

September 1, 1998

Federal Communications Commission
Authorized and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Gentlemen:

Please find enclosed the application and technical exhibits for Type Acceptance of Glenayre Electronics' transmitter, FCC ID BFLGL-T8100. This transmitter is an FM land-mobile base unit for use in the 924 to 960 MHz frequency range with an RF power output of 0.25 Watt.

Digital signal processing (DSP) and direct digital synthesis (DDS) techniques are used at low signal levels for processing, modulation, and RF generation.

This application demonstrates FCC compliance for digital modulation to 4800 Baud.

Glenayre requests that this transmitter be authorized to operate with three optional devices.

1. TX control (TXC) which houses a 10 MHz reference oscillator and replaces the internal 10 MHz reference oscillator in the transmitter. This optional unit has been approved for use with other Glenayre transmitters using the same exciter by the FCC under FCC ID: BFLGL-T8600, BFLGL-T8500, BFLGL-T8501, BFLGL-T8601 (and others) .
2. The GL-C2000 is also an external 10 MHz reference source and controller. The GL-C2000 uses Global Positioning Satellite receivers for precision frequency control of the 10 MHz oven-controlled crystal oscillator and timing synchronism of the system. This optional unit has been approved for use with Glenayre transmitters using the same exciter by the FCC under FCC ID: BFLGL-T8600, BFLGL-T8500, BFLGL-T8501, BFLGL-T8601 (and others).
3. The Motorola C-Net™ Platinum Series controller. This controller houses the 10 MHz oscillator, which is the RF reference for the transmitter. Glenayre has characterized the performance of this oscillator over the temperature range of -30 to +50 degrees Centigrade. The Model Number for this controller: C-Net™ Platinum.

Glenayre takes the responsibility of ensuring the performance of this oscillator assembly as presented in the technical exhibits is maintained as in Part 2.931.

This optional unit has been approved for use with other Glenayre transmitters using the same exciter by the FCC under FCC ID: BFLGL-T8600-CN.

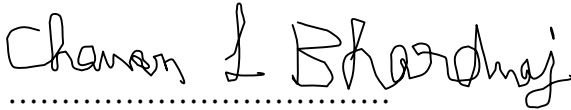
The use of the optional external 10 MHertz reference oscillators in no way degrades the spectral character of the BFLGL-T8100 as presented in this Type Acceptance submission.

Sincerely,

Chaman L. Bhardwaj
Lead Compliance Engineer

**TYPE APPROVAL APPLICATION
FOR
MODEL:GL-T8100
FCC ID:BFLGL-T8100
TEST DATES: AUGUST 10 THROUGH SEPTEMBER 1, 1998**

TEST REPORT PREPARED BY:



.....
Chaman L. Bhardwaj
LEAD COMPLIANCE ENGINEER

APPROVED BY:

.....
Joseph E. Jones, Jr., P.E., NCE
SR. MANAGER COMPLIANCE GROUP

CERTIFICATION OF TEST DATA

I hereby certify that the test data identified below were taken by myself, or under my direct supervision; that the tests were conducted according to accepted good engineering practice; and that the data are true and correct, according to my knowledge and belief.

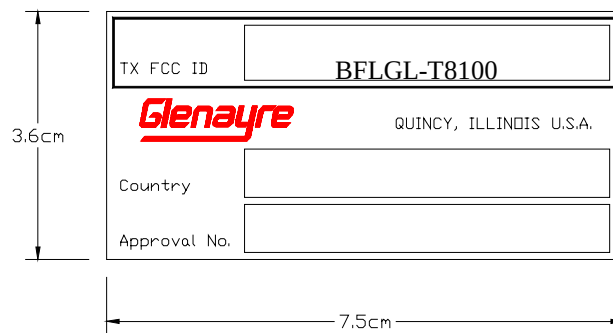
Standards used for measurements for the transmitter is TIA/EIA-603

Signed Chaman L Bhargava Date: September 3, 1998

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EXHIBIT 1: EQUIPMENT IDENTIFICATION LABEL (FCC 2.1003)

**NOTES:**

1. Color - Background Black. Blocks (3 Plcs) & lettering to be natural aluminum color.
2. Pressure sensitive adhesive backing to be 3m 467 or equivalent.
3. Positioned vertically on std. strip.
4. Block Sizes - (A) 0.6 cm X 5.4 cm (B) 0.6 cm X 4.0 cm
5. Label must have manufacturer's Identifier Mark.
6. Affixed to Rear of EXCITER Chassis

EXHIBIT 2: TECHNICAL SPECIFICATION:

1	Type of emission	16K0F3E, 14K4F1D, 9K6F1D
2	Frequency Range	924 to 960 MHz
3	Operating Power Range	0.25 Watts
4	Maximum occupied bandwidth	16 kHz [22.359 (b)(2), 90.210(g)]
5	Maximum Deviation	+/- 4.8 kHz
6	Maximum Digital Information Rate (Bits per second)	2 level modulation - 4800 bps 4 level modulation - 9600 bps
7	Final amplifier voltage and current	Powered by 18-30 volt power supply and draws 1 ampere
8	Function of each active circuit	See Technical Manual / Instruction Book
9	Complete circuit diagram	See EXHIBIT 10
10	Technical manual	See EXHIBIT 9
11	Tune up procedure	See Technical Manual - EXHIBIT 9
12	Frequency stabilizing device	The carrier frequency is controlled by an oven controlled crystal oscillator (OXCO) in all modulation modes
13a	Spurious suppression device	In all modes of operation the transmitter uses two local oscillators to convert a 100 kHz signal to the output frequency. Frequency stability is derived directly from the OCXO. The first intermediate frequency and the second intermediate frequency (carrier frequency) are filtered to remove mixing products. The final power amplifier is followed by a low-pass filter to attenuate harmonics that may be produced.
13b	Modulation limiting circuits	Analog and digital modulation are accomplished by digital processing. For any audio signal within the specified audio range, deviation is monitored by the DSP circuits and not allowed to exceed the set limit. Digital modulation is determined by the data state of the TTL compatible input. The input only recognizes two data states (1 and 0) and cannot be overdriven to cause over-modulation.
13c	Power limiting circuits	Power generated by the final amplifier is controlled by an automatic gain control circuit. This circuit maintains a constant power output under all conditions.
14	Identification label	EXHIBIT 1

Exhibit 2

EXHIBIT 3: TEST PROCEDURES AND RESULTS

CONTENTS DESCRIPTION	REF. FCC #	PAGE Start at
Brief Technical Description of Device Under Test (DUT)	BFLGL-T8100	7
Test Equipment List		8
RF Power Output	2.985	9
Modulation Characteristics	2.987	10
Occupied Bandwidth	2.989	19
Spurious Emissions	2.991	34
Field Strength	2.993	37
Frequency Stability (Temperature)	2.995 (a)(1)	Appendix I - IV
Frequency Stability (warm-up)	2.995 (c)	Appendix I - IV
Frequency Stability (line voltage)	2.995 (d)	Appendix I - IV
Test Configurations		A1-A4

BRIEF TECHNICAL DESCRIPTION:

The device under test (DUT) Model: GL-T8100 is a low power non-broadcast transmitter. The block diagram for this device is shown in figure 10-2 of the user's manual.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	S/N	Cal. due date
Bird	Power Meter	4421	1014	Spt./1998
Hewlett Packard	Spectrum Analyzer	8562E	3728A00454	Sept./1998
Hewlett Packard	Modulation Analyzer	8901A	2134A01494	Aug./1999
Bird	Power attenuator	8327-300	2079	May/1999
Hewlett Packard	Spectrum Analyzer	8563E	3745A08025	Nov./1998
Hewlett Packard	Frequency Counter	5316 A	2120A01229	June/1999
Fluke	Multimeter	12	56210002	Aug./1999
Wavetek	Audio & Data generator	20	C92010051	Jun/1999
Hewlett Packard	Distortion analyzer	339A	2025A05312	May/1999
EMCO	Biconilog antenna	3141	1081	June/2000
EMCO	Horn antenna	3115	5394	Jan/2000
Associated Environmental Systems	Environmental Chamber	SK-3108	5258	Oct./1998
Tektronix	Oscilloscope	2465	050-1778-03	July/1999
Band Pass Filter	Microlab/FXR 840-960 MHz	LB-C08	1052	NA

RF POWER OUTPUT DATA [FCC 2.985(a)]

Tune equipment according to procedure in user's manual. Terminate RF output of Transmitter equipment into antenna terminal into a 50-ohm, resistive load. Monitor equipment RF power output using a calibrated RF wattmeter. The test configuration is shown in Appendix A1.

Measure dc voltage and current applied to final RF amplifying device(s).

Record RF power output and dc current and voltage input at the RF power levels for which the equipment is rated.

