

EMI TEST REPORT

Samsung Electronics Co., Ltd.

416 Maetan 3-Dong, Yeongtong-Gu,
Suwon-Si, Gyeonggi-Do, 443-742 Korea
(Tel: 031 277 7752, Fax: 031 277 7753)

Project No. : LBE060772
Page (1)/(21)

**1. 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 : 2006.03.08

2. Purpose for the report : Approval for EMI

3. Kind of product : Notebook PC (Model name : NP-Q1)

4. Date of test : 2006.03.08

5. Applied standard : FCC Part 15:2003 Subpart B

6. Test result : PASS

The equipment under test has found to be compliant with the applied standards.
(Refer to the attached test result for more detail.)

Tested by

Name : Young Hun Cheong

Reviewed by

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.

2006. 03. 14

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

TEST RESULT

Test Report No. : LBE060772

Applicant / Address : Samsung Electronics Co., Ltd.
416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do
443-742 Korea

Manufacture / Address : Samsung Electronics
198, Fangzhou Road, Suzhou Industry Park, Suzhou, Jiangsu
Province, China

EUT : 1. Product name : Notebook PC
2. Model name : NP-Q1
3. FCC ID : **A3L-NP-Q1**
4. Brand name : Samsung
5. Variant model : None

Basic Standards : ANSI C63.4:2003

Test Result : **PASS**
The equipment under test has found to be compliant
with the applied standards

Test Lab. : CS Management Center, Samsung Electronics Co., Ltd.



Tested by : Young Hun Cheong

Reviewed by : No Cheon Park

Date of Issue : 2006. 03. 14

Table of contents

1. General information

- 1.1 Basic information related product
- 1.2 Detail information related product
- 1.3 Operating mode and condition
- 1.4 Equipment modifications
- 1.5 Test procedure
- 1.6 Test configuration
- 1.7 Applied standard
- 1.8 Test facility

2. Summary of test results

3. Description of individual tests

- 3.1 Conducted Emission
- 3.2 Radiated Emission

4. Appendix

- 4.1 Test photography
- 4.2 EUT photography

1. General information

1.1 Basic information related product

Applicant	Samsung Electronics Co., Ltd.
Model name	NP-Q1
Applicant address	416 Maetan 3-Dong, Yeongtong-Gu, Suwon-Si, Gyeonggi-Do 443-742 Korea
Contact person	Young Hun, Cheong
Kind of product	Notebook PC
Variant model	-
Manufacturer	Samsung Electronics 198, Fangzhou Road, Suzhou Industry Park, Suzhou, Jiangsu Province, China
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 Pentium-M Dothan Core ULV 1.3GHz Cache 2MB, FSB 400MHz	-
Chipset	Intel 915GMS + ICH6M, 400MHz FSB	-
Main Memory	Main memory: Samsung, DDR2 400MHz, 512MB(M470T6554BZ3) * 1	-
Graphic controller	Intel 915GMS IGD(max 200MHz, 1.05V), DVM T Max 128 MB	Internal Gfx
Inverter Board	DARFON, V216-001 GP, 21Vdc Max	
LCD DISPLAY	CPT CLAA070VA01, 7" WVGA 800*480	
HDD	HITACHI, PATA type 30GB(HTC426030G5CE00), 1.8".	
LAN	Marvell 88E8036, 10M/100M	
Wireless LAN	Atheros / Askey, AR5BXB61 KR, 802.11bg, 54Mbps, Mini-card MIC No.: ATH-AR5BXB61	
Bluetooth	Broadcom, BCM92045NMD, USB 2.0 type, Bluetooth Ver 2.0 MIC No.: R-LARN-05-0240	FCC ID: QDS- BRCM1018
DMB	SDM-1000, Personal Telecom, INC	Korea only
ADAPTER	Acbel, API1AD02, AD-6019, 60W, 19Vdc, 2pin	
Input Devices	Touch screen panel, Young Fast, 4-wire resistive type	
Battery	SDI / 3Cell(AA-PB0UC3B, 2600mA/cell) LI-ION.	
Ports	LAN(RJ45), 2 USB, 1 VGA, CF card socket, DC IN, 1HP-OUT	

Operating Frequency

1.3GHz(CPU Speed), 100MHz (Host Clock), 400MHz(DDR2), 33MHz(PCI Clock),
100MHz (PCIE Clock), 14.318MHz(Ref), 27MHz(LCD clock), 48MHz(USB),
24MHz(Audio bit clock), 25MHz(LAN)

1.3 Operating mode and 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, and writes to all serial , parallel ports and modem.

