FCC PART 74
EMI MEASUREMENT AND TEST REPORT

For

Enping Karsect Electronics Corp., Ltd.

No. 32 Xinping Road,
Enping, China

FCC ID: QSRKRV10-53V

January 9, 2003

This Report Concerns:	**Equipment Type:**
☒ Original Report	Wireless Microphone Transmitter Unit

Test Engineer:	Benjamin Jin
Report Number:	R0211212
Test Date:	December 9, 2002
Reviewed By:	Jeff Lee
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Applicant:	Enping Karsect Electronics Corp., Ltd.
Product:	Wireless Microphone
Model Name:	KST-53V/KRV-10
Serial Number:	N/A
FCC ID:	QSRKRV10-53V
Transmitter Frequency:	174.15-215.95MHz
Maximum Output Power:	8.91dBm
Dimension:	8.1” L x 1.2” W x 1.2” H
DC Voltage:	9V dc
Applicable Standard:	FCC Part 74 Subpart H

- *The EUT was a battery powered equipment, and the battery was a new one for the test.*

** The test data was good for test sample only. It may have deviation for other product samples.*

1.2 Objective

This report is prepared on behalf of *Enping Karsect Electronics Corp., Ltd.* in accordance with Part 74 Subpart H of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for peak output power, modulation characteristics, occupied bandwidth of emission, spurious emission, field strength of spurious radiation, frequency stability and line conduction.

1.3 Test Methodology

Measurements contained in this report were also conducted with TIA/EIA Standard 603, Telecommunications Industry Association Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.4 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22: 1997, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.5 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8566B	2610A02165	12/6/03
HP	Spectrum Analyzer	8593B	2919A00242	12/20/03
HP	Amplifier	8349B	2644A02662	12/20/03
HP	Quasi-Peak Adapter	85650A	917059	12/6/03
HP	Amplifier	8447E	1937A01046	12/6/03
A.H. System	Horn Antenna	SAS0200/571	261	12/27/03
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/03
Com-Power	Biconical Antenna	AB-100	14012	11/2/03
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/03
Com-Power	LISN	LI-200	12208	12/20/03
Com-Power	LISN	LI-200	12005	12/20/03
BACL	Data Entry Software	DES1	0001	12/20/03
Rohde & Schwarz	Signal Generator	SMIQ03B	1125.5555.03	7/10/03
Agilent	Power Meter	E4419B	GB40202891	4/8/03

*** Statement of Traceability:** Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using standards traceable to National Institute of Standard and Technology (NIST).

2 - REQUIREMENTS OF PROVISIONS

2.1 Definition

Low Power Auxiliary Stations: Devices authorized as low power auxiliary stations are intended to transmit over distances of approximately 100 meters for uses such as wireless microphones, cue and control communications, and synchronization of TV camera signals.

Intentional radiator: a device that intentionally generates and emits radio frequency energy by radiation or induction.

Transmitter Power: the power at the transmitter output terminals and delivered to the antenna, antenna transmission line, or any other impedance-matched, radio frequency load. For the purpose of this subpart, the transmitter power is the carrier power.

2.2 Frequencies Available

According to Sec. 74.802 of Part 74, the following frequencies are available for low power auxiliary station:

Frequencies (MHz)

26.100-26.480
54.00-72.0
76.00-88.0
161.625-161.775 (except in Puerto Rico or the virgin Islands)
174.000-216.000
450.000-451.000
455.000-456.000
47.000-488.000
488.000-494.000 (except Hawaii)
614.000-806.000
944.000-952.000

2.3 Requirements and Test Summary

FCC Rules	Rules Description	Test Result
§74.861(e)	Low power auxiliary transmitters not required to operate on specific carrier frequencies shall operate sufficiently within the authorized frequency band edges to insure the emission bandwidth falls entirely within the authorized band.	Compliant
§74.861(e)(1)(i)	Maximum Output Power For low power auxiliary station operating in the 174-216MHz band, the power of the measured unmodulated carrier power ant the output of the transmitter power amplifier (antenna input power) may not exceed 50mW	Compliant
§74.861(e)(3) & §2.1047(a)	Modulation Characteristics Any form of modulation may be used. A maximum deviation of ±75 kHz is permitted when frequency modulation is employed.	Compliant
§74.831(e)(4) & §2.1055(a)(1)	Frequencies Tolerance The frequency tolerance of the transmitter shall be 0.005 percent	Compliant
§74.861(e)(5) & §2.1049(c)(1)	Occupied Bandwidth The operating bandwidth shall not exceed 200 kHz	Compliant
§74.861(e)(6) & §2.1051	Spurious Emissions at Antenna Terminals	Compliant
§74.861(e)(6) & §2.1053	Radiated of Spurious Emissions	Compliant

