

Intertek Testing Services

FCC Part 15.239 Test Report
for
Innovative Wireless Products
on the
Low Power Transmitter
Model: N-10
FCC ID: NWH-0700N15F

Test Report #: 20155381
Date of Report: July 30, 2000

Job #: J2015538
Date of Test: July 27, 2000

Total No. of Pages Contained in this Report: 13

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1.0 Summary of Test Results**Model: N-10
FCC ID: NWH-0700N15F**

TEST	REFERENCE	RESULTS
Bandwidth	15.239(a)	Pass
Radiated Emission	15.239(b)	Pass
Out of Band Radiated Emission	15.239(c)	Pass
AC Conducted Emission	15.207	N/A
Radiated Emission from Digital Part	15.109	Pass
Antenna Requirement	15.203	Pass

Based on the test results, the tested sample was found to be in compliance with the FCC Part 15 requirements.

We attest to the accuracy of this report.

Test Engineer: _____

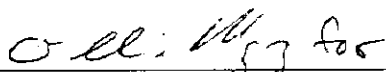


Xi-Ming Yang

Date: _____

8/4/00

Engineering Mgr. _____



David Chernomordik

Date: _____

8/4/00

2.0 General Description**2.1 Product Description**

The Innovative Wireless Products Model N-10 is a low power transmitter device use for cellular devices.

A pre-production version of the sample was received on July 27, 2000 in good condition.

Overview of the EUT	
Manufacturer, Model & FCC ID of transmitter module	N/A
Type of Equipment	☒ Transmitter only ☐ Transceiver
Type of Transmission	☒ FM
Actual Frequency Range, MHz	88.1 MHz – 107.9 MHz
Number of Channels	
Antenna Requirement	☒ The EUT uses a permanently connected antenna. ☐ The antenna is affixed to the EUT using a unique connector which allows for a replacement of a broken antenna, but does not use a standard antenna jack or electrical connector. ☐ The EUT requires professional installation (attach supporting documentation if using this option).

3.0 System Test Configuration

3.1 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For the measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power without modulation.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meters reading using inverse scaling with distance.

Small loop antenna was used at close distance measurement of bandwidth and band edge plots.

Maximum sensitivity frequency 1 kHz audio was input to the other cellular phone which was wirelessly connected to the cellular phone connected conductively to the EUT. The value was adjusted until the saturation period.

3.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.3 Mode of Operation During Test

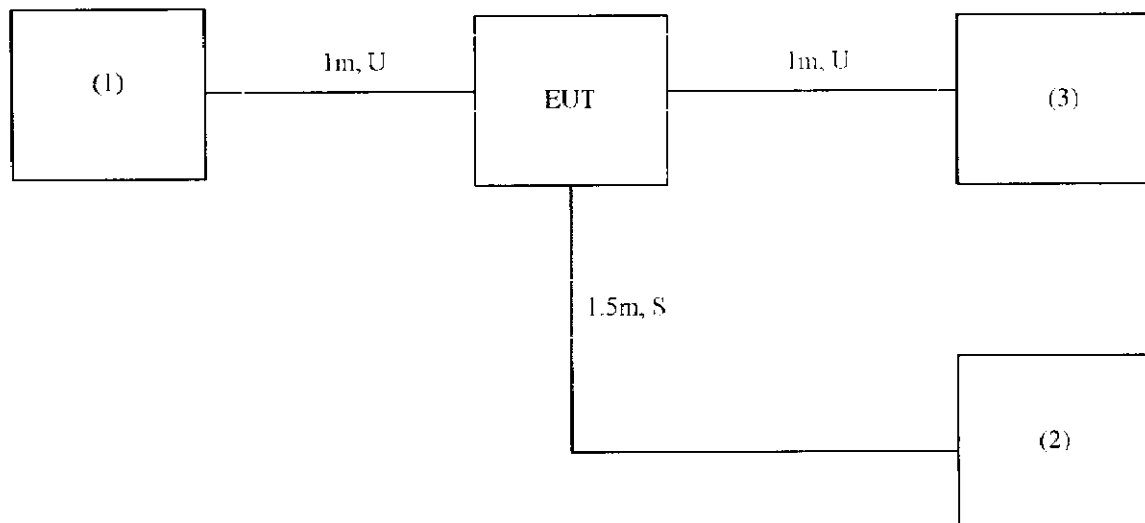
The EUT was continuously transmitting.

