

# Electromagnetic Emission

## FCC MEASUREMENT REPORT

### CERTIFICATION OF COMPLIANCE

#### FCC Part 15 Certification Measurement

**PRODUCT** : LCD TV  
**MODEL/TYPE NO** : DCM-15ST  
**FCC ID** : QEWD CM-15ST  
**APPLICANT** : Digital Cynos Co., Ltd.  
3-906, DaeRyung Technotown, 448, Gasan-dong,  
Geumcheon-gu, Seoul, 153-803, Korea  
Attn.: Jong Hyun, Lee / Assistant Manager  
**FCC CLASSIFICATION** : Class B personal computers and peripherals  
**FCC RULE PART(S)** : FCC Part 15 Subpart B  
**FCC PROCEDURE** : Certification  
**TRADE NAME** : Digital Cynos  
**TEST REPORT No.** : E05.0627.FCC.370N  
**DATES OF TEST** : June 14 – June 25, 2005  
**DATES OF ISSUE** : June 27, 2005  
**TEST LABORATORY** : ETL Inc. ( FCC Registration Number : 95422)  
#584 Sangwhal-ri, Kanam-myon, Yaju-kun, Kyounggi-do,  
469-885, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074

This LCD TV, Model DCM-15ST has been tested in accordance with the measurement procedures specified in ANSI C63.4-2001 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part 15 Subpart B:

I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

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.

*Yo Han, Park*

Yo Han, Park / Chief Engineer

**ETL Inc.**

**#584 Sangwhal-ri, Kanam-myon, Yaju-kun,  
Kyounggi-do, 469-885, Korea**



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**Scope** – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

## General Information

**Applicant Name** : Digital Cynos Co., Ltd.

**Address** : 3-906, DaeRyung Technotown, 448, Gasan-dong,  
Guumcheon-gu, Seoul, 153-803, Korea

**Attention** : Jong Hyun, Lee / Assistant Manager

- **EUT Type** : LCD TV
- **Model Number** : DCM-15ST
- **FCC ID** : QEWDCM-15ST
- **S/N** : N/A
- **FCC Rule Part(s)** : FCC Part 15 Subpart B
- **Test Procedure** : ANSI C63.4-2001
- **FCC Classification** : Class B personal computers and peripherals
- **Dates of Tests** : June 14 – June 25, 2005  
ETL Inc.  
EMC Testing Lab (FCC Registration Number : 95422)
- **Place of Tests** : 584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,  
Kyounggi-Do, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No.** : E05.0627.FCC.370N

## 1. INTRODUCTION

The measurement for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myun, Youju-kun, Kyungki-do, Korea. The open area test site is constructed in conformance with the requirements of the ANSI C63.4-2001 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 and 10 meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2001 and registered to the Federal Communications Commission(Registration Number : 95422 ).

The measurement procedure described in American national standard for method of measurement of radio-noise emission from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz (ANSI C.63.4-2001) was used in determining radiated and conducted emissions from the Digital Cynos Co., Ltd. Model: DCM-15ST

## 2. PRODUCT INFORMATION

### 2.1 General Remark

### 2.2 Equipment Description

The Equipment Under Test (EUT) is the Digital Cynos Co., Ltd., LCD TV, DCM-15ST

### 2.3 General Specification

|   |   |
|---|---|
| Chassis Type                                      | : Plastic   |
| List of Each OSC. Or X-Tal. Freq. ( $\geq 1$ MHz) | : X-Tal: 14.318 MHz   |
| LCD Panel   | : Type – Amorphous Silicon TFT-LCD<br>Size – 15" (diagonal length)<br>Pixel Pitch – 0.297 mm x 0.297 mm<br>Contrast Ratio 350 : 1 (Typ.)<br>Brightness – Max. 300 cd/m <sup>2</sup><br>Actual Display Size – 304.1 mm (H) x 228.1 mm (V)<br>Viewing Angle – L/R: 120 ° U/D: 100 °<br>Interface - LVDS |
| TV Broadcasting System                            | : NTSC-M Type   |
| Audio Output                                      | : MAX 3 W x 2 / Stereo  |
| PC Monitor  | : Horizontal Frequency 30 – 61 kHz<br>Vertical Frequency 60 – 75 Hz<br>Colors – 16M colors (6bit with FRC)<br>Max. Resolution – XGA: 1024 (H) x 768 (V)   |
| Power   | : Adaptor input AC 100 V - 240 V, 50 -60 Hz<br>Adaptor output DC 12 V / 3.3 A   |
| Power Consumption                                 | : In-Operation - <40 W<br>Power-Saving Mode/OFF - <5 W  |
| Energy Saving Mode                                | : VESA DPMS   |

