

# Electromagnetic Emission

## FCC MEASUREMENT REPORT

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### CERTIFICATION OF COMPLIANCE

### FCC Part 15 Verification Measurement

**PRODUCT** : Multimedia Portable Player  
**MODEL/TYPE NO** : SP-100  
**FCC ID** : P6QSP-100  
**APPLICANT** : C&S Technology Inc.  
C&S Venture B/D. Nonhyun-Dong, 221-2 Kangnam-Gu,  
Seoul 135-829, Korea  
Attn. : Young-Man, Kim / QA Team Manager of Technical Team  
**FCC CLASSIFICATION** : Part 15 Class B Unintentional Radiators  
Computing Device Peripheral(JBP)  
**FCC RULE PART(S)** : FCC Part 15 Subpart B Unintentional Radiators  
**FCC PROCEDURE** : Certification  
**TRADE NAME** : Session  
**TEST REPORT No.** : E02.0627.FCC.370N  
**DATES OF TEST** : June 25 ~ 27  
**DATES OF ISSUE** : June 27, 2002  
**TEST LABORATORY** : ETL Inc ( FCC Registration Number : 95422)  
#584, Sangwhal-ri, Kanam-myon, Yaju-kun, Kyounggi-do, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074

This Multimedia Portable Player, Model: SP-100 has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B : Unintentional Radiators.

I attest to the accuracy of data. All measurement herein performed by me or made under my supervision and 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.

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Name : Yo Han, Park

Title : Chief Engineer & Lab.Manager



**E-RAE Testing Laboratory Inc.**  
#584, Sangwhal-ri, Kanam-myon, Yaju-kun,  
Kyounggi-do, 469-885, Korea

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## FCC MEASUREMENT REPORT

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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** : C&S Technology Inc.

**Address** : C&S Venture B/D. Nonhyun-Dong, 221-2 Kangnam-Gu,  
Seoul 135-829, Korea

**Attention** : Young-Man, Kim / QA Team Manager of Technical Team

- **EUT Type** : Multimedia Portable Player
- **Model Number** : SP-100
- **FCC Identifier** : P6QSP-100
- **S/N** : N/A
- **Modulation** : N/A
- **FCC Rule Part(s)** : FCC Part 15 Subpart B Unintentional Radiators
- **Test Procedure** : ANSI C63.4-1992
- **FCC Classification** : FCC Part 15 Subpart B Unintentional Radiators  
Computing Device Peripheral (JBP)
- **Dates of Tests** : June 25 ~ 27
- **Place of Tests** : ETL Inc  
EMC Testing Lab (FCC Registration Number : 95422)  
584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,  
Kyounggi-Do, Korea  
Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No.** : E02.0627.FCC.370N

## 1. INTRODUCTION

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The measurement test 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, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 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 C63.4-1992 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 9kHz to 40GHz (ANSI C.63.4-1992) was used in determining radiated and conducted emissions from the C&S Technology Inc., Model : SP-100

## 2. PRODUCT INFORMATION

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### 2.1 Equipment Description

The Equipment Under Test (EUT) is the Multimedia Portable Player, Model: SP-100  
Please refer to Users manual

### 2.2 General Specification

- CASE : Plastic
- List of Each OSC. Or X-Tal. Freq. ( $\geq 1$ MHz) : X-TAL: 48MHz, 3.6864MHz, 32.368KHz
- Chipset Brand & Part No. : 16256V-70LLT – AMC, K9F560800A-YCB0 – SAMSUNG  
EP7212-CV-D – CIRRUS LOGIC, L60851D – OKI  
39VF800A – SST
- Number of Layers : MAIN – 4Layers, DVR BACK PANEL – 4Layers,  
HDD CONTROL – 4Layers, VGA – 4Layers, Module – 4Layers
- CPU : CIRRUS LOGIC EP 7212 (ARM7TDMI CPU)
- Memory : 64MB Flash Memory (Expandable)  
SMC Slot to expand memory (8, 16, 64, 128MB – Option)
- Display : 320 x 240 Pixel (3.9 inch, 0.24 Dot pitch), EL Backlight, BW
- Touch Screen : 4 wire Analog Resistive Touch Screen
- Record type/Time : ADPCM/8 hours approx. (Basis on 128MB)  
Built-in Microphone, Line in recording
- Play Time : 20 or more hours (Session Play Time)  
25 or more hours (LCD off audio play time)
- Ear phone : Stereo Ear Phone set
- Interface : USB 1.1 (bandwidth over 6.5Mbps)
- Language : English, Korean, Japanese, Chinese
- Size/Weight : 138 X 86 X 16mm / 145g (193g-Including Batteries)
- Battery / Power : 2 x AA-Size / 3 Volt DC In adapter