2.4 Labeling Requirement

Each equipment for which a type acceptance applications is filed on or after May 1, 1981, shall bear an identification plate or label pursuant to §2.295 (Identification of Equipment) and §2.926 (FCC identifier)

3 - OUTPUT POWER MEASUREMENT

3.1 Provision Applicable

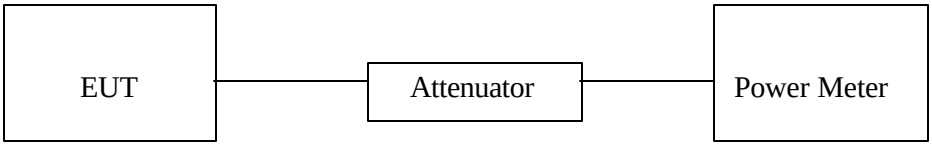
According to §74.861(e)(1)(i), for low power auxiliary station operating in the 174-216MHz band, the power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed 50mW

3.2 Test Procedure

The maximum output power was measured with a power meter connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation.

3.3 Test equipment

Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter



3.4 Test Results

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	174.20	9.3	8.51	50
Mid	209.15	9.5	8.91	50
High	215.20	9.1	8.13	50

4 - MODULATION CHARACTERISTICS

4.1 Provision Applicable

According to FCC 2.1047 (a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100Hz to 5000Hz shall be measured. For equipment required to have an audio low-pass filter, the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be measured.

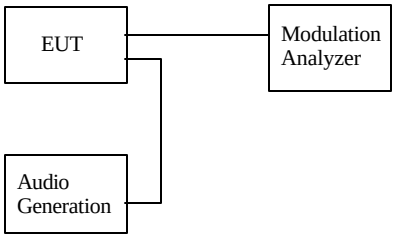
According to §74.861(e)(3), any form of modulation may be used. A maximum deviation of ±75 kHz is permitted when frequency modulation is employed.

4.2 Test Procedure

4.2.1 Frequency response of audio circuits

1) Position the EUT as shown in figure 1

Figure 1
Modulation Characteristic
Measurement Configuration



2) Adjust the audio input frequency for 100, 300, 1000, 3000 and 5000Hz in sequence and the input level from 0V to maximum permitted input voltage with recording the change in output responding to respective input level

4.2.2 Audio Low Pass Filter Response

An audio signal generator and an audio spectrum analyzer were connected to the input and output of the post limiter low pass filter respectively. The audio signal generator frequency was set between 1000 Hz and the upper low pass filter limit. The audio frequency response at test frequency was calculated as

$$LEV_{FREQ} - LEV_{REF}$$

4.2.3 Modulation Limit

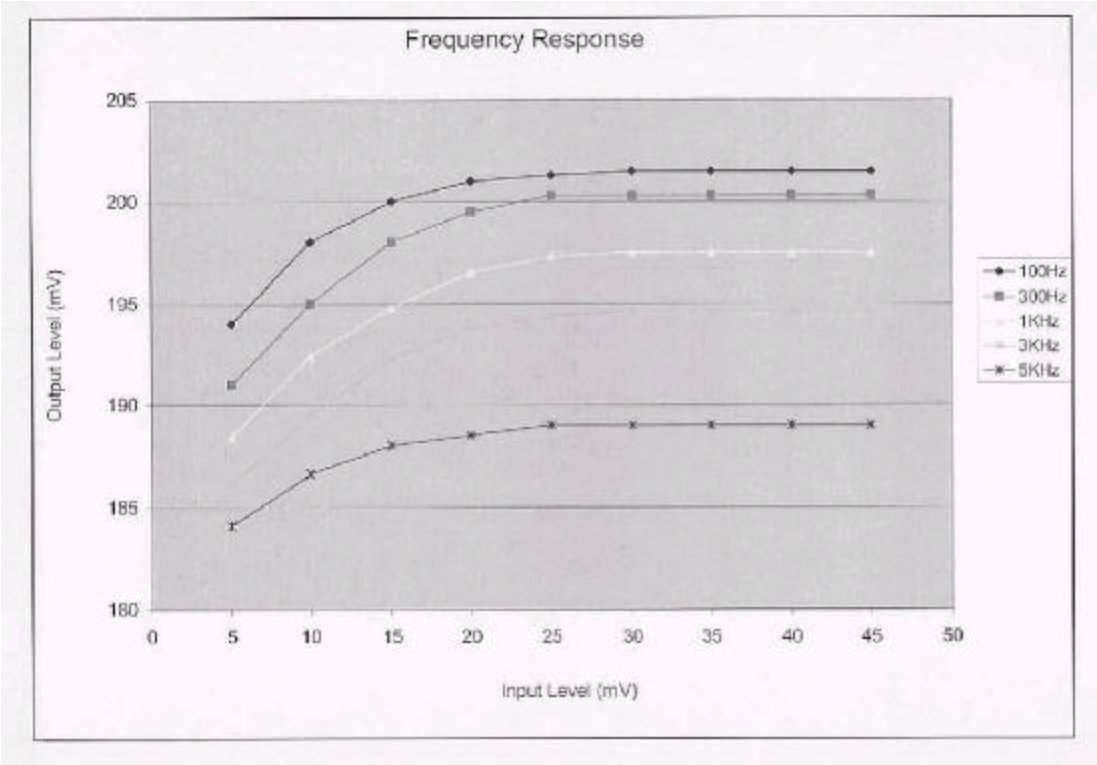
1) Position the EUT as shown in figure 1, adjust the audio input frequency to 300 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.
2) Repeat step 1 with changing the input frequency for 1000 and 3000 Hz in sequence.

