


PAGE NO. 1 of 20.

Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

TEST REPORT

- a)
- b) Laboratory: M. Flom Associates, Inc.  
 (FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107  
 (Canada: IC 2044) Chandler, AZ 85224
- c) Report Number: d9940040
- d) Client: Telex Communications, Inc.  
 8601 E. Cornhusker Highway  
 P.O. Box 5579  
 Lincoln, NE 68505-5579
- e) Identification: SH-100E  
 FCC ID: B5DH213E  
 Description: Digital Wireless Microphone
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: April 19, 1999  
 EUT Received: April 8, 1999
- h, j, k): As indicated in individual tests.
- i) Sampling method: No sampling procedure used.
- l) Uncertainty: In accordance with MFA internal quality manual.
- m) Supervised by:   
 Morton Flom, P. Eng.
- n) Results: The results presented in this report relate only to the item tested.
- o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

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LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATIONIN ACCORDANCE WITH FCC RULES AND REGULATIONS,  
VOLUME II, PART 2 AND TO

74 H

Sub-part 2.1033

(c) (1): NAME AND ADDRESS OF APPLICANT:Telex Communications, Inc.  
8601 E. Cornhusker Highway  
P.O. Box 5579  
Lincoln, NE 68505-5579MANUFACTURER:

Applicant

- (c) (2): FCC ID: B5DH213E
- MODEL NO: SH-100E
- (c) (3): INSTRUCTION MANUAL(S):  
PLEASE SEE ATTACHED EXHIBITS
- (c) (4): TYPE OF EMISSION: 200KF3D
- (c) (5): FREQUENCY RANGE, MHz: 668 to 746
- (c) (6): POWER RATING, Watts: 10 mW  
\_\_\_ Switchable \_\_\_ Variable x N/A
- (c) (7): MAXIMUM POWER RATING, Watts: 0.250

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Subpart 2.1033 (continued)

(c) (8): VOLTAGES & CURRENTS IN ALL ELEMENTS IN FINAL R. F. STAGE,  
INCLUDING FINAL TRANSISTOR OR SOLID STATE DEVICE:

COLLECTOR CURRENT, A = per manual  
COLLECTOR VOLTAGE, Vdc = per manual  
SUPPLY VOLTAGE, Vdc = 3 V

(c) (9): TUNE-UP PROCEDURE:

PLEASE SEE ATTACHED EXHIBITS

(c) (10): CIRCUIT DIAGRAM/CIRCUIT DESCRIPTION:  
Including description of circuitry & devices provided for  
determining and stabilizing frequency, for suppression of  
spurious radiation, for limiting modulation and limiting  
power.

PLEASE SEE ATTACHED EXHIBITS

(c) (11): LABEL INFORMATION:

PLEASE SEE ATTACHED EXHIBITS

(c) (12): PHOTOGRAPHS:

PLEASE SEE ATTACHED EXHIBITS

(c) (13): DIGITAL MODULATION DESCRIPTION:

ATTACHED EXHIBITS  
  x   N/A

(c) (14): TEST AND MEASUREMENT DATA:

FOLLOWS

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Sub-part  
2.1033(c) (14):TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

