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APPLICANT: ADCON TELEMETRY, INC.

FCC ID: MQXA723

TEST REPORT:

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GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

2.1033 ADCON TELEMETRY, INC. will sell the
(c)(1)(2) FCC ID: MQXA723 UHF transceiver in quantity,
 for use under FCC RULES PART 90.

2.1033 (c) TECHNICAL DESCRIPTION

2.1033 (3) User Manual See Exhibit 9

2.1033 (4) Type of Emission: 7K3F2D For 25KHz
 7K3F2D For 12.5KHz

For 25KHz & 12kHz

$B_n = 2M + 2DK$

$M = 4,000$ Bits per second

$D = 1.65\text{KHz}$ (Peak Deviation)

$K = 1$

$B_n = 2(4000/2) + 2(1.65\text{K})(1) = 4.0\text{K} + 3.3\text{K} = 7.3\text{k}$

ALLOWED AUTHORIZED BANDWIDTH = 20.00KHz.

For 12.5KHz

ALLOWED AUTHORIZED BANDWIDTH = 11.25KHz.

90.209(b)(5)

2.1033 (5) Frequency Range: 450-470 MHz

(6) Power Range and Controls: There are NO user Power
 controls.

(7) Maximum Output Power Rating:
 .018 Watts into a 50 ohm resistive load.

(8) DC Voltages and Current into Final Amplifier:

POWER INPUT

FINAL AMPLIFIER ONLY

$V_{ce} = 6.2$ Volts

$I_c = .040$ A

(9) Tune-up procedure. The tune-up procedure is given
 in EXHIBIT 8.

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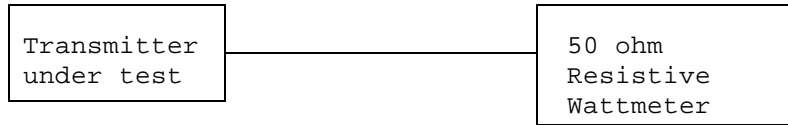
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- 2.1033 (10) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 3. The block diagram is included as EXHIBIT 4.
- (11) Function of each electron tube or semiconductor device or other active circuit device:
-SEE EXHIBIT 9.
- (8) Instruction book. The instruction manual is included as EXHIBIT 9.
- (10) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in the instruction manual.
- 2.1033(c)(11) A photograph or drawing of the equipment identification label is shown in Exhibit 1.
- 2.1033(c)(12) Photographs of the equipment of sufficient clarity to reveal equipment construction and layout and label location are shown in Exhibit 6-7.
- 2.1033(c)(13) For equipment employing digital modulation, a detail description of the modulation technique. This UUT uses FSK to modulate the transmitter.
- 2.1033(c)(14) data required for 2.1046 to 2.1057 SEE Below
- 2.1046(a) RF power output.
RF power is measured by connecting a 50 ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage of 6.2 VDC, and the transmitter properly adjusted the RF output measures:

INPUT POWER - $(6.2V)(0.043A) = .266 \text{ Watts}$

OUTPUT POWER: HIGH - .018 Watts

METHOD OF MEASURING RF POWER OUTPUT



2.1047(a) Voice Modulation characteristics:
NOT APPLICABLE, F2 type of emission.

2.1049 Audio Low Pass Filter
This UUT does not have a low pass filter.

2.1049 Occupied bandwidth:
90.210(c,)

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211(b), the power of any emission must be attenuated below the unmodulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(f_d in kHz) of more than 5kHz but not more than 10 kHz: At least $83 \log(f_d/5)$ dB; (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency(f_d in kHz) of more than 10kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(f_d/11)$ dB or 50dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43 + 10 \log(P_o)$ dB.

Data in the plots shows that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + \log(P)$ dB.

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90.210(d) Emission Mask D - 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.

(2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27 (f_d - 2.88 \text{ kHz})$ dB.

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

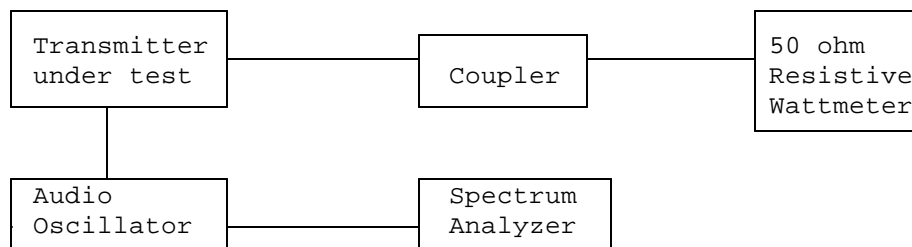
EXEMPTION FROM TECHNICAL STANDARDS - SEE PAGE 7

Radiotelephone transmitter with modulation limiter.

