

Certification of Compliance

CFR 47 Part 15 Subpart B / Class B PC Peripherals
CFR 47 Part 15 Subpart C / Operation in the band 88-108 MHz

Test Report File No. 04-IST-0045 Date of Issue Apr. 11, 2004

Model AP-200

Kind of Product Digital Audio Player

Applicant SODIFF E&T Co.,LTD.

Address 678-7, Changman-ri, Kwangtan-myun, Paju City, Kyunggi
Province, Korea

Manufacturer SODIFF E&T Co.,LTD.

Address 678-7, Changman-ri, Kwangtan-myun, Paju City, Kyunggi
Province, Korea

Test Result	(*) Positive	() Negative
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Reviewed By

Approved By



J.H. Lee / General Manager of EMC

G. Chung / Chief

- Investigations requested : Measurement to the relevant clauses of F.C.C rules and regulations Part 15 Subpart B - Class B PC Peripherals / FM Broadcast receivers
- Part 15 Subpart C - Operation in the band 88-108MHz
- The test report with appendix consists of 15 pages.
- The test result only responds to the tested sample.
- It is not allowed to copy this report even partly without the allowance of IST EMC Laboratory.
- This equipment as for has been shown to be capable of continued compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4 2001.



TABLE OF CONTENTS

Table of contents	2
Information of test laboratory, Environmental condition,	
Power used	3
Description of test	
Conducted Emission	4
Radiated Emission	5
Summary	6
Test conditions and data	
Conducted emissions	0.15 MHz - 30 MHz Applicable
Test equipment	7
Data and plots	8-11
Radiated emissions	30 MHz - 1 GHz Applicable
Test equipment	12
Data	13
Radiated Output Power & Occupied Bandwidth	14
Data & plots	15-16

INFORMATIONS OF TEST LABORATORY

EMC LABORATORY of IST Co., Ltd. (Yongin Lab., **Filed to FCC**)
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TEL : +82 31 323 3012 FAX : +82 31 323 3014

ENVIRONMENTAL CONDITIONS

Temperature	14 °C
Humidity	38 %
Atmospheric pressure	1002 mbar

POWER SUPPLY SYSTEM USED

Product Information

Memory	128MB
Voltage	1.5 V
Battttery	1 AAA Size Battery
LCD Display	Graphic LCD Letter(128 x64 dot)
Size(WxHxD)/ Weight	43 X 80 X 18mm35g / (Excluding battery)
Case	Plastic
File Transferring Speed	4.5 Mbps
Voice Recording	MPEG 1, 2, 2.5 Layer-3, VAD
Noise Ratio	90dB
Earphone Output	10mW
Output Frequency Rage	20Hz ~ 20KHz

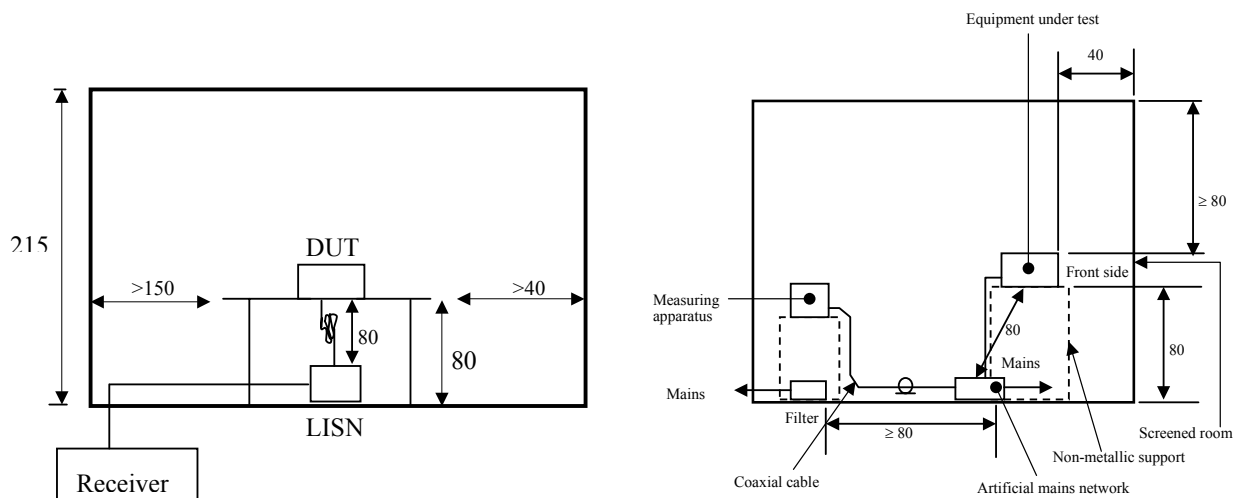
DESCRIPTIONS OF TEST

Conducted Emissions:

