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APPLICANT: BG TECH LTD.

FCC ID: QFRVHF50

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GENERAL_INFORMATION_REQUIRED
FOR_TYPE_ACCEPTANCE

- 2.1033(c) BG TECH LTD. will sell the FCC ID: QFRVHF50 VHF Marine transmitter in quantity, for use under FCC RULES PART 80.
- 2.1033(c) TECHNICAL_DESCRIPTION
- (4) Type of Emission: 16K0G3E/16K0F3E For 20KHz
For 25KHz
 $B_n = 2M + 2DK$
 $M = 3000$
 $D = 5.0\text{KHz}$ (Peak Deviation)
 $K = 1$
 $B_n = 2(3.0K) + 2(5.0K)(1) = 6.0K + 10.0 = 16.0K$
- 80.205(A) ALLOWED AUTHORIZED BANDWIDTH = 20.00KHz.
- 2.1033(c)(3) Instruction book. The instruction manual is included as EXHIBIT #7.
- 2.1033(c)(5) Frequency Range: 156.025 - 157.425 MHz
- 2.1033(c)(6) Power Range and Controls: There is a user Power switch for High/Low Power.
- 2.1033(c)(8) DC Voltages and Current into Final Amplifier:
- POWER INPUT
 FINAL AMPLIFIER ONLY
- | High | Low |
|-------------------|------------------|
| Vce = 7.4 Volts | Vce = 7.4 VDC |
| Ice = 1.36 A. | Ice = 0.72 A. |
| Pin = 10.06 Watts | Pin = 5.33 Watts |
- Function of each electron tube or semiconductor device or other active circuit device: - SEE EXHIBIT# 3
- 2.1033(c) (9) Tune-up procedure. The tune-up procedure is given in EXHIBIT #9.
- 2.1033(c)(10) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 2. The block diagram is included as EXHIBIT 1.

2.1033(c) (13) Digital modulation. This unit does NOT use digital modulation.

The data required by 2.1046 through 2.1055 is submitted below.

80.203(b) External Controls: The transmitter is capable of changing frequency between 156.05-157.425 MHz by external control. The available channels are shown in the user manual. These channels are programmed by the manufacturer and change of frequency is inaccessible to the station operator.

80.203(c) Five Minute continuous transmission test: The antenna was connected to a dummy load and the radio was locked in a transmit PTT mode. An external timer digital clock was used to observe the duration of the unmodulated transmission. The transmitter turned off and the radio went to receive mode at 4 minutes, 58 seconds as displayed by the external digital clock.

80.203(n) Not applicable as this radio does not have DSC capability.

80.911 Not applicable as this radio does not have DSC capability.

2.1046(a)
80.215(e)(1)

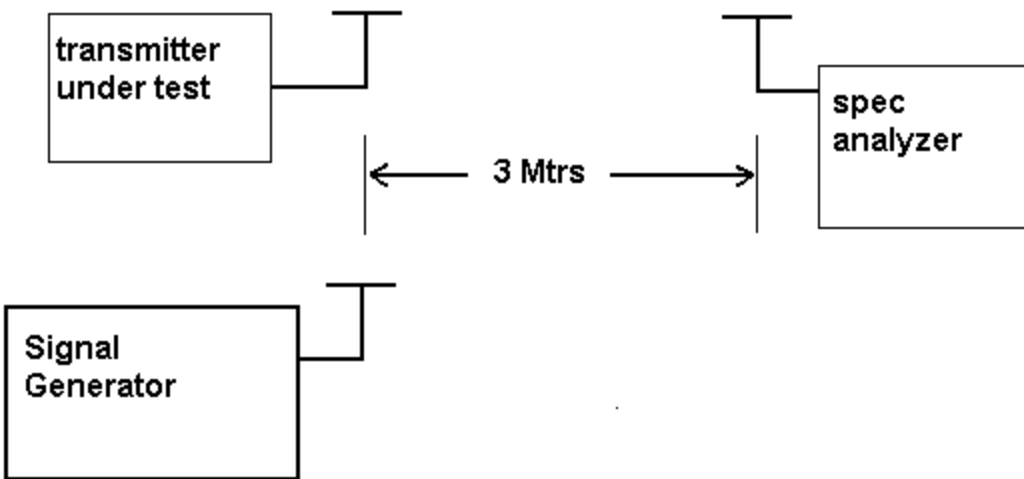
RF_power_output.