- \_\_\_\_\_ 21 - Domestic Public Fixed Radio Services
- \_\_\_\_\_ 22 - Public Mobile Services
- \_\_\_\_\_ 22 Subpart H - Cellular Radiotelephone Service
- \_\_\_\_\_ 22.901(d) - Alternative technologies and auxiliary services
- \_\_\_\_\_ 23 - International Fixed Public Radiocommunication services
- \_\_\_\_\_ 24 - Personal Communications Services
- x   74 Subpart H - Low Power Auxiliary Stations
- \_\_\_\_\_ 80 - Stations in the Maritime Services
- \_\_\_\_\_ 80 Subpart E - General Technical Standards
- \_\_\_\_\_ 80 Subpart F - Equipment Authorization for Compulsory Ships
- \_\_\_\_\_ 80 Subpart K - Private Coast Stations and Marine Utility Stations
- \_\_\_\_\_ 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
- \_\_\_\_\_ 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
- \_\_\_\_\_ 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
- \_\_\_\_\_ 80 Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)
- \_\_\_\_\_ 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
- \_\_\_\_\_ 80 Subpart X - Voluntary Radio Installations
- \_\_\_\_\_ 87 - Aviation Services
- \_\_\_\_\_ 90 - Private Land Mobile Radio Services
- \_\_\_\_\_ 94 - Private Operational-Fixed Microwave Service
- \_\_\_\_\_ 95 Subpart A - General Mobile Radio Service (GMRS)
- \_\_\_\_\_ 95 Subpart C - Radio Control (R/C) Radio Service
- \_\_\_\_\_ 95 Subpart D - Citizens Band (CB) Radio Service
- \_\_\_\_\_ 95 Subpart E - Family Radio Service
- \_\_\_\_\_ 95 Subpart F - Interactive Video and Data Service (IVDS)
- \_\_\_\_\_ 101 - Fixed Microwave Services

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STANDARD TEST CONDITIONS  
and  
ENGINEERING PRACTICES

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

In accordance with ANSI C63.4-1992, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

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

PAGE NO. 6 of 20.  
NAME OF TEST: Carrier Output Power (Radiated)  
SPECIFICATION: 47 CFR 2.1046(a)  
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1  
TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE (RADIATED)

1. The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading of a dipole was calculated from the equation  $P_t = ((E \times R)^2 / 49.2)$  watts, where  $R = 3m$ .
2. Measurement accuracy is  $\pm 1.5$  dB.

MEASUREMENT RESULTS

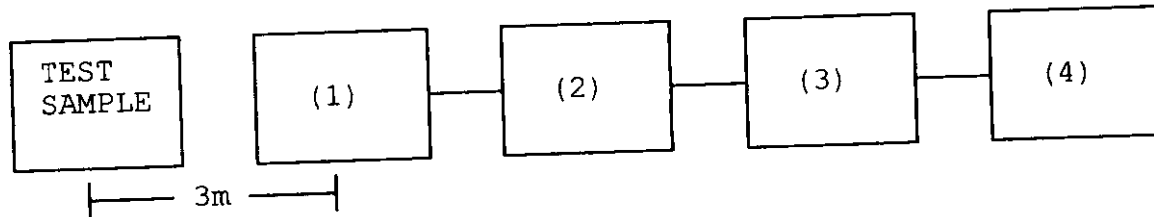
FREQUENCY OF CARRIER, MHz = 673.5, 668.1, 679.5

<u>POWER SETTING</u>	<u>R. F. POWER, ERP, WATTS</u>
High	10 mW

SUPERVISED BY:

  
Morton Flom, P. Eng.

TRANSMITTER RADIATED MEASUREMENTS



Asset	Description	s/n
(1)	<u>TRANSDUCER</u>	
x	i00091 Emco 3115	001469
x	i00089 Aprel Log Periodic	001500
(2)	<u>HIGH PASS FILTER</u>	
x	i00 Narda $\mu$ PAD (In-Band Only)	
x	i00 Trilithic (Out-Of-Band Only)	
(3)	<u>PREAMP</u>	
x	i00028 HP 8449 (+30 dB)	2749A00121
(4)	<u>SPECTRUM ANALYZER</u>	
x	i00048 HP 8566B	2511A01467
	i00043 HP 8558B	2004A02076
	i00057 HP 8557A	1531A00191
x	i00029 HP 8563E	3213A00104

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NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.12

