Regulatory Compliance Report

EQUIPMENT IDENTIFICATION

FCC ID: MNT-PTX-150

Applicable FCC Parts

22, 90

NAMEPLATE DRAWING

ATTACHED, EXHIBIT A.

LOCATION

AS PER LABEL DRAWING(S)

DATE OF REPORT

March 13, 2000

Supervised By:

John Sonnenberg
CEO/Chief Technical Officer
Sonik Technologies Corporation

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1. Statements

1.1 INFORMATION TO USER(CFR 15.21)

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.2 SPECIAL ACCESSORIES (CFR 15.27(a))

No special equipment or accessories are required to be supplied with the unit or by the user to ensure compliance with the applicable standards.

1.3 Spectrum Efficiency Certification(CFR 2.203(j)(i))

This products transmitter is factory programmed (non-user programmable), for use on 25kHz spaced channels. The only data transmission capability it has is to send one-way paging data, which is exempt from the 4800bps/6.25kHz efficiency requirements for data per 90.203(j)(7).

1.4 Programmability (CFR 90.203(g))

The user cannot change the frequency step size or bandwidth of the product using the operator's controls.

2. Declaration of Conformity (CFR 2.1071)

The applicant is aware that it is the responsible party as defined per CFR 2.909.

The applicant has tested and confirmed that the product referenced in this application conforms to the applicable technical standards within the CFR Part 15, provided that no un-authorized change to the equipment is made.

The applicant warrants that each product marketed is identical to the unit tested for conformance.

The applicant maintains the records of the compliance testing of the product. All units produced are tested to ensure that they have the same characteristics as the unit tested.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

IN ACCORDANCE WITH FCC RULES AND REGULATIONS, VOLUME II, PART 2 AND PARTS 22 and 90.

Sub-part

2.1033(C1) : NAME AND ADDRESS OF APPLICANT:
SONIK TECHNOLOGIES CORPORATION
310 VIA VERA CRUZ, SUITE 111
SAN MARCOS, CA 92069

VENDOR: APPLICANT

2.1033(C2) : FCC ID: MNT-PTX-150
MODEL NO:PTX-150

2.1033(C3): User manual: See attached exhibit.

2.1033(C4): TYPES OF EMISSION: 16K0F1D

2.1033(C5): FREQUENCY RANGE, MHz: 138MHz to 174MHz

2.1033(C6): POWER RATING, Watts: 100W (programmable and set at factory)

2.1033(C7): MAXIMUM POWER RATING, Watts: 100

2.1033(C8): VOLTAGES & CURRENTS IN ALL ELEMENTS IN FINAL R. F. STAGE, INCLUDING FINAL TRANSISTOR OR SOLID STATE DEVICE:

COLLECTOR CURRENT, A	= <14
COLLECTOR VOLTAGE, Vdc	= 24
SUPPLY VOLTAGE, VAC	= 120

2.1033(C9): Tune-up procedure: Please see attached Technical Manuals.

2.1033(C10): CIRCUIT DIAGRAM and Description of:
(a) SUPPRESSION OF SPURIOUS RADIATION,
(b) LIMITING MODULATION,
(c) LIMITING POWER:
Please see attached Technical Manuals

2.1033(C11): Labeling Information: See Exhibit A.

2.1033(C12): Photographs: See Exhibit I.

2.1033(C13): DIGITAL MODULATION DESCRIPTION: See attached circuit description.

2.1033(C13): TEST AND MEASUREMENT DATA: FOLLOWS

2.2.1073: Declaration of Conformity: See Statements in Section 2.5 of this report.

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.1031-2.1057, and the following individual Parts:

90 - Private Land Mobile Radio Services
22 - Public Mobile Service
15 – Radio Frequency Devices

3. STANDARD TEST CONDITIONS and ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

ROOM TEMPERATURE	= 25 ±5°C
ROOM HUMIDITY	= 20-50%
A.C. SUPPLY VOLTAGE, VAC	= 120VAC

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. There are no external gain controls on this unit.

Measurement results, unless otherwise noted, are worst case measurements.

4. Test Results

4.1 RF Power Output

PARAGRAPH: 47 CFR 2.1046(a)
GUIDE: EIA STANDARD 603, Paragraph 2.2.1
TEST CONDITIONS: STANDARD TEMPERATURE & HUMIDITY
TEST EQUIPMENT: AS PER ATTACHED LIST

MEASUREMENT PROCEDURE

1. The EUT was connected to a wattmeter and then to a 50 ohm resistive termination, and the unmodulated output power was measured by means of the RF Power Meter. The power level of the EUT was set for 100W output power.

2. Measurement accuracy is ±3%.

HIGH POWER MEASUREMENT RESULTS

Nominal Frequency	RF Power Output, Watts
138	103
156	102
174	100

POWER OUTPUT TEST EQUIPMENT

TEST 1: R. F. POWER OUTPUT

(1)COAXIAL ATTENUATOR: WEINSCHEL ENGINEERING 9803-20-34
(2)COAXIAL ATTENUATOR: NARDA 771-30
(3)POWER METER Bird Model 43
(4)FREQUENCY COUNTER HP 8594E

4.2 VOICE MODULATION CHARACTERISTICS -

VOICE MODULATING CHARACTERISTICS NOT APPLICABLE TO DIGITALLY MODULATED RADIOS-

FREQUENCY RESPONSE OF AUDIO LOW PASS FILTER NOT APPLICABLE TO DIGITALLY MODULATED RADIOS-

4.3 OCCUPIED BANDWIDTH

PARAGRAPH: 47 CFR 2.1049(b) for wide-band 25kHz
GUIDE: EIA STANDARD RS 603, Paragraph 2.2.11
TEST CONDITIONS: S. T. & H.
TEST EQUIPMENT AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.

2. A paging Terminal or a data generator were connected as required to the data input(s) of the EUT .

3. The total power was measured on the spectrum analyzer using a 100kHz RBW. It was noted that the total channel power was +0.6dBm at the input of the spectrum analyzer. See plot in section 4.3.1. of this report. The display was normalized with the total channel power level as the reference level.

