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FCC ID: PQXHKG2003

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GENERAL INFORMATION REQUIRED  
FOR CERTIFICATION

2.1033(c)(1)(2) HK PROTECH, INC will manufacture the  
FCCID: PQXHKG2003 GMRS CHANNELS  
TRANSCEIVER in quantity, for use under FCC RULES  
PART 95.

HK PROTECH, INC  
3-10, CHUNGCHUN-DONG, BUPYUNG-GU  
INCHON KOREA

2.1033 (c) TECHNICAL DESCRIPTION

2.1033(c)(3) Instruction book. A draft copy of the instruction  
manual is included as EXHIBIT 9A-9P.

2.1033(c) (4) Type of Emission: 9K5F3E  
95.631

$$\begin{aligned} B_n &= 2M + 2DK \\ M &= 3000 \\ D &= 1.75K \\ B_n &= 2(3.0) + 2(1.75) = 9.5K \end{aligned}$$

Authorized Bandwidth 20.0KHz

2.1033(c)(5) Frequency Range: 462.5625 - 462.7250 MHz  
95.621

2.10311c)(6)(7) The Maximum Output Power Rating:

High: 3.245 Watts ERP  
Low: .5 Watt ERP

2.1033(c)(8) DC Voltages and Current into Final Amplifier:  
FINAL AMPLIFIER ONLY

FOR LOW POWER SETTING INPUT POWER: (6.0V)(.210A) = 1.26 Watts  
FOR HIGH POWER SETTING INPUT POWER: (6.0V)(.600A) = 3.60 Watts

2.1033(c)(9) Tune-up procedure. The tune-up procedure is included  
11A-11C.

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2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 8 of this report. The block diagrams are included as EXHIBIT 7 of this report.

2.1033(c)(11) A photograph or a drawing of the equipment identification label is included as exhibit No. 1.

2.1033(c)(12) Photographs(8"X10") of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, labels for controls, including any view under shields. See exhibits 3-6B.

2.1033(c)(13) Digital modulation is not allowed.

2.1033(c)(14) The data required by 2.1046 through 2.1057 is submitted below.

95.639 Power Output shall not exceed 50.0 Watts effective radiated power. There can be no provisions for increasing the power or varying the power. RF power output.

95.649

2.1046(a) RF power is measured by connecting a 50 ohm, resistive watt meter to the RF output connector. With a nominal battery voltage of 8.4 V, and the transmitter properly adjusted the RF output measures:

OUTPUT POWER: HIGH: 3.245 Watts  
LOW: 0.50 Watt

2.1046(a) RF power output. The test procedure used was TIA/EIA-603 S2.2.1.

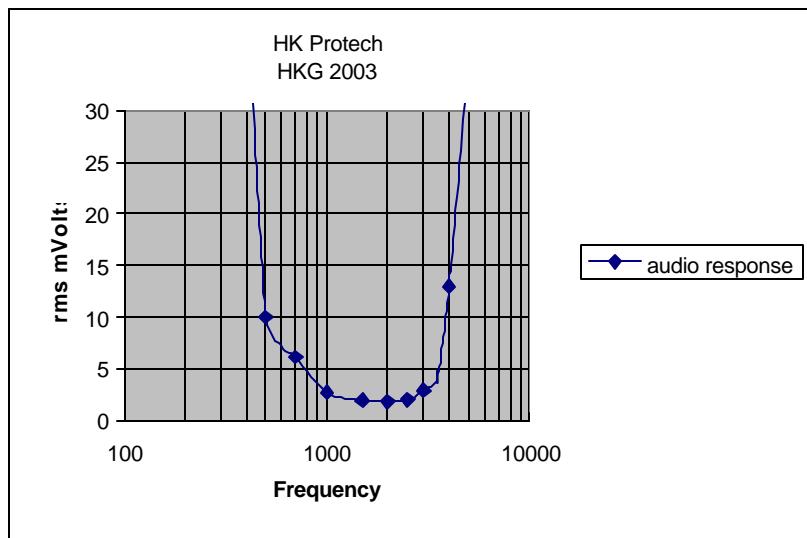


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2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE