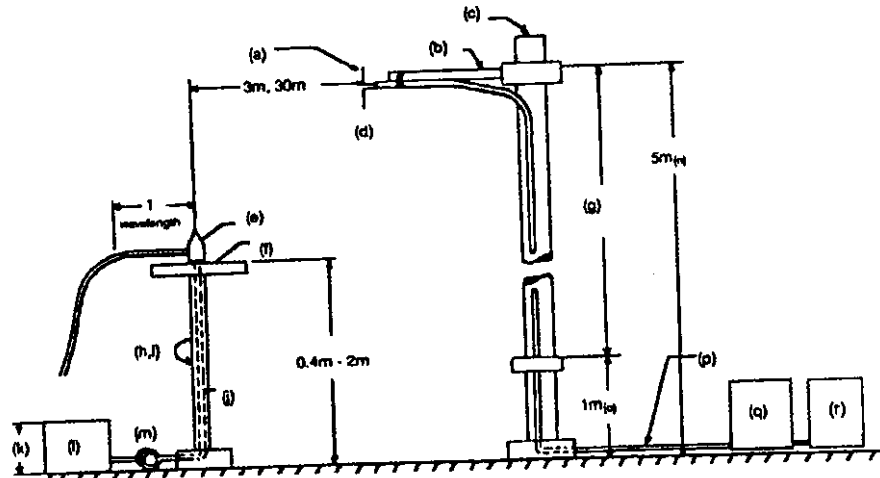
TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 2.948, by letter from the FCC dated March 3, 1997, FILE 31040/SIT. All pertinent changes will be reported to the Commission by up-date prior to March 2000.
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 at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.
3. In the field, the test sample was placed on a wooden turntable above ground at three (or thirty) meters away from the search antenna. Excess power leads were coiled near the power supply.  
The cables were oriented in order to obtain the maximum response. At each emission frequency, the turntable was rotated and the search antennas were raised and lowered vertically.
4. The emission was observed with both a vertically polarized and a horizontally polarized search antenna and the worst case was used.
6. The field strength of each emission within 20 dB of the limit was recorded and corrected with the appropriate cable and transducer factors.
7. The worst case for all channels is shown.
8. Measurement results: ATTACHED FOR WORST CASE



RADIATED TEST SETUP



NOTES:

- (a) Search Antenna - Rotatable on boom
- (b) Non-metallic boom
- (c) Non-metallic mast
- (d) Adjustable horizontally
- (e) Equipment Under Test
- (f) Turntable
- (g) Boom adjustable in height.
- (h) External control cables routed horizontally at least one wavelength.
- (i) Rotatable
- (j) Cables routed through hollow turntable center
- (k) 30 cm or less
- (l) External power source
- (m) 10 cm diameter coil of excess cable
- (n) 25 cm (V), 1 m-7 m (V, H)
- (o) 25 cm from bottom end of 'V', 1m normally
- (p) Calibrated Cable at least 10m in length
- (q) Amplifier (optional)
- (r) Spectrum Analyzer

Asset	Description	s/n	Cycle	Last Cal
<u>TRANSUDCER</u>				
—	i00065	EMCO 3109B 100Hz-50MHz	2336	12 mo.
—	i00033	Singer 94593-1 10kHz-32MHz	0219	12 mo.
x	i00088	EMCO 3109-B 25MHz-300MHz	2336	12 mo. Oct-98
x	i00089	Aprcl 2001 200MHz-1GHz	001500	12 mo. Oct-98
x	i00103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo. Oct-98
—	i00085	EMCO 3116 10GHz-40GHz	2076	12 mo.
<u>AMPLIFIER</u>				
—	i00028	HP 8449A	2749A00121	12 mo. Mar-98
<u>SPECTRUM ANALYZER</u>				
—	i00029	HP 8563E	3213A00104	12 mo. Aug-98
x	i00033	HP 85462A	3625A00357	12 mo. Dec-98
—	i00048	HP 8566B	2511AD1467	6 mo. Dec-98

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NAME OF TEST: Field Strength of Spurious Radiation  
 g9940025: 1999-Apr-09 Fri 15:20:00  
 STATE: 1:High Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	METER, dBuV	CF, dB	uV/m @ 3m	ERP, dBm	MARGIN, dB
673.500000	1346.931667	36.67	30.1	2180.22	-30.65	-17.6
673.500000	2020.381667	67.33	4.71	3999.45	-25.35	-12.4
673.500000	2693.846667	66.67	7.79	5284.45	-22.95	-9.9
673.500000	3367.310000	51.33	9.55	1106.62	-36.45	-23.5
673.500000	4040.756667	47	11.38	829.85	-38.95	-26
673.500000	4714.236667	43.33	12.17	595.66	-41.85	-28.9
673.500000	5388.300000	39.17	14.67	492.04	-43.55	-30.6
673.500000	6061.883333	39.67	16.06	611.65	-41.65	-28.7
673.500000	6735.008333	31.5	17.21	272.58	-48.65	-35.7