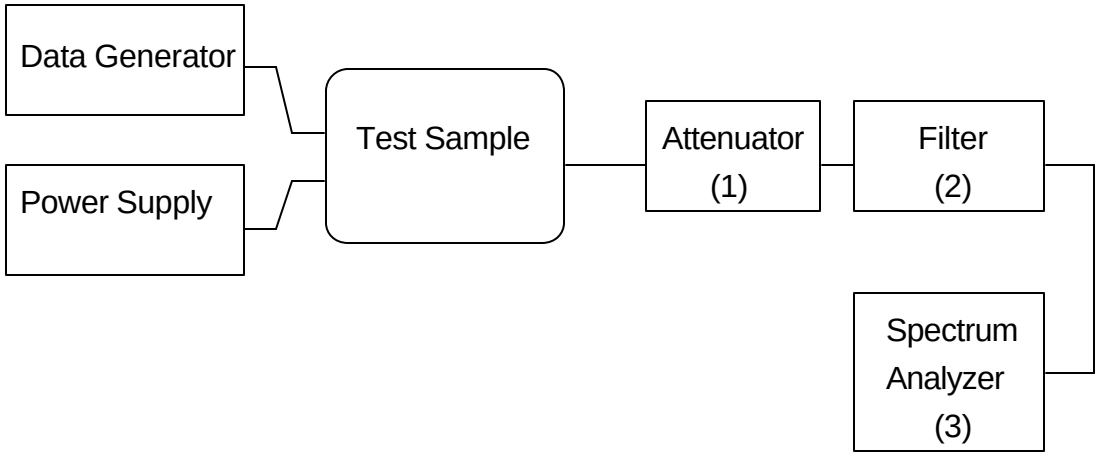
4. The EUT was set to POCSAG mode. The RBW was changed to 100Hz and the spectrum analyzer swept on peak-hold over a 50kHz span. The plots are shown in sections 4.3.2 and 4.3.3 of this report for data rates of 2400bps and 512bps and the limits noted on them.

5. The EUT was changed to ERMES mode. To verify compliance, the Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results, using 6400 baud, 4-level and 3200 baud, 4-level data. The results are shown in sections 4.3.4 and 4.3.5 of this report.

6. The EUT was changed to FLEX mode. To verify compliance, the Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results, using 6400 baud, 4-level, 3200 baud, 4-level and 1600 baud 2-level data. The results are shown in sections 4.3.6, 4.3.7 and 4.3.8 of this report.

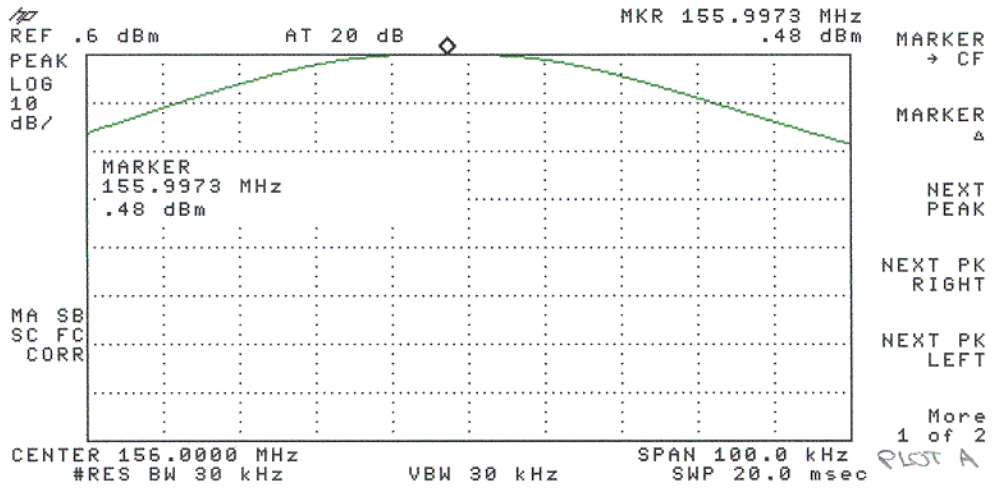
TRANSMITTER SPURIOUS EMISSION AND SPURIOUS OUTPUT TEST SETUP

TEST A. OCCUPIED BANDWIDTH (IN-BAND SPURIOUS)
TEST B. OUT-OF-BAND SPURIOUS

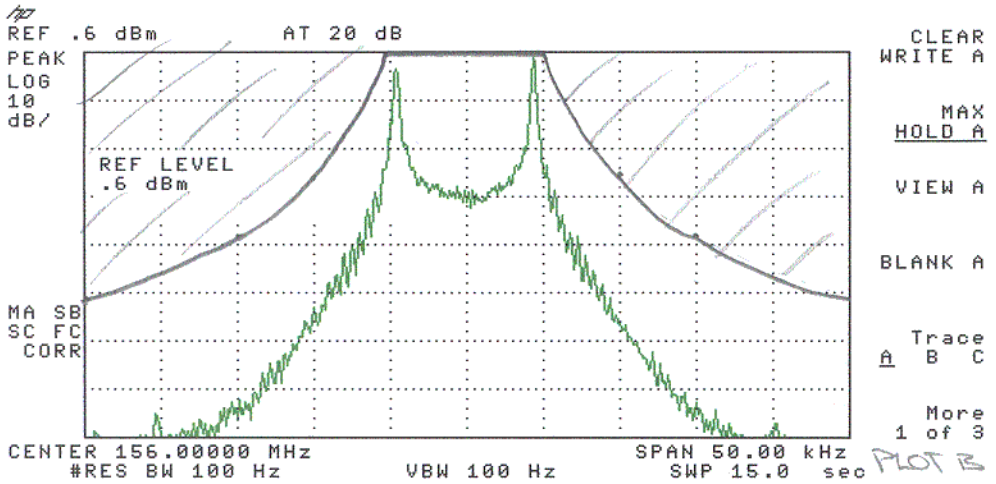


1. COAXIAL ATTENUATORS: NARDA 771-30
   Weinschel Engineering 9803-20-34
2. FILTERS: Custom HPF Used only for TEST B
3. SPECTRUM ANALYZER: HP 8594E
4. Data Generators: HP 1645A
   ZETRON 901-9573