The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50 Ω /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 an bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located in a shielded room. The wooden table 80cm height is placed 40cm away from the vertical wall and 1.5m away from the other wall of the shielded room. The LISNs are bonded to bottom of the shielded room. The EUT is located on the wooden table with distance more than 80cm from the LISN and powered from the powered LISN .The peripheral equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cutting power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 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 this supply lines will be connected to the appropriate LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling 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 conditions. The RF output of the LISN was connected to the R/S receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was re-measured using Quasi-Peak detector and average detector by manual measurement or final measurement program of R&S, after scanned by automatic Peak mode for frequency range from 0.15 to 30MHz. The bandwidth of the receiver was set to 10kHz. The EUT, peripheral equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.



DESCRIPTION OF TEST

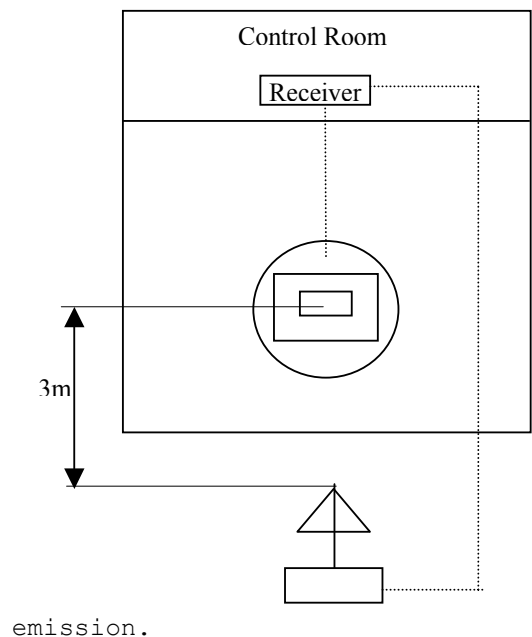
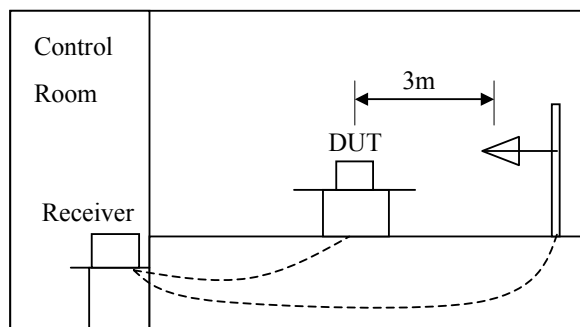
Radiated Emissions:

The measurement was 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 measurement was made with the detector set for "quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using bi-conical and log-periodic antennas, and spectrum analyzer to determine the frequency producing the max. emission in anechoic chamber. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turn-table azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30MHz to 230MHz using bi-conical antenna and 230 to 1000MHz using log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made at open site with 3 or 10 meters test distance using Bi-log antenna, Bi-conical antenna, Log-periodic antenna or horn antenna. The OATS have been verified in regular for its normalized site attenuations. The test equipment was placed on a wooden table. Sufficient time for the EUT, peripheral 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, peripheral equipment and interconnecting cables were configured as same in chamber, were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, peripheral equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system

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emission.

SUMMARY

☒ Conducted Emission

The requirements are

● MET

○ Not MET

Minimum limit margin

15.9dB at 0.180MHz

Maximum limit exceeding

Remarks : With A-V detector/Neutral Phase

☒ Radiated Emission

The requirements are

● MET

○ Not MET

Minimum limit margin

3.0dB at 825.1MHz

Maximum limit exceeding

Remarks : FM Transmitting Mode

Spurious

Radiated Output Power & Occupied Bandwidth

Reported By



H.C. Kim / EMC Engineer

Note :

☒ means the test is applicable, ☐ is not applicable.

