



# Electromagnetic Emission

## FCC MEASUREMENT REPORT

### CERTIFICATION OF COMPLIANCE

#### FCC PART80 CERTIFICATION

<b>PRODUCT</b>	: Marine DSC/VHF Radio Telephone (For GMDSS)
<b>MODEL/TYPE NO</b>	: STR-580D
<b>FCC ID</b>	: RN6STR580D
<b>TRADE NAME</b>	: SAMYUNG ENC Co.,Ltd. SAMYUNG ENC Co.,Ltd.
<b>APPLICANT</b>	: 1123-17, Dongsam-Dong, Youngdo-gu, Busan, 606-083, Korea Attn. : In-Joon, Choi / Managing Director
<b>FCC CLASSIFICATION</b>	: GVH Part 80 VHF Transmitter (GMDSS)
<b>FCC RULE PART(S)</b>	: FCC Part 80 Stations in the Maritime Services
<b>FCC PROCEDURE</b>	: Certification
<b>DATES OF TEST</b>	: December 8, 2003
<b>DATES OF ISSUE</b>	: December 10, 2003
<b>TEST REPORT No.</b>	: BWS-03-RF-0004
<b>TEST LAB.</b>	: BWS Tech., Inc. (Registration No. : 553281)

This Wireless Microphone STR-580D has been tested in accordance with the measurement procedures specified in ANSI C63.4-2000 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part80.

I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision. 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 may not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tae Hyun, Nam  
Chief of Laboratory Division  
BWS TECH Inc.

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# FCC TEST REPORT

**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)

## 1. General Information

### Applicant

**Company Name** : SAMYUNG ENC Co., Ltd.  
**Company Address** : 1123-17, Dongsam-Dong, Youngdo-gu, Busan, 606-083, Korea  
**Phone/Fax** : Phone : +82-50-601-6600 Fax : +82-51-412-6616

### Manufacturer

**Company Name** : SAMYUNG ENC Co., Ltd.  
**Company Address** : 1123-17, Dongsam-Dong, Youngdo-gu, Busan, 606-083, Korea  
**Phone/Fax** : Phone : +82-50-601-6600 Fax : +82-51-412-6616

**● EUT Type :** Marine DSC/VHF Radio Telephone (For GMDSS)  
**● Model Number :** STR-580D  
**● FCC Identifier :** RN6STR580D  
**● S/N :** 2380  
**● Freq. Range :** 156.025 MHz ~ 157.425 MHz

**● Channel :**  
ITU Channel : 80CH  
USA/CNA Channel : 57CH  
Private Channel : 700CH  
Weather Channel (Receive Only) : 9CH  
Scan Memory Channel : 10CH

**● Modulation Method :** FM  
**● RF Power Output :** 25/1 Watt  
**● FCC Classification :** GVH : Part 80 VHF Transmitter (GMDSS)  
**● FCC Rule Part(s) :** FCC Part 80 Stations in the Maritime Services  
**● Test Procedure :** ANSI C63.4-2000  
**● Dates of Tests :** December 1, 2003

**● Place of Tests :**  
BWS TECH Inc.(FCC Registration Number : 553281)  
294-9, Jungdae-Dong, Kwangju-Si,  
Kyunggi-Do, 464-080, Korea  
TEL: +82 31 762 0124 FAX: +82 31 762 0126

**● Test Report No. :** BWS-03-RF-0004

## 2. Description of Test Facility

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The measurement for radiated and conducted emission test were conducted at the open area test site of BWS TECH Inc. facility located at 294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission 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 : 553281 ).

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.63.4-2000) was used in determining radiated and conducted emissions from the SAMYUNG ENC Co., Ltd. Marine DSC/VHF Radio Telephone Model : STR-580D.

### 3. Product Information

The Equipment Under Test (EUT) is the SAMYUNG ENC Co., Ltd. Marine DSC/VHF Radio Telephone model: STR-580D(FCC ID: RN6STR580D).

The STR-580D includes DSC/VHF radiotelephone and DSC watchkeeping receiver required by the Global Maritime Distress and Safety System(GMDSS). It is designed to be compact and lightweight for easy installation in any ship of 100 gross tons or more, as well as in conventional ships ( all passenger and cargo ships of over 300 gross tons engaged in international navigation).

The STR-580D is equipped with Digital Selective Calling(DSC) functions for distress calls and routine calls, as well as usual voice communication function.

It incorporates all the necessary units for DSC service , such as the DSC unit, CH70 watchkeeping receiver, and power supply.

#### 3.1 Client Information

DESCRIPTION	MODEL NO.	QUANTITY	REMARKS
1.VHF radiotelephone (main unit)	STR-580D		With handset Assembled into STR-580D
Mother Board	V-405	1	
RX Board	V-400	1	
DSC Board	V-401	1	
TX Drive	V-402	1	
Power supply	V-404	1	
Cup Board modem	V-406	1	
Front keyboard LCD display	V-407	1	
Power filter	V-408	1	
TX power AMP	V-467	1	
2.Antenna	SAN-150(RX/TX) (3dB)	1 set	With bracket
3.Antenna	SAN-150(DSC WKR) (3dB)	1 set	With bracket
4. Instruction manual		1EA	
5.LCD	DG12232S-2FBLY	1EA	
6.AC/DC Power Supply	SP-580AD	1set	
7.CABLE	VCTF1.25SQ X EC	2EA	
8.CABLE	VCTF1.25SQ X 4C	1EA	
VHF EMG LIGHT	DC24V / 3W		STAND TYPE
DSC/VHF PRINTER	DPU DPU----414		WITH CABLE
HANDSET	H H----36R		
ANTENNA CABLE	RG RG----8UY		
BATTERY CABLE	DPYCS DPYCS----2C X 14SQ		
AC POWER CABLE	DPYCS DPYCS--2C X 2.0 SQ		

### 3.2 General Specification

General	Transmission frequency range	DUP 156.025 - 157.425 MHz SIMP 156.025 - 157.425 MHz
	Reception frequency range	156,000-162.550
	CHANNEL capacity	USA/CNA CHANNEL MAX 57CH ITU CH:MAX 80 CH PRIVATE CHANNEL MAX 560CH SCAN MEMORY CHANNEL MAX 10CH WEATHER CHANNEL (reception only) 9CH
	Channel spacing	25KHz
	Communication modes	Simplex and duplex press to talk (simplex and semi duplex on private channels)
	Type of emission	F3E, F2B(G3E, G2B)
	Frequency accuracy	Within $1 \times 10^{-6}$
	Antenna impedance	50ohm
	Main controls	Transmitting and stopping distress signals, transmission and reception channels, transmission power setting, dimmer, squelch
	Main display item	transmission and reception channels, output power, scan condition, alarm condition, speaker mode, date, time, position, DSC condition etc.
	Rated power supply voltage	DC24V (DC18 - 31.2V) AC110V/AC220V 10%(50/60Hz 6%)
	Current consumption	DC13.6V 25W TRANSMISSION 6A MAX RECEIVING 1.5A MAX
	Dimension and weight	216mm(H) x 80mm(w) x 302mm(D) (excluding projecting parts)
Transmitter	Antenna output power	25w +20% - 50%, 0.1 - 1w (reduced output)
	Oscillation method	Synthesizer method
	Maximum frequency deviation	within 5KHz
	Occupied bandwidth	within 16KHz
	Microphone input impedance	600ohm balanced
	Standard modulation input	-53dBm
	Pre-emphasis characteristics	6dB/oct characteristic +dB, -3dB
	Overall distortion	10% or less
	Signal-to-noise ratio	20dB or more
	Spurious emission	2.5 $\mu$ V or less
	DSC modulation rate	1200baud $30 \times 10^{-6}$
	DSC modulation method	FSK

