TEST REPORT

Ref. Report No.
00-341-003-01

Name and address of the applicant

AM Equipment
P.O. BOX 790
402 E. HAZEL JEFFERSON, OR 97352
U.S.A.

Standard / Test regulation

FCC Part 15, Subpart B

Test result

Pass

Incoming date : January 21, 2000

Test date : March 21, 2000

Test item(s) ;

Superregenerative Receiver
(RF Motor Control System)

Model/type ref. ;

MIDAS2

Manufacturer ;

SAM-M ELECTRON

Additional information ;

-Required Authorization : Certification
-FCC ID. : OYT-3201219

Issue date : April 14, 2000

Tested and reported by

Jeong-Min Kim , Senior Engineer

Reviewed by

Seok-Jin Kim , EMC Team Leader

KOREA TESTING LABORATORY

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. GENERAL INFORMATION

1. Grantee Name and Mailing Address	:	AM Equipment P. O. Box 790, 402 E. HAZEL JEFFERSON, OR 97352 U.S.A.
2. Manufacturer's Name and Mailing Address	:	SAM-M ELECTRON 239-12 Gasan-Dong, Kumchon-Gu, Seoul, Korea 152-023

3. Equipment Descriptions

3.1 Tuning Frequency	:	315.0MHz
3.2 Detect Method	:	Superregenerative Detector
3.3 Used Oscillator	:	4MHz (Crystal)
3.4 Power Supply	:	DC 12V (Battery or AC adapter)

4. Rules and Regulations	:	FCC Part 15, Subpart B
5. Measuring Procedure	:	ANSI C63.4-1992

6. Date of Measurement

6.1 Line Conducted	:	March 17, 2000
6.2 Radiated Emission	:	March 21, 2000

. GENERAL REQUIREMENTS OF THE EUT

1. Labelling Requirement (Section 15.19)

> This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interface, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.1 Location of Label : Bottom side of EUT
1.2 How Applied : By ink-printing on adhesive label

2. Information to User (Section 15.21)

The following or similar statements were provided in the manual for user instruction.
Please refer page 1 of the attached manual for details.

> CAUTION : Any changes or modifications in construction of this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3. Special Accessories (Section 15.27)

3.1 Were the special Accessories provided? [ ] yes, [x] no

3.2 If yes, details for the special accessories are as follows :

3.3 If yes, were the appropriate instructions provided on the first page of the text concerned with the device?
[ ] yes, [ ] no

3.4 Are these accessories provided of the type which can be readily obtained from multiple retail outlets ?
[ ] yes, [ ] no

And therefore does the manual specify what additional components or accessories are required to used in order to comply with the Rules?
[ ] yes, [ ] no

. CONDUCTED EMISSION MEASUREMENT (Section 15.107)

1. Test Procedure

Conducted emission measurements on the EUT were performed by "AC Power Line Conducted Emissions Testing" procedure as per ANSI C63.4. The EUT was set up on a wooden table 0.8 meters height, 1.0 by 1.5 meters in size, placed in the shielded enclosed with a side of wall of which constituted a vertical conducting surface of 2.2m x 3.1m in size to maintain 40cm from the rear of EUT

LISN's(Line Impedance Stabilization Network, EMCO, 3825/2, 50ohm/50∝H) were installed and electrically boned to the conducting ground plane. The EUT was connected to the LISN.

One of two 50ohm output terminals of the LISN was connected to the Spectrum Analyzer(HP, 8566B, 10kHz to 22GHz) with the Quasi-Peak Adapter (HP, 85650A, 10kHz to 1.0GHz) and the other was terminated in 50 ohms. Measurements were again performed after interchanging such a connection oppositely.

The frequency range from 450kHz to 30MHz was examined and the peak values that are within 6dB of the limit would be compared to quasi-peak values using the Quasi-Peak instrument (ROHDE & SCHWARZ, ESH3, 9kHz to 30MHz : Detector Function CISPR Quasi-Peak) or HP Quasi-Peak adapter(85650A, 10kHz to 1.0GHz)

The voltage developed across the 50ohms port in LISN was measured by the Spectrum Analyzer and graphed by the Plotter(HP, 7470A). The 6dB bandwidth of the Spectrum Analyzer and Quasi-Peak Adapter was set to 9kHz with no post detector video filter.

The position of connecting cables of the EUT was changed to find the worst case configuration during measurements. The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph for the worst case configuration

3. Sample Calculation

The emission level measured in decibels above one microvolt (dB∂) was converted into microvolt (∂) as shown in following sample calculation.

