STATEMENT OF CERTIFICATION

The technical data supplied with this application, having been taken under my supervision is hereby duly certified. The following is a statement of my qualifications:

College Degree: **BSEE, Valparaiso University, Valparaiso, Indiana, USA**
MSEE, Illinois Institute of Technology, Chicago, Illinois, USA

18 years of Design and Development experience in the field of two-way radio communication.

NAME: **Ken Weiss**

SIGNATURE: _____

DATE: **February 2, 2001**

POSITION: **Lead Electrical Engineer**

I hereby certify that the above application was prepared under my direction and that to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct:

NAME: **Ron Wegner**

SIGNATURE: _____

DATE: **February 2, 2001**

POSITION: **Engineering Manager**

SUBMITTED MEASURED DATA -- INDEX

EXHIBIT	DESCRIPTION	
11A	RF Output-Data	
11E	Occupied Bandwidth (Note 1, 2)	
11E-1	Occupied Bandwidth, Carrier with 2500 Hz Audio Tone	25 kHz Channels
11E-2	Occupied Bandwidth, Carrier with 2500 Hz Audio Tone	12.5 kHz Channels
11E-3	Occupied Bandwidth, Carrier with 12 kbps Digitized Secure Voice	25 kHz Channels
11E-4	Occupied Bandwidth, Carrier with 9600 bps Digitized Voice / Data	12.5 kHz Channels
11F	Conducted Spurious Emissions: Setup, Specifications, Index	
11F-1	Conducted Spurious Emissions, Harmonics, Power Output at 350 Watts	
11F-2	Conducted Spurious Emissions, Harmonics, Power Output at 125 Watts	
11F-3	Conducted Spurious Emissions, Close-In, Power Output at 350 Watts, 162 MHz	
11F-4	Conducted Spurious Emissions, Close-In, Power Output at 125 Watts, 162 MHz	
11G	Radiated Spurious Emissions: Setup, Specifications, Index	
11G-1	Radiated Spurious Emissions, Power Output at 350 Watts	

Note 1: The associated type approved base station is filed for several emission designators for 25 kHz / 12.5 kHz, analog / digital, and control channel / data emissions. The exhibits included here are a subset of the possible occupied bandwidth exhibits, and are meant to show that the high power booster amplifier can be used with any of the possible modulations to produce a clean RF amplified modulated carrier signal.

Note 2: Each of the occupied bandwidth exhibits shown consists of 3 sheets. The first sheet of each exhibit is a description of the modulation, channel type, setup, and measurement method. Sheet 2 of each exhibit is the occupied bandwidth using the booster amplifier. Sheet 3 of each exhibit is the occupied bandwidth without using the booster amplifier, that is, the signal that would is input into the high power booster.

RF POWER OUTPUT DATA

The RF power output was measured with the indicated voltage applied to and current into the final RF amplifying device.

Measured RF output	**350**	Watts
Normal DC Voltage	**28.0**	Volts
Normal DC Current	**32.9**	Amperes
Input power for final RF amplifying device(s)	**921**	Watts
Primary Supply Voltage	**115**	Volts AC

Minimum Measured RF output	**125**	Watts
Normal DC Voltage	**28.0**	Volts
Normal DC Current	**18.2**	Amperes
Input power for final RF amplifying device(s)	**510**	Watts
Primary Supply Voltage	**115**	Volts AC

OCCUPIED BANDWIDTH

Modulation Type: Carrier with 2500 Hz Audio Tone
Emission Designator: 16K0F3E
Channelization: 25 kHz
Deviation Limit: **±5.0 kHz Max**

SPECIFICATION REQUIREMENT:

§ 90.210 B-Mask Emission limits:

For transmitters equipped with an audio low pass filter and designed to operate with a 25 kHz channel spacing (authorized bandwidth 20 kHz), the power of any emission must be below the unmodulated carrier power (P) as follows:

On any frequency removed from the assigned frequency by a displacement frequency (F_d in kHz) of:

a) >10 kHz up to and including 20 kHz — *At least 25 dB;*
b) >20 kHz up to and including 50 kHz — *At least 35 dB;*
c) >50 kHz — *at least 43+10 * Log_{10} (P) dB or 80 dB; (whichever is the lesser attenuation).*

Necessary Bandwidth Calculation:
The necessary bandwidth of the modulation signal per the formulas defined in 47 CFR 2.202 (b) is as follows:

Max Mod Freq, M	*Max Deviation, D*	*2*(M+D)*	*Nec BW*
3 kHz	5 kHz	16 kHz	16K0

Measurement Setting and Procedure, per TIA/EIA 603:

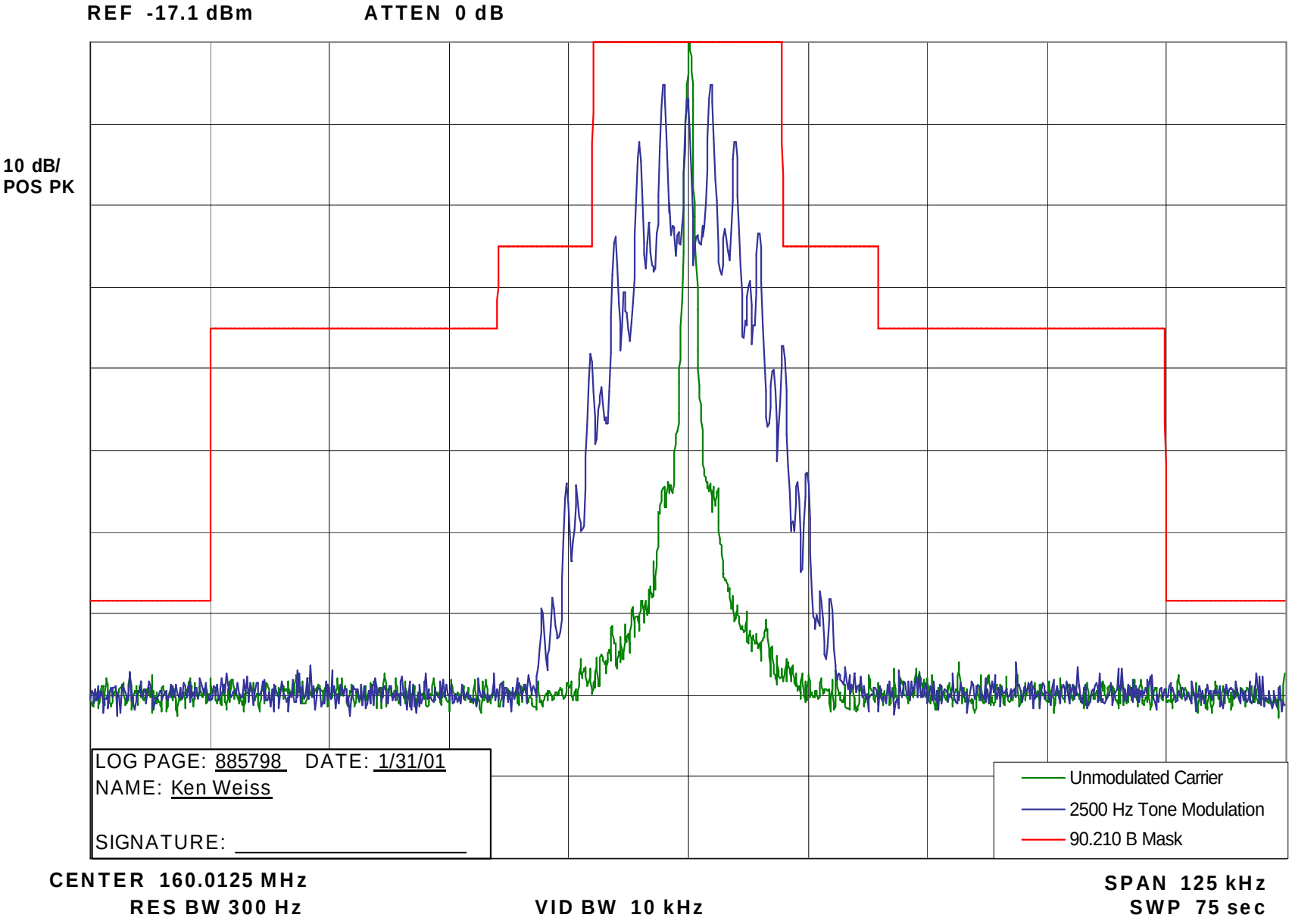
Analyzer Settings:

Horizontal:	12 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	75 Seconds (<2000 Hz / Second)	Span:	120 kHz
Detector Mode:	Positive Peak		

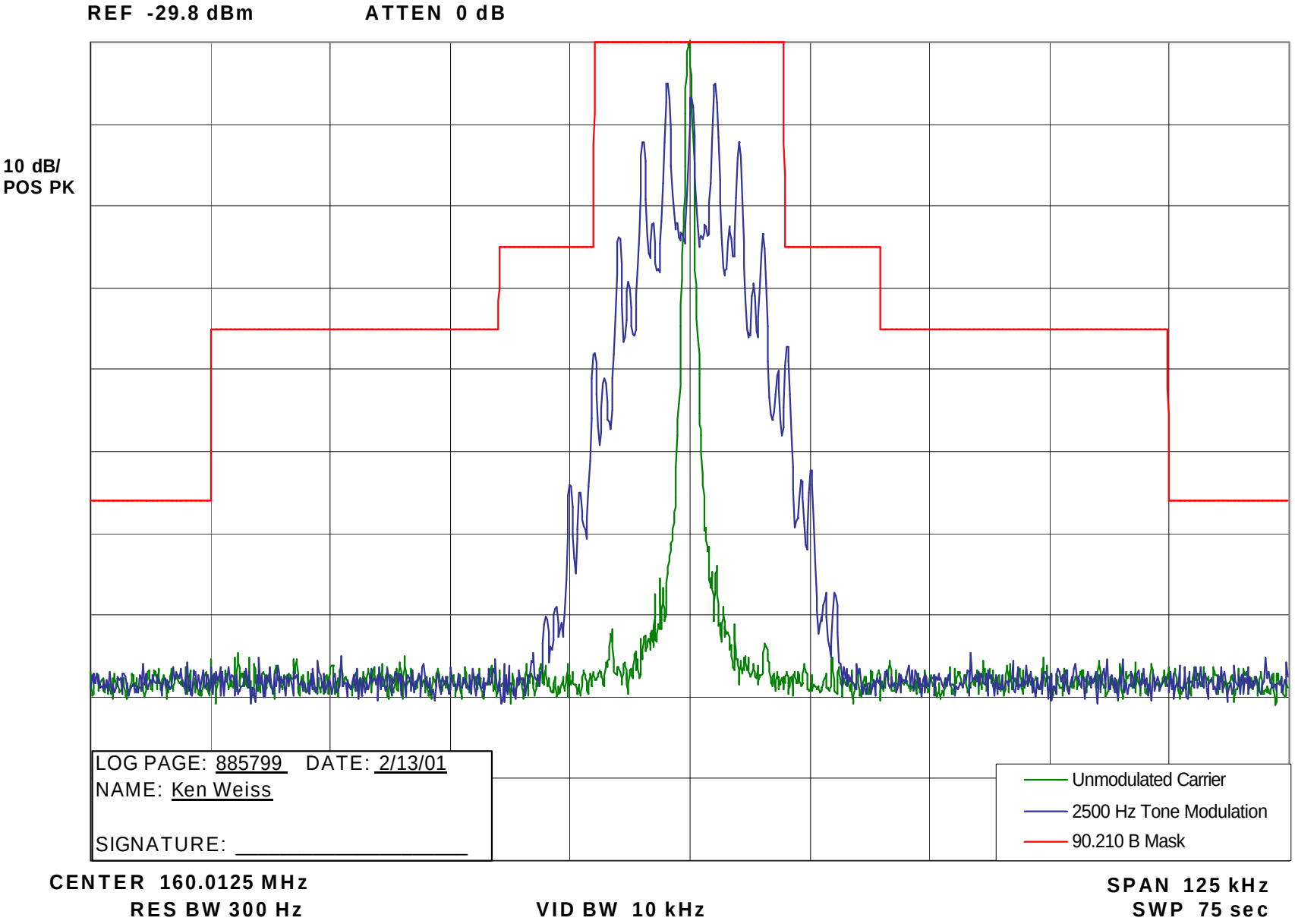
Test Procedure:

1) Key the station with no modulation to obtain the unmodulated carrier reference level on the analyzer. Use the analyzer controls to set this reference to a full-scale reference line. Store this analyzer trace in trace A.
2) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation.
3) Allow the analyzer to sweep, and record the resultant emission levels in trace B.
4) Plot the resulting two analyzer traces. The occupied bandwidth mask is then added along with additional labeling as appropriate.

Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio Tone - With Booster Amplifier



Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio Tone - Without Booster Amplifier



OCCUPIED BANDWIDTH

Modulation Type: Carrier with 2500 Hz Audio Tone
Emission Designator: 11K0F3E
Channelization: 12.5 kHz
Deviation Limit: **±2.5 kHz Max**

SPECIFICATION REQUIREMENT:

§ 90.210 D-Mask Emission limits:

For transmitters designed to operate with a 12.5 kHz 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 5.625 kHz removed from f_0: *Zero dB.*

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: *At least 7.27 *(f_d –2.88 kHz) dB.*

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: *At least 50 plus 10 log_{10}(P) decibels or 70 decibels (whichever is the lesser attenuation).*

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide to capture the true peak emission of the equipment under test.

Necessary Bandwidth Calculation:
The necessary bandwidth of the modulation signal per the formulas defined in 47 CFR 2.202 (b) is as follows:

Max Mod Freq, M	*Max Deviation, D*	*2*(M+D)*	*Nec BW*
3 kHz	2.5 kHz	11 kHz	11K0

Measurement Setting and Procedure, per TIA/EIA 603:

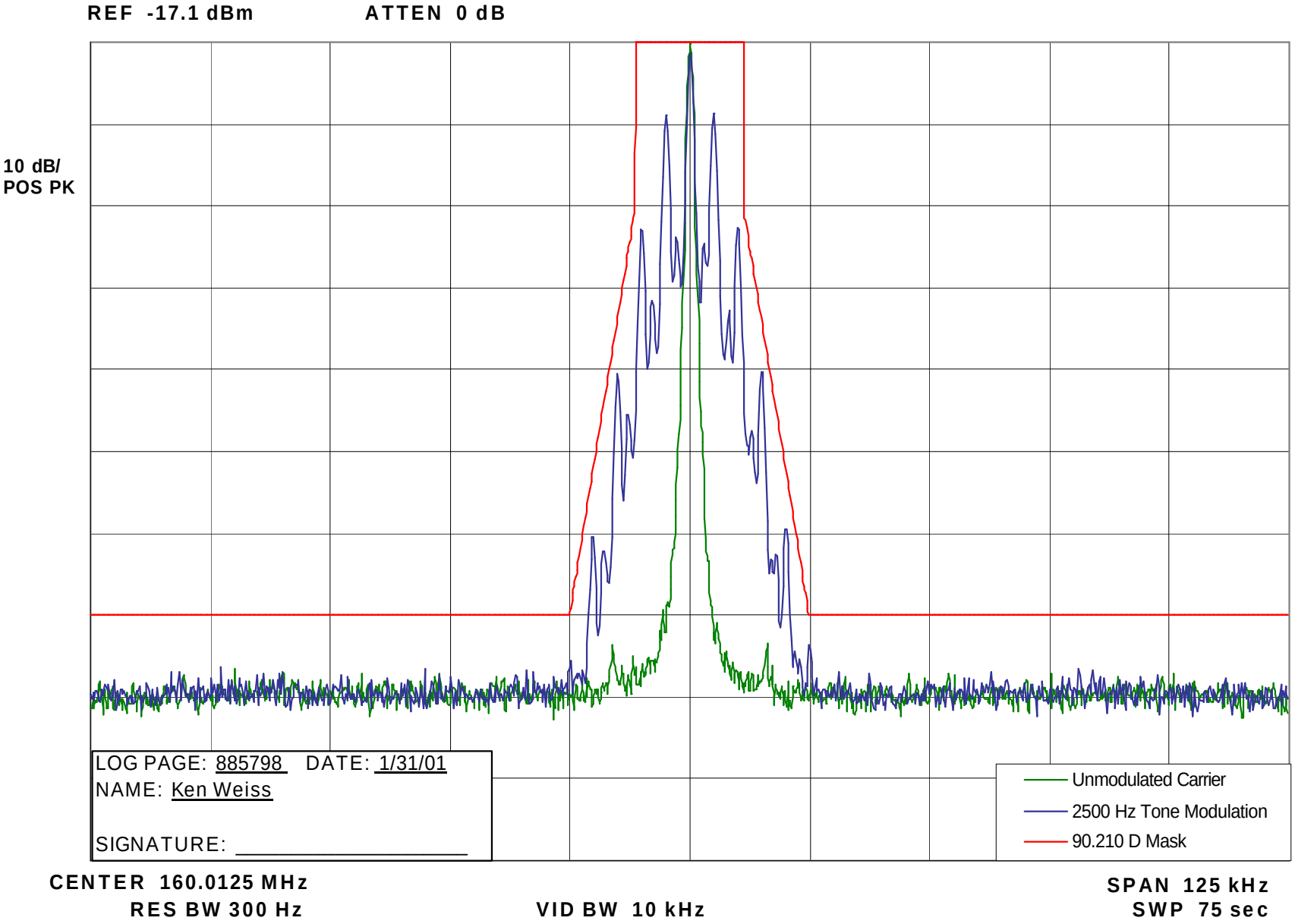
Analyzer Settings:

Horizontal:	12 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	75 Seconds (<2000 Hz / Second)	Span:	120 kHz
Detector Mode:	Positive Peak		

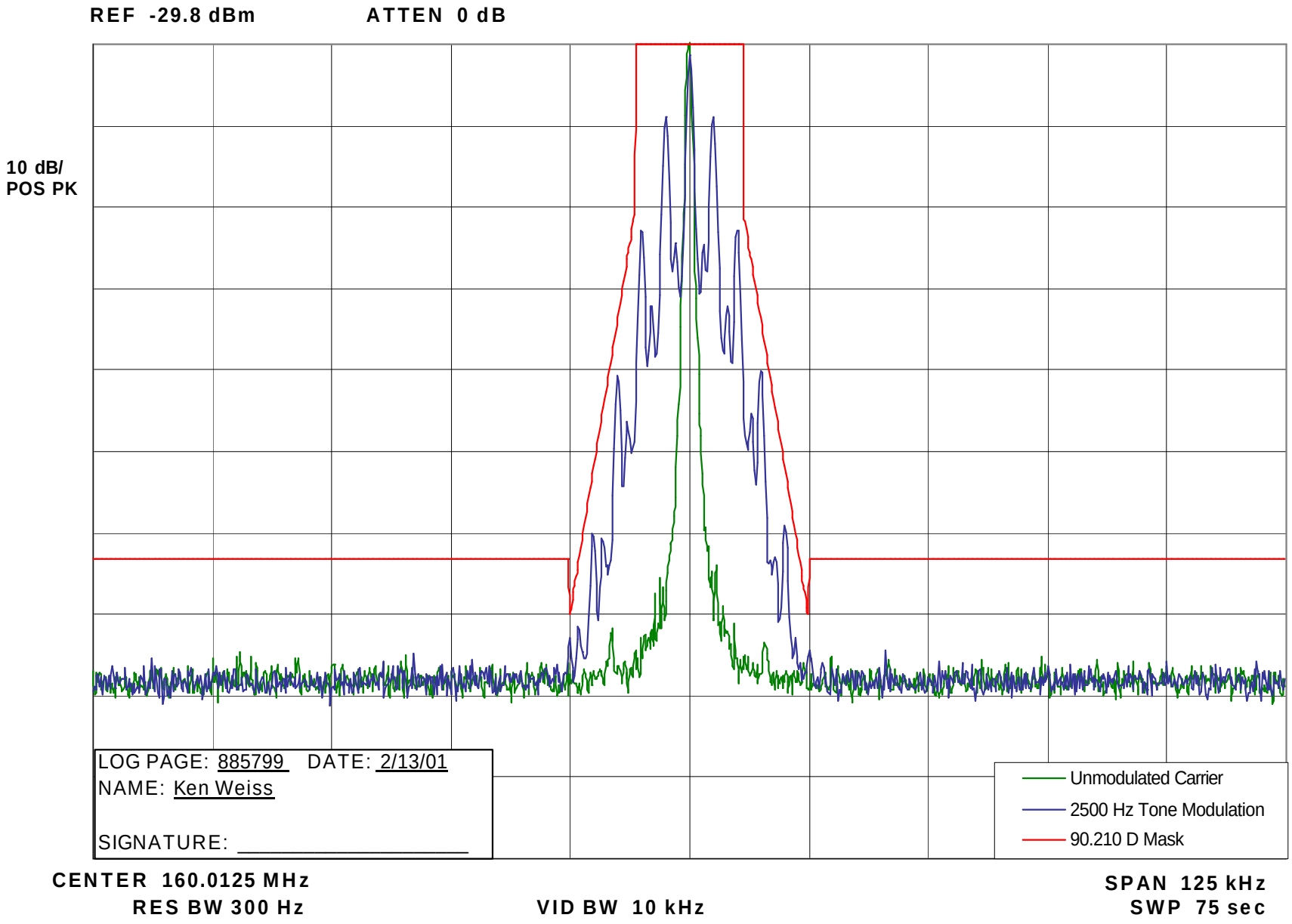
Test Procedure:

1) Key the station with no modulation to obtain the unmodulated carrier reference level on the analyzer. Use the analyzer controls to set this reference to a full-scale reference line. Store this analyzer trace in trace A.
2) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation.
3) Allow the analyzer to sweep, and record the resultant emission levels in trace B.
4) Plot the resulting two analyzer traces. The occupied bandwidth mask is then added along with additional labeling as appropriate.

