

Marstech Limited

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Authorized by:
Professional Engineer
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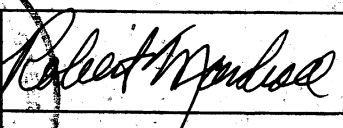
Engineering &
Administrative



Testing For FCC
Submissions/Verifications

Approved Test Facility



TEST REPORT			
REPORT DATE:		14 November 2001	
		REPORT NO: 21414D	
CONTENTS:	See Table of Contents		
SUBMITTOR:	Mandolyn Electronic Technology Inc. 250 Shields Court, Unit 10B Markham, Ontario L3R 9W7		
SUBJECT:	Model No: RM1HX [Also covers Model RM1X]		
	FCC ID: PLJRM1HX		
TEST SPECIFICATION:	47 CFR Part 15 Subpart "C" Intentional Radiators Sections: 15.205, 15.231(b), (c), (e) NOTE: Tests Conducted Are "Type" Tests.		
DATE SAMPLE RECEIVED:	19 & 25 October 2001	DATE TESTED:	06 & 13 November 2001
RESULTS:	Equipment tested complies with referenced specification with the following modification: R18, 6.8KΩ resistor was changed to 15KΩ.		
Tested by:		Approved by:	
	Edward Chang	Date:	Nov 21/01
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TECHNICAL REPORT - FCC 2.1033(b)

Applicant

Mandolyn Electronic Technology Inc.
250 Shields Court, Unit 10B
Markham, Ontario
L3R 9W7

FCC Identifier

PLJRM1HX

Manufacturer

W. H. Mandolyn International Ltd.
Yen Yang Industrial City
Zhang Mu Tou Zhen
Dongguan, China

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D	Report of Measurements Device Measured Test Facility and Equipment Test Results and Methods Test Set-up Photo	2.1033(b)(6)	Exhibit D Exhibit D(1) Exhibit D(2)-1 to -2 Exhibit D(3)-1 to -13 Exhibit D(3)-14
E	Photographs Label Equipment	2.1033(b)(7)	Exhibit E Exhibit E(1) Exhibit E(2)-1 to -4

EXHIBIT D

[FCC Ref. 2.1033(b)(6)]

"Report of Measurements"

EXHIBIT D(1)

DEVICE MEASURED

[FCC Ref. 2.1033(b)(6)]

APPLICANT: Mandolyn Electronic Technology Inc.
250 Shields Court, Unit 10B
Markham, Ontario
L3R 9W7

MANUFACTURER: W. H. Mandolyn International Ltd.
Yen Yang Industrial City
Zhang Mu Tou Zhen
Dongguan, China

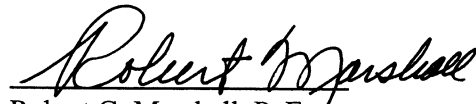
FCC IDENTIFIER: PLJRM1HX

MODEL NUMBER: RM1HX, RM1X

SERIAL NO.: Not Marked

Marstech Limited
11 Kelfield Street
Etobicoke, Ontario
M9W 5A1 CANADA

TECHNICIAN:
Edward Chang


Robert G. Marshall, P. Eng.

Date: Dec 21/01

EXHIBIT D(2)

TEST FACILITY AND EQUIPMENT LIST

Radiated ANSI C63.4 (FCC OET/55) open field 3 metre test range. This test range is protected from the cold and moisture by a non-conductive enclosure.

EQUIPMENT

Anritsu 2601A Spectrum Analyzer
Advantest R3261A Spectrum Analyzer
Hewlett-Packard RF generator # 8640 B with an 002 doubler
A.H. Systems biconical antenna; 20 MHz to 330 MHz
A.H. Systems log periodic antenna; 300 MHz to 1.8 GHz
Eaton dipole antennas; T1, T2, T3 25 MHz to 1.0 GHz
Roberts dipole antennas; T1, T2, T3 & T4 25 MHz to 1.0 GHz
Compliance Design P950 Preamp (16 dB) ... 25 MHz to 1.0 GHz

NOTE:

The Anritsu 2601A Spectrum Analyzer and the Advantest R3261A Spectrum Analyzer are calibrated annually, and that calibration is directly traceable to the National Research Council of Canada. (NRC)
This equipment is only used by qualified technicians and only for the purpose of EMI measurements.
The three metre test range has been carefully evaluated to the ANSI document C63.4 and will be remeasured for reflections and losses every three years.

