# Intertek Testing Services

***FCC Part 90 Certification***

Performed on the

**Remote Emergency Device**
**Model: RED**
**FCC ID: BIB54530001**

for
**Meteor Communications Corporation**

Date of Test: November 16, 1998

Job #: J98029181

Total No. of Pages Contained in this Report: 23



The results contained in this report were derived from measurements performed on the identified test samples. Any implied performance of other samples on this report is dependent on the representative of the samples tested.

NVLAP®

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## 1.0 **Introduction**

### 1.1 Test Summary

| FCC RULE | DESCRIPTION OF TEST | RESULT | PAGE |
|---|---|---|---|
| 2.985 | RF Power Output | Pass | 3 |
| 2.989(I), 90.209(b)(5), 90.210 | Occupied Bandwidth, Bandwidth Limitation, Emission masks | Pass | 4 |
| 2.991 | Spurious emissions at antenna terminals | Pass | 6 |
| 2.993, 15.109 | Field Strength of Spurious Radiation | Pass | 7 |
| 15.107 | Line Conducted Emissions | N/A | 13 |
| 2.995(a) | Frequency Stability vs. Temperature | Pass | 14 |
| 2.995(d)(1) | Frequency Stability vs. Voltage | Pass | 15 |
| 2.914 | Transient frequency behavior | N/A | 17 |

***Tested By:*** Cleveland Kwan, Test Engineer — 1/22/99 (Date)

***Approved By:*** David Chernomordik, EMC Site Manager — 1/22/99 (Date)

## 1.2 Product Description

The Meteor Communications Corporation is a Remote Emergency Transmitter. For more details see the information below and user manual.

| | |
|---|---|
| Applicant and Mailing Address | Meteor Communications Corporation<br>8631 South 212th Street<br>Kent, Washington 98031 |
| Manufacturer and Mailing Address | |
| FCC ID | BIB54530001 |
| Use of Product | Perosonal Emergency-Signaling Device |
| Whether quantity (>1) production is planned | [X] Yes, [ ] No |
| Type(s) of Emission | 16K0G1WWN |
| Max. Allowed Modulation | 2.0 kHz |
| Type of Modulation | BPSK |
| Range of RF Output | 250 mW |
| Means for variation of operating power, if any | N/A |
| The dc voltage applied to and current into the several elements of the final RF amplifying device | Voltage: 9V<br><br>Current: 0.25 |
| Frequency Range | 36 - 50 MHz |
| Max. number of Channels | 1 |
| Antenna(e) & Gain | Loop, - 36 dBd |
| Detachable antenna ? | [ ]Yes [X] No |
| Receiver L.O. frequency | N/A |
| External input | [ ] Audio [X] Digital Data |

## 2.0 **RF Power Output**, FCC §2.985(a), §90.205

### 2.1 Test Procedure

The transmitter output was connected to a calibrated coaxial attenuator, the other end of which was connected to a spectrum analyzer. The resolution bandwidth and the video bandwidth of the spectrum analyzer were set up to 100 kHz and 30 kHz respectively. The attenuator was included in spectrum analyzer OFFSET function.

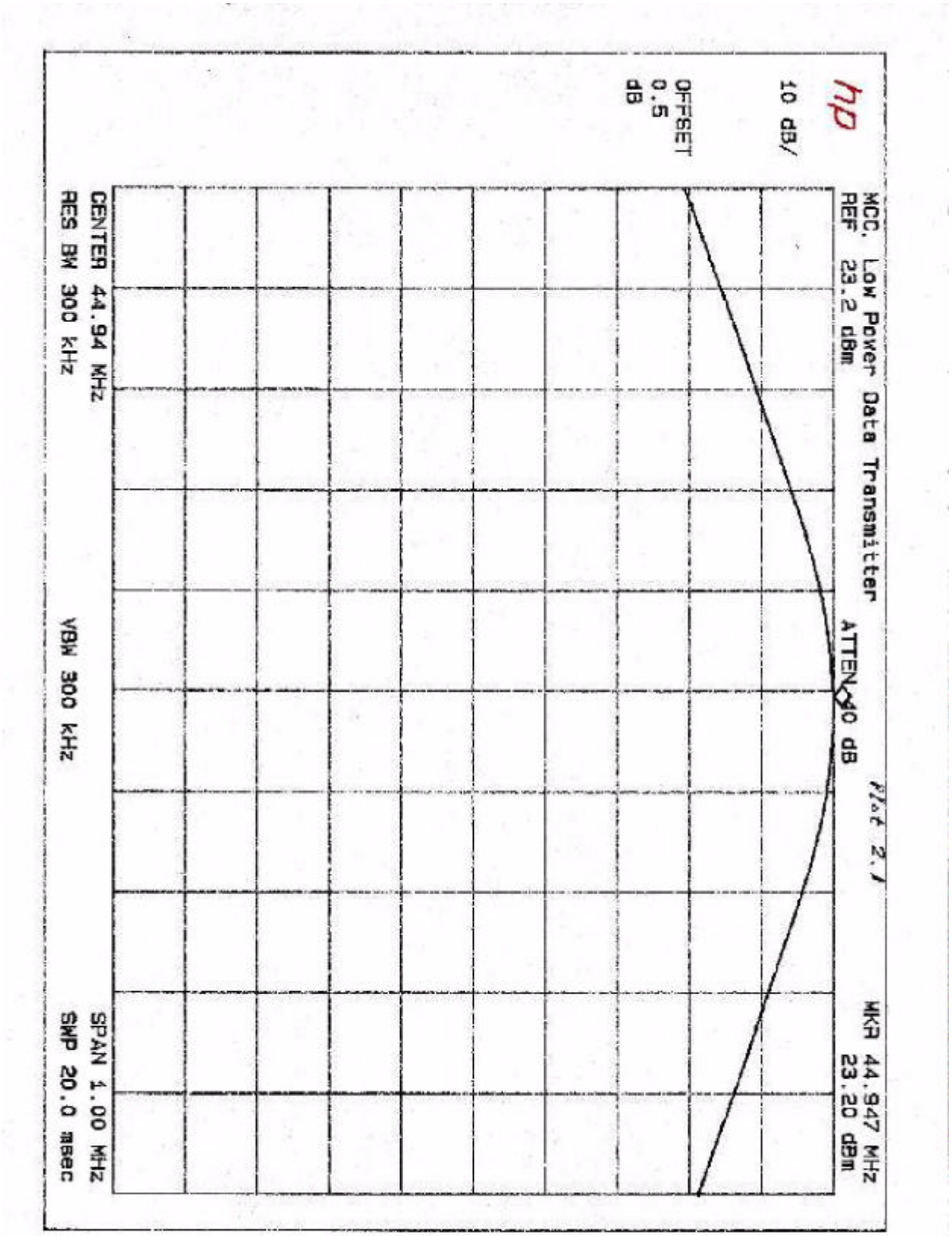
Transmitter output was read off the spectrum analyzer.