Receiver	Receiving system	Superheterodyne
	1 st 1F	21.4 MHz
	2 nd 1F	455 KHz
	Local oscillation frequency	Reception frequency - 21.4 MHz
	Local oscillation method	Synthesizer method
	Sensitivity	2 $\mu$ V or less (20dB N/S)
	Sensitivity (DSC)	Symbol error rate at 1 $\mu$ V is 1 % or less
	Squelch sensitivity	1 $\mu$ V or less
	Selectivity	6dB bandwidth : 12 KHz or more 70dB bandwidth : 25KHz or less
	Spurious response	80dB or more (20 dB N/S)
	Spurious response(DSC)	Symbol error rate is 1% or less at a wanted signal level of 3dBu and an unwanted signal level of 73dBu
	Blocking	90dBu or more (20dBu N/S)
	Blocking(DSC)	Symbol error rate is 1% or less at wanted signal level of 3dBu and an unwanted signal level of 68dBu
	Intermodulation	70dBu or more (20dB N/S)
	Intermodulation(DSC)	Symbol error rate is 1% or less at wanted signal level of 3dBu and an unwanted signal level of 68dBu
	Overall distortion	10% or less
	Signal-to-noise ratio	40dB or more
	Rated audio output	1 w (8ohm)
	De-emphasis characteristics	6dB/oct, +1dB, -3dB
	message file for distress	message :20 for the other messages :20
CH70 Watchkeeping Receiver	Receiving frequency	156.525 MHz (CH70)
	Reception mode	F2B(G2B)
	Frequency accuracy	Within $1 \times 10^{-6}$
	Antenna impedance	50 ohm unbalanced
	Reception method	Double superheterodyne
	1 st 1F	10.7 MHz
	2 st 1F	455 KHz
	Local oscillation frequency	145.825 MHz
	Local oscillation method	FREQUENCY SYNTHESIZER
	Sensitivity	Symbol error rate of 1% or less at 1uv
	Spurious response	Symbol error rate of 1% or less at a wanted signal level of 3dBu and unwanted signal level of 73dBu
	Blocking	Symbol error rate of 1% or less at a wanted signal level of 3dBu and unwanted signal level of 73dBu
	Intermodulation	Symbol error rate of 1% or less at a wanted signal level of 3dBu and unwanted signal level of 68dBu
	DE-EMPHASIS	6dB/OCT , +1dB, -3dB
	Radiation	4000 uuW or less

## 4. Summary of Test Results

TEST REQUIREMENTS	FCC Paragraph	Spec.	Meas.	Result
RF Power Output (Conducted)	§2.1046 §80.215	25 / 1 Watt	25 / 1	Pass
RF Power Output (ERP)	§80.215	18 Watt	17.74	Pass
RF Exposure (MPE)	§1.1310, §2.1091	-	0.76	Pass
Audio Frequency Response	§2.1047	N/A	Graph	Pass
Audio Low pass Filter Response	§2.1047	N/A	Graph	Pass
Modulation Limiting	§2.1047	5 kHz	Graph	Pass
Occupied Bandwidth	§80.211	Emission Mask	Plot	Pass
Field Strength of Spurious Radiation	§2.1053 §80.211	43+10log <sub>10</sub> P	Plot	Pass
Spurious Emissions at Antenna Terminals	§2.1053 §80.211	43+10log <sub>10</sub> P	66.19	Pass
Frequency Stability/Temperature Variation	§2.1053	5 x 10 <sup>-6</sup>	Graph	Pass

## 5. TEST DATA

### 5.1 RF Power Output (Conducted) : FCC Rules Part 2 §2.1046 , §80.215

#### 5.1.1 Method of Measurement

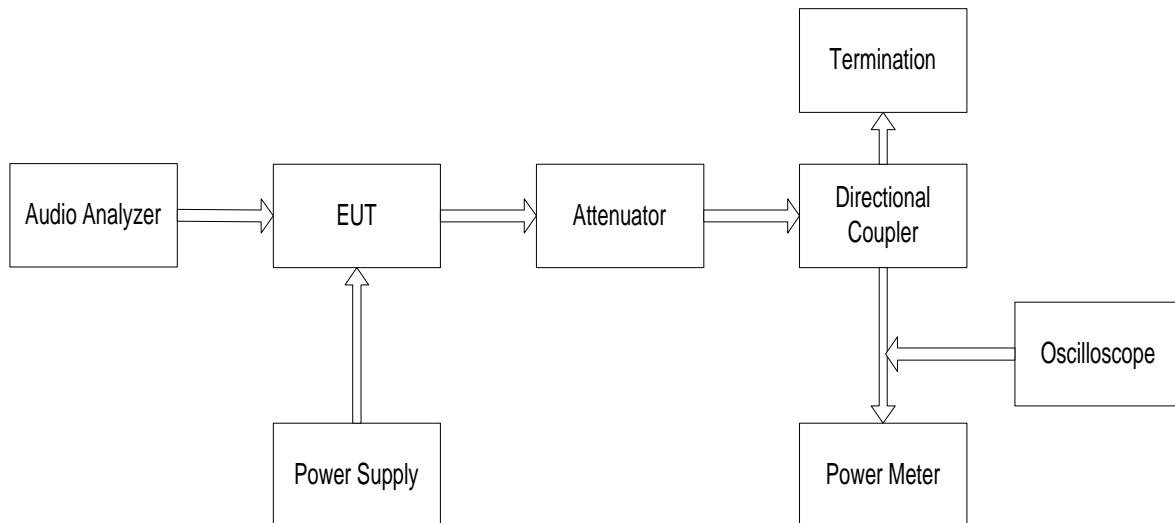


Fig.1

Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Audio Analyzer	8903B	Agilent
Attenuator	RFA500NMF30	BWS
Directional Coupler	778D	Agilent
Termination	8173	Bird
Oscilloscope	TDS3032	Tektronix
Power Sensor	8481A	Agilent
Power Meter	E4418A	Agilent

## 5.1.2 Test Result

### 5.1.2.1. High Power (25 Watt)

Transmitter Channel Setting	Frequency Tuned (MHz)	Measured Power (dBm)	Rated Power (Watts)	Limit (Watt)
Lowest	156.050	43.97	25.00	25.00
Middle	156.900	43.90	24.55	25.00
Highest	157.425	43.93	24.72	25.00