TEST CONDITIONS AND DATA

Conducted Emissions

[Applicable]

◆ Test Equipment Used

Model Name	Manufacturer	Description	Next Cal. Date
ESH3	Rohde Schwarz	Receiver	Dec. 12, 2004
ESH2-Z5	Rohde Schwarz	LISN	Dec. 12, 2004
ESH3-Z2	Rohde Schwarz	Pulse Limiter	Dec. 12, 2004

◆ Auxiliary Equipment Used

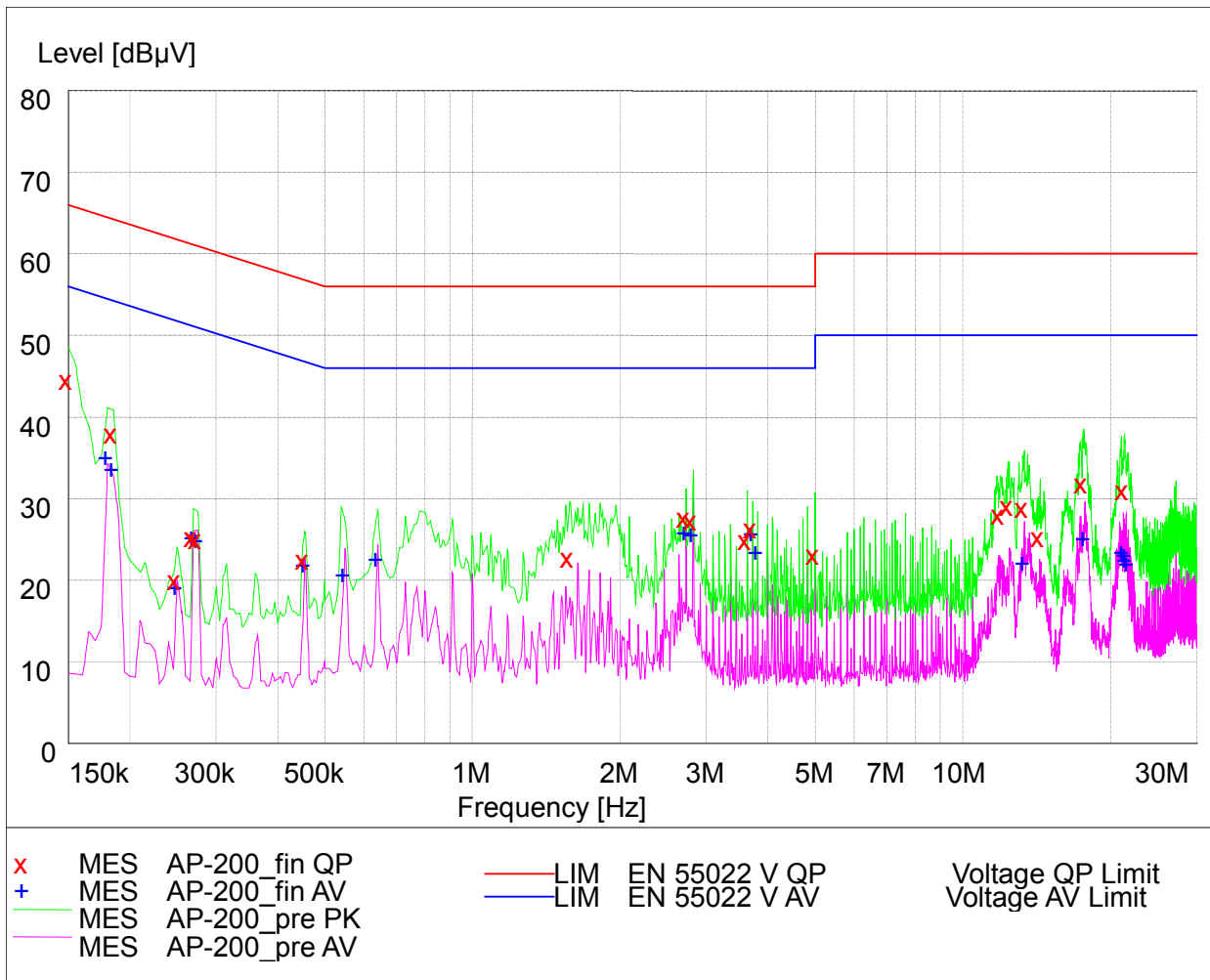
Model Name	Manufacturer	Descriptions	FCC Compliance information
Pavilion t328k	HP	Desktop PC	DoC
5219	HP	Keyboard (PS/2)	E5XKB5209
M042KO	HP	Mouse (PS/2)	DoC
529B	Daewoo	Monitor	FCC ID : C5F7NFFCMC529B
A0302380	Northern Telecom	Printer	FCC ID : BS46XU225C-L
SMB-400	Sejin Electron Inc	Mouse (RS-232C)	FCC ID : GJJS965M3
AN-2005	Aion Korea	Headphone/MIC	N/A
HD335F	NICs Intek	External HDD	FCC ID : QGJHD335

◆ Test Program Read and Write

◆ Test Area Shielded Room

Note : It was employed the EN standard in lieu of CFR 47 Part 15 Sec. 15.107.

