SEA, Inc. of Delaware

APPLICATION FOR CERTIFICATION

MODEL SEA 245

MARINE MF/HF SSB RADIOTELEPHONE

WITH DSC CONTROLLER

CONTAINS:

LIST OF EXHIBITS AND

EXHIBITS 1 THROUGH 12

30 MAY, 2001

FCC IDENTIFIER: BZ6SEA245

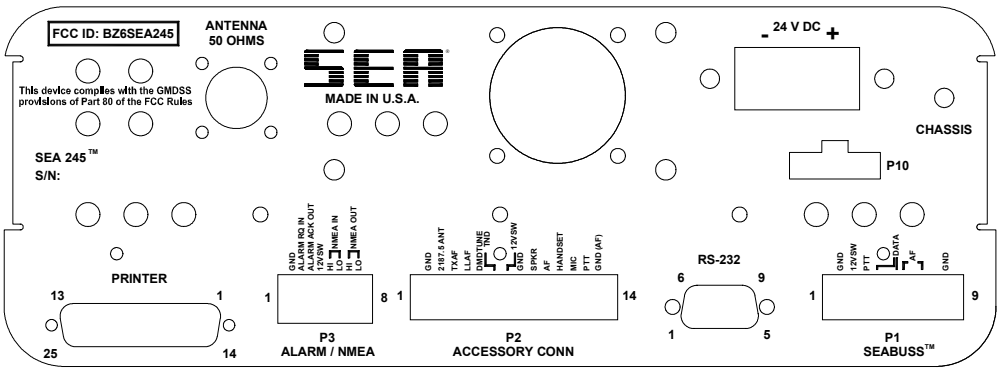
LIST OF EXHIBITS

FCC ID: BZ6SEA245

SAMPLE FCC LABEL FOR SEA 245 PER FCC 2.925 (a)

This device complies with the GMDSS provisions of Part 80 of the FCC Rules

SAMPLE GMDSS LABEL FOR SEA 245 PER FCC 80.1103 (e)



REAR PANEL DRAWING OF SEA 245 SHOWING LABEL LOCATIONS (NOT TO SCALE)

LIST OF FIGURES

EXHIBIT 1 : INTRODUCTION

INTRODUCTION

SEA, Inc. of Delaware (SEA) is pleased to submit this application for certification of its new MF/HF/DSC Marine SSB transceiver, the SEA 245. SEA seeks certification of the SEA 245 under Parts 80 (Maritime services), 87 (Aviation services) and 90 (Private land mobile radio services).

The SEA 245 is designed to meet the requirements of Part 80 as it pertains to MF/HF SSB radiotelephones for use on boats and ships and at private (simplex) marine coast stations including the GMDSS requirements for compulsory vessels in sea area A2. The model SEA 245 is also designed to meet the requirements of Part 87 for ground stations in the aviation service and the requirements of Part 90 for the private land mobile radio service.

Basic features of this MF/HF SSB transceiver include a transmitter frequency range of 1.605 to 29.999 MHz controlled by a multi-loop, high-resolution frequency synthesizer. The transceiver can operate in either simplex or semi-duplex modes. Transmitter and receiver channel selection is controlled by the front panel keypad. A list of standard U.S. and international (ITU) marine MF/HF channel frequencies is prestored in read-only-memory by channel number. Direct frequency entry is not allowed. The transmitter develops 150 watts maximum power. Two lower power levels (approximately -3 dB and -6 dB below maximum PEP), are front panel selectable. The transceiver includes an integral class A DSC controller and a dedicated watch receiver on the MF DSC distress frequency of 2187.5 kHz.

Operating requirements compliance. The SEA 245 is equipped to operate on all currently authorized channels in the MF/HF band. Its operator on/off select, transmit/receive select and channel select controls are all readily accessible and can be changed as fast as the operator can push the buttons. The SEA 245 is fully capable of operation in compliance with the following requirements as they apply to telephony operations in the MF/HF band:

Marine service, Part 80.203

Aviation service, Part 87.145(b)

Private land mobile service, Part 90.203

Compulsory ships compliance. The SEA 245 is capable of complying with these requirements as they pertain to MF/HF radiotelephones operating in the 1.605-27.5 MHz band:

Subpart Q (1600 gross tons): Part 80.807. See Exhibit 4 for transmitter power output. There is a TX annunciator on the front panel to indicate the transmitter is supplying power to the antenna. See Exhibit 11 for characteristics of the radiotelephone alarm signal. The receiver is capable of receiving H3E or A3E signals on 2182 kHz. The receiver is tuned to 2182 kHz at powerup. See Exhibit 5 for audio output.