### 3. DESCRIPTION OF TESTS

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#### 3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurement were performed over the frequency range of 0.15MHz to 30MHz 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 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located inside a shielded room 1m X 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the side wall of the shielded room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from the another EMCO LISN. Power to the LISNs 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 EMCO LISN. Non-inductive bundling to a 1m length shortened all interconnecting cables more than 1m. 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 ESHS 30 Receiver to determine the frequency producing the max. emission from the EUT. The frequency producing the max level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

### 3. DESCRIPTION OF TESTS

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#### 3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurements were performed over the frequency range of 30MHz to 1GHz 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 120KHz.

- Procedure of Test

Preliminary measurements were made at 10 meter using broadband antennas, and spectrum analyzer to determined the frequency producing the max. emission in shielded room. Appropriate precaution was taken to ensure that all emission 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 1000MHz using SchwarzBeck Log-Bicon antenna. Above 1GHz, 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-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 120kHz 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 nonmetallic 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

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### 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	Worst Case
MP 3 FILE PLAY	O
DOWN LOAD	X

O: Worst case investigated during the Test

### 4.3 Support Equipment Used

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

#### EUT – Multimedia Portable Player

FCC ID : P6QSP-100  
Model Name : SP-100  
Serial No. : N/A  
Manufacturer : NTL Telecom Co., Ltd.  
Power Supply Type : Switching (Power supply from DC 3V of Adapter)  
Power Cord : Non-Shielded, Detachable, 1.2m  
Port : DC IN: 1, USB: 1, LINE IN: 1, EAR PHONE: 1, SMC: 1

#### Support Unit 1 - PC

FCC ID : (N/A) DOC  
Model Name : MMP  
Serial No. : BK1W31S  
Manufacturer : DELL  
Power Supply Type : Switching  
Power Cord : Non-Shielded, Detachable, 1.2m  
Port : Keyboard: 1, Mouse: 1, USB: 2, RS-232: 2, Parallel: 1, Audio In:1,  
MIC: 1, Audio out: 1, RJ-45: 1





Support Unit 2 - Keyboard (DELL)

FCC ID : N/A(DOC)  
Model Name : SK-8000  
Serial No. : 2965  
Manufacturer : DELL  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.2m

Support Unit 3 – MOUSE (LOGITECH)

FCC ID : DZL211029  
Model Name : M-S34  
Serial No. : LNA10212779  
Manufacturer : LOGITECH  
Power Supply Type : N/A  
Power Cord : N/A  
Data Cable : Shielded, 1.5m

Support Unit 4 – Serial Mouse (PETRA)

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

Support Unit 6 – Printer (SINDORICO)

FCC ID : N/A  
Model Name : Colorcab 330  
Serial No. : N/A  
Manufacturer : LEXMARK INTERNATIONAL INC.  
Power Supply Type : Switching  
Power Cord : Non-Shielded, Detachable, 1.2m  
Data Cable : Shielded, 1.5m

Support Unit 7 – LCD MONITOR (E-RAE)

FCC ID : OIOELM-150A  
Model Name : ELM-150A  
Serial No. : N/A  
Manufacturer : E-RAE Electronics Industry Co., Ltd.  
Power Supply Type : Switch (Supply from DC Adapter DC12V)  
Power Cord : Non-Shielded, Detachable, 1.2m  
Data Cable : Shielded detachable 15-pin D-sub and ferrite core on signal cable

