EMC TEST REPORT

Project No.	LBE072528	**Revision No.**	03
Applicant	**Name of organization**	**Samsung Electronics Co., Ltd.**	
	Address	416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742 Korea	
	Date of application	2007.07.31	
EUT Equipment Under Test	**Type of device**	Class B personal computers and peripherals	
	Equipment authorization	☐ Declaration of Conformity ☒ Certification ☐ Verification	
	FCC ID	A3L-NP-X22 ☐ Not applicable	
	Kind of product	**Notebook Computer**	
	Model No.	**NP-X22**	
		Variant Model No.	None
	Manufacturer	Samsung Electronics Co.,Ltd. 416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742 Korea	
Applied Standards		FCC Part 15, Subpart B / ANSI C63.4-2003	
Issue date		2007.07.31	

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 :** No Cheon, Park
J. Y. H.	N. c. Park

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

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1. Summary of test results

1.1 Emission

The EUT has been tested according to the following specifications:

Applied	Test type	Applied standard	Result	Remarks
☒	Conducted Disturbance	FCC Part 15 Subpart B	Complied	Meets Class B Limit Minimum margin is 9.4 dB at 0.161 MHz
☒	Radiated Disturbance		Complied	Meets Class B Limit Minimum margin is 4.4 dB at 213.5 MHz

2. General Information

2.1 Test facility

The SEC EMC Laboratory is located on Samsung Electronics Co., Ltd. at 416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do, South 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 SEC EMC Laboratory is operated as testing laboratory in accordance with the requirements of ISO/IEC 17025:1995.

2.2 Accreditation and listing

Laboratory Qualifications		Remarks
	KOLAS(Korea Laboratory Accreditation Scheme)	Accredited : 124
	Radio Research Laboratory	Accredited : KR0004
	FCC(Federal Communications Commission)	Accredited : KR0004
	National Voluntary Laboratory Accreditation Program	Lab Code: 200623-0
	Norges Elektriske Materiellkontroll	Accredited : ELA 195
	VCCI (Voluntary Control Council for Interference by Information Technology Equipment)	C-2421,R-2224
	China Quality Certification Center	5-053, 5-054
	TUV Rhineland	H9354285
	GOST(GOSTSTANDART)	ROSTEST
	Elektrotechnicky Zkusebni Ustav	Reg. No.: 001
	IC(Industry Canada)	Assigned Code: 5871

3. Test Setup configuration

3.1 Test Peripherals

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
Notebook PC	NP-X22	-	Samsung	A3L-NP-X22
X-DOCK	AARD2NX25		Samsung	-
AC Adapter	AD-9019S	CNBA4400233AB Z0474B7773	DELTA	-
LCD Monitor	1702FP	KR08G15247602 55KD	DELL	Doc
AC Adapter	PSCV360104 A	C020381569B	Samsung	-
Printer	C6427B	MY02Q1F0JN	H/P	Doc
PS/2 mouse	SMOP5000W X-UAG	0606002823	ANYZEN	Doc
Serial mouse	M-M35	LZA71452614	Logitech	Doc
USB mouse	MS201U	69G1459	Monterey International Corp.	Doc
USB mouse	MS201U	69G1154	Monterey International Corp.	Doc
USB mouse	MS201U	69G1720	Monterey International Corp.	Doc
USB mouse	MS201U	69G1107	Monterey International Corp.	Doc
USB mouse	MS201U	69G0522	Monterey International Corp.	Doc
USB mouse	MS201U	69G0542	Monterey International Corp.	Doc
Headset	MH21	-	ATA	-
Headset	Axis-202	-	Labtec	-

3.2 EUT operating mode

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

Operating Mode 1	Normal Using (HDD Read & Write, LAN, TEL)

3.3 Details of Sampling

Customer selected, single unit.

