapter was connected and All external peripherals were connected to the I/O ports to the EUT.

1.5 Test procedure

1.5.1 Conducted emission

EUT was placed on a platform nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting ground plane.

The rear of EUT, including peripherals was aligned and flush with rear of tabletop.

All other surfaces of tabletop was at least 80 cm from any other grounded conducting surface.

I/O cables and AC cables that were connected to the peripherals were bundled in center.

They were folded back and forth forming a bindle 30 cm to 40 cm long and were handed at a 40 cm height to the ground plane.

Each EUT current-carrying power lead, except the ground(safety) lead, were individually connected through a LISN to the input power source.

All unused 50 ohm connectors of the LISN were resistively terminated in 50 ohm when not connected to the measuring equipment.

Frequency Band [MHz]	Instrument	Detector	Resolution Bandwidth	Video Bandwidth
0.15 to 30	EMI Receiver	Quasi-Peak	9 kHz	-
		Average	9 kHz	-

1.5.2 Radiated emission

EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The rear of EUT, including peripherals was aligned and flush with rear of tabletop.

The I/O cables that were connected to the peripherals were bundle in center.

They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged 40 cm height to the ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The measurement antenna was varied in height above the conducting ground plane and the trun table azimuth was varied to obtain the maximum signal strength

The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found.

The spectrum was scanned from 30 to 1 000 MHz using biconiLog antenna.

Frequency Band [MHz]	Instrument	Detector	Resolution Bandwidth	Video Bandwidth
30 to 1 000	EMI Receiver	Quasi-Peak	120 kHz	-
Above 1 000	EMI Receiver	Peak	1 MHz	1 MHz

1.6 Test configuration

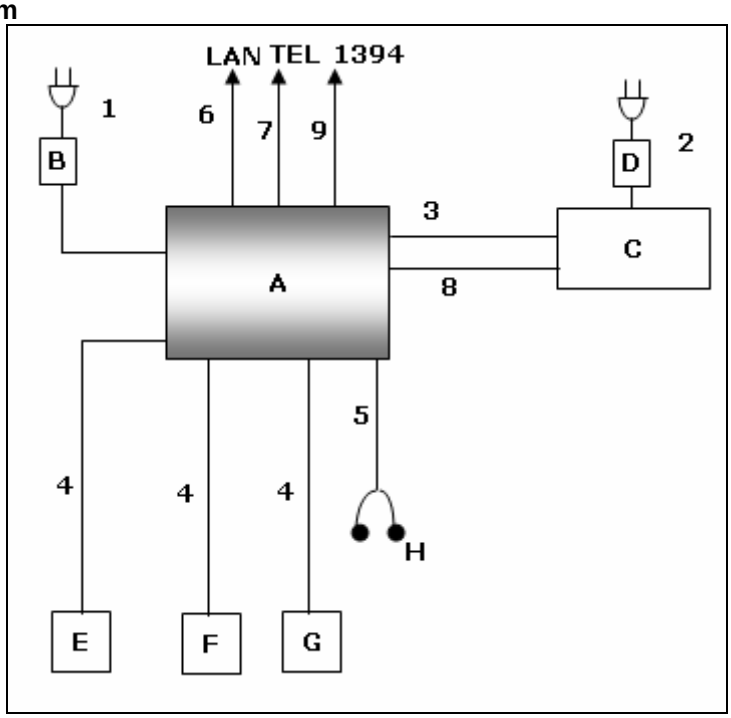
1.6.1 Used EUT and peripherals

Seq	Device	Model Name	Serial #	Maker	Note
A	Notebook PC	Transport T2500	-	Samsung	EUT
B	AC Adapter	PA-1900-08	650002480A	LITE-ON	For EUT
C	Monitor	1702FP	KR08G1524760225KDTFU	DELL	-
D	AC Adapter	AD-4214L	-	Dongguan Samsung Electro-Mechanics	-
E	USB mouse	MS201U	69G0585	Monterey International Corp.	-
F	USB mouse	MS201U	69G1973	Monterey International Corp.	-
G	USB mouse	MS201U	69G0556	Monterey International Corp.	
H	Headset	MH21	-	ATA	

1.6.2 Used cable description

No	Connect Cable	Length [m]	Shielded [Y/N]	Remark
1	Power	1.8	No	For n/pc
2	Power	1.8	No	For monitor
3	Monitor (RGB)	1.8	Yes	From pc(RGB) to monitor
4	USB	1.8	Yes	From pc to mouse
5	Headset	1.6	Yes	From pc to headset
6	LAN	1.8	Yes	From pc to lan
7	TEL	1.8	Yes	From pc to tel
8	Monitor (DVI)	1.5	Yes	From pc(HDMI) to monitor
9	1394	1.5	Yes	Termination

1.6.3 Block Diagram



1.7 Applied Standards

Test standard	Test method
FCC Part 15 B	ANSI C63.4:2003

1.8 Test Facility

1.8.1 General information

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 22, 16-1, 16-2.