For example :

	Measured Value at 25.35MHz	32.1 dB∂
+	Cable Losses *	0.0 dB
=	Conducted Emission	32.1 dB∂
		(= 40.3 ∂)

* In case of RG214/ RF cable 15Ft, the loss is about 0.17dB at the frequency of 30MHz which is negligible.

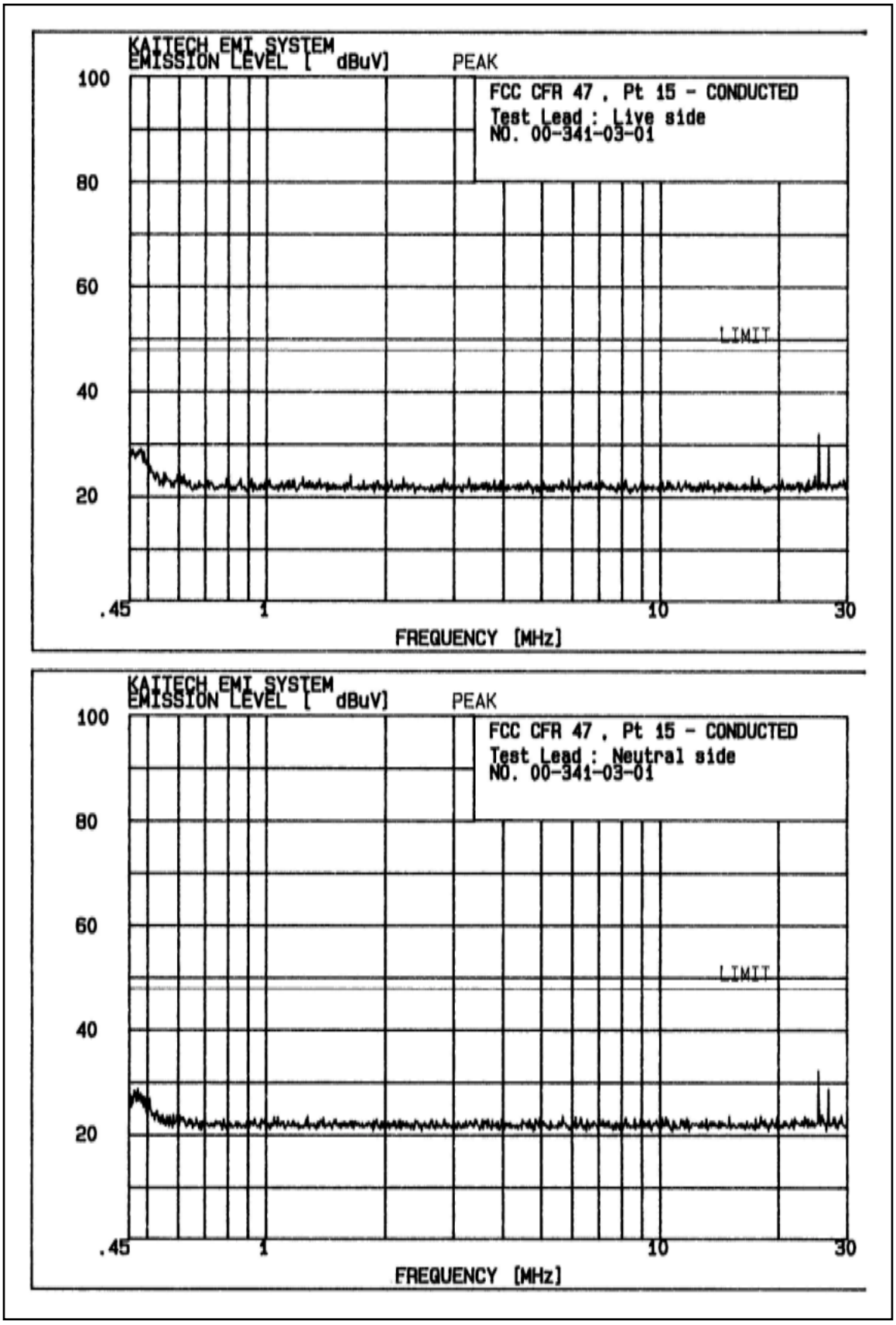
4. Measurement Data

- Resolution Bandwidth : x Peak (6dB Bandwidth : 9kHz)
  x CISPR Quasi-Peak (6dB Bandwidth : 9kHz)