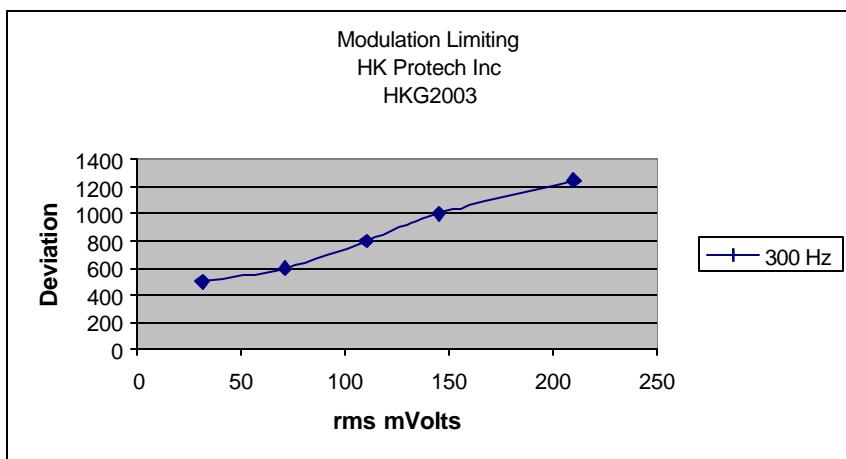
The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on the next page. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.



2.1047(b)

Audio input versus modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are on the following pages. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.