SUMMARY OF RESULTS

COMPLIANCE

(yes) (no)

FIELD STRENGTH OF THE CARRIER FREQUENCY

Transmitter: 15.231(b) 72.52 dB μ V/M @ 3 Meters @ 433.71 MHz Limit: 72.86 dB μ V/M (x) ()

BANDWIDTH

Transmitter: 15.231(c) 408 KHz (x) ()

TRANSMITTER BAND RESTRICTIONS

The limit for spurious emission per 15.231(e) is lower than the general limit of 54 dB μ V/M for restricted bands. (x) ()

SPURIOUS RADIATION LEVELS

Transmitter: 15.231(b) 50.90 dB μ V/M @ 867.41 MHz Limit: 52.86 dB μ V/M (x) ()

LINE CONDUCTED RADIATION

Transmitter: N/A

PEAK TO AVERAGE RATIO

Transmitter: -8 dB (x) ()

SPURIOUS RADIATED EMISSIONS

Page 1 of 2

RESULTS

The maximum field strength of the carrier while transmitting was:

Transmitter: **Maximum field strength of 72.52dB μ V/M at 433.71MHz.**

TEST CONDITIONS

Equipment Positioning:

Receiver: N/A
Transmitter: Vertical

Antenna Polarization: Vertical

Measurement Bandwidth: 120KHz

Supply Voltage:

Transmitter: Two "AA" Size 1.5V Batteries
Receiver: N/A

METHODS OF MEASUREMENT

Transmitter:

The transmitter was placed individually on a one meter high non-metallic turntable. The EUTs were unmodified samples, as supplied by the manufacturer. All emissions were measured and recorded.

For each of the above conditions, the turntable was rotated through 360 degrees, while the receiving antenna, at three (3) meters from the EUT, was varied in height from 1 to 4 meters, to find the maximum signal strength. The measured level was converted to a field strength using the antenna correction factors and cable losses.

RADIATED EMISSION RESULTS

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Test Data:**RM1HX**

Frequency Band MHz	Meter Reading @ 3 m dB μ V	Antenna	Cable and ACF dB	Field Strength dB μ V/M	Pk/Av Ratio (dB)	Corrected F. S. dB μ V/M	FCC Limit dB μ V/M	Margin dB	Detector & BW KHz
433.71	55.72	RT4 V	24.80	80.52	8	72.52	72.86	-0.34	PK 100
867.41	29.70	LP V	29.20	58.90	8	50.90	52.86	-1.96	PK 100
1301.14 (R)	21.50	LP V	35.50	57.00	8	49.00	52.86	-3.86	PK 1000
1734.84	15.83	Horn V	31.47	47.30	8	39.30	52.86	-13.56	PK 1000
2168.55	9.83	Horn V	32.97	42.80	8	34.80	52.86	-18.06	PK 1000
2602.26	---								
3035.97	11.00	Horn V	34.45	45.45	8	37.45	52.86	-15.41	PK 1000
3469.68	---								
3903.39 (R)	7.54	Horn V	35.85	43.39	8	35.39	52.86	-17.47	PK 1000
4337.10 (R)	---								

(R) = Restricted Bands

NOTE: The FCC limit for spurious emission per 15.231(e) is lower than the general limit of 54 dB μ V/M for restricted bands.

PEAK TO AVERAGE RATIO

The peak to average ratio was measured and calculated as follows:

One complete cycle was 93.6 mS (refer to Graph D)

One pulse has an on time of 70.8 mS (refer to Graph F) and an off time of 22.8 mS (refer to Graph E)

The total number of pulses in one cycle is 25 (refer to Graph D).