This EMC Testing Lab. is accredited by Korea Laboratory Accreditation Scheme(KOLAS) which signed the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the above test item(s) and test method(s).

This Lab. is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:1998.

1.8.2 Accreditation and listing

1.8.3 Measurement uncertainty

(According to CISPR 16-4 and Lab. 34)

Test item	Measurement uncertainty
Conducted emission	± 2.8 dB
Radiated emission (Bi-Log Antenna)	± 5.1 dB ± 5.09 dB

2. Summary of test results

Result : Complied

The equipment under test (EUT) has been found to comply with the applied standards.

Section of the Product Standard		Applied Standard	Result
Electromagnetic Emission Test			
3.1	Conducted Emission	FCC Part 15 B	Complied
3.2	Radiated Emission	FCC Part 15 B	Complied

3. Description of individual tests

3.1 Conducted emission

3.1.1 Test information

Test engineer	Sang Kyu, Seo
Test date	April 3, 2007
Climate condition	Ambient temperature : 23.7 ℃, Relative humidity : 27 % Atmospheric pressure : 101.5 kPa
Test place	Shielded room #1

3.1.2 Test equipment

Equipment	Model name	Manufacturer	Serial no.	Calibration	
				Date	Interval (Month)
EMI TEST RECEIVER	ESCI	R&S	100369	2006-05-01	12
LISN (For EUT)	ENV216	R&S	100116	2006-09-01	12
LISN (For Peripheral)	ESH3-Z5	R&S	100261	2006-07-21	12
Test Software	EMC 32	R&S	Ver 4.40.0	N/A	N/A

3.1.3 Test result : **Complied**

The Measured emissions of the EUT have found to be below the specified limits.

3.1.4.1 Test graph

Test Information

Test Description: Transport T2500
Operating Conditions:
Operator Name:
Comment:

Hardware Setup: Voltage with ENV 2-Line-LISN - [EMI conducted]

Subrange 1
Frequency Range: 150kHz - 30MHz

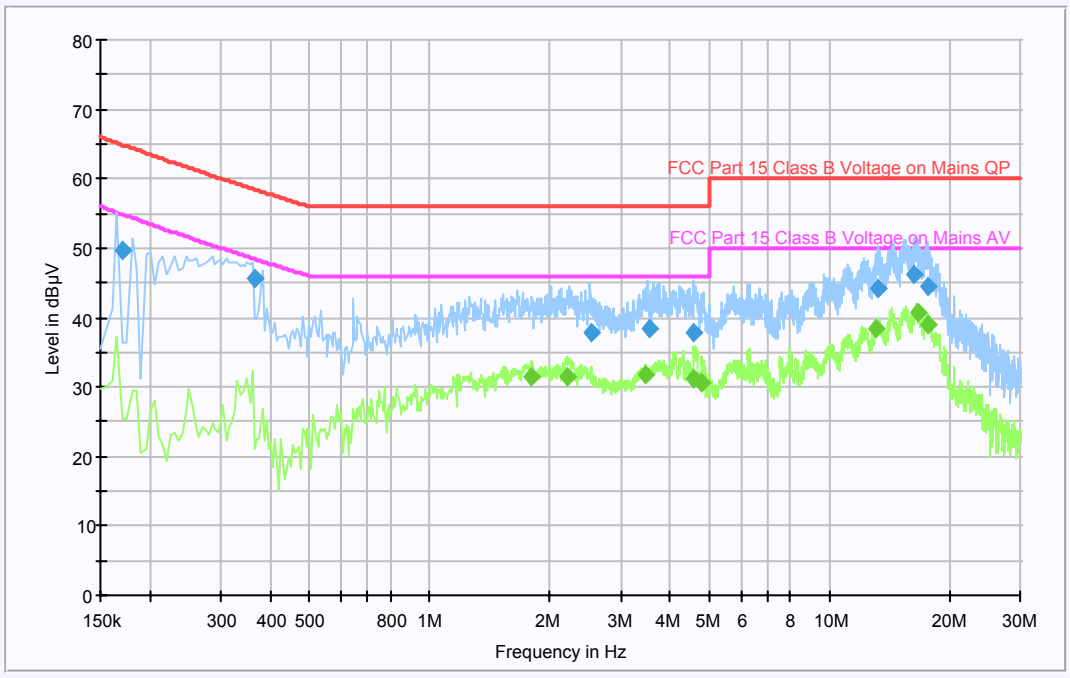
Receiver: ESCI 3 [ESCI 3]
@ GPIB0 (ADR 20), SN 100369/003, FW 3.82
Signal Path: Receiver-2-Line-LISN ENV216
FW 1.0
Correction Table: Receiver-2-LISN ENV216
LISN: ENV216
Correction Table (Line 0): ENV216_100116_N
Correction Table (Line 1): ENV216_100116_L