3.4 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;

Connected cable	Length [m]	Shielded [Y/N]	Note
Power	1.8	Yes	-
Monitor (RGB)	1.8	Yes	From PC to Monitor
Monitor (DVI)	1.8	Yes	From PC to Monitor
USB	1.8	Yes	From PC to Mouse
PS/2	1.8	No	From PC to Mouse
Headset	1.6	No	From PC to Headset
LAN	1.8	No	From PC to LAN
TEL	1.8	Yes	From PC to TLE
Serial	1.5	Yes	From PC to Serial

3.5 EUT Description

The following features describe EUT represented by this report:

Item	Specification	Remarks
CPU	Intel Core 2 Duo Processor (2.00GHz) Cache 4MB, FSB 800MHz	-
Chipset	Intel 965PM + ICH8M	-
Main Memory	Total: 1GB Samsung, PC2-5300S(667MHz) 1GB*1	-
Graphic controller	External Gfx, ATI Mobility Radeon TM HD 2400 (M72-S), 128MB	-
LCD DISPLAY	Samsung, LTN141W1-L03, 14.1'WXGA, Glare, 1280*800	-
Inverter Board	**DELTA, DAC-09N019 AF, DC,8.5Vto20V, 1550Vrms,PWM**	-
HDD	**Fujitsu, MHW2080BH, 80G, 5400rpm**	-
Turbo Flash Module	**Intel Turbo Memory 1G Module, NVCPEMWR001G1ES**	-
ODD	**TSST, TS-L462D ATA device, DVD-Combo**	-
LAN	Marvell, 88E8055 , 10/100 Ethernet	-
Wireless LAN	Intel, WM3945ABG, 802.11abg, 54Mbps, Mini-card FCC ID : PD9WM3945ABG	-
Bluetooth	Broadcom, BCM92045NMD, USB 2.0 type, Bluetooth Ver 2.0 FCC ID : QDS-BRCM1018	-
Docking System	**X-Dock, AA-RD2NX25**	-
ADAPTER	**Delta, SADP-90FH , AD-9019S, 90W, 19Vdc, 3pin**	-
Battery	Samsung SDI[4Cell]	-
Input Devices	Keyboard, 19.05mm pitch, 2.6mmH travel length PS/2 Touchpad	-
Ports	1 LAN, 1 Modem, 3 USB, 1 VGA, 1 HDMI, DC IN, 1 MIC-IN, 1HP-OUT, Express card socket, 6 in 1 socket	-

3.6 Clock Frequencies

Kind of Clocks	Frequency[MHz]	Kind of Clocks	Frequency[MHz]
CPU Speed	2000	Host	166
DDR2	667	PCI	33
Pcie	100	Ref	14.318
Micom	10	RGB encoder	66
LAN	25	USB controller	48
AC97 DOT	12.288	Cardbus controller	24.576
RTC	32.768	-	-

3.7 Operating mode condition

The EUT exercise program used during radiated and conducted emissions testing was the Samsung Standardized Emission Test Program for Windows. During the certification test, the LCD panel was open and video 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 tested 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. A hard drive from the remote PC was mapped to the EUT and a data file was read and written over the network connection to provide continuous activity. The EUT was connected to a remote PC through the Ethernet 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

3.8 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.)

3.8.1 Emission

Test type		Measurement uncertainty (C.L. 95 %, k = 2)
Conducted disturbance	Mains Port	± 2.8 dB
Radiated disturbance	Horizontal	± 5.1 dB
	Vertical	± 5.09 dB

4. Results of individual test

4.1 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 mains ports of class A

Frequency range Limits MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60
Note 1: 1 μV is regarded as 0 dB. Note 2: If the average limit is met in the measurement with quasi-peak detector, the measurement with average detector at the same frequency is unnecessary. Note 3: The lower limit shall apply at the transition frequency.		

Limits for conducted disturbance at the mains ports of class B

Frequency range Limits MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
Note 1: 1 μV is regarded as 0 dB. Note 2: The limits shall decreases linearly with the logarithm of the frequency in the range 150 - 500 kHz. Note 3: If the average limit is met in the measurement with quasi-peak detector, the measurement with average detector is unnecessary. Note 4: The lower limit shall apply at the transition frequency.		