RF power is measured by connecting a 50 ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage of 7.4 V, and the transmitter properly adjusted the RF output measures:

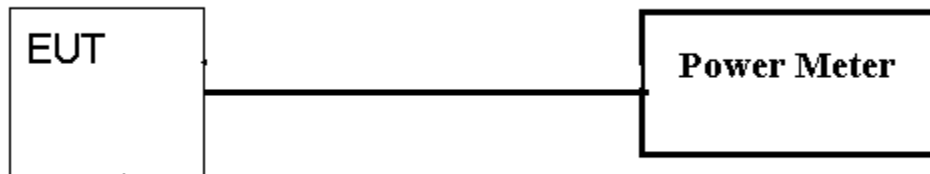
POWER OUTPUT

HIGH POWER: 3.55 W ERP, 5.13 W Conducted
LOW POWER: 0.49 W ERP, 1.23 W Conducted

METHOD OF MEASURING RF POWER OUTPUT



ERP



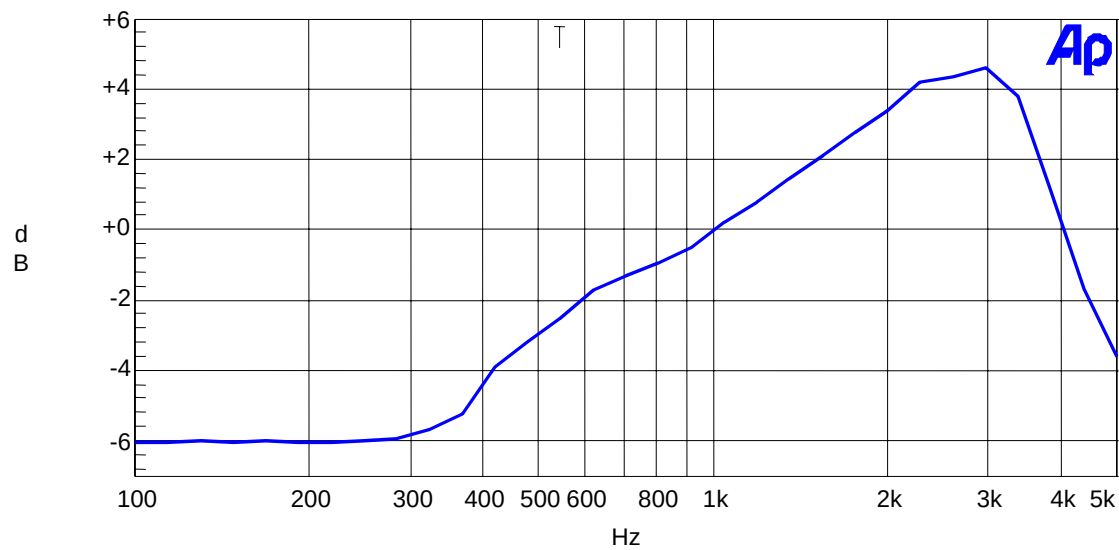
CONDUCTED

2.1047(a) Voice Modulation_characteristics:

(b) AUDIO_FREQUENCY_RESPONSE

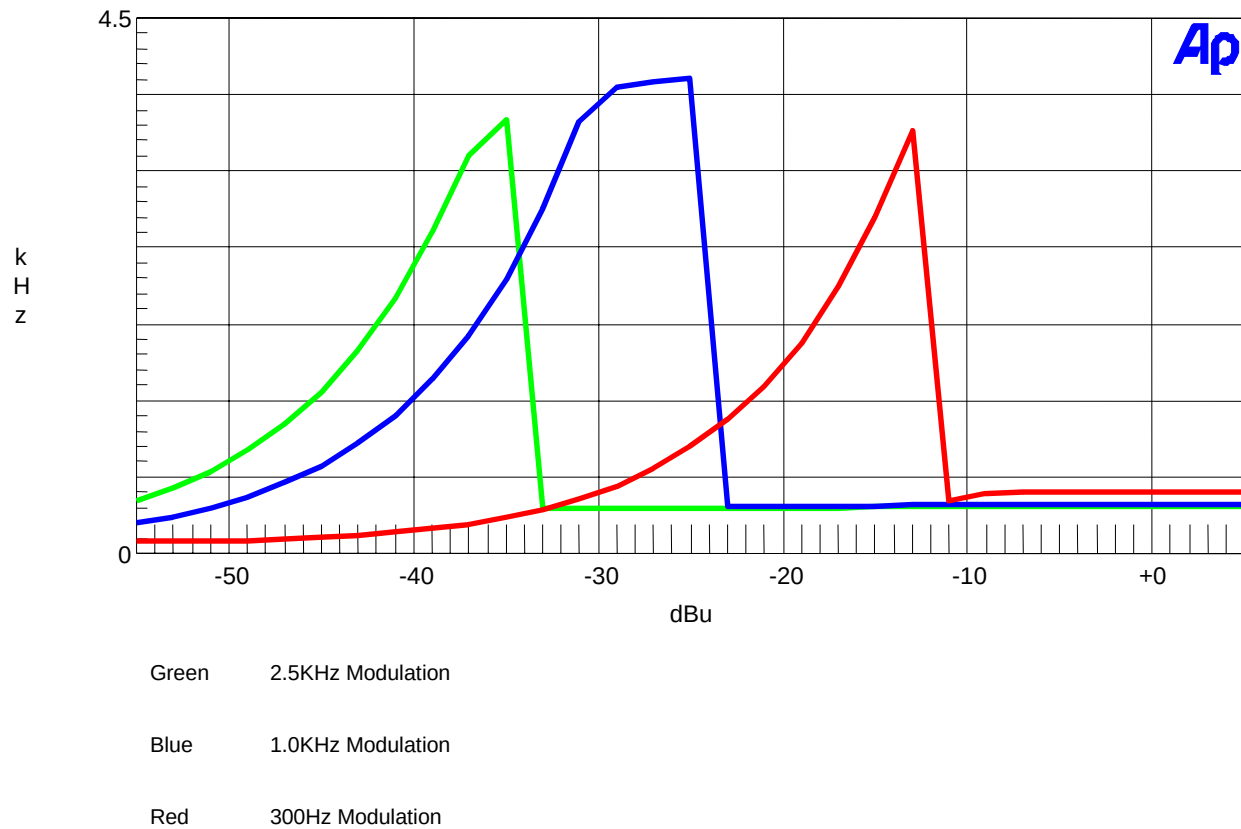
AUDIO FREQUENCY RESPONSE GRAPH

BG TECH LTD. - FCC ID: QFRVHF50



2.1047(b) Audio_input_versus_modulation: A plot of the
80.213(d) audio input versus deviation is shown below.