3.4 System Test Configuration

3.4.1 Support Equipment

Item #	Description	Model No.	Serial No.	FCC ID
1	Cellular Phone	Nokia 6160	23508400083	LJPNSW-3AX
2	Microphone	N/A	N/A	N/A
3	12VDC Battery	N/A	N/A	N/A

3.4.2 Block Diagram of Test Setup



* = EUT
** = No ferrites on video cable

S = Shielded:
U = Unshielded

F = With Ferrite

3.5 Equipment Modification

Any modifications installed previous to testing by Innovative Wireless Products will be incorporated in each production model sold/leased in the United States.

3.6 Additions, deviations and exclusions from standards

None

4.0 Emission Results

AC line conducted emission measurements were performed from 0.45 MHz to 30 MHz. Analyzer resolution is 10 kHz or greater.

Radiated emission measurements were performed from 30 MHz to 5000 MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for >1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

4.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

where FS = Field Strength in dB(μ V/m)
RA = Receiver Amplitude (including preamplifier) in dB(μ V)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:-

$$FS = RR + LF$$

where FS = Field Strength in dB(μ V/m)
RR = RA - AG in dB(μ V)
LF = CF + AF in dB

Assume a receiver reading of 52.0 dB(μ V) is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB(μ V/m). This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB(μ V)	AF = 7.4 dB/m
RR = 23.0 dB(μ V)	CF = 1.6 dB
LF = 9.0 dB	AG = 29.0 dB

$$FS = RR + LF$$
$$FS = 23 + 9 = 32 \text{ dB}(\mu\text{V/m})$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } \{[32 \text{ dB}(\mu\text{V/m})]/20\} = 39.8 \mu\text{V/m}$$

4.2 Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results: Passed by 0.8dB at 107.9 MHz
--

Note: a) All emissions not reported are at least 20 dB below the limits

Radiated Emissions Test Data

Company: Innovative Wireless Products
EUT:
Project #:
Test Mode: Tx @ 98.0MHz

Model #: N-10
S/N #:
Test Date: July 27, 2000
Engineer: Xi-Ming Y.

Standard: FCC § 15B
Limits: 2
Test Distance: 3 meters
Duty Relaxation: 0 dB

Antenna Used	Pre-Amp Used	Cable Used	Transducer Used
Number: 1	7	0	0
Model: EMCO 3143	EM LPA-25	None	None

Frequency	Reading	Detector	Ant. #	Amp. #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/O	#	#	H/V	dB(1m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
98.00E+0	37.8	Peak	1	0	H	7.6	0.0	0.9	0.0	46.3	48.0	-1.7
38.40E+0	11.0	Peak	1	0	H	10.8	0.0	0.5	0.0	22.3	40.0	-17.7
57.66E+0	13.2	Peak	1	0	H	5.0	0.0	0.7	0.0	18.9	40.0	-21.1
196.00E+0	21.0	Peak	1	0	H	11.0	0.0	1.5	0.0	33.5	43.5	-10.0
294.00E+0	11.0	Peak	1	0	H	13.5	0.0	1.8	0.0	26.3	46.0	-19.7
392.00E+0	11.5	Peak	1	0	H	15.7	0.0	2.2	0.0	29.4	46.0	-16.6
490.00E+0	11.0	Peak	1	0	H	17.9	0.0	2.3	0.0	31.2	46.0	-14.8
588.00E+0	10.0	Peak	1	0	H	19.4	0.0	2.9	0.0	32.3	46.0	-13.7
686.00E+0	11.0	Peak	1	0	H	20.7	0.0	3.0	0.0	34.7	46.0	-11.3
784.00E+0	11.5	Peak	1	0	H	22.5	0.0	3.0	0.0	37.0	46.0	-9.0
882.00E+0	12.3	Peak	1	0	H	23.7	0.0	3.4	0.0	39.4	46.0	-6.6
980.00E+0	10.0	Peak	1	5	H	23.6	9.4	3.5	0.0	27.7	54.0	-26.3

Notes: a) D.C.F. Distance Correction Factor

b) Insert Loss (dB) = Cable A + Cable B + Cable C

c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert Loss - Transducer Loss - Duty Relaxation (transmitter only)

d) Negative signs (-) in Margin column signify levels below the limits

e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits

Radiated Emissions Test Data

Company:	Innovative Wireless Products	Model #:	N-10	Standard	FCC § 15B
EUT:		S/N #:		Limits	2
Project #:		Test Date:	July 27, 2000	Test Distance	3 meters
Test Mode:	Tx @ 88.1MHz	Engineer:	Xi-Ming Y	Duty Relaxation	0 dB

