

EMI TEST REPORT

Test report No. : EMC- FCC- 0275

Type of equipment : External HDD Storage

Model No. : ES-H20

FCC ID. : A3L05SPUH

Applicant : SAMSUNG ELECTRONICS CO., LTD.

Test standards : FCC part 15 subpart B, Class B

Test Procedure and Items :

- AC Power Line Conducted Emissions Measurement: ANSI C63.4-1992
- Radiated Emissions Measurement : ANSI C63.4-1992


Test result : **Complied**

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.

The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: 2005. 05. 11

Issued date: 2005 .05. 17

Tested by : 

PARK, SEUNG SOO

Approved by: 

YOO, SAN-SOO

EMC Compliance Ltd.

82-1, JEIL-RI, YANGJI-MYUN, YONGIN-CITY, KYUNGGI-DO, KOREA
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1. Client information

Applicant: SAMSUNG ELECTRONICS CO., LTD.
Address: 416, Maetan-3Dong, Yeongtong-Gu, Suwon City,
Kyungki-Do, Korea
Telephone number: 82-31-200-5922
Facsimile number: 82-31-200-5938

Manufacture: SAMSUNG ELECTRONICS CO., LTD.
Address: 416, Maetan-3Dong, Yeongtong-Gu, Suwon City,
Kyungki-Do, Korea
Telephone number: 82-31-200-5922
Facsimile number: 82-31-200-5938

2. Laboratory information

Address

EMC compliance Ltd.