### 2.2 Test Equipment

Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782 Spectrum Analyzer, 100 Hz - 40 GHz

### 2.3 Test Results

The EUT passed the test, refer to the attached plot #2.1


hp
MCC. Low Power Data Transmitter
REF 23.2 dBm
ATTEN 40 dB
Plot 2.1
MKR 44.947 MHz
23.20 dBm
10 dB/
OFFSET
0.5
dB
CENTER 44.94 MHz
SPAN 1.00 MHz
RES BW 300 kHz
VBW 300 kHz
SWP 20.0 msec

## 3.0 **Effective Radiated Power**, FCC § 90.205

### 3.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site.

The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidth of the spectrum analyzer were set to 100 kHz. The maximum emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading was recorded.

The ERP was calculated as follows:

$$ERP_{(dBm)} = E_{(dBuV/m)} + 20 \log D - 10 \log 30 - 10 \log G - 90$$

where D = 3m, distance
G = 1.64, gain of half-wave dipole

### 3.2 Test Equipment

Hewlett Packard HP8566B Spectrum Analyzer
CDI Biconical Antenna

### 3.3 Test Results

The ERP was found as -34.1 dBm

4.0 **Occupied Bandwidth**, **Bandwidth Limitation, Emission masks.** FCC §2.989(I), 90.209(b)(5), 90.210

4.1 Test Procedure

The antenna was disconnected from the transmitter and the short cable was connected to a spectrum analyzer. The resolution bandwidth and the video bandwidth of the spectrum analyzer were set up to 300 kHz respectively.

The resolution bandwidth of the spectrum analyzer was set up at least 10 times higher then the authorized bandwidth of the transmitter. The spectrum analyzer reading was recorded and plotted. This reading is used as a reference for emission mask measurements.

The resolution bandwidth of the spectrum analyzer was set up to 100 Hz and the spectrum of the transmitting signal was recorded. This spectrum was compared to the required emission mask. The emission designator was defined as 16K0G1WWN.