## 3. DESCRIPTION OF TESTS

### 3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-2001 "measurement of information technology equipment ". The measurement were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 /50uH LISN as the input transducer to a spectrum analyzer or a field intensity meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

#### - Procedure of Test

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table which is placed 40cm away from the vertical wall and 1.5m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from another LISN. Powers to the LISN are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner  $\phi$  1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMC LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer or test receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using the detector function set to the CISPR Quasi-Peak and average mode by manual, after scanned by automatic Peak mode from 0.15 to 30 MHz. The bandwidth of the spectrum analyzer or test receiver was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

## 3. DESCRIPTION OF TESTS

### 3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 12.2 in ANSI C63.4-2001 "measurement of information technology equipment ". The measurements were performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz.

#### - Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determine the frequency producing the maximized emission in shielded room. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000 MHz using broadband antenna. For above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 10-meters. The test equipment was placed on a wooden turn-able table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the max. Emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the max emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

## 4. TEST CONDITION

### 4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

### 4.2 EUT operation

| Operating Mode                            | The worst operating condition |
|---|-------------------------------|
| Stand-by mode                             | X                             |
| Video Input display mode                  | X                             |
| 1024 * 768 75Hz, Full "H" pattern display |                               |

: Worst case investigated during the test.

### 4.3 Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

#### EUT – LCD TV

FCC ID : QEWDCM-15ST  
Model Name : DCM-15ST  
Serial No. : N/A  
Manufacturer : Digital Cynos Co., Ltd.  
Power Supply Type : Adaptor (Input AC 100-240 V, 50-60 Hz Output DC 12 V, 3.3 A)  
Power Cord : Non-Shielded, Detachable: 1.5 m  
Data Cable : 1.8 m Shielded RGB, 1.2 m Shielded RCA, 1.2 m Shielded S-Video

#### Support unit 1 – Personal computer (DELL)

FCC ID : N/A (DoC)  
Model Name : DHM  
Serial No. : H9MB71S  
Manufacturer : DELL  
Power Supply Type : Switching  
Power Cord : Non-Shielded, Detachable: 1.2 m  
Data Port : RGB IN:1, Parallel:1, RS-232:1, PS/2: 2, USB: 4, RJ-45:1  
: Audio in:1, Audio out:1, MIC IN:1

#### Support unit 2 –Keyboard (COMPAQ)

FCC ID : N/A (DoC)  
Model Name : KB-9963  
Serial No. : B26960GBUKO13F  
Manufacturer : COMPAQ  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.5m



**Support unit 3 – Mouse (LOGITECH)**

FCC ID : DZL211029  
Model Name : M-S34  
Serial No. : LZC01002314  
Manufacturer : LOGITECH  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : None-Shielded, 1.2m

**Support unit 4 – USB Mouse (N/A)**

FCC ID : N/A  
Model Name : HL898W  
Serial No. : HL80811837  
Manufacturer : N/A  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.2m

**Support unit 5 – Serial Mouse (PETRA)**

FCC ID : JKGMUS5S01  
Model Name : MUS5S  
Serial No. : E183027  
Manufacturer : PETRA  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.2m

**Support unit 6 – EAR-MIC (JETECH)**

FCC ID : N/A  
Model Name : JE101  
Serial No. : N/A  
Manufacturer : JETECH  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.5m

**Support unit 7 – DVD Box (ALPHACAST)**

FCC ID : N/A  
Model Name : DVDP-M100  
Serial No. : N/A  
Manufacturer : ALPHACAST  
Power Supply Type : DC 12 V of Adaptor  
Power Cord : Non-shielded, Detachable: 1.2 m  
Data Cable : Shielded, 1.2m

**Support unit 8 – Printer (SINDO RICOH)**

FCC ID : N/A  
Model Name : Color cap 330  
Serial No. : 11-03098  
Manufacturer : LEXMARK INTERNATIONAL INC.  
Power Supply Type : AC 110V~220V  
Power Cord : Non-Shield, 1.5m  
Data Cable : Shielded, 1.5m

## 5. TEST RESULTS

### 5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

| Test Rule Parts | Measurement Required            | Result                    |
|-----------------|---------------------------------|---------------------------|
| 15.107          | Conducted emissions measurement | <b>Passed by 12.20 dB</b> |
| 15.109          | Radiated emissions measurement  | <b>Passed by 5.20 dB</b>  |

The data collected shows that the **Digital Cynos Co., Ltd. / LCD TV / DCM-15ST** complied with technical requirements of above rules part 15.107 and 15.109 Class B Limits and CISPR Publication 22.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