82-1, JEIL-RI, YANGJI-MYUN, YONGIN-CITY, KYUNGGI-DO, KOREA

Telephone Number : 82 31 336 9919

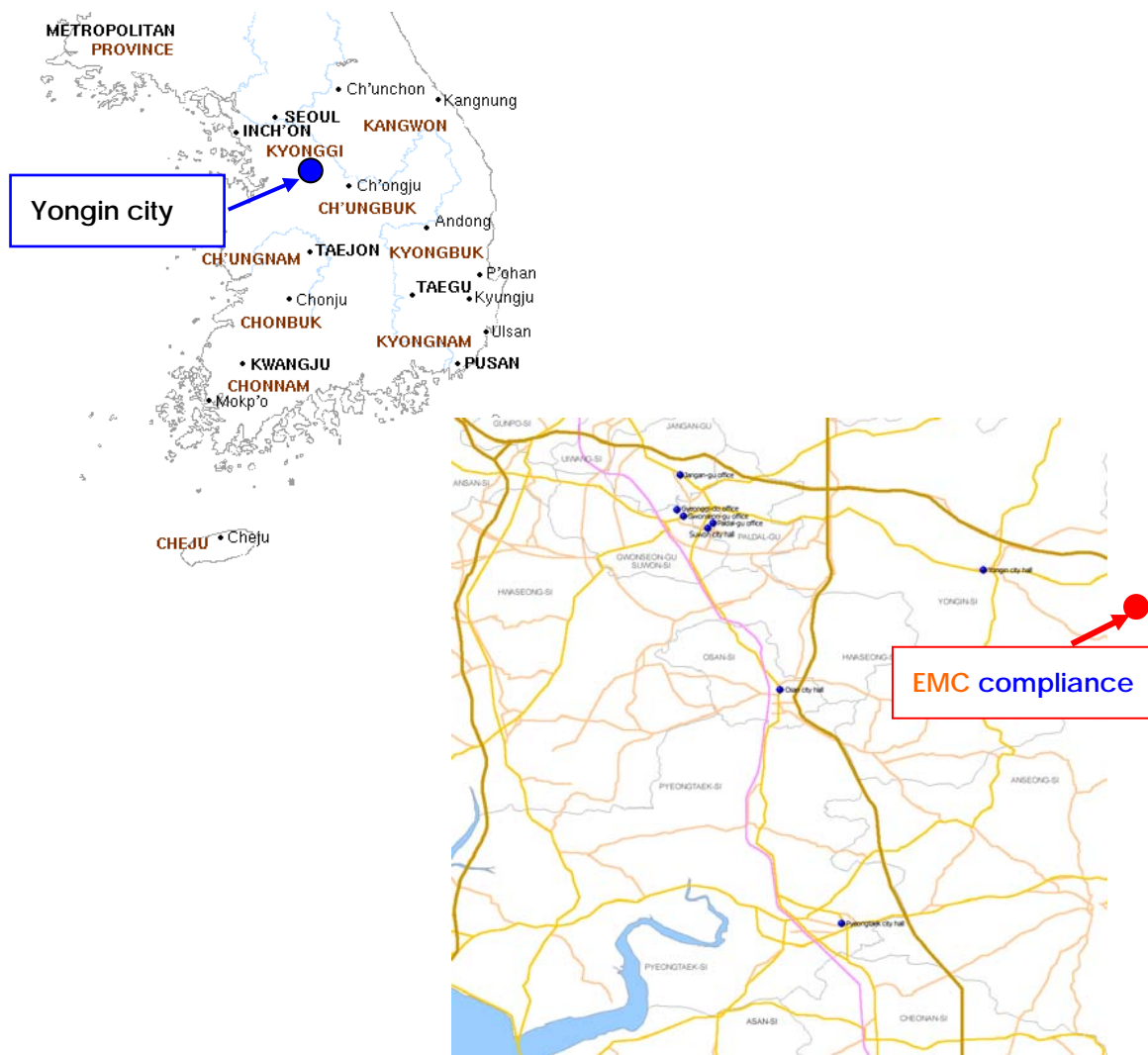
Facsimile Number : 82 31 336 4767

FCC Filing No. : 793334

VCCI Registration No. : C-1713, R-1606

KOLAS NO.: 231

SITE MAP



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3. Test system configuration

3.1 Operation Environment

	Temperature	Humidity	Pressure
OATS :	13 °C	45 %	1001 hPa
Shielded room :	22 °C	48 %	1003 hPa

Test site

These testing were performed following locations;

Shielded room: Conducted emission

OATS (10m) : Radiated emission

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMI. The factors contributing to uncertainties are test receiver, Cable Loss, antenna factor calibration, Antenna directivity, antenna factor Variation with height, antenna phase center variation, antenna Frequency interpolation, measurement distance variation, Site imperfection, mismatching, and system repeatability.

Based on NIS 80, 81, the measurement uncertainty level with a 95% confidence level was applied.

3.3 Sample calculation

Conducted emission

The field strength is calculated by adding the LISN factor, cable loss to the measured reading.

The sample calculation is as follows :

$$FS = MR + LF + CL$$

MR = Meter Reading

LF = LISN Factor

CL = Cable Loss

If MR is 30dB, LISN Factor 1dB, CL 1dB

The result (MR) is

$$30 + 1 + 1 = 32\text{dBuV}$$

Radiated emission

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.

The sample calculation is as follows :

$$FS = MR + AF + CL + AT - AG$$

MR = Meter Reading

AF = Antenna Factor

CL = Cable Loss

AP = Antenna Pad

AG=Amplifier Gain

If MR is 30dB, AF 12dB, CL 5dB, AP 10dB, AG 35dB

The result (MR) is

$$30 + 12 + 5 + 10 - 35 = 22\text{dBuV/m}$$

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4. Description of E.U.T.

4.1 Product description

Applicant :	Samsung Electronics Co., Ltd.
Address:	416, Maetan 3-dong, Youngtong-gu, Suwon city, Kyunggi-do, Korea
Manufacturer:	Samsung Electronics Co., Ltd.
Address:	416, Maetan 3-dong, Youngtong-gu, Suwon city, Kyunggi-do, Korea
Type of equipment:	External HDD Storage
Basic Model:	ES-H20
Serial number:	N/A
Rating:	Adaptor input: 100-240Vac, 50/60Hz, 150mA Output: DC 4.8V, 1A