4.2 Test Equipment

HP 8566B Spectrum Analyzer, 100 Hz - 22 GHz
HP 7470A Plotter

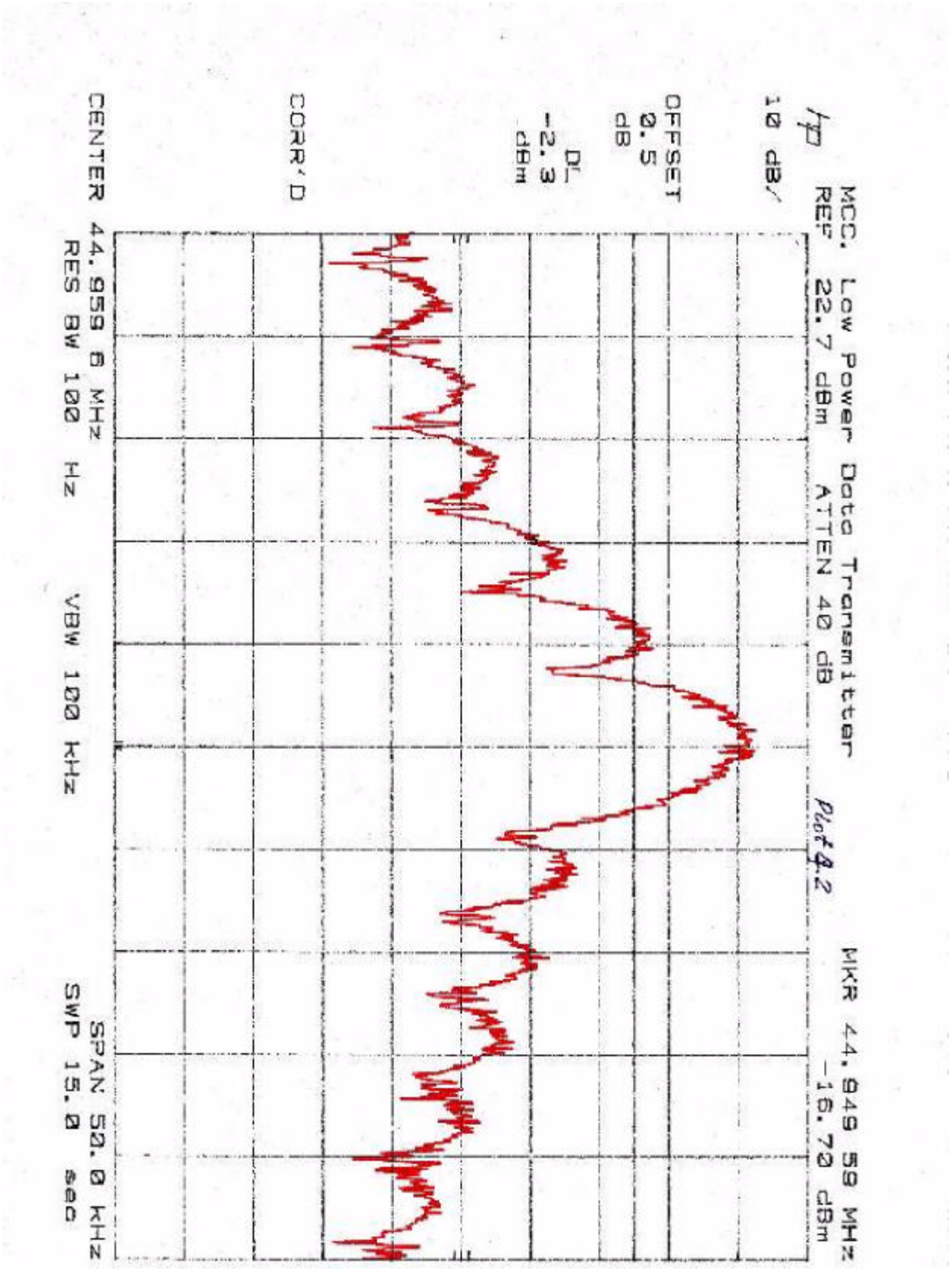
4.3 Test Results

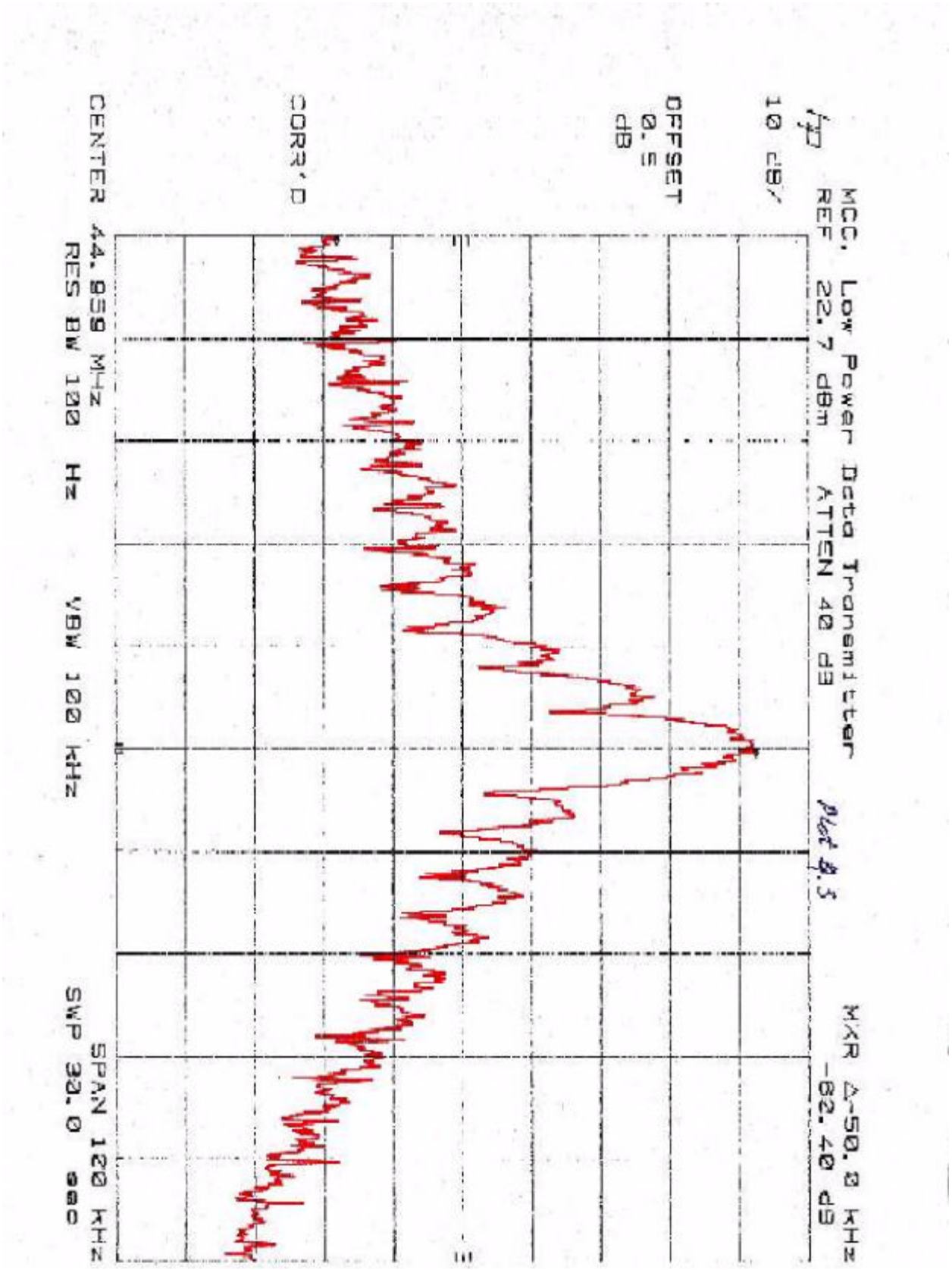
The EUT meets the requirements for the emission mask C - 20 kHz channel bandwidth equipment.