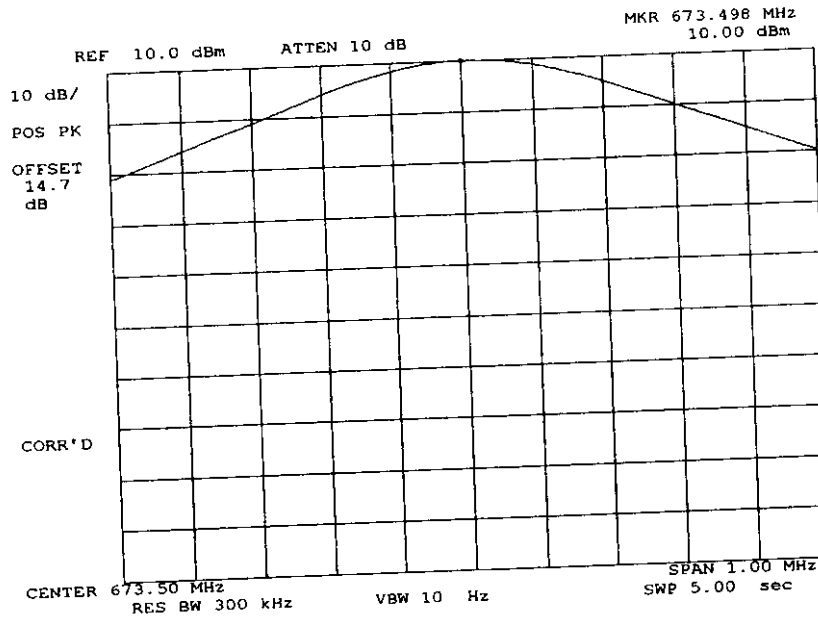
PAGE NO. 11 of 20.  
NAME OF TEST: Emission Masks (Occupied Bandwidth)  
SPECIFICATION: 47 CFR 2.1049(c) (1)  
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.11  
TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.
2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for  $\pm 2.5$  kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.
5. MEASUREMENT RESULTS: ATTACHED

PAGE NO. 12 of 20.

NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g9940093: 1999-Apr-13 Tue 10:38:00  
STATE: 2:High Power



POWER:  
MODULATION:

HIGH  
DIGITAL  
REFERENCE LEVEL

SUPERVISED BY:

*Morton Flom P. Eng.*  
Morton Flom, P. Eng.

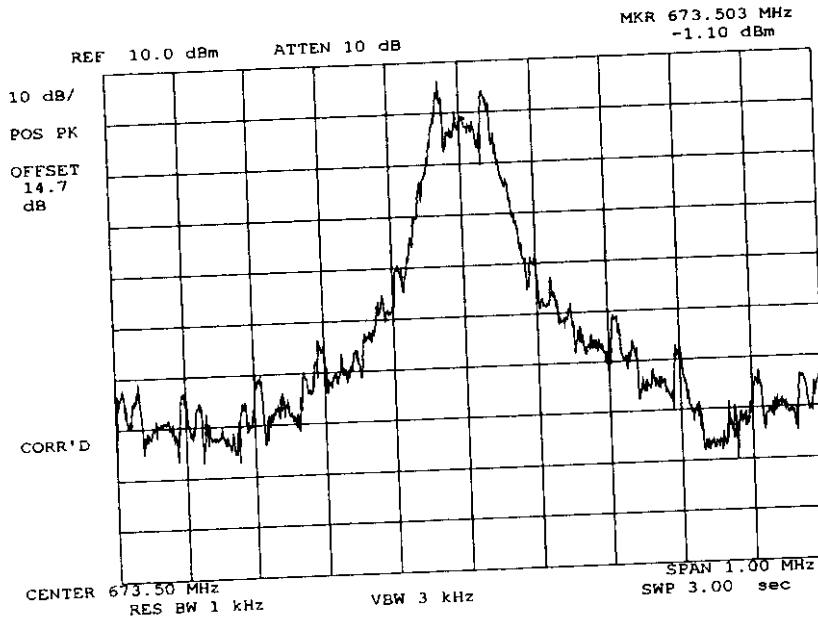
PAGE NO.