Music is played from the Memory 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 network connection to provide continuous activity. The EUT was connected to a remote PC through the Ethernet port with Unshielded Twisted Pair Ethernet cable and Modem port by using hyper terminal program. Ethernet testing was performed at 100 Mbps operation. Cable were attached to each of the available I/O Ports. Where applicable, peripherals were attached to the I/O cables.

- 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.

For the LCD panel the WXGA resolution was set to its maximum value of 800X480

The AC adapter was connected to notebook PC. 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 turn 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	1MHz	1MHz

1.6 Test configuration

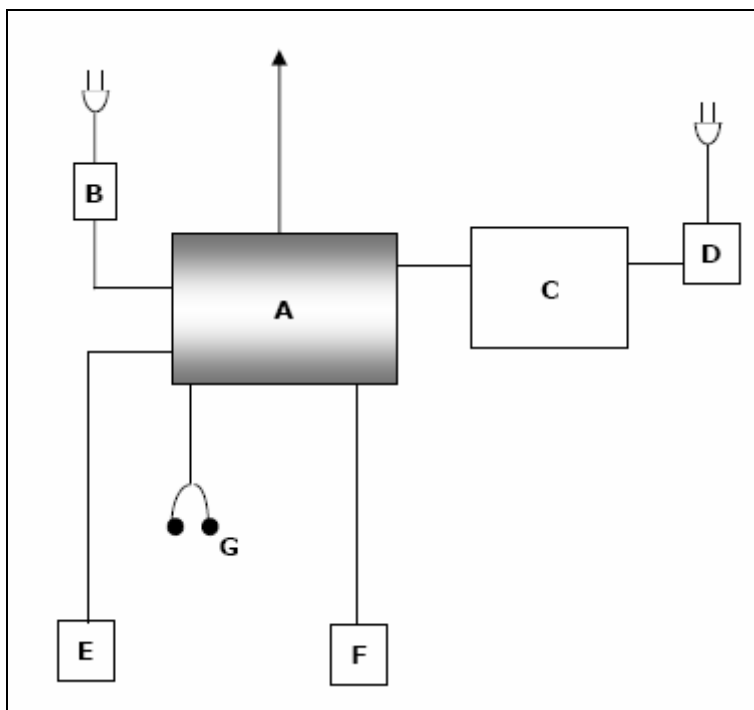
1.6.1 Used EUT and peripherals

Mark	Item	Model No.	Serial No.	Manufacturer	FCC ID
A	Notebook PC	NP-Q1	-	Samsung	A3L-NP-Q1
B	AC Adapter	AD-6019	CNBA4400162ABJ6F54C 2802	Acbel	-
C	LCD Monitor	GH17US	N352H4KW400591	Samsung	Doc
D	AC Adapter	PSCV360104A	C020381825	Samsung	-
E	USB Mouse	M-UV-69a	HCA50702145	Logitech	Doc
F	USB Mouse	M-UV-69a	HCA50702145	Logitech	Doc
G	Headset	Axis-202	-	Labtec	-

1.6.2 Used cable description

Mark	Connect Cable	Length [m]	Shielded [Y/N]	Remark
1	Power	1.8	No	EUT
2	LAN(RJ45)	3.5	No	-
3	USB	1.8	Yes	-
4	Headset	1.8	Yes	-
5	Monitor	1.6	Yes	-