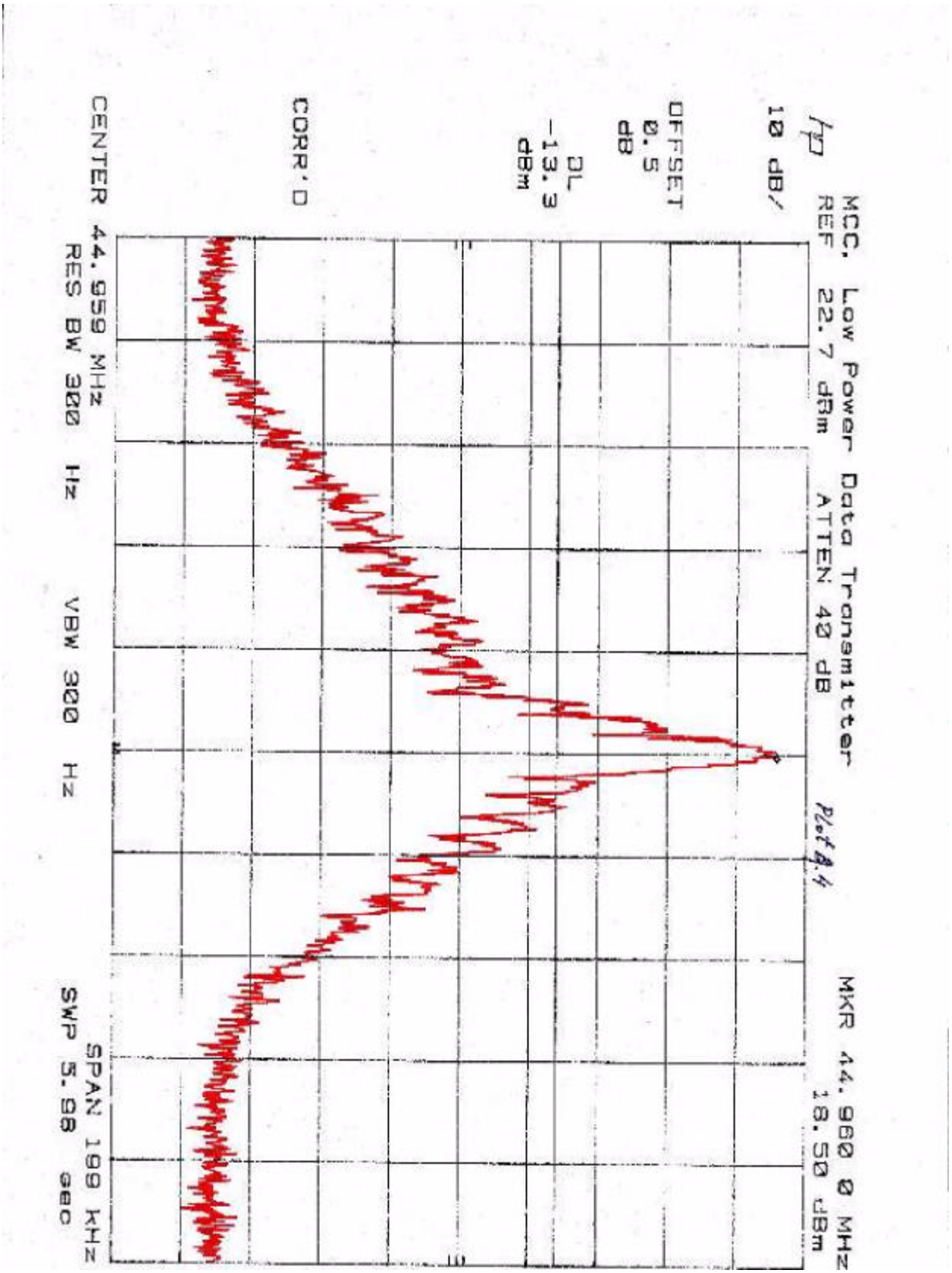
Refer to the attached plots 4.2 - 4.5.

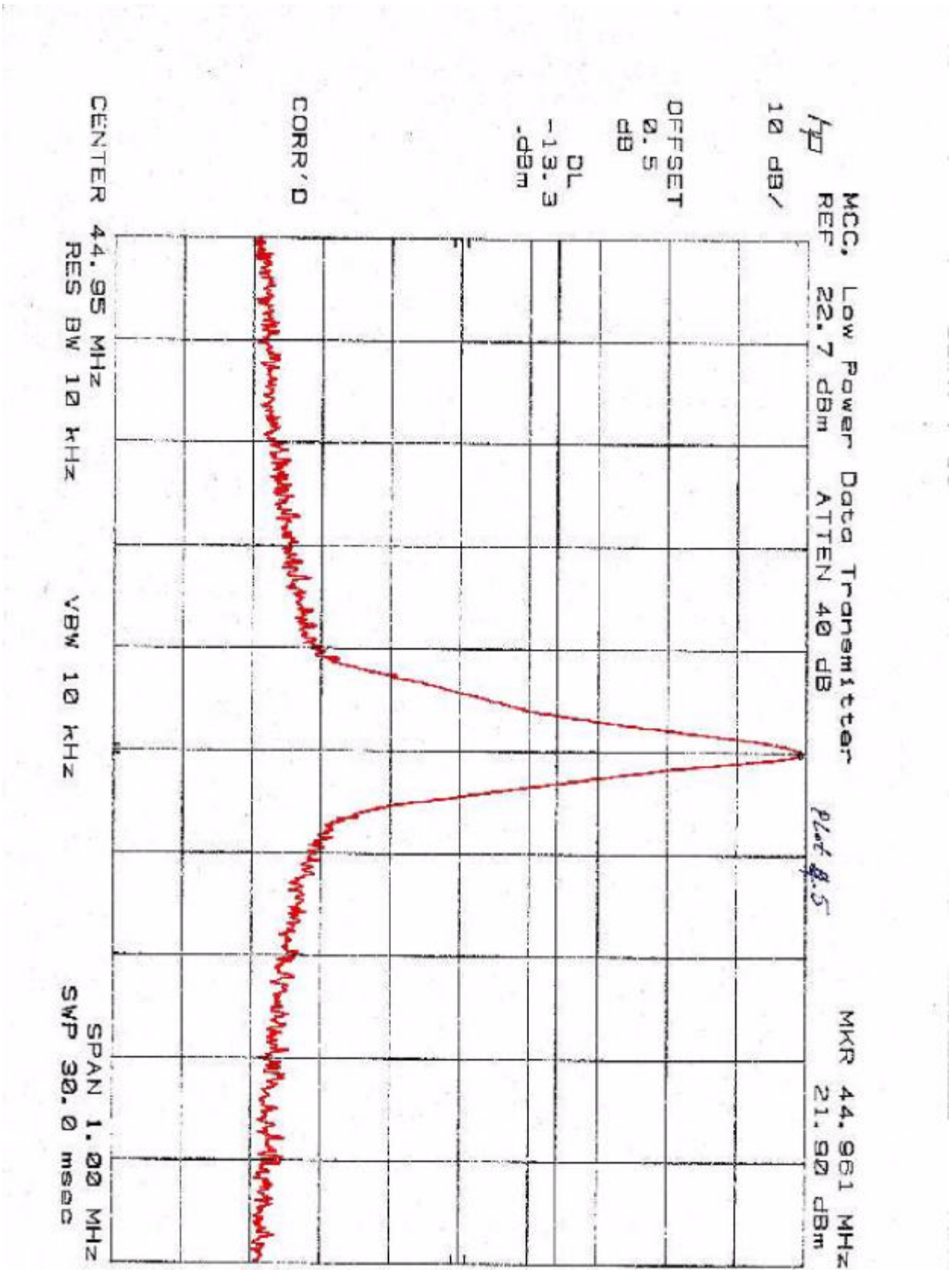
Emission Limitations, Occupied Bandwidth Plots