Subpart R (300 gross tons): Parts 80.855, 80.856, 80.857, 80.858. The transmitter is capable of J3E transmission on all assigned frequencies in the 1.605-3.5 MHz band including 2182 kHz and 2638 kHz. H3E mode is also available on 2182 kHz. See Exhibit 4 for transmitter power output. There is a TX annunciator on the front panel to indicate the transmitter is supplying power to the antenna. See Exhibit 11 for characteristics of the radiotelephone alarm signal. The receiver is capable of receiving H3E or J3E signals on 2182 kHz and J3E signals on all other assigned MF marine frequencies. The radiotelephone is fitted with a durable nameplate on the front panel. The receiver provides sensitivity better than 50 μV in accordance with 80.858(d) and 80.858(e).

Subpart S (Small passenger boats): Parts 80.905, 80.909, 80.913, 80.927, 80.929. The SEA 245 transmits in J3E mode on all the frequencies required by 80.905(a)(2), 80.905(a)(3)(iii)(A), and 80.905(a)(4)(iii)(A). See Exhibit 4 for transmitter power output. J3E reception is possible on all the frequencies required by 80.913(a) and 80.913(b). The receiver provides sensitivity better than 1 μV in accordance with 80.913(e) and 80.913(g). There is a TX annunciator on the front panel to indicate the transmitter is supplying power to the antenna. The radiotelephone is fitted with a durable nameplate on the front panel.

NAME OF APPLICANT, Part 2.1033(c)(1)

SEA, Inc. of Delaware --- Manufacturer

EQUIPMENT IDENTIFICATION, Part 2.1033(c)(2)

The FCC identifier for the SEA 245, MF/HF DSC SSB transceiver is BZ6SEA245.

EXHIBIT 2 : FCC 2.1033(c) (TECHNICAL DESCRIPTION)

TECHNICAL DESCRIPTION, Part 2.1033(c)

INSTRUCTION BOOKS, Part 2.1033(c)(3)

See Preliminary SEA 245 Instruction Manual (Enclosed as separate attachment).

TYPE OF EMISSION, Parts 2.1033(c)(4) and 80.207(d):

Part 80.207(d)	(1) 2K80J3E	(2) 2K80R3E	(3) 280HJ2B
Part 87.137(a)	(1) 2K80J3E	(2) 2K80R3E	(3) 280HJ2B
Part 90.207(c)(d)	(1) 2K80J3E	(2) 2K80R3E	(3) 280HJ2B

(2K80H3E available on 2182.0 kHz)

FREQUENCY RANGE, Part 2.1033(c)(5):

1.605 to 29.999 MHz

RANGE OF OPERATING POWER LEVELS, Part 2.1033(c)(6):

40 - 150 Watts PEP. Low power function(s) are provided

MAXIMUM POWER RATING, Part 2.1033(c)(7):

150 Watts PEP

DC VOLTAGES AND CURRENTS APPLIED TO FINAL AMPLIFIER, Part 2.1033(c)(8):

Test conditions:

Two equal tones. Output power 150 Watts PEP into 50 ohms

DC Voltage: 24 Volts DC Current: 8 Amps

TUNE-UP PROCEDURE, Part 2.1033(c)(9)

See Preliminary SEA 245 Instruction Manual (enclosed as separate attachment), Chapter 4, "Installation" and Chapter 6, "Maintenance".

COMPLETE CIRCUIT DIAGRAM, Part 2.1033(c)(10):

See separate attachments.

FREQUENCY DETERMINING AND STABLILIZATION CIRCUITS, Part 2.1033(c)(10)

Please refer to the following diagrams for this discussion:

SEA 245 Synthesizer Functional Block Diagram, Figure 5.5.1, and Mainboard Schematic Diagram, Sheet 2, in the Preliminary SEA 245 Instruction Manual (enclosed in separate attachments).

General: The primary frequency control is maintained through a master oven controlled crystal oscillator (OCXO) operating at 12.288 MHz. Clock stability is achieved through a combination of temperature stabilization and temperature compensation techniques.

All conversion oscillators in the SEA 245 make use of the master clock signal. This causes any frequency shift experienced by the clock to be contributed to the output frequency in a PROPORTIONAL fashion. That is, the lower the desired SEA 245 output frequency, the lower will be the effect of any given clock oscillator frequency change. Figure 2.1 on Page 2-2 of this report demonstrates this relationship.