Test procedure: TIA/EIA-603 para 2.2.11 , with the exception that various tones were used.

Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT



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OCCUPIED BANDWIDTH PLOT
12.5 kHz CHANNEL SPACING
2 kHz MODULATED CARRIER

MKR 465.000 3 MHz
70.70 dB μ V

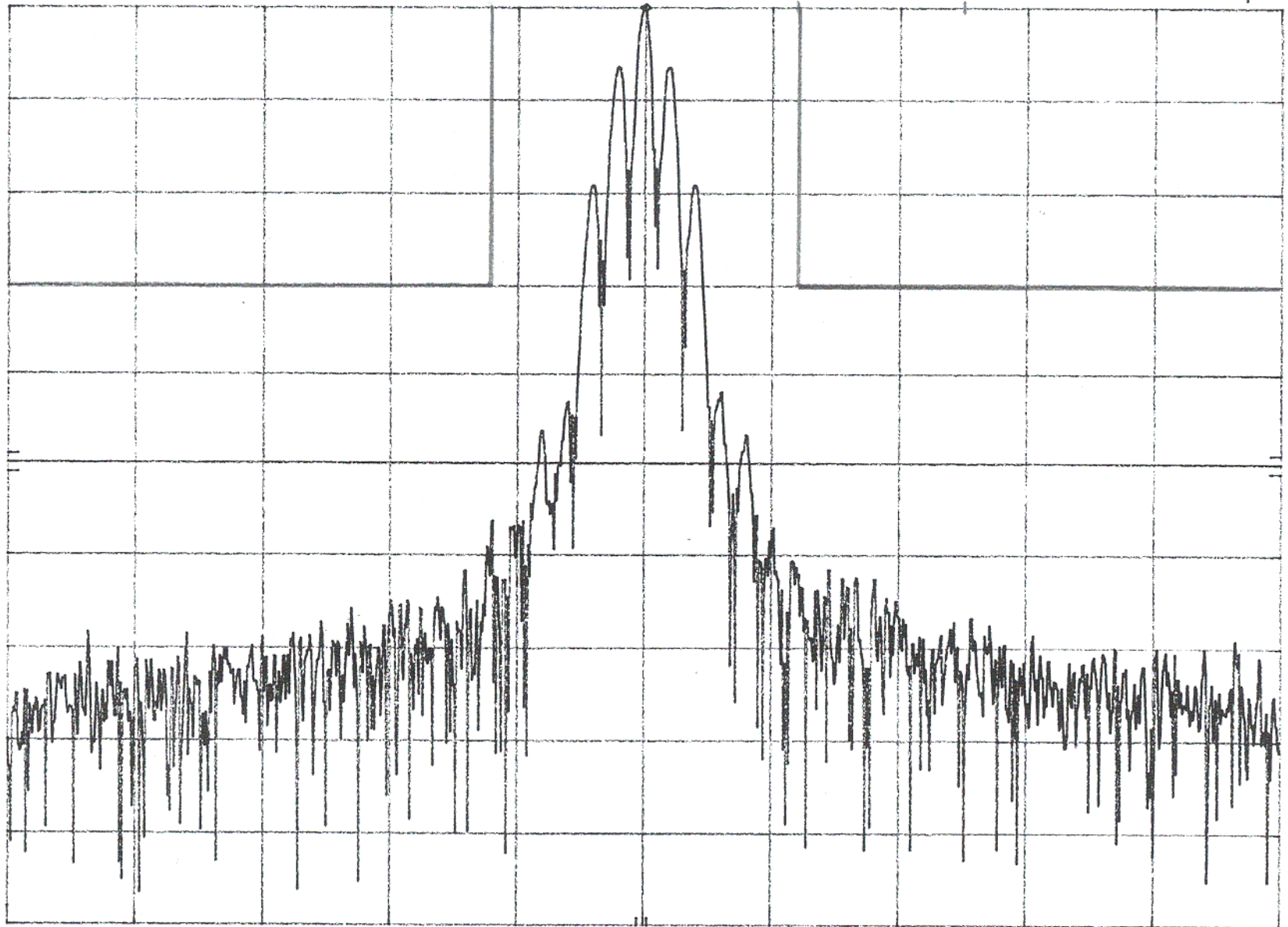
hp REF 70.7 dB μ V ATTN 0 dB +0 dB