Scan Setup: FCC Part 15 Class_B with ENV 2-Line-LISN fin [EMI conducted]

Hardware Setup: Voltage with ENV 2-Line-LISN
Level Unit: dB µV

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
150kHz - 30MHz	QuasiPeak; Average	9kHz	15s	ESCI 3

FCC Part 15 Class_B with ENV 2-Line-LISN



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dB µV)	Line	Corr. (dB)	Margin (dB)	Limit (dB µV)
0.169 500	49.8	N	9.6	15.1	64.9
0.363 500	45.5	N	9.6	13.0	58.5
2.524 500	37.7	N	9.7	18.3	56.0
3.529 500	38.5	N	9.7	17.5	56.0
4.594 500	37.9	L1	9.7	18.1	56.0
13.228 500	44.3	N	9.9	15.7	60.0
16.215 500	46.1	L1	10.0	13.9	60.0
17.739 500	44.6	N	10.0	15.4	60.0

Final Measurement Detector 2

Frequency (MHz)	Average (dB µV)	Line	Corr. (dB)	Margin (dB)	Limit (dB µV)
1.795 500	31.4	L1	9.7	14.6	46.0
2.210 500	31.4	N	9.7	14.6	46.0
3.479 500	31.8	N	9.7	14.2	46.0
4.550 500	31.3	L1	9.7	14.7	46.0
4.774 500	30.7	L1	9.8	15.3	46.0
13.133 500	38.5	N	9.9	11.5	50.0
16.609 500	40.7	L1	10.0	9.3	50.0
17.734 500	39.1	N	10.0	10.9	50.0

* QP : Quasi-peak, AV: Average

* Level (QuasiPeak or Average) = Meter Reading(QP or AV) + Corr. (LISN Insertion loss + Cable loss)

* Margin = Limit – Result

3.2 Radiated Emission

3.2.1 Test information

Test engineer	Sang Kyu, Seo
Test date	March 30, 2007
Climate condition	Ambient temperature : 24.3 ℃, Relative humidity : 21 % Atmospheric pressure : 101.8 kPa
Test place	10m Semi Anechoic Chamber