Frequency Range: 924-960 MHz

Power Rating: 0.25 watts

At 0.25 watts

Measured RF Output	0.25	watts
Measured dc voltage	13.5	volts
Measured dc current	0.85	amperes
dc power input	11.48	watts

MODULATION CHARACTERISTICS - ANALOG (FCC 2.987)**1.0 Voice Mode -2.987 (a)**

Connect audio generator with variable output level to the transmitter audio input terminals. Measure audio level at input terminals. Terminate the transmitter antenna terminal with a 23 dB, 50 ohm, and 2 watt resistive load. Measure the modulation deviation using a deviation monitor.

Hold constant audio input level required to produce +/- 1.5 kHz frequency deviation at 1000 Hz. Record demodulated output level .

Repeat at audio frequencies of 100, 200, 300, 500, 2000, 2500, 3000, 3500, 4000, and 5000 Hz.

Results: Reference EXHIBIT 3-1 for standard audio board.

Test Configuration can be found in appendix: A2

2.0 Deviation Limiter Operation –2.987 (b)

Connect audio generator, with variable output level to transmitter audio input terminals. Terminate the transmitter antenna terminal with a 23 dB, 50-ohm and 2 watts resistive load. Sample RF output with a deviation monitor.

Record the frequency deviation at each audio input level and frequency.

Repeat at audio input levels of –6, 0, +3, +6, +10, and +16 dB. Use 0 dB reference level as the input required to produce 50% modulation (+2.5 kHz deviation) at 1000 Hz.

Repeat each set of measurement for audio frequencies of 300, 600, 1000, and 2500 Hz.

Results: Reference EXHIBIT 3-2(a), and 3-2(b) for standard audio board.

FREQUENCY RESPONSE

Audio Board: Standard

Device Under Test:

Model: GL-T8100

FCC ID:BFLGL-T8100

Tested By: Steve Schmitt/Chaman Bhardwaj

Audio	Audio Output Level		
Frequency (Hz)	Voice Input with pre-emphasis turned enabled (dB)	Flat Input (dB) (with pre-emphasis disabled)	
100	-29	-0.2	
300	-10.5	-0.1	
500	-6.0	0	
1000	0	0	
2000	+5.9	-0.3	
2500	+8.2	-0.3	
3000	+9.0	-0.8	
3500	+4.6	-3.2	
4000	-4.2	-8.5	
4500	-37.5	-18.8	
5000	-42.5	-33	

EXHIBIT 3-1

DEVIATION LIMITER OPERATION

Audio Board: Standard

Device Under Test:

Model: GL-T8100

FCC ID:BFLGL-T8100

Tested By: Steve Schmitt/Chaman Bhardwaj

Mode of Operation: Flat Mode/ pre-emphasis circuit disabled

Audio Input	Frequency Deviation			
Level relative to 50% Deviation	300 Hz	600 Hz	1000 Hz	2500 Hz
	+/- kHz	+/- kHz	+/- kHz	+/- kHz
-6 dB	1.3	1.3	1.30	1.3
0 dB	2.5	2.5	2.50	2.5
+3 dB	3.6	3.6	3.7	3.6
+6 dB	4.8	4.8	4.8	4.8
+10 dB	4.8	4.8	4.8	4.8
+16 dB	4.8	4.8	4.8	4.8

Exhibit 3-2 (a)

Mode of Operation: Pre-emphasis circuit enabled:

Audio Input	Frequency Deviation			
Level	300 Hz	600 Hz	1000 Hz	2500 Hz
	+/- kHz	+/- kHz	+/- kHz	+/- kHz
-6 dB	0.42	0.80	1.30	3.2
0 dB	0.80	1.53	2.50	4.46
+3 dB	1.10	2.15	3.50	4.8
+6 dB	1.55	3.03	4.8	4.8
+10 dB	2.40	4.8	4.8	4.8
+16 dB	4.8	4.8	4.8	2.9

EXHIBIT 3-2(b)

Modulation Characteristics – Analog (FCC 2.987)

Analog modulation is generated and shaped by digital-signal processing techniques (DSP). The filter does not exist in a conventional analog sense. The frequency response plots for the analog filter is shown in the EXHIBIT 3-3 . Equipment data complies with applicable limits specified in 47CFR, Parts 22.359, 24.133 , 90.209, 90.210, and 90.669 for occupied bandwidth .

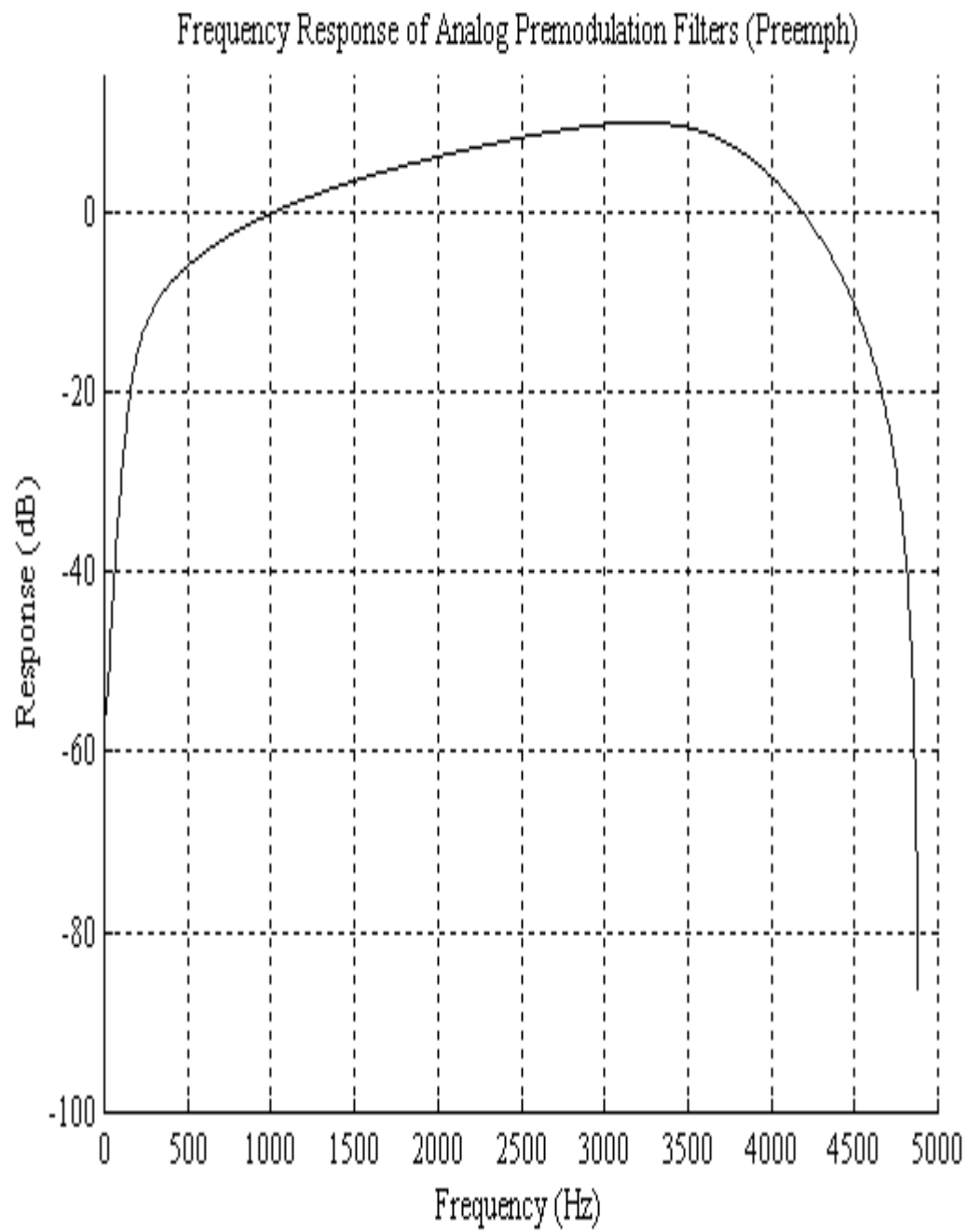


EXHIBIT 3-3

MODULATION CHARACTERISTICS – DIGITAL (FCC 2.987)

Digital modulation is generated and shaped by digital signal processing techniques (DSP). The filter does not exist in a conventional analog sense. The frequency response plots for the digital filter is shown in EXHIBIT 3-4 for the data rise times which are selectable for 88 microsecond filter (Filter #1) and 150 (Filter #2) microseconds. All data complies with applicable limits as specified in 47 CFR, Parts 22.359, 24.133, 90.209, 90.210, and 90.669 for occupied bandwidth.