Conducted Emissions



Live Phase

MEASUREMENT RESULT: "AP-200_fin QP"

3/9/04 1:50AM

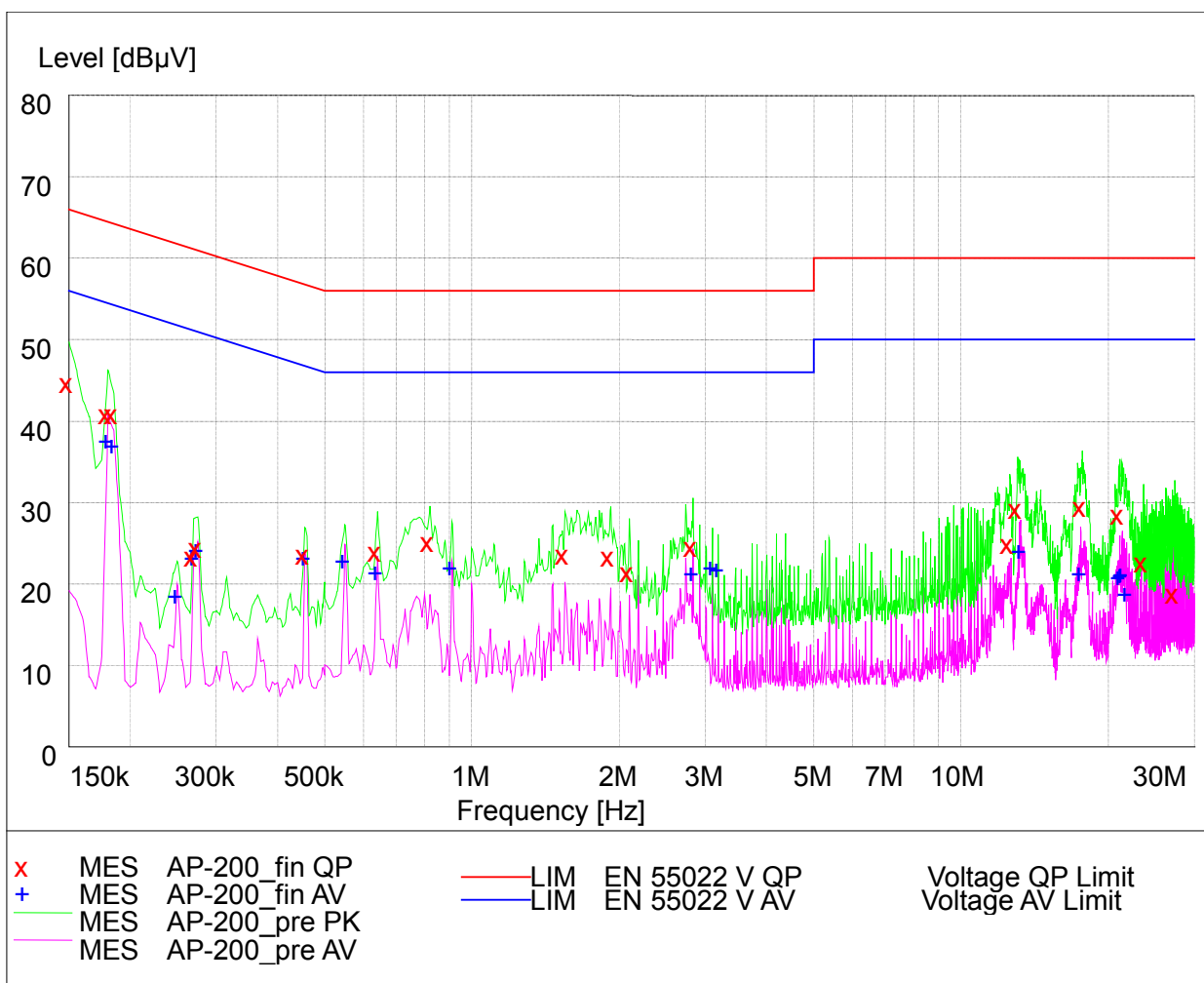
Frequency MHz	Level dBμV	Transd	Limit dB	Margin dBμV	Line dB	PE
0.150000	45.60	10.1	66	20.4	L1	GND
0.185000	39.00	10.1	64	25.3	L1	GND
0.250000	21.10	10.1	62	40.6	L1	GND
0.270000	26.40	10.1	61	34.7	L1	GND
0.275000	26.10	10.1	61	34.8	L1	GND
0.455000	23.60	10.2	57	33.2	L1	GND
1.580000	23.90	10.2	56	32.1	L1	GND
2.730000	28.70	10.3	56	27.3	L1	GND
2.820000	28.40	10.3	56	27.6	L1	GND
3.640000	26.00	10.3	56	30.0	L1	GND
3.730000	27.50	10.3	56	28.5	L1	GND
5.000000	24.20	10.4	56	31.8	L1	GND
11.960000	29.20	10.6	60	30.8	L1	GND
12.460000	30.20	10.7	60	29.8	L1	GND
13.360000	30.00	10.7	60	30.0	L1	GND
14.380000	26.40	10.8	60	33.6	L1	GND
17.660000	32.90	11.0	60	27.1	L1	GND
21.400000	32.20	11.3	60	27.8	L1	GND