Support Unit 8 – EAR MIC (JE TECH)

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

Support Unit 9 – EAR MIC (N/A)

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

## 5. TEST RESULTS

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### 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(e)	Conducted Emissions Measurement	Passed by – 20.90 dB
15.109(e)	Radiated Emissions Measurement	Passed by – 5.70 dB

The data collected shows that the C&S Technology Inc., Multimedia Portable Player, SP-100 complies with technical requirements of above rules part 15.107 and 15.109 Class B Limits.

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	Multimedia Portable Player / SP-100 (SN:N/A)
Limit apply to	15.107(e)
Test Date	June 25, 2002
Operating Condition	MP3 FILE PLAY MODE
Environment Condition	Humidity Level : 40 %RH, Temperature : 26
Result	Passed by – 20.90 dB

### Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarization of live and neutral line.

Detector mode : CISPR Quasi-Peak mode ( 6dB Bandwidth : 9 KHz )

Frequency [MHz]	Reading [dB $\mu$ V]		Phase (*H/**N)	Limit [dB $\mu$ V]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Quasi-Peak	Average
0.150	37.00	-	H	66.00	56.00	29.00	-
0.274	35.50	-	H	60.99	50.99	25.49	-
0.380	36.80	-	H	58.27	48.27	21.47	-
0.550	28.30	-	H	56.00	46.00	27.70	-
0.970	35.10	-	H			20.90	-
4.400	23.60	-	N			32.40	-
7.950	20.70	-	N	60.00	50.00	39.30	-
15.91	19.10	-	H			40.90	-
23.85	24.30	-	H			35.70	-

#### NOTES :

1. \* H : HOT Line , \*\*N : Neutral Line
2. Margin value = Limit – Reading
3. Measurement were performed at the AC Power Inlet in the frequency band of 150kHz ~ 30MHz according to the FCC PART 15 Section 15.107(e)
4. If the Reading Quasi-Peak value is bellowed the Average Limit, Do not test Average Mode.