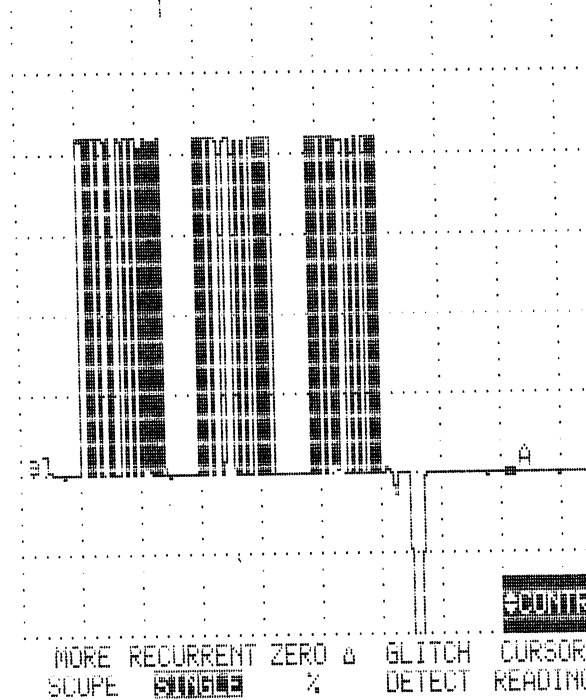
The total number of on pulses is $11 \times 1.96 \text{ mS}$ (Graph I) + $14 \times 0.98 \text{ ms}$ (Graph J) = 35.28 mS.

The peak to average ratio is the total on time (35.28 mS) divided by the total cycle time (93.6 mS).

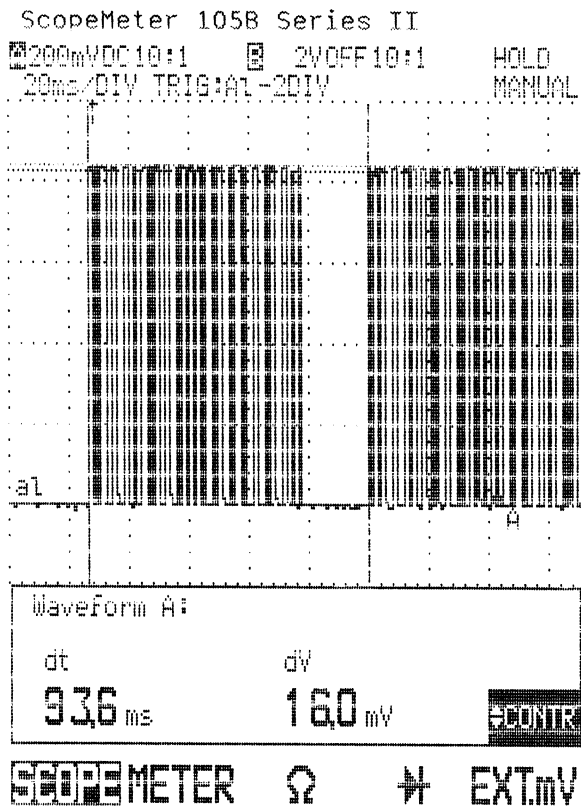
Peak to average ratio: $\frac{35.28}{93.6} = 0.377$