MEASUREMENT RESULT: "AP-200_fin AV"

3/9/04 1:50AM

Frequency MHz	Level dBμV	Transd	Limit dB	Margin dBμV	Line dB	PE
0.180000	36.00	10.1	55	18.5	L1	GND
0.185000	34.60	10.1	54	19.7	L1	GND
0.250000	20.20	10.1	52	31.5	L1	GND
0.270000	26.20	10.1	51	24.9	L1	GND
0.275000	25.90	10.1	51	25.0	L1	GND
0.455000	22.90	10.2	47	23.9	L1	GND
0.550000	21.70	10.2	46	24.3	L1	GND
0.640000	23.70	10.2	46	22.3	L1	GND
2.730000	26.80	10.3	46	19.2	L1	GND
2.820000	26.60	10.3	46	19.4	L1	GND
3.730000	26.70	10.3	46	19.3	L1	GND
3.820000	24.50	10.3	46	21.5	L1	GND
13.360000	23.20	10.7	50	26.8	L1	GND
17.760000	26.10	11.0	50	23.9	L1	GND
21.260000	24.40	11.3	50	25.6	L1	GND
21.500000	24.10	11.3	50	25.9	L1	GND
21.580000	23.50	11.3	50	26.5	L1	GND
21.740000	23.00	11.3	50	27.0	L1	GND

Conducted Emissions



Neutral

MEASUREMENT RESULT: "AP-200_fin QP"

3/9/04 1:38AM

Frequency MHz	Level dBμV	Transd	Limit dB	Margin dBμV	Line dB	PE
0.150000	45.80	10.1	66	20.2	N	GND
0.180000	42.00	10.1	65	22.5	N	GND
0.185000	41.90	10.1	64	22.4	N	GND
0.270000	24.50	10.1	61	36.6	N	GND
0.275000	25.50	10.1	61	35.4	N	GND
0.455000	24.70	10.2	57	32.1	N	GND
0.640000	25.10	10.2	56	30.9	N	GND
0.820000	26.20	10.2	56	29.8	N	GND
1.550000	24.70	10.2	56	31.3	N	GND
1.920000	24.40	10.2	56	31.6	N	GND
2.100000	22.50	10.2	56	33.5	N	GND
2.830000	25.60	10.3	56	30.4	N	GND
12.600000	26.00	10.7	60	34.0	N	GND
13.080000	30.30	10.7	60	29.7	N	GND
17.720000	30.50	11.0	60	29.5	N	GND
21.140000	29.60	11.3	60	30.4	N	GND
23.600000	23.80	11.4	60	36.2	N	GND
27.420000	19.90	12.0	60	40.1	N	GND

MEASUREMENT RESULT: "AP-200_fin AV"

3/9/04 1:38AM

Frequency MHz	Level dBμV	Transd	Limit dB	Margin dBμV	Line dB	PE
0.180000	38.60	10.1	55	15.9	N	GND
0.185000	38.00	10.1	54	16.3	N	GND
0.250000	19.50	10.1	52	32.2	N	GND
0.270000	24.30	10.1	51	26.8	N	GND
0.275000	25.20	10.1	51	25.7	N	GND
0.455000	24.30	10.2	47	22.5	N	GND
0.550000	23.90	10.2	46	22.1	N	GND
0.640000	22.40	10.2	46	23.6	N	GND
0.910000	23.00	10.2	46	23.0	N	GND
2.830000	22.30	10.3	46	23.7	N	GND
3.100000	23.00	10.3	46	23.0	N	GND
3.190000	22.70	10.3	46	23.3	N	GND
13.240000	25.00	10.7	50	25.0	N	GND
17.580000	22.30	11.0	50	27.7	N	GND
21.160000	21.80	11.3	50	28.2	N	GND
21.320000	22.00	11.3	50	28.0	N	GND
21.400000	22.20	11.3	50	27.8	N	GND
21.800000	19.80	11.3	50	30.2	N	GND