### 5.1.2.2. Low Power (1 Watt)

Transmitter Channel Setting	Frequency Tuned (MHz)	Measured Power (dBm)	Rated Power (Watts)	Limit (Watt)
Lowest	156.050	30.00	1.00	1.00
Middle	156.900	29.95	0.99	1.00
Highest	157.425	29.97	0.99	1.00

Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 1 , and was loaded into a 50 ohm resistive termination.
2. The unit was powered though its normally accompanied power cord by a DC power supply.
3. Power supply voltage was set to nominal voltage at the power supply terminals with transmitter off.
4. The unit was operated for three consecutive test cycles of 15 minutes standby and 5 minutes in transmitting.
5. At the end of the third 5 minutes period, the RF output power is measured.
6. During the test, no components of the emission spectrum exceed the limit specified in the applicable rule part for occupied bandwidth or emission limitations.
7. FCC Limits (According to part 80.215): High (25Watt) and Low (1 Watt)

## 5.2 RF Power Output (ERP) : FCC Rules Part 80 §80.215

### 5.2.1 Method of Measurement

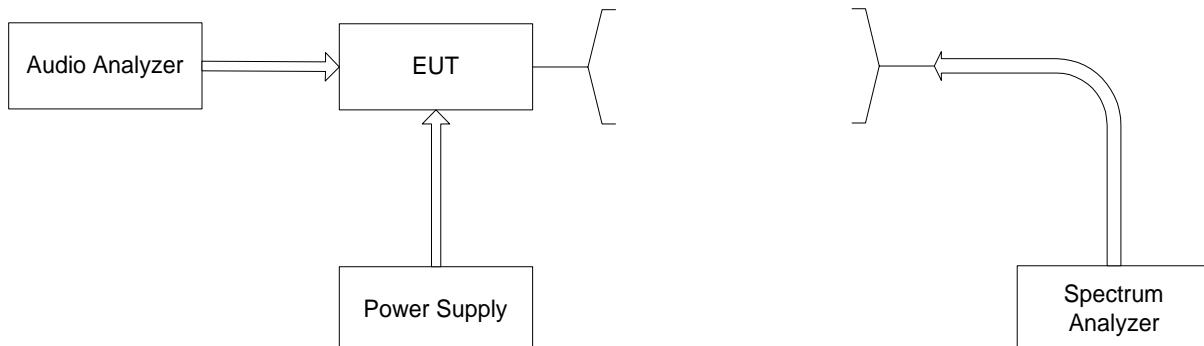


Fig. 2

### Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
RX/TX Antenna	SAN-150	SAMYUNG ENC
Audio Analyzer	8903B	Agilent
Spectrum Analyzer	E7403A	Agilent
Biconical Antenna	VHA9103(BBA9106)	SWALZBECK
Log Periodic Antenna	LP01	PMM

### 5.2.2 Test Result

ERP Power Frequency Tuned (MHz)	EUT Conducted Power (dBm)	Max. E-Field of EUT (dBm)	Antenna Polarization (V/H)	Signal GEN. Power (dBm)	Dipole Gain (dBi)	Measured ERP Power		Limit (Watt)
						dBm	Watts	
156.050	44.00	28.17	V	26.13	2.04	42.49	17.74	18.00
156.900	43.83	28.03	V	25.91	2.12	42.35	17.18	18.00
157.425	43.83	28.09	V	25.91	2.18	42.41	17.42	18.00

Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 2.
2. Transmitter was set to the high power output condition.
3. The EUT antenna as specified by the manufacturer was used(unity gain).
4. The maximum measured ERP is dBm( Watts), as recorded in the above table.
5. FCC Limits (according to part 80.215) : 18 Watt

## 5.3 RF Exposure Requirements : FCC Rules Part 1 §1.1310, §2.1091

### 5.3.1 Method of Measurement

Maritime Services operating under section Part80 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits. These devices are not exempted from compliance does not exceed the Commission's RF exposure guidelines. Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.

Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits Any other RF exposure related issues that may affect MPE compliance.

### 5.3.2 Limits

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

#### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
30-300	61.4	0.163	1.0	6
(B) Limits for General Population/Uncontrolled Exposure				
30-300	27.5	0.073	0.2	30

### 5.3.3 Test Result

Frequency (MHz)	Measured ERP Power (dBm)	Antenna Gain (dBi)	Calculated EIRP (Watt)	Duty cycle (%)	The time averaged power over 30 minutes (Watt)	Laboratory's Recommended Minimum RF Safety Distance r (meters)
156.050	42.49	2.04	28.38	50	14.19	0.75
156.900	42.35	2.12	27.99	50	14.00	0.75
157.425	42.41	2.18	28.77	50	14.39	0.76

#### Calculation Method of RF Safety Distance:

$$S = \frac{PG}{4\pi r^2} = \frac{EIRP}{4\pi r^2}$$

P : power input to the antenna in mW  
 EIRP : Equivalent (effective) isotropic radiated power.  
 S : power density mW/cm<sup>2</sup>  
 G : numeric gain of antenna relative to isotropic radiator  
 R : distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{\frac{PG}{4\pi S}} = \sqrt{\frac{EIRP}{4\pi S}}$$

Note :

1. S = 0.2 mW/cm<sup>2</sup> for Limits for General Population/Uncontrolled Exposures.
2. This Equipment assume a typical transceiver duty cycle with 50% transmit time.
3. The time averaged power over 30 minutes will be calculated from 15 minutes TX on time and 15 minutes TX off time .
4. Minimum calculated separation distance between antenna and persons required : 0.76m

## 5.4 Modulation Characteristics – Audio Frequency Response : FCC Rules Part 2 §2.1047

### 5.4.1 Method of Measurement

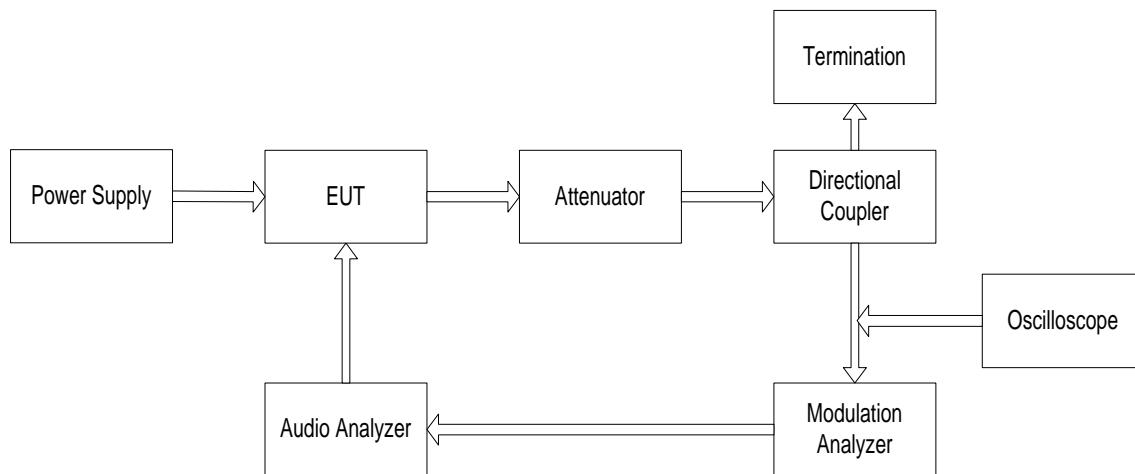


Fig. 3

### Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	RFA500NMF30	BWS
Directional Coupler	778D	Agilent
Termination	8173	Bird
Oscilloscope	TDS3032	Tektronix