1.6.3 Block Diagram



1.7 Applied Standards

Test standard	Basic standard
FCC Part 15:2003 Subpart 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	± 3.3 dB
Radiated emission (Bi-Log Antenna)	± 4.3 dB

2. Summary of test results

Result : PASS

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	ANSI C63.4 : 2003	Complied
3.2	Radiated Emission	ANSI C63.4 : 2003	Complied

3. Description of individual tests

3.1 Conducted emission

3.1.1 Test information

Test engineer	Young Hun, Cheong
Test date	Mar. 08, 2006
Climate condition	Ambient temperature : 21.0 °C, Relative humidity : 34 % Atmospheric pressure : 101.8 kPa
Test place	Shielded room #1

3.1.2 Test equipment

Equipment	Model name	Manufacturer	Serial no.	Calibration	
				Next date	Interval
Field strength meter	ESCI	R&S	100136	2006-04-17	12
LISN	ENV216	R&S	100116	2006-09-08	12
LISN	ENV216	R&S	100117	2006-08-18	12
Test Software	EMC 32	R&S	Ver 4.40.0	N/A	N/A

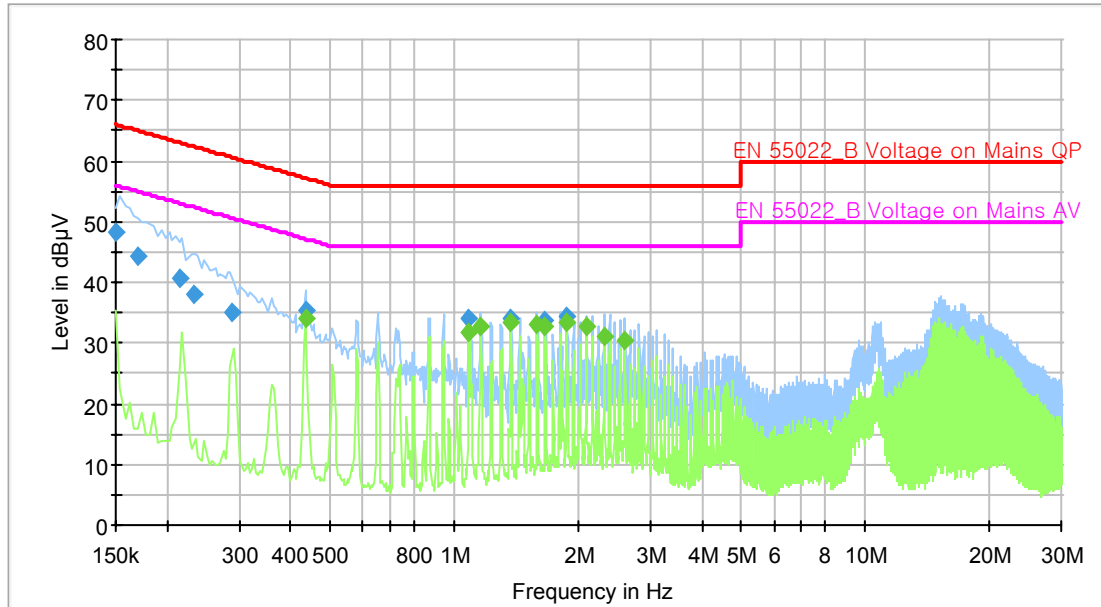
3.1.3 Test result : **Passed**

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

3.1.4 Test data and graph

The Initial step in collecting conducted data was to perform a peak and average scan over the measurement range using a receiver. The find data represents worst-case emissions.