TEST CONDITIONS AND DATA

Radiated Emission

[Applicable]

◆ Test Equipment Used

Model Name	Manufacturer	Description	Next Cal. Date
ESVS10	Rohde & Schwarz	Receiver	Dec. 12, 2004
HUF Z3	Rohde & Schwarz	Log-periodic Antenna	Jun. 21, 2004
VHA9103	SCHWARZBECK	Bi-conical Antenna	Jun. 20, 2004

◆ Auxiliary Equipment Used

Model Name	Manufacturer	Descriptions	FCC Compliance information
Pavilion t328k	HP	Desktop PC	DoC
5219	HP	Keyboard (PS/2)	E5XKB5209
M042KO	HP	Mouse (PS/2)	DoC
529B	Daewoo	Monitor	FCC ID : C5F7NFFCMC529B
A0302380	Northern Telecom	Printer	FCC ID : BS46XU225C-L
SMB-400	Sejin Electron Inc	Mouse (RS-232C)	FCC ID : GJJS965M3
AN-2005	Aion Korea	Headphone/MIC	N/A
HD335F	NICs Intek	External HDD	FCC ID : QGJHD335

◆ Test Program Read and Write / Playback / FM Receiving / FM Transmitting

◆ Test Area Open Area Test Site #1

Note :

Radiated Emissions

(Disturbance Radiation)

- The measured values are as following

Freq. (MHz)	Reading (dBuV/m)	C.Loss (dB)	Ant. Factor (dBuV/m)	Azimuth (°)	Ant. Height (cm)	Pol. (H/V)	Limits (dBuV/m)	Result (dB)	Margin [dB]
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Playback

169.6	12.8	3.1	15.4	53	176	H	43.5	31.3	12.2
180.9	14.3	3.3	15.3	229	170	H	43.5	32.9	10.6
192.2	16.1	3.4	15.7	43	162	H	43.5	35.2	8.3

FM Receiving

195.6	14.9	3.4	15.9	22	192	V	43.5	34.2	9.3
195.6	21.0	3.4	15.9	311	155	H	43.5	40.3	3.2
215.6	17.7	3.6	17.2	215	100	H	43.5	38.5	5.0

Read and Write

102.4	23.0	2.0	10.6	186	100	V	43.5	35.6	7.9
114.6	16.3	2.3	12.2	144	100	V	43.5	30.8	12.7
130.9	17.4	2.6	13.7	230	100	V	43.5	33.7	9.8
181.3	11.9	3.3	15.3	215	324	H	43.5	30.5	13.0
192.0	17.0	3.4	15.7	231	166	H	43.5	36.1	7.4
240.0	25.4	3.9	11.4	68	400	V	46.0	40.7	5.3
243.6	26.8	3.9	11.5	167	100	V	46.0	42.2	3.8
244.1	24.1	3.9	11.5	290	400	H	46.0	39.5	6.5
294.9	24.3	4.2	14.4	57	100	V	46.0	42.9	3.1

Note : Please refer to following pages for FM transmitting mode test result.

Radiated Emission Measurements

Occupied bandwidth according to 15.239(a)