Peak to average ratio: $20 \log 0.377 = -8.47 \text{ dB}$ or -8 dB

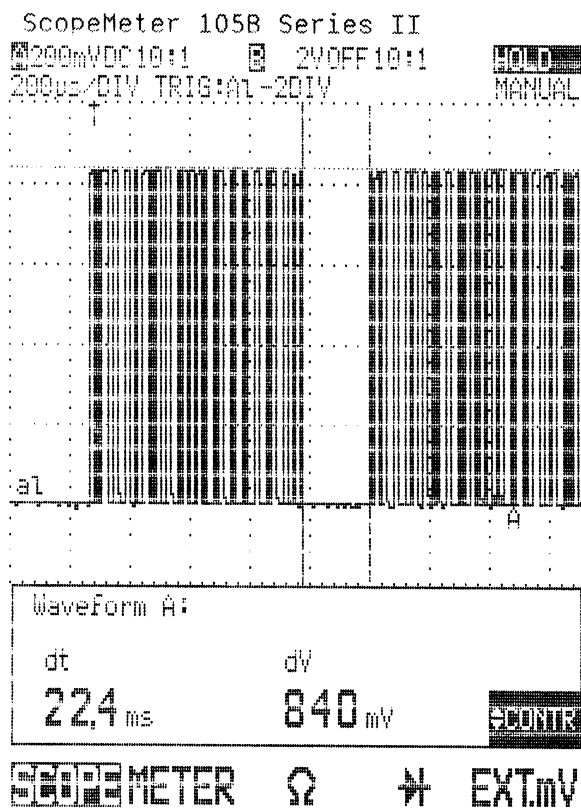
ScopeMeter 105B Series II
200mVDC 10:1 2V OFF 10:1 HOLD
50ns/DIV TRIG:A1-20IV MANUAL