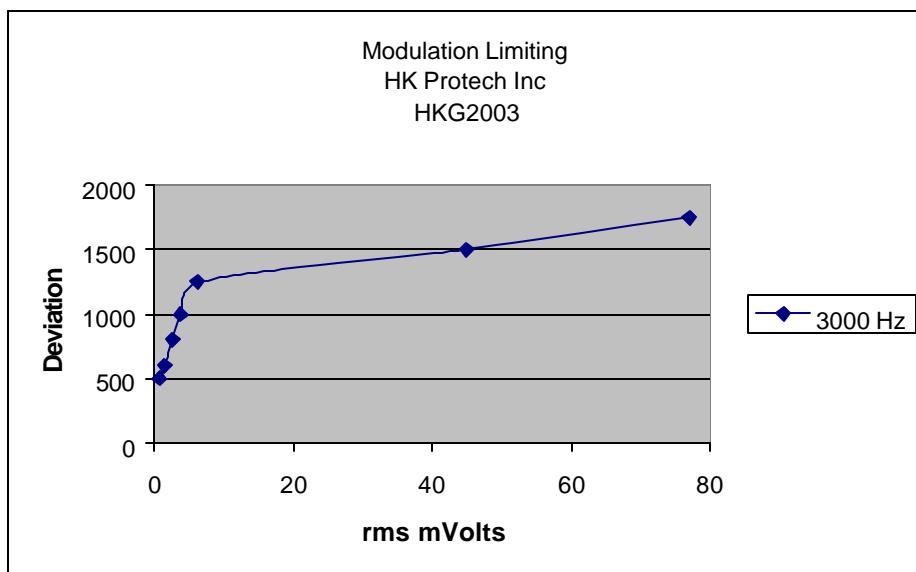
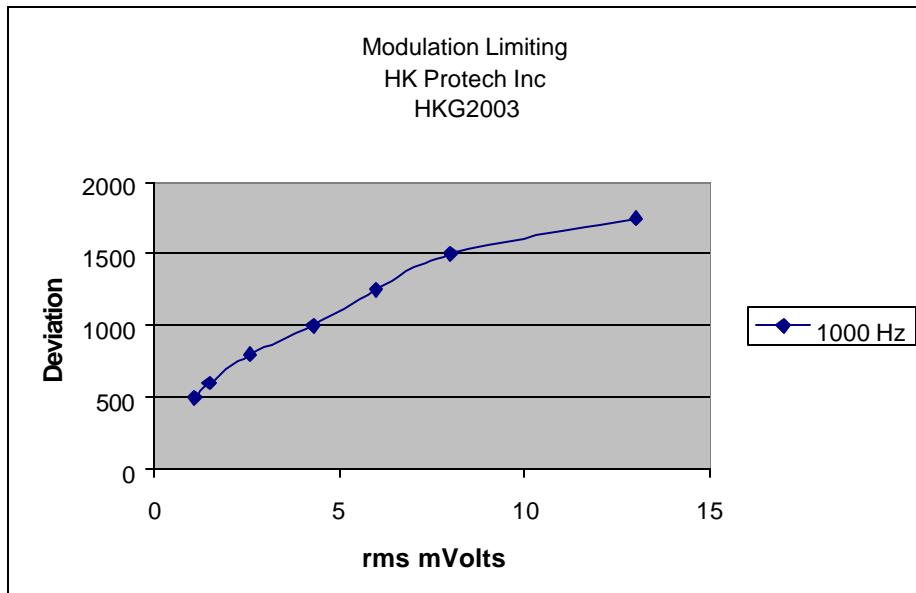
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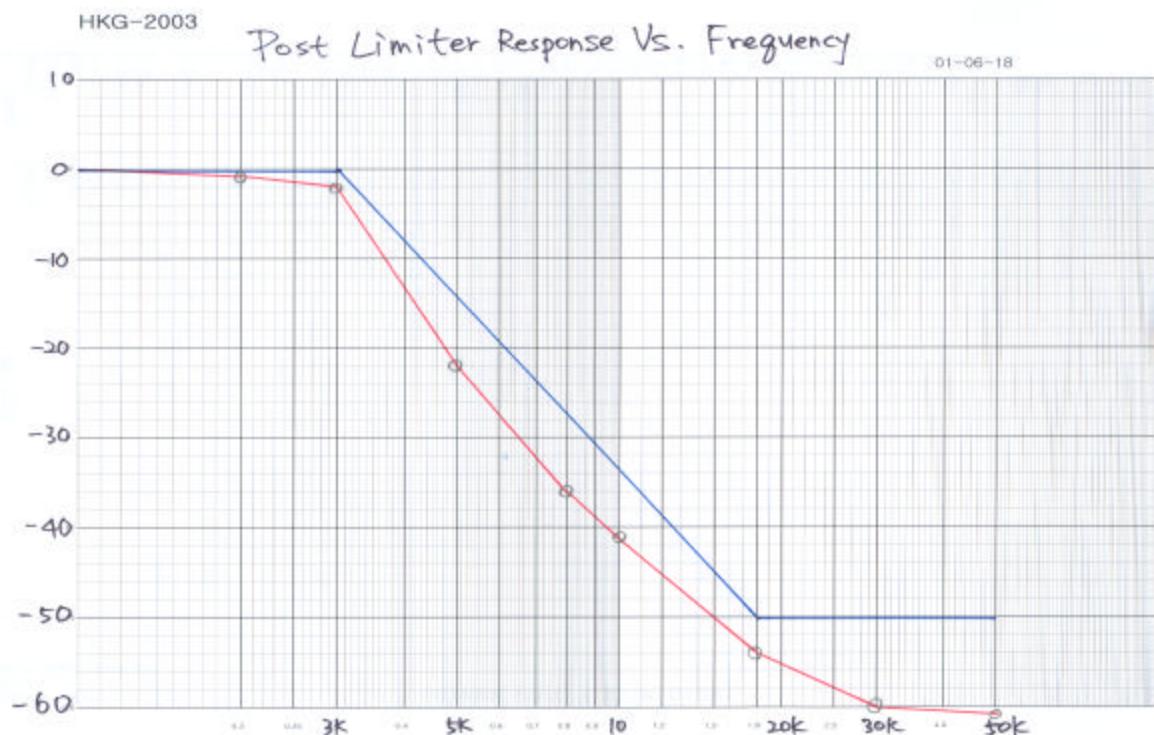
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95.637

Post Limiter Filter Each GMRS transmitter, except a mobile station transmitter with a power of 2.5Watts or less, must be equipped with an audio low pass filter. At any frequency between 3 & 20KHz the filter must have an attenuation of  $60\log(f/3)$  greater than the attenuation at 1KHz.