4.2 Peripherals

Description	Model / Part #	Serial number	Manufacturer
PC	DIMENSION4700	6FZRD1S	DELL
MONITOR	E173FPB	CN-OC5385- 46633-539-OTYL	DELL
PRINTER	EPSON STYLUS C60	DR5K014977	EPSON
KEYBOARD	SEM-DT35	51024371	SAMSUNG
MOUSE	OK-720	N/A	A4Tech
MOUSE	MF-48A	HCA20918641	samsung
HEADSET	C-322	N/A	Microsoft

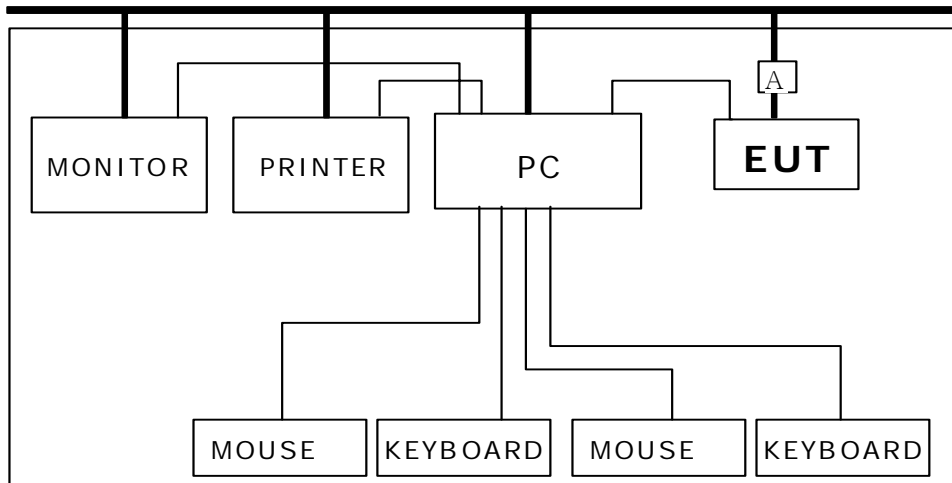
4.3 Operating conditions

-File Up/Down Mode.

4.4 Used cables

Start		END		Cable Spec.	
Name	I/O Port	Name	I/O Port	Length	Shield
EUT	USB	PC	USB	1.2	Shield

4.5 EUT test configuration



5. Summary of test results

5.1 Modification to the E.U.T.

None

5.2 Standards & results

FCC Part 15 Subpart B (Class B)

ANSI C63.4 – 1992

Test items	Test methods	Result
Conducted emission	ANSI C63.4-1992	Pass
Radiated emission	ANSI C63.4-1992	Pass

6. Test results

6.1 Conducted Emission

6.1.1 Measurement procedure

Mains

The measurements were performed in a shielded room.

EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane.

The rear of table was located 0.4 m to the vertical conducted plane.

Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source.

Both lines of power cord, hot and neutral, were measured.

6.1.2 Used equipments

Equipment	Model	Serial No.	Makers	Next Cal. Date	Used
Test receiver	ESHS10	843276/003	R&S	05.12.27	<input checked="" type="checkbox"/>
L.I.S.N.	ESH3-Z5	100267	R&S	05.06.14	<input checked="" type="checkbox"/>
	L3-32A	0120J20305	PMM	06.05.03	<input checked="" type="checkbox"/>
Test site	Shield room	-	-	-	<input checked="" type="checkbox"/>

6.1.3 Measurement uncertainty

Conducted emission measurement : (k=2, 95%)

