



HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.

Product Compliance Division, EMC Team
SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNKI-DO, 467-701, KOREA
TEL : +82 31 639 8517 FAX : +82 31 639 8525

CERTIFICATION

Manufacture;

GAON Electronics CO., LTD.

#401, SUNGHWA BLDG., 528-7, GURO-DONG,
GURO-GU, SEOUL, REP. OF KOREA

GAON Electronics FRN : 0012-0940-17

Date of Issue: November 08, 2004

Test Report No.: HCT-F04-1110

Test Site: HYUNDAI CALIBRATION & CERTIFICATION
TECHNOLOGIES CO., LTD.

HCT FRN : 0005-8664-21

FCC ID :

SOKGTS-100

MODEL :

GTS-100

Rule Part(s): FCC PART 15 Subpart C(2001)

Equipment Class: FM Stereo Transmitter

Port/Connector(s): Audio Output / RCA Jack

This equipment has been shown to be in 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 (Grant Notes: #19, #28).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are 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.

Report prepared by : Ki-Soo Kim
Manager of EMC Tech. Part



HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.



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MEASUREMENT REPORT

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

Applicant Name:	GAON Electronics CO., LTD.
Address:	#401, SUNGHWA BLDG, 528-7, GURO-DONG, GURO-GU, SEOUL, REP. OF KOREA

- **Equipment Class:** Digital Device
- **EUT Type:** FM STEREO TRANSMITTER
- **Model(s):** GTS-100
- **Output Frequencies :** 88.1 ~ 88.7 MHz (User selectable)
- **Input audio Frequencies :** 50 Hz ~ 15 KHz
- **Method of modulation :** FM
- **Type pf radiowave :** one way communication
- **Number of channels :** 4
- **Operation humidity** 0% ~ 40%

• Input Power

1.5V AAA battery X 2 or DC12V car battery

Place of Tests : 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI KYOUNGKI-DO,467-701,KOREA

2.1 INTRODUCTION(Site Information)

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) was used in determining radiated and conducted emissions emanating from **GAON Electronics CO., LTD. FM STEREO TRANSMITTER. FCC ID : SOKGTS-100**

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO, 467-701,KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 24,2000 (Registration Number: EA90661)

3.1 PRODUCT INFORMATION

3.1.1 Equipment Description

Equipment Under Test (EUT) is **GAON Electronics CO., LTD.** **FM STEREO TRANSMITTER. (FCC ID : SOKGTS-100)**

• Equipment Class:	Digital Device
• EUT Type:	FM STEREO TRANSMITTER
• Model(s):	GTS-100
• Output Frequencies :	88.1 ~ 88.7 MHz (User selectable)
• Input audio Frequencies :	50 Hz ~ 15 KHz
• Method of modulation :	FM
• Type pf radiowave :	one way communication
• Number of channels :	4
• Operation humidity	0% ~ 40%
• Input Power	1.5V AAA battery X 2 or DC12V car battery

4.1 Limitation

4.1.1 Conducted Emission Limits:

The power line conducted RFI measurements were performed according to CISPR 22.

The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50 Ω / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50 Ω / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were 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 to determine the frequency producing the maximum EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was remeasured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the centre with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached. Each EME reported was calibrated using the Rohde & Schwarz SMX signal generator and are listed on Table 1. RFI Conducted CISPR Class B

RFI CONDUCTED		CISPR 22 CLASS B Limits dB(uV/m)	
Freq. Range	CISPR 22 Quasi-Peak	CISPR 22 Average	
150kHz - 0.5MHz	66-56**		56-46**
0.5MHz - 5MHz	56		46

5MHz - 30MHz	60	50
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Table 1. RFI Conducted Limits

4.1.2 Radiated Emission Limits:

According to 15.239 the field strength of emissions from internal radiators operated under these frequency band shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental	
	□/meter	□□/meter
88-108	250	48

Field strength limits are at the distance of 3 meter, emissions radiated outside of the specified band, shall be according to the general radiated limits in 15.209, as following table:

Other Frequencies (MHz)	Field Strength of Fundamental	
	□/meter	□□/meter
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.3 Emissions Band Limits:

According to 15.239(a), emissions from the intentional radiator shall be confined within a band 200kHz wide centered on the operating frequency. The 200kHz band shall lie wholly within the

frequency range of 88-108 MHz

5.1 List of Support Equipment

5.1.1 Support Equipment used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
FM STEREO TRANSMITTER (EUT)	GAON Electronics CO., LTD.	GTS-100	SOKGTS-100	N/A
MP3 PLAYER	IRIVER	Ifp-195tc	DoC	EUT