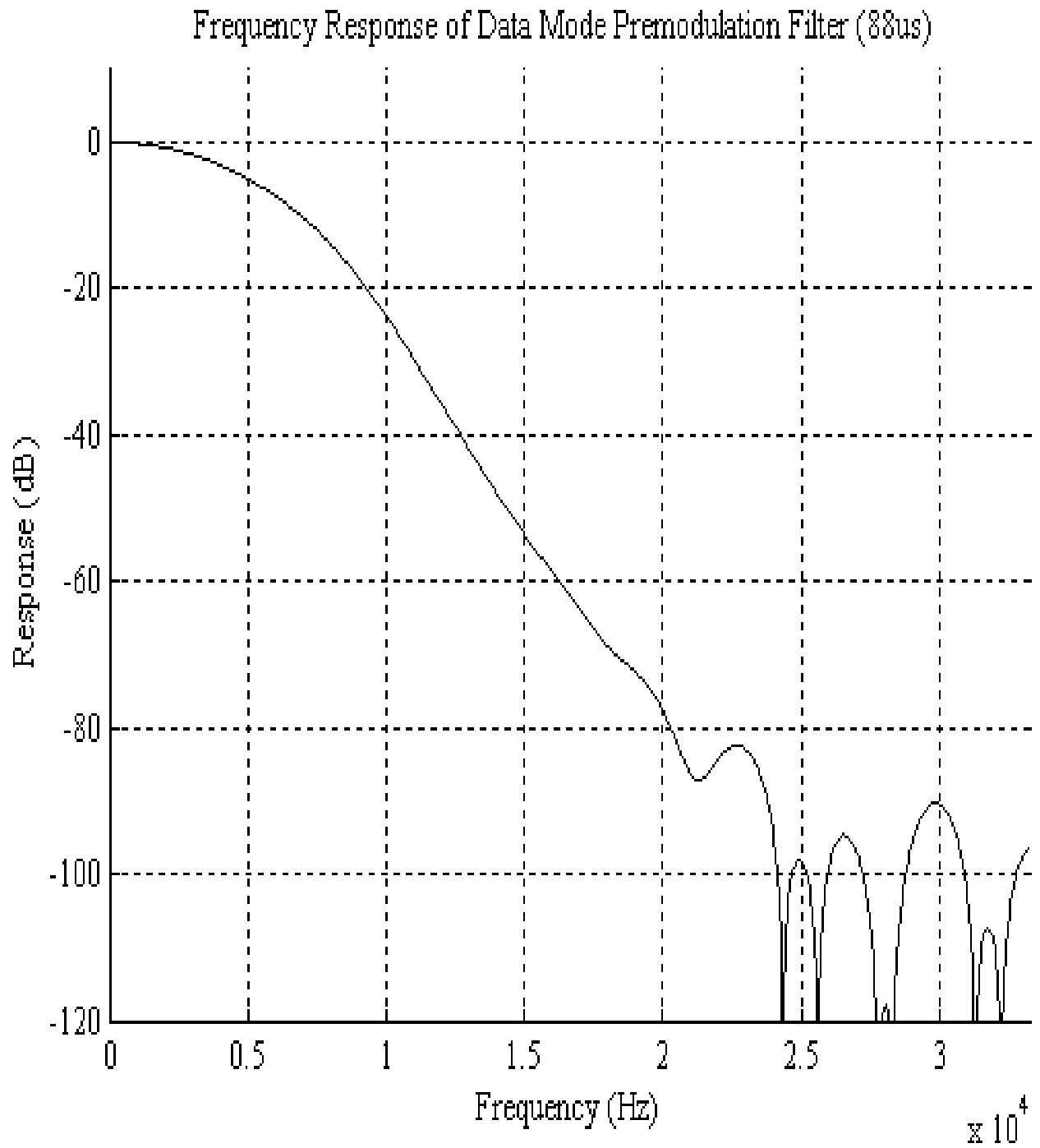
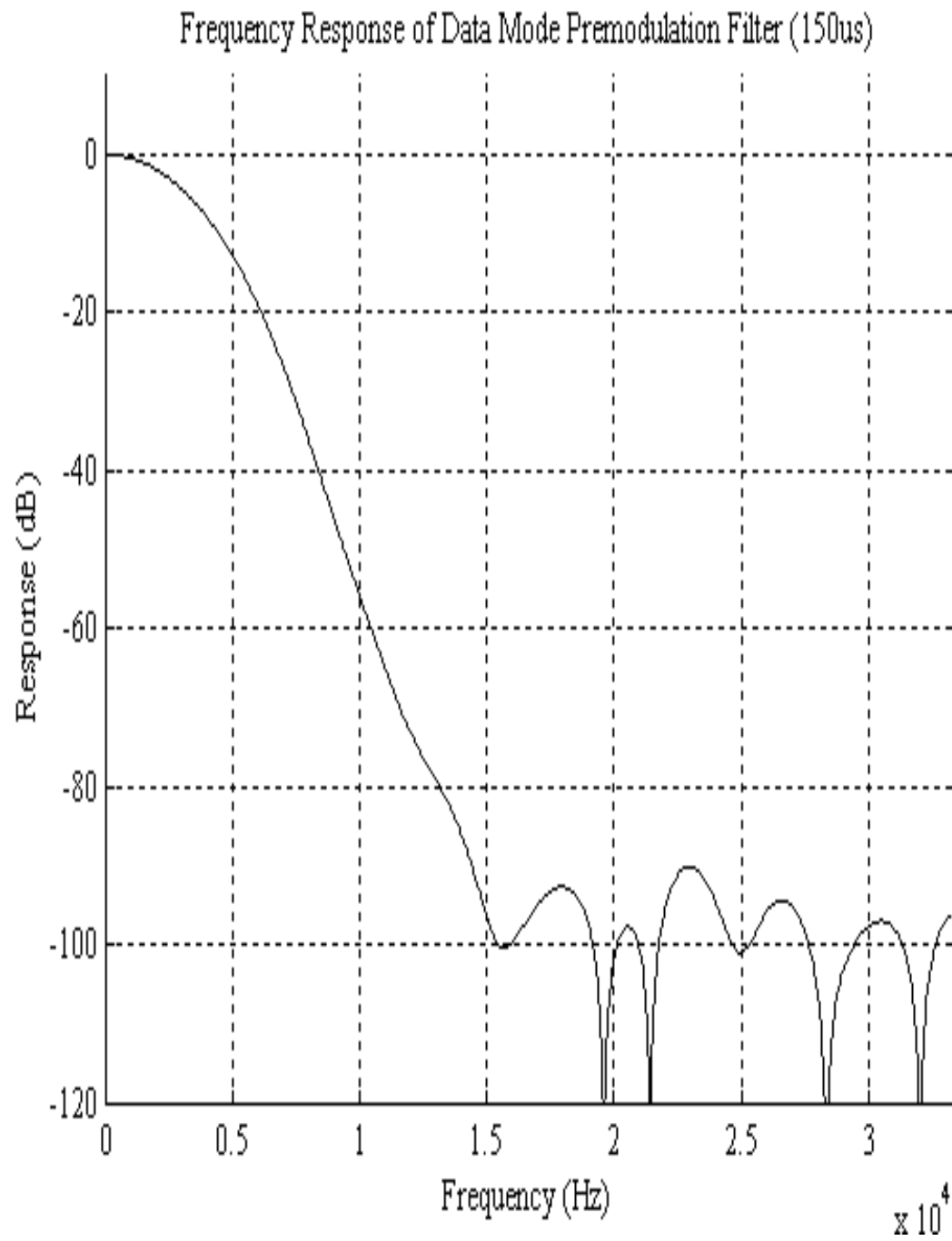


EXHIBIT 3-5

Exhibit 3-6

OCCUPIED BANDWIDTH ANALOG (FCC 2.989)

Modulate the transmitter with a 2500 Hz tone at an input level 16 dB greater than that required to produce 50% modulation at 1 kHz at rated maximum RF power output. Terminate the transmitter antenna terminal with a 50-ohm, 2 watt resistive load. Measure the RF spectrum with a spectrum analyzer.

- Step #1 Establish a power reference using an unmodulated carrier with Transmitter operating at a maximum rated RF output power.
- Step #2 Operate equipment with a specified input signal to produce a modulated RF signal at the antenna terminal.
- Step #3 Plot spectral graph with the emission mask specified in 47CFR, Part 22.359(a)

The test results showing compliance to 47 CFR Part 22.359 (a) are presented in EXHIBIT 3-8.