10 dB/

OFFSET
-20.0
dB

DL
20.7
dB μ V

CENTER 465.000 MHz SPAN 100 kHz
RES BW 1 kHz (i) VBW 3 kHz SWP 750 msec



OCCUPIED BANDWIDTH PLOT
25 kHz CHANNEL SPACING
2 kHz MODULATED CARRIR

MKR 465.000 3 MHz
70.70 dB μ V

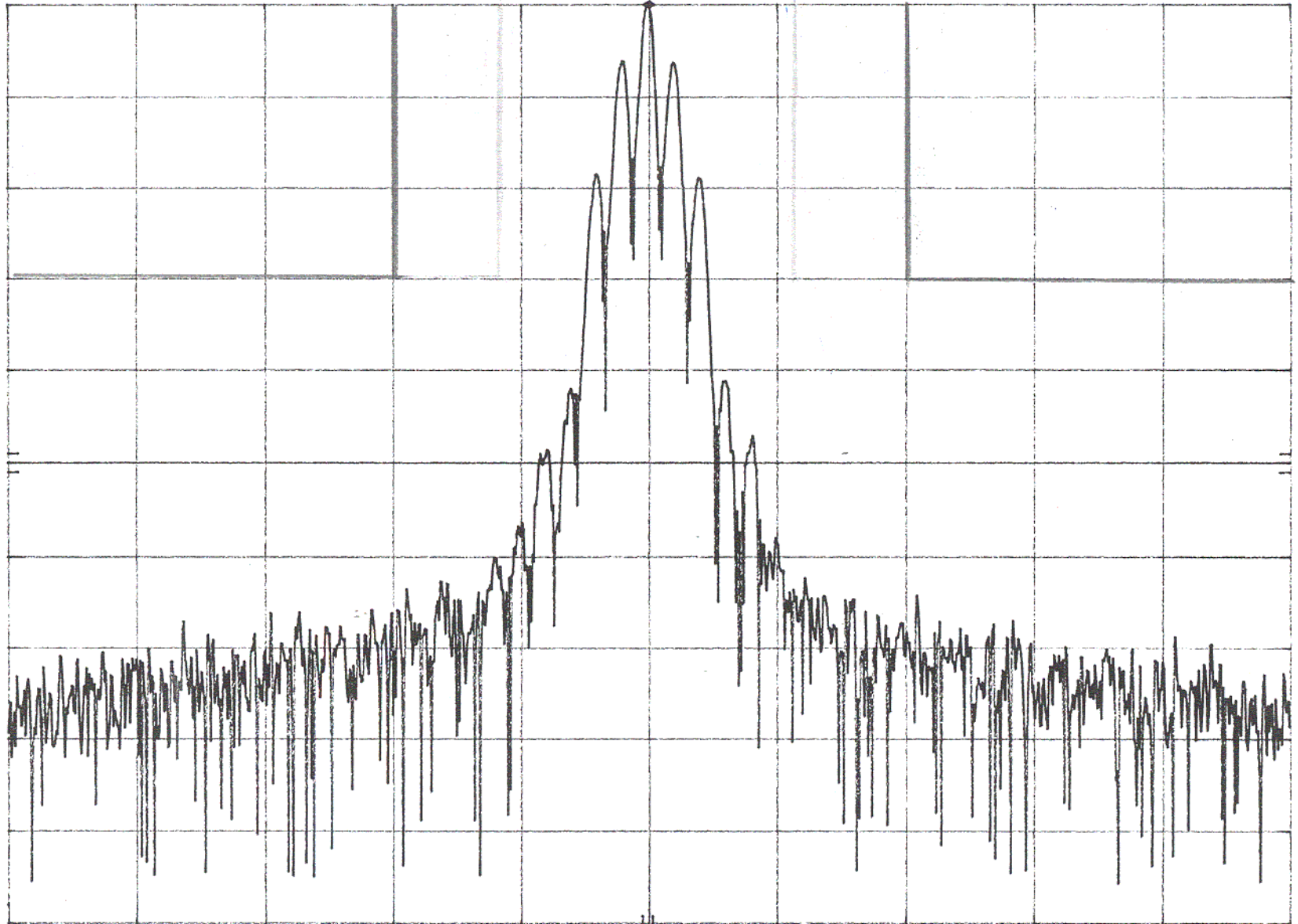
hp

REF 70.7 dB μ V ATTN 0 dB +0 dB

10 dB/

OFFSET
-20.0
dB

DL
20.7
dB μ V



CENTER 465.000 MHz

RES BW 1 kHz (i)

