# EMI TEST REPORT

**Test report no.** : ERI-FCC-0090

**Type of equipment :** CD-RW / DVD Drive

**Model no.** : SM-316

**FCC ID** : A3LSM316

**Applicant.** : SAMSUNG ELECTRONICS Co., Ltd.

**Test standards** : FCC Part15 Subpart B (Class B)

**Test result : Complied**

This equipment has been tested for FCC Part 15 standard.
The results in this report apply only to the sample tested.
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**Date of test: 2002. 1. 2** **Issued date: 2002. 1. 5**

**Tested by :** YOUNG-SIK, KIM

**approved by:** MIN-SEOK, CHUNG

**This laboratory is registered by KOLAS, KOREA.**

**This test report have been performed in accordance with Its terms of registration.**

**80, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA**
**TEL: 82 31 336 1186 FAX : 82 31 336 1184 homepage : www.esak.or.kr**

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# Contents




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## 6. Photographs

Radiated Emission Test
Conducted Emission test

# 1. Client information

**Applicant** : SAMSUNG ELECTRONICS Co., Ltd.

**Address** : 416 Maetan 3 Dong, Paldal-Ku, Suwon City,
Kyungki Do, Korea, 442-742

**Telephone Number** : 82-31-200-4252
**Facsimile Number** : 82-31-200-7890

**Manufacturer** : SAMSUNG ELECTRONICS Co., Ltd.

**Address** : 416 Maetan 3 Dong, Paldal-Ku, Suwon City,
Kyungki Do, Korea, 442-742

**Telephone Number** : 82-31-200-4252
**Facsimile Number** : 82-31-200-7890


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# 2. Laboratory information

## Address

The open area test site and EMC facilities are used for these testing.
This facility was accredited by KOLAS, EK of Korea, MIC, FCC.

EMC RESEARCH INSTITUTE .
80, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA

Telephone Number : 82- 31- 336- 1186
Facsimile Number : 82- 31- 336 -1184

KOLAS No. : 111
EK : J
MIC : KR0030
FCC Filing No. : 96753


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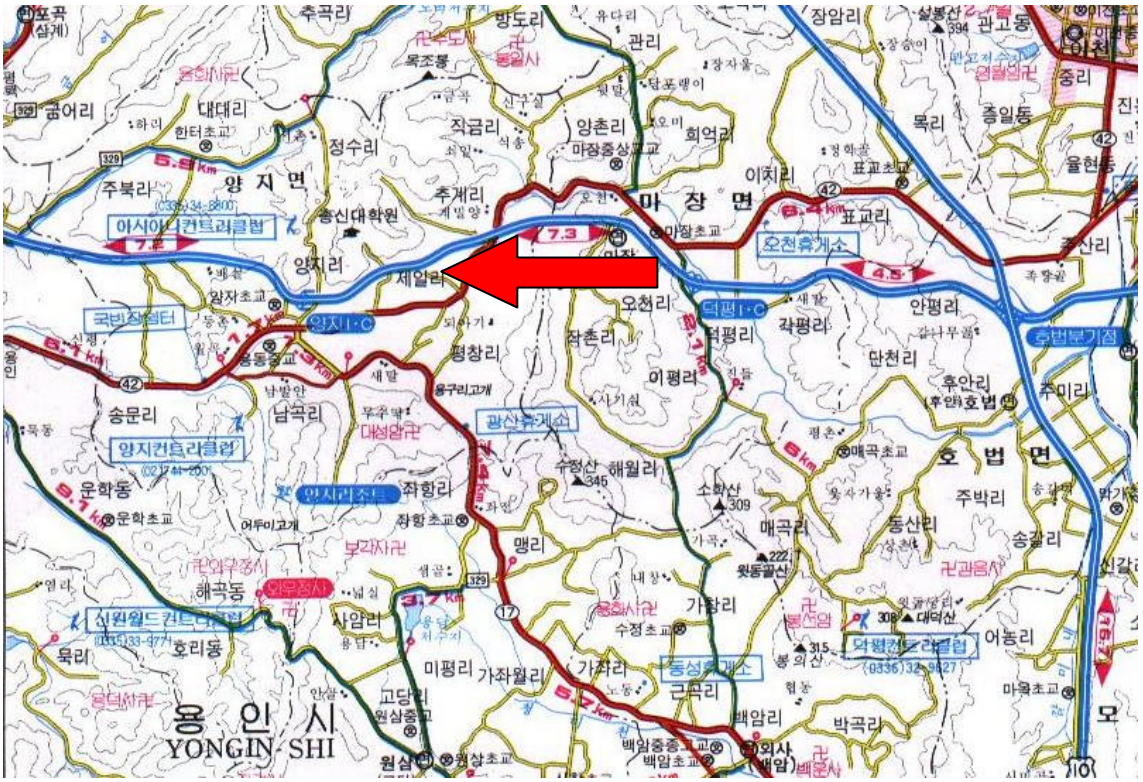
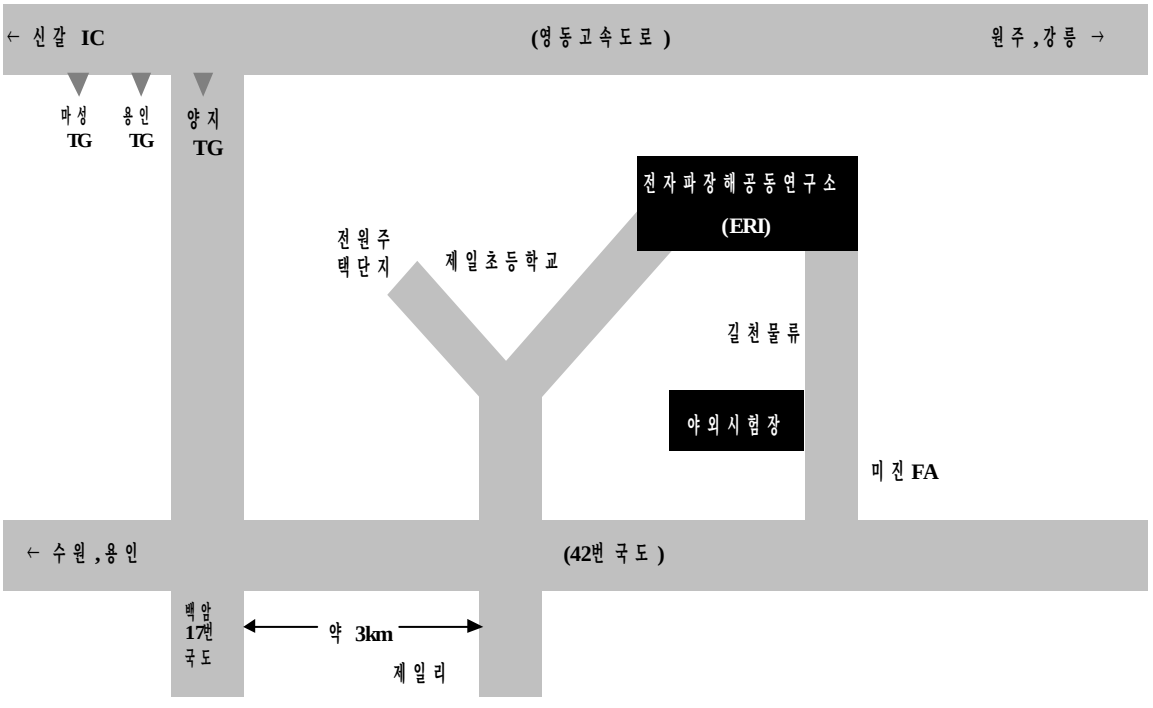
## MAP





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# 3. TEST SYSTEM CONFIGURATION

## 3.1 Operation Environment

| | Temperature | Humidity | pressure |
|---|---|---|---|
| 3m OATS (Radiated Emission) : | 2° C | 25 % | 1003hPa |
| Shielded room (Conducted Emission) : | 23 ° C | 45 % | 1003hPa |

## 3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, specially in field of EMC.
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 were applied.