The bandwidth calculation for 16K0F3E, the direct frequency modulation of the carrier in the analog mode is:

$$B_n = 2M + 2D$$

where $M = 3.0 \text{ kHz}$ and $D = 5.0 \text{ kHz}$

$$B_n = 2(3.0 \text{ kHz}) + 2(5.0 \text{ kHz})$$

$$B_n = 16.0 \text{ kHz}$$

Occupied Bandwidth (analog)**0.25 watt Maximum Output Power**

(1)FCC Rule 22.359 (a) analog (**Emission mask 22.359 (a))**

Spectrum Analyzer settings:

Ref Level: 0 dBm

Resolution BW= 300 Hz

Video BW= 300 Hz

Span=100 kHz

Detector: Peak

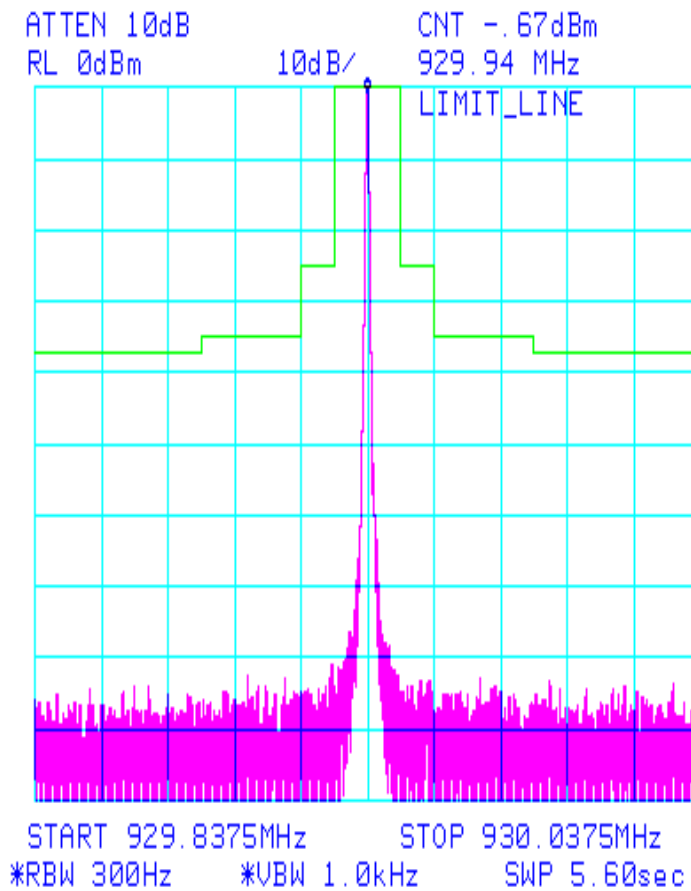
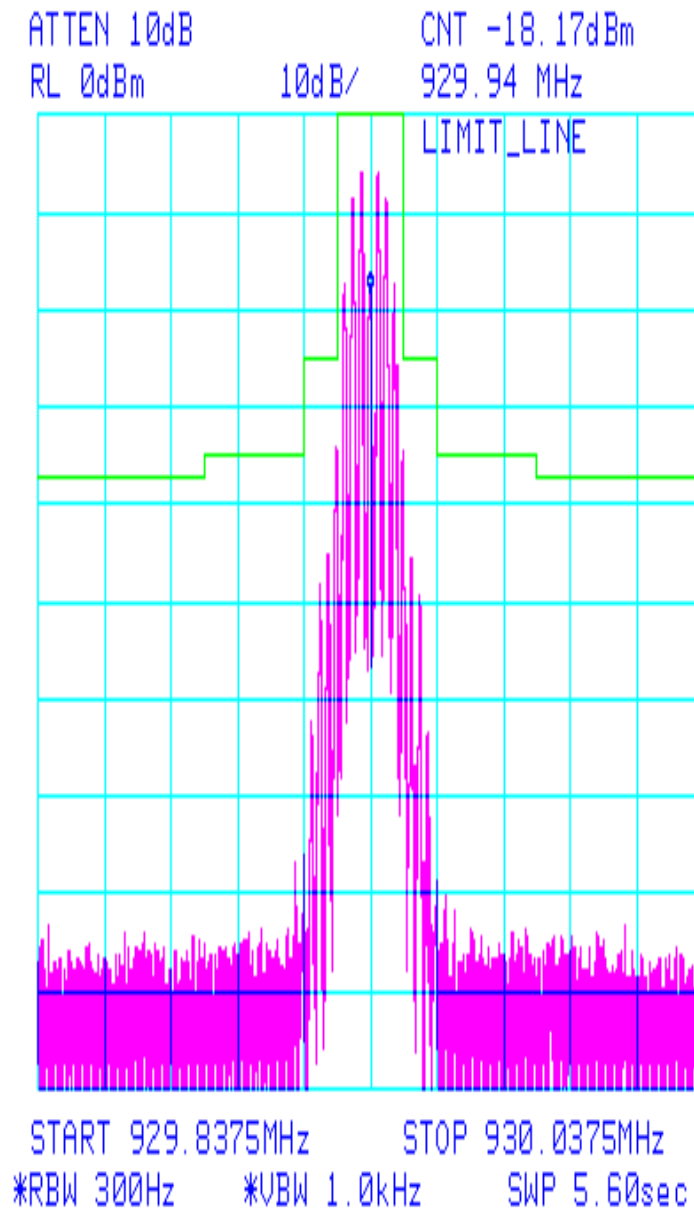


Exhibit 3-7



Analog modulation with 22.359(a) Mask

Exhibit 3-8

PER FCC RULE 22.359 (B), OCCUPIED BANDWIDTH - Digital Mode

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of +/- 4.8 kHz. The spectrum is observed at 0.25 watt power output level.

- Step #1 Establish a power reference using an unmodulated carrier with Transmitter operating at a maximum rated RF output power.
- Step #2 Operate equipment with a specified input signal to produce a modulated RF signal at the antenna terminal.
- Step #3 Plot spectral graph with the emission mask specified in 47CFR, Part 22.359(b)

The test results showing compliance to 47 CFR Part 22.359 (b) are presented in exhibits 3-9, and 3-10.

The test results showing compliance to FCC Rules 22.359 (b)

Results: Spectrum bandwidth limitations meet or exceed FCC requirements as defined by Part 22.359(b)(2)

The bandwidth calculations for 14 K4F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule...

$$B_n = 2(M + D) \quad (\text{Where } M = \text{the highest modulation frequency})$$

$$M = [4800 \text{ symbols} / (2 \text{ symbols / cycle})]$$

$$M = 2400 \text{ Hz}$$

or

$$M = (9600 \text{ bits} / \text{second}) / \text{FSK level}$$

$$M = 9600 / 4$$

$$M = 2400 \text{ Hz}$$

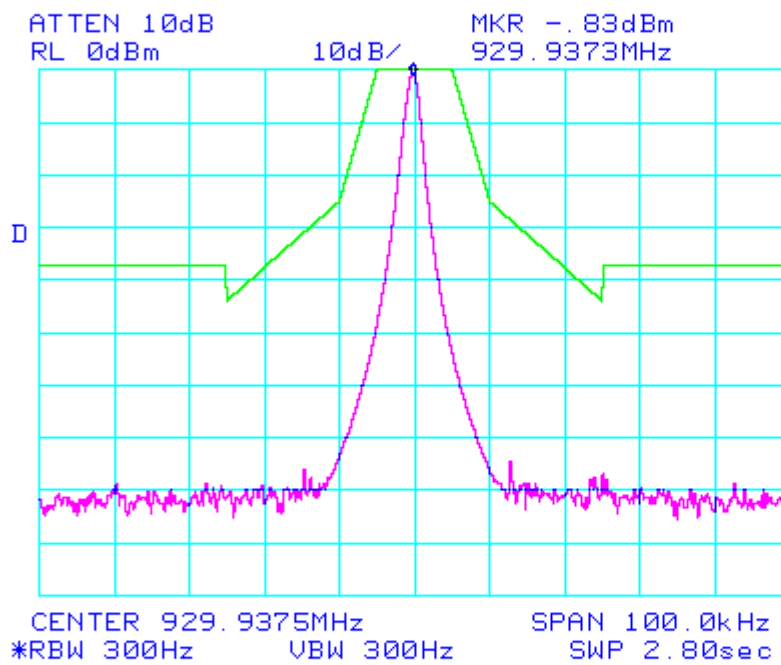
$$D = \text{Highest Deviation rate. } +/- 4.8 \text{ kHz}$$

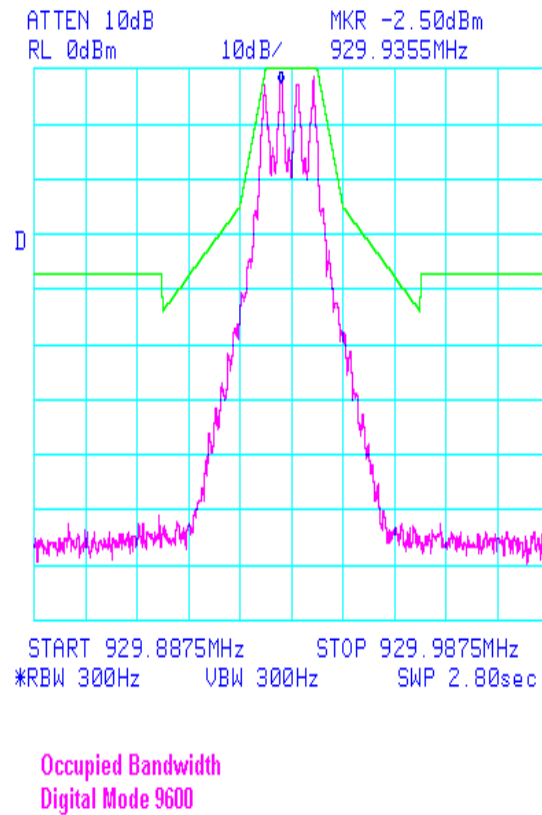
$$B_n = 2(2400 + 4800)$$

$$B_n = 14.4 \text{ kHz}$$

Occupied Bandwidth (digital)*

Analyzer Settings:	Ref. Level	0 dBm
	SW Width	100 kHz
	Res. Bandwidth	300 Hz
	Video Filter	300 Hz
	Detector:	Peak





Digital modulation with 22.359(b) Mask

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-10

PER FCC RULE 24-133 (1) OCCUPIED BANDWIDTH - Digital Mode

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of +/- 4.8 kHz. The spectrum is observed at 0.25 watts power output level.