VBW 3 kHz

SPAN 100 kHz
SWP 750 msec

EXEMPTION FROM TECHNICAL STANDARDS

90.217 Except as noted herein, transmitters used below 800 MHz on any frequency listed in Subparts B and C of this Part or licensed on a business category channel above 800 MHz which has an output power not exceeding 120 mW are exempt from the technical requirements set out in this subpart but must instead comply with the following:

- a. The equipment designed to operate with a 25 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 40 kHz or more removed from the associated frequency is attenuated at least 30 dB below the unmodulated carrier.
- b. The equipment designed to operate with a 12.5 kHz channel bandwidth, the sum of the bandwidth occupied by the emitted signal plus the bandwidth required for frequency stability shall be adjusted so that any emission appearing on a frequency 25 kHz or more removed from the associated frequency is attenuated at least 30 dB below the unmodulated carrier.

This device has a radiated power of 18 mW and is therefore exempt and meets the requirements of Subpart b. See Pages 5 and 6 above for occupied bandwidth plots.

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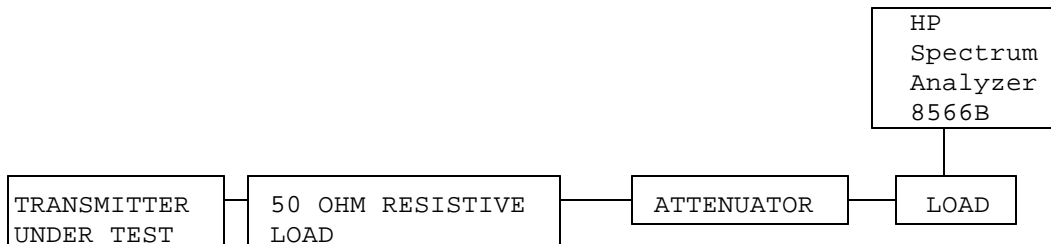
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2.1051 Spurious emissions at antenna terminals(conducted):
2.1052 Data on the following page shows the level of conducted spurious responses. The carrier was modulated using a 2500Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.
For 25KHz $43 + 10\log(0.018) = 25.55$ dB
For 12.5KHz $50 + 10\log(0.018) = 32.55$ dB

NOT REQUIRED FOR THIS DEVICE AS IT HAS A FIXED ANTENNA.

Method of Measuring Conducted Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was TIA/EIA-603 STANDARD without any exceptions. An audio generator was connected to the UUT through a dummy microphone circuit and the output of the transmitter connected to a standard load and from the standard load through a pre-selector filter of the spectrum analyzer. The spectrum was scanned from 400KHz to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer. The measurements were made using the shielded room located at TIMCO ENGINEERING INC. 849 N.W. State Road 45, Newberry, Florida 32669.

2.1053 Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be $50 + 10\log(P_o)$ dB below the mean power output of the transmitter.

$$50 + 10\log(0.018) = 32.55 \text{ dB}$$

TEST DATA:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
460.00	460.00	88.1	V	3.10	18.70	109.90	00.00
460.00	920.00	20.0	V	4.50	24.60	49.10	28.25
460.00	1,380.00	24.1	V	3.70	28.20	56.00	21.35
460.00	2,300.00	5.1	V	3.70	28.98	37.78	39.57