Number:	Antenna Used	Pre-Amp Used	Cable Used	Transducer Used
1	7	0	5	0
Model:	EMCO EMLEPA-25 3143	CDL_P650	None	NPS665
		None	None	None

Frequency	Reading	Detector	Ant. Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/C	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
88.10E+0	37.5	Peak	1	0	H	8.1	0.0	0.0	46.5	48.0	-1.5
38.40E+0	11.5	Peak	1	0	H	10.8	0.0	0.0	22.8	40.0	-17.2
57.66E+0	13.0	Peak	1	0	H	5.0	0.0	0.0	18.7	40.0	-21.3
176.20E+0	14.0	Peak	1	0	H	9.2	0.0	0.0	24.6	43.5	-18.9
264.30E+0	11.0	Peak	1	0	H	12.5	0.0	0.0	25.3	46.0	-20.7
352.40E+0	11.0	Peak	1	0	H	15.4	0.0	0.0	28.6	46.0	-17.4
440.50E+0	11.3	Peak	1	0	H	17.0	0.0	0.0	30.6	46.0	-15.4
528.60E+0	10.0	Peak	1	0	H	18.7	0.0	0.0	31.2	46.0	-14.8
616.70E+0	11.0	Peak	1	0	H	19.5	0.0	0.0	33.2	46.0	-12.8
704.80E+0	11.6	Peak	1	0	H	21.1	0.0	0.0	35.7	46.0	-10.3
792.90E+0	9.4	Peak	1	0	H	22.1	0.0	0.0	34.5	46.0	-11.5
881.00E+0	9.9	Peak	1	5	H	23.7	12.7	3.4	0.0	24.3	-21.7

Notes:

- D. C. F. Distance Correction Factor
- Insert Loss (dB) = Cable A + Cable B + Cable C
- Net (dB) = Reading + Antenna Factor - Pre-amp + Insert Loss - Transducer Loss - Duty Relaxation (transmitter only)
- Negative signs (-) in Margin column signify levels below the limits
- All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Radiated Emissions Test Data

Company:	Innovative Wireless Products	Model #:	N-10	Standard	FCC § 15B
EUT:		S/N #:		Limits	2
Project #:		Test Date:	July 27, 2000	Test Distance	3 meters
Test Mode:	Tx @107.9MHz	Engineer:	Xi-Ming Y.	Duty Relaxation	0 dB

Antenna Used	Pre-Amp Used	Cable Used	Transducer Used
Number: 1	5	5	0
Model: EMCO EM-LPA-25 31.43	CDL P950	NPS665	None

Frequency MHz	Reading dB(μV)	Detector P/A/C	Ant. #	Amp. #	Ant. Pol H/V	Ant. Factor dB(1/m)	Pre-Amp dB	Insert Loss dB	D.C.F. dB	Net dB(μV/m)	Limit @3m dB(μV/m)	Margin dB
107.90E+0	39.0	Peak	1	0	H	7.2	0.0	1.0	0.0	47.2	48.0	-0.8
38.40E+0	11.3	Peak	1	0	H	10.8	0.0	0.5	0.0	22.6	40.0	-17.4
57.66E+0	12.5	Peak	1	0	H	5.0	0.0	0.7	0.0	18.2	40.0	-21.8
215.80E+0	12.5	Peak	1	0	H	11.1	0.0	1.5	0.0	25.1	43.5	-18.4
431.60E+0	12.4	Peak	1	0	H	17.2	0.0	2.3	0.0	31.9	46.0	-14.1
539.50E+0	10.4	Peak	1	0	H	19.0	0.0	2.5	0.0	31.9	46.0	-14.1
647.40E+0	10.0	Peak	1	0	H	20.7	0.0	2.7	0.0	33.4	46.0	-12.6
755.30E+0	11.0	Peak	1	0	H	21.9	0.0	3.0	0.0	35.9	46.0	-10.1
863.20E+0	12.0	Peak	1	0	H	23.1	0.0	3.4	0.0	38.5	46.0	-7.5
971.10E+0	11.5	Peak	1	0	H	23.4	0.0	3.5	0.0	38.4	54.0	-15.6
1079.00E+0	9.8	Peak	1	0	H	24.0	0.0	3.6	0.0	37.4	54.0	-16.6
980.00E+0	9.0	Peak	1	5	H	23.6	9.4	3.5	0.0	26.7	54.0	-27.3

Notes:

- D.C.F. Distance Correction Factor
- Insert Loss (dB) = Cable A + Cable B + Cable C
- Net (dB) = Reading + Antenna Factor - Pre-amp + Insert Loss - Transducer Loss - Duty Relaxation (transmitter only)
- Negative signs (-) in Margin column signify levels below the limits.
- All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