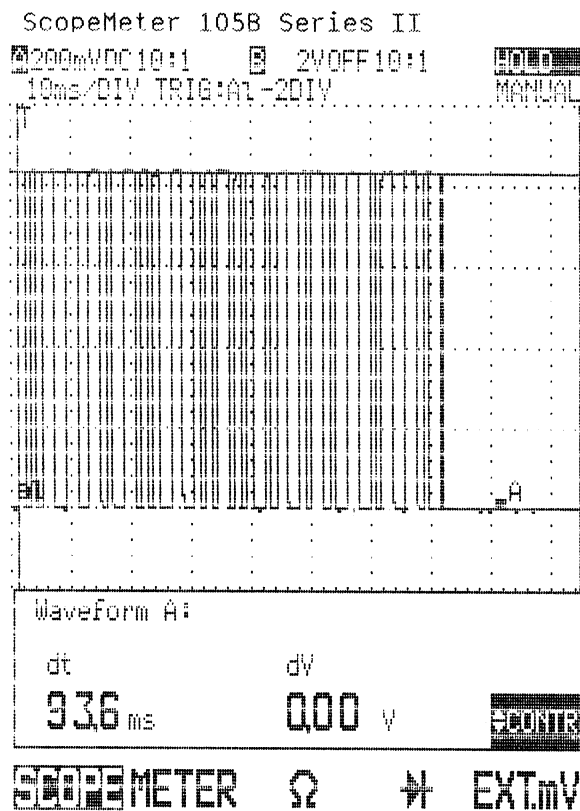
GRAPH A



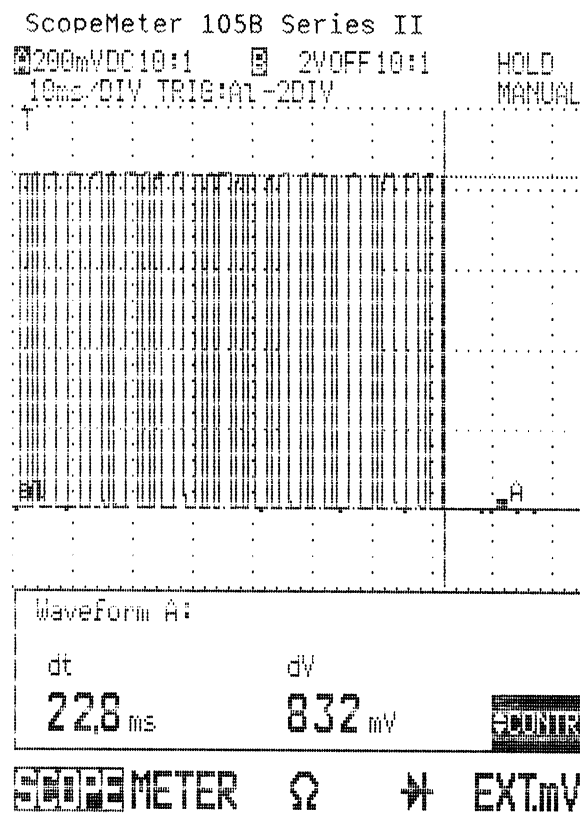
GRAPH B



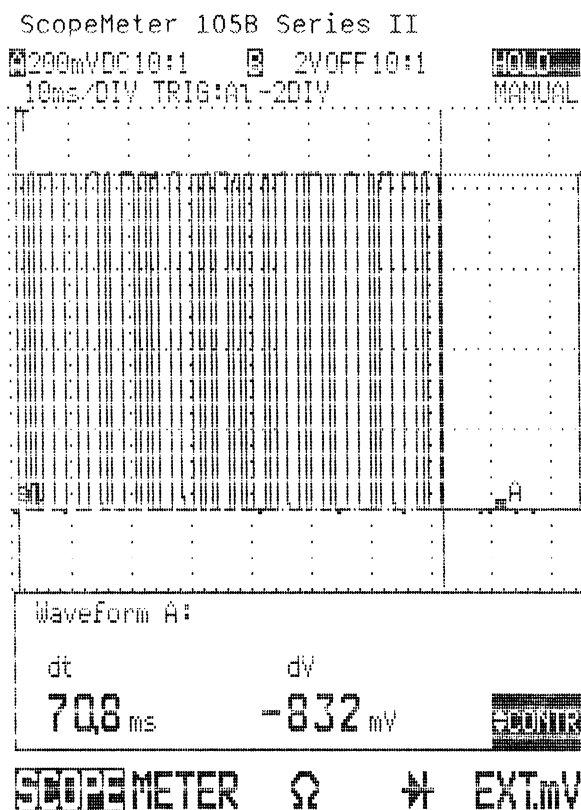
GRAPH C



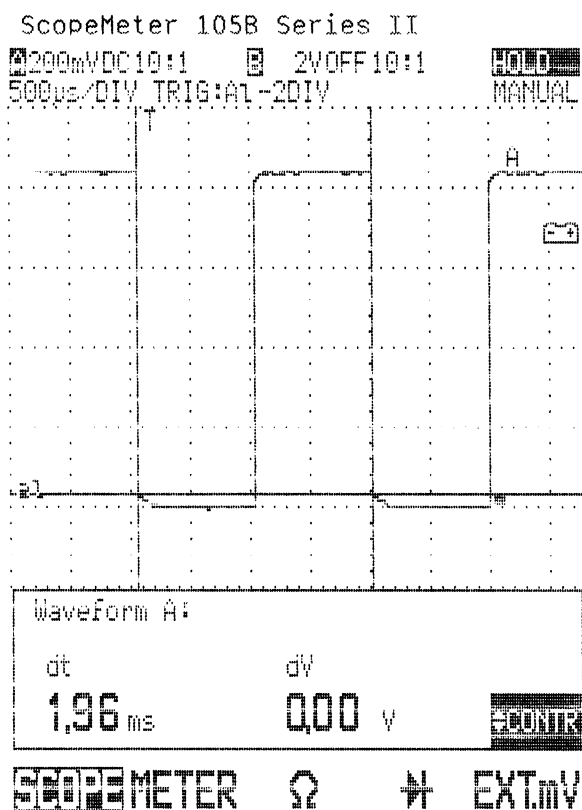
GRAPH D



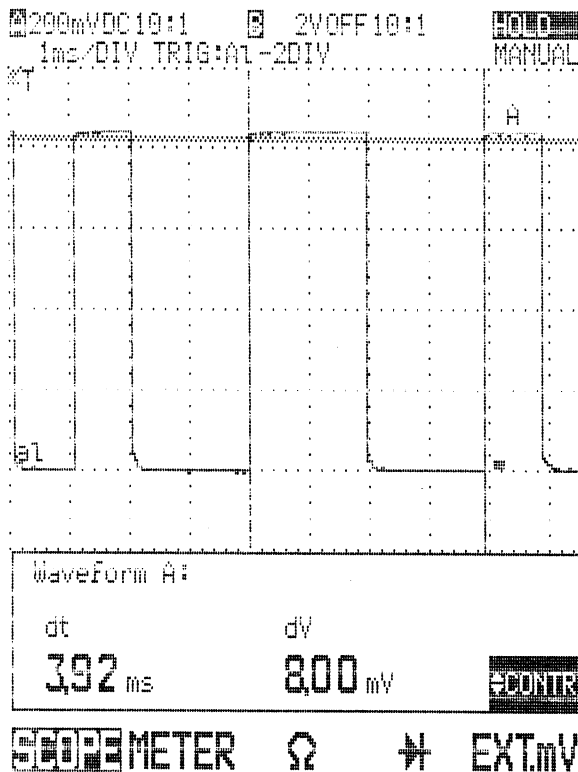
GRAPH E



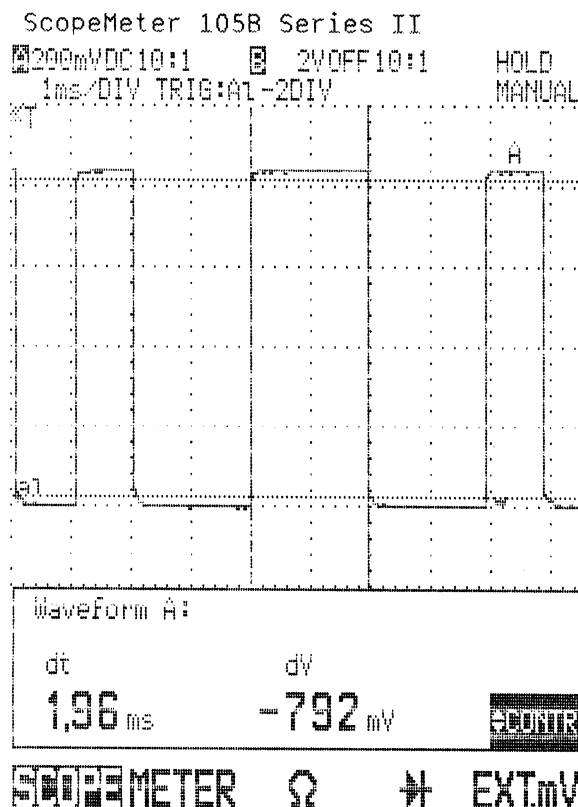
GRAPH F



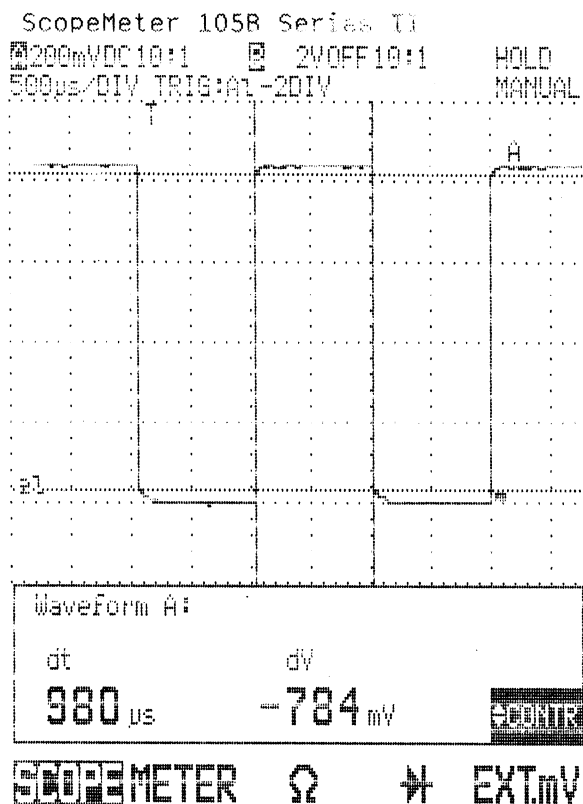
GRAPH G