3.1.4.1 Test graph



3.1.4.2 Quasi-peak results

Frequency (MHz)	Quasi Peak (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150 000	48.3	L1	9.6	17.7	66.0
0.170 500	44.2	N	9.6	20.7	64.9
0.214 500	40.8	L1	9.6	22.2	63.0
0.231 500	38.0	L1	9.6	24.4	62.4
0.288 500	35.2	N	9.6	25.4	60.6
0.433 500	35.4	N	9.6	21.8	57.2
1.084 500	34.0	L1	9.6	22.0	56.0
1.375 500	34.1	L1	9.6	21.9	56.0
1.665 500	33.8	L1	9.6	22.2	56.0
1.881 500	34.3	L1	9.6	21.7	56.0

3.1.4.3 Average results

Frequency (MHz)	Average (dBμV)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.434 500	34.1	N	9.6	13.1	47.2
1.085 500	31.9	N	9.6	14.1	46.0
1.157 500	32.6	L1	9.6	13.4	46.0
1.374 500	33.4	N	9.6	12.6	46.0
1.591 500	33.1	N	9.6	12.9	46.0
1.664 500	32.6	N	9.6	13.4	46.0
1.881 500	33.2	N	9.6	12.8	46.0
2.098 500	32.7	N	9.6	13.3	46.0
2.315 500	31.1	N	9.6	14.9	46.0
2.605 500	30.4	N	9.6	15.6	46.0

* 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	Young Hun, Cheong
Test date	Mar. 08, 2006
Climate condition	Ambient temperature : 23.2 °C, Relative humidity : 33 % Atmospheric pressure : 101.5 kPa
Test place	10m Semi Anechoic Chamber

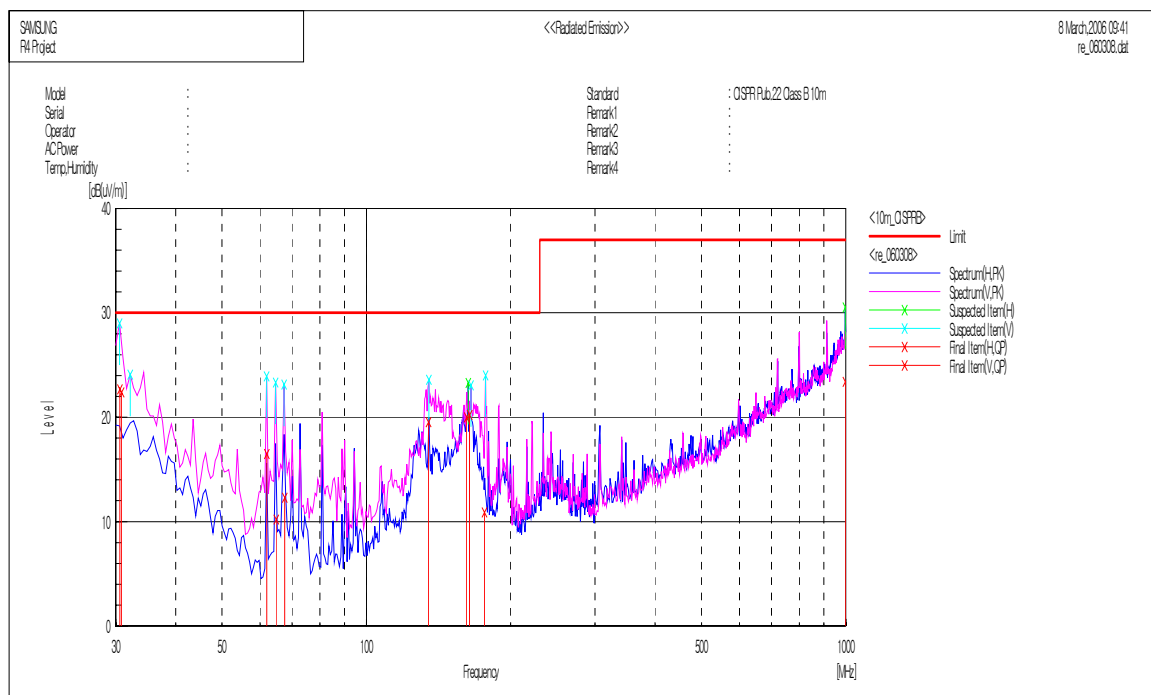
3.2.2 Test equipment

Equipment	Model name	Manufacturer	Serial no.	Calibration	
				Next date	Interval
Bi-con Antenna	CBL6141A	SCHAFFNER	4266	2006-05-24	12
Bi-con Antenna	CBL6141A	SCHAFFNER	4268	2006-05-24	12
EMI Receiver	ESI26	R&S	100287	2007-03-05	12
AMPLIFIER	310N	SONOMA	251677	2007-03-05	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 : **Passed**