3.2.2 Test equipment

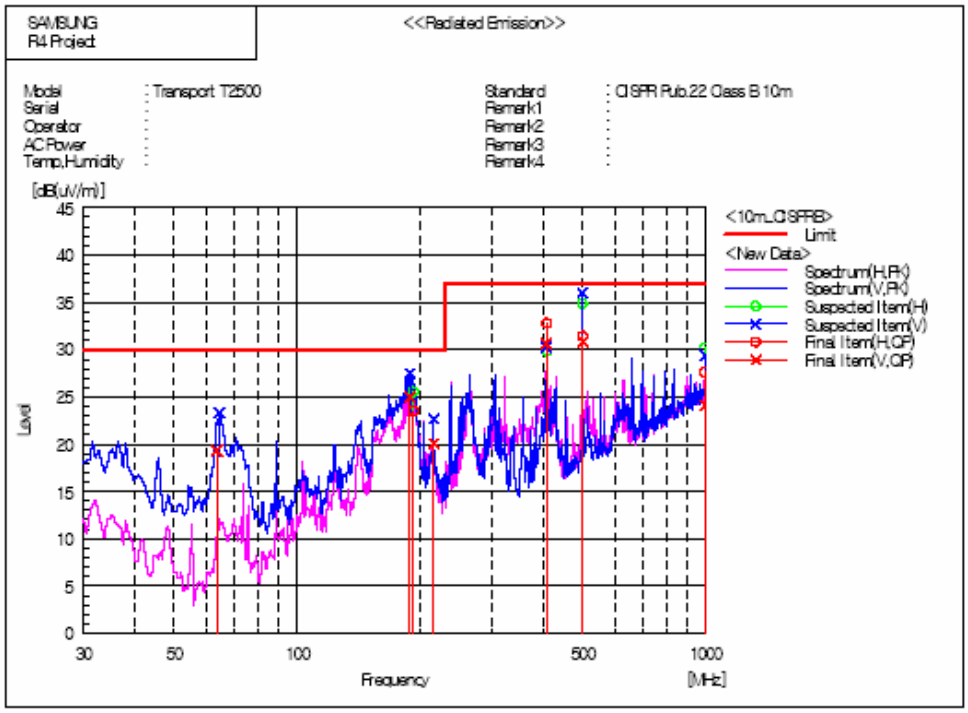
Equipment	Model name	Manufacturer	Serial no.	Calibration	
				Date	Interval (Month)
Bi-con Antenna	CBL6112D	SCHAFFNER	22602	2006-06-26	12
EMI Receiver	ESI-26	R&S	832692/002	2007-02-28	12
AMPLIFIER	310N	SONOMA	186467	2007-03-17	12
Ant Mast	MA4000	Inn-co	-	N/A	N/A
Ant Mast	MA4000	Inn-co	-	N/A	N/A
Mast Controller	CO2000	Inn-co	-	N/A	N/A
RF Selector	NS4900	TOYO	-	N/A	N/A

3.2.3 Test result : **Complied**

The Measured emissions of the EUT have found to be below the specified limits.

3.2.4 Test data

(1). 30 MHz – 1 GHz



Final Result

--- Horizontal Polarization (QP)---

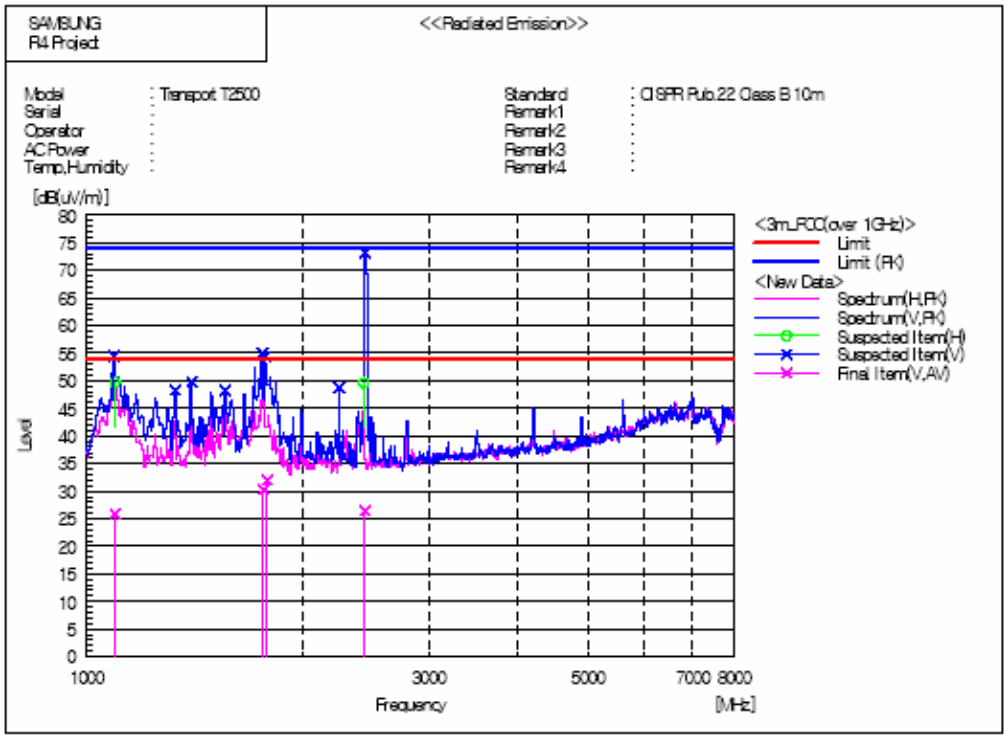
No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	192.977	43.6	-20.1	23.5	30.0	6.5
2	408.037	43.4	-10.6	32.8	37.0	4.2
3	499.991	40.3	-8.9	31.4	37.0	5.6
4	995.743	28.6	-1.0	27.6	37.0	9.4