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NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g9940094: 1999-Apr-13 Tue 10:42:00  
STATE: 2:High Power



POWER:  
MODULATION:

HIGH  
DIGITAL

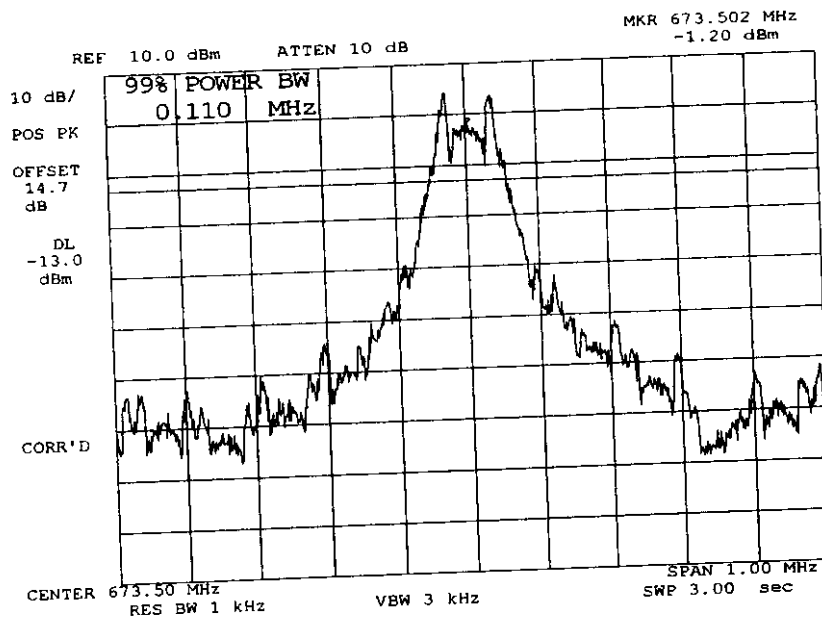
SUPERVISED BY:

*Morton Flom P. Eng.*  
Morton Flom, P. Eng.

PAGE NO.

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NAME OF TEST: Emission Masks (Occupied Bandwidth)  
g9940095: 1999-Apr-13 Tue 10:44:00  
STATE: 2:High Power



POWER:  
MODULATION:

HIGH  
DIGITAL  
99 % POWER BANDWIDTH

SUPERVISED BY:

*Morton Flom P. Eng.*  
Morton Flom, P. Eng.

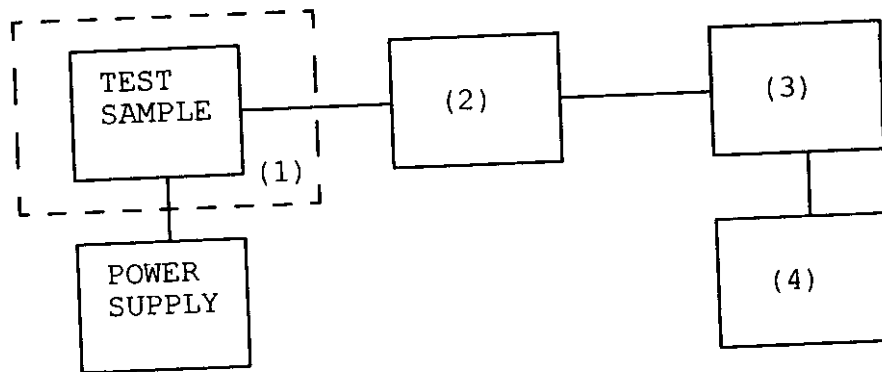
PAGE NO. 15 of 20.  
NAME OF TEST: Frequency Stability (Temperature Variation)  
SPECIFICATION: 47 CFR 2.1055(a) (1)  
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2  
TEST CONDITIONS: As Indicated  
TEST EQUIPMENT: As per previous page