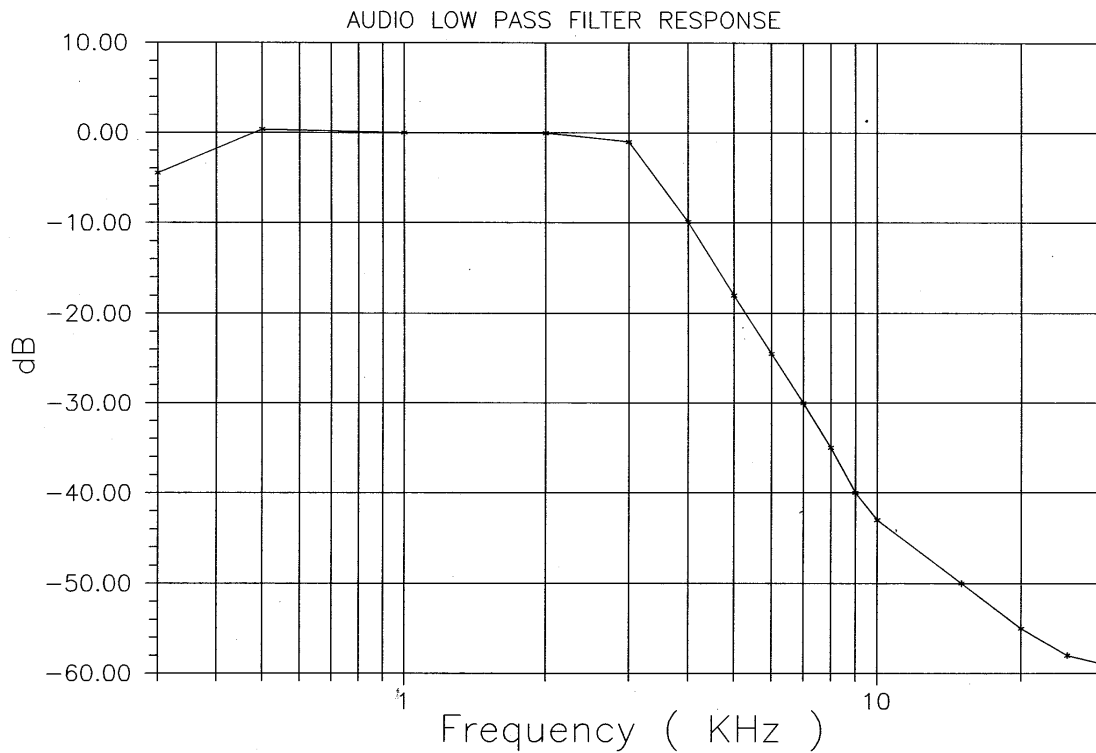
Modulation Limiting: 2.5KHz, 1.0KHz, and 300Hz



2.1047(a)

AUDIO_LOW_PASS_FILTER

The audio low pass filter is included and the plot is shown below. Rules 80.213(e) for ship stations with a low pass filter.



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2.1049(c) Occupied bandwidth:

80.213(b)

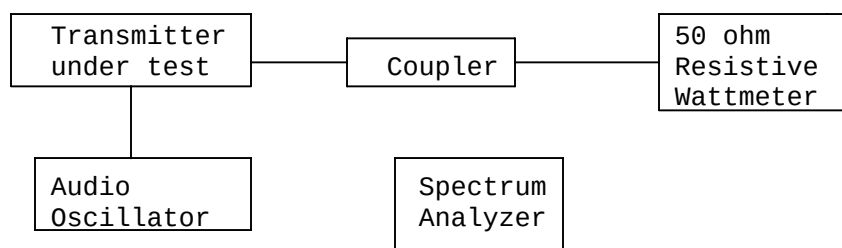
Data in the plots shows that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35dB. On any frequency removed from the assigned frequency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