## 5. TEST RESULTS

### 5.2 Conducted Emissions Measurement

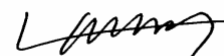
|                       |  |
|-----------------------|--|
| EUT                   | LCD TV / DCM-15ST (SN: N/A)                |
| Limit apply to        | FCC Part 15. 107                           |
| Test Date             | June 23, 2005                              |
| Operating Condition   | Full "H" pattern display(1024 x 768, 75Hz) |
| Environment Condition | Humidity Level: 47 %RH, Temperature: 21    |
| Result                | Passed by 12.20 dB                         |

The following table shows the highest levels of conducted emissions on both polarizations of hot and neutral line.  
Detector mode: CISPR Quasi-Peak mode ( 6dB Bandwidth : 9 kHz )

| Frequency<br>[MHz] | Result<br>[dBμV] |         | Phase<br>[*H/**V] | Limit<br>[dBμV] |         | Margin<br>[dB] |         |
|--------------------|------------------|---------|-------------------|-----------------|---------|----------------|---------|
|                    | Quasi-peak       | Average |                   | Quasi-peak      | Average | Quasi-peak     | Average |
| 0.199              | 48.00            |         | N                 | 63.65           | 53.65   | 15.65          |         |
| 0.268              | 42.30            |         | H                 | 61.18           | 51.18   | 18.88          |         |
| 0.330              | 38.60            |         | H                 | 59.45           | 49.45   | 20.85          |         |
| 0.397              | 37.80            |         | H                 | 57.92           | 47.92   | 20.12          |         |
| 0.601              | 40.90            |         | H                 | 56.00           | 46.00   | 15.10          |         |
| 0.670              | 43.00            |         | H                 | 56.00           | 46.00   | 13.00          |         |
| 4.611              | 43.80            |         | H                 | 56.00           | 46.00   | 12.20          |         |
| 4.676              | 43.80            |         | H                 | 56.00           | 46.00   | 12.20          |         |
| 5.080              | 44.20            |         | H                 | 60.00           | 50.00   | 15.80          |         |

#### NOTES:

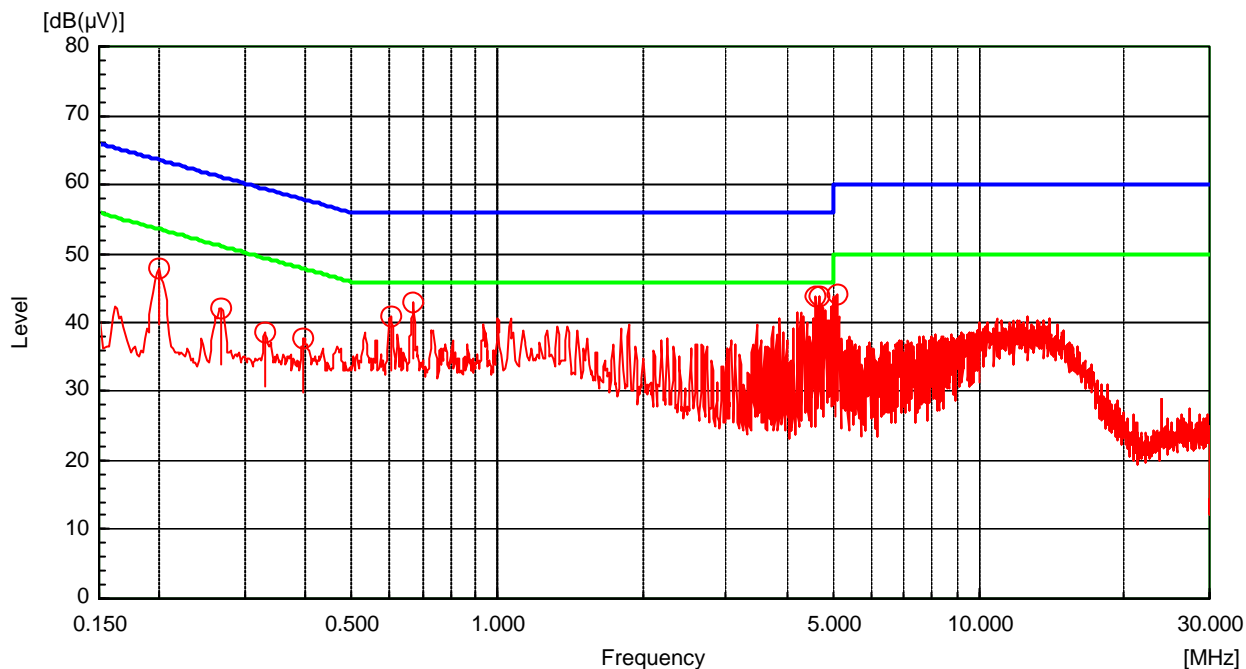
- \* H : HOT Line , \*\*N : Neutral Line
- Margin value = Limit – Result
- Measurement were performed at the AC power inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15 Class B
- If the reading Quasi-Peak value is bellowed the average limit, do not test average mode.



