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APPLICANT: AEROTRON-REPCO SYSTEMS, INC.

FCC ID: N6RUHFHH-01

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GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

2.983 (a,b,c) AEROTRON-REPCO SYSTEMS, INC. will sell the
FCC ID: N6RUHFHH-01 UHF transmitter in quantity,
for use under FCC RULES PART 22 & 90.

2.983 (d) TECHNICAL DESCRIPTION

(1) Type of Emission: 16K0F3E For 25KHz
10K4F3E For 12.5KHz

For 25KHz

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 2.2\text{KHz (Peak Deviation)}$$

$$K = 1$$

$$B_n = 2(3.0K) + 2(2.2K)(1) = 6.0K + 4.4K = 10.4K$$

ALLOWED AUTHORIZED BANDWIDTH = 20.00KHz.

For 12.5KHz

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 2.2\text{KHz (Peak Deviation)}$$

$$K = 1$$

$$B_n = 2(3.0K) + 2(2.2K)(1) = 6.0K + 3.2K = 10.4K$$

ALLOWED AUTHORIZED BANDWIDTH = 11.25KHz.

90.209(b)(5)

(2) Frequency Range: 450-470 MHz

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

(4) Maximum Output Power Rating:
4.0 Watts & 2.0 Watt
into a 50 ohm resistive load.

(5) DC Voltages and Current into Final Amplifier:

POWER INPUT

High FINAL AMPLIFIER ONLY

$$V_{ce} = 7.20 \text{ Volts}$$

$$I_{ce} = 1.80 \text{ A.}$$

$$P_{in} = 12.96 \text{ Watts}$$

Low FINAL AMPLIFIER ONLY

$$V_{ce} = 7.20 \text{ Volts}$$

$$I_{ce} = 1.25 \text{ A.}$$

$$P_{in} = 8.64 \text{ Watts}$$

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- (6) Function of each electron tube or semiconductor device or other active circuit device: SEE EXHIBIT 7.
- 2.983(d) (7) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 6A-6C. The block diagram is included as EXHIBIT 5.
- (8) Instruction book. The instruction manual is included as EXHIBIT #9.
- (9) Tune-up procedure. The tune-up procedure is given in EXHIBIT #10.
- (10) Description of all circuitry and devices provided for determining and stabilizing frequency is included in the circuit description in the instruction manual.
- 2.983 (11) Description of any circuits or devices employed for suppression of spurious radiation, for limiting modulation, and for limiting power.
- In addition to the interstage filtering the multi-section low pass filter made up of L12, L11, C40, C47, C95, C46, C94, C45, & C26.
- Limiting Modulation:
The transmitter audio limiting circuitry is contained in the loop filter IC01.
- Limiting Power: There is no provision for limiting power.
- (12) Digital modulation. This unit does NOT use digital modulation.
- 2.983(e) The data required by 2.985 through 2.997 is submitted below.

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2.985(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 7.2V, and the transmitter properly adjusted the RF output measures:

POWER HIGH

INPUT POWER: (7.2V)(1.80A) = 12.98 Watts

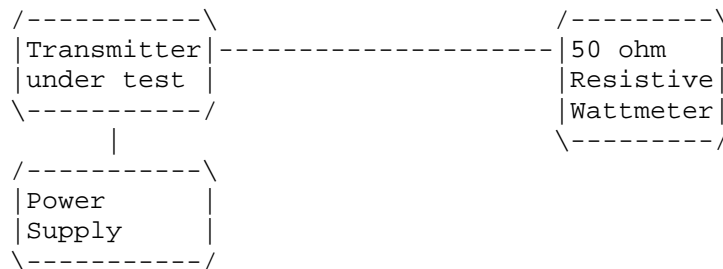
OUTPUT POWER: 4.2 Watts Efficiency: 32%

LOW POWER

INPUT POWER: (7.2V)(1.20A) = 8.64 Watts

OUTPUT POWER: 2.1Watts Efficiency: 24%

METHOD OF MEASURING RF POWER OUTPUT



2.987(a) **Voice Modulation characteristics:**

(a) AUDIO FREQUENCY RESPONSE See the EXHIBIT #9.

2.987(a) AUDIO LOW PASS FILTER

The audio low pass filter is included and the plot is shown as EXHIBIT #13. Rules 90.210(b,d, & e) for mobile stations with a low pass filter.

2.987(b) Audio input versus modulation A plot of the audio input versus deviation is shown in in EXHIBIT #12A-12C.

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2.989(c) Occupied bandwidth:
90.210(b,)

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.