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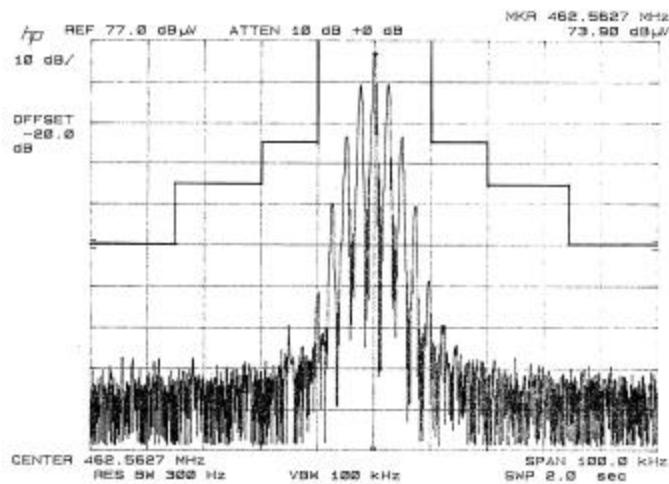
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2.1049 Occupied bandwidth:

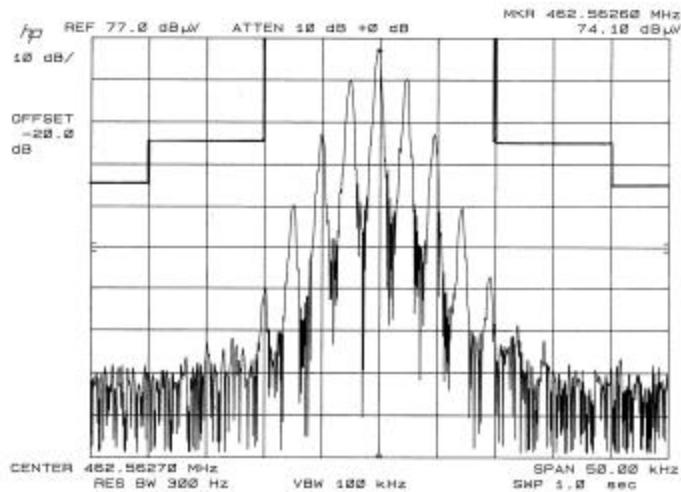
95.635(b)(1)(3)(7)

At least 25dB on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth. At least 35 dB on any frequency removed from the center of the authorized BW by more than 100% up to and including 250% of the authorized BW. At least  $43 + \log_{10}(T)$  on any frequency removed from the center of the authorized bandwidth by more than 250%.