4.1.1 Test instrumentation

Test instrumentation used in the Conducted disturbance test was as follows:

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Test Software	EMC 32	R&S	Ver 5.20.2	N/A	N/A
Measuring receiver	ESCI	R&S	100368	2007-06-01	12
Artificial mains network	ENV216	R&S	100116	2006-09-01	12
Artificial mains network	ESH3-Z5	R&S	100261	2006-08-23	12

4.1.3 Test results

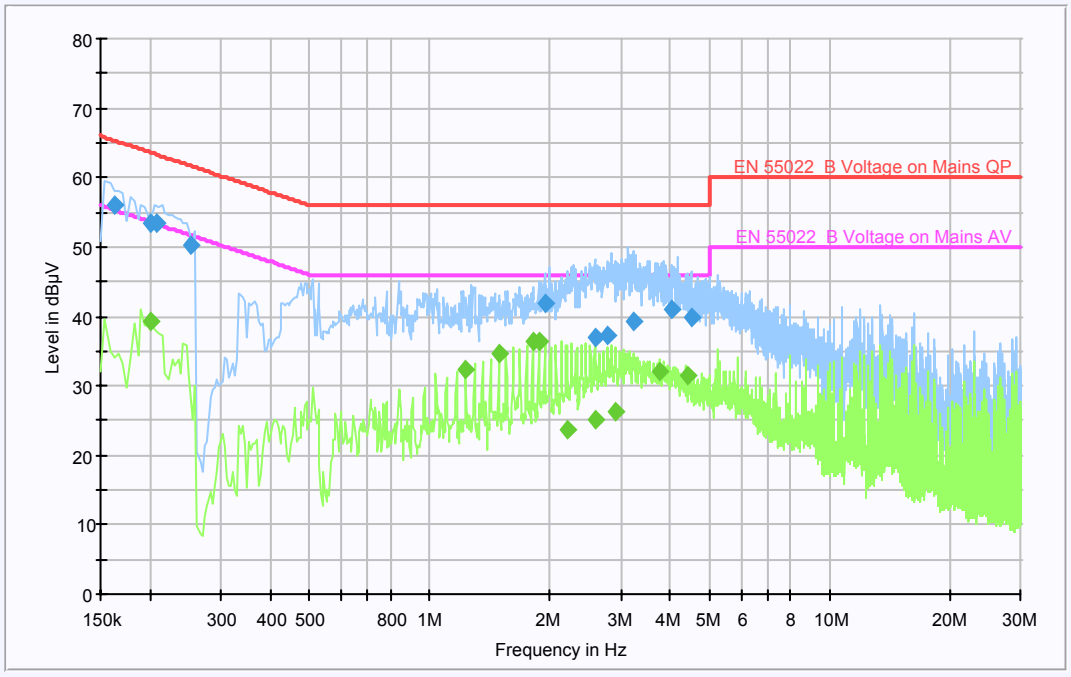
Operating condition	Normal Using			
Test date	2007-08-03	**Test engineer**	Young Hun, Cheong	
Climate condition	**Ambient temperature**	24.1 ℃	**Relative humidity**	54 %
	Atmospheric pressure	100.0 kPa		
Test place	Shielded room #1			
Note	* QP : Quasi-peak, AV: Average * Result = Level(QP or AV) + Transd (LISN Insertion loss + Cable loss) * Margin = Limit - Level			

Scan Setup: EN55022_B_ENV 2-Line-LISN fin [EMI conducted]

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

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

EN55022_B with ENV 2-Line-LISN



Final Measurement Detector 1

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.161 700	56.0	L1	9.6	9.4	65.4
0.199 700	53.5	L1	9.6	10.1	63.6
0.207 300	53.3	L1	9.6	10.0	63.3
0.253 100	50.3	L1	9.6	11.4	61.7
1.940 600	41.8	N	9.7	14.2	56.0
2.582 000	36.9	N	9.7	19.1	56.0
2.781 400	37.2	N	9.7	18.8	56.0
3.215 000	39.2	N	9.7	16.8	56.0
4.016 400	41.1	N	9.8	14.9	56.0
4.531 200	40.0	N	9.8	16.0	56.0

Final Measurement Detector 2

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.199 500	39.2	L1	9.6	14.4	53.6
1.226 600	32.4	L1	9.7	13.6	46.0
1.485 600	34.7	L1	9.7	11.3	46.0
1.808 800	36.3	N	9.7	9.7	46.0
1.875 000	36.4	L1	9.7	9.6	46.0
2.197 400	23.8	N	9.7	22.2	46.0
2.586 800	25.1	N	9.7	20.9	46.0
2.908 200	26.2	N	9.7	19.8	46.0
3.756 400	32.1	L1	9.8	13.9	46.0
4.413 000	31.6	L1	9.8	14.4	46.0

4.2 Radiated disturbance

Of those disturbances above (*L* - 20dB), 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.