Occupied Bandwidth - 12.5 kHz Channel - Carrier with 2500 Hz Audio Tone - With Booster Amplifier



Occupied Bandwidth - 12.5 kHz Channel - Carrier with 2500 Hz Audio Tone - Without Booster Amplifier



OCCUPIED BANDWIDTH

Modulation Type: Carrier with 12 kbps Digitally Encrypted Voice Modulation
Emission Designator: 20K0F1E
Channelization: 25 kHz

SPECIFICATION REQUIREMENT:

§ 90.210 C-Mask Emission limits:

For transmitters that are not equipped with an audio low pass filter, and are designed to operate with a 25 kHz channel spacing (authorized bandwidth 20 kHz), the power of any emission must be below the unmodulated carrier power (P) as follows:

On any frequency removed from the assigned frequency by a displacement frequency (F_d in kHz) of:

a) >more than 5 kHz up to and including 10 kHz — *At least t 83 * Log_{10} (F_d/5) dB;*

b) >10 kHz up to and including 50 kHz — *At least t 29 * Log_{10} (F_d^2/11) dB or 50 dB (whichever is the lesser attenuation).*

c) >50 kHz — *at least 43+10 * Log_{10} (P) dB.*

Necessary Bandwidth Calculation:
The necessary bandwidth of the modulation signal per the formulas defined in 47 CFR 2.202 (b) is as follows:

Max Mod Freq, M	*Max Deviation, D*	*2*(M+D)*	*Nec BW*
6 kHz	4 kHz	20 kHz	20K0

Measurement Setting and Procedure, per TIA/EIA 603:

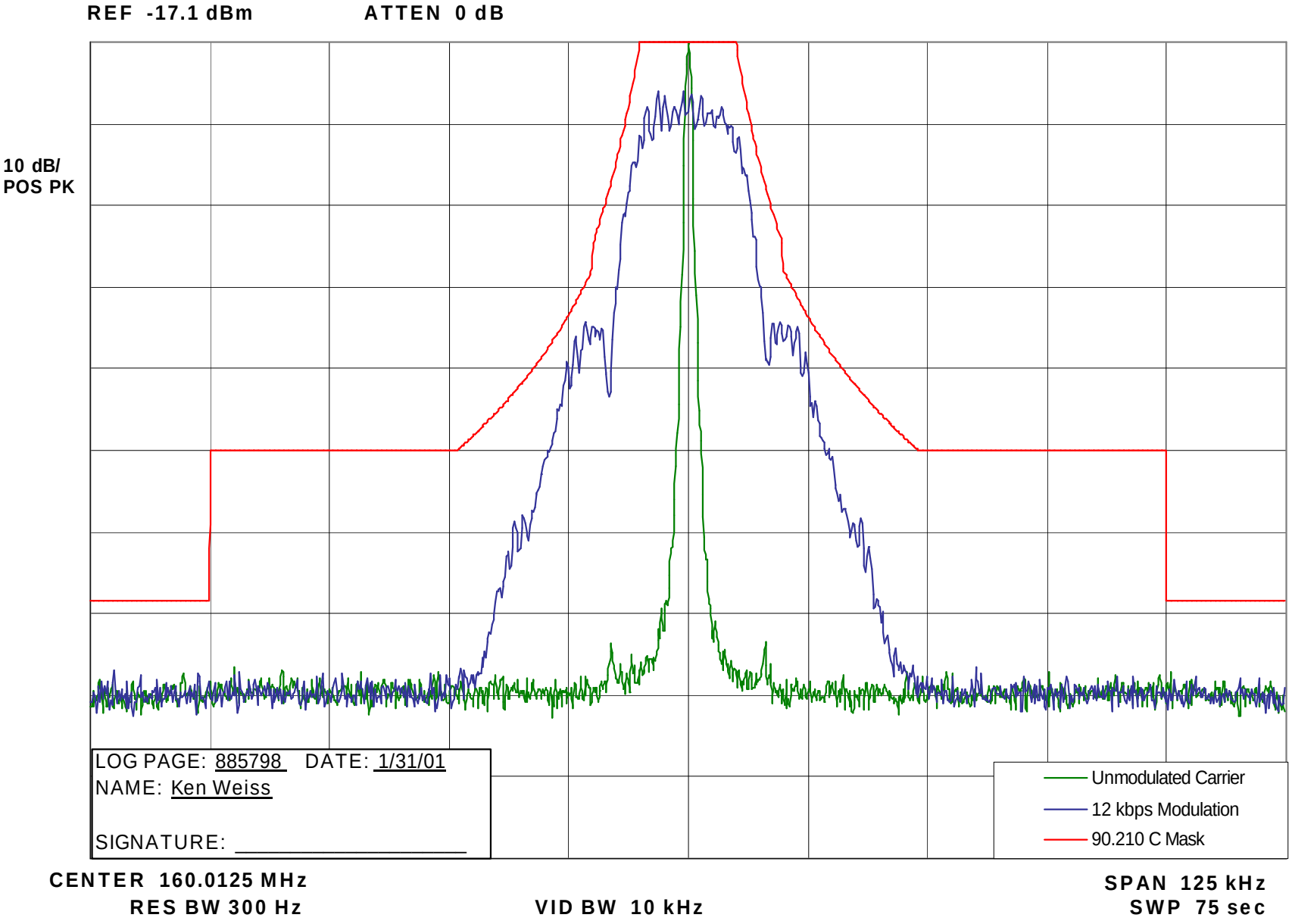
Analyzer Settings:

Horizontal:	12 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	75 Seconds (<2000 Hz / Second)	Span:	120 kHz
Detector Mode:	Positive Peak		

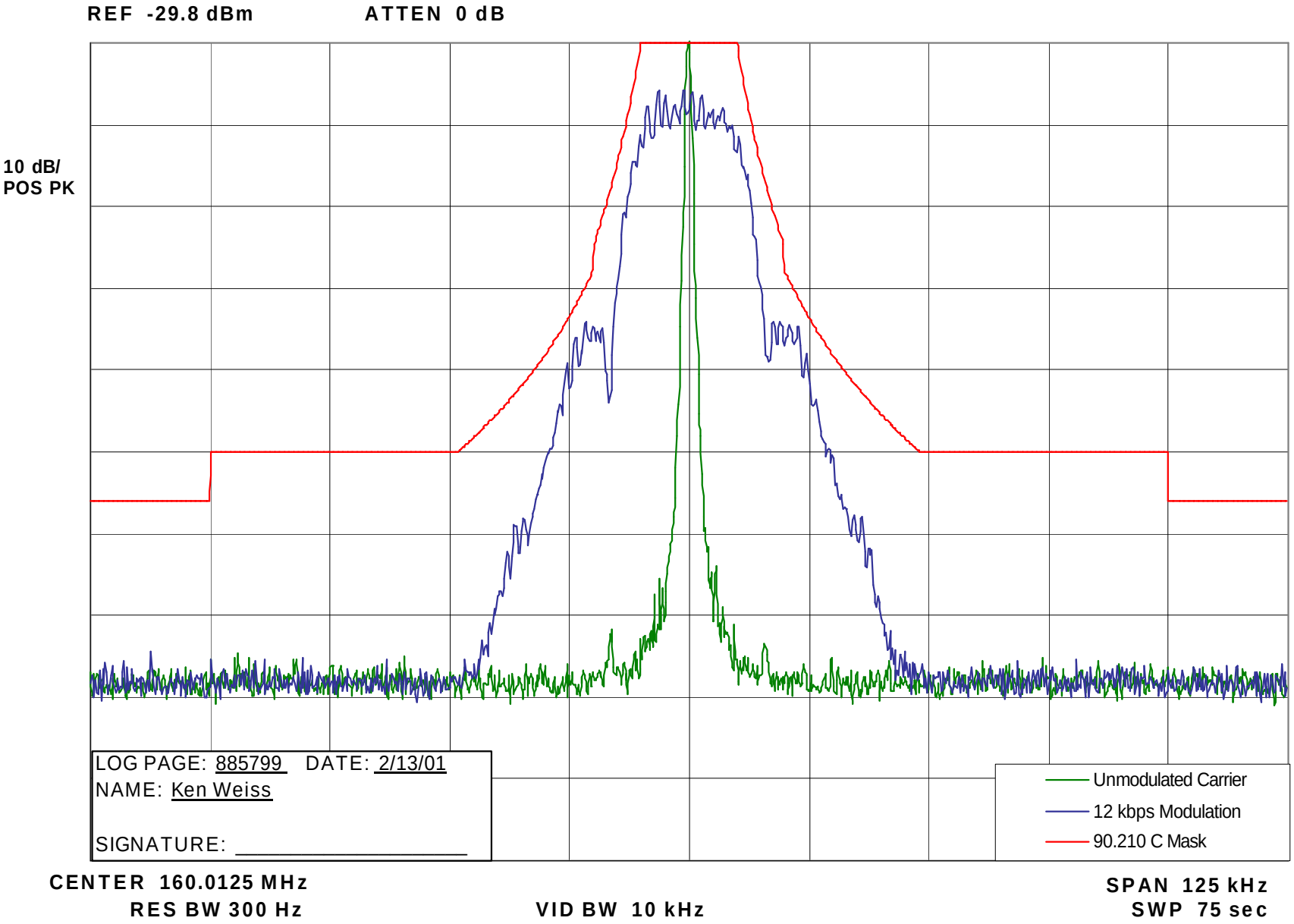
Test Procedure:

1) Key the station with no modulation to obtain the unmodulated carrier reference level on the analyzer. Use the analyzer controls to set this reference to a full-scale reference line. Store this analyzer trace in trace A.
2) Setup the station for 12 kbps random data modulation, key the station with this modulation.
3) Allow the analyzer to sweep, and record the resultant emission levels in trace B.
4) Plot the resulting two analyzer traces. The occupied bandwidth mask is then added along with additional labeling as appropriate.