The clock oscillator makes use of a high stability quartz crystal mounted within a proportional oven. The oven supply voltage is derived from the +12 volt regulator output. Crystal temperature is thus held to 75 °C ± 1 °C over the temperature range of –30 to +50 °C. The crystal is specified to have less than 1 ppm variation from 70 to 80 °C.

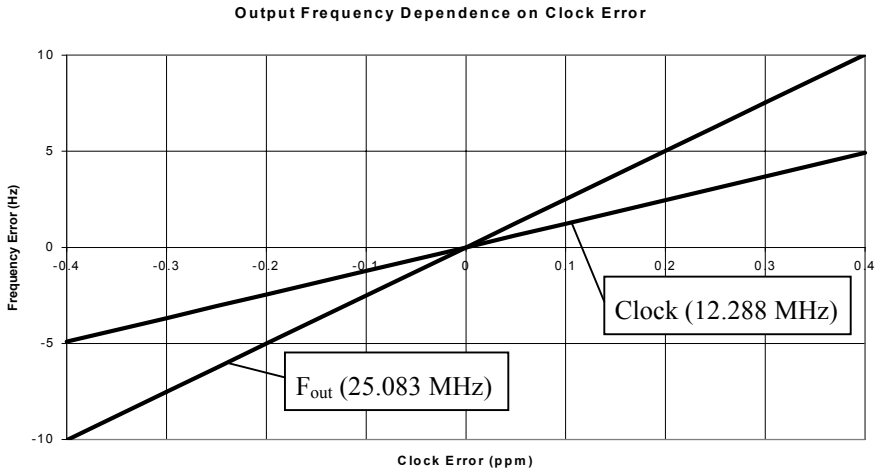


FIGURE 2.1 PROPORTIONALITY OF CLOCK TO FREQUENCY

DESCRIPTION OF MODULATION LIMITING, POWER LIMITING AND SPURIOUS RADIATION SUPPRESSION CIRCUITRY, Part 2.1033(c)(10)

The modulation limiter circuitry in the SEA 245 consists of digitally implemented audio VOGAD, limiting and bandpass filtering. The resulting bandwidth and amplitude limited audio provides a very stable exciter output signal, free from instantaneous overshoot.

The ALC system protects the power amplifier stage from RF overdrive. The ALC circuitry is a DSP based feedback system. The control signal(s) for the ALC are taken from the output of the power amplifier through a directional coupler located on the Power Amplifier Assembly. Control voltages are derived from detector diodes CR3 (Forward Power) and CR4 (Reflected Power), buffered by dual operational amplifier U1 and sent to inputs on the system CPU A/D converter. The data is then used by the DSP circuitry, which provides the necessary algorithm to control the low level transmitter gain to prevent overload. This same circuitry is also used to provide the two lower power modes when desired.

The circuitry employed to suppress spurious signals consists of directly generating the SSB signal at the intermediate frequency of 45 MHz and then downconverting to the MF/HF band, placing the unwanted VHF image frequencies outside the passband of a system of cascaded filters. See the Instruction Manual for filter diagrams. See also Figure 2.2 of this report (Page 2-4) for a simplified electrical diagram of the low pass filter arrangement.

Five filters are used to cover the MF/HF spectrum from 1.605 to 29.999 MHz. These filters are designed to provide a minimum of 40 dB rejection in the 2nd harmonic region and 55 dB rejection in the 3rd harmonic region and higher. These filters, combined with the harmonic rejection specifications of the power amplifier (Second harmonic -30 dB, third harmonic -15 dB) provide a minimum of 70 dB rejection for harmonic signals. See figures 2.3 though 2.7 for filter response curves.