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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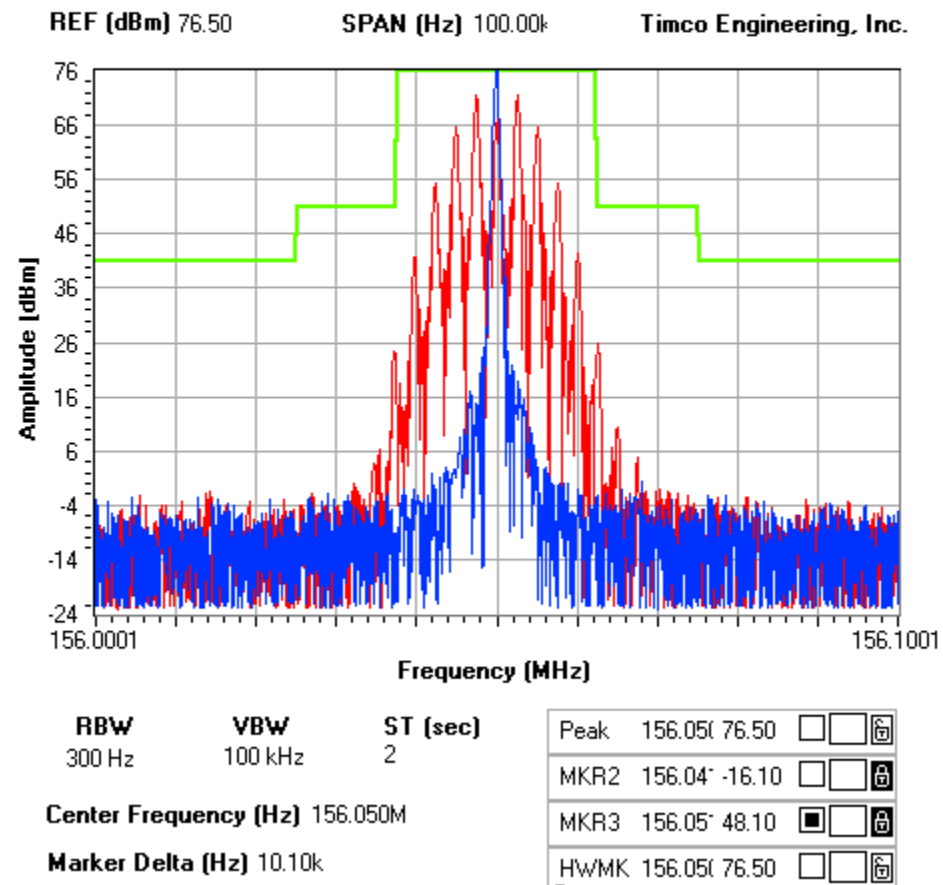
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OCCUPIED BANDWIDTH PLOT

NOTES:

FCC 90.210 Mask B



2.1051 Spurious emissions at antenna terminals(conducted):
80.211 The data on the following page shows the level of conducted spurious responses. The carrier was modulated 100% 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.

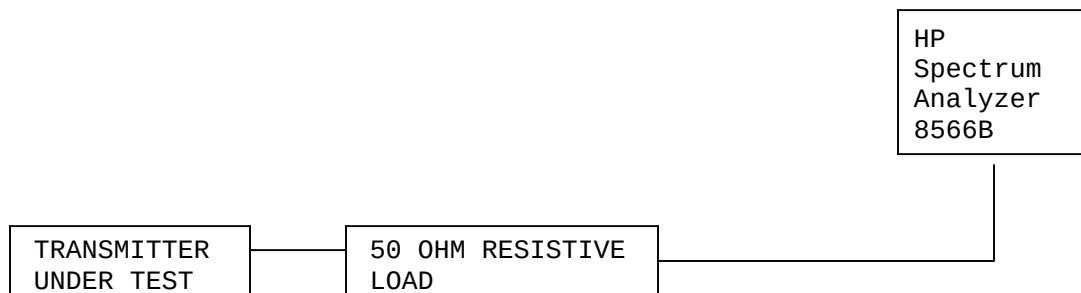
For 156 MHz HIGH POWER $43 + 10\log(5.13) = 50.1$ dB
LOW POWER $43 + 10\log(1.23) = 43.9$ dB

For 157.4 MHz HIGH POWER $43 + 10\log(5.01) = 50.0$ dB
LOW POWER $43 + 10\log(1.20) = 43.8$ dB

156 MHz	HIGH POWER	LOW POWER	157.4 MHz	HIGH POWER	LOW POWER
EF	dB below carrier	dB below carrier	EF	dB below carrier	dB below carrier
156	0	0	157.4	0	0
312	67.4	63.6	314.8	67.8	63.9
468	75.1	80.2	472.2	73.7	80.6
624.1	78.4	79	629.6	76.4	76.6
780.1	81.1	91.3	787	81.3	87
936.2	81.3	85.1	944.5	83.6	87.6
1092.3	72	78.4	1101.9	75.6	82.6
1248.3	84.1	87.6	1259.3	82	86.1
1404.4	98.7	84.1	1416.7	93.2	83.9
1560.4	95.5	103.1	1574.1	95.2	101.8

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 STATE ROAD, NEWBERRY FLORIDA 32669.