Test Engineer : C. S. Kim

## 5. TEST RESULTS

### Line: HOT Line

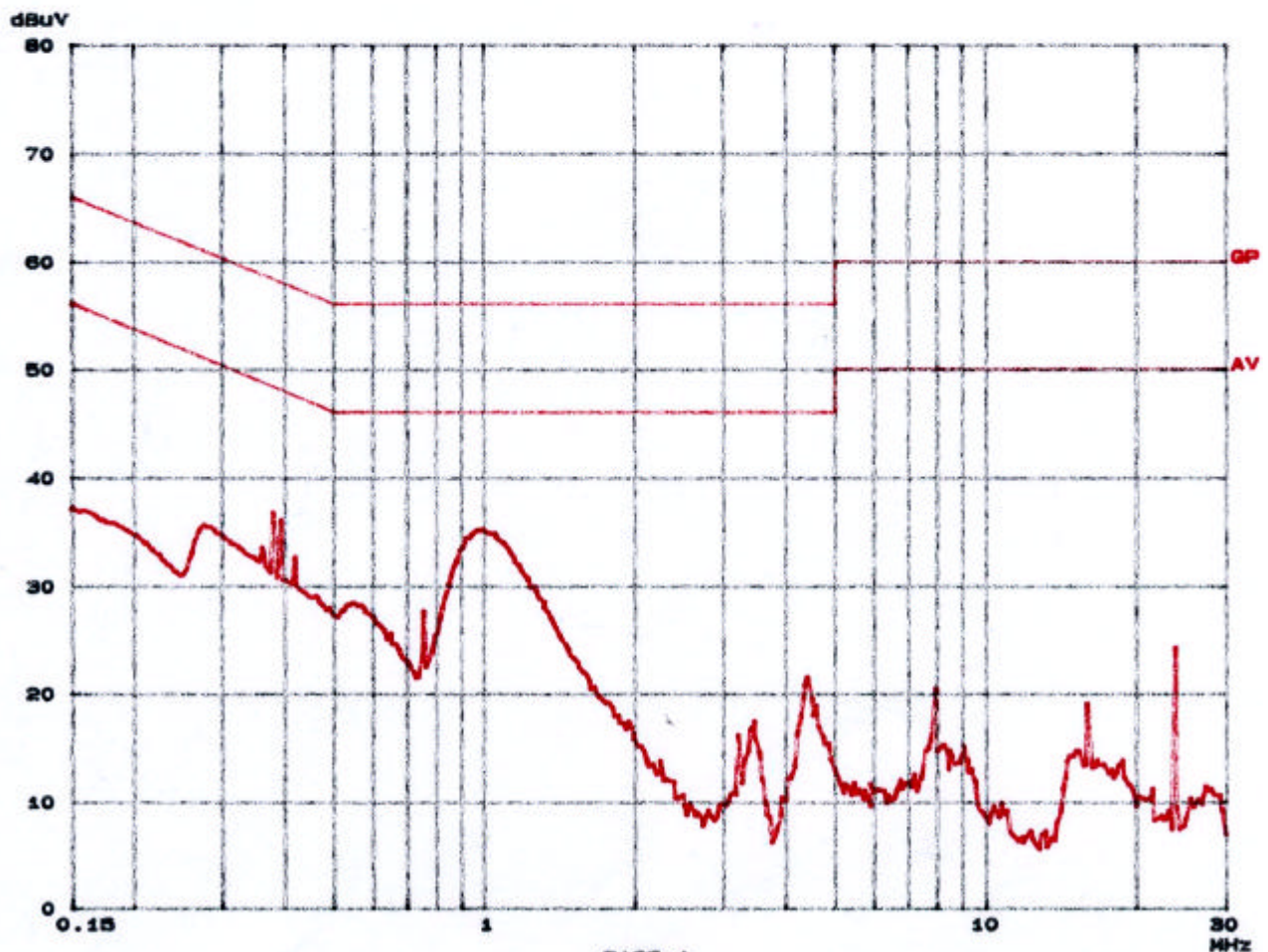
ETL Inc.  
CONDUCTED EMISSION

EUT: Multimedia Portable Player  
Manuf: C&S Technology  
Op Cond: MP-3 FILE PLAY & DOWN LOAD MODE  
Operator: CHON SIK KIM  
Test Spec: EN55022 CLASS B  
Comment: HOT

#### Scan Settings (3 Ranges)

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	2k	10k	PK	100ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK	20ms	AUTO	LN OFF	60dB

Final Measurement: x GP  
Meas Time: 1 s  
Subranges: 50  
Acc Margin: 6dB  
Transducer No. 1  
Start 150k  
Stop 30M  
Name EN55022