4.3 Test Equipment

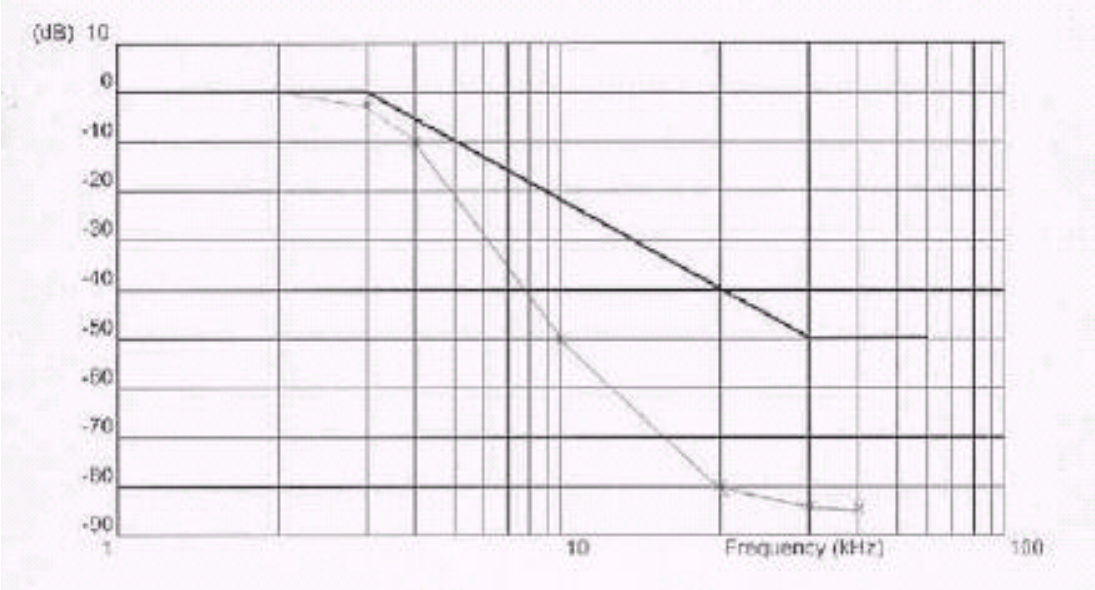
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Hewlett Packard HP8901A Modulation Analyzer
Lecroy 9350A Oscillscope