Limits for radiated disturbance of ITE at a measuring distance of 10 m

Frequency range Limits MHz	Quasi-peak Limits dB dB(μV/m)	
	Class A	Class B
30 to 230	40	30
230 to 1000	47	37
Note 1: The lower limit shall apply at the transition frequency. Note 2: Additional provisions may be required for cases where interference occurs. Note 3: 1 μV/m is regarded as 0 dB.		

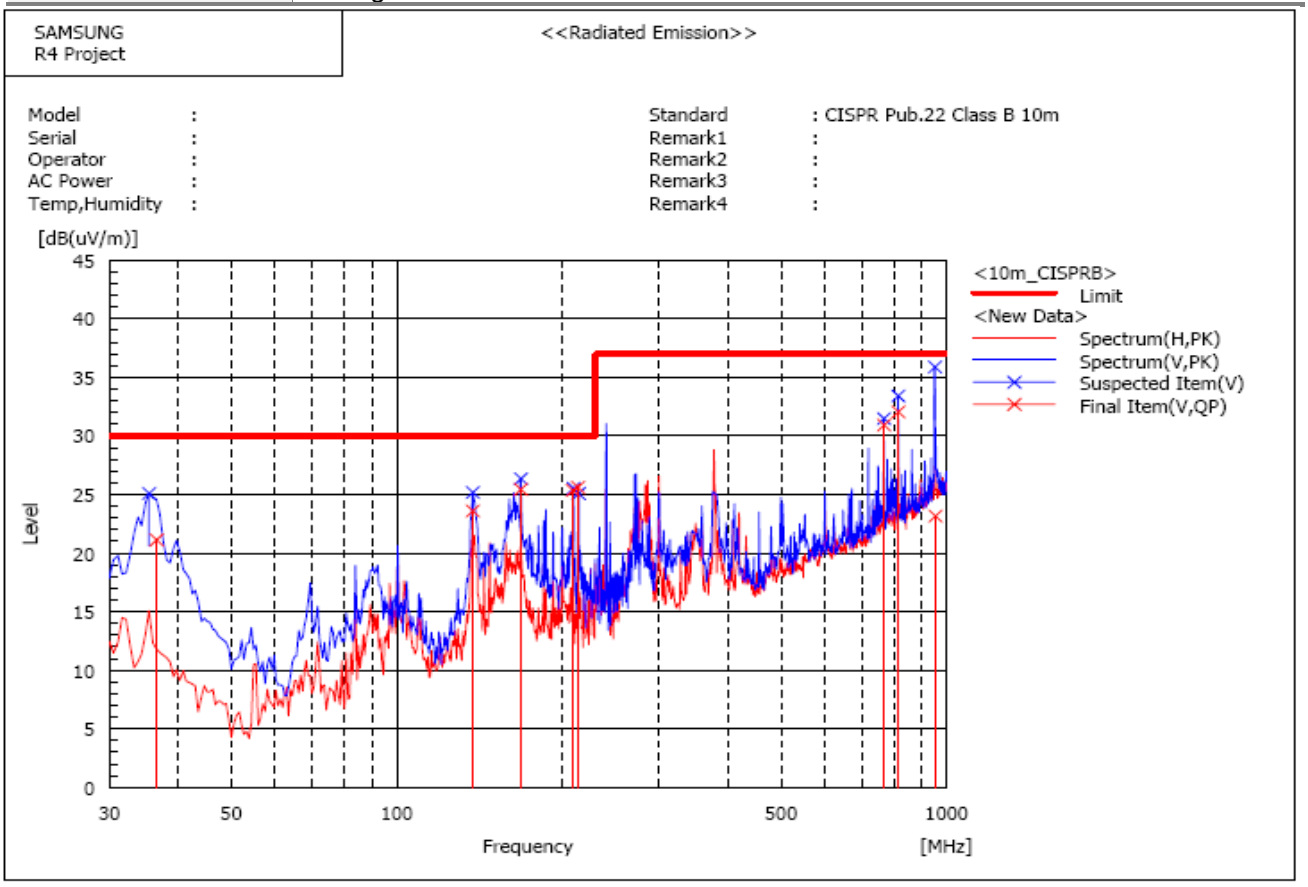
4.2.1 Test instrumentation

Test instrumentation used in the Radiated disturbance was as follows:

Test instrumentation	Model name	Manufacturer	Serial or Firmware (No./Ver.)	Calibration	
				Date	Interval (Month)
Bi-con Antenna	CBL6112D	SCHAFFNER	22602	2006-06-26	24
Bi-con Antenna	CBL6112D	SCHAFFNER	22601	2007-04-02	24
EMI Receiver	ESIB-26	R&S	100289	2007-03-22	12
EMI Receiver	ESIB-26	R&S	100287	2007-04-10	12
AMPLIFIER	310N	SONOMA	186467	2007-03-17	12
AMPLIFIER	310N	SONOMA	251673	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
Test software	EP5/RE	TOYO	VER 3.1.20	N/A	N/A
RF Selector	NS4900	TOYO	-	N/A	N/A
HORN ANTENNA	BBHA9120B	SCHWARZBECK	335	2007-01-08	24
HORN ANTENNA	BBHA9120C	SCHWARZBECK	9120C-352	2007-03-15	24

4.2.3 Test results (30 MHz ~ 1 GHz)

Operating condition	Normal Using			
Test date	2007-07-31	**Test engineer**	Young Hun, Cheong	
Climate condition	**Ambient temperature**	26.0 ℃	**Relative humidity**	46 %
	Atmospheric pressure	99.8 kPa		
Test place	10m Semi-Anechoic Chamber #1			
Note	* Receiving antenna mode : Horizontal, Vertical * Test distance : 10 m (RF Semi Anechoic Chamber) * Result = Reading + c.f (Antenna factor + Cable loss- Amp Gain) * Margin = Limit – Result			