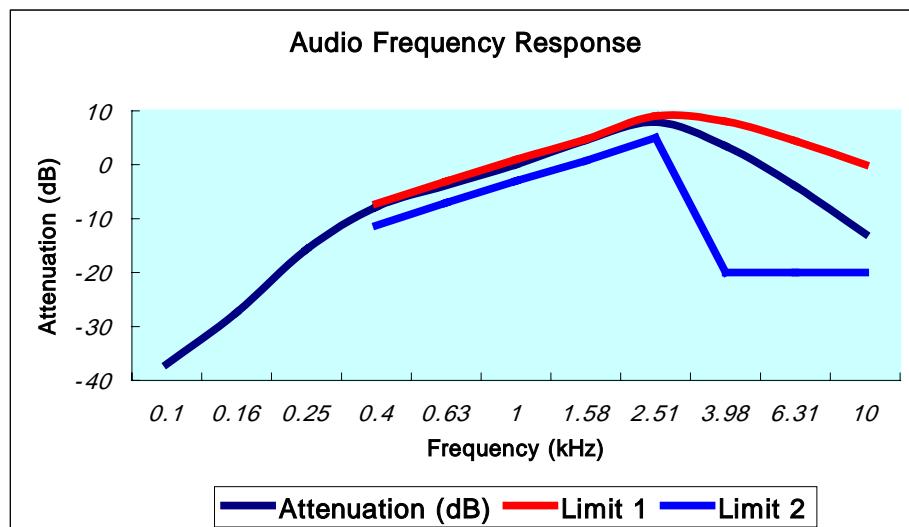
#### Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 3 , and was loaded into a 50 ohm resistive termination.
2. The audio analyzer was connected to the audio input circuit/microphone of the EUT.
3. The audio signal input was adjusted to obtain 50% modulation at 1 kHz, and this point was taken as the 0 dB reference level.
4. With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 50 Hz to 10 kHz.
5. The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.

### 5.4.2 Test Result

Audio Input Frequency (Hz)	Attenuation (dB)	Input Audio Frequency (Hz)	Attenuation (dB)	Input Audio Frequency (Hz)	Attenuation (dB)
50	-38.0	900	-0.9	2600	7.9
60	-38.0	1000	0	2700	7.8
70	-38.0	1100	0.9	2800	7.6
80	-38.0	1200	1.7	2900	7.3
90	-38.0	1300	2.5	3000	7.1
100	-37.0	1400	3.3	3100	6.7
150	-29.0	1500	4.0	3200	6.4
200	-21.2	1600	4.7	3300	6.0
250	-15.7	1700	5.3	3400	5.7
300	-12.0	1800	5.9	3500	5.3
350	-9.5	1900	6.4	4000	3.4
400	-7.8	2000	6.9	5000	-0.1
450	-6.6	2100	7.3	6000	-3.1
500	-5.7	2200	7.5	7000	-5.8
600	-4.2	2300	7.7	8000	-8.3
700	-3.0	2400	7.9	9000	-10.6
800	-1.9	2500	7.9	10000	-12.8

### 5.4.3 Graph



## 5.5 Modulation Characteristics – Audio Low pass Filter Response : FCC Rules Part 2 §2.1047

### 5.5.1 Method of Measurement

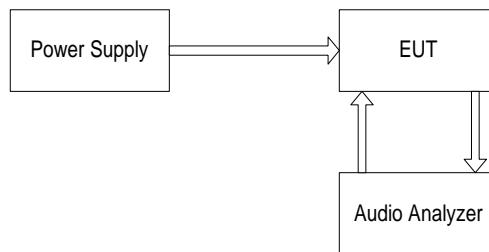


Fig. 4

Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Audio Analyzer	8903B	Agilent

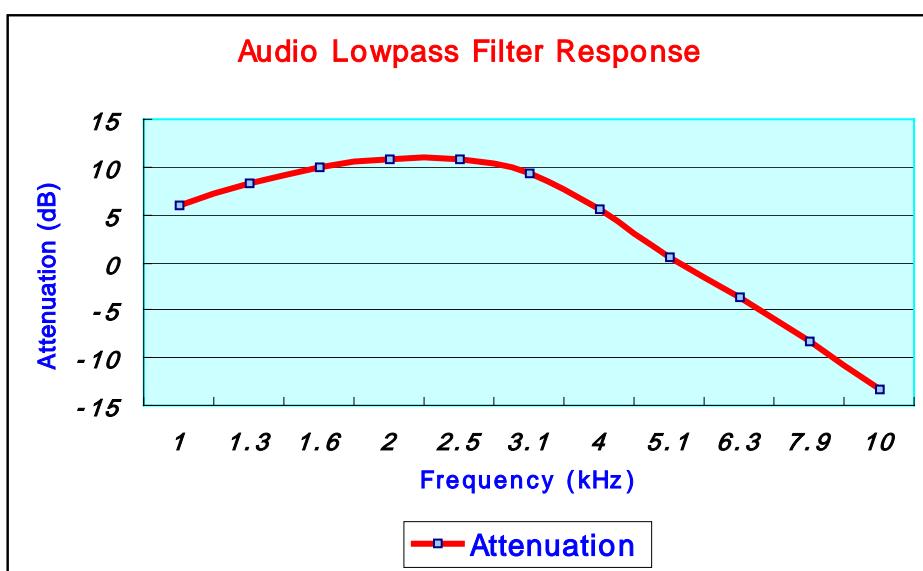
Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 4 , and was loaded into a 50 ohm resistive termination.
2. To measure the audio low pass filter response, an audio analyzer were connected to the actual Printed Circuit Board of the transmitter.
3. Audio analyzer monitored the output of the audio filter.
4. An AF input level was maintained constant at least 10 dB below the saturation level at maximum response frequency.
5. The measurement was made under the above conditions by varying the frequency between 50Hz and 10kHz.