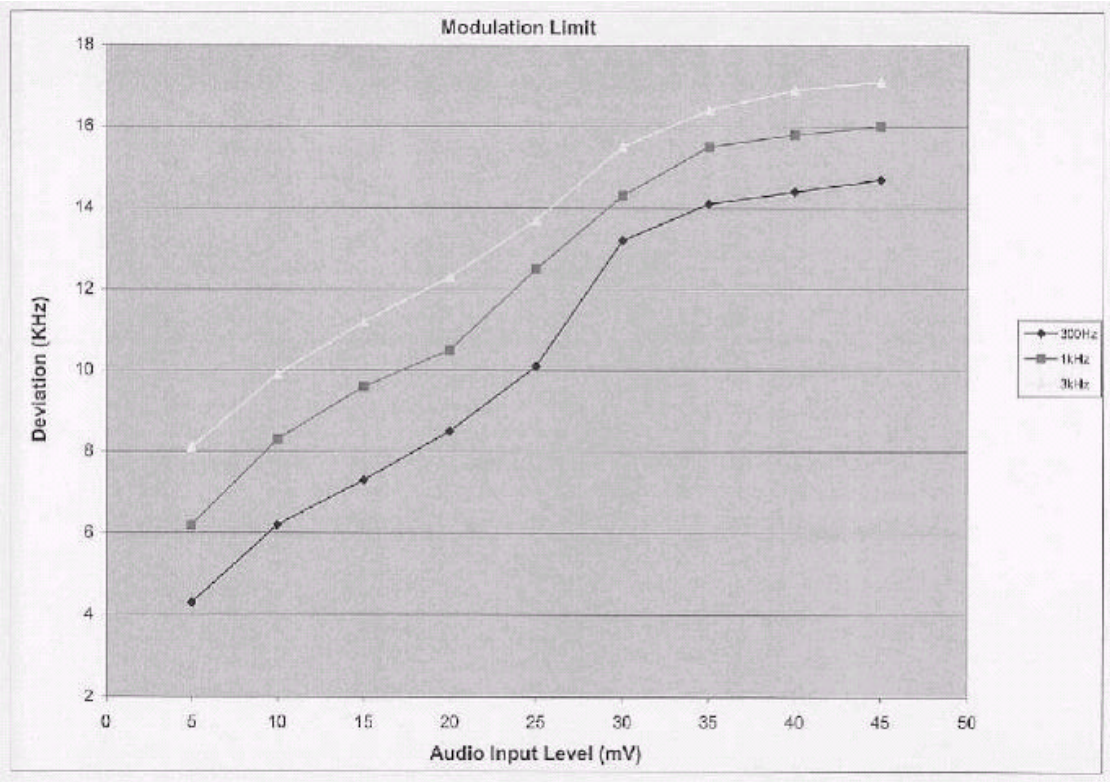
4.4 Test Results

The plot(s) of modulation characteristic is presented hereinafter as reference.



Audio Low Pass Filter Response





5 - OCCUPIED BANDWIDTH OF EMISSION

5.1 Provision Applicable

According to FCC 2.1049 (c) (1), for radiotelephone transmitter, other than single sideband or independent sideband transmitter, when modulated by a 2.5 kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating curcuit.

According to §74.861(e)(5), the operating bandwidth shall not exceed 200 kHz

5.2 Test Procedure

The antenna was disconnected from the transmitter and the short cable was connected to the transmitter RF output.

The RF output was connected to the input f the spectrum analyzer through sufficient attenuation.

With the transmitter keyed, the level of the unmodulated carrier was set to the full scale reference line of the spectrum analyzer. This is used as a 0dB reference for emission mask measurements.

After input level was derived from a 2500 Hz tone 16 dB greater than the necessary to produce 50% modulation, this input level was then established at the frequency of maximum response of the modulating circuit. The transmitter was modulated with the maximum response frequency. The resolution bandwidth of the spectrum analyzer was set up to 300 Hz and the spectrum of the transmitting signal was recorded. This spectrum was compared to the required emission mask.

5.3 Test Equipment

Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Leader LFG-1300S Function Generator