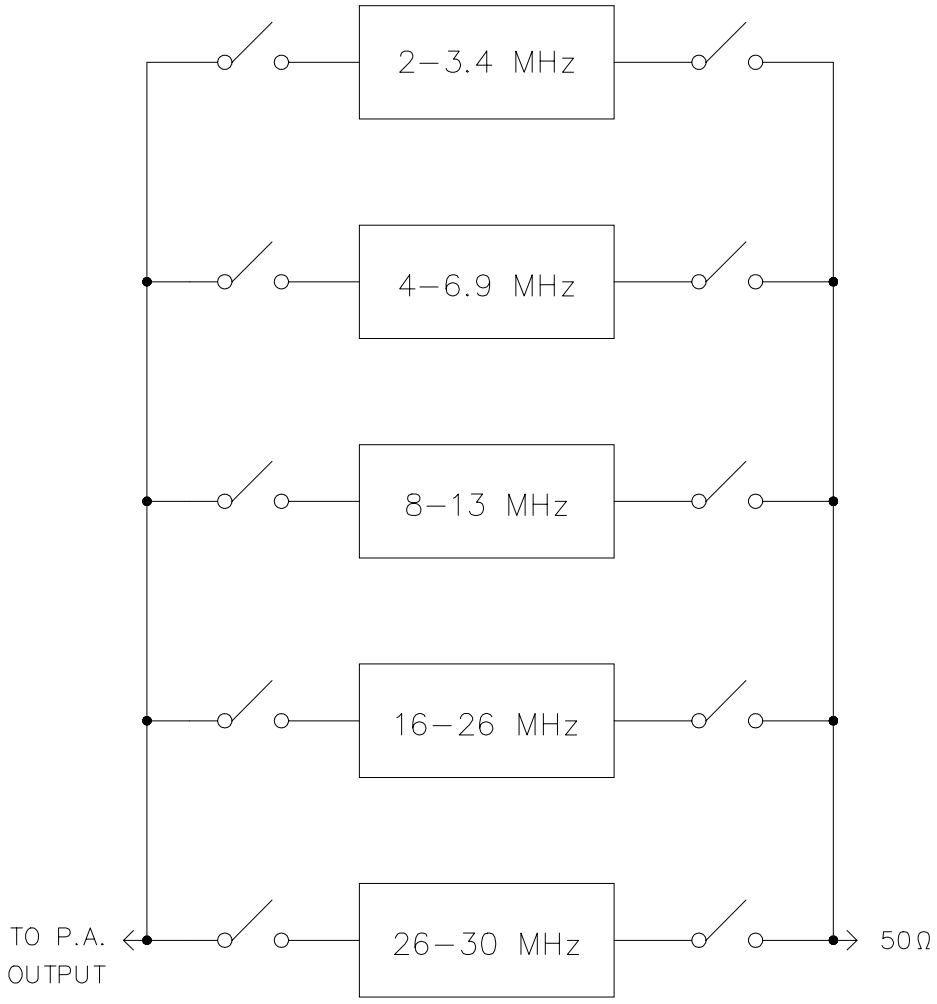


FIGURE 2.2 SIMPLIFIED ELECTRICAL DIAGRAM OF THE TRANSCEIVER OUTPUT CIRCUIT