### 5.5.2 Test Result

Audio Input Frequency (Hz)	Attenuation (dB)	Input Audio Frequency (Hz)	Attenuation (dB)	Input Audio Frequency (Hz)	Attenuation (dB)
50	-23.7	900	5.1	2600	10.7
60	-21.3	1000	5.9	2700	10.5
70	-19.4	1100	6.7	2800	10.3
80	-17.7	1200	7.5	2900	10.1
90	-16.4	1300	8.2	3000	9.8
100	-15.2	1400	8.9	3100	9.5
150	-10.9	1500	9.4	3200	9.1
200	-8.1	1600	9.9	3300	8.7
250	-6.0	1700	10.2	3400	8.3
300	-4.3	1800	10.5	3500	7.8
350	-2.8	1900	10.7	4000	5.5
400	-1.6	2000	10.8	5000	1.3
450	-0.5	2100	10.9	6000	-2.3
500	0.4	2200	10.9	7000	-5.5
600	2.1	2300	10.9	8000	-8.3
700	3.3	2400	10.9	9000	-10.9
800	4.3	2500	10.8	10000	-13.3

### 5.5.3 Graph



## 5.6 Modulation Characteristics – Modulation Limiting : FCC Rules Part 2 §2.1047

### 5.6.1 Method of Measurement

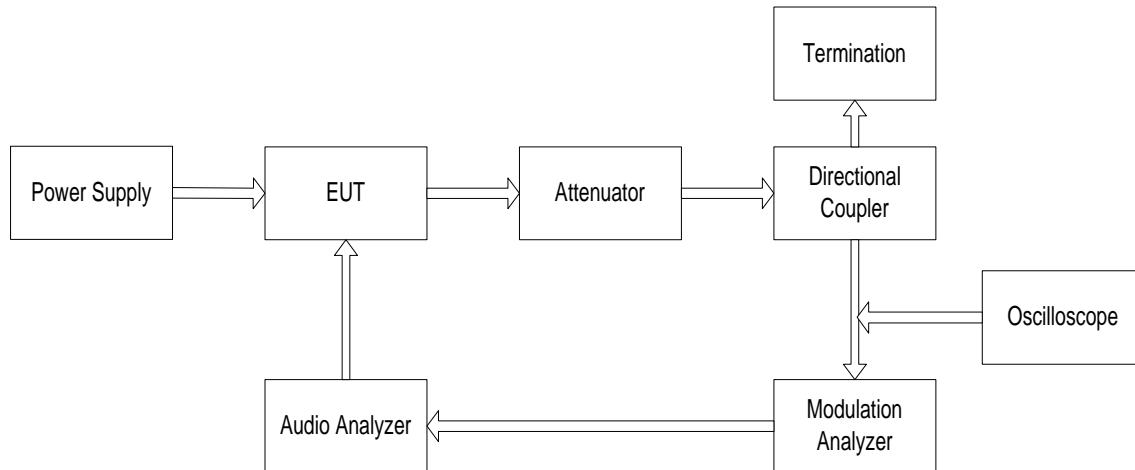


Fig. 5

### Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	RFA500NMF30	BWS
Directional Coupler	778D	Agilent
Termination	8173	Bird
Oscilloscope	TDS3032	Tektronix

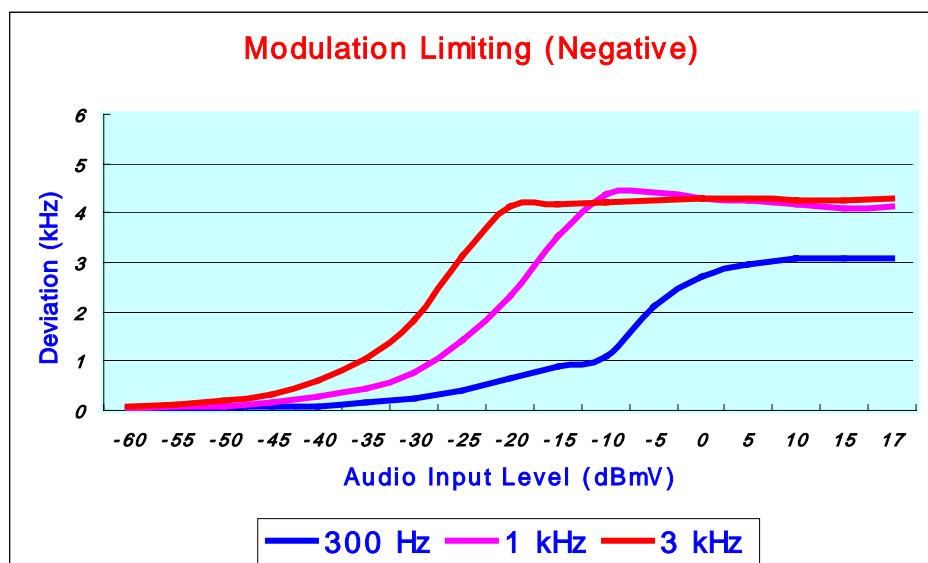
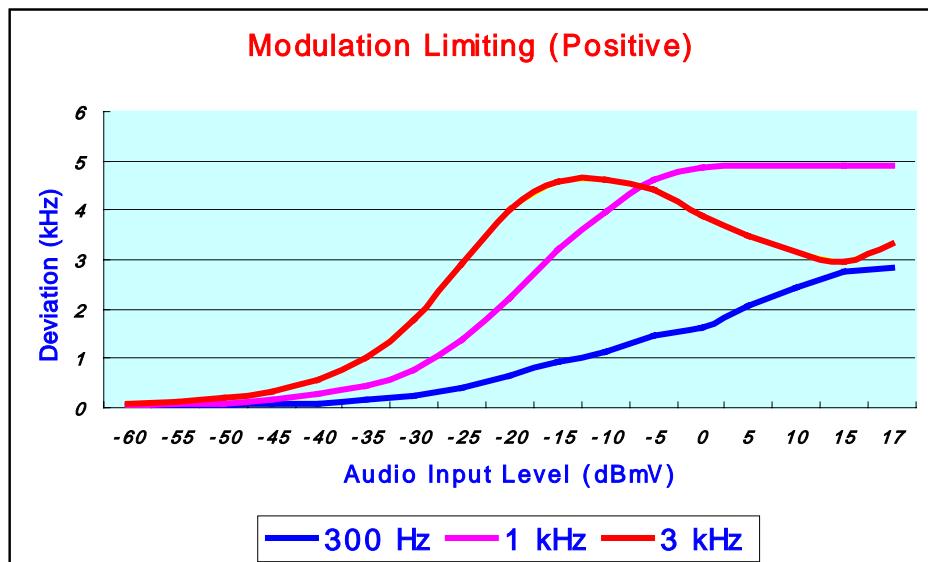
#### Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 5 , and was loaded into a 50 ohm resistive termination.
2. The modulation response was measured for each of three frequencies (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.
3. The input level was varied from 30% modulation ( $\pm 1.5$  kHz deviation) to at least 20 dB higher than the saturation point.
4. Measurements were performed for both negative and positive modulation and the respective results were recorded.
5. The limit was applied according the 5 kHz.