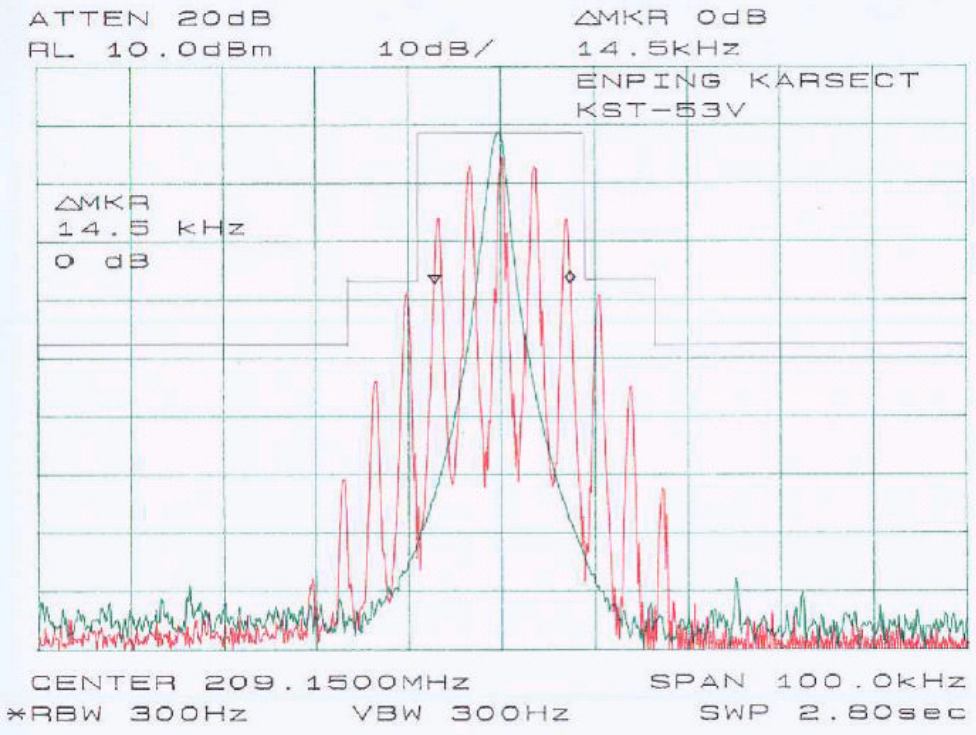
5.4 Test Results

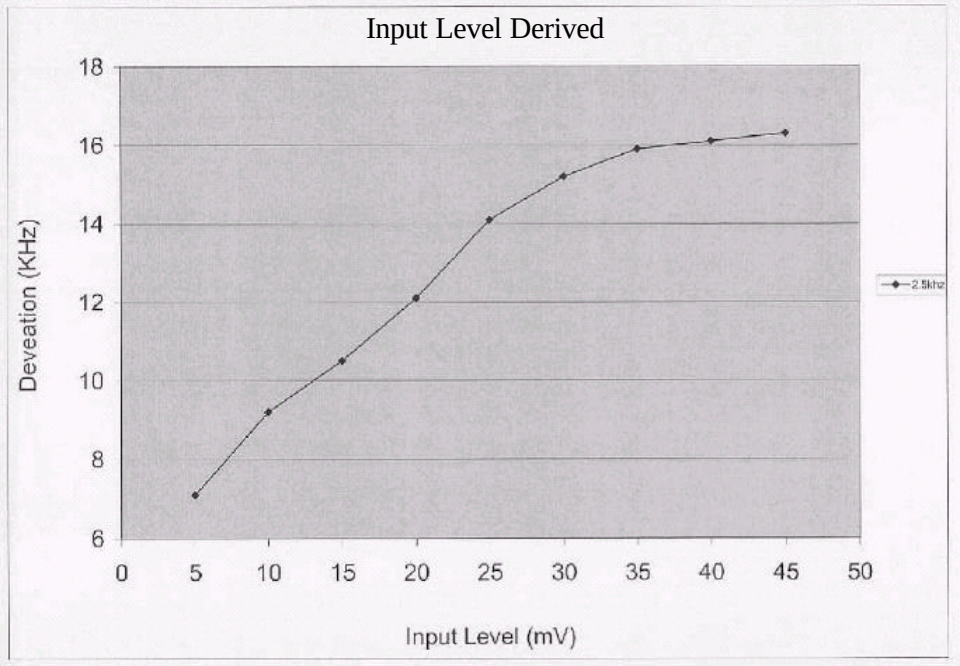
Please refer the following curve and plots.

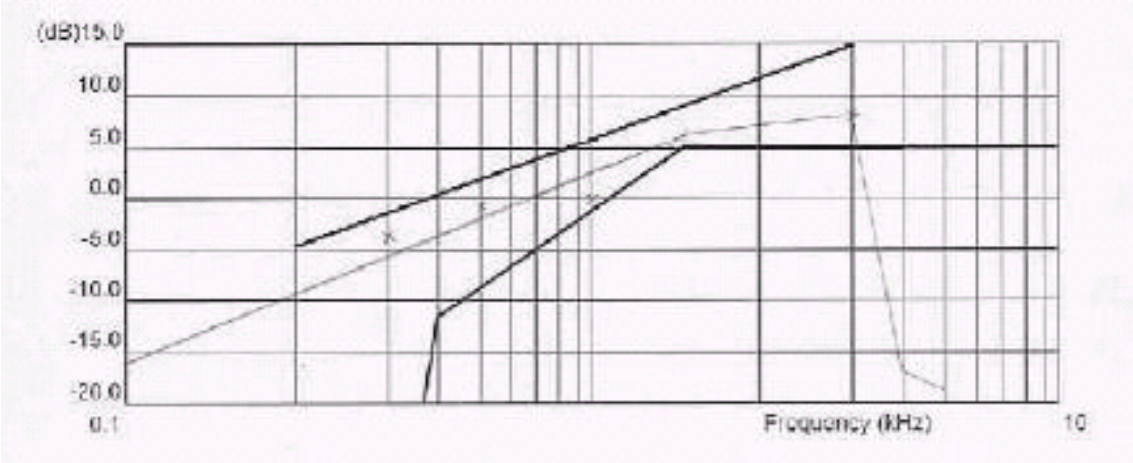
5.5 Emission Designator

2M + 2D = (2x3kHz) + (2x16.5kHz) = 39K0F3E

Please refer to the plots on page 13.