--- Vertical Polarization (QP)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	69.798	44.4	-25.0	19.4	30.0	10.6
2	168.345	45.3	-20.3	25.0	30.0	5.0
3	216.011	40.1	-20.0	20.1	30.0	9.9
4	408.037	41.2	-10.6	30.6	37.0	6.4
5	499.991	39.7	-8.9	30.8	37.0	6.2
6	997.384	25.1	-1.0	24.1	37.0	12.9

* Receiving Antenna Mode : Horizontal, Vertical
* Test distance : 10 m (Semi-Anechoic Chamber)
* Result = Meter Reading + c.f (Antenna factor + Cable loss-Amp. Gain)
* Margin = Limit – Result

(2). 1 GHz – 8 GHz



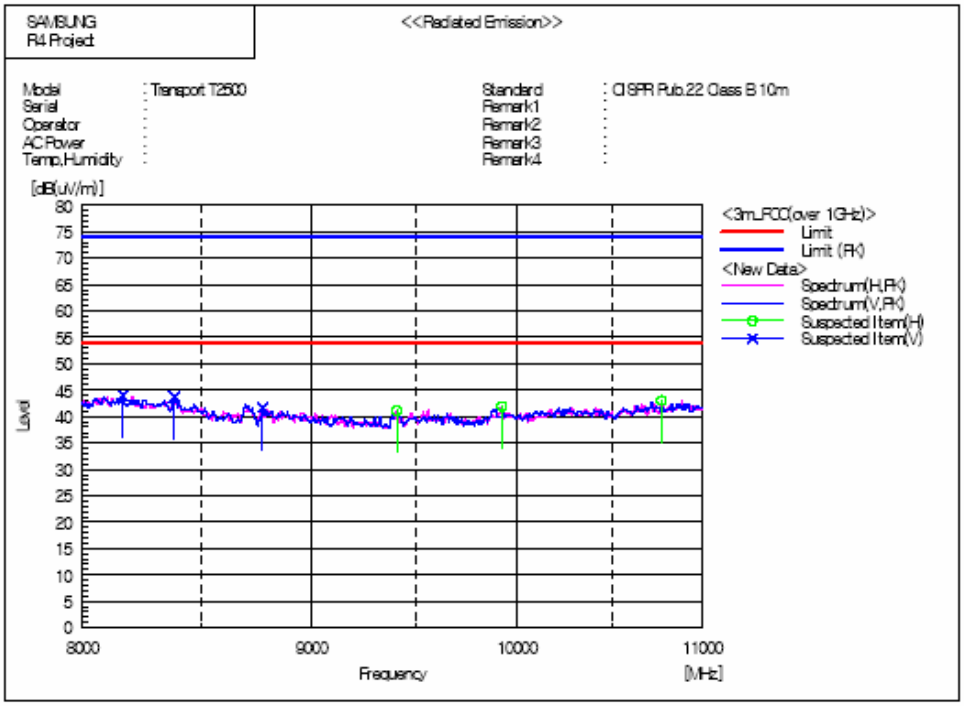
Final Result

--- Vertical Polarization (AV)---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
1	2444.810	32.9	-5.8	26.5	54.0	27.5
2	1765.811	39.2	-8.8	30.4	54.0	23.6
3	1096.192	38.0	-12.1	25.9	54.0	28.1
4	1784.390	40.8	-8.7	32.1	54.0	21.9

* Measurement detector function and bandwidth
  - Detector function : peak
  - Bandwidth : 1MHz
* Receiving Antenna Mode : Horizontal, Vertical
* Test distance : 3 m (Semi-Anechoic Chamber)
* Result = Meter Reading + c.f (Antenna factor + Cable loss-Amp. Gain)
* Margin = Limit – Result

(3). 8 GHz – 11 GHz



Spectrum Selection

--- Horizontal Polarization ---

No.	Frequency	Reading	c.f	Result PK	Limit	Margin	Remark
	[MHz]	[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	
1	9402.806	31.5	9.7	41.2	54.0	12.8	
2	9923.848	31.9	10.0	41.9	54.0	12.1	
3	10778.547	31.1	11.9	43.0	54.0	11.0	