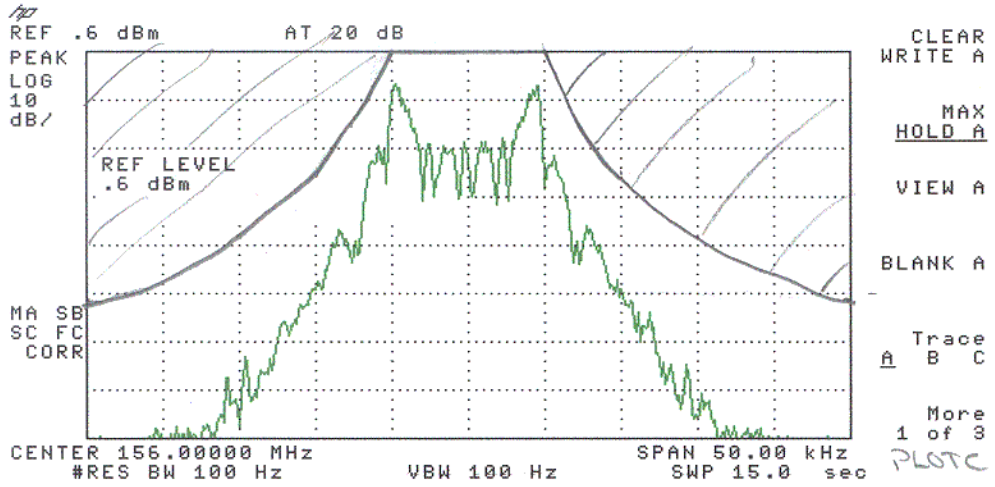
4.3.1 Total Channel Power



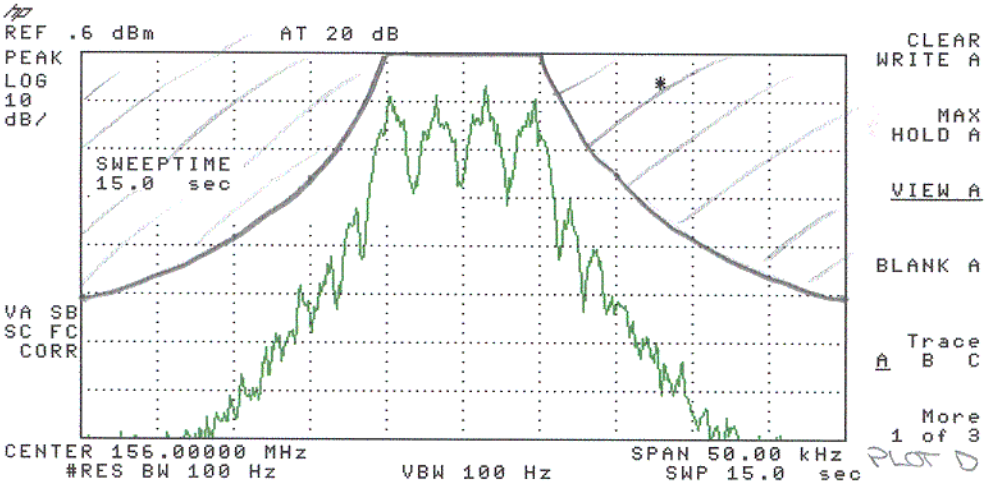
4.3.2 Occupied bandwidth,512 BAUD, POCSAG



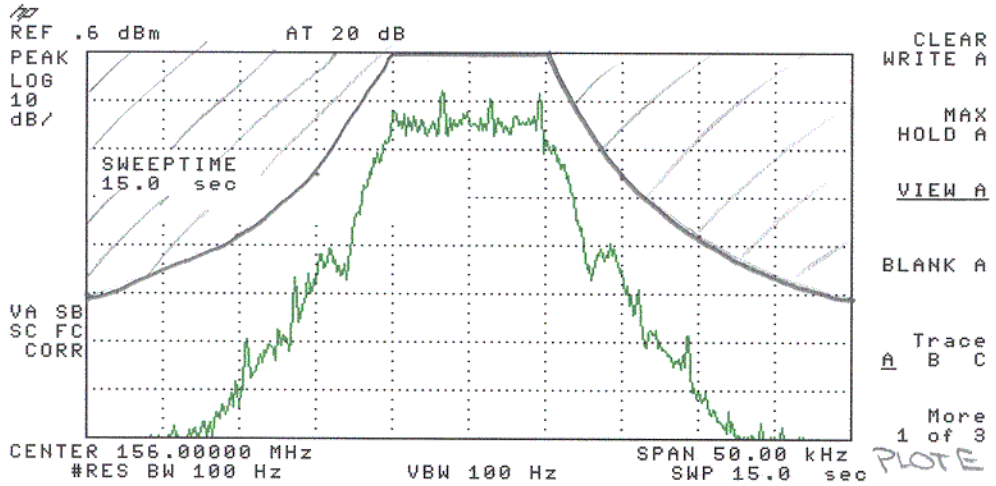
4.3.3 Occupied Bandwidth,2400 BAUD, POCSAG



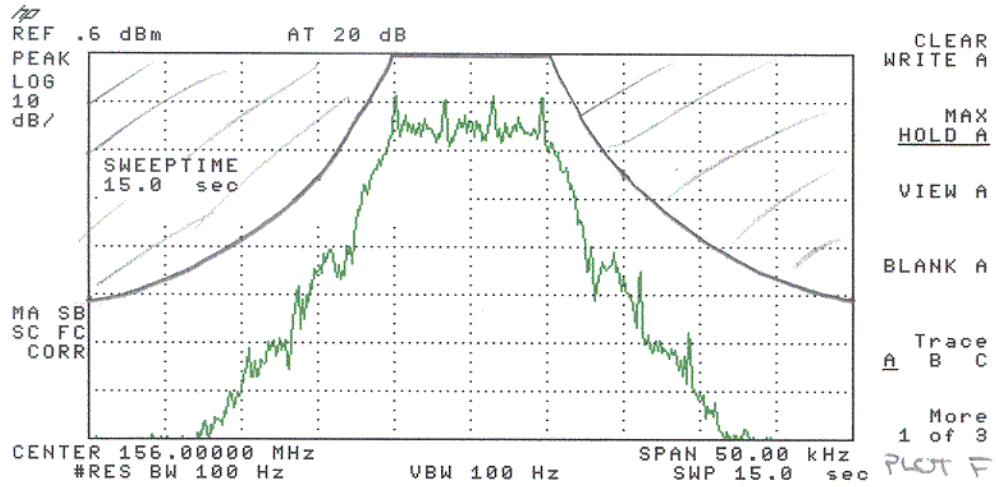
4.3.4 Occupied Channel Bandwidth 3200 BAUD,ERMES, 4-LEVEL



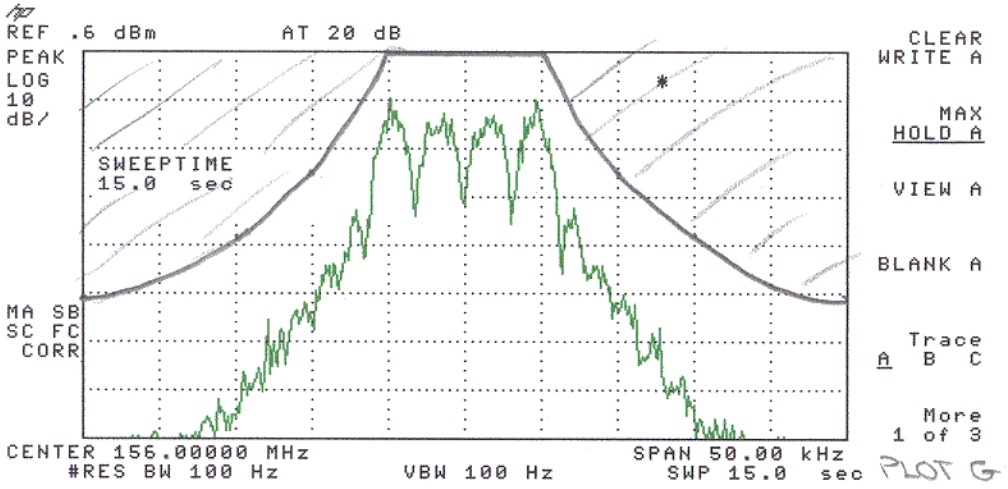
4.3.5 Occupied Bandwidth,6400 BAUD,ERMES, 4 LEVEL