## 3.3 sample calculation

### 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 :


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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 = 22dBuV/m

## Conducted emission

The field strength is calculated by adding the LISN factor, cable loss from 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 insertion loss Factor 1dB, CL 1dB
The result (MR) is

30 + 1 + 1 = 32dBuV


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# 4. Description of e.u.t.

## 4.1 Product Description

| | |
|---|---|
| **Manufactured By** | SAMSUNG ELECTRONICS Co., Ltd. |
| **Address** | 416 Maetan 3 Dong, Paldal-Ku, Suwon City, Kyungki Do, Korea, 442-742 |
| **Test Requested By** | SAMSUNG ELECTRONICS Co., Ltd. |
| **Model** | SM-316 |
| **Serial Number** | N/A |
| **Power Supply** | DC 5V/12V |
| **Electric Current** | 2.7A/1.5A |
| **Clock** | EN/DEC : 33.86MHz, DSP : 22.5792MHz, RF IC : 28.2MHz |
| **General Description** | This EUT(Equipment Under Test) is CD-RW / DVD Drive |
| **Speed** | CD-ROM : 40X, DVD-ROM : 12X<br>CD-R : 16X, CD-RW : 10X |
| **Loading Type** | Motorized Tray |
| **Buffer** | 2MB |
| **Interface** | Enhanced IDE (ATAPI) |
| **Size** | 149(W) ×42.5(H) ×180(D) mm |

## 4.2 peripherals

| Description | Manufacturer | Model / Part # | Serial Number | Remark |
|---|---|---|---|---|
| CD-RW / DVD Drive | SAMSUNG | SW-232 | - | EUT |
| Monitor | SAMSUNG | SAMTRON 55E | - | |
| PC | Trigem | DreamSys EZ/AC | 50041 354 00304 | |
| Speaker | FENGSHIN ELECTRONICS | CAMAC.G7 | - | |
| GAME PAD | DEXXA | G-YD1 | CCC93508076 | |
| Mouse | COMPAQ | M-S34 | - | |
| Keybaord | B.C.T. Korea | 5900 | K98102824 | |
| Mouse | SEJIN LECTRON INC. | SMB-400 | 7CFF079075 | |
| Head Phone | Trigem | DW-400M | - | |
| Printer | HEWLETT PACKARD | 895CXI | SG8BN1W11G | |
| Adapter | - | AT3018A-0101 | 7500M2090 | |
| Mic | - | - | - | |


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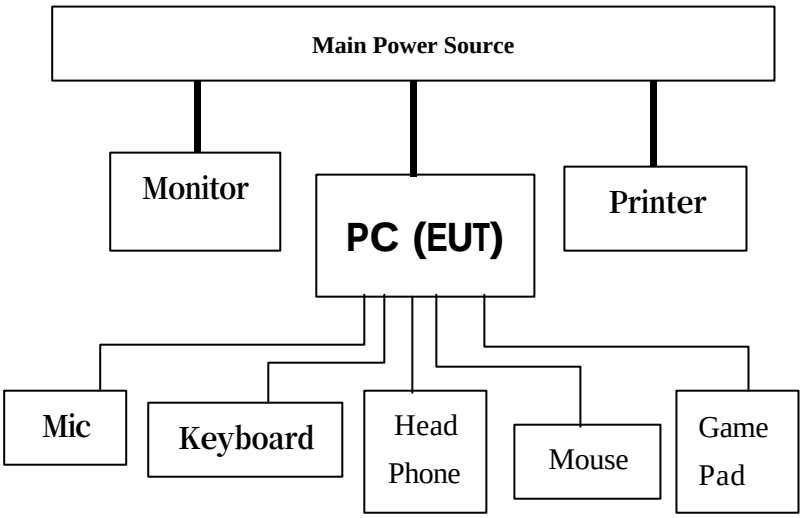
## 4.3 used cables

| EUT Port | Length (meters) | type | pin | Shield (Y/N) | Connected To |
|---|---|---|---|---|---|
| IDE | 0.35 | IDE | 39 | N | Main Board |
| POWER | 0.2 | Line | 4 | N | Power Board |
| AUDIO | 0.2 | Line | 4 | N | Main Board |
| Head Phone | 1.0 | P-Jack | 3 | N | Head Phone |