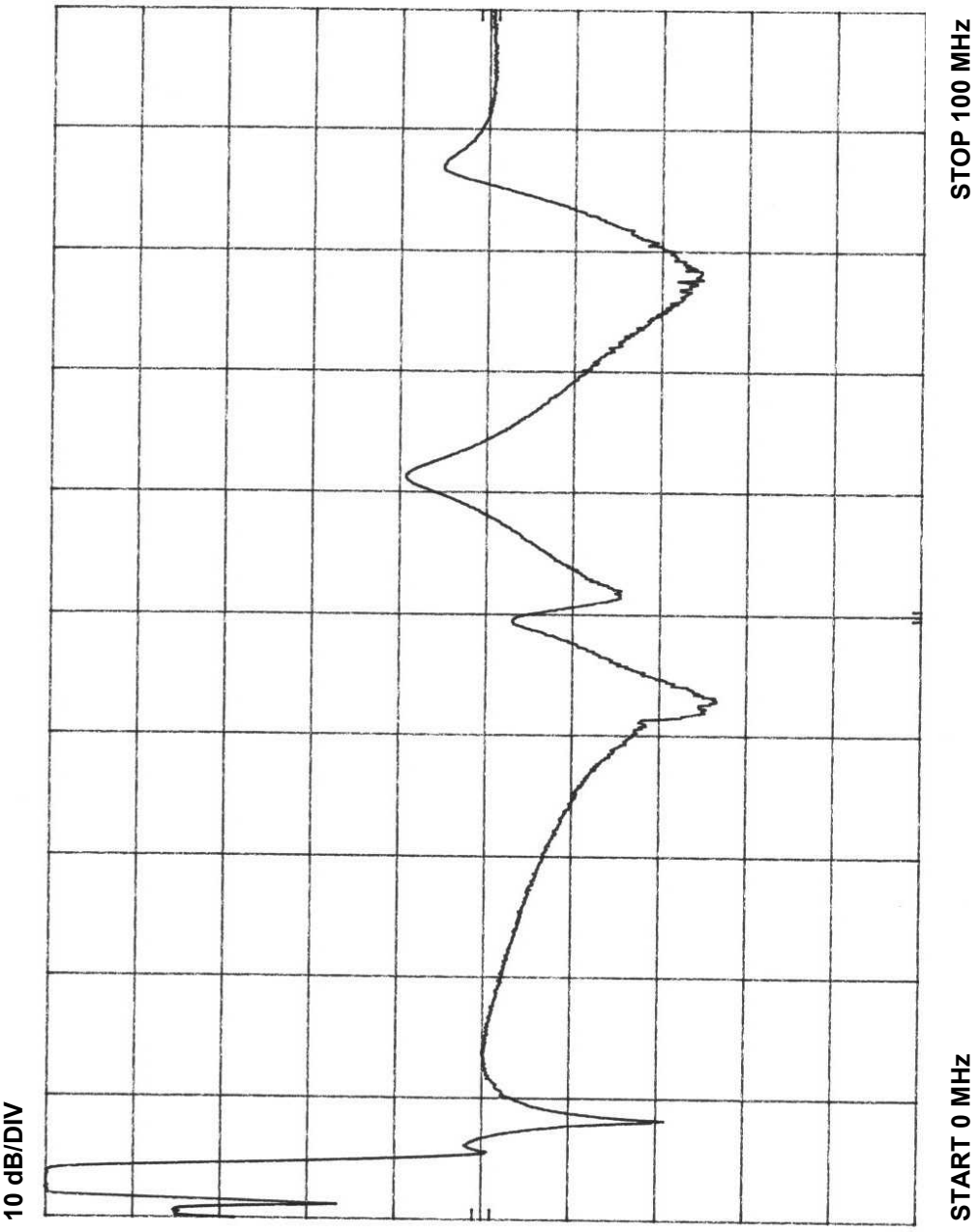


FIGURE 2.3 TRANSMITTER OUTPUT FILTER RESPONSE, FREQ=2-3.4 MHz

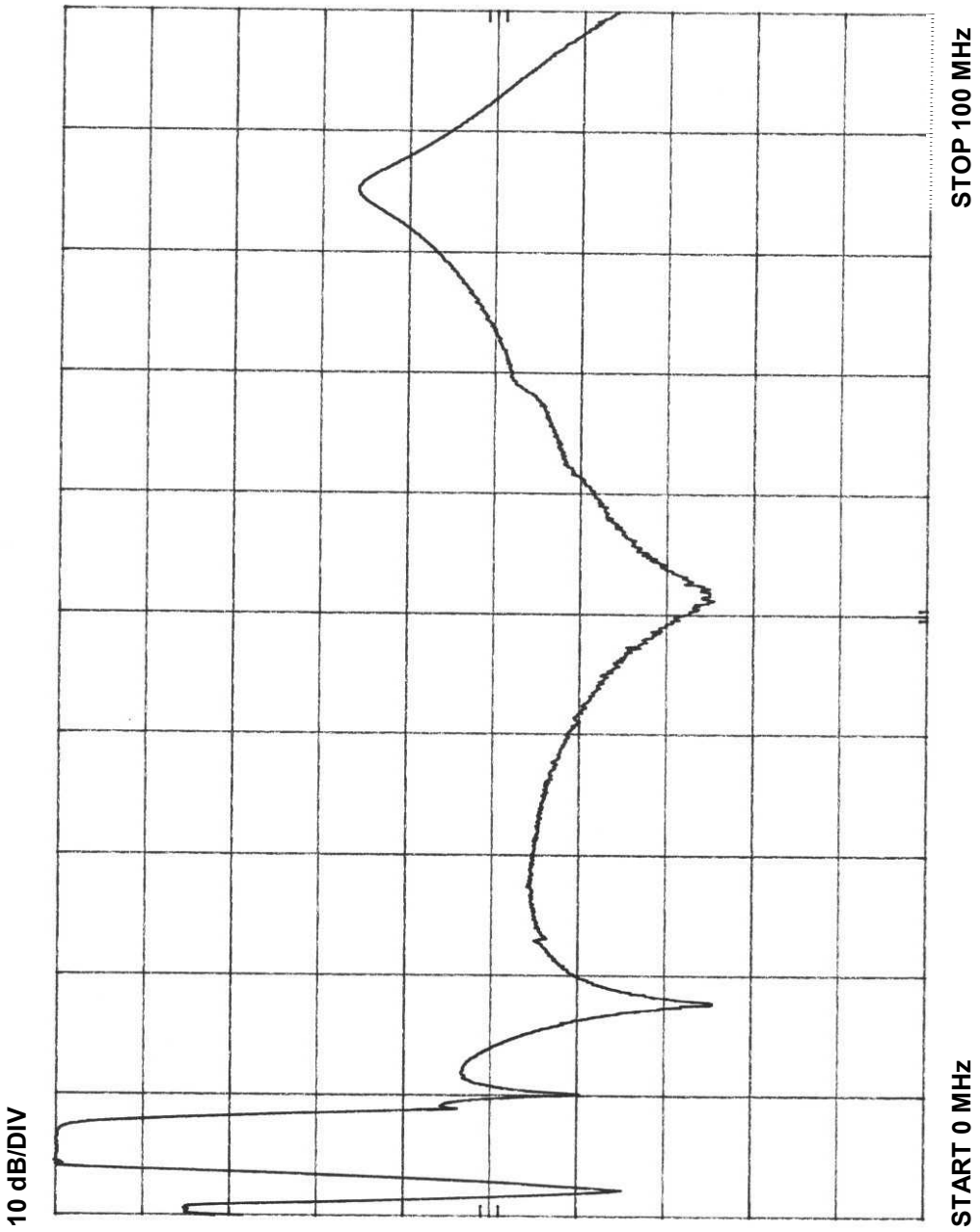