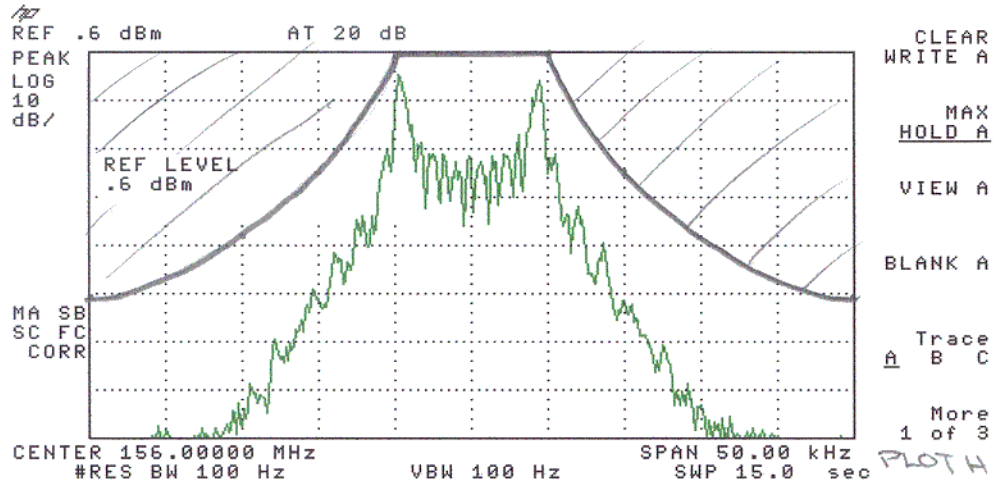
4.3.6 Occupied Channel Bandwidth, 6400 BAUD, FLEX, 4 LEVEL



4.3.7 Occupied Channel Bandwidth, 3200 BAUD, FLEX, 4 LEVEL



4.3.8 Occupied channel Bandwidth, 1600 BAUD, FLEX, 2 LEVEL



4.4 TRANSMITTER CONDUCTED SPURIOUS EMISSIONS

PARAGRAPH: 47 CFR 2.1049
GUIDE: EIA STANDARD 603, Paragraph 2.2.13
TEST CONDITIONS: S. T. & H.
TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The emissions were measured for the worst case as follows:

(a): within a band of frequencies defined by the carrier frequency plus and minus one channel.

(b): from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency.

2. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

3. The spectrum analyzer was configured to take into account the 50dB external attenuation and cable losses. The magnitude of the largest spurious emissions was measured.

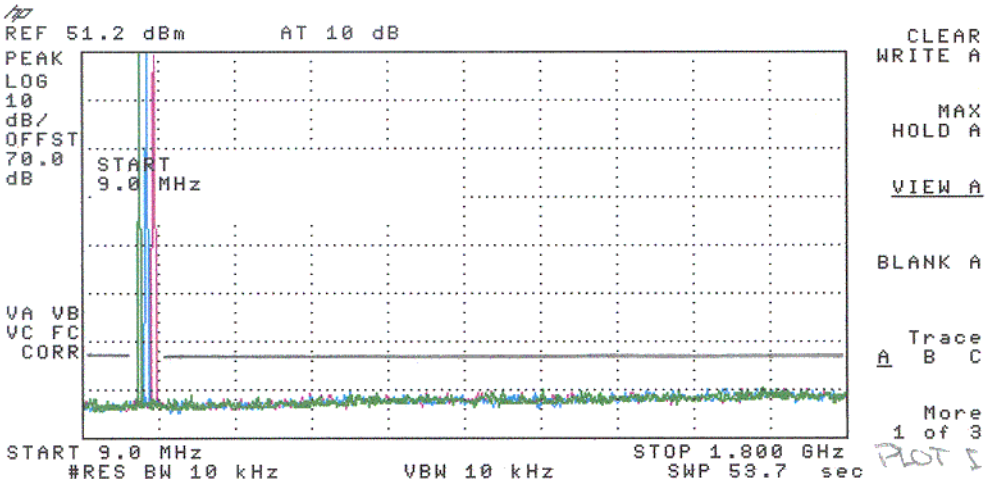
3. MEASUREMENT RESULTS: ATTACHED FOR WORST CASE

FREQUENCY OF CARRIER, MHz	= 138, 156, 174
SPECTRUM SEARCHED, GHz	= 0 to 10 x Fc (0 to 1.8 GHz)
MAXIMUM RESPONSE, MHz	= 276 MHz, -75.2 dBc
ALL OTHER EMISSIONS	= ≥ 20 dB BELOW LIMIT
LIMIT, dBc: -[43 + 10 LOG(P0)]	= -63.0dBc

Transmitter Conducted Spurious Emissions Results

Tuned Frequency, MHz	Emission Frequency, MHz	Level, dBc
138	276	-75
138	414	-96
156	312	-90
156	468	-102
174	348	-101
174	522	-94

All other emissions were >20 dB below limit



4.5 FIELD STRENGTH OF RADIATED SPURIOUS EMISSIONS

PARAGRAPH: 47 CFR 2.1053(a)
GUIDE: SEE MEASUREMENT PROCEDURE BELOW
TEST CONDITIONS: S. T. & H.
TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. A description of the measurement facilities was filed with the F.C.C. and was found to be in compliance with the requirements of Section 15.38. All pertinent changes have been reported to the Commission by up-date December 15 1999, Reg # 90579. The radiated field strength measurements were taken at *Electromagnetic Engineering Services, Incorporated*, San Diego, CA (EESI).

2. At first, in order to locate all spurious frequencies and approximate amplitudes, and to determine proper equipment functioning, the test sample was set up in an RF shielded room, at a distance of 1 meter from suitable test antennas. Any signal found to be emitted by the unit under test was noted for later field evaluation. The unit was scanned while transmitting at 138MHz, 156MHz, and 174MHz

3. In the field, the test sample was placed on a wooden turntable above ground at three meters away from the search antenna. The test sample was connected to an R.F. Wattmeter and a 50 ohm dummy load, and adjusted to its rated output.

4. In order to obtain the maximum response at each spurious frequency, the turntable was rotated. Also, the Search Antennas were raised and lowered vertically, and all cables were oriented. Excess power lead was coiled near the power supply.

5. Step 4 was repeated with antennas oriented at 90 degrees to the way they were oriented in step 4. The maximum value of step 4 and 5 at each spurious frequency was recorded.