- Step #1 Establish a power reference using an unmodulated carrier with Transmitter operating at a maximum rated RF output power.
- Step #2 Operate equipment with a specified input signal to produce a modulated RF signal at the antenna terminal.
- Step #3 Plot spectral graph with the emission mask specified in 47CFR, Part 24.133(1)

The test results showing compliance to 47 CFR, Part 24.133 (1)

Results: Spectrum bandwidth limitations meet or exceed FCC requirements as defined by Part 24.133 (1)

The bandwidth calculations for 14 K4F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule...

$$B_n = 2(M + D) \quad (\text{Where } M = \text{the highest modulation frequency})$$
$$M = [4800 \text{ symbols} / (2 \text{ symbols / cycle})]$$
$$M = 2400 \text{ Hz}$$

or

$$M = (9600 \text{ bits} / \text{second}) / \text{FSK level}$$
$$M = 9600 / 4$$
$$M = 2400 \text{ Hz}$$

$$D = \text{Highest Deviation rate. } +/- 4.8 \text{ kHz}$$

$$B_n = 2(2400 + 4800)$$

$$B_n = 14.4 \text{ kHz}$$

PER FCC RULE 24.133(1) OCCUPIED BANDWIDTH (digital)*

For transmitters authorized a bandwidth greater than 10 kHz.

Analyzer Settings:	Ref. Level	0 dBm
	SW Width	10 kHz/Div
	Res. Bandwidth	300 Hz
	Video Filter	300 Hz
	Detector:	Peak

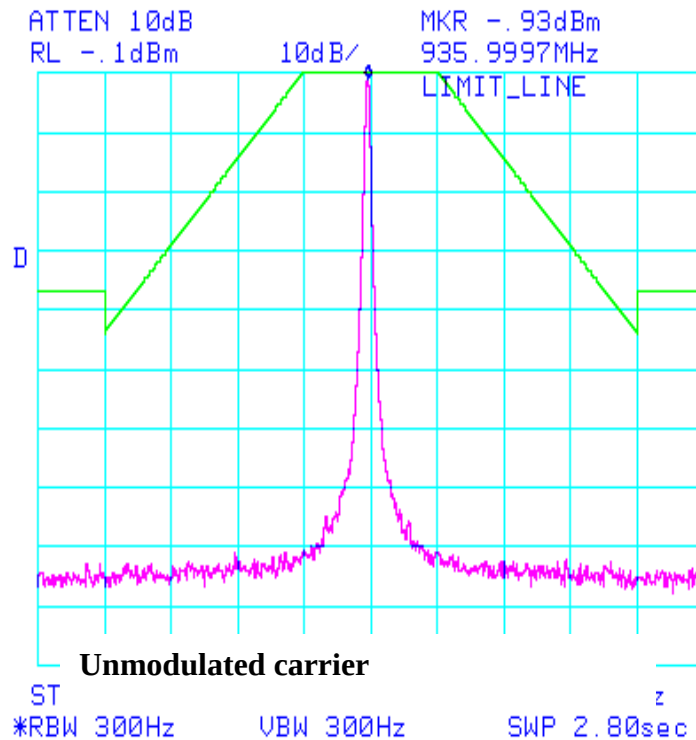
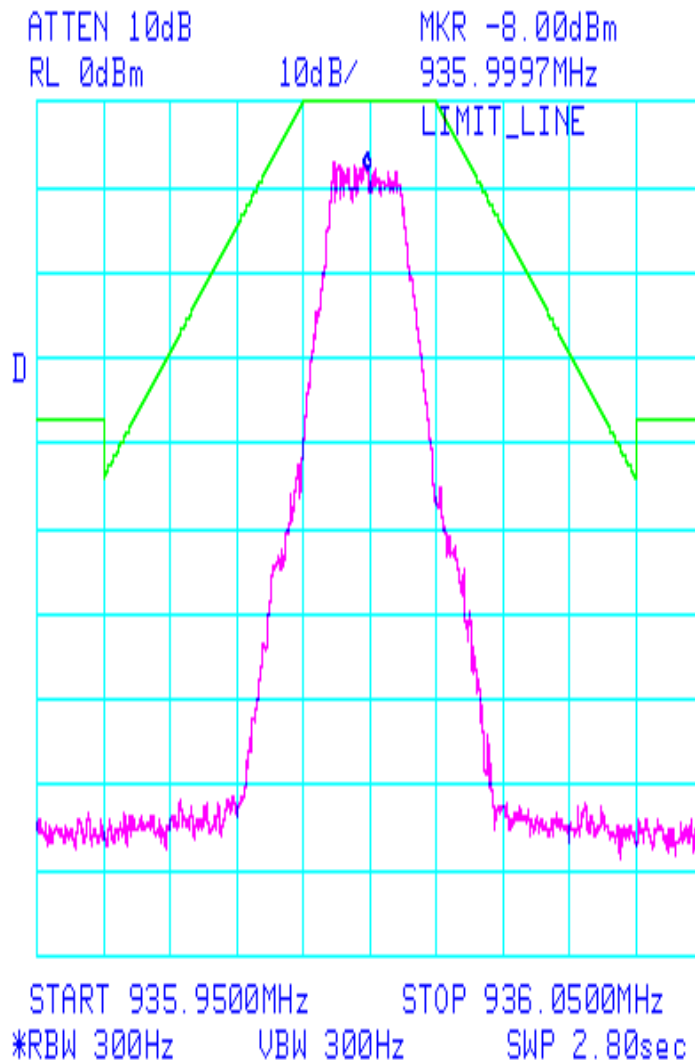


Exhibit 3-11



Modulated Carrier per mask 24.133 (1)

Exhibit 3-12

PER FCC RULE 90-210 (J)OCCUPIED BANDWIDTH - Digital Mode

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of +/-2.4 kHz. The spectrum is observed at 0.25 watts power output level.

- Step #1 Establish a power reference using an unmodulated carrier with Transmitter operating at a maximum rated RF output power.
- Step #2 Operate equipment with a specified input signal to produce a modulated RF signal at the antenna terminal.
- Step #3 Plot spectral graph with the emission mask specified in 47CFR, Part 90-210(j)

The test results showing compliance to 47 CFR, Part 90.210(j)

The bandwidth calculations for 9K6F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule...

$$B_n = 2(M + D) \quad (\text{Where } M = \text{the highest modulation frequency})$$