| Plot Number | Description |
|---|---|
| 4.2 | Occupied bandwidth, scan 50 kHz |
| 4.3 | Occupied bandwidth, scan 100 kHz |
| 4.4 | Occupied bandwidth, scan 200 kHz |
| 4.5 | Occupied bandwidth, scan 1 MHz |


MCC. Low Power Data Transmitter
REF 22.7 dBm
ATTEN 40 dB
Plot 4.2
10 dB/
OFFSET 0.5 dB
DL -2.3 dBm
CORR'D
MKR 44.949 59 MHz
-16.72 dBm
CENTER 44.959 8 MHz
RES BW 100 Hz
VBW 100 kHz
SPAN 50.0 kHz
SWP 15.0 sec


MCC, Low Power Data Transmitter
REF 22.7 dBm
10 dB/
ATTEN 40 dB
OFFSET 0.5 dB
CORR'D
CENTER 44.850 MHz
RES BW 100 Hz
VBW 100 kHz
SPAN 120 kHz
SWP 30.0 sec
MKR Δ-50.0 kHz
-82.40 dB
Plot #3.5


MCC. Low Power Data Transmitter
REF 22.7 dBm
10 dB/
OFFSET 0.5 dB
DL -13.3 dBm
CORR'D
ATTEN 40 dB
Plot 4.4
MKR 44.960 0 MHz
18.50 dBm
CENTER 44.959 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 199 KHz
SWP 5.98 sec


MCC, Low Power Data Transmitter
REF 22.7 dBm
ATTEN 40 dB
10 dB/
OFFSET 0.5 dB
DL -13.3 -dBm
CORR'D
MKR 44.961 MHz
21.90 dBm
CENTER 44.95 MHz
RES BW 10 kHz
VBW 10 kHz
SPAN 1.00 MHz
SWP 30.0 msec

Plot #5

## 5.0 **Out of Band Emissions at Antenna Terminals** , FCC §2.991

Out of Band Emissions:

The power of emissions must be attenuated below the power of the unmodulated carrier (P) on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth - at least 43 + 10 log P dB.

### 5.1 Test Procedure

The antenna was disconnected from the transmitter. The transmitter output was connected to a spectrum analyzer. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show the out-of- band emissions if any up to 10th harmonic.