5.1.2 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
FM STEREO TRANSMITTER	Power	N	N/A	1.5(P)
	Audio In	N	N/A	0.3(D)

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

5.1.3 Noise Suppression Parts on Cable (I/O CABLE)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
FM STEREO TRANSMITTER	POWER	N	N/A	N	N/A
	Audio In	N	N/A	Y	EUT END

6.1 Conducted Emissions according to § 15.207

N/A

NOTES:

1. The EUT use 1.5V AAA battery X 2 or DC12V car battery
2. Skip the Conducted Emission Test according to §15.207(c)

7.1 Radiated Emissions according to § 15.239(b)

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
88.1	29.4	8.5	2.1	V	40.0 Av	48	-8.0
88.1	31.5	8.5	2.1	V	42.1 Pk	68	-25.9
88.3	29.6	8.5	2.1	V	40.2 Av	48	-7.8
88.3	31.5	8.5	2.1	V	42.1 Pk	68	-25.9
88.5	29.5	8.5	2.1	V	40.1 Av	48	-7.9
88.5	30.9	8.5	2.1	V	41.5 Pk	68	-26.5
88.7	29.2	8.5	2.1	V	39.8 Av	48	-8.2
88.7	30.0	8.5	2.1	V	40.6 Pk	68	-27.4

Radiated Measurements at 3-meters.

NOTES:

1. The radiated limits are listed on Table 2 (Page 7).
2. Av = Average detection mode, Pk = Peak detection mode.

8.1 Radiated Emissions according to § 15.239(C)

Frequency MHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
146.0	18.7	14.8	2.7	V	36.2	43.5	-7.3
144.0	15.1	14.7	2.6	H	32.4	43.5	-11.1
239.0	14.2	17.2	3.5	H	34.9	46	-11.1
435.1	12.3	18.0	4.8	V	35.1	46	-10.9

474.3	12.9	18.8	5.0	V	36.7	46	-9.3
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Radiated Measurements at 3-meters.

Center Frequency (MHz)	Measured occupied bandwidth (KHz)	Pass/Fail
88.1	89.5	Pass
88.3	67.5	Pass
88.5	65.5	Pass
88.7	67.0	Pass

NOTES:

1. The radiated limits are listed on Table 2 (Page 7).

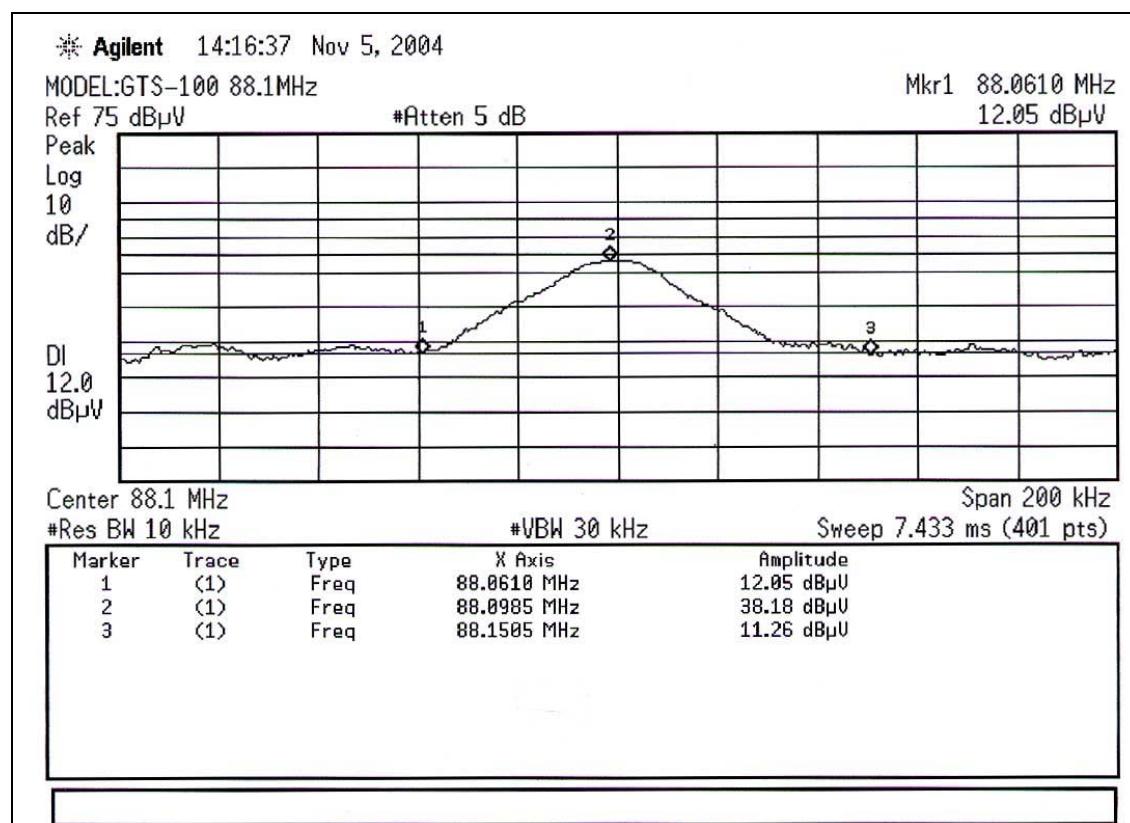
*** Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 3MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