FIGURE 2.4 TRANSMITTER OUTPUT FILTER RESPONSE, FREQ=4-6.9 MHz

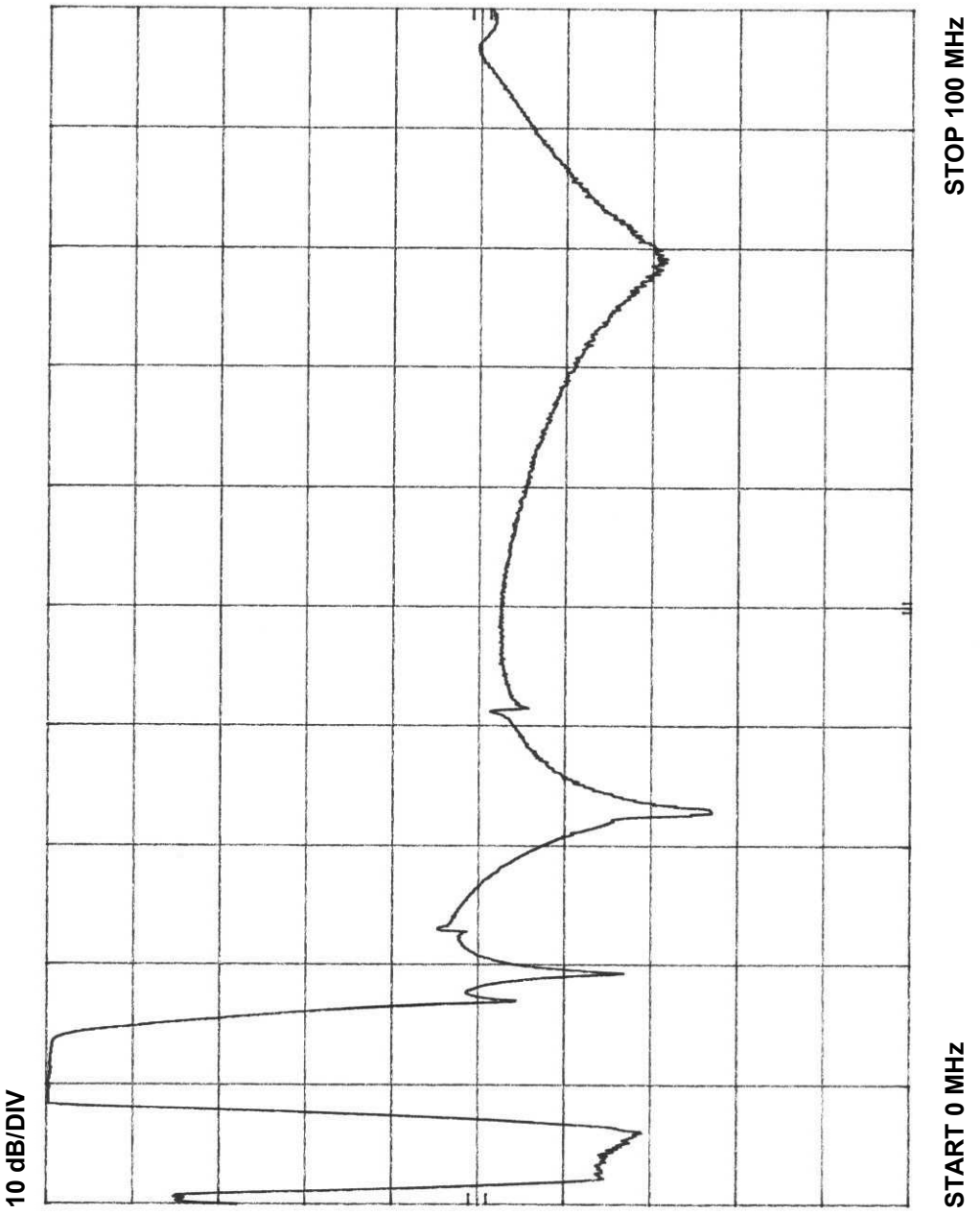