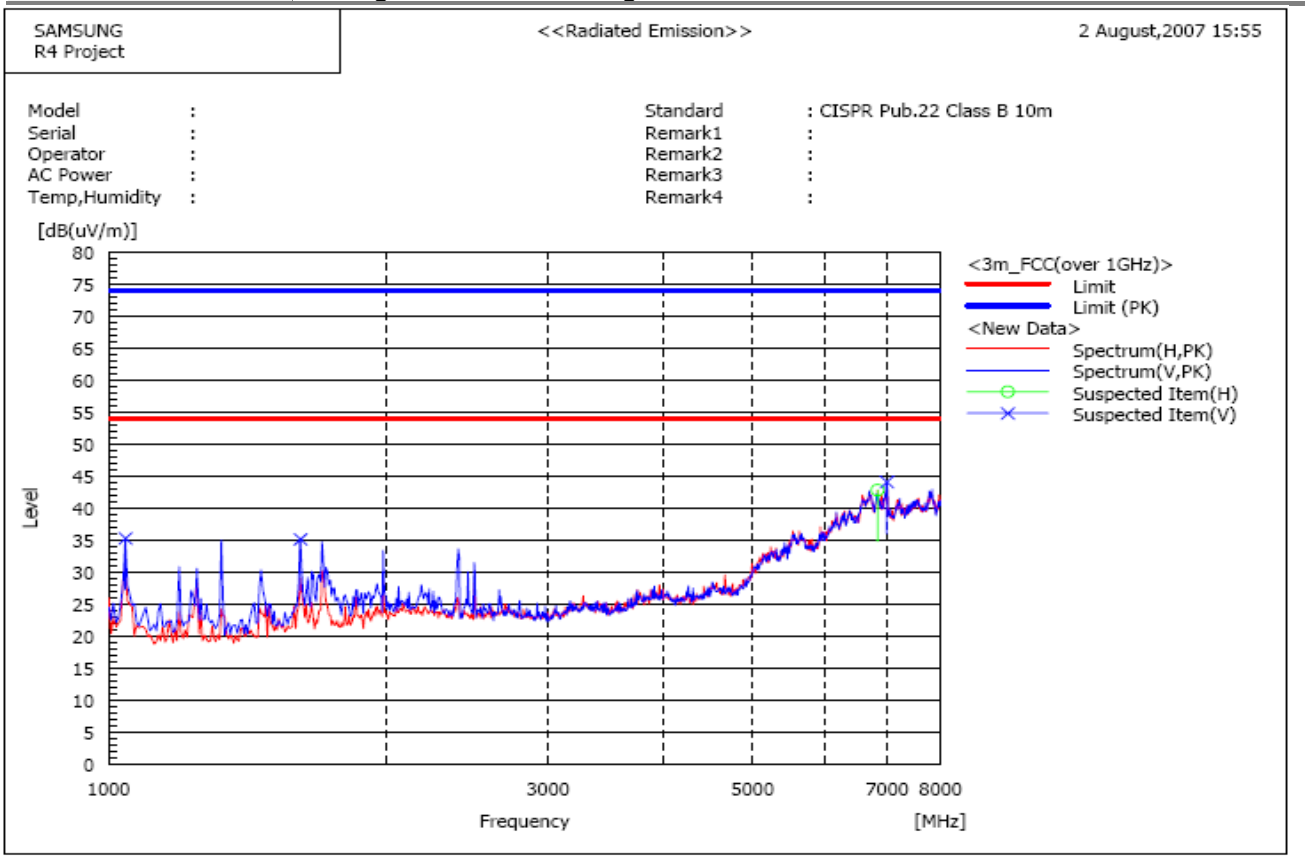


Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	System
1	36.501	V	37.8	-16.7	21.1	30.0	8.9	100.0	350.4	2
2	137.402	V	41.8	-18.2	23.6	30.0	6.4	100.0	260.9	2
3	168.022	V	45.0	-19.5	25.5	30.0	4.5	100.0	172.1	2
4	208.922	V	45.1	-19.7	25.4	30.0	4.6	100.0	167.2	2
5	213.549	V	45.1	-19.5	25.6	30.0	4.4	100.0	167.2	2
6	767.983	V	35.8	-4.9	30.9	37.0	6.1	200.0	354.3	2
7	815.987	V	36.4	-4.3	32.1	37.0	4.9	200.0	329.7	2
8	952.733	V	25.0	-1.8	23.2	37.0	13.8	191.0	274.1	2

4.2.4 Test results (1 GHz ~ 8 GHz)

Operating condition	Normal Using			
Test date	2007-08-02	**Test engineer**	Young Hun, Cheong	
Climate condition	**Ambient temperature**	26.0 ℃	**Relative humidity**	46 %
	Atmospheric pressure	99.8 kPa		
Test place	10m Semi-Anechoic Chamber #1			
Note	* Receiving antenna mode : Horizontal, Vertical * Test distance : 3 m (Semi Anechoic Chamber) * Result = Reading + c.f (Antenna factor + Cable loss- Amp Gain) * Margin = Limit – Reading			