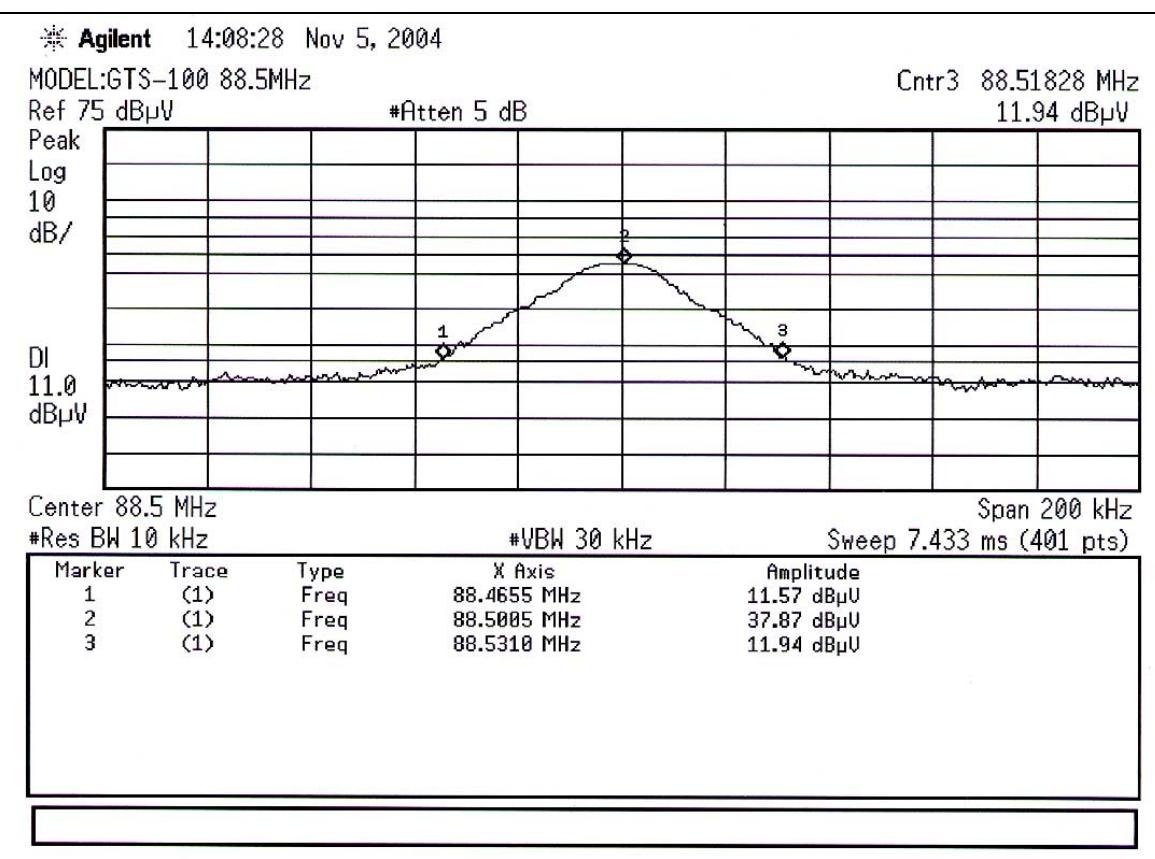
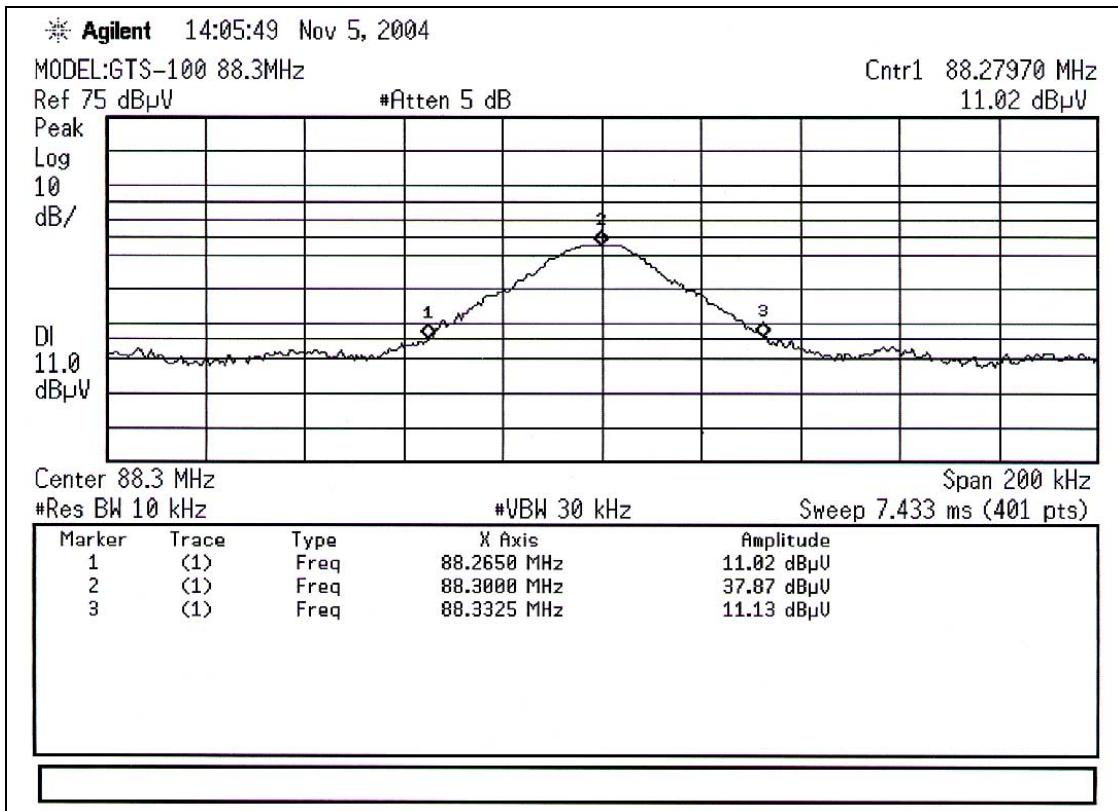
9.1 Emissions Band Measurement according to § 15.239(a)