6. The level of each spurious radiation with reference to the transmitter power in dB, was calculated.

Carrier Power = 100 watts = 50.0dBm
Maximum spurious output = -43 - 10Log(P) = -63.0dBc (wide mode)
Field Strength of 100W at 3 meters = 50.0 + 95.2 = 145.2dBuV/m
Maximum Allowed Filed strength of spurs = 145.2 – 63.0 = 82.2dBuV/m = 12.8mV/m

9. The worst case for all channels is shown.

10. Measurement summary:

FREQUENCY OF CARRIER, MHz	= 138, 156, 174
SPECTRUM SEARCHED, MHz	= 9.0 TO 1740MHz
Worst case measurement	= 73.0dBuV/m
LIMIT, dBuV/m	= 82.2dBuV/m
ALL OTHER EMISSIONS	= ≥ 20 dB BELOW LIMIT

11. Measurement results: See attached report from EESI for test results.

4.6 FREQUENCY STABILITY - TEMPERATURE VARIATION

PARAGRAPH: 47 CFR 2.1055 (a)(1)&(b)
GUIDE: EIA STANDARD RS 603, Paragraph 2.2.2.
TEST CONDITIONS: AS INDICATED
TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

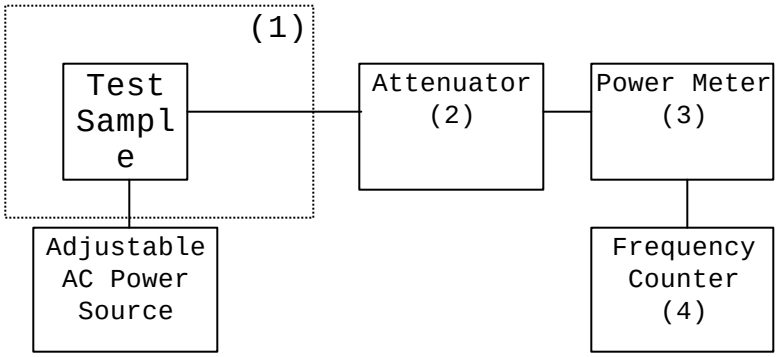
4. The temperature tests were performed for the worst case.

5. MEASUREMENT RESULTS:

Temp	-30°	-15°	-10°	0°	+10°	+20°	+25°	+30°	+40°	+50°	+60°
PPM error	-0.5	-0.8	-0.4	+0.9	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2

Limit: 1.5ppm
Worst case measured: +0.9ppm

TRANSMITTER FREQUENCY STABILITY TEST EQUIPMENT



(1)TEMPERATURE: Thermatron Temp. Chamber
(2)COAXIAL ATTENUATORS: Narda 771-30
WEINSCHEL ENGINEERING 9803-20-34

(3)R.F. POWER: Bird model 43
(4)FREQUENCY COUNTER: HP 8595E with external rubidium reference.

4.7 FREQUENCY STABILITY - VOLTAGE VARIATION

PARAGRAPH: 47 CFR 2.1055 (d)
GUIDE: SEE MEASUREMENT PROCEDURE BELOW
TEST CONDITIONS: AS SHOWN
TEST EQUIPMENT: AS PER PREVIOUS PAGE

MEASUREMENT PROCEDURE

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for “Frequency Stability - Temperature Variation” test.

2. The supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.

3. The variation in frequency was measured for the worst case.

MEASUREMENT RESULTS

LIMIT, ppm = 1.5
LIMIT, Hz = 234Hz

Standard Test Voltage	120VAC supply	PPM	Change in Frequency in hertz
85%	102VAC	+.04	+6
100%	120VAC	0	0
115%	138VAC	+.02	+3

4.8 NECESSARY BANDWIDTH AND EMISSION BANDWIDTH

PARAGRAPH: 47 CFR 2.201 and 2.202

There are four modulation modes within the unit. They are automatically configured by the microprocessor in the device. The four modes are:

POCSAG paging data, 2400bps, +/- 4.5kHz deviation 16K0F1D
FLEX
ERMES

Calucations:

NECESSARY BANDWIDTH CALCULATION **(25kHz channel spacing, data)** :

MAXIMUM MODULATION (M) , kHz = 3.2
MAXIMUM DEVIATION (D), kHz = 4.5
CONSTANT FACTOR (K) = 1.06
NECESSARY BANDWIDTH (Bn), kHz = (2 x M) + (2 x D x K)= 16.0

Regarding the value of M, D and K for the maximum modulation frequency. These values were chosen for the following reasons:

1) 6.4kbps is the highest modulation data rate this product has. By 47 CFR 2.202, M=B/2.

2) The deviation in the type of paging system this transmitter will be used is set to 4.5KHz. Therefore D=4.5

3) The occupied bandwidth of this signal is approximately 16kHz. K must equal 1.06 in this case.

4) Other paging transmitters made by our competitors have been approved with designators of 16K0F1D, and Sonik was following them by also specifying a 16kHz bandwidth, which at 4.5kHz deviation means k must = 1.06.

4.9 TRANSIENT FREQUENCY BEHAVIOR

PARAGRAPH: 47 CFR 90.214

GUIDE: SEE MEASUREMENT PROCEDURE BELOW and EIA603 2.2.19

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The EUT was set up as per EIA-603 paragraph 2.2.19.

2. The oscilloscope was set to trigger on any detected RF pulse.

3. The modulation analyzer (test receiver) was adjusted for ranges fixed by user to insure proper dynamic range for power and deviation.

4. All settings were verified with a spectrum analyzer to show a minimum 30 dB difference in the input of the peak detector with the transmitter turned “ON” or “OFF”.

5. The RF signal generator was set to a level 20dB below the output of the attenuator, and to ±25kHz deviation.

6. The EUT was keyed on and the Transient Frequency Behavior was measured with the instrument controls set as shown on the test results. The test was also run with modulation enabled sending data at 512 baud, 2400 baud and 6400 baud 4 level, and it should be noted that the transient characteristics did not change.