## 4.4 E.U.T Test Configuration




## 4.4 Operating conditions

Operating : - The system was configured in typical fashion (as a customer would normally use it) for testing.
- The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

- Play mode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# 5. TEST RESULTS

## 5.1 Conducted emission

### 5.1.1 Measurement procedure

**Mains**

The measurements were performed in a shielded room.
EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.
The rear of tabletop was located 40Cm to the vertical conducted plane.
All other surfaces of tabletop was at least 80cm 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 bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.
Each EUT power lead, except ground (safety) lead, were individually connected through a LISN to input power source.
Both lines of power cord, hot and neutral, were measured.

### 5.1.2 Used equipment

| Equipment | Model | Serial No. | Makers | Cal.Date | Used |
|---|---|---|---|---|---|
| Test receiver | ESS | 848588/006 | R&S | 01. 6. 08 | x |
| | ESHS30 | 831332/002 | R&S | 01. 1. 29 | |
| L.I.S.N. | ESH3-Z5 | 827246/008 | R&S | 01. 2. 27 | x |
| | ESH3-Z5 | 100029 | R&S | 01.5. 21 | |

### 5.1.3 measurement uncertainty

Conducted Emission measurement : ± 2.4 (K=2)


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### 5.1.4 test data

| Frequency Range [MHz] | Tested Freq. [MHz] | LISN Pol. | Meter Reading[A] [dBuV] | Total Loss [B] [dB] | Results QP [A] + [B] [dBuV] | Margin [C]-[A+B] [dBuV] | Limits [C] [dBuV] |
|---|---|---|---|---|---|---|---|
| 0.45~30 | 0.459 | N | 31.40 | 0.18 | 31.58 | 16.42 | 48 |
| | 0.723 | N | 31.70 | 0.18 | 31.88 | 16.12 | 48 |
| | 0.789 | N | 32.80 | 0.18 | 32.98 | 15.02 | 48 |
| | 0.918 | N | 32.10 | 0.19 | 32.29 | 15.71 | 48 |
| | 0.984 | N | 34.70 | 0.19 | 34.89 | 13.11 | 48 |
| | 1.179 | N | 32.60 | 0.19 | 32.79 | 15.21 | 48 |
| | 1.248 | N | 32.80 | 0.19 | 32.99 | 15.01 | 48 |
| | 1.443 | N | 32.40 | 0.20 | 32.60 | 15.40 | 48 |
| | 1.509 | N | 32.30 | 0.20 | 32.50 | 15.50 | 48 |
| | 1.773 | N | 33.10 | 0.21 | 33.31 | 14.69 | 48 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* Margin = Limits Result
* IF Bandwidth = 9kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESS (Rohde & Schwarz)

### 5.1.5 Result

Complied


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## 5.2 Radiated Emission

### 5.2.1 Measurement procedure

A pretest was performed at 3m distance in an semi-anechoic chamber for searching correct frequency.
The final test was done at a 3m open area test site with a quasi-peak detector.
EUT was placed on a non-metallic table height of 0.8m above the reference 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.

### 5.2.2 Used equipment

| Equipment | Model No. | Serial No. | Makers | Cal. Date |
|---|---|---|---|---|
| Test receiver | ESMI | 826210/007 | R&S | 01. 6. 8 |
| | ESCS30 | 830986/015 | R&S | 01.1.29 |
| | ESS | 848588/006 | R&S | 01.6. 4 |
| Bi-conical antenna | HK116 | 825177/013 | R&S | 01. 6. 4 |
| Log-Periodic antenna | HL223 | 825032/017 | R&S | 01. 6. 4 |
| Antenna Mast | EMAT2014 | N/A | EM | - |
| Turn Table | EMRT2015 | N/A | EM | - |
| Test site | OATS (10m) | Test site | EM | - |
| | chamber(3m) | | EM | - |

### 5.2.3 measurement uncertainty

Radiated Emission measurement :