FIGURE 2.5 TRANSMITTER OUTPUT FILTER RESPONSE, FREQ=8-13 MHz

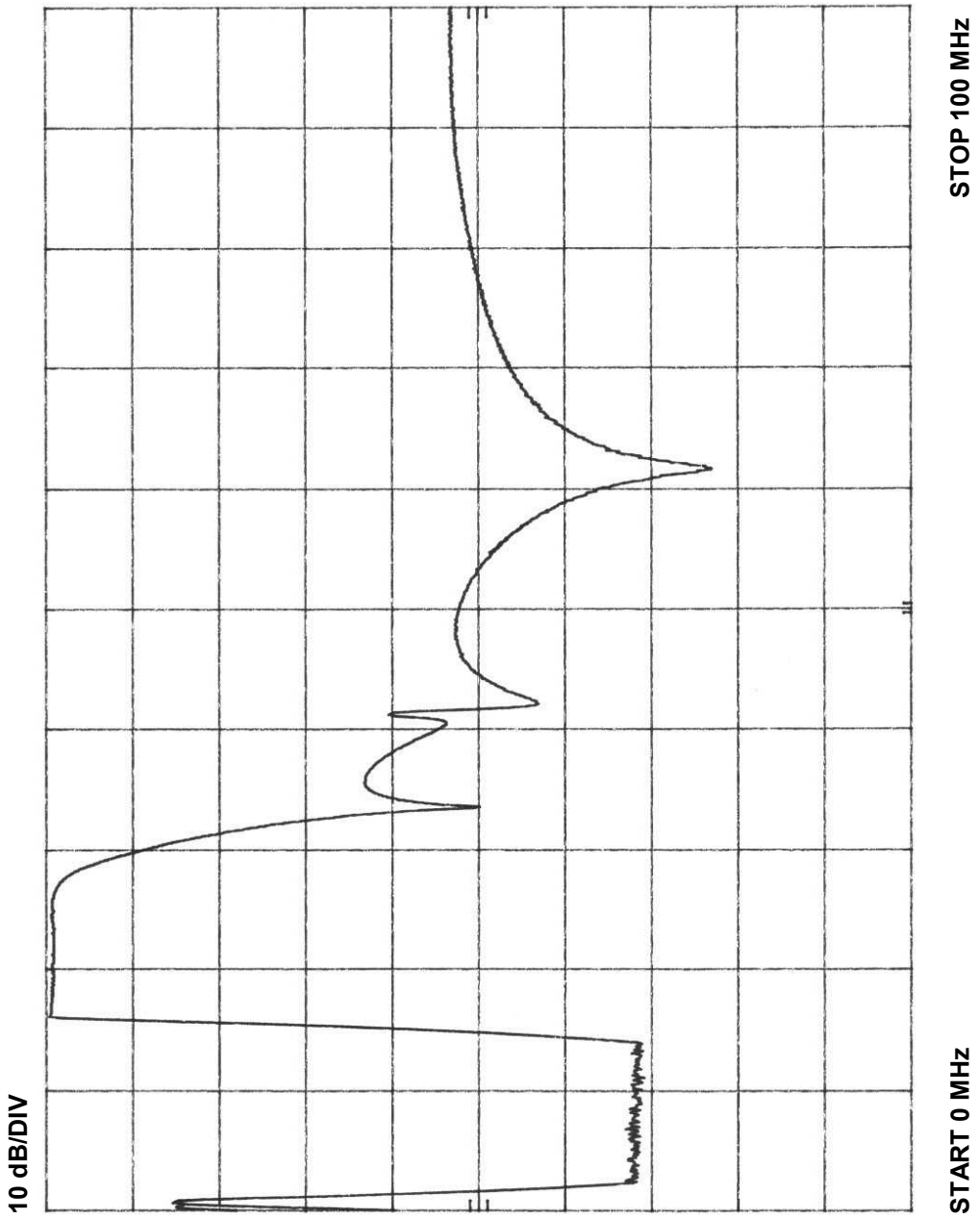


FIGURE 2.6 TRANSMITTER OUTPUT FILTER