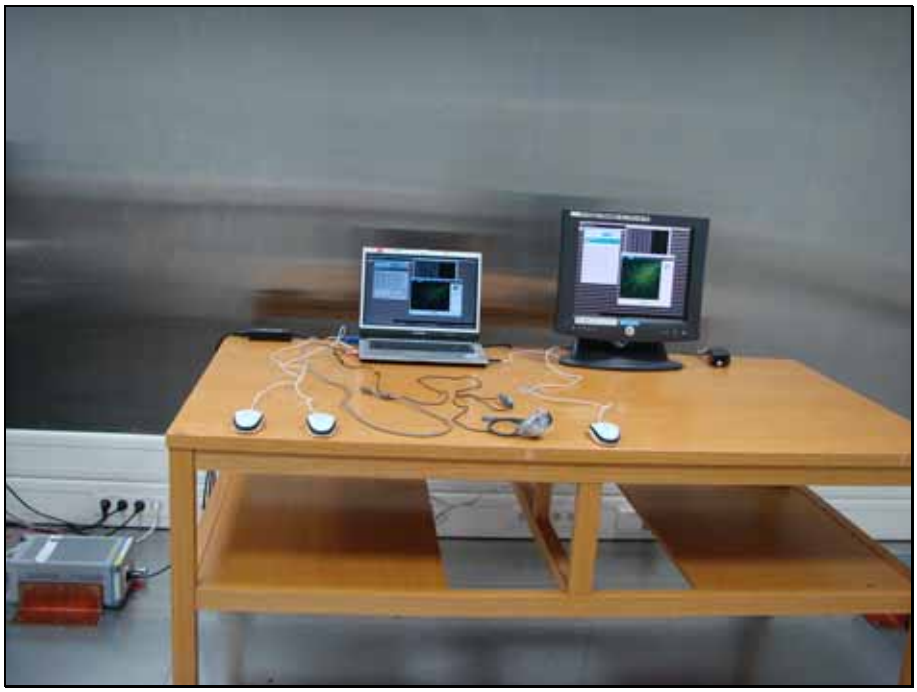
--- Vertical Polarization ---

No.	Frequency	Reading	c.f	Result PK	Limit	Margin	Remark
	[MHz]	[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	
1	8166.337	33.8	10.2	44.0	54.0	10.0	
2	8384.770	33.7	10.1	43.8	54.0	10.2	
3	8777.555	32.0	9.8	41.8	54.0	12.2	

* Measurement detector function and bandwidth
  - Detector function : peak
  - Bandwidth : 1MHz
* Receiving Antenna Mode : Horizontal, Vertical
* Test distance : 3 m (Semi-Anechoic Chamber)
* Result = Meter Reading + c.f (Antenna factor + Cable loss-Amp. Gain)
* Margin = Limit – Result