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

3.2.4 Test data



Final Result

No.	Frequency [MHz]	(P)	S.C	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	Remark
1	30.605	V	S	29.6	-6.9	22.7	30.0	7.3	100.0	287.7	1	
2	30.852	V	S	29.4	-7.0	22.4	30.0	7.6	105.0	295.7	2	
3	61.986	V	S	38.1	-21.6	16.5	30.0	13.5	191.0	237.8	2	
4	64.859	V	S	32.4	-22.2	10.2	30.0	19.8	101.0	233.1	2	
5	67.554	V	S	34.9	-22.6	12.3	30.0	17.7	305.0	281.1	2	
6	134.794	V	S	37.2	-17.7	19.5	30.0	10.5	201.0	319.2	1	
7	161.832	H	S	38.2	-18.2	20.0	30.0	10.0	399.0	262.5	1	
8	164.234	V	S	38.3	-18.1	20.2	30.0	9.8	105.0	290.0	2	
9	176.360	V	S	30.2	-19.3	10.9	30.0	19.1	290.0	315.1	1	
10	997.300	H	S	22.5	0.9	23.4	37.0	13.6	394.0	225.0	1	

* QP : Quasi-peak, AV: Average

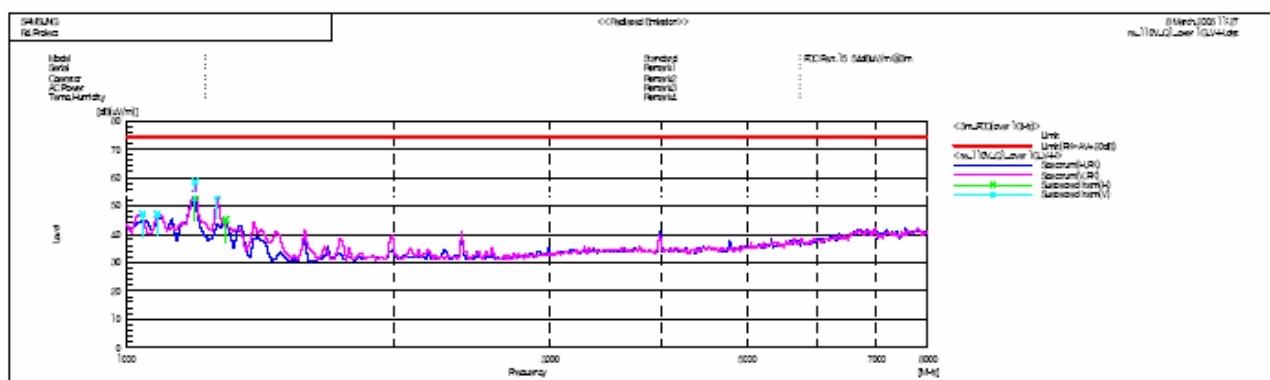
* Level (QuasiPeak or Average)

= Meter Reading(QP or AV) + Corr. (Antenna facor + Cable loss – Amp.gain)