$$M = [4800 \text{ symbols} / (2 \text{ symbols / cycle})]$$

$$M = 2400 \text{ Hz}$$

or

$$M = (9600 \text{ bits / second}) / \text{FSK level}$$

$$M = 9600 / 4$$

$$M = 2400 \text{ Hz}$$

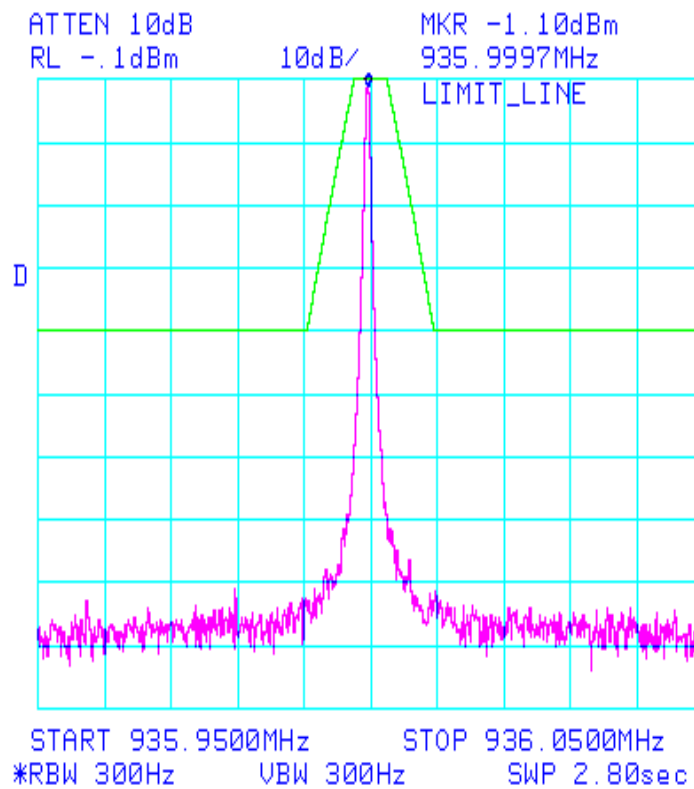
$$D = \pm 2.4 \text{ kHz}$$

$$B_n = 2(2400 + 2400)$$

$$B_n = 9.6 \text{ kHz}$$

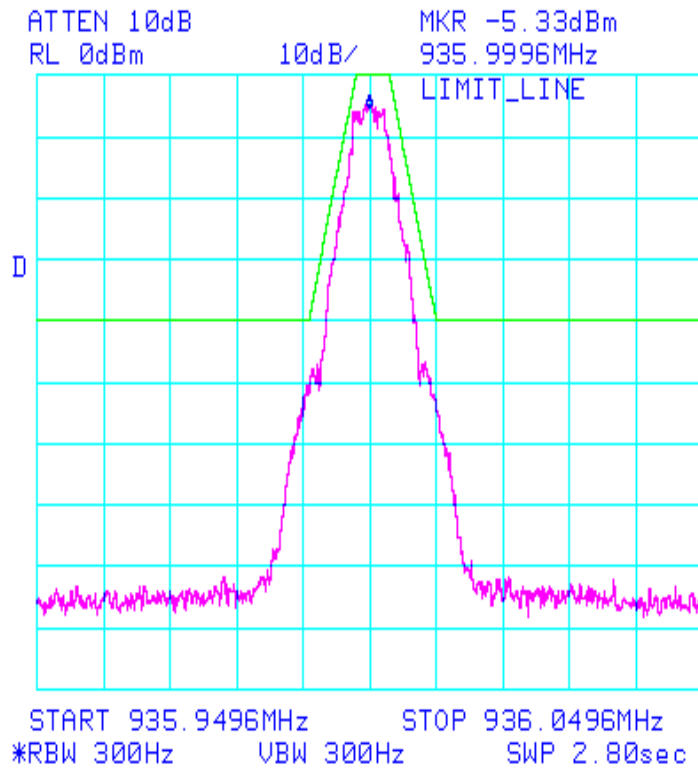
PER FCC RULE 90.210(J) OCCUPIED BANDWIDTH (digital)*

Analyzer Settings: Ref. Level 0 dBm
 SW Width 10 kHz/Div
 Res. Bandwidth 300 Hz
 Video Filter 300 Hz
 Detector: Peak



Unmodulated Carrier

Exhibit 3-13

**Modulated Carrier per mask 90.210(j)**

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-14

PER FCC RULE 90-669 (A) OCCUPIED BANDWIDTH - Digital Mode

Test procedure: A digital signal is fed into the data input of the transmitter to simulate data. The transmitter is placed in the digital modulation mode and its RF output observed on a spectrum analyzer. The transmitter is set for a maximum deviation of +/-2.4 kHz. The spectrum is observed at 0.25 watts power output level.

- Step #1 Establish a power reference using an unmodulated carrier with Transmitter operating at a maximum rated RF output power.
- Step #2 Operate equipment with a specified input signal to produce a modulated RF signal at the antenna terminal.
- Step #3 Plot spectral graph with the emission mask specified in 47CFR, Part 90-669(a)

The test results showing compliance to 47 CFR , Part 90.669(a)

The bandwidth calculations for 9K6F1D, the direct frequency modulation of the carrier in the digital mode is:

Carson's bandwidth rule...

$$B_n = 2(M + D) \quad (\text{Where } M = \text{the highest modulation frequency})$$

$$M = [4800 \text{ symbols} / (2 \text{ symbols /cycle})]$$

$$M = 2400 \text{ Hz}$$

or

$$M = (9600 \text{ bits} / \text{second}) / \text{FSK level}$$

$$M = 9600 / 4$$

$$M = 2400 \text{ Hz}$$

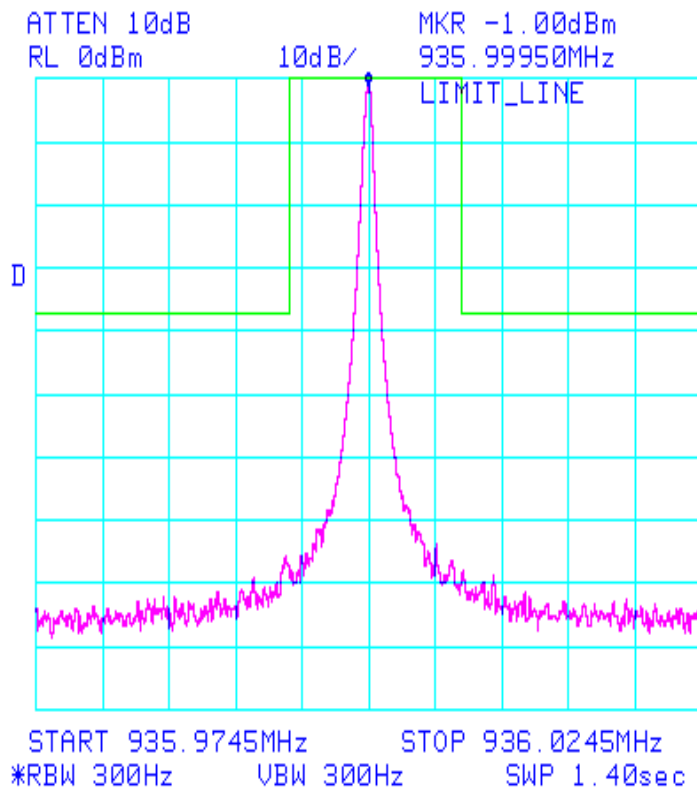
$$D = \pm 2.4 \text{ kHz}$$

$$B_n = 2(2400 + 2400)$$

$$B_n = 9.6 \text{ kHz}$$

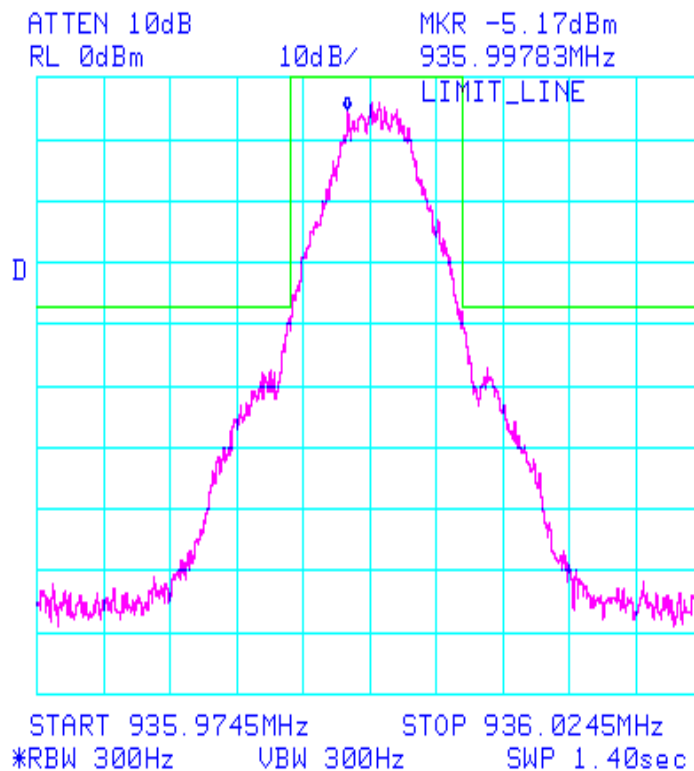
Occupied Bandwidth (digital)

Analyzer Settings:	Ref. Level	0 dBm
	SW Width	10 kHz/Div
	Res. Bandwidth	300 Hz
	Video Filter	300 Hz
	Detector:	Peak



Occupied Bandwidth (digital)*

Analyzer Settings:	Ref. Level	0 dBm
	SW Width	10 kHz/Div
	Res. Bandwidth	300 Hz
	Video Filter	300 Hz
	Detector:	Peak



Modulated Carrier per mask 90.669(a)

* 9600 bits/second,
4 Level modulation with
88 microseconds rise time filter (highest rise time)

EXHIBIT 3-16

SPURIOUS EMISSIONS (FCC 2.991)**Analog Test Procedure**

Modulate the transmitter in analog mode with a 2500 Hz tone at an input level 16 dB greater than that required to produce 50% modulation at 1 kHz and at maximum rated power output. Terminate the transmitter antenna terminal with a 50-ohm resistive load. Provide a sample of RF output that is independent of frequency. Apply RF sample to spectrum analyzer input. All of the testing modes described in

Record the frequency and relative amplitude of each spurious response.