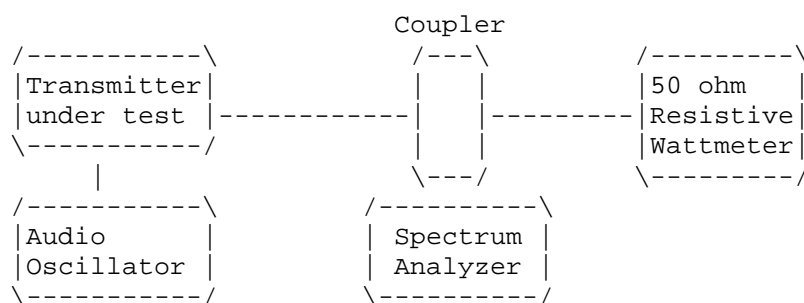
90.210(d) 12.5KHz channel bandwidth equipment. For transmitters designed to operate with a 12.5KHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows; (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625kHz removed from f_{P0} : Zero dB. (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency $(f_d - 2.88\text{kHz})$ dB of more than 5.625kHz but no more than 12.5kHz: At least $7.27(f_d - 2.88\text{kHz})$. (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency $(f_d \text{ in kHz } \log(P))$ or 70dB, whichever is the lesser attenuation.

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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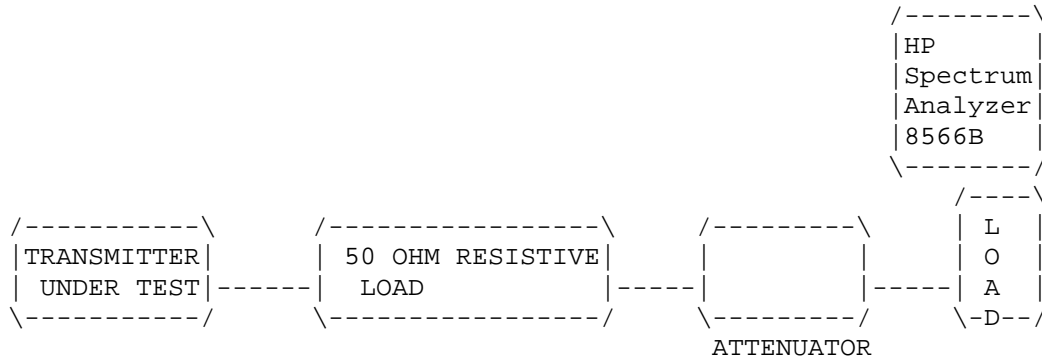
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Method of Measuring Conducted Spurious Emissions



2.991 Continued Spurious Emissions at the Antenna Terminals:

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

For 25KHz	$43 + 10\log(4.2) = 43 + 6.2 = 49.23\text{B}$
For 12.5KHz	$50 + 10\log(P_o) = 50 + 3.01 = 53.01$
For 12.5KHz	$50 + 10 \log(2.0) = 46\text{dB}$

	EMISSION FREQUENCY	dB BELOW CARRIER
HIGH POWER	470.00	00.0
	939.97	-62.5
	1409.94	-70.3
	1879.94	-92.5
	2349.95	-90.2
	2819.94	-92.6
	3289.94	-74.6
	4229.88	-83.9
LOW POWER	470.00	00.0
	939.97	-58.5
	1409.94	-68.3
	1879.94	-82.5
	2349.95	-88.2
	2819.94	-90.6
	3289.94	-75.6
	4229.88	-81.9

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2.991 Continued Spurious Emissions at the Antenna Terminals:

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. 25355 WEST NEWBERRY ROAD, NEWBERRY FLORIDA 32669.

2.993(a)(b) Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

HIGH POWER $50 + 10\log(4.2) = 49.23\text{dB}$
 LOW POWER $50 + 10\log(2.0) = 46.0 \text{ dB}$

EMISSION FREQUENCY MHz	METER READING @ 3 METERS dBuV	COAX LOSS dB	ACF dB	FIELD STRENGTH dBuV/m	ATT. dB	MARGIN dB	ANT. POL.
HIGH POWER							
450.00	115.10	1.60	18.15	134.85	0.00	0.00	V
900.00	36.80	2.90	24.20	63.90	70.95	21.72	H
1350.00	19.40	1.00	25.40	45.80	89.05	39.82	V
1800.00	20.00	1.00	27.20	48.20	86.65	37.42	V
2250.00	26.20	1.07	28.63	55.89	78.96	29.72	V
2700.00	24.30	1.14	29.75	55.19	79.66	30.43	V
3150.00	24.00	1.20	30.88	56.08	78.77	29.54	V
3600.00	24.50	1.27	32.00	57.77	77.08	27.85	V
4050.00	17.20	1.34	33.06	51.59	83.26	34.02	H
4500.00	9.30	1.41	33.56	44.27	90.58	41.35	H
LOW POWER							
450.00	108.20	1.60	18.15	127.95	0.00	0.00	V
900.00	30.60	2.90	24.20	57.70	70.25	24.03	V
1350.00	15.20	1.00	25.40	41.60	86.35	40.13	H
1800.00	16.20	1.00	27.20	44.40	83.55	37.33	V
2250.00	26.60	1.07	28.63	56.29	71.66	25.44	V
2700.00	25.90	1.14	29.75	56.79	71.16	24.94	H
3150.00	26.50	1.20	30.88	58.58	69.37	23.15	H
3600.00	23.60	1.27	32.00	56.87	71.08	24.86	H
4050.00	17.10	1.34	33.06	51.49	76.46	30.23	V
4500.00	16.00	1.41	33.56	50.97	76.98	30.76	H