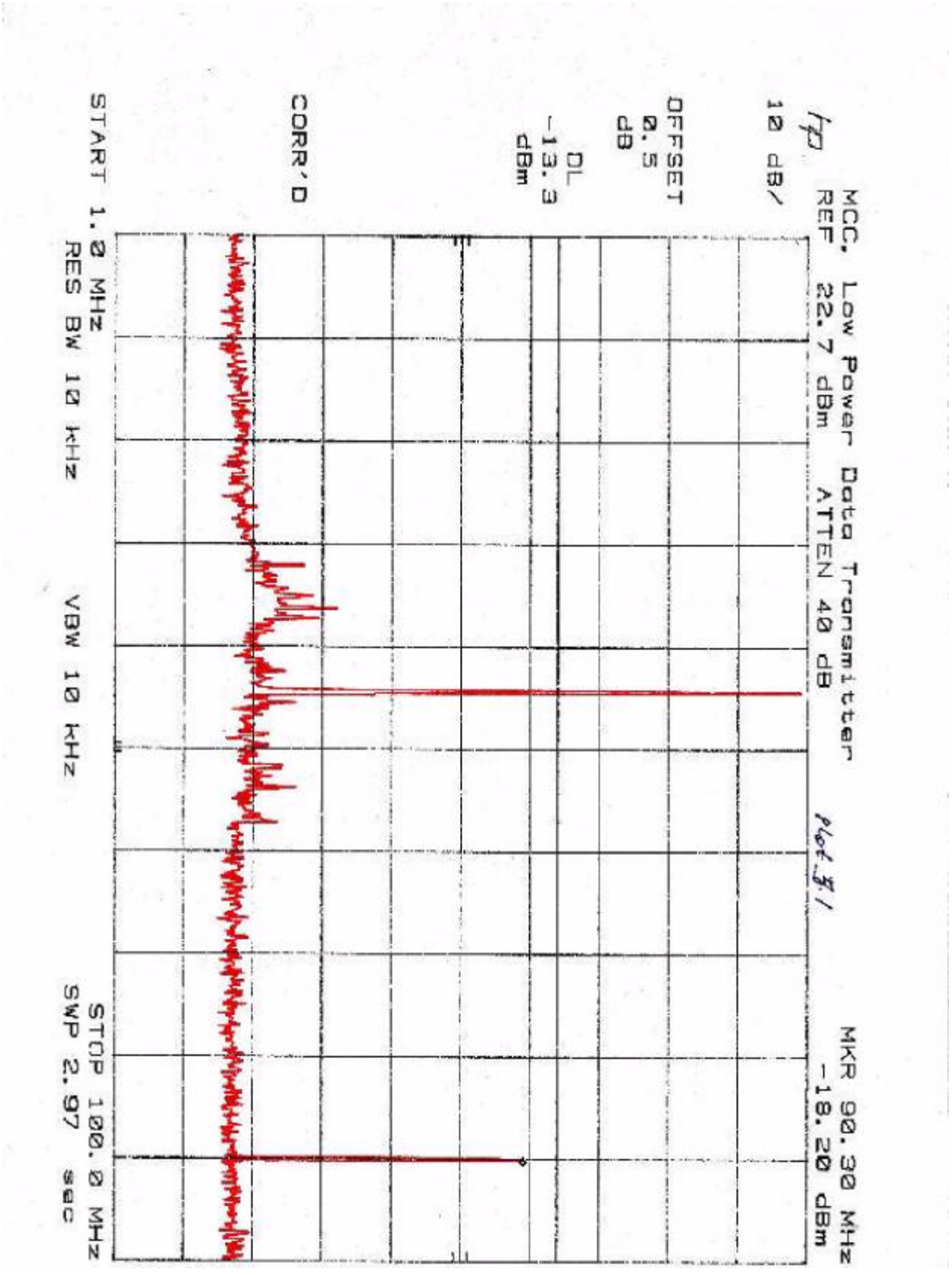
### 5.2 Test Equipment

HP 8566B Spectrum Analyzer, 100 Hz - 22 GHz
HP 7470A Plotter

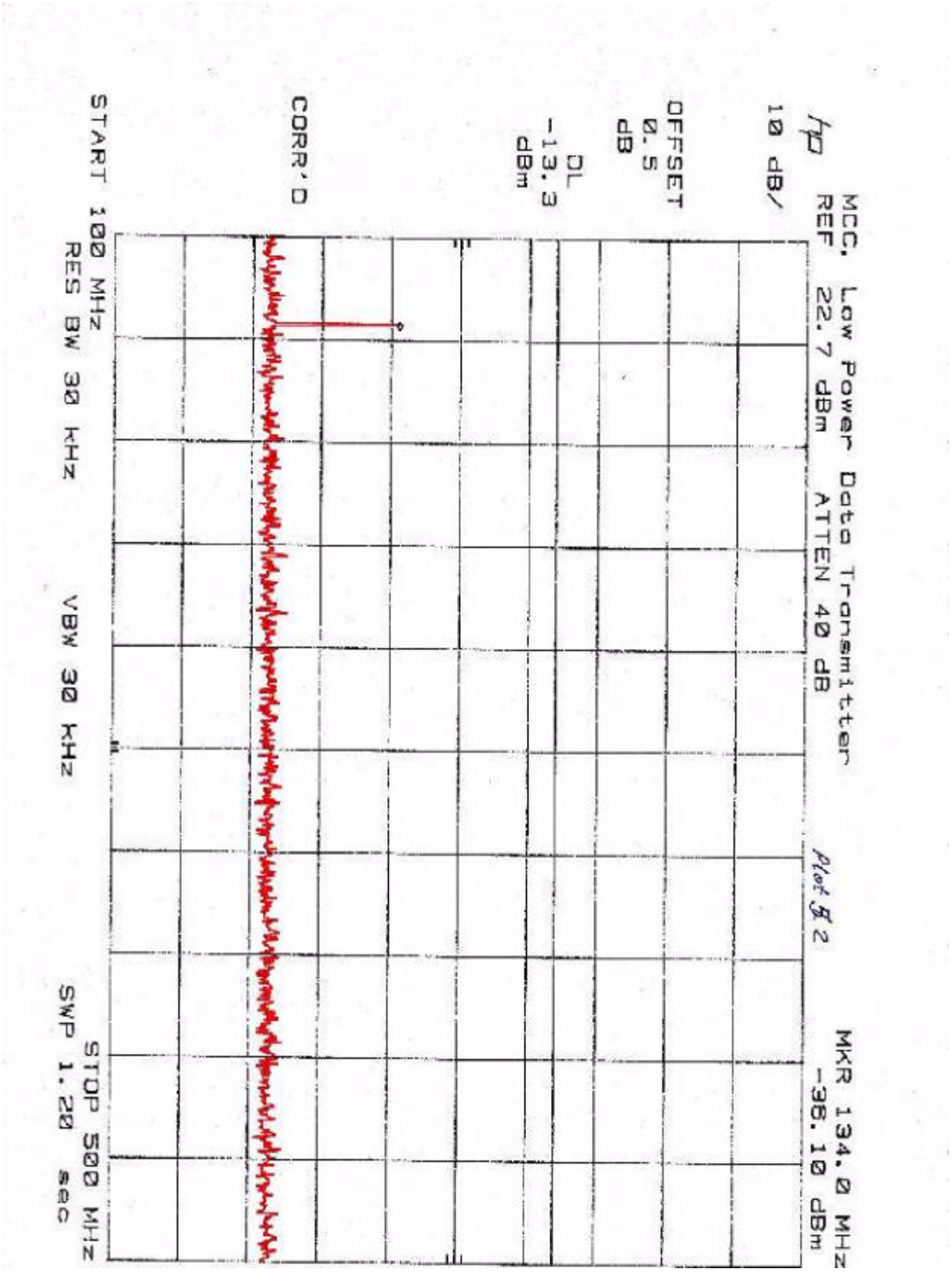
### 5.3 Test Results

The EUT passed the test, refer to the attached plots.