Occupied Bandwidth Plot



Occupied Bandwidth Plot



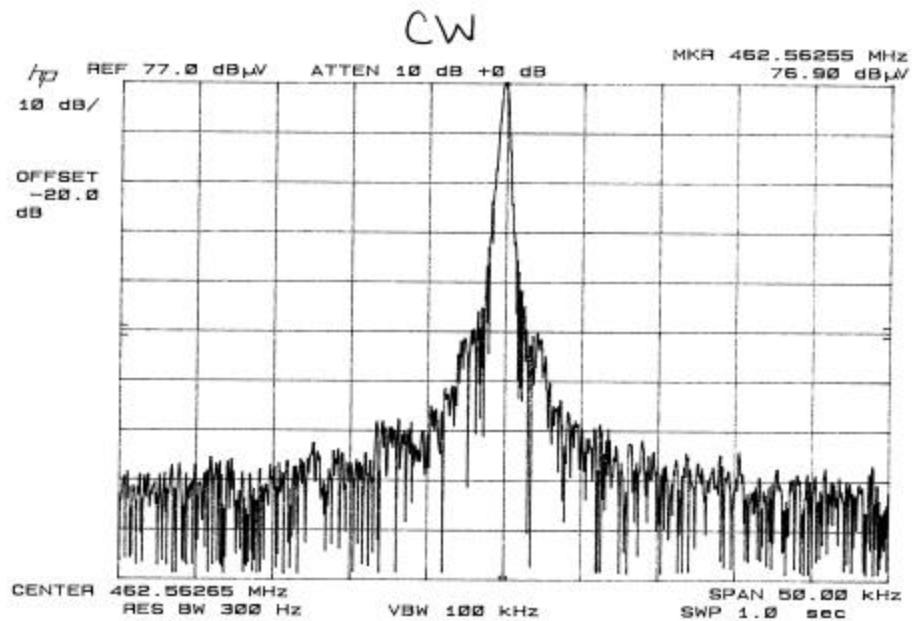
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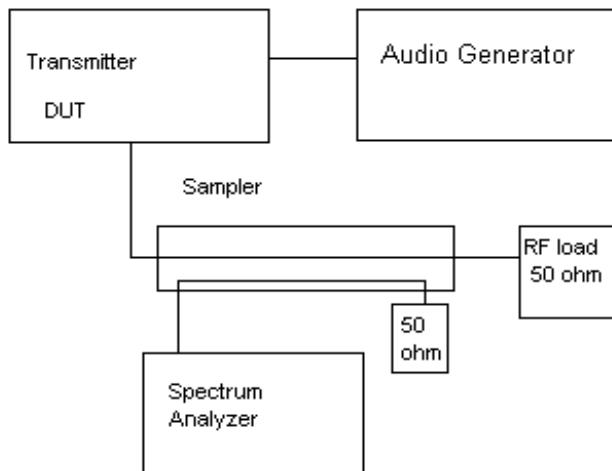
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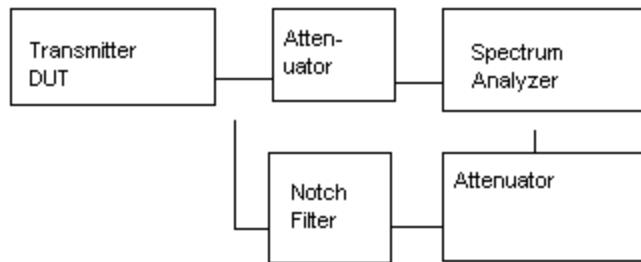
Occupied BW Test Equipment Setup



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2.1051 Spurious emissions at antenna terminals (conducted):  
The following data shows the level of conducted spurious responses at the antenna terminal. The test procedure used was TIA/EIA 603 S2.2.13 with the exception that the emissions were recorded in dBc. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental.

Spurious Emissions at  
Antenna Terminals



Method of Measuring Conducted Spurious Emissions

2.1051 Spurious emissions at the Antenna Terminals

NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

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

THIS UNIT HAS A FIXED ANTENNA, THEREFORE THIS DOES NOT APPLY.

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2.1053  
95.635(b)(7)

UNWANTED RADIATION:

The tabulated Data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 to at least the 10th harmonic of the fundamental. This test was conducted per ANSI C63.4-1992.