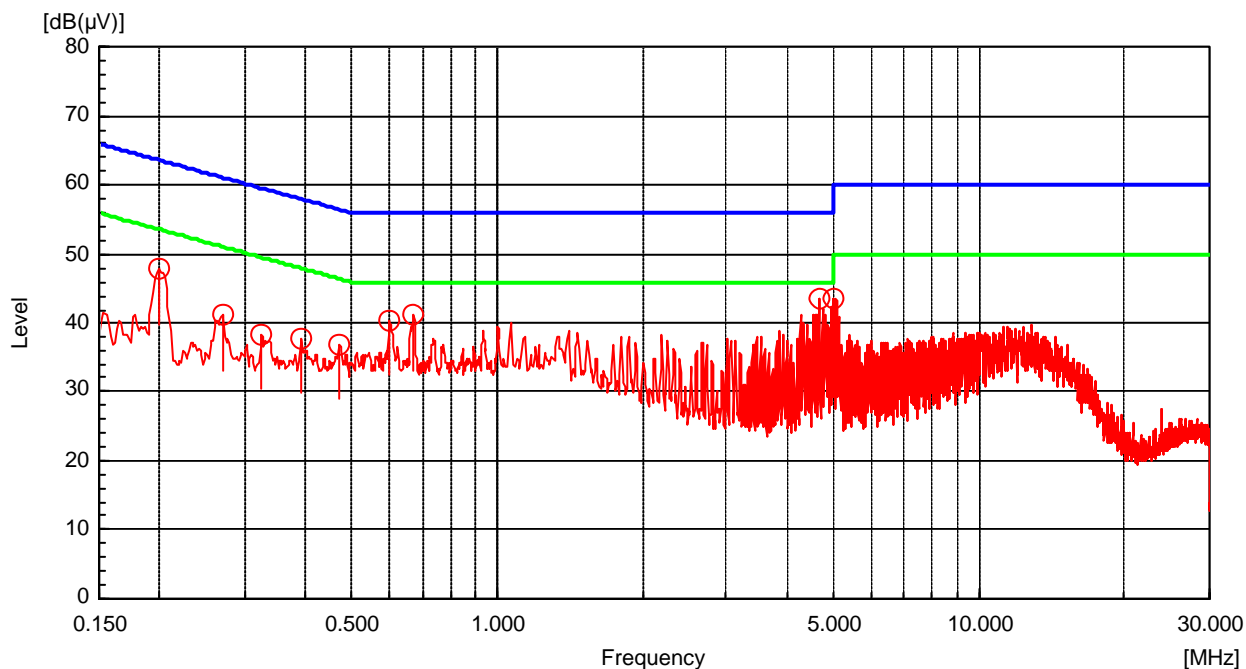
Test Engineer: H. S. Lee

## 5. TEST RESULTS

Line: HOT Line



Line: Neutral Line



## 5. TEST RESULTS

### 5.3 Radiated Emissions Measurement

|                       |  |
|-----------------------|--|
| EUT                   | LCD TV / DCM-15ST (SN: N/A)                |
| Limit apply to        | FCC Part 15. 109(CISPR Pub.22 Class B)     |
| Test Date             | June 23, 2005                              |
| Operating Condition   | Full "H" pattern display(1024 x 768, 75Hz) |
| Environment Condition | Humidity Level: 45 %RH, Temperature: 22    |
| Result                | Passed by 5.20 dB                          |

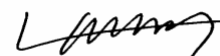
#### Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.  
Detector mode: CISPR Quasi-Peak mode ( 6dB Bandwidth : 120 kHz )