30-300MHz +3.96dB / -4.04dB
300-1000MHz +3.04dB / -3.00dB


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## 5.2.4 test data

| Frequency Range [MHz] | Tested Frequency [MHz] | ANT Pol. | Meter Reading [A] [dBuV/m] | Total Loss [B] | Results [A+B] [dBuV/m] | Margin [c]-[A+B] [dBuV/m] | Limits [c] [dBuV/m] |
|---|---|---|---|---|---|---|---|
| *30 - 88* | 41.57 | H | 3.10 | 12.90 | 16.00 | 23.00 | 40.0 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| *88-216* | 115.40 | H | 12.10 | 13.30 | 25.40 | 18.10 | 43.5 |
| | 135.69 | V | 6.40 | 14.70 | 21.10 | 22.40 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| *216-960* | 250.28 | V | 5.20 | 19.70 | 24.90 | 21.60 | 46.0 |
| | 384.04 | V | 6.00 | 20.99 | 26.99 | 19.51 | |
| | 400.88 | V | 19.00 | 21.80 | 40.80 | 5.70 | |
| | 664.38 | H | 12.00 | 28.04 | 40.04 | 6.46 | |
| | 746.09 | H | 5.10 | 29.55 | 34.65 | 11.85 | |
| | 779.97 | V | 9.70 | 29.87 | 39.57 | 6.93 | |
| | 875.79 | V | 11.00 | 31.90 | 42.90 | 3.60 | |
| *960-* | | | | | | | 54.0 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

* Receiving Antenna Mode : *Horizontal, Vertical*
* Test Distance :3m
* Results = Meter Reading(QP) + Total Loss(LISN Insertion loss + Cable loss)
* IF Bandwidth = 120kHz
* Detecting Mode : Quasi-Peak
* Used receiver : ESCS30 (Rohde & Schwarz)

## 5.2.5 Result

Complied


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# 6. TEST PHOTOGRAPHS

## Conducted Emission

<Test Mode : Play>


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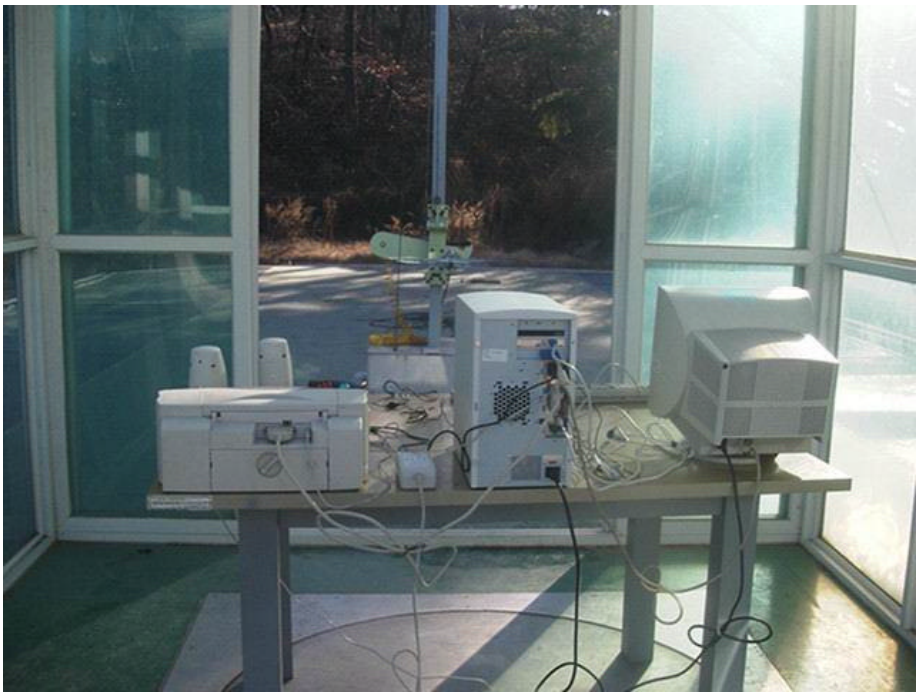
## Radiated Emission

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