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR 0dB
14.5kHz
ENPING KARSECT
KST-53V
ΔMKR
14.5 kHz
0 dB
CENTER 209.1500MHz
SPAN 100.0kHz
*RBW 300Hz
VBW 300Hz
SWP 2.80sec


Input Level Derived
Deveation (KHz)
18
16
14
12
10
8
6
0
5
10
15
20
25
30
35
40
45
50
Input Level (mV)
2.5khz


(dB)15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
0.1
Frequency (kHz)
10

6 – RADIATED SPURIOUS EMISSION

6.1 Provision Applicable

According to FCC2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediated circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to FCC74.861 (e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

1. on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

2. on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

3. on any frequency removed from the operating frequency by more than 250 percent up to and the authorized bandwidth shall be attenuated below the un-modulated carrier by at least 43 plus 10 Log (output power in watts)dB.

6.2 Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

6.3 Test Equipment

Com-Power AL-100 Log Periodic Antenna

Com-Power AB-100 Biconical Antenna

High Pass Filter

Preamplifier

Hewlett Packard HP8566B Spectrum Analyzer

Hewlett Packard HP 7470A Plotter

Rohde & Schwarz Generator

6.4 Test Results

Low Frequency: -22.7dB at 348.4MHz
Middle Frequency: -22.4dB at 418.3MHz
High Frequency: -23 dB at 430.4MHz

Low Frequency, 30 - 5000MHz

Indicated		Table	Test Antenna		Substitution		Substitution Antenna		Correction Factor		Absolute	FCC	FCC
Frequency MHz	Ampl. dBμV/m	Angle Degree	Height Meter	Polar H/ V	Frequency MHz	Level dBm	Half-wave cm	Polar H/V	Antenna dB	Cable dB	level dBm	Limit dB	Margin dB
174.2	100.2	180	2.5	h	174.2	6.3	68	h	2.1	0.3	8.1		
174.2	95.46	130	2.2	v	174.2	5.5	68	v	2.1	0.3	7.3		
348.4	58.3	290	1.5	h	348.4	-37.5	34	h	2.1	0.3	-35.7	-13	-22.7
348.4	44.9	270	1.5	v	348.4	-39.7	34	v	2.1	0.3	-37.9	-13	-24.9
522.6	55.2	330	1.2	h	522.6	-41.6	22	h	2.1	0.5	-40	-13	-27
696.8	55.4	60	1.2	h	696.8	-42.8	17	h	2.1	0.5	-41.2	-13	-28.2
522.6	52.8	0	1.2	v	522.6	-44.9	22	v	2.1	0.5	-43.3	-13	-30.3
871	46.2	160	1.8	h	871	-46.1	13	h	2.1	0.7	-44.7	-13	-31.7
696.8	52.3	90	1.5	v	696.8	-46.5	17	v	2.1	0.5	-44.9	-13	-31.9
871	43.6	110	1.5	v	871	-48.6	13	v	2.1	0.7	-47.2	-13	-34.2

Middle Frequency, 30 - 5000 MHz

Indicated		Table	Test Antenna		Substitution		Substitution Antenna		Correction Factor		Absolute	FCC	FCC
Frequency MHz	Ampl. dBμV/m	Angle Degree	Height Meter	Polar H/ V	Frequency MHz	Level dBm	Half-wave cm	Polar H/V	Antenna dB	Cable dB	level dBm	Limit dB	Margin dB
209.15	100.8	30	1.5	h	209.15	6.8	68	h	2.1	0.3	8.6		
209.15	92.3	0	1.8	v	209.15	5.6	68	v	2.1	0.3	7.4		
418.3	58.6	120	1.5	h	418.3	-37.2	34	h	2.1	0.3	-35.4	-13	-22.4
418.3	45.2	170	1.5	v	418.3	-39.5	34	v	2.1	0.3	-37.7	-13	-24.7
627.45	55.4	310	1.8	h	627.45	-41.3	22	h	2.1	0.5	-39.7	-13	-26.7
836.6	55.7	270	1.5	h	836.6	-42.6	17	h	2.1	0.5	-41	-13	-28
627.45	53.1	290	1.5	v	627.45	-44.7	22	v	2.1	0.5	-43.1	-13	-30.1
1045.75	46.8	90	1.5	h	1045.75	-45.9	13	h	2.1	0.7	-44.5	-13	-31.5
836.6	52.8	240	2	v	836.6	-46.2	17	v	2.1	0.5	-44.6	-13	-31.6
1045.75	43.9	110	2.2	v	1045.75	-48.3	13	v	2.1	0.7	-46.9	-13	-33.9