RESPONSE, FREQ=16-26 MHz

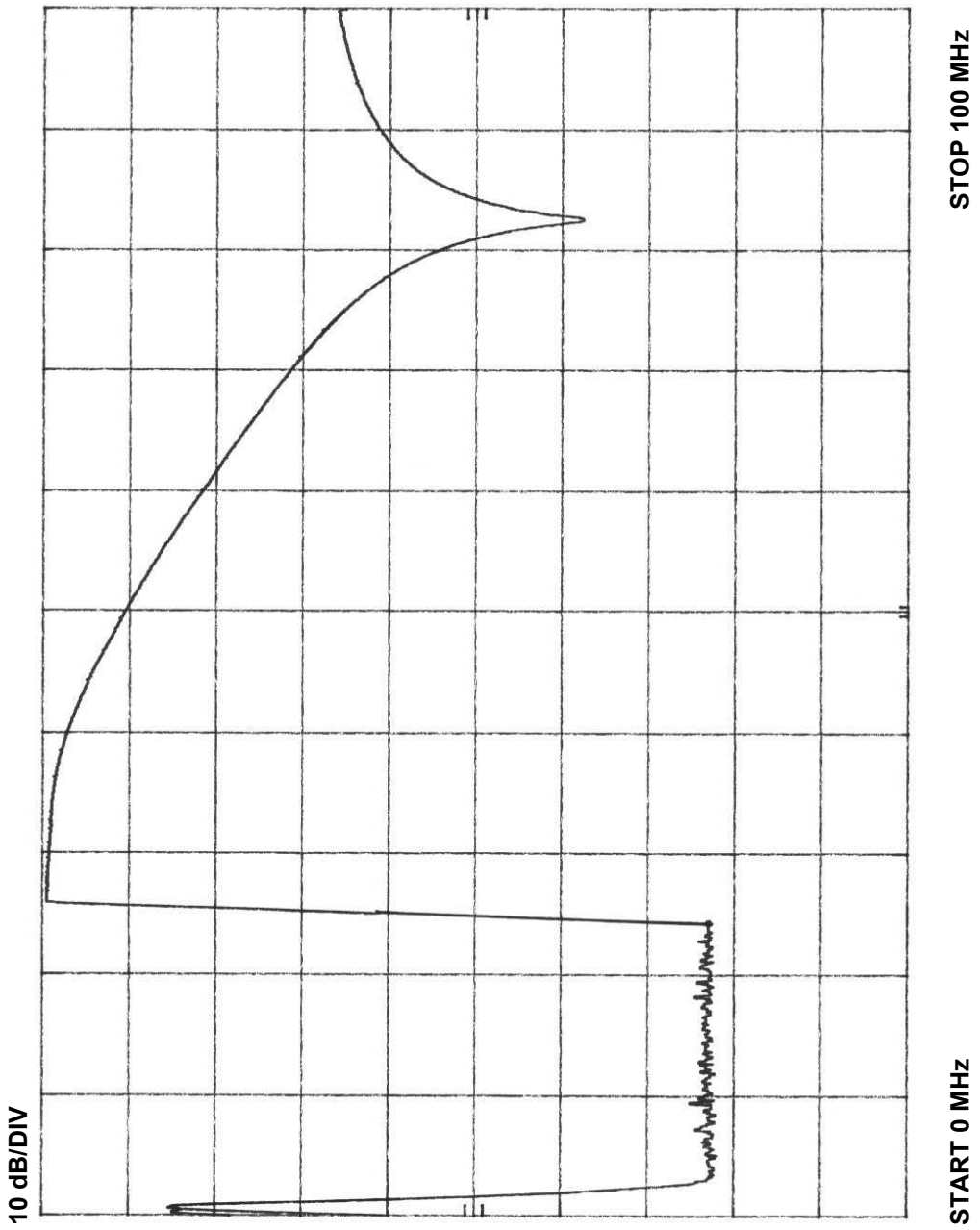


FIGURE 2.7 TRANSMITTER OUTPUT FILTER RESPONSE, FREQ=26-30 MHz