REQUIREMENTS: HIGH POWER:  $43 + 10\log(3.245) = 48.11$  dB  
LOW POWER:  $43 + 10\log(0.50) = 39.99$  dB

TEST DATA:

HIGH POWER

Emission Frequency MHz	Meter Reading dBuv	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dBuv/m	Margin dB
462.50	111.7	V	3.10	17.80	132.49	0.00
925.10	52.4	V	1.95	24.60	80.64	3.74
1,387.70	48.2	V	3.00	27.25	77.81	6.57
1,850.30	39.4	V	3.00	28.45	70.69	13.69
2,312.90	28.1	V	3.80	28.82	60.17	24.21
2,775.40	24.3	H	3.80	29.97	57.89	26.49
3,238.00	42.1	H	4.80	30.89	77.03	7.35
3,700.60	32.1	H	4.80	31.90	68.50	15.88
4,163.20	32.3	V	6.20	33.33	70.66	13.72
4,625.80	23.5	V	6.20	33.64	62.82	21.56

LOW POWER

Emission Frequency MHz	Meter Reading dBuv	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dBuv/m	Margin Db
462.50	103.2	H	3.10	17.80	123.99	0.00
925.10	51.3	V	1.95	24.60	79.54	4.46
1,387.70	44.8	V	3.00	27.25	74.41	9.59
1,850.30	38.3	V	3.00	28.45	69.59	14.41
2,312.90	20.0	V	3.80	28.82	52.07	31.93
2,775.40	17.9	H	3.80	29.97	51.49	32.51
3,238.00	38.7	H	4.80	30.89	73.63	10.37
3,700.60	23.9	H	4.80	31.90	60.30	23.70
4,163.20	27.7	H	6.20	33.33	66.06	17.94
4,625.80	20.3	V	6.20	33.64	59.62	24.38

METHOD OF MEASUREMENT: The procedure used was TIA/EIA 603. The measurements were made at the test site located at TIMCO ENGINEERING INC. 849 NW State Road 45 Newberry, Florida 32669.

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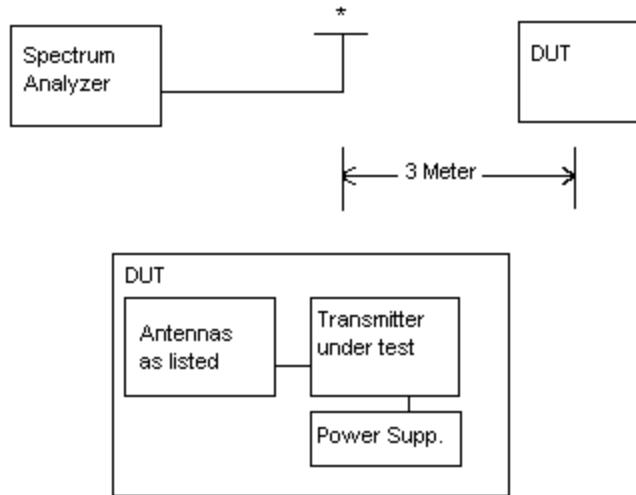
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Method of Measuring Radiated Spurious Emissions



Equipment placed 80cm above ground  
on a rotatable platform.

\* Appropriate antenna raised from 1 to 4 M.

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2.1055  
95.621(b)

Frequency stability:

Temperature and voltage tests were performed to verify that the frequency remains within the 0.0005%, 5 ppm specification limit. 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 plus and minus 15% of the battery voltage of 6.0 VDC.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 462.562 500

<u>TEMPERATURE_C</u>	<u>FREQUENCY_MHz</u>	<u>PPM</u>
REFERENCE_____	462.562500	00.00
-30C_____	462.562623	0.27
-20C_____	462.563503	2.17
-10C_____	462.563860	2.94
0C_____	462.564245	3.78
10C_____	462.564045	3.34
20C_____	462.563423	2.00
30C_____	462.562545	0.10
40C_____	462.561866	-1.37
50C_____	462.561519	-2.12

BATT. %	BATT. DATA	VOLTS	BATT. PPM
-15%	462.562922	6	0.91
+15%	462.562933	5.1	0.94

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was -2.12 to +3.78 ppm. The maximum frequency variation with voltage was 0.94 ppm.

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TEST EQUIPMENT LIST

1. 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. Biconnical Antenna: Eaton Model 94455-1, S/N 1057
3. Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171
4. 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  
ANS-25/2, S/N 2604
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. 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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