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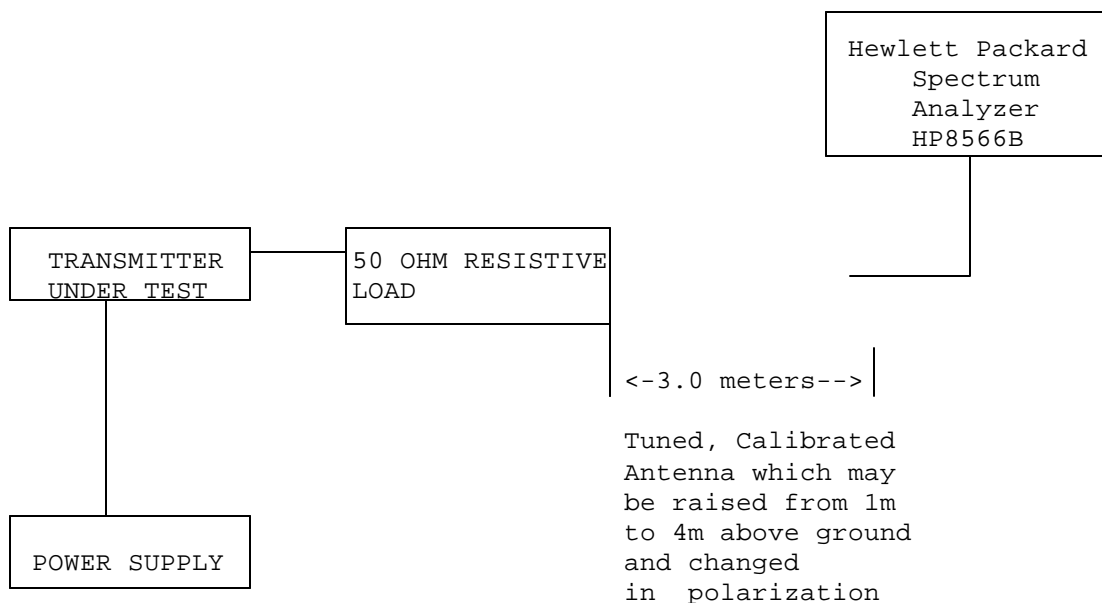
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METHOD OF MEASUREMENT: The tabulated Data shows the results of the radiated field strength emissions and attenuation calculated per TIA/EIA 603. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA 603. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 849 N.W. STATE ROAD 45, NEWBERRY, FL 32669.

Method of Measuring Radiated Spurious Emissions



Equipment placed 80 cm above ground on a rotatable platform.

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2.1055 Frequency stability:

90.213(a)(1)

Temperature and voltage tests were performed to verify that the frequency remains within the .0005%, 5 ppm specification limit, for 25KHz spacing & 0.00025% for 12.5KHz spacing and 0.0001% for 6.25KHz spacing. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 degrees C.

Readings were also taken at minus 15% of the battery voltage of 6.2 VDC, which we estimate to be the battery endpoint.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 465.000 000 MHz

TEMPERATURE_°C	FREQUENCY_MHz	PPM
REFERENCE_____	465.000 000	00.00
-30_____	465.001 085	+ 2.33
-20_____	465.001 024	+ 2.20
-10_____	465.001 014	+ 2.18
0_____	465.000 814	+ 1.75
+10_____	465.000 607	+ 1.31
+20_____	465.000 420	+ 0.90
+30_____	465.000 098	+ 0.21
+40_____	465.999 851	- 0.32
+50_____	465.999 620	- 0.82

-15% Battery End-Point VDC 465.000 242 + 0.52

+15% Battery End-Point VDC 465.000 243 + 0.52

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was +2.33 ppm.

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2.10 Measurement Procedures.

Measurement techniques have been in accordance with TIA/EIA STD 603-1992.

TEST EQUIPMENT LIST

- 1._X_Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/
preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter
HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02,
S/N 3008A00372
- 2._X_Biconnical Antenna: Eaton Model 94455-1, S/N 1057,
- 3.___Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171
- 4._X_Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632
- 5.___Log-Periodic Antenna: Electro-Metrics Model LPA-30, S/N 409
- 6.___Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180,
1-18 GHz, S/N 2319
- 7.___18-26.3GHz Systron Donner Standard Gain Horn #DBE-520-20
- 8.___Horn 40-60GHz: ATM Part #19-443-6R
- 9.___Line Impedance Stabilization Network: Electro-Metrics Model
EM-7820, w/NEMA Adapter S/N 2682
- 10.___Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7
- 11.___Frequency Counter: HP Model 5385A, S/N 3242A07460
- 12.___Peak Power Meter: HP Model 8900C, S/N 2131A00545,
- 13._X_Open Area Test Site #1-3meters
- 14.___Signal Generator: HP 8640B, S/N 2308A21464
- 15.___Signal Generator: HP 8614A, S/N 2015A07428
- 16.___Passive Loop Antenna: EMCO Model 6512, 9KHz to 30MHz, S/N
9706-1211
- 17.___Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153
- 18.___AC Voltmeter: HP Model 400FL, S/N 2213A14499
- 19.___Digital Multimeter: Fluke Model 8012A, S/N 4810047
- 20.___Digital Multimeter: Fluke Model 77, S/N 43850817
- 21.___Oscilloscope: Tektronix Model 2230, S/N 300572

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