| Frequency [MHz] | Reading [dB $\mu$ V] | Polarization [*H/**V] | Ant.Factor [dB/m] | Cable Loss [dB] | Result [dB $\mu$ V/m] | Limit [dB $\mu$ V/m] | Margin [dB] |
|-----------------|----------------------|-----------------------|-------------------|-----------------|-----------------------|----------------------|-------------|
| 54.30           | 6.07                 | V                     | 12.03             | 2.10            | 20.20                 | 30.0                 | 9.80        |
| 67.12           | 10.67                | V                     | 10.36             | 2.17            | 23.20                 | 30.0                 | 6.80        |
| 119.10          | 8.22                 | V                     | 11.99             | 3.08            | 23.30                 | 30.0                 | 6.70        |
| 146.10          | 5.88                 | V                     | 13.33             | 3.49            | 22.70                 | 30.0                 | 7.30        |
| 166.35          | 8.46                 | V                     | 12.58             | 3.76            | 24.80                 | 30.0                 | 5.20        |
| 268.95          | 9.21                 | V                     | 12.25             | 5.13            | 26.60                 | 37.0                 | 10.40       |
| 378.75          | 5.23                 | H                     | 14.79             | 6.39            | 26.40                 | 37.0                 | 10.60       |
| 471.50          | 5.51                 | V                     | 17.22             | 7.37            | 30.10                 | 37.0                 | 6.90        |

NOTES : \* H : Horizontal polarization , \*\* V : Vertical polarization

1. Result = Reading + Antenna factor + Cable loss
2. Margin value = Limit - Result
3. The measurement was performed for the frequency range 30 MHz ~ 1000 MHz according to the FCC Part 15 Class B / CISPR 22 Class B



Test Engineer: H. S. Lee

## 6. SAMPLE CALCULATION

### Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.  
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

$$dB(\mu V/m) = 20 \log_{10} (\mu V / m) : \text{Equation 1}$$

$$dB\mu V = dBm + 107 : \text{Equation 2}$$

Example : @ 166.35 MHz

$$\text{Class B Limit} = 30.00 \text{ dB}\mu V/m$$

$$\text{Reading} = 8.46 \text{ dB}\mu V$$

$$\text{Antenna Factor} + \text{Cable Loss} = 12.58 + 3.76 = 16.34 \text{ dB/m}$$

$$\text{Total} = 24.80 \text{ dB}\mu V/m$$

$$\text{Margin} = 30.00 - 24.80 = 5.20 \text{ dB}$$

$$= 5.20 \text{ dB below Limit}$$

## 7. List of test equipments used for measurements

|                                     | Test Equipment          | Model      | Mfg.            | Serial No.  | Cal. Due Date |
|-------------------------------------|-------------------------|------------|-----------------|-------------|---------------|
| <input checked="" type="checkbox"/> | Spectrum Analyzer       | E7402A     | H.P             | US39110107  | 05-10-18      |
| <input checked="" type="checkbox"/> | Spectrum Analyzer       | R3261A     | Advantest       | 21720033    | 05-10-26      |
| <input checked="" type="checkbox"/> | Receiver                | ESVS 10    | R & S           | 835165/001  | 06-04-07      |
| <input checked="" type="checkbox"/> | EMI TEST Receiver       | ESHS30     | Rohde & Schwarz | 0401901/002 | 05-10-18      |
| <input type="checkbox"/>            | Preamplifier            | HP 8347A   | HP              | 2834A00544  | 06-04-07      |
| <input checked="" type="checkbox"/> | LISN                    | 3825/2     | EMCO            | 9006-1669   | 06-04-06      |
| <input checked="" type="checkbox"/> | LISN                    | 3825/2     | EMCO            | 9208-1995   | 06-04-07      |
| <input checked="" type="checkbox"/> | TriLog Antenna          | VULB9160   | Schwarz Beck    | 3082        | 05-07-27      |
| <input type="checkbox"/>            | LogBicon                | VULB9165   | Schwarz Beck    | 2023        | 05-07-06      |
| <input type="checkbox"/>            | Dipole Antenna          | VHAP       | Schwarz Beck    | 964         | 06-06-10      |
| <input type="checkbox"/>            | Dipole Antenna          | VHAP       | Schwarz Beck    | 965         | 05-07-09      |
| <input type="checkbox"/>            | Dipole Antenna          | UHAP       | Schwarz Beck    | 949         | 05-07-09      |
| <input type="checkbox"/>            | Dipole Antenna          | UHAP       | Schwarz Beck    | 950         | 06-06-10      |
| <input type="checkbox"/>            | Broad band Horn antenna | BBHA 9120D | Schwarz Beck    | 227         | 06-04-04      |
| <input checked="" type="checkbox"/> | Turn-Table              | DETT-03    | Daeil EMC       | -           | N/A           |
| <input checked="" type="checkbox"/> | Antenna Master          | DEAM-03    | Daeil EMC       | -           | N/A           |
| <input checked="" type="checkbox"/> | Chamber                 | DTEC01     | DAETONG         | -           | N/A           |
| <input type="checkbox"/>            | Thermo Hygrograph       | 3-3122     | ISUZU           | 3312201     | 06-04-13      |
| <input type="checkbox"/>            | Aneriod BaroMeter       | -          | Regulus         | -           | 06-03-15      |