## 5.TEST RESULTS

### Line: Neutral Line

ETL Inc.  
CONDUCTED EMISSION

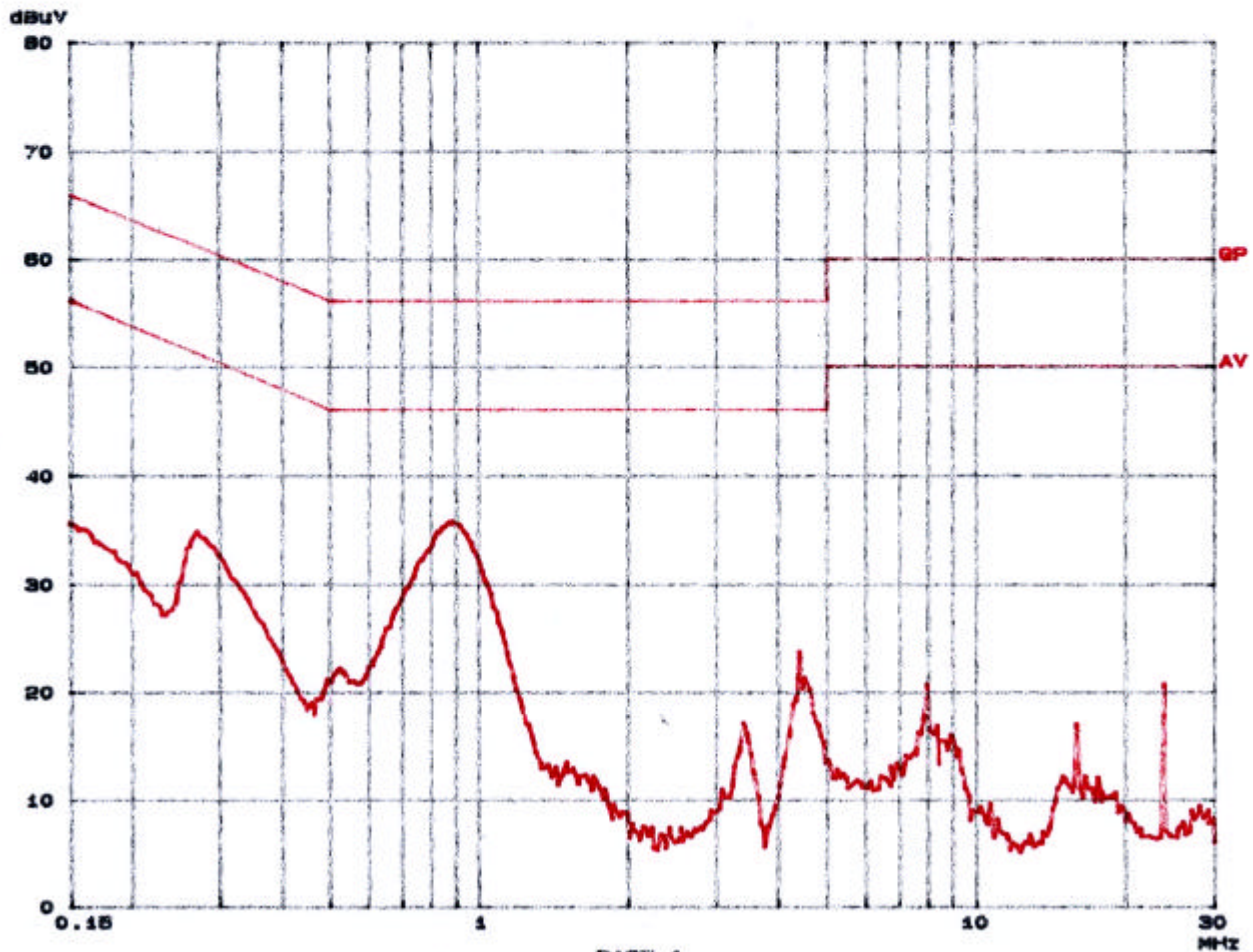
EUT: Multimedia Portable Player  
Manuf: C&S Technology  
Op Cond: MP-3 FILE PLAY & DOWN LOAD MODE  
Operator: CHON SIK KIM  
Test Spec: EN55022 CLASS B  
Comment: NEUTRAL

#### Scan Settings (3 Ranges)

Frequencies			Receiver Settings						
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150k	500k	2k	10K	PK	100ms	AUTO	LN	OFF	
500k	5M	5k	10K	PK	20ms	AUTO	LN	OFF	
5M	30M	10k	10K	PK	20ms	AUTO	LN	OFF	

Final Measurement: x GP  
Meas Time: 1 s  
Subranges: 50  
Acc Margin: 8dB

Transducer No. 1 Start 150k Stop 30M Name EN55022



## 5. TEST RESULTS

### 5.3 Radiated Emissions Measurement

EUT	Multimedia Portable Player / SP-100 (SN:N/A)
Limit apply to	15.109 (e)
Test Date	June 26, 2002
Operating Condition	MP3 FILE PLAY MODE
Environment Condition	Humidity Level : 35 %RH, Temperature : 25
Result	Passed by - 5.70dB

### Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode: CISPR Quasi-Peak mode ( 6dB Bandwidth : 120 kHz )

Measurement Distance: 10 meters

Frequency [MHz]	Reading [dB $\mu$ V]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Emission Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
192.00	7.53	H	9.71	3.82	21.06	30.0	8.90
211.23	10.79	H	9.49	4.00	24.28		5.70
221.18	9.11	H	10.28	4.00	23.39		6.60
260.02	10.45	H	11.34	4.30	26.09	37.0	10.90

#### NOTES :

1. \* H : Horizontal polarization , \*\* V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss
3. Margin value = Limit - Emission Level
4. The measurement was performed for the frequency range 30MHz ~ 1000MHz according to the FCC PART 15, Section 15.109 (e)

Test Engineer : C. S. Kim

## 6. SAMPLE CALCULATION

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### 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 1 : @ 0.970 MHz

Class B Limit	=	631 $\mu V$ = 56.0 dBuV
Reading	=	35.10 dBuV
Convert to $\mu V$	=	56.90 $\mu V$
Margin	=	35.10 - 56.0 = - 20.90
	=	- 20.90 dB below Limit

Example 2 : @ 211.23 MHz

Class B Limit	=	32 $\mu V$ = 30.10 dBuV/m
Reading	=	10.79 dBuV
Antenna Factor + Cable Loss	=	13.49 dB
Total	=	24.28 dBuV/m
Margin	=	24.28 - 30.0 = - 5.72
	=	- 5.72 dB below Limit

## 7. TEST EQUIPMENT LIST

### List of Test Equipments Used for Measurements

	Test Equipment	Model	Mfg.	Serial No.	Cal Due. Date
<input checked="" type="checkbox"/>	Spectrum Analyzer	R3261A	Advantest	21720033	02-10-25
<input checked="" type="checkbox"/>	Receiver	ESVS 10	R & S	835165/001	03-03-21
<input checked="" type="checkbox"/>	Receiver	ESHS30	R & S	84190/002	03-01-24
<input checked="" type="checkbox"/>	Spectrum Analyzer	E7402A	HP	US39110107	03-05-21
<input checked="" type="checkbox"/>	LISN	3825/2	EMCO	9208-1995	02-12-27
<input checked="" type="checkbox"/>	LISN	3825/2	EMCO	9006-1669	02-12-27
<input checked="" type="checkbox"/>	Preamplifier	HP 8447D	HP	2944A07626	03-01-10
<input type="checkbox"/>	Preamplifier	HP 8347A	HP	2834A00544	03-05-23
<input checked="" type="checkbox"/>	TriLog Antenna	VULB9160	Schwarz Beck	3082	03-06-19
<input type="checkbox"/>	LogBicon	VULB9165	Schwarz Beck	2023	03-06-21
<input checked="" type="checkbox"/>	Dipole Antenna	VHAP	Schwarz Beck	964	03-05-04
<input type="checkbox"/>	Dipole Antenna	VHAP	Schwarz Beck	965	03-05-04
<input checked="" type="checkbox"/>	Dipole Antenna	UHAP	Schwarz Beck	949	03-05-04
<input type="checkbox"/>	Dipole Antenna	UHAP	Schwarz Beck	950	03-05-04
<input type="checkbox"/>	Double Ridged Horn	3115	EMCO	9809-2334	02-09-20
<input type="checkbox"/>	Magnetic Loop Antenna	6502	EMCO	9810-2111	02-12-11
<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"/>	Plotter	7440A	H.P	2725A 75722	N/A
<input checked="" type="checkbox"/>	Chamber	DTEC01	DAETONG	-	N/A
<input type="checkbox"/>	Impedance Matching Pad	6001.01.A	SUNNER	3252	02-09-22
<input checked="" type="checkbox"/>	Thermo Hygograph	3-3122	ISUZU	3312201	03-01-10
<input checked="" type="checkbox"/>	BaroMeter	-	Regulus	-	-