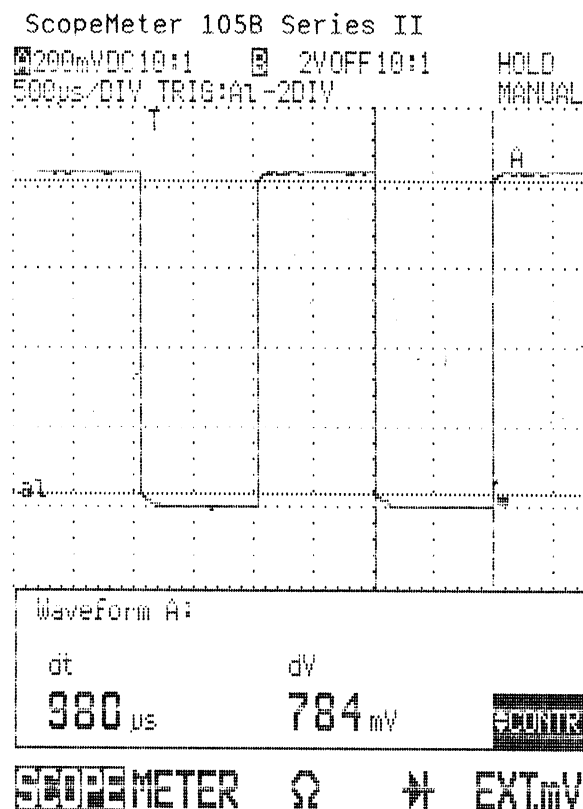
GRAPH H



GRAPH I



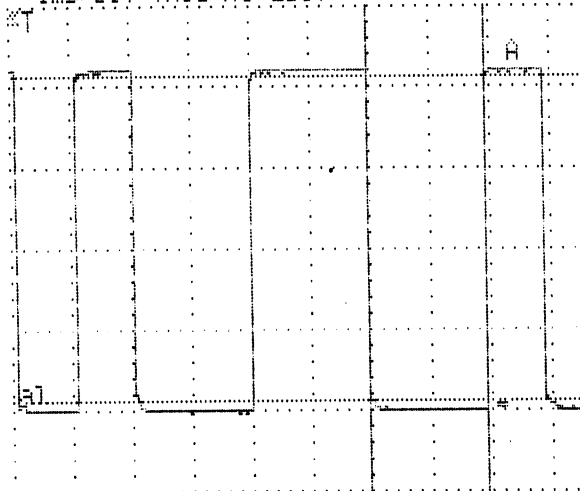
GRAPH J



GRAPH K

ScopeMeter 105B Series II

200mVDC10:1 2VAC10:1 HOLD
1ms/DIV TRIG:A1-2DIV MANUAL



Waveform A:

dt

1.96 ms

dV

800 mV

SONIX

SCOPEMETER Ω $\rightarrow$ EXT.mV

GRAPH L

BANDWIDTH

The 20 dB bandwidth was measured at 408 KHz, which is less than 0.25% of 433 MHz = 1082 KHz.