Fc = 929.9375 MHz

Analyzer Settings:	Ref. Level	0dBm
	Res. Bandwidth	30 kHz
	Video Filter	30 kHz
	Detector:	Peak

Device Under Test:

Model:GL-T8100

Test Freq.:929.9375 MHz

Tested By:Steve Schmitt & Chaman Bhardwaj

Method of calculation:

Measured level dBc = Spectrum analyzer reading + cable and attenuator losses (dB)

Frequency (MHz)	Measured reading (dBm)	Limit dBm	Remarks/ Margin
1,852.00	-50.67	-37	Passed
2,774.00	-52.5	-37	Passed
3,722.00	< -55.0	-37	Passed
4,652.50	< -55.0	-37	Passed
10,000.00	< -55.00	-37	Passed

Note: There were no other detectable signals in the frequency range of 30-10,000 MHz

Exhibit 3-17

SPURIOUS EMISSIONS (FCC 2.991)

Digital Test Procedure

Modulate the transmitter in digital mode at a maximum 9600 bit rate with a test signal (square wave) for + 4.8 kHz deviation to simulate data transmission. Operate at maximum output power rating

Terminate transmitter antenna terminal with a 50-ohm resistive load. Provide a sample of RF output that is frequency independent.

Apply RF sample to spectrum analyzer input through a notch filter tuned to transmitter carrier frequency.

Record the frequency and relative amplitude of each spurious response. The worst case emissions are recorded in this exhibit. The spurious emissions were scanned in all tests as indicated in Occupied Bandwidth measurement tests.

Results are recorded in exhibits 3-18

Fc = 929.9375 MHz

Analyzer Settings:	Ref. Level	0dBm
	Res. Bandwidth	30 kHz
	Video Filter	30 kHz

Device Under Test:

Model:GL-T8100

Test Freq.:929.9375 MHz

Tested By:Steve Schmitt & Chaman Bhardwaj

Method of calculation:

Measured level dBc = Spectrum analyzer reading + cable and attenuator losses (dB)

Frequency (MHz)	Measured reading (dBm)	Limit dBm	Remarks/ Margin
1,852.00	-50.67	-37	Passed
2,774.00	-52.5	-37	Passed
3,722.00	< -55.0	-37	Passed
4,652.50	< -55.0	-37	Passed
10,000.00	< -55.00	-37	Passed

Note: There were no other detectable signals in the frequency range of 30-10,000 MHz

Exhibit 3-18

Field Strength (FCC 2.993)

Description of test site: 3-Meter Anechoic test Chamber, on file with Commission November 15, 1996. The receiver antenna is located 1 meter from the transmitter.

Test Procedure: Modulate the transmitter with a 2500 Hz tone at an input level 16 dB greater than that required to produce 50% modulation. Operate transmitter at maximum rated power output. Repeat tests at minimum rated power output.

If transmitter is to operate in digital mode, use the same modulation test setup as in spurious emissions (digital) tests, Page 22. Perform field strength test at both maximum and minimum rated power output, the worst case results are recorded below in exhibit 3-19.

Calibrated Broad Band antennas are used as the receive antenna.

Final stage Power amplifier out put **Pt** = 0.25 Watts
Theoretical Numerical gain of a dipole antenna = 1.64

The following formula can be used to compute a field strength at a known distance **d** (meters) :

$$E \text{ (v/m)} = \frac{(30 \text{ Pt. } 1.64)^{1/2}}{d}$$

$$E = 3.507 \text{ v/m}$$

$$E \text{ dB}\mu\text{V/m} = 20 \log (3.507 \times 10^6) = 130.9 \text{ dB}\mu\text{V/m}$$

FCC limit for harmonics:

$$\text{FCC Minimum} = 43 + 10 \log (\text{Pt in watts})$$

$$= 43 + 10 \log (0.25)$$

$$= 37.0 \text{ dBc}$$

$$\text{FCC limit (*) } 130.9 - 37 = 93.9 \text{ dB}\mu\text{V/m} \quad \text{.....Limit at 1 m test distance}$$

$$\text{FCC limit (**)} \quad 130.9 - 37 - 9.5 = 84.4 \text{ dB}\mu\text{V/m} \quad \text{.....Limit at 3 m test distance}$$

Note: All data taken is worst case as transmitter is rotated 360 degrees and Receive antenna height varied from 1-4 meter.

Calculation :

Total Measured Value E (dB μ V /m) = Receiver/ analyzer reading dB μ V -Pre Amp.
Gain + Cable Loss (dB) + AF (dB)

Note: there was no external pre amplifier used, so Pre- amp gain = 0 dB

Test distance = 1 meter for frequency range 1-10 GHz and 3.0 meters for 30-1000 MHz

Results: Device under test meets FCC requirements of Field Strength (FCC 2.993)

Fundamental Freq. = 929.9375MHz.

Analyzer Settings:

Resolution BW =120KHz
Video BW = 1MHz
Span/ div = auto/50 MHz
Sweep rate = 914 msec.
Detector: Peak

Mode of Operation: Digital Modulation

S/N	Frequency MHz	Total Measured Value dB μ V/m	FCC Limit (*) dB μ V/m
1	840.08	56.79	93.9
2	1859.8	47.5	93.9
3	2789.8	43.0	93.9
4	3719.8	41.0	93.9
5	4649.6	52.7	93.9
6	5579.6	50.4	93.9
7	6509.5	<74.5	93.9
8	7439.5	<75.6	93.9
9	8369.0	<81.2	93.9
10	9293.7	<81.2	93.9

Note: All data taken is worst case as transmitter is rotated 360 degrees and receiving antenna polarization is changed (H and V) and height was varied from 1-4 m .
Frequency spectrum was checked for radiated spurious and harmonic emissions out to tenth harmonic. The range of spectrum scanned 30MHz to 10 GHz. The S/N 5 through 10 levels are the analyzer base line levels.

Exhibit 3-19

ANTENNA FACTOR CHART

Manufacturer: EMCO

Antenna: Biconilog

Model: 3141 – 3.0 Meter Calibration

S/N: 1081

FREQUENCY MHZ	ANTENNA FACTOR dB
26	13.8
28	13.1
30	12.4
40	9.0
50	7.3
60	7.7
70	8.8
80	9.8
90	10.2
100	10.1
110	9.8
120	9.4
130	9.3
140	9.9
150	10.4
160	10.7
170	11.0
180	10.9
190	10.9
200	11.1
225	12.3
250	13.1
275	14.0
300	15.4
325	15.4
350	15.8
375	16.4
400	16.7
425	16.9
450	17.4
475	17.9
500	18.4
525	19.1
550	19.6

575	20.3
600	20.9
625	21.0
650	21.0
675	21.5
700	21.9
725	21.9
750	22.0
775	22.3
800	22.4
825	22.7
850	23.1
875	23.8
900	24.1
925	24.1
950	24.1
975	24.3
1000	24.6
1050	24.8
1100	25.2
1150	26.2
1200	26.8
1250	26.2
1300	26.5
1350	27.5
1400	27.4
1450	27.2
1500	27.8
1550	29.0
1600	28.7
1650	28.4
1700	28.7
1750	29.8
1800	29.8
1850	30.2
1900	30.0
1950	30.3
2000	30.6