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: ATTACHED

TRANSMITTER TEST SET-UP

- TEST A. OPERATIONAL STABILITY
- TEST B. CARRIER FREQUENCY STABILITY
- TEST C. OPERATIONAL PERFORMANCE STABILITY
- TEST D. HUMIDITY
- TEST E. VIBRATION
- TEST F. ENVIRONMENTAL TEMPERATURE
- TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
- TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION



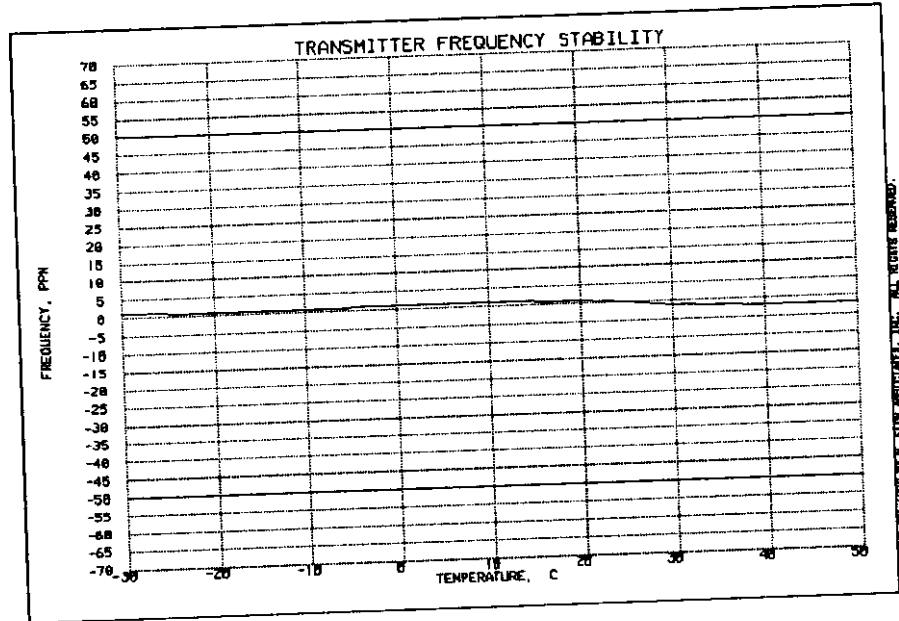
Asset	Description	s/n
(1)	<u>TEMPERATURE, HUMIDITY, VIBRATION</u>	
<u>x</u>	i00027 Tenny Temp. Chamber	9083-765-234
---	i00 Weber Humidity Chamber	
---	i00 L.A.B. RVH 18-100	
(2)	<u>COAXIAL ATTENUATOR</u>	
---	i00122 NARDA 766-10	7802
---	i00123 NARDA 766-10	7802A
---	i00113 SIERRA 661A-3D	1059
---	i00069 BIRD 8329 (30 dB)	10066
(3)	<u>R.F. POWER</u>	
---	i00014 HP 435A POWER METER	1733A05839
---	i00039 HP 436A POWER METER	2709A26776
<u>x</u>	i00020 HP 8901A POWER METER	2105A01087
(4)	<u>FREQUENCY COUNTER</u>	
---	i00042 HP 5383A	1628A00959
---	i00019 HP 5334B	2704A00347
<u>x</u>	i00020 HP 8901A	2105A01087



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NAME OF TEST: Frequency Stability (Temperature Variation)  
g9940055: 1999-Apr-13 Tue 11:33:00  
STATE: 0:General



SUPERVISED BY:

*M. Flom P. Eng.*  
Morton Flom, P. Eng.