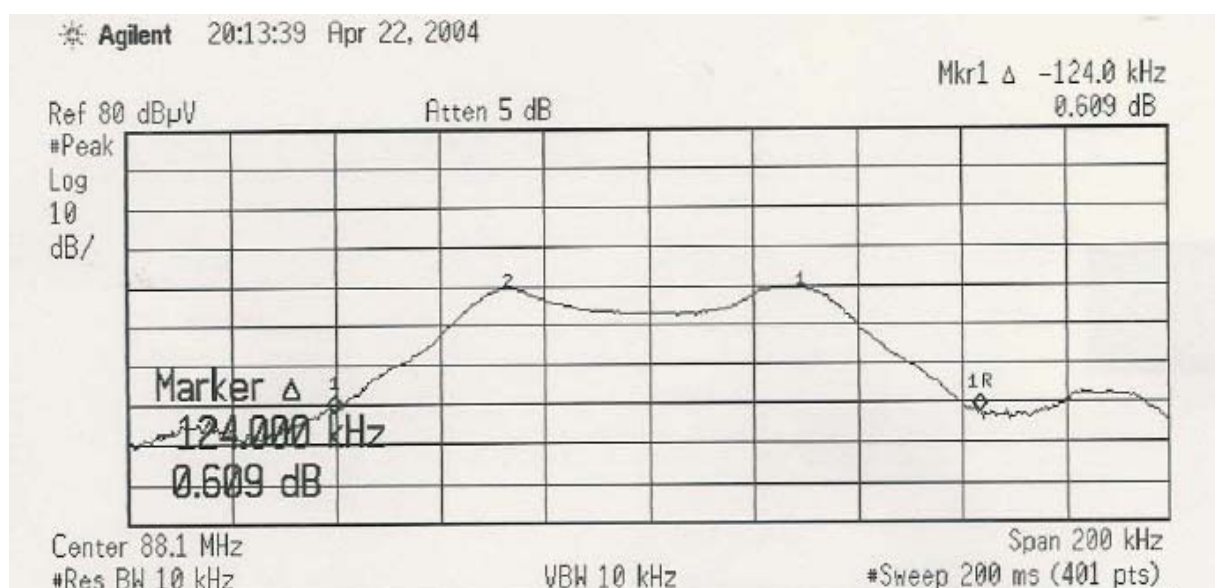
This test was performed to demonstrate that the emission from the EUT are confined within The band of 200KHz wide centered on the operating frequency. The 200KHz band shall lie Wholly within the frequency range 88-108MHz.

The measurements were performed at three channel: low(88.1MHz),middle(88.5MHz), and High(88.9MHz). The spectrum trace data around transmitter fundamental frequency was Obtained with the spectrum analyzer in "Max Hold" mode. The measured results are less than 200KHz. The measured spectrum of the signal is shown in Figure 1. Form the plot we see that in the worst case, the bandwidth is 129.5KHz at 88.5MHz.

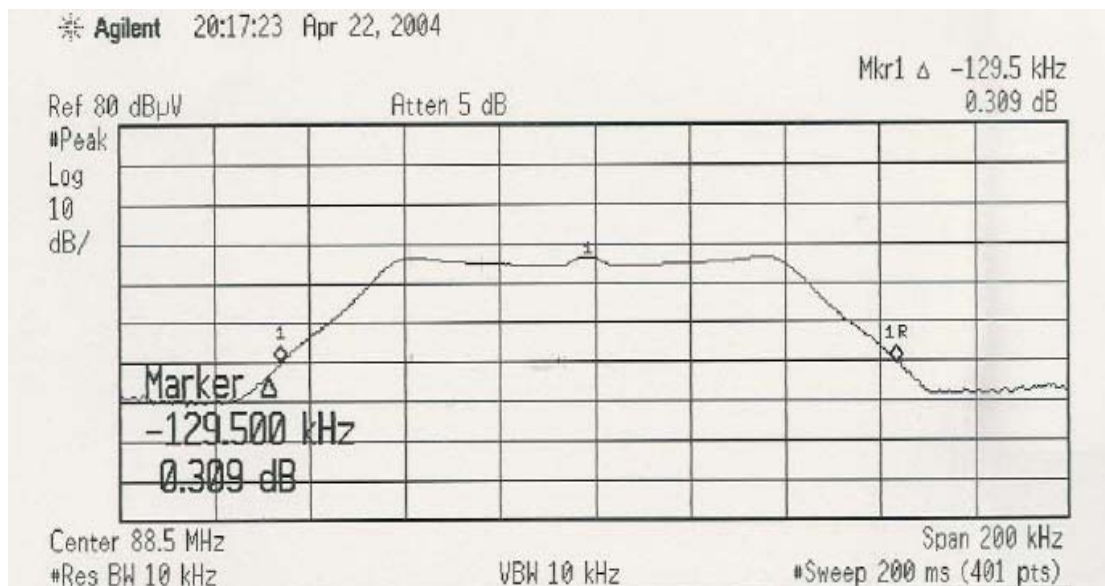
Center frequency (MHz)	Measured occupied bandwidth (KHz)	Pass/fail
88.1	124.0	Pass
88.5	129.5	Pass
88.9	125.5	pass