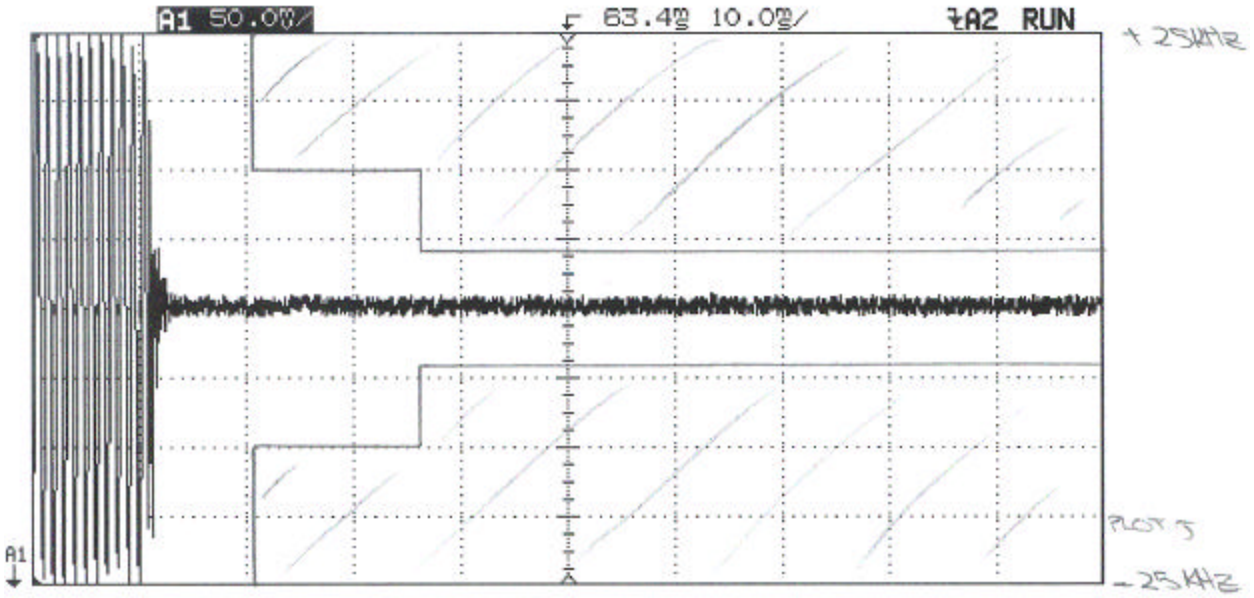
7. MEASUREMENT RESULTS: See following pages

8. Test Equipment List:

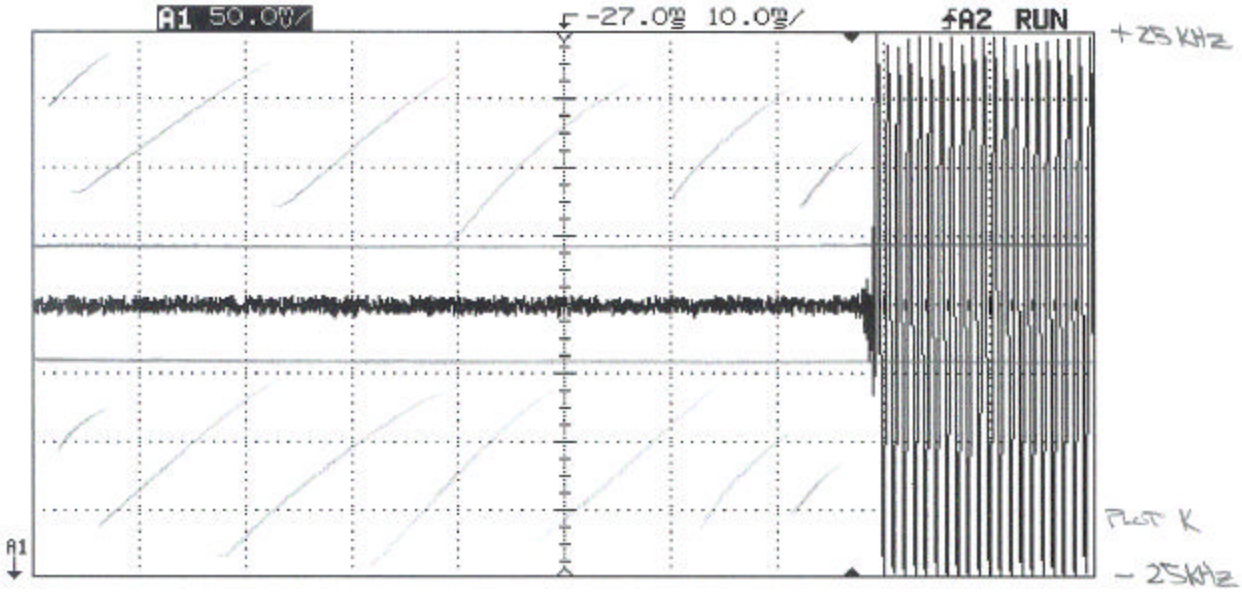
TRANSIENT FREQUENCY BEHAVIOR TEST EQUIPMENT

(1)	COAXIAL ATTENUATOR:	NARDA 771-30
(2)	COAXIAL ATTENUATOR	Weinschel Engineering 9803-20-34
(3)	COMBINER LAB, 8.2 dB	
(4)	RF SIGNAL GENERATOR	Marconi 2022
(5)	DETECTOR	HP 8595E tuned to Fo.
(6)	SCOPE	HP 54645
(7)	FM DEMODULATOR	HP 8595E w/FM demodulator option