PAGE NO. 18 of 20.  
NAME OF TEST: Frequency Stability (Voltage Variation)  
SPECIFICATION: 47 CFR 2.1055(b)(1)  
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2  
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 power 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.

RESULTS: Frequency Stability (Voltage Variation)  
g9940098: 1999-Apr-14 Wed 10:54:40  
STATE: 0:General

LIMIT, ppm = 50  
LIMIT, Hz = 33675  
BATTERY END POINT (Voltage) = 2.3

% of STV	Voltage	Frequency, MHz	Change, Hz	Change, ppm
85	2.55	673.499980	-20	-0.03
100	3	673.500000	0	0.00
115	3.45	673.499990	-10	-0.01
77	2.3	673.499910	-90	-0.13

*Morton Flom P. Eng.*  
Morton Flom, P. Eng.

SUPERVISED BY:

PAGE NO. 19 of 20.  
NAME OF TEST: Necessary Bandwidth and Emission Bandwidth  
SPECIFICATION: 47 CFR 2.202(g)

MODULATION = 200KF3D

MEASURED AT 26 dbc POINTS = 150 kHz

SPECIFIED BY MANUFACTURER = 200 kHz

DE-MODULATED DATA PRESENTATION FOLLOWS

SUPERVISED BY:

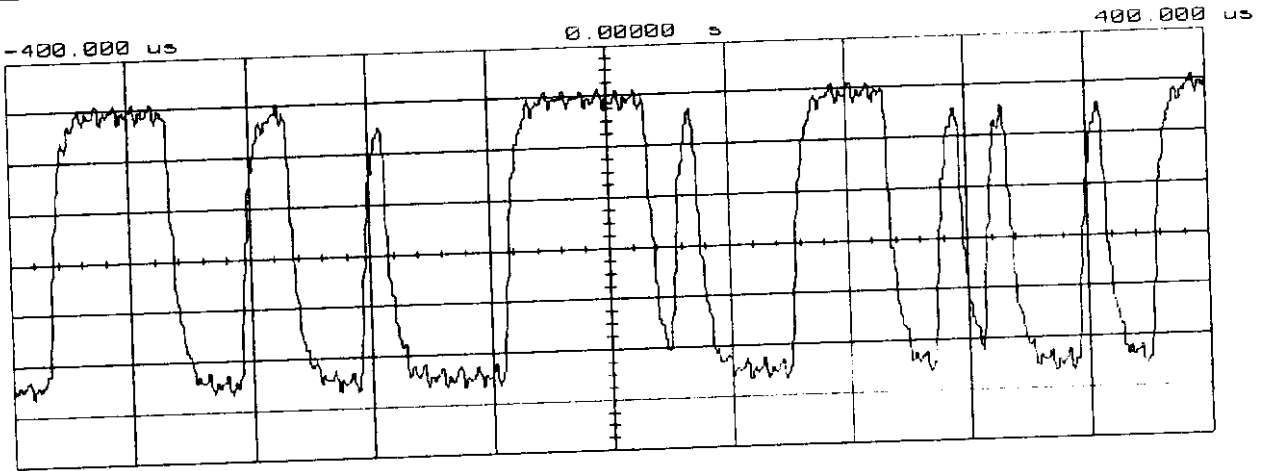


Morton Flom, P. Eng.

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 OSCILLOSCOPE PRESENTATION  
 TELEX, SH - 100E  
 1999-APR-13, 11:04, TUE

ADDENDUM

POWER: HIGH  
 MODULATION: DIGITAL



Main	Timebase 80.0 us/div	Delay/Pos 0.00000 s	Reference Center	Mode Realtime (EXTENDED)
Channel 1	Sensitivity 10.0 mV/div	Offset 0.00000 V	Probe 1.000 :1	Coupling dc BW Lim (50 ohm)

Trigger mode : Edge  
 On Positive Edge Of Chan1  
 Trigger Level  
 Chan1 = 105.000 mV (noise reject OFF)  
 Holdoff = 40.000 ns

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