### 5.6.2 Test Result

Audio Input Level (dBmV)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-60	0.03	0.05	0.09	0.03	0.06	0.09
-55	0.04	0.08	0.13	0.04	0.07	0.13
-50	0.05	0.10	0.21	0.05	0.10	0.20
-45	0.07	0.17	0.34	0.07	0.16	0.34
-40	0.10	0.27	0.58	0.09	0.27	0.59
-35	0.15	0.45	1.01	0.15	0.46	1.04
-30	0.25	0.78	1.78	0.23	0.79	1.83
-25	0.40	1.36	2.93	0.40	1.40	3.14
-20	0.66	2.22	4.01	0.63	2.33	4.12
-15	0.93	3.20	4.60	0.89	3.51	4.19
-10	1.13	3.99	4.64	1.09	4.38	4.23
-5	1.46	4.63	4.42	2.09	4.40	4.27
0	1.63	4.88	3.91	2.71	4.30	4.29
5	2.05	4.91	3.50	2.94	4.24	4.28
10	2.45	4.90	3.17	3.09	4.17	4.27
15	2.76	4.89	2.95	3.09	4.11	4.25
17	2.85	4.90	3.32	3.07	4.14	4.28

### 5.6.3 Graph



## 5.7 Occupied Bandwidth : FCC Rules Part 80 §80.211

### 5.7.1 Method of Measurement

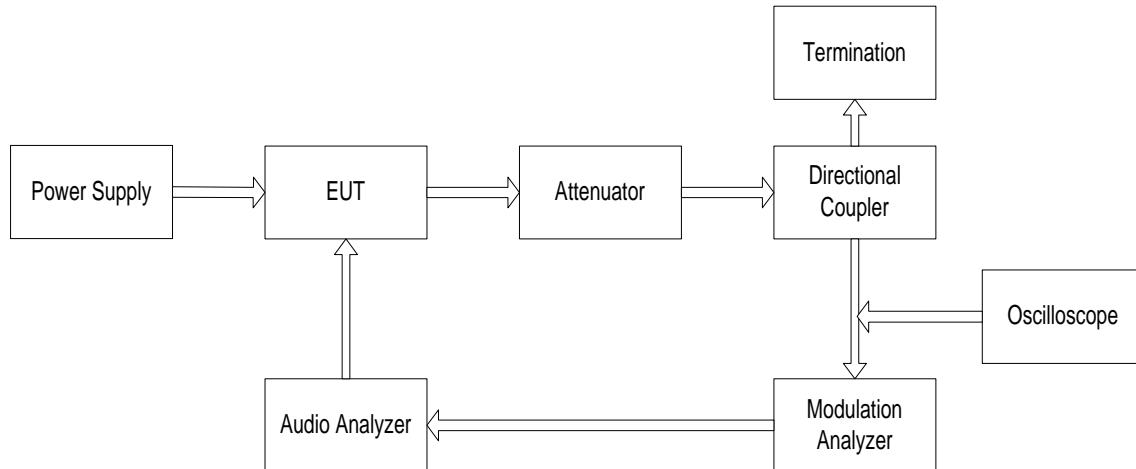


Fig. 6

### Test Equipment List

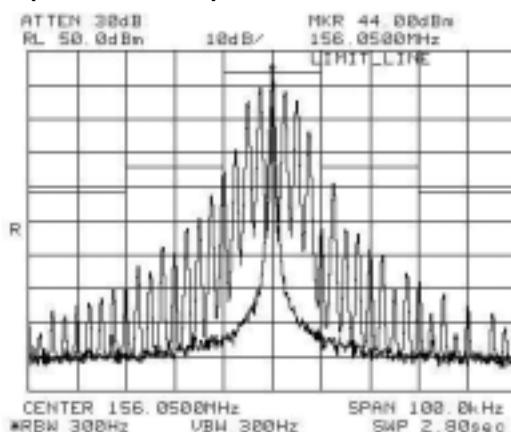
Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	RFA500NMF30	BWS
Directional Coupler	778D	Agilent
Termination	8173	Bird
Oscilloscope	TDS3032	Tektronix

#### Note :

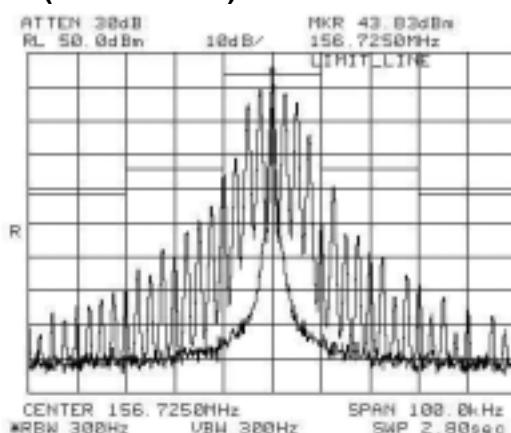
1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 6 , and was loaded into a 50 ohm resistive termination.
2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for  $\pm 2.5$  kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.
5. Authorized Bandwidth is 20kHz according to part 80.205.
6. FCC Limits (according to part 80.215)
  - 50~150% (10~30kHz) of assigned frequency : 28 dB
  - 150~250% (30~50kHz) of assigned frequency : 35 dB
  - Above 250% (50kHz) of assigned frequency :  $43+10\log_{10}$  (mean power in watts) dB dB

## 5.7.2 Test Plot

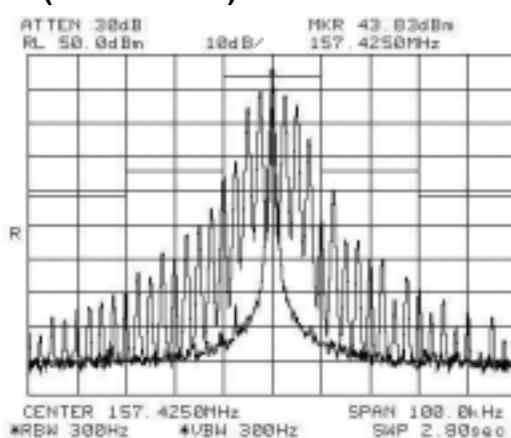
### 5.7.2.1 Ch.1 (156.050 MHz)