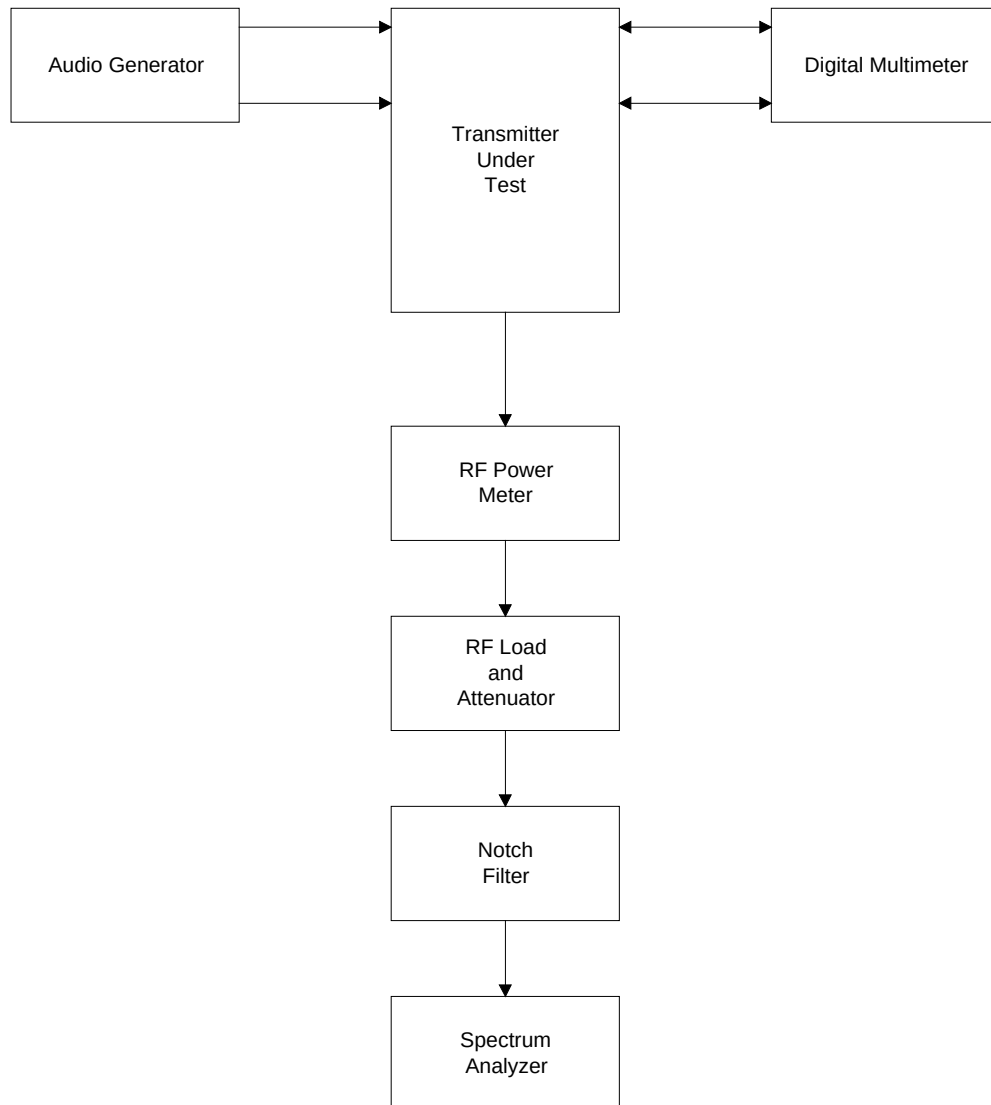
Manufacturer: EMCO

Antenna: Double Ridged Guide
Model: 3115 – 1.0 Meter Calibration
S/N: 1081

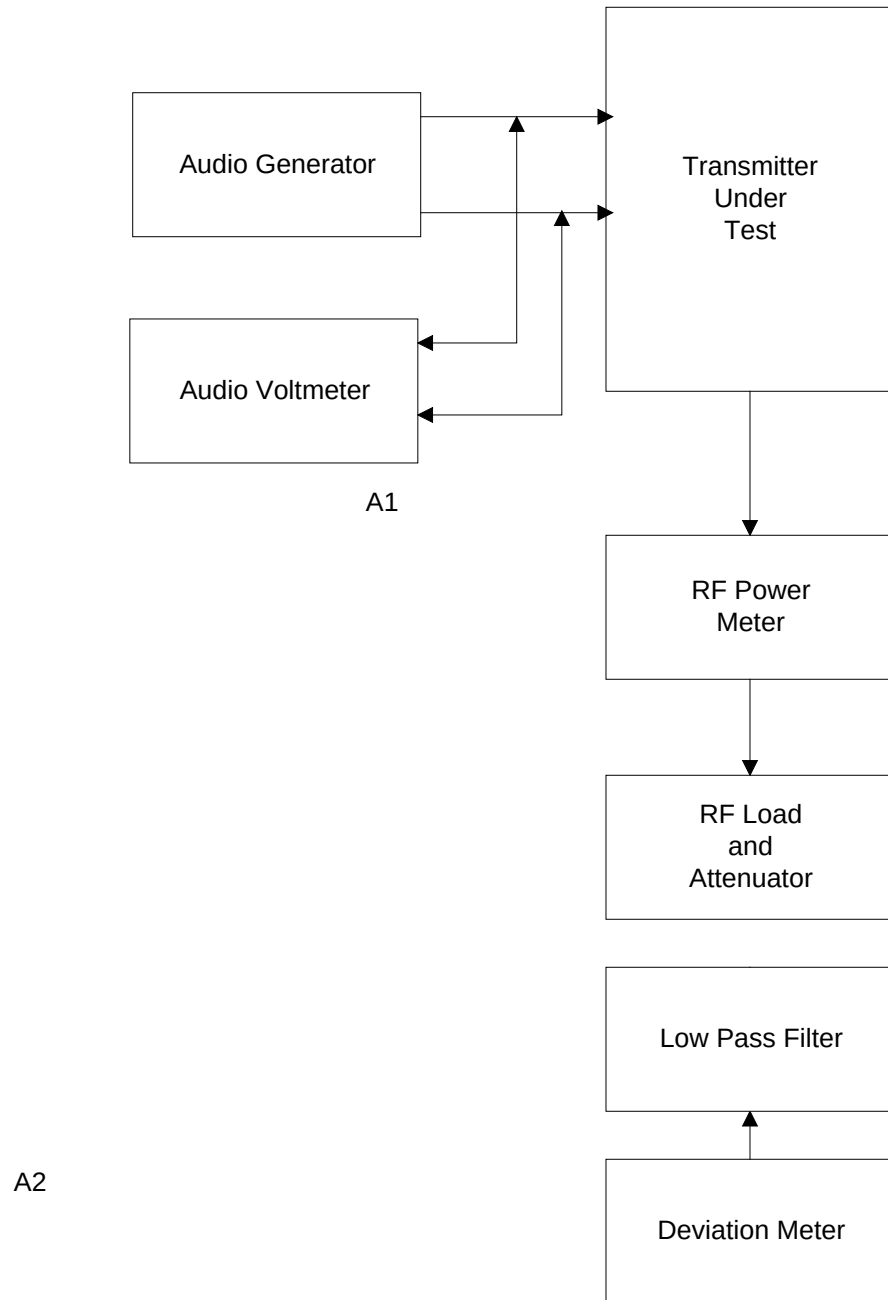
FREQUENCY MHZ	ANTENNA FACTOR dB
1000	25.1
1500	25.2
2000	27.5
2500	28.7
3000	30.6
3500	32.7
4000	32.1
4500	32.2
5000	33.9
5500	34.6
6000	35.0
6500	35.3
7000	36.1
7500	36.7
8000	37.1
8500	37.9
9000	38.4
9500	38.1
10000	38.2
10500	38.2
11000	38.4
11500	39.0
12000	39.2
12500	39.3
13000	40.8
13500	41.8
14000	41.5
14500	41.5
15000	39.9
15500	38.4
16000	38.3
16500	39.9
17000	41.9
17500	43.7
18000	48.3

Exhibit 3-21

GLENAYRE ELECTRONICS

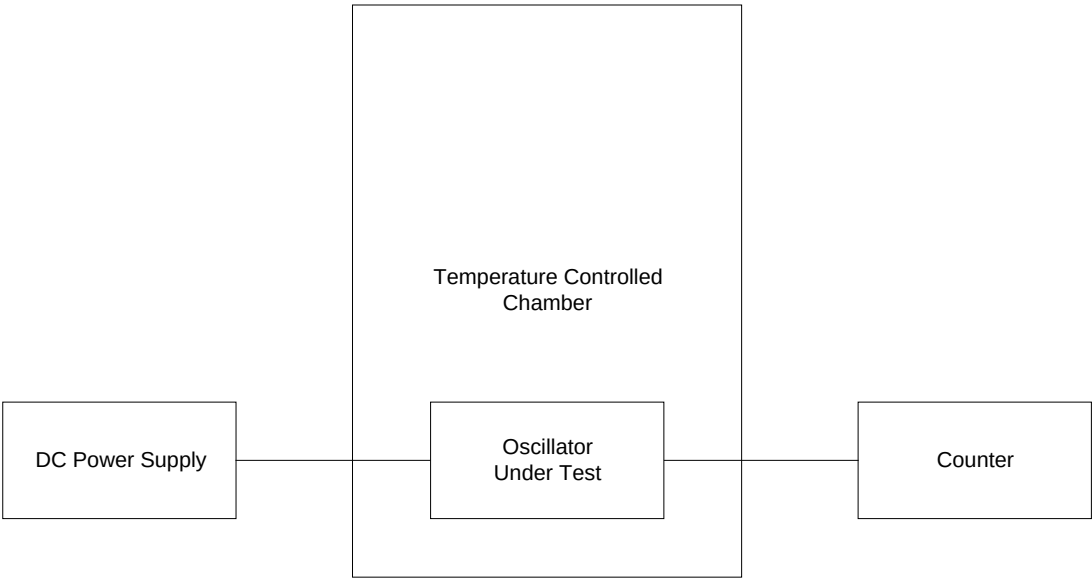
RF Power Output, Occupied Bandwidth, and Spurious Emissions
Test Setup

GLENAYRE ELECTRONICS

Frequency Response and Deviation Limiter Operation
Test Setup

GLENAYRE ELECTRONICS

Oscillator Teperature Stability and Warm-Up Time
Test Setup



GLENAYRE ELECTRONICS

Oscillator Line Voltage Stability
Test Setup