Method of Measuring Conducted Spurious Emissions



2.1053(a) 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.

For 156 MHz HIGH POWER $43 + 10\log(2.63) = 47.20$ dB
LOW POWER $43 + 10\log(0.49) = 39.90$ dB

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
156.00	H	34.20	0	0	0
312.00	H	-46.50	0	-1.22	81.92
468.10	V	-46.00	0	-1.46	81.66
624.20	V	-38.30	0	-1.54	74.04
780.20	V	-35.40	0	-1.31	70.91
936.20	V	-39.90	0	-1.33	75.43
1092.20	V	-52.30	1	-3.54	89.04
1248.20	V	-59.50	1	-4.08	96.78
1404.30	V	-46.90	1	-4.63	84.73
1560.30	H	-57.40	1.1	-5.03	95.53

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
156.00	H	26.9	0	0	0.00
312.00	H	-51.8	0	-1.22	79.92
468.10	V	-52.2	0	-1.46	80.56
624.20	V	-43.4	0	-1.54	71.84
780.20	V	-44.7	0	-1.31	72.91
936.20	V	-42.1	0	-1.33	70.33
1092.20	V	-53.3	1	-3.54	82.74
1248.20	V	-61.1	1	-4.08	91.08
1404.30	V	-47.5	1	-4.63	78.03
1560.30	V	-58.7	1.1	-5.03	89.53

For 157.4 MHz

HIGH POWER $43 + 10\log(3.55) = 48.50 \text{ dB}$

LOW POWER $43 + 10\log(0.55) = 40.40 \text{ dB}$

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
157.40	H	35.50	0	0	0
314.80	H	-42.00	0	-1.22	78.72
472.20	V	-40.00	0	-1.46	76.96
629.60	H	-47.50	0	-1.54	84.54
787.00	V	-28.60	0	-1.31	65.41
944.50	V	-39.10	0	-1.33	75.93
1101.80	H	-45.40	1	-3.54	83.44
1259.20	V	-58.40	1	-4.08	96.98
1416.60	H	-55.40	1	-4.63	94.53
1574.00	V	-56.70	1.1	-5.03	96.13

Emission Frequency MHz	Ant. Polarity	Corrected EUT Signal Reading	Coax Loss (dB)	Substitution Antenna (dBd)	dB Below Carrier (dBc)
157.40	H	27.4	0	0	0.00
314.80	H	-50.7	0	-1.22	79.32
472.20	V	-47.3	0	-1.46	76.16
629.60	V	-42.8	0	-1.54	71.74
787.00	V	-44.9	0	-1.31	73.61
944.50	V	-42.6	0	-1.33	71.33
1101.80	V	-57.2	1	-3.54	87.14
1259.20	V	-60.6	1	-4.08	91.08
1416.60	V	-46.8	1	-4.63	77.83
1574.00	V	-59.5	1.1	-5.03	90.83

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 TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

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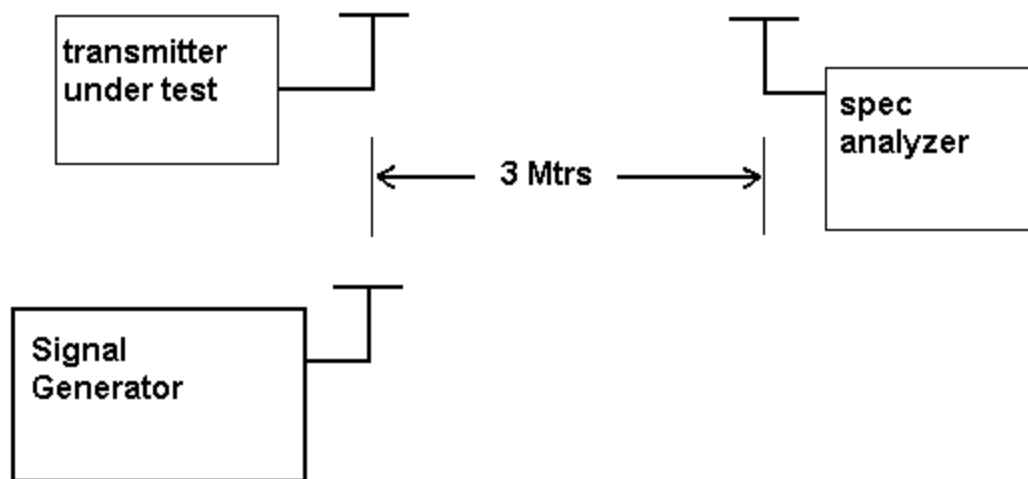
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2.1053(a) Continued Field_strength_of_spurious_emissions:

Method of Measuring Radiated Spurious Emissions



Frequency stability:

2.1055(a)(2)

80.209(a)

Temperature and voltage tests were performed to verify that the frequency remains within the .0010%,10.0 ppm specification limit, for 20kHz 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 7.4 V, which we estimate to be the battery endpoint.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 156.050 000MHz

TEMPERATURE_C	FREQUENCY_MHz	PPM
REFERENCE_____	156.050 000	0.00
-30_____	156.050 65	+4.17
-20_____	156.050 751	+4.81
-10_____	156.050 631	+4.04
0_____	156.050 689	+4.42
+10_____	156.050 547	+3.51
+20_____	156.050 229	+1.47
+30_____	156.049 979	-0.13
+40_____	156.049 698	-1.94
+50_____	156.049 574	-2.73

Batt. Volts	Batt. Data	Batt. PPM
-15%	156.050 129	+0.83

RESULTS OF MEASUREMENTS: The test results indicates that the EUT meets the requirements.

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EMC Equipment List

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/26/01	3/26/04
3-Meter OATS	TEI	N/A	N/A	Listed 1/13/03	1/13/06
Audio Generator	B&K Precision	3010	8739686	CHAR 12/1/02	12/1/04
Audio Oscillator	HP	653A	832-00260	CHAR 12/1/02	12/1/04
Biconnical Antenna	Eaton	94455-1	1057	CAL 3/18/03	3/18/05
Biconnical Antenna	Eaton	94455-1	1096	CAL 10/1/01	10/1/03
Biconnical Antenna	Electro-Metrics	BIA-25	1171	CAL 4/26/01	4/26/03
Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/15/03	4/15/05
Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 4/15/03	4/15/05
Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/15/03	4/15/05
Frequency Counter	HP	5352B	2632A00165	CAL 11/28/01	11/28/03
Frequency Counter	HP	5382A	1620A03535	CHAR 3/2/01	3/2/03
Frequency Counter	HP	5385A	2730A03025	CAL 3/7/03	3/7/05
Frequency Counter	HP	5385A	3242A07460	CAL 3/7/03	3/7/05
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/9/01	10/9/03
LISN	Electro-Metrics	EM-7820	2682	CAL 3/12/03	3/12/05
Log-Periodic Antenna	Eaton	96005	1243	CAL 5/8/03	5/8/05
Log-Periodic Antenna	Electro-Metrics	EM-6950	632	CHAR 10/15/01	10/15/03
Log-Periodic Antenna	Electro-Metrics	LPA-25	1122	CAL 10/2/01	10/2/03
Log-Periodic Antenna	Electro-Metrics	LPA-30	409	CAL 3/4/03	3/4/05
Modulation Analyzer	HP	8901A	3435A06868	CAL 9/5/01	9/5/03
Modulation Meter	Boonton	8220	10901AB	CAL 4/15/03	4/15/05
Peak Power Meter	HP	8900C	2131A00545	CAL 7/2/03	7/2/05

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Power Meter And Sensor	Bird	4421-107 & 4022	0166 & 0218	CAL 4/16/03	4/16/05
Signal Generator	HP	8640B	2308A21464	CAL 2/15/02	2/15/04
Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CHAR 3/4/01	3/4/03
Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 8/31/01	8/31/03
Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 8/31/01	8/31/03
Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 8/31/01	8/31/03
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 1/22/02	1/22/04