### 5.7.2.2 Ch.18 (156.7250 MHz)



### 5.7.2.3 Ch.88 (157.425 MHz)



## 5.8 Field Strength of Spurious Radiation : FCC Rules Part 2 §2.1053(a)

### 5.8.1 Method of Measurement

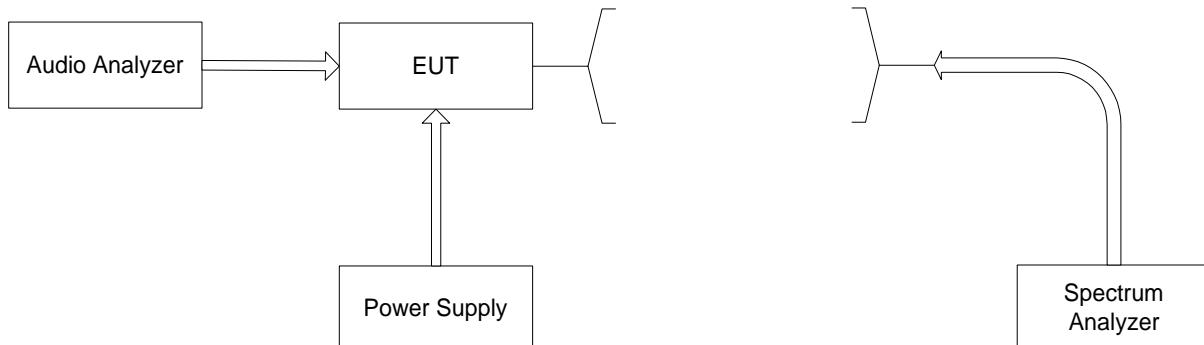


Fig. 7

### Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNGNC
Power Supply	STR-580AD	SAMYUNGNC
RX/TX Antenna	SAN-150	SAMYUNGNC
Audio Analyzer	8903B	Agilent
Spectrum Analyzer	E7403A	Agilent
Biconical Antenna	VHA9103(BBA9106)	SWALZBECK
Log Periodic Antenna	LP01	PMM

### 5.8.2 Test Result : PASSED

ERP Power Frequency Tuned (MHz)	EUT Conducted Power (dBm)	Max. E-Field of EUT (dBm)	Antenna Polarization (V/H)	Signal GEN. Power (dBm)	Dipole Gain (dBd)	Measured ERP Power (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
156.05	44.00	28.17	V	26.13	2.04	42.49	-	N/A	-
312.10	-21.00	-36.78	V	-32.36	-4.42	-23.70	-66.19	-56.98	-9.21
468.15	-32.14	-45.27	V	-39.97	-5.30	-28.41	-70.90	-56.98	-13.92

Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 7 , and was loaded into a 50 ohm resistive termination.
2. The spectrum bandwidth was set to RBW 100 kHz (freq. up to 1GHz) and RBW 1 MHz(freq above 1GHz).
3. Transmitter was set to the high power output condition.
4. The spectrum was checked from 30 MHz up to the 10th harmonic of the carrier frequency.
5. All emissions measured were not found to be more than 20dB below the limit.
6. The EUT was positioned through 3 orthogonal axis and worst-case are reported.
7. ERP measurements were performed using the standard battery with full charged condition.
8. The limit was applied according the  $43+10\log_{10}(\text{mean power in Watts})$  dB.

## 5.9 Spurious Emissions at Antenna Terminals

### 5.9.1 Method of Measurement

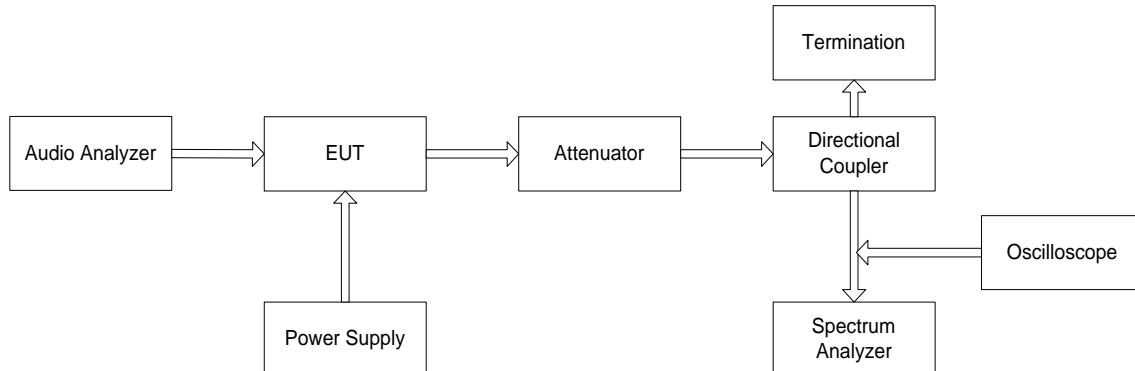


Fig. 8

### Test Equipment List

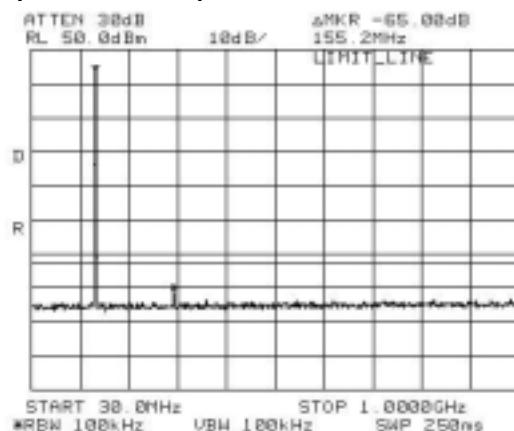
Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Audio Analyzer	8903B	Agilent
Attenuator	RFA500NMF30	BWS
Directional Coupler	778D	Agilent
Termination	8173	Bird
Oscilloscope	TDS3032	Tektronix
Spectrum Analyzer	8563E	Agilent

Note :

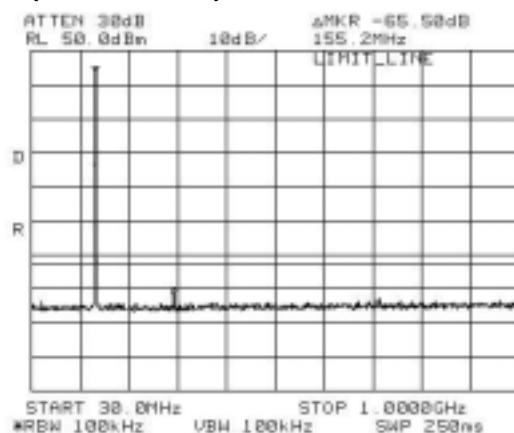
1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 8, and was loaded into a 50 ohm resistive termination.
2. The unit of conducted spurious emission levels shall be the power.
3. The unit was modulated with a 2500Hz tone at an input level 16dB greater than that required 50% modulation. The spectrum was scanned from the lowest frequency generated in the equipment to the 10<sup>th</sup> harmonic of the carrier.
4. The limit was applied according the  $43+10\log_{10}(\text{mean power in Watts})$  dB.