High Frequency, 30 - 5000 MHz

Indicated		Table	Test Antenna		Substitution		Substitution Antenna		Correction Factor		Absolute	FCC	FCC
Frequency MHz	Ampl. dBµV/m	Angle Degree	Height Meter	Polar H/ V	Frequency MHz	Level dBm	Half-wave cm	Polar H/V	Antenna dB	Cable dB	level dBm	Limit dB	Margin dB
215.2	98.6	0	2.8	h	215.2	6.1	68	h	2.1	0.3	7.9		
215.2	91.1	30	2.5	v	215.2	5.4	68	v	2.1	0.3	7.2		
430.4	57.5	90	1.8	h	430.4	-37.8	34	h	2.1	0.3	-36	-13	-23
430.4	43.7	150	2.2	v	430.4	-39.9	34	v	2.1	0.3	-38.1	-13	-25.1
645.6	54.6	110	1.5	h	645.6	-41.9	22	h	2.1	0.5	-40.3	-13	-27.3
860.8	54.8	270	2	h	860.8	-43.1	17	h	2.1	0.5	-41.5	-13	-28.5
645.6	52.1	60	1.5	v	645.6	-45.1	22	v	2.1	0.5	-43.5	-13	-30.5
1076	44.7	180	1.5	h	1076	-46.4	13	h	2.1	0.7	-45	-13	-32
860.8	51.2	240	1.8	v	860.8	-46.7	17	v	2.1	0.5	-45.1	-13	-32.1
1076	42.5	140	1.5	v	1076	-48.9	13	v	2.1	0.7	-47.5	-13	-34.5

Compliance Statement:

According to FCC Part 15, at 3-meter distance the emission from an intentional radiator shall not exceed the field strength level 40dBuV/m within 30-88MHz, 43.5dBuV/m within 88-216MHz, 46dBuV/m within 226-960MHz, 54dBuV/m above 960MHz. The level of any unwanted emissions shall not exceed the level of the fundamental frequency.

The levels of unwanted emission of this device were below the above limits. This device was compliant with the FCC Part 15.

The test was performed by placing the EUT on 3 orthogonal axis.

7 - SPURIOUS EMISSION AT ANTENNA TERMINAL

7.1 Standard Applicable

According to §2.1051 and §74.861(e)(6), the RF voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals

7.2 Test Procedure

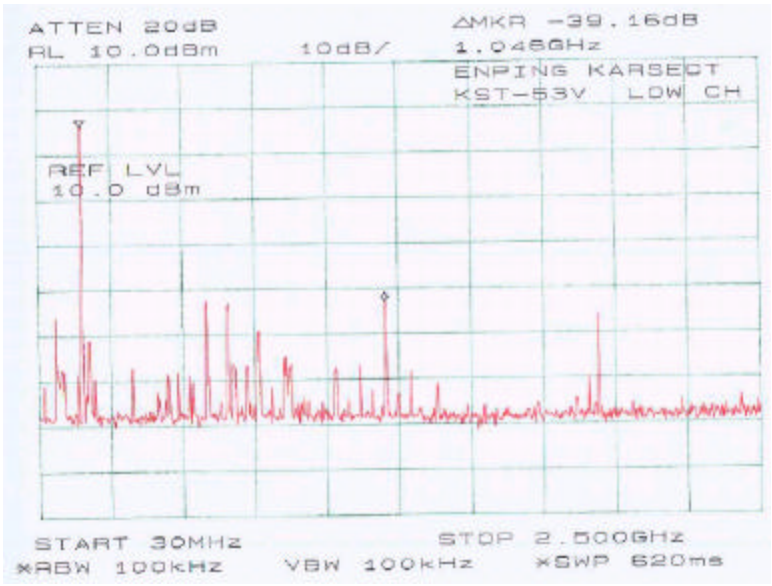
The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolustion bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