4.9.1. TRANSIENT FREQUENCY BEHAVIOR, NO MODULATION

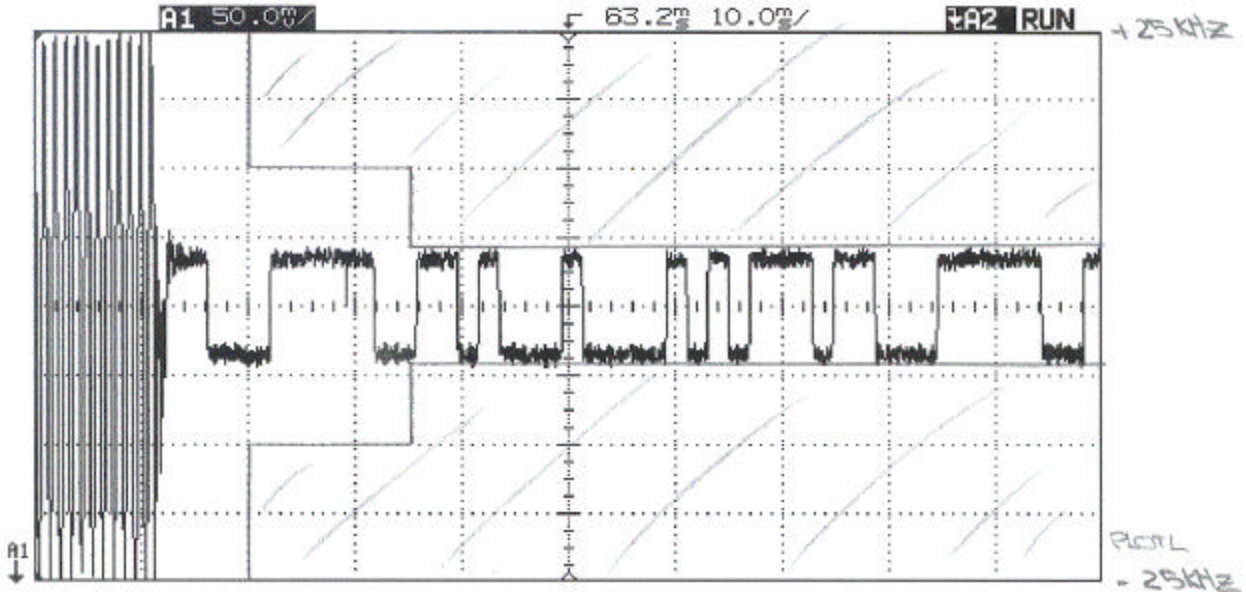


REF GENERATOR = ±25 KHz
CARRIER ON TIME

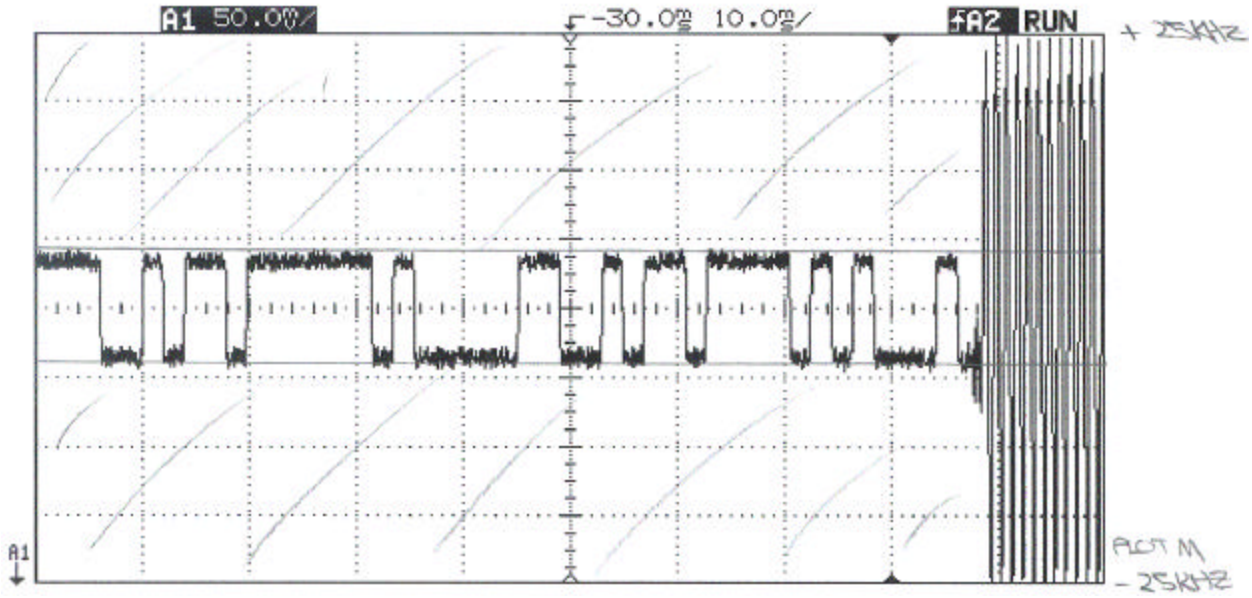


REF GENERATOR ±25 KHz DEVIATION
CARRIER OFF TIME

4.9.2. TRANSIENT FREQUENCY BEHAVIOR, 512 BAUD

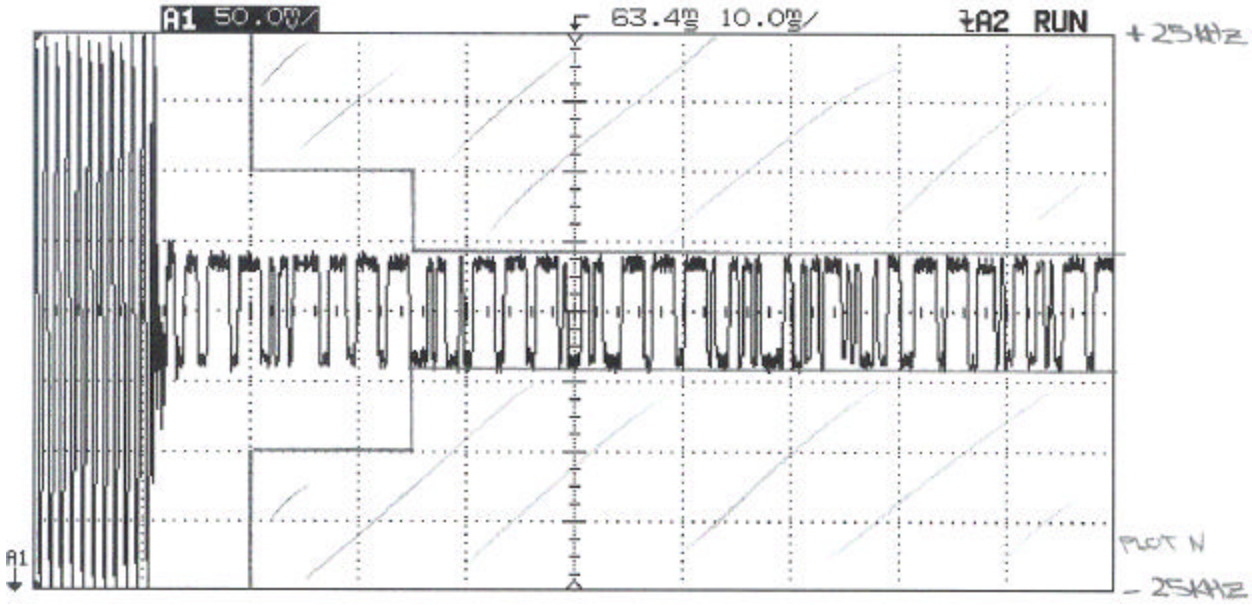


REF GENERATOR = ±25 KHz
CARRIER ON TIME

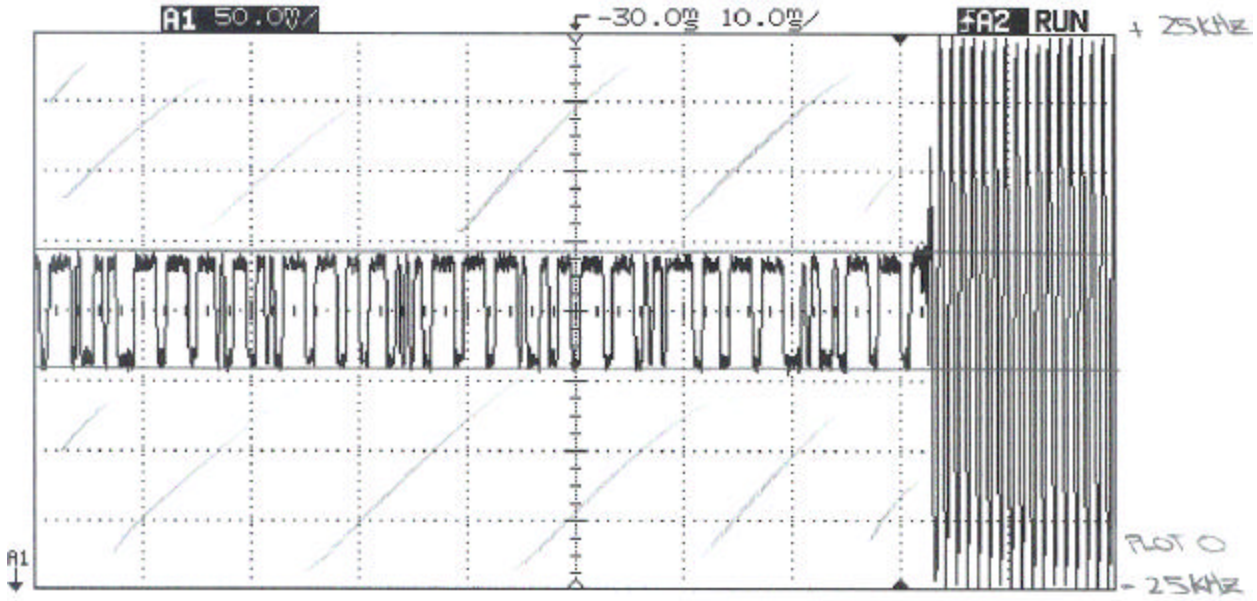


REF GENERATOR = ±25 KHz
CARRIER OFF TIME

4.9.3. TRANSIENT FREQUENCY BEHAVIOR, 2400 BAUD

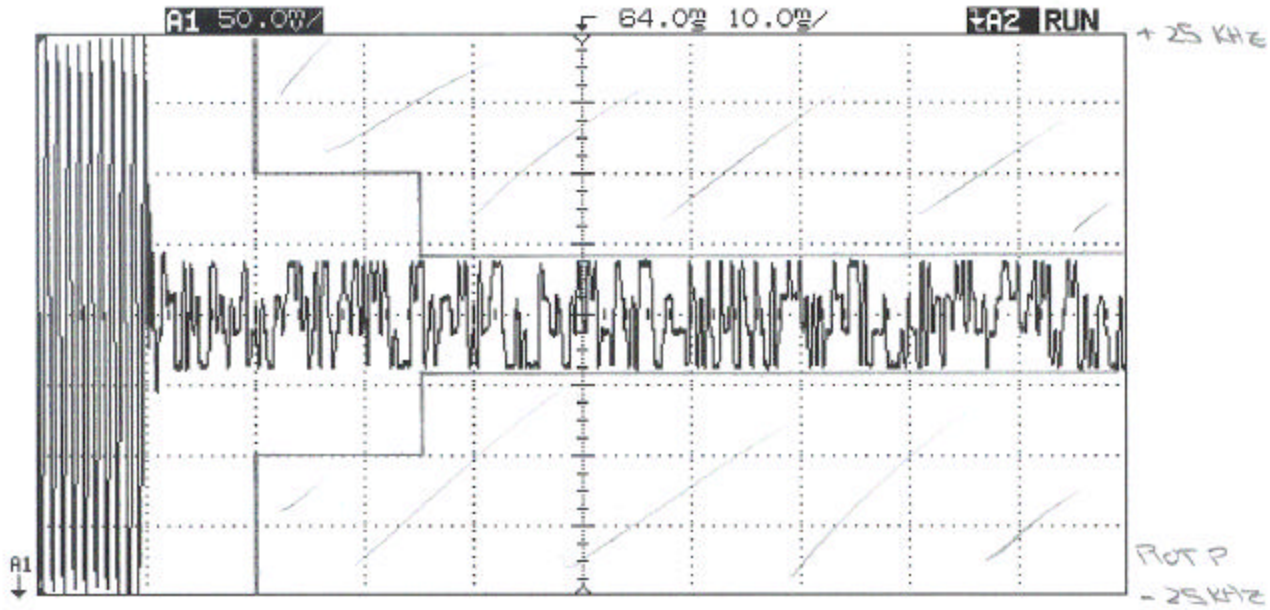


REF GENERATOR = ±25 KHz
CARRIER ON TIME

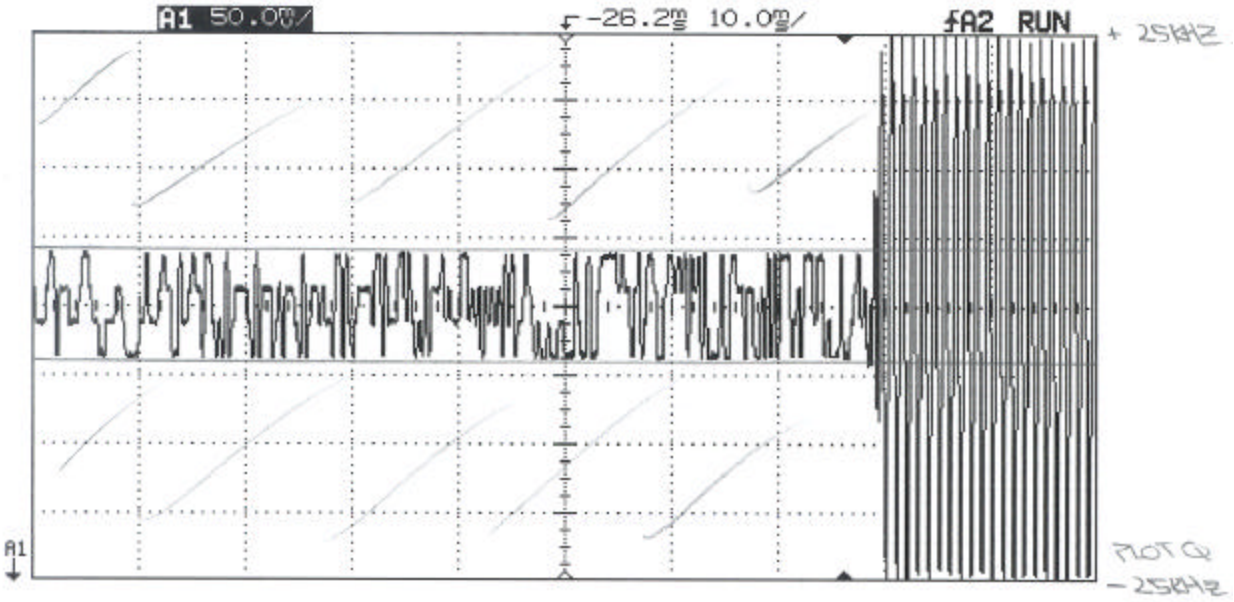


REF GENERATOR = ±25 KHz
CARRIER ON TIME

4.9.4. TRANSIENT FREQUENCY BEHAVIOR, 6400 BAUD,4 LEVEL



REF GENERATOR = ±25 KHz
CARRIER ON TIME



REF GENERATOR = ±25 KHz
CARRIER OFF TIME

4.10 TESTIMONIAL AND STATEMENT OF CERTIFICATION:

THIS IS TO CERTIFY:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.

2. THAT the technical data supplied with the application was taken under my direction and supervision.

3. THAT the data was obtained on representative units, randomly selected.

4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

5. THAT, the test equipment used to perform the tests reported herein is calibrated.

_____

By: John Sonnenberg
CEO and Chief Technical Officer
Sonik Technologies Corporation