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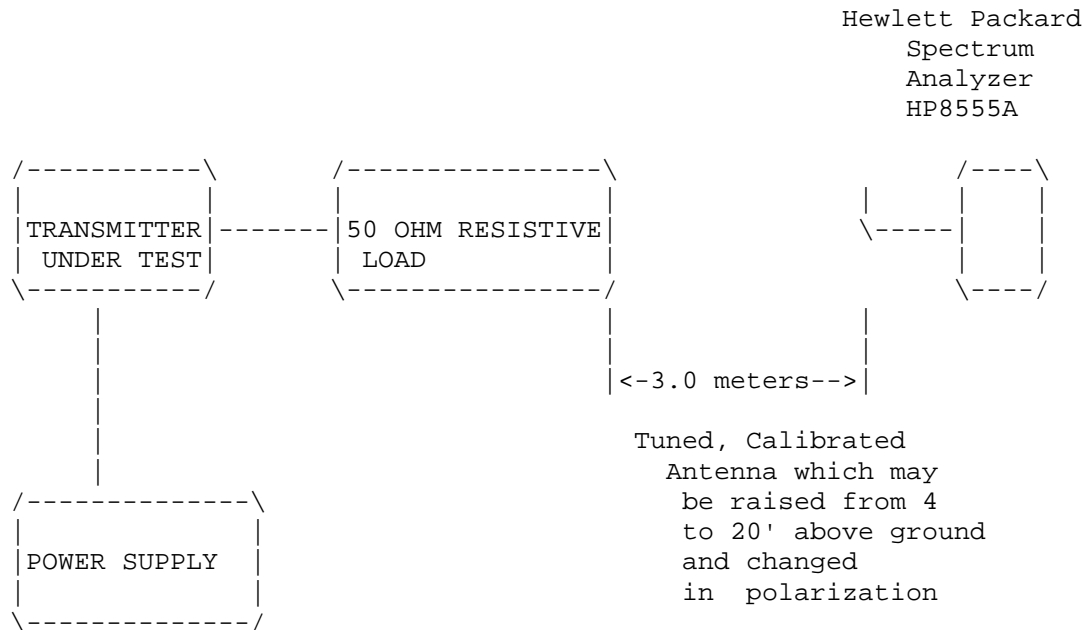
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2.993(a)(b) Field strength of spurious emissions:

METHOD OF MEASUREMENT: The tabulated Data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental. This test was conducted per ANSI STANDARD C63.4-1992 with the exception of briefly connecting the transmitter to a half wave dipole for the purpose of establishing a reference. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 6051 N.W. 19th Lane Gainesville, FL 32605.

:

Method of Measuring Radiated Spurious Emissions



Equipment placed 4' above ground
on a rotatable platform.

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2.995(a)(b)(d) Frequency stability:

90.213(a)

Temperature and voltage tests were performed to verify that the frequency remains within the .00025%, 2.5 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 25% of the battery voltage of 5.4VDC, which we estimate to be the battery endpoint.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 469.987 500MHz

TEMPERATURE C	FREQUENCY MHz	PPM
REFERENCE_____	469.987 500	00.00
-30_____	469.987 520	+0.04
-20_____	469.987 540	+0.08
-10_____	469.987 560	0.13
0_____	469.987 470	-0.08
+10_____	469.987 460	-0.08
+20_____	469.987 400	-0.21
+30_____	469.987 440	-0.13
+40_____	469.987 350	-0.31
+50_____	469.987 320	0.38

20oC Battery End-Point 5.6VDC 469.987 620 +0.26

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was -0.38 to 0.08 ppm. The maximum frequency variation over the voltage range was +0.26 ppm.

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2.995(a)(b)(d) Frequency stability:
90.214 Transient Frequency Behavior

REQUIREMENTS: In the 421-512MHz frequency band, transient frequencies must be within the maximum frequency difference limits during the time interval indicated below for 12.5kHz Channels:

Time Interval	Maximum Frequency	Portable Radios 421-512Mhz
t1	+12.5kHz	10.0ms
t2	+6.25kHz	25.0ms
t3,t4	+12.5kHz	10.0ms

TEST PROCEEDURE: TIA/EIA TS603 PARA 2.2.19, the levels were set as follows;

1. Using the variable attenuator the transmitter level was set to 40dB below the test recievers maximum input level, then the transmitter was turned off.
2. With the Transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30dB.
4. With the levels set as above the transient frequency behavior was observed & recorded.