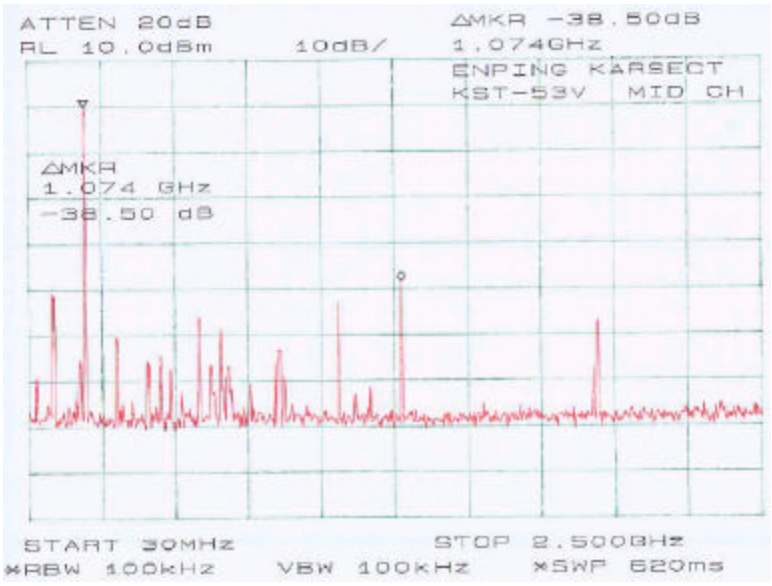
7.3 Test Equipment

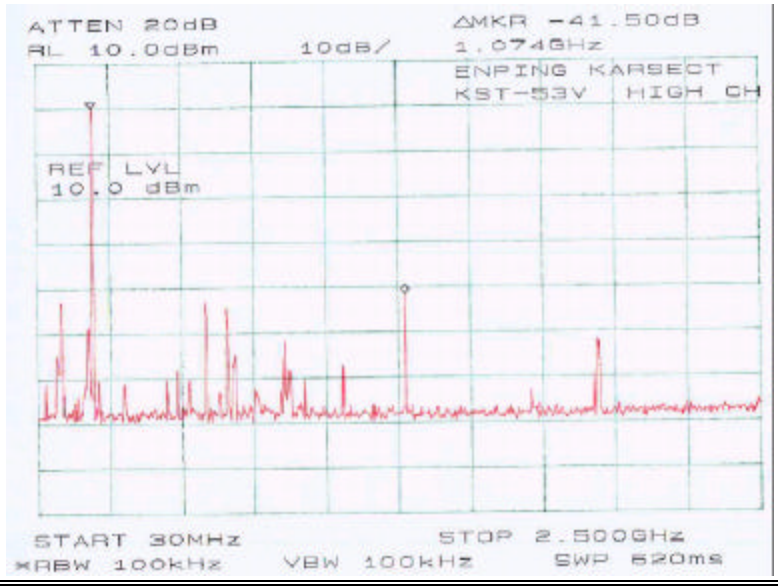
HP 8566B Spectrum Analyzer
HP7470A Plotter
Hewlett Packard HP8566B Spectrum Analyzer

7.4 Test Result

The detailed test data was presented hereinafter as reference.


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR -39.16dB
1.046GHz
ENPING KARSECT
KST-53V LOW CH
REF LVL
10.0 dBm
START 30MHz
#RBW 100kHz
VBW 100kHz
STOP 2.500GHz
#SWP 620ms


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR -38.50dB
1.074GHz
ENPING KARSECT
KST-53V MID CH
ΔMKR
1.074 GHz
-38.50 dB
START 30MHz
#RBW 100kHz
VBW 100kHz
STOP 2.500GHz
#SWP 620ms


ATTEN 20dB
RL 10.0dBm
10dB/
ΔMKR -41.50dB
1.074GHz
ENPING KARSECT
KST-53V HIGH CH
REF LVL
10.0 dBm
START 30MHz
#RBW 100kHz
VBW 100kHz
STOP 2.500GHz
SWP 620ms

8 - FREQUENCY STABILITY MEASUREMENT

8.1 Provision Applicable

According to FCC 2.1055(a)(1), the frequency stability shall be measure with variation of ambient temperature from –30ºC to +50ºC, and according to FCC 2.1055(d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to FCC 74.861(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

8.2 Test Procedure

8.2.1 Frequency stability versus environmental temperature

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

8.2.2 Frequency Stability versus Input Voltage

At room temperature (25±5°C), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage.

8.3 Test Equipment

Temperature Chamber, -50°C to +100°C
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Hewlett Packard HP 5383A Frequency Counter
Goldstar DC Power Supply, GR303

8.4 Test Results

Reference Frequency: 209.1500 MHz, Limit: 5ppm			
Environment Temperature (°C)	**Power Supplied (Vdc)**	**Frequency Measure with Time Elapsed**	
		MCF (MHz)	**PPM Error**
50	New Batt.	209.1500	0.0
40	New Batt.	209.1502	0.6
30	New Batt.	209.1499	-0.3
20	New Batt.	209.1498	-0.6
10	New Batt.	209.1499	-0.3
0	New Batt.	209.1501	0.3
-10	New Batt.	209.1502	0.6
-20	New Batt.	209.1505	1.0
-30	New Batt.	209.1505	1.0

Frequency Stability Versus Input Voltage

Reference Frequency: 209.1500 MHz, Limit: 5ppm						
Power Supplied (Vdc)	**Frequency Measure with Time Elapsed**					
	2 Minutes		**5 Minutes**		**10 Minutes**	
	MHz	**ppm**	**MHz**	**ppm**	**MHz**	**ppm**
5.6Vdc	209.1500	0.0	209.1501	0.3	209.1499	-0.3

The manufacturer declares that the battery operating end point is 5.6 Vdc

Conclusion: The EUT complied with the applicable Frequency Stability Limits.