Occupied Bandwidth - 25 kHz Channels - Carrier with 12 kbps Digitized Voice - With Booster Amplifier



Occupied Bandwidth - 25 kHz Channels - Carrier with 12 kbps Digitized Voice - Without Booster Amplifier



OCCUPIED BANDWIDTH

Modulation Type: Carrier with 9600 bps Digitized Voice / Data
Emission Designator: 8K10F1E
Channelization: 12.5 kHz

SPECIFICATION REQUIREMENT:

§ 90.210 D-Mask Emission limits:

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

(2) On any frequency from the center of the authorized bandwidth (f_0) to 5.625 kHz removed from f_0: *Zero dB.*

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: *At least 7.27 *(f_d –2.88 kHz) dB.*

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: *At least 50 plus 10 $\log_{10}$(P) decibels or 70 decibels (whichever is the lesser attenuation).*

(4) The reference level for showing compliance with the emission mask shall be established using a resolution bandwidth sufficiently wide to capture the true peak emission of the equipment under test.

Necessary Bandwidth Calculation:
The necessary bandwidth of the modulation signal per the formulas defined in 47 CFR 2.202 (b) is as follows:

Max Mod Freq, M	*Symbol Deviation, D*	*Mod Index, K*	*2M+2KD*	*Nec BW*
2.4 kHz	1.8 kHz	.917	8.10 kHz	8K10

Measurement Setting and Procedure, per TIA/EIA 603:

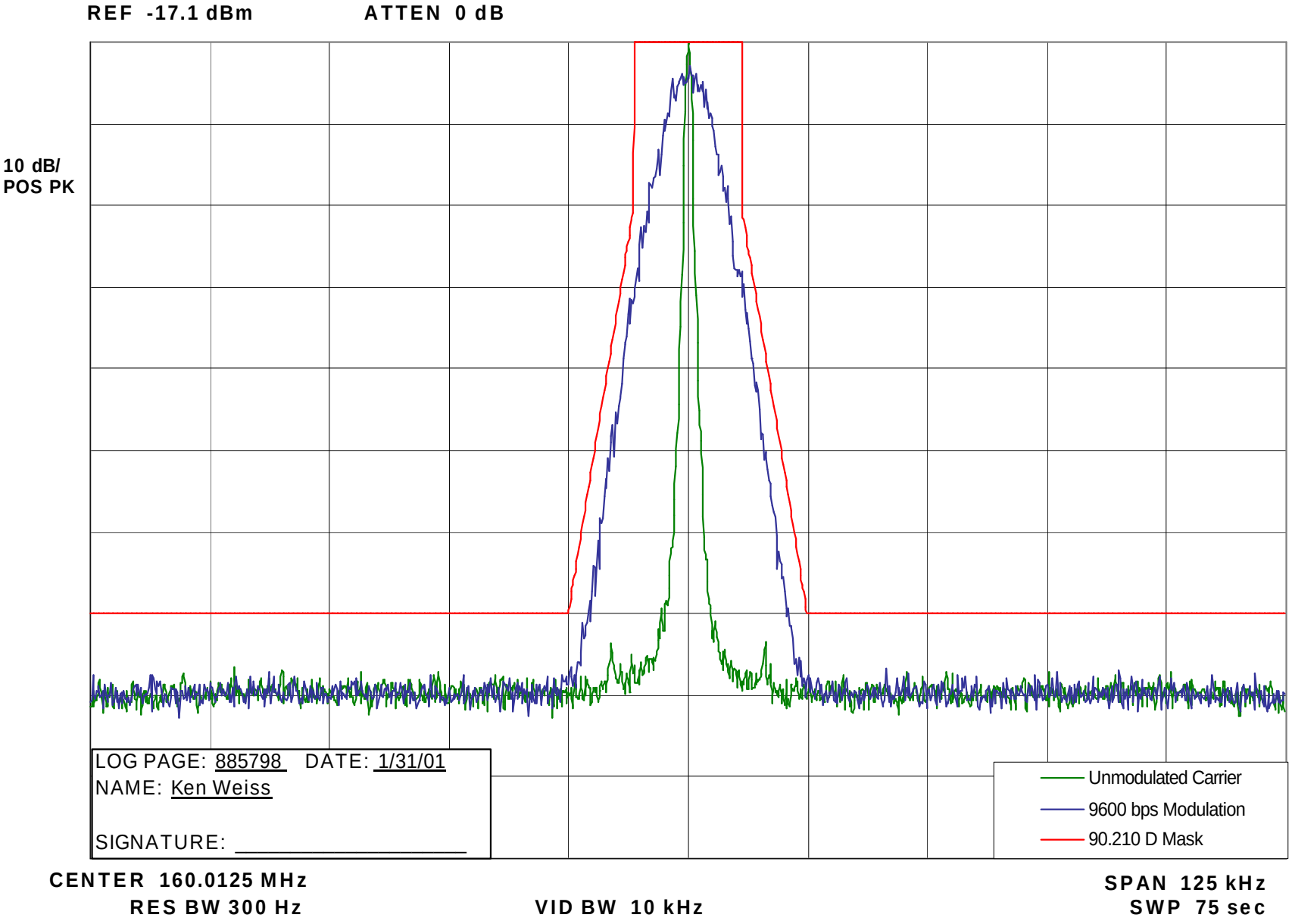
Analyzer Settings:

Horizontal:	12 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	75 Seconds (<2000 Hz / Second)	Span:	120 kHz
Detector Mode:	Positive Peak		