9kHz-150 kHz : ±3.50

150kHz-300 MHz : ±3.05

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6.1.4 Test data

Frequency [MHz]	Correction Factor		Line	Quasi-peak			Average		
	LISN	Cable		Limit	Reading	Result	Limit	Reading	Result
				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.201	0.03	0.2	N	63.57	31.57	31.80	53.57	20.99	21.22
0.210	0.03	0.2	H	63.21	49.86	50.09	53.21	43.00	43.23
0.309	0.09	0.2	N	60.00	34.78	35.07	50.00	30.13	30.42
0.315	0.09	0.2	N	59.84	43.03	43.32	49.84	38.17	38.46
0.420	0.10	0.2	N	57.45	41.64	41.94	47.45	39.63	39.93
0.423	0.08	0.2	H	57.39	36.33	36.61	47.39	31.11	31.39
0.525	0.10	0.3	N	56.00	41.22	41.62	46.00	39.52	39.92
1.053	0.12	0.4	N	56.00	40.84	41.36	46.00	40.22	40.74
1.158	0.13	0.4	N	56.00	40.75	41.28	46.00	39.97	40.50
1.788	0.14	0.4	N	56.00	39.58	40.12	46.00	38.99	39.53
1.899	0.13	0.4	H	56.00	41.14	41.67	46.00	40.21	40.74
2.004	0.13	0.4	H	56.00	41.41	41.94	46.00	39.76	40.29
5.050	0.18	0.4	N	60.00	37.62	38.20	50.00	32.53	33.11
5.580	0.20	0.5	N	60.00	23.32	24.02	50.00	16.73	17.43
6.420	0.20	0.5	N	60.00	27.21	27.91	50.00	19.03	19.73
6.840	0.22	0.5	N	60.00	27.60	28.32	50.00	18.98	19.70
9.680	0.40	0.3	N	60.00	23.85	24.55	50.00	15.58	16.28
9.890	0.40	0.3	N	60.00	25.65	26.35	50.00	18.01	18.71

- Note. QP = Quasi-Peak, AV = Average / LINE(N) : NEUTRAL, LINE(H) : HOT
- Loss = LISN Loss + Cable Loss
- Measurement time : 1 s

6.1.5 Result

Complied

6.2 Radiated Emission

6.2.1 Measurement procedure

A pretest was performed at 3 m distance in a mini chamber for searching correct frequency.

The final test was done at a 10 m open area test site with a quasi-peak detector.

EUT was placed on a non-metallic table height of 0.8 m above the reference ground plane.

They were folded back and forth forming a bundle 0.3 m to 0.4 m long and were hanged at a 0.4 m height to the ground plane.

Cables connected to EUT were fixed to cause maximum emission.

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 to obtain the maximum signal strength.

6.2.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next cal. date	Used
Test receiver	ESVD	827864/006	R&S	06.05.17	<input checked="" type="checkbox"/>
TRILOG Broadband Antenna	VULB 9160	9160-3149	SCHWARZBECK	06.09.29	<input checked="" type="checkbox"/>
Antenna Mast	A109	N/A	DEAIL	-	<input checked="" type="checkbox"/>
Turn Table	TS14	N/A	DEAIL	-	<input checked="" type="checkbox"/>
10m OATS	-	-	EMC Compliance	-	<input checked="" type="checkbox"/>

6.2.3 Measurement uncertainty

Radiated Emission measurement : (k=2, 95%)

30-300 MHz ; 3 m: ± 3.56 , 10 m: ± 3.50

300-1000 MHz ; 3 m: ± 4.47 , 10 m: ± 2.64

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6.2.4 Test data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	angle	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
					Antenna	Cable			
32.80	7.5	V	1.4	95	11.53	0.84	30.0	19.87	10.13
72.50	8.2	V	1.0	189	9.81	1.30	30.0	19.31	10.69
144.00	5.1	V	1.0	71	12.85	2.04	30.0	19.99	10.01
166.40	9.4	V	1.1	115	12.82	2.23	30.0	24.45	5.55
192.00	8.0	V	2.2	204	10.32	2.36	30.0	20.68	9.32
200.10	4.9	H	4.0	28	9.80	2.40	30.0	17.10	12.90
284.60	15.5	H	4.0	61	12.72	3.04	37.0	31.26	5.74
291.90	16.3	V	2.7	360	12.87	3.11	37.0	32.28	4.72
720.00	5.1	H	3.6	333	20.99	6.10	37.0	32.19	4.81
772.10	4.7	H	2.5	172	21.92	6.56	37.0	33.18	3.82
903.20	0.6	V	1.0	230	23.21	7.21	37.0	31.02	5.98
960.10	0.4	H	2.5	184	24.02	7.50	37.0	31.92	5.08