Occupied bandwidth measurement results

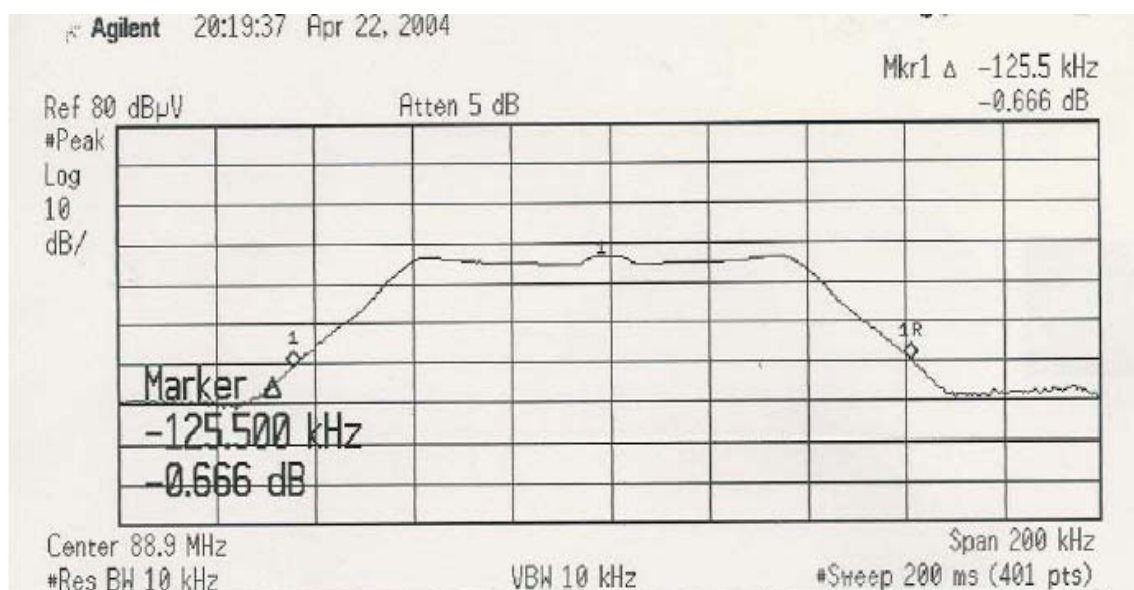
Figure 1:Occupied bandwidth measurement results



low channel (88.1MHz)



middle channel (88.5MHz)



high channel (88.9MHz)

Field strength of emissions according to 15.239(b)

According to 15.239(b), the field strength of emissions from intentional Radiated under these frequency band shall not exceed the following:

Fundamental frequency (MHz)	Field strength of Fundamental at 3m distance	
	uV/meter	dBuV/meter
88-108	250	48

Freq. (MHz)	Reading (dBuV/m)	C.Loss (dB)	Ant. Factor (dBuV/m)	Azimuth (°)	Ant. Height (cm)	Pol. (H/V)	Limits (dBuV/m)) AV	Result (dB) AV	Margin [dB]
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FM Transmitting

88.1	35.2	1.8	8.1	269	199	H	48	45.1	2.9
88.5	35.7	1.8	8.1	252	217	H	48	45.6	2.4
88.9	35.2	1.8	8.2	52	266	H	48	45.2	2.8

Out of band radiated emissions test according to 15.239(b)

This test performed to measure radiated emissions on frequencies outside of the specified 200KHz band and also to verify the EUT full compliance with 15.209,as followings:

Freq. (MHz)	Reading (dBuV/m)	C.Loss (dB)	Ant. Factor (dBuV/m)	Azimuth (°)	Ant. Height (cm)	Pol. (H/V)	Limits (dBuV/m)) QP	Result (dB) QP	Margin [dB]
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FM Transmitting

271.3	11.0	4.1	12.4	26	100	H	46.0	27.5	18.5
305.2	12.8	4.4	14.5	195	100	H	46.0	31.7	14.3
418.2	12.0	5.5	15.2	310	100	H	46.0	32.7	13.3
474.8	14.2	5.9	16.3	71	187	H	46.0	36.4	9.6
508.7	16.2	6.2	17.6	106	160	H	46.0	40.0	6.0
531.2	16.6	6.4	17.1	96	178	H	46.0	40.1	5.9
565.1	10.7	6.7	17.6	218	146	H	46.0	35.0	11.0
825.1	10.8	8.9	23.3	128	100	H	46.0	43.0	3.0
836.5	10.2	8.9	23.0	122	100	H	46.0	42.1	3.9

Note : 88.1 ~ 88.9MHz-(Fundamental) / 271.3 ~ 836.5MHz-(Spurious).

Characteristics of Device;

1. Apply Audio signal 1KHz 400mV into Audio mp3 file to mp3player of the FM transmitter .
2. Select the frequency to transmit(Channel 1:88.1MHz, Channel 2:88.5MHz, Channel 3:88.9MHz) then search the Car FM Radio to receiver the concern frequency.

Antenna requirement

1. Standard Applicable

According to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

2. Antenna Construction

The antenna is permanently mounted on **PCB**, no consideration of replacement.