Power Lead Tested	Frequency (MHz)	Measured Value		Emission Level		Limit	(*) Margin (dB)
		Peak (dB∂)	Q-Peak (dB∂)	(dB∂)	(∂)	(∂)	
Live to Ground	0.48	28.9	17.7	17.7	7.7	250	-30.3
	25.35	32.2	32.1	32.1	40.3	250	-15.9
	27.04	32.1	32.0	32.0	39.8	250	-16.0
	-	-	-	-	-	-	-
Neutral to Ground	0.48	28.6	16.3	16.3	6.5	250	-31.7
	25.35	32.4	32.0	32.0	39.8	250	-16.0
	27.04	30.8	30.5	30.5	33.5	250	-17.5
	-	-	-	-	-	-	-

Note : The noise floor level of the spectrum analyzer was observed in 22dB∂.
Refer to measured graphs on next page.

* Margin(dB) : Emission Level (dB) - Limit (dB)


KAITECH EMI SYSTEM
EMISSION LEVEL [dBuV]
PEAK
FCC CFR 47 , Pt 15 - CONDUCTED
Test Lead : Live side
NO. 00-341-03-01
LIMIT
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]
KAITECH EMI SYSTEM
EMISSION LEVEL [dBuV]
PEAK
FCC CFR 47 , Pt 15 - CONDUCTED
Test Lead : Neutral side
NO. 00-341-03-01
LIMIT
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

. RADIATED EMISSION MEASUREMENT (Section 15.109)

1. Test Procedure

1.1 Preliminary Testing for Reference

Preliminary testing was performed in a KTL absorber-lined room to determine the emission characteristics of the EUT. The EUT was placed on the wooden table which has dimensions of 0.8 meters in height, 1 meter in length and 1.5 meters in width. Receiving antenna (Biconical antenna : 30 to 300MHz, Log-periodic antenna : 200 to 1000MHz or Horn Antenna : 1 to 18GHz) was placed at the distance of 1 meter from the EUT.

In order to cohere the individual components of the characteristic broadband emission from the receiver(EUT), a RF generator(CW signal) and a log-periodic antenna were used. The frequency and output level of the generator were adjusted for highest observed coherent receiver emissions on the spectrum analyzer with RF amplifier.

An attempt was made to maximize the emission level with the various configurations of the EUT. The effect of changing the position of the cable was observed to find the worst case configuration while rotating the table and varying antenna height and it's polarization.

Radiated and spurious emissions were checked from 30 MHz to 3000 MHz according to section 15.33.

1.2 Final Radiated Emission Test at a Absorber-Lined Room

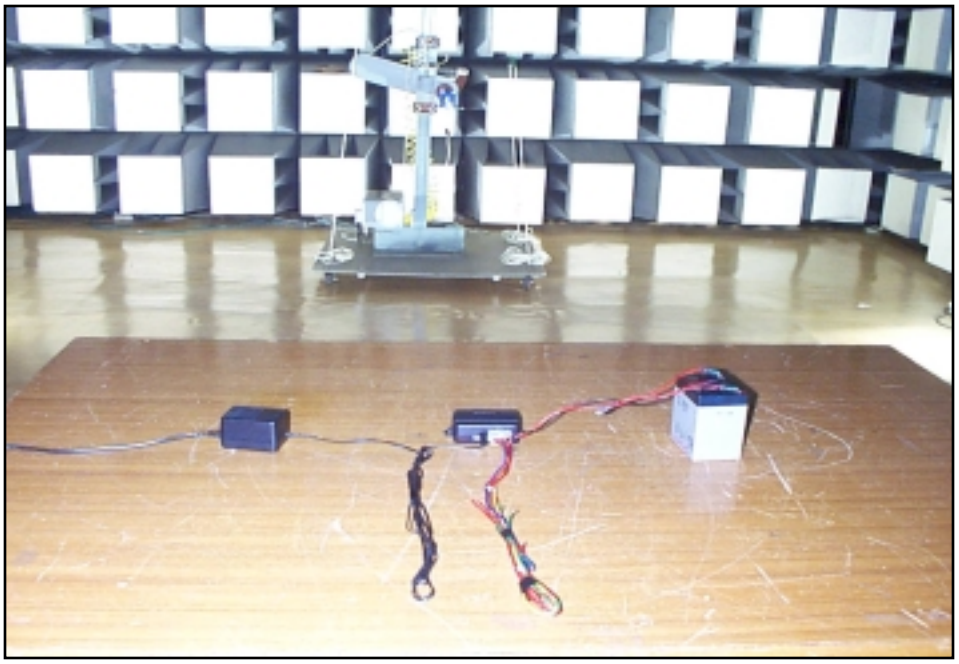
The final measurement of radiated field strength was carried out in a KTL Absorber-Lined Room that was listed up at FCC according to the "Radiated Emissions Testing" procedure specified by ANSI C63.4.