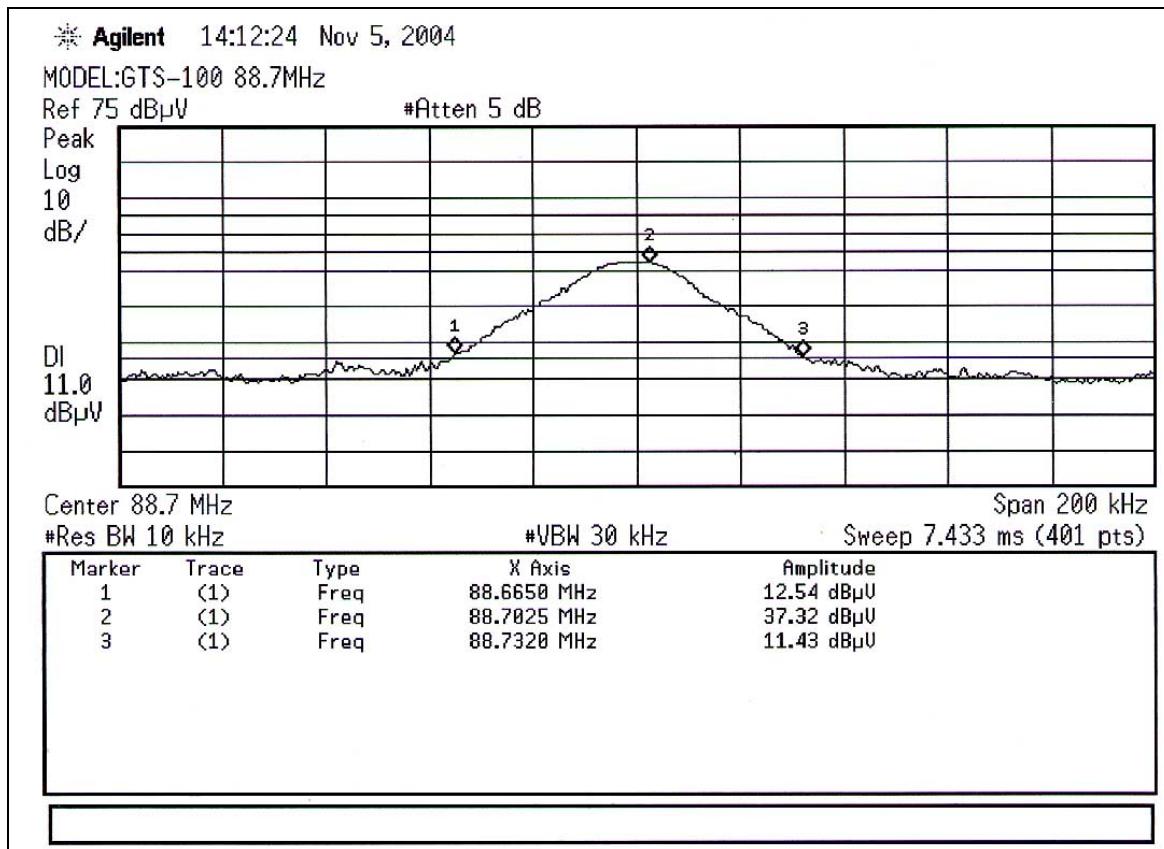
NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported.
2. The radiated limits are listed on Table 2 (Page 7).