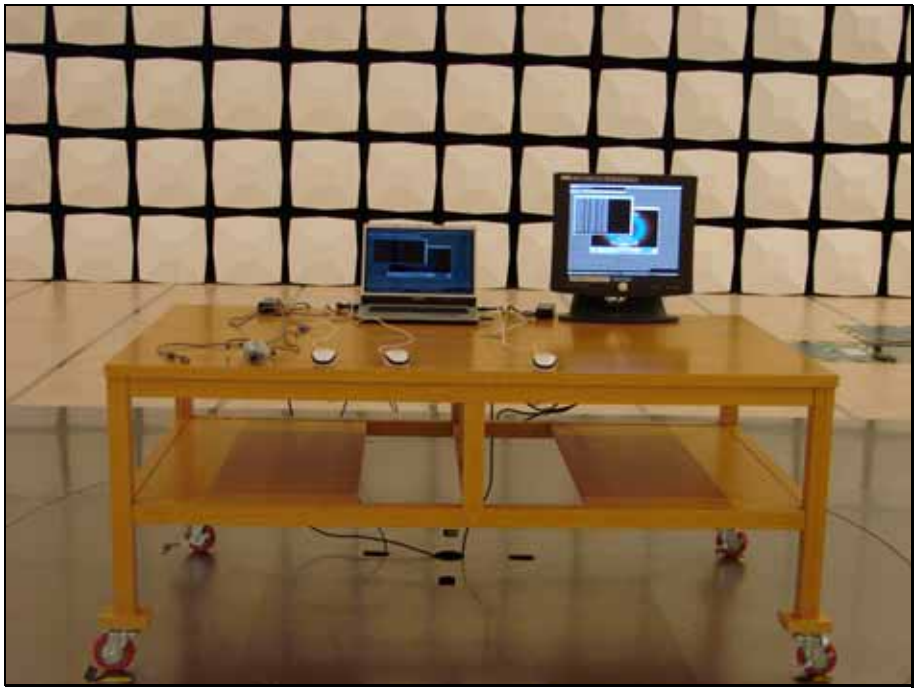
4. Appendix

4.1 Test photography

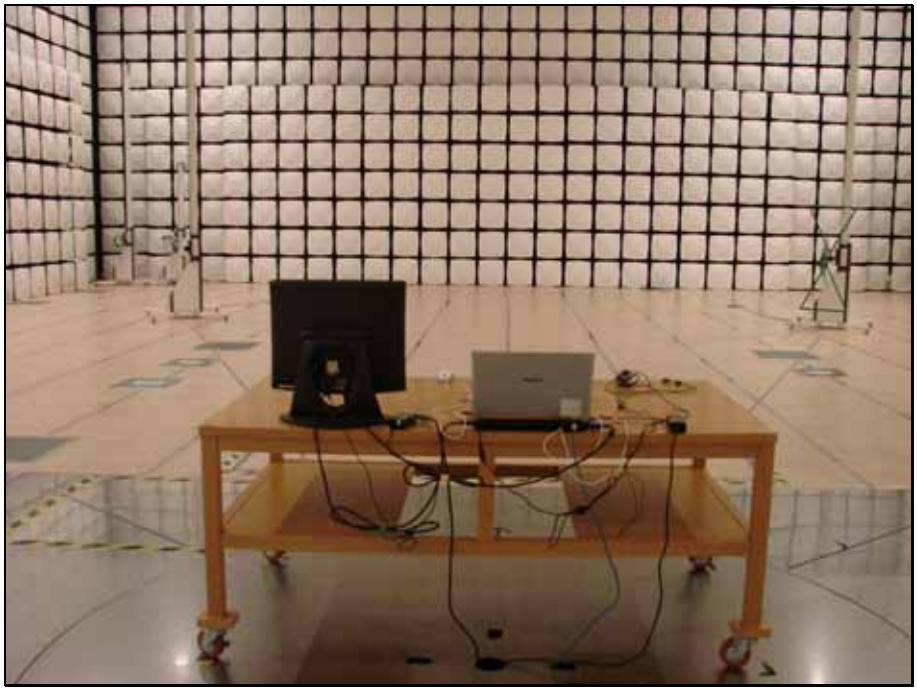


Picture 1. Conducted emission (Front)

Picture 2. Conducted emission (Rear)



Picture 3. Radiated emission (Front)



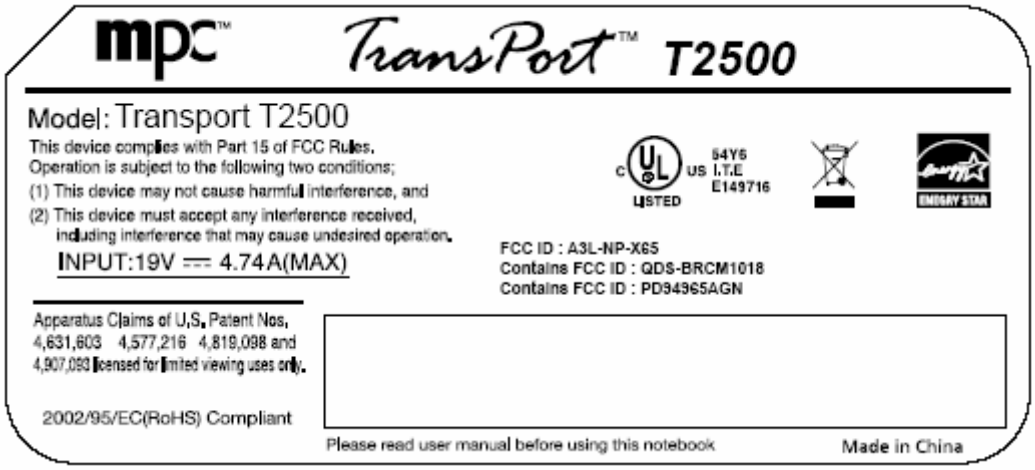
Picture 4. Radiated emission (Rear)

4.2 EUT photography

Picture 5. EUT (Top)

Picture 6. EUT (Rear)

Picture 7. Label Location



Picture 8. Label