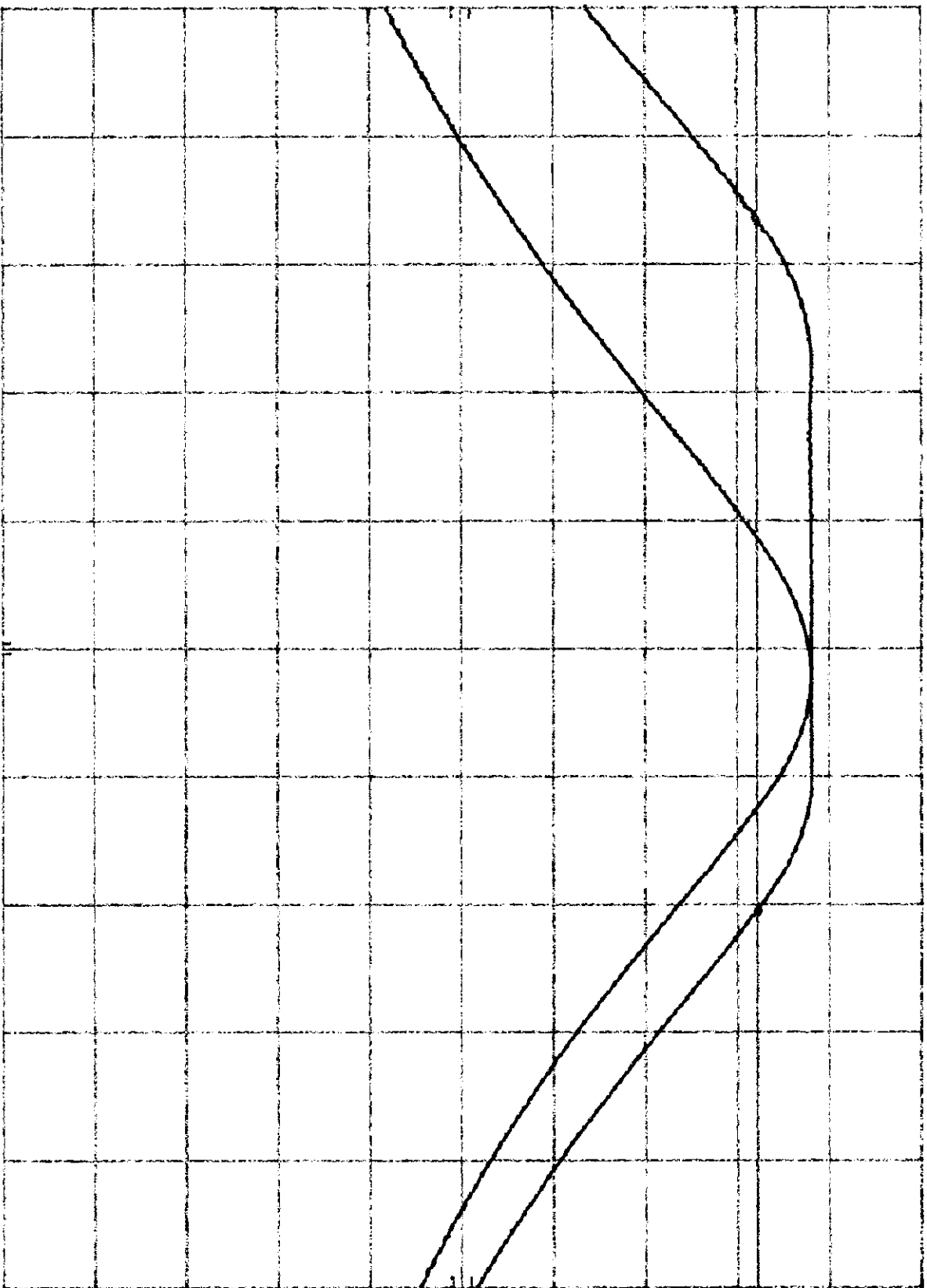
h_p

REF 77.0 dBμV ATTEN 0 dB

MKR Δ 108.0 kHz
.30 dB

10 dB/

DL
59.2
dBμV



START 88.0000 MHz STOP 88.2000 MHz
RES BW 30 kHz VBW 30 kHz SWP 20 msec

h_{ij}

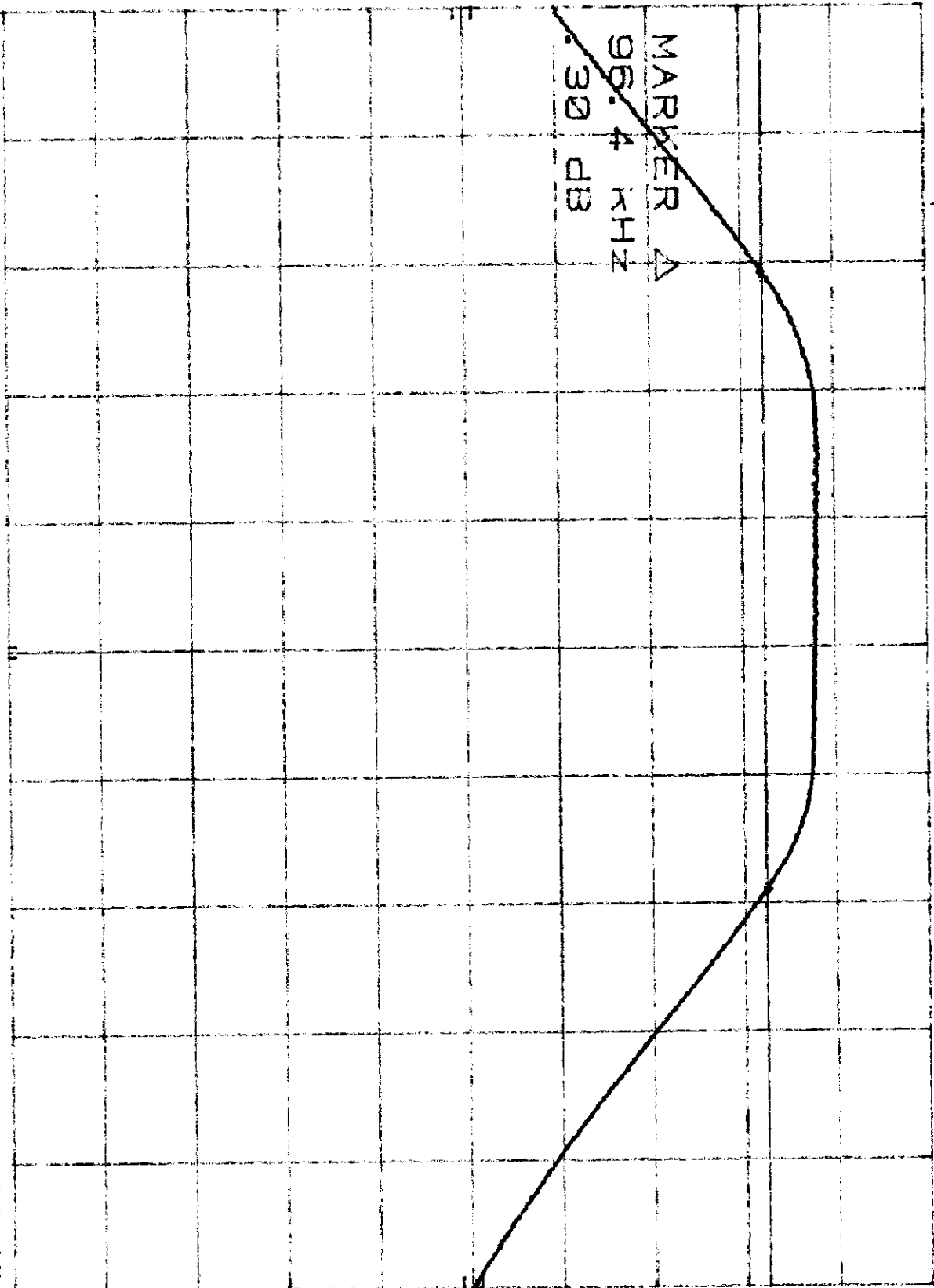
10 dB/

REF 77.0 dBμV ATTEN 0 dB

MKR Δ 96.4 kHz
.30 dB

DL
59.4
dBμV

MARKER Δ
96.4 kHz
.30 dB



START 107.0000 MHz STOP 108.0000 MHz
RES BW 30 kHz VBW 30 kHz SWP 20 mhz

4.3 Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results: N/A, the unit is battery powered device

Note: a) A complete scan from 0.45 - 30 MHz was made.

5.0 Antenna Requirement

X	The transmitter uses a permanently connected antenna.
	The antenna is affixed to the EUT using a unique connector that allows for replacement of a broken antenna, but does NOT use a standard antenna jack or electrical connector.
	The EUT requires professional installation. Please refer to the attached documentation for details).

6.0 Miscellaneous Information or Other Comments

None