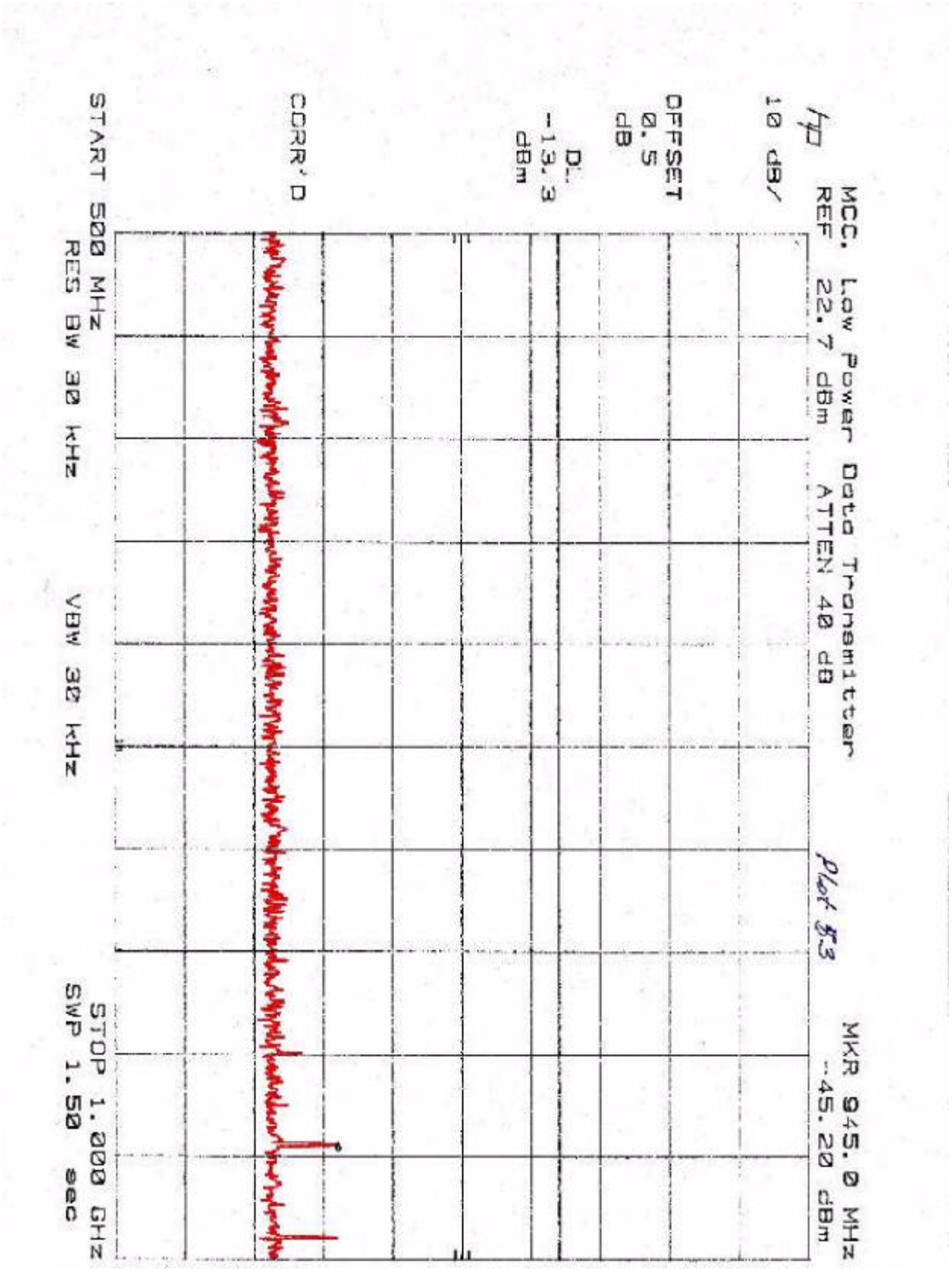
| Plot Number | Description |
|---|---|
| 5.1 | 1 - 100 MHz |
| 5.2 | 100 - 500 MHz |
| 5.3 | 0.5 - 1 GHz |


MCC, Low Power Data Transmitter
REF 22.7 dBm
ATTEN 40 dB
10 dB/
OFFSET 0.5 dB
DL -13.3 dBm
CORR'D
START 1.0 MHz
RES BW 10 kHz
VBW 10 kHz
STOP 100.0 MHz
SWP 2.97 sec
MKR 90.30 MHz
-18.20 dBm

Plot #1


MCC. Low Power Data Transmitter
REF 22.7 dBm
ATTEN 40 dB
10 dB/
OFFSET 0.5 dB
DL -13.3 dBm
CORR'D
MKR 134.0 MHz -36.10 dBm
START 100 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 500 MHz
SWP 1.20 sec

Plot # 2


MCC. Low Power Data Transmitter
REF 22.7 dBm
ATTEN 40 dB
10 dB/
OFFSET 0.5 dB
D1 -13.3 dBm
CORR'D
MKR 945.0 MHz -45.20 dBm
START 500 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 1.000 GHz
SWP 1.50 sec

Plot #3

## 6.0 **Field Strength of Spurious Radiation**, FCC § 2.993, §15.109

### 6.1 Test Procedure

The transmitter was placed on a wooden 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.

The spurious harmonic attenuation was calculated as the difference between E in dB(uV/m) at the fundamental frequency and at the spurious emission frequency.