### 5.9.2 Test Plot

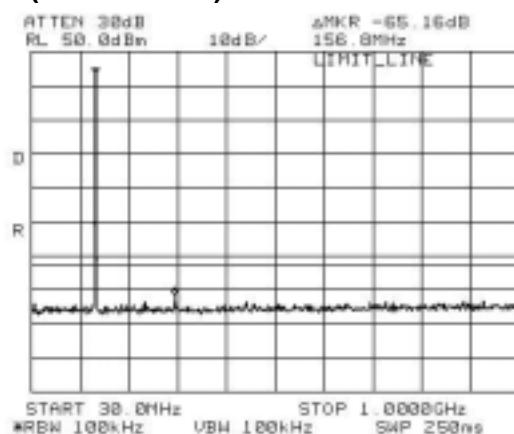
#### 5.9.1 Ch.1 (156.050 MHz)



#### 5.9.2 Ch.18 (156.900 MHz)



#### 5.9.3 Ch.88 (157.425 MHz)



## 5.10 Frequency Stability/Temperature Variation : FCC Rules Part 2 §2.1053(a)

### 5.10.1 Method of Measurement

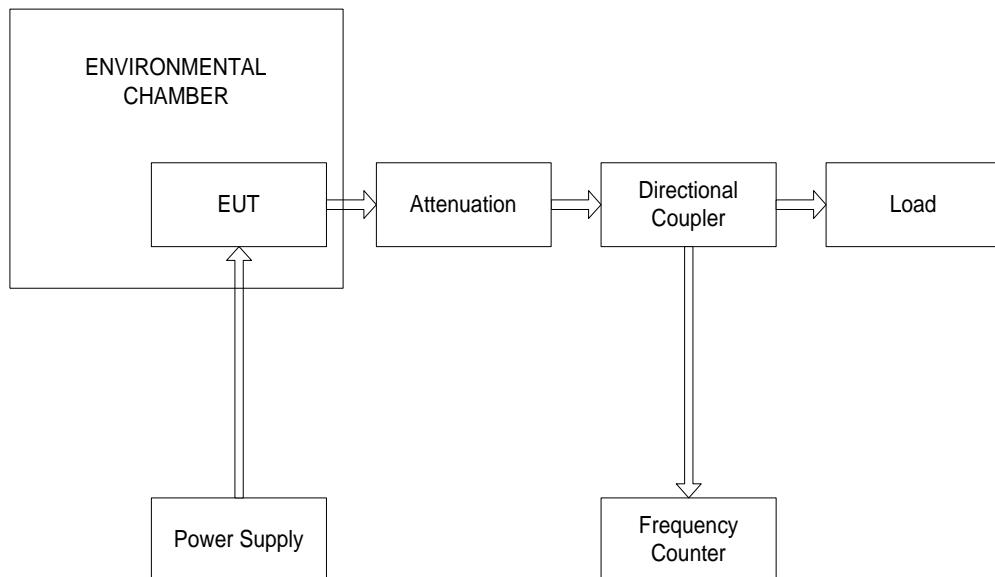


Fig. 9

### Test Equipment List

Equipment	Model Name	Manufacture
EUT	STR-580D	SAMYUNG ENC
Power Supply	STR-580AD	SAMYUNG ENC
Directional Coupler	778D	Agilent
Termination	8173	Bird
Attenuator	RFA500NMF30	BWS
Frequency Counter	R5372	Advantest
Environmental Chamber	SC-50	Seo-Jin

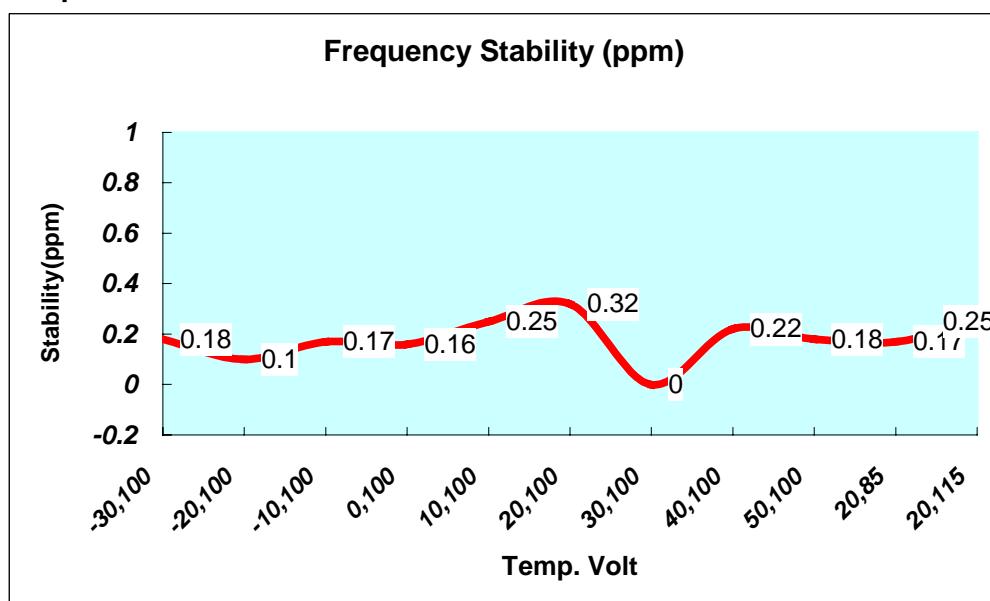
Note :

1. The unit was turn-up in accordance with the alignment procedure stated in the FIG. 9 , and was loaded into a 50 ohm resistive termination.
2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
4. The temperature tests were performed for the worst case.
5. FCC Limits (according to part 80.215) :  $5 \times 10^{-6} \times$  Frequency

### 5.10.2 Test Result

Voltage (%)	Power Supply (Vac)	Temperature (°C)	Frequency (Hz)	Deviation (ppm)	Limit (ppm)
100 %	220	+20(Ref)	156049877	0	5
100 %	220	-30	156049849	0.18	5
100 %	220	-20	156049892	0.10	5
100 %	220	-10	156049850	0.17	5
100 %	220	0	156049902	0.16	5
100 %	220	+10	156049916	0.25	5
100 %	220	+20	156049927	0.32	5
100 %	220	+30	156049878	0	5
100 %	220	+40	156049843	0.22	5
100 %	220	+50	156049849	0.18	5
85 %	187	+20	156049904	0.17	5
115 %	253	+20	156049916	0.25	5

### 5.10.2 Graph



## 6. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

<u>Test Equipment</u>	<u>Manufacture Model Number</u>	<u>Serial Number</u>	<u>Calibrated Date</u>	<u>Calibration Due date</u>
Audio Analyzer	8903B	Agilent	2003-05-07	2004-05-07
Modulation Analyzer	8901B	Agilent	2003-05-07	2004-05-07
Attenuator	RFA500NMF30	BWS	2003-01-28	2004-01-28
Directional Coupler	778D	Agilent	2003-10-14	2004-10-14
Oscilloscope	TDS3032	Tektronix	2003-05-27	2004-05-27
Spectrum Analyzer	8563E	Agilent	2003-05-14	2004-05-14
Spectrum Analyzer	E7403A	Agilent	2003-02-19	2004-02-19
Power Sensor	8481A	Agilent	2003-04-25	2004-04-25
Power Meter	E4418A	Agilent	2003-04-25	2004-04-25
Biconical Antenna	VHA9103(BBA9106)	SWALZBECK	2003-09-12	2004-09-12
Log Periodic Antenna	LP01	PMM	2003-10-30	2004-10-30
Frequency Counter	R5372	Advantest	2003-04-28	2004-04-28
Environmental Chamber	SC-50	Seo-Jin	2003-04-28	2004-09-01
Termination	8173	Bird	-	-