* Margin = Limit – Result

2. Test Data (1GHz ~ 8GHz)

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



Spectrum Selection

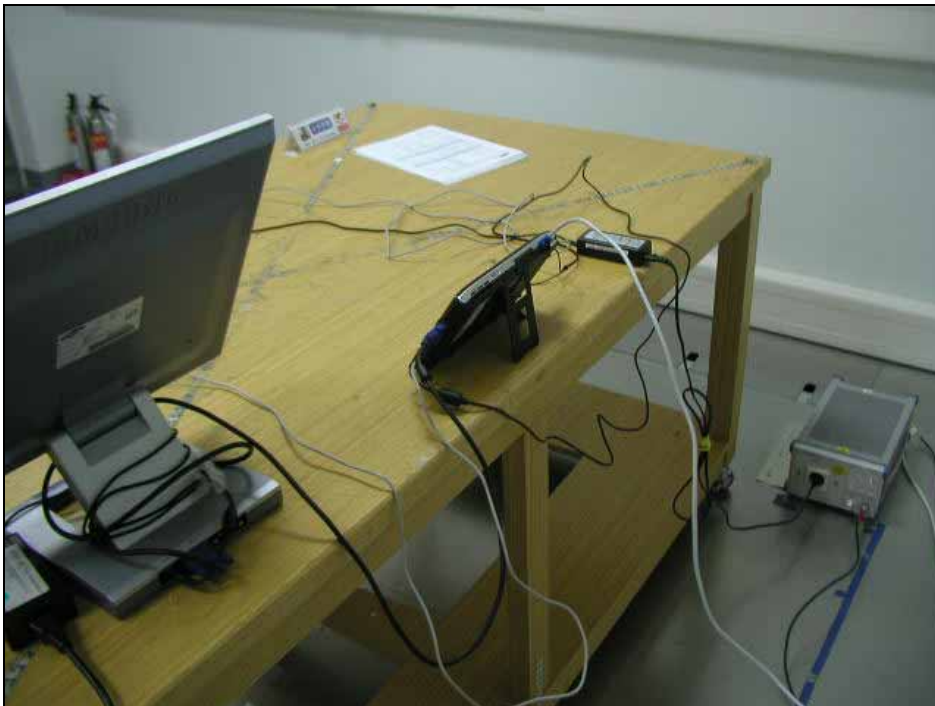
No.	Frequency (P)	Reading	c.f	Result	Limit	Margin	Height	Angle	Remark
	[MHz]	[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]	
1	1042.084	V	69.6	-12.8	47.2	74.0	26.8	200.0	282.8
2	1084.168	V	69.9	-12.8	47.8	74.0	26.7	100.0	42.1
3	1188.898	V	71.2	-12.5	68.7	74.0	15.8	100.0	283.4
4	1188.898	H	65.1	-12.5	62.6	74.0	21.4	200.0	197.8
5	1268.688	V	68.0	-12.4	63.6	74.0	20.4	100.0	283.4
6	1294.688	H	67.8	-12.4	45.2	74.0	28.8	100.0	282.8

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



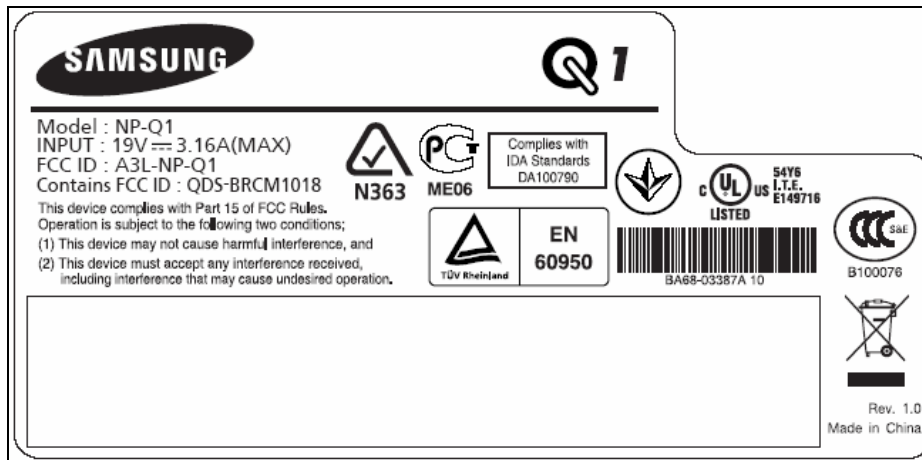
Picture 5. EUT (Top)



Picture 6. EUT (Bottom)



Picture 7. Label Location



Picture 8. Label