Spectrum Selection

--- Horizontal Polarization ---

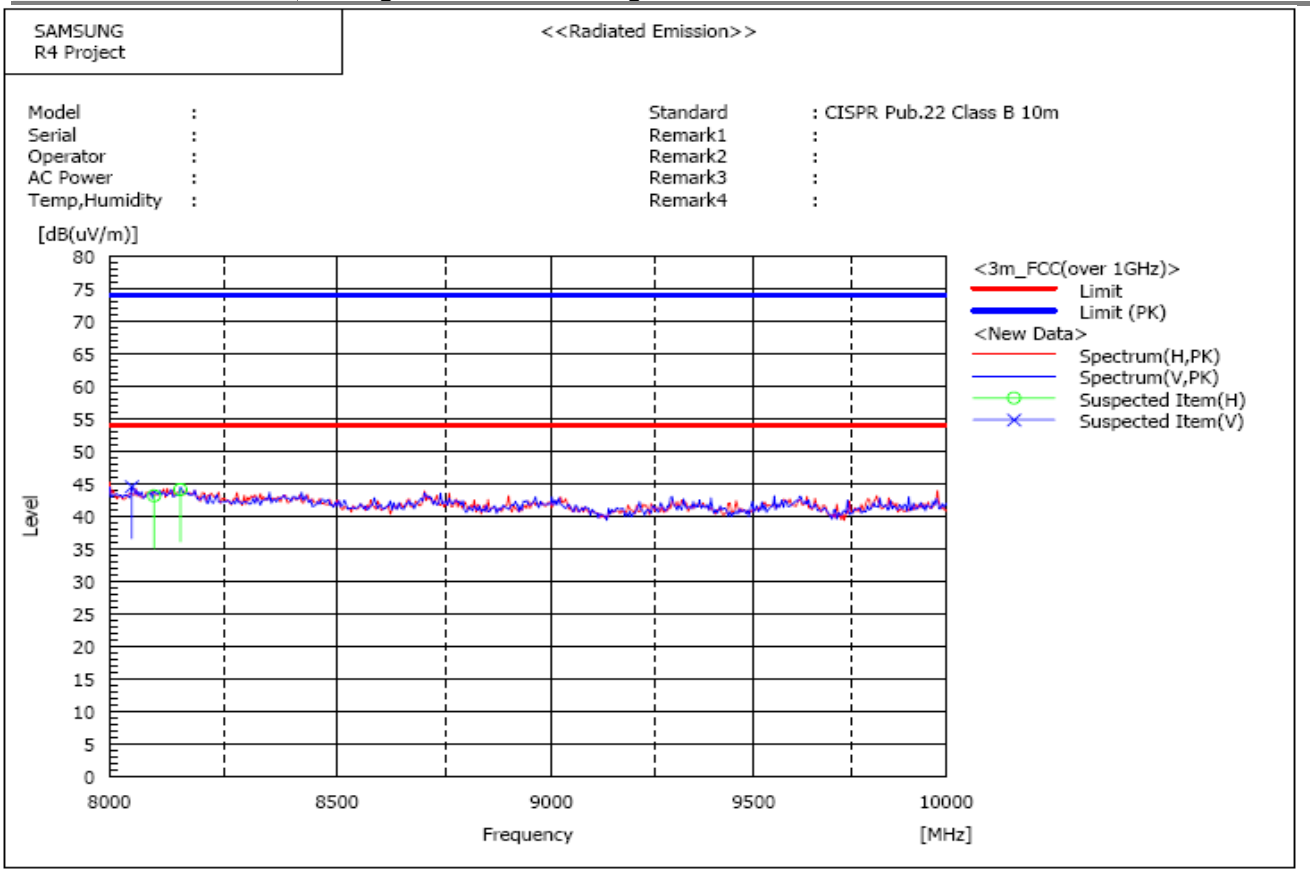
No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	6837.675	35.3	7.5	42.8	54.0	11.2	

--- Vertical Polarization ---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	6989.980	35.8	8.3	44.1	54.0	9.9	
2	1042.084	47.6	-12.3	35.3	54.0	18.7	
3	1613.227	44.9	-9.7	35.2	54.0	18.8	

4.2.5 Test results (8 GHz ~ 10 GHz)

Operating condition	Normal Using			
Test date	2007-08-02	**Test engineer**	Young Hun, Cheong	
Climate condition	**Ambient temperature**	26.0 ℃	**Relative humidity**	46 %
	Atmospheric pressure	99.8 kPa		
Test place	10m Semi-Anechoic Chamber #1			
Note	* Receiving antenna mode : Horizontal, Vertical * Test distance : 3 m (Semi Anechoic Chamber) * Result = Reading + c.f (Antenna factor + Cable loss- Amp Gain) * Margin = Limit – Reading			



Spectrum Selection

--- Horizontal Polarization ---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	8152.305	33.8	10.2	44.0	54.0	10.0	
2	8096.193	32.9	10.2	43.1	54.0	10.9	

--- Vertical Polarization ---

No.	Frequency [MHz]	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]	Remark
1	8048.096	34.3	10.2	44.5	54.0	9.5	