* Receiving Antenna Mode : *Horizontal, Vertical*

* 10 m OATS

* Note : Reading = Test Receiver meter,

P = Polarization → POL H = Horizontal, POL V = Vertical

* Result = Field Strength (Antenna factor + Cable factor + Reading)

6.2.5 Result

Complied

7. Test Graph

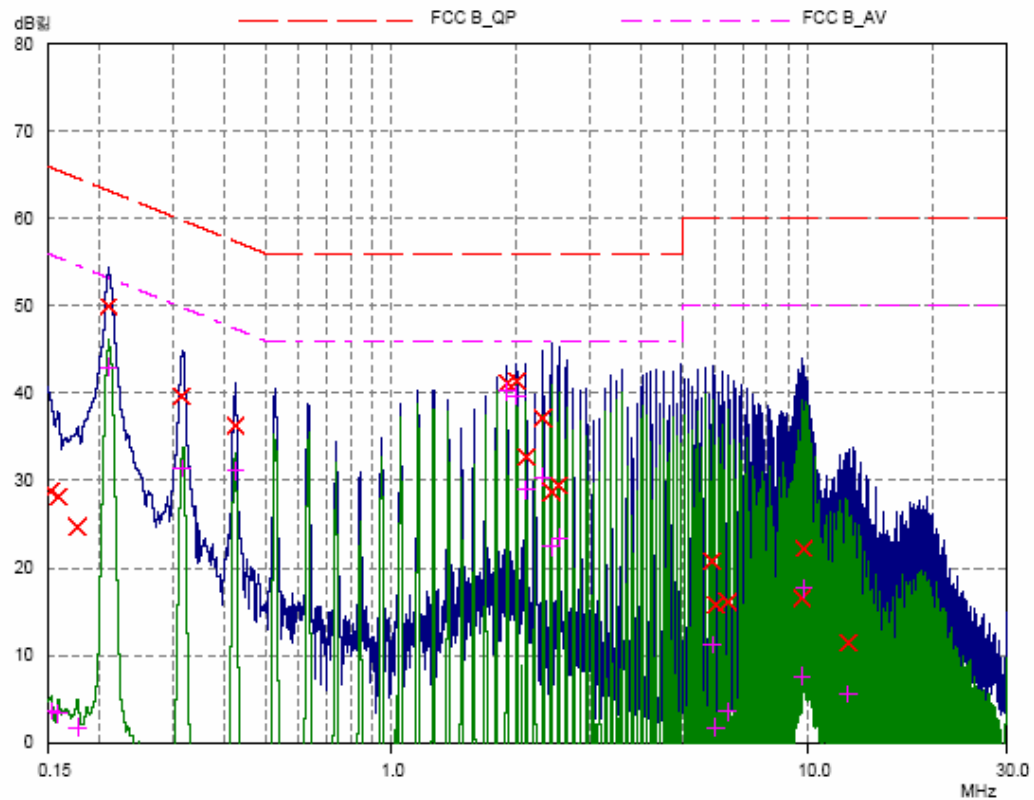
Conducted Emission test graph

EUT: ES-H20
 Manuf:
 Op Cond: H
 Operator:
 Test Spec: FCC Class B Conducted Emission
 Comment:

Result File: 505131h.dat : ES-H20

Scan Settings (2 Ranges)			Receiver Settings						
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	3MHz	3kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB	
3MHz	30MHz	10kHz	10kHz	PK+AV	5msec	Auto	OFF	60dB	

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Peaks: 8
 Acc Margin: 25 dB



EUT: ES-H20
 Manuf:
 Op Cond: N
 Operator:
 Test Spec: FCC Class B Conducted Emission
 Comment:

Result File: 505131n.dat : ES-H20

Scan Settings (2 Ranges)

Frequencies			Receiver Settings						
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	3MHz	3kHz	10kHz	PK+AV	10msec	Auto	OFF	80dB	
3MHz	30MHz	10kHz	10kHz	PK+AV	5msec	Auto	OFF	80dB	

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Peaks: 8
 Acc Margin: 25 dB