Figure 1 : Occupied bandwidth measurement results







10.1 Sample Calculations

$$\text{dB } \square = 20 \log_{10} \square$$

$$\text{dB } \square = \text{dBm} + 107$$

9.1.2 Example 1:

@ 20.3 MHz

Class B limit	= 250 V = 47.96 dB V
Reading	= - 67.8 dBm (calibrated level)
Convert to db V	= - 67.8 + 107 = 39.2 dB V
10 ^(39.2/20)	= 91.2 V

$$\text{Margin} = 39.2 - 47.96 = - 8.76$$

$$= \mathbf{8.8 \text{ dB below limit}}$$

9.1.3 Example 2:

@ 66.7 MHz

Class B limit	= 100 \square V/m = 40.0 dB V/m
Reading	= - 76.0 dBm (calibrated level)
Convert to db V/m	= - 76.0 + 107 = 31.0 dB V/m
Antenna Factor + Cable Loss	= 5.8 dB
Total	= 36.8 dB V/m
Margin	= 36.8 - 40.0 = - 3.2
	= 3.2 dB below limit

11.1 Test Equipment

<u>Type</u>	<u>Manufacture</u>	<u>Model Number</u>	<u>CAL Due Date</u>
EMI Test Receiver	Rohde & Schwarz	ESI40	2004.11.16
EMI Test Receiver	Rohde & Schwarz	ESVS30	2005.07.16
LISN	Rohde & Schwarz	ESH2-Z5	2005.07.28
LISN	EMCO	ESH3-Z5	2005.07.28
Attenuator	Rohde & Schwarz	ESH3-Z2	2004.11.16
Amplifier	Hewlett-Packard	8447E	2005.08.23
TRILOG Antenna	Schwarzbeck	9160	2005.04.06
Antenna Position Tower	EMCO	1051-12	N/A
Turn Table	EMCO	1060-06	N/A
Power Analyzer	Voltech	PM 3300	2005.02.15
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2004.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A

12.1 Test Software Used

~~The EUT was actived standby mode during radiated and conducted testing.~~

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

The device under test was operated during the measurement under following conditions:

- 1KHz Audio signal was saved in the MP3 Player and used as source for signal transmission during EUT test.

13.1 Conclusion

The data collected shows that **GAON Electronics CO., LTD.** **FM STEREO TRANSMITTER.** **FCC ID :** **SOKGTS-100**

complies with §15.239(b), §15.209 and §15.207(c) of the FCC Rules.