Based on the test results in preliminary test, measurement was made in same test set up and configuration which produced maximum emission level. Receiving antenna was installed at 3-meter distance from the EUT, and was connected to an EMI receiver or spectrum analyzer(for above 1GHz) with a RF amplifier.

Turntable was rotated through 360 degrees and receiving antenna height was varied from 1 to 4 meters above the ground plane to read maximum emission level.

The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

2. Photograph for the worst case configuration



3. Sample Calculation

The emission level measured in decibels above one microvolt (dB∂) was converted into microvolt per meter (∂/m) as shown in following sample calculation.

For example :

	Measured Value at 316.2 MHz	49.1 dB∂
+	Antenna Factor	18.3 dB
+	Cable Loss	3.3 dB
-	Preamplifier	30.0 dB
-	Distance Correction Factor *	0.0 dB
=	Radiated Emission	40.7 dB∂/m
	(=	108.4 ∂/m)

* Extrapolated from the measured distance(1.5m) to the specified distance(3m) by an inverse linear distance extrapolation.

4. Measurement Data

- Resolution Bandwidth : ___ CISPR Quasi-Peak (6dB Bandwidth : 120kHz)
  x Peak (3dB Bandwidth : 100kHz)
- Measurement Distance : 3 Meter

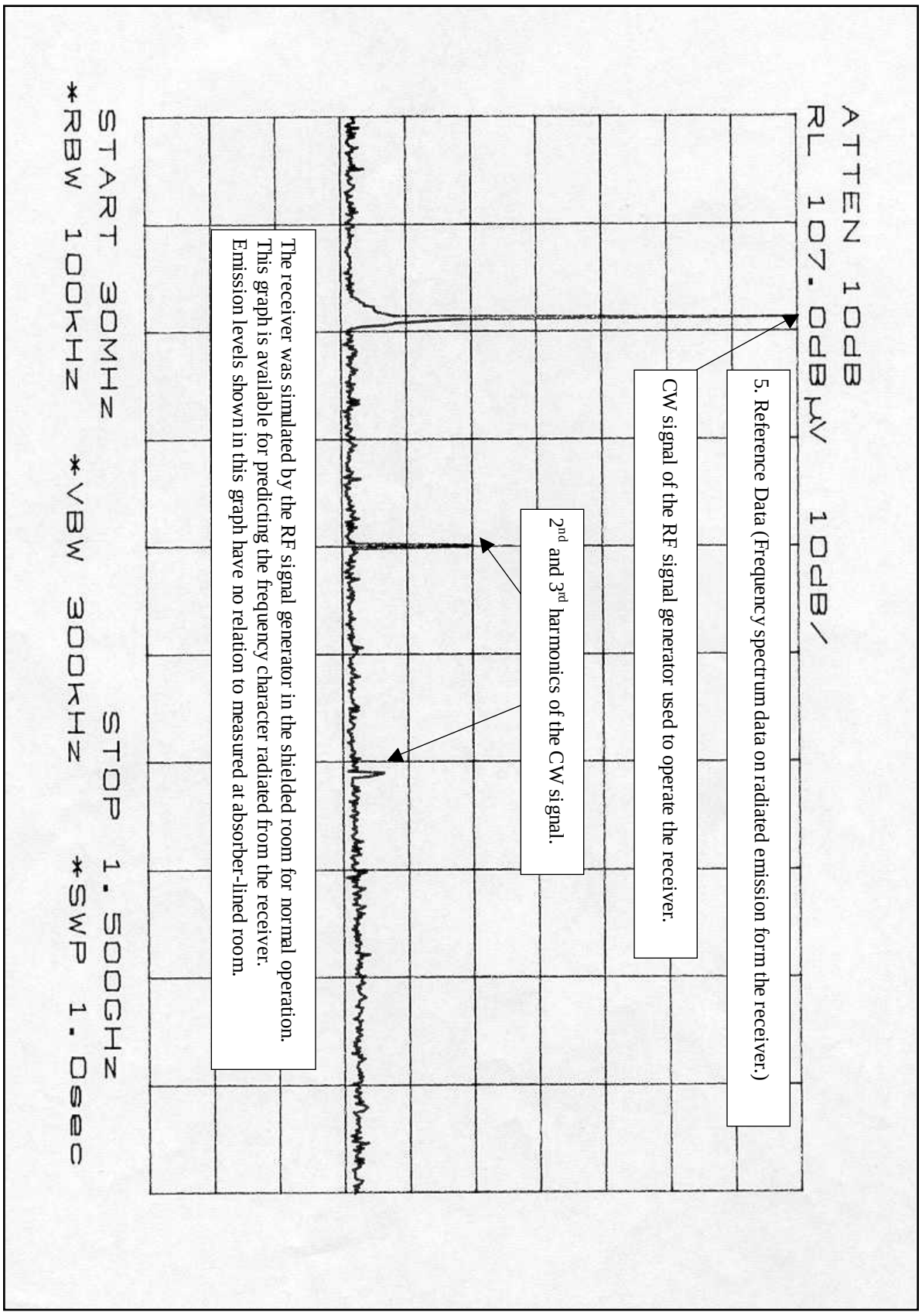
Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB∂)	* A.F. + C.L (dB)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB∂/m)	Emission Level (∂/m)	Limit (∂/m)	** Margin (dB)
316.2	P	H	49.1	21.6	-30.0	-	40.7	108.4	200	-5.3
632.4	P	H/V	< 32.0	29.7	-30.0	-	< 31.7	< 38.5	200	< -14.3
948.6	P	H/V	< 32.0	35.2	-30.0	-	< 37.2	< 72.4	200	< -8.8
1264.8	P	H/V	< 32.0	31.9	-30.0	-	< 33.9	< 49.5	500	< -20.1
-	-	-	-	-	-	-	-	-	-	-