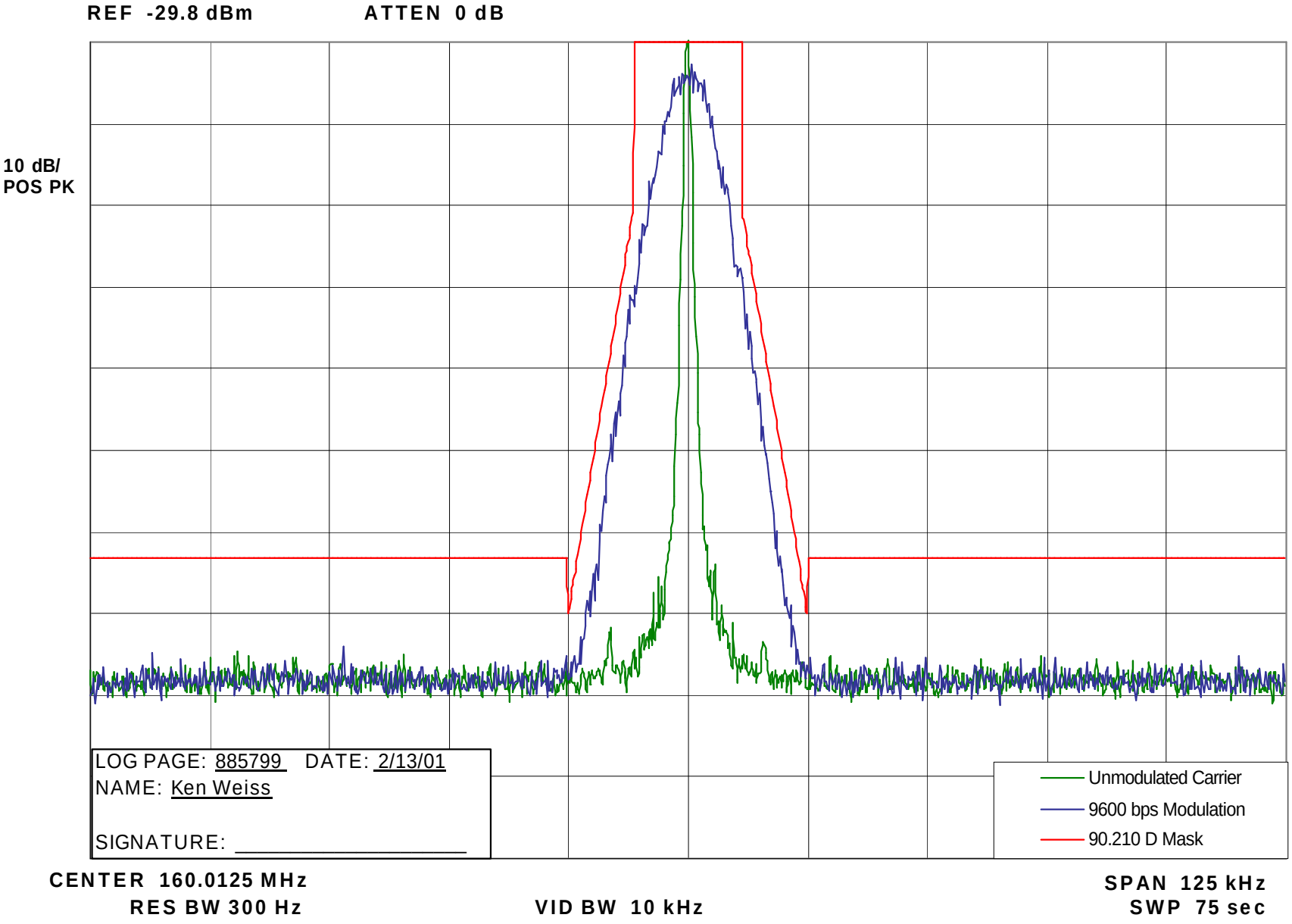
Test Procedure:

1) Key the station with no modulation to obtain the unmodulated carrier reference level on the analyzer. Use the analyzer controls to set this reference to a full-scale reference line. Store this analyzer trace in trace A.
2) Setup the station for 9600 bps random data modulation, key the station with this modulation.
3) Allow the analyzer to sweep, and record the resultant emission levels in trace B.
4) Plot the resulting two analyzer traces. The occupied bandwidth mask is then added along with additional labeling as appropriate.

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 9600 bps Digitized Voice - With Booster Amplifier



Occupied Bandwidth - 12.5 kHz Channels - Carrier with 9600 bps Digitized Voice - Without Booster Amplifier



CONDUCTED SPURIOUS EMISSIONS

SPECIFICATION REQUIREMENT:

Reference: Part 90.210 (Emission Mask B, C)

For transmitters operating on 25 kHz channels, that are equipped with an audio low pass filter (Mask B) or that are not equipped with an audio low pass filter (Mask C), the power of any emission must be below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: *at least 43 plus 10 log_{10}(P) dB*.

For this transmitter operating at the full power setting of 350 Watts, this specification limit is: *-68.4 dBC*.

For this transmitter operating at the low power setting of 125 Watts, this specification limit is: *-64.0 dBC.*

Reference: Part 90.210 (Emission Mask D)

For transmitters designed to operate on 12.5 kHz channels, the power of any emission must be below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz, the lesser attenuation of: *at least 50 plus 10 log_{10}(P) or 70 dB*.

For this transmitter operating at the full power setting of 350 Watts, this specification limit is: *-70.0 dBC*.

For this transmitter operating at the low power setting of 125 Watts, this specification limit is: *-70.0 dBC*.

Modulation: Tone modulation per TIA

Carrier Frequency: Carrier frequencies at the low, middle and high end of the operating band 150-174 MHz were measured.

SPURIOUS EMISSION PLOTS:

EXHIBIT	DESCRIPTION
11F-1	Conducted Spurious Emissions, Harmonics, Power Output at 350 Watts
11F-2	Conducted Spurious Emissions, Harmonics, Power Output at