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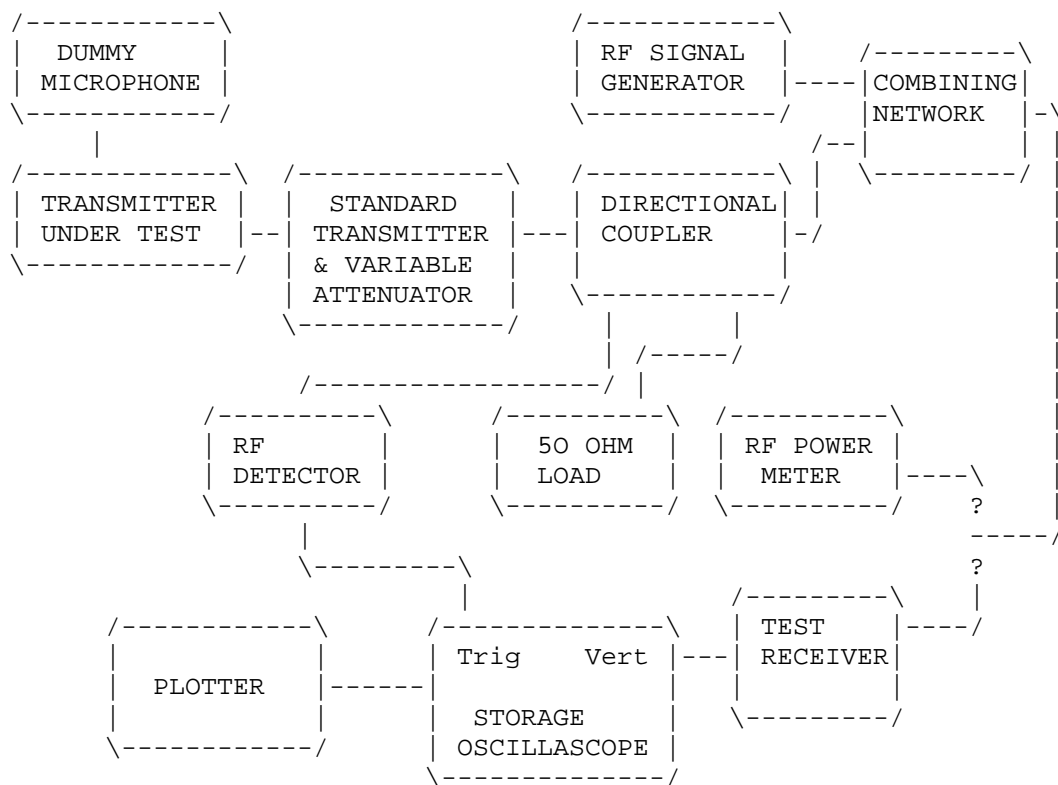
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2.995(a)(b)(d) Frequency stability:
 90.214 Transient Frequency Behavior
 (Continued)



- 2.983(f) Photo or Drawing of Label:
See Page 2.
- 2.983(g) Photos of Equipment:
See Pages 4A-4G.
- 2.999 Measurement Procedures for Type Acceptance:

Measurement techniques have been in accordance
with EIA specifications and the FCC requirements.
- 2.909 Certification of Technical Data by Engineers

We, the undersigned, certify that the enclosed
measurements and enclosed data are true and
correct.

S.S. Sanders
Engineer

LIST OF TEST EQUIPMENT

1. Spectrum Analyzer: Hewlett Packard 8566B - Opt 462, w/
preselector 85685A, & Quasi-Peak Adapter HP 85650A, & HP
8449B - OPT H02 Cal. 7/6/99
2. Signal Generator, Hewlett Packard 8640B, cal. 10/1/98
3. Signal Generator, HP 8614A Serial No.2015A07428 cal. 5/27/99
3. Eaton Biconnical Antenna Model 94455-1
20-200 MHz Serial No. 0997 Cal. 10/30/98
4. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA-30 10/31/98
5. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 10/30/98
6. Electro-Metric Antennas Model TDA-30/1-4, Cal. 10/15/98
7. Electro-Metric Line Impedance Stabilization Network Model
No. EM-7821, Serial No. 101; 100KHz-30MHz 50uH. Cal.11/19/98
8. Electro-Metric Line Impedance Stabilization Network Model
No. EM-7820, Serial No. 2682; 10KHz-30MHz 50uH. Cal. 11/19/98
9. Special low loss cable was used above 1 GHz
10. Tenney Temperature Chamber

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