Note

The observed spectrum analyzer noise floor level with RF preamplifier was 32.0dB∂. And all other emissions not reported on data were more than 25dB below the permitted level.

* D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
A.F. : Antenna Factor
C.L. : Cable Loss
A.G. : Amplifier Gain
D.C.F. : Distance Correction Factor
< : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)


ATTEN 10dB
RL 107.0dBµV 10dB/
5. Reference Data (Frequency spectrum data on radiated emission form the receiver.)
CW signal of the RF signal generator used to operate the receiver.
2nd and 3rd harmonics of the CW signal.
The receiver was simulated by the RF signal generator in the shielded room for normal operation.
This graph is available for predicting the frequency character radiated from the receiver.
Emission levels shown in this graph have no relation to measured at absorber-lined room.
START 30MHz
STOP 1.500GHz
*RBW 100KHz
*VBW 300KHz
*SWP 1.0sec

. TEST EQUIPMENT USED FOR MEASUREMENTS

Equipment	Model No.	Manufacturer	Serial No.	Effective Cal. Duration
[x] EMI Receiver (20MHz-1GHz)	ESVS30	R & S	830516/002	06/29/99-06/29/00
[x] Spectrum Analyzer (9kHz-26.5GHz)	8563A	H. P.	3222A02069	02/18/00-02/18/01
[x] Spectrum Analyzer (100Hz-22GHz)	8566B	H. P.	3014A07057	05/29/99-05/29/00
[x] Quasi-Peak Adapter (10kHz-1GHz)	85650A	H. P.	3107A01511	05/29/99-05/29/00
[x] RF-Preselector (20Hz-2GHz)	85685A	H. P.	3010A01181	05/29/99-05/29/00
[x] Test Receiver (9kHz-30MHz)	ESH3	R & S	860905/001	06/29/99-06/29/00
[x] Pre-Amplifier (0.1-3000MHz, 30dB)	8347A	H. P.	2834A00543	05/29/99-05/29/00
[x] LISN(50ohm , 50μH) (10kHz-100MHz)	3825/2	EMCO	9011-1720	-
[x] Plotter	7470A	H. P.	3104A21292	-
[x] Tuned Dipole Ant. (30MHz-300MHz)	VHA 9103	Schwarzbeck	-	*
[x] Tuned Dipole Ant. (300MHz-1GHz)	UHA 9105	Schwarzbeck	-	*
[x] Biconical Ant. (30MHz-300MHz)	BBA 9106	Schwarzbeck	-	*
[x] Log Periodic Ant. (200MHz-1GHz)	3146	EMCO	-	*
[x] Horn Ant. (1GHz-18GHz)	3115	EMCO	-	*
[ ] DC Power Supply	6260B	H.P.	1145A04822	-
[ ] Shielded Room (5.0m x 4.5m)	-	SIN-MYUNG	-	-

* Each set of antennas has been calibrated to ensure correlation with ANSI C63.5 standard. The calibration of antennas is traceable to Korea Standard Research Institute(KSRI).