Note: Since the EUT's antenna is non-detachable and the EIRP is very low (-32 dBm), the limit for spurious radiation is defined as $\{43 + 10 \text{ Log (EIRP)}\}$ dB, In this case the limit is 0 dB

### 6.2 Test Equipment

EMCO 3143 Bi-log Antenna
HP 8566B Spectrum Analyzer
CDI P-950 Preamplifier

6.3 Test Results

**Spurious Harmonic Attenuation**

Test Site: #1
Test Engineer: C. Kwan
Operation Mode: Continuously transmitting at 44.96 MHz

| Frequency MHz | Antenna Pol. | SA Reading dB(uV) | Antenna Factor dB (1/m) | Pre-amp. Correct. dB | Cable loss dB | Distance Correct. dB | Field Strength dB(uV/m) | Spurious attenuat. dB |
|---|---|---|---|---|---|---|---|---|
| 45.0 | V | 53.3 | 10.0 | 0 | 0 | 0 | 63.3 | - |
| 90.0 | V | 33.8 | 6.5 | 0 | 0 | 0 | 40.3 | 20.0 |
| 135.0 | V | 28.6 | 7.8 | 0 | 0.2 | 0 | 36.6 | 26.6 |
| 180.0 | V | 32.8 | 8.5 | 0 | 0.3 | 0 | 41.6 | 21.1 |
| 225.0 | V | 25.0 | 10.6 | 0 | 0.6 | 0 | 36.2 | 27.1 |
| 270.0 | V | 12.3 | 11.6 | 0 | 0.7 | 0 | 24.6 | 38.7 |
| 315.0 | V | 12.3 | 12.8 | 0 | 0.8 | 0 | 25.9 | 37.4 |
| 360.0 | V | 14.5 | 14.1 | 0 | 1.0 | 0 | 29.6 | 33.7 |
| 405.0 | V | 13.9 | 14.8 | 0 | 1.2 | 0 | 29.9 | 33.4 |
| 450.0 | V | 15.9 | 15.6 | 0 | 1.4 | 0 | 32.9 | 30.4 |

| RESULT | **Passed** |
|---|---|

## FCC Part 15.109 Radiated Emission

Test site: #1
Test Engineer: D. Chernomordik
Operation Mode: Continuously transmitting at 44.96 MHz.

| Frequency MHz | Antenna Pol. | SA Reading dB(uV) | Antenna Factor dB(1/m) | Pre-amp. Correct. dB | Cable loss dB | Field Strength dB(uV/m) | Limit dB(uV/m) | Margin dB |
|---|---|---|---|---|---|---|---|---|
| No emissions, except harmonics of transmitter, were detected above the noise floor, which is at least 20 dB below the limit | | | | | | | | |

Note: All measurements were made at 3 m distance.
Frequency range investigated is from 30 to 1000 MHz.

## 7.0 **Line Conducted Emissions**, FCC § 15.107

### 7.1 Test Procedure

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to the DC power supply, that was connected to the AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

### 7.2 Test Configuration Setup - Line Conducted Emissions

Not applicable, the EUT is battery powered only.

### 7.3 Test Results

Not applicable, the EUT is battery powered only.

8.0 **Frequency Stability vs Temperature**, FCC § 2.995(a), § 90.213

8.1 Test Procedure

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. The DC leads, RF output cable, exited the chamber through an opening

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

8.2 Test Equipment

Temperature Chamber, -50C to +100C
Hewlett Packard 5383A Frequency Counter
Goldstar DC Power Supply, GR303

8.3 Test Results

The EUT passed the test, refer to the test data below.

| **Frequency (MHZ):** | **44.96** | Tolerance: 50 ppm, 2300 Hz |
|---|---|---|
| **Temperature, C** | **Frequency (MHz)** | **Difference (Hz)** |
| +50 | 44.959013 | -987 |
| +40 | 44.959083 | -917 |
| +30 | 44.959048 | -952 |
| +20 | 44.959273 | -727 |
| +10 | 44.959550 | -450 |
| 0 | 44.959230 | -770 |
| -10 | 44.959490 | -510 |
| -20 | 44.959111 | -889 |
| -30 | 44.959150 | -850 |

9.0 **Frequency Stability vs Voltage,** FCC 2.995(d)(2), § 90.213

9.1 Test Procedure

An external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115% of the DC nominal value and for 85% of the nominal value.

9.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
Tektronix 2784 Spectrum Analyzer
Goldstar DC Power Supply, GR303

9.3 Test Results.

The EUT passed the test, refer to the test data below.

| **Frequency (MHZ)**: | **44.96** | Tolerance: 50 ppm, 2300 Hz |
|---|---|---|
| **Voltage, V** | **Frequency (MHz)** | **Difference (Hz)** |
| 10.35 | 44.959048 | -952 |
| 9.0 | 44.959046 | -954 |
| 7.65 | 44.959047 | -953 |

## 10.0 **Transient Frequency Behavior,** FCC 90.214

### 10.1 Test Procedure

Test was performed according the TIA/EIA/IS-102.CAAA, Section 2.2.18. The transmitter was continuously transmitting a modulated signal (FSK, 2400 bits/sec.). The generator was generating FM signal (1 kHz tone, 12.5 kHz deviation). Several plots were made on the FM demodulator output with the EUT turned ON and OFF.

### 10.2 Test Result

This test is not applicable.

## 11.0 List of Exhibits

The following exhibits were submitted as separate attachments:

| | | |
|---|---|---|
| 1. | Authorization Letter | - See Cover Letters |
| 2. | ID Label Format | - Page 17 of Meteor's manual |
| 3. | ID Label Location | - Page 18 of Meteor's manual |
| 4. | Equipment Photographs | - EUT1, EUT2, EUT3, EUT4 |
| 5. | Block Diagram | - See Page 5 of Meteor's manual |
| 6. | Circuit Diagram | - See Page 11 of Meteor's manual |
| 7. | Theory of Operation | - See Page 5 of Meteor's manual |
| 8. | Test Setup Photo | - Photo 2 |
| 9. | Antenna Information | - Page 12 & 13 of Meteor's manual |
| 10. | Instruction Manual | - See attached Meteor's manual |