MODEL RMIHX
BANDWIDTH OF EMISSION
[15.231(c)]

14:06:26 NOV 13, 2001

/P

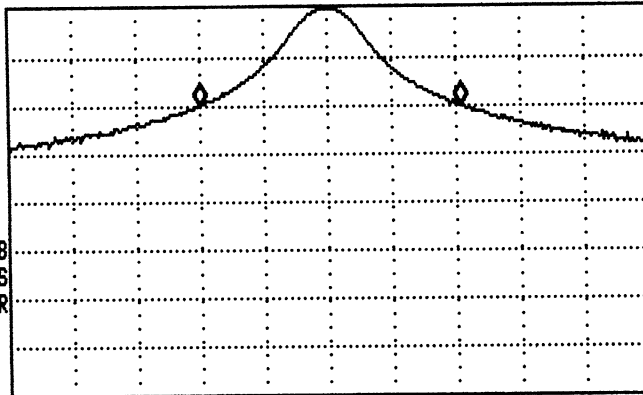
MARKER Δ
408 kHz
.02 dB

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 408 kHz
.02 dB

LOG REF 57.0 dBμV

10
dB/
#ATN
0 dB

MA SB
SC FS
CORR



CENTER 433.725 MHz SPAN 1.000 MHz
#IF BW 120 kHz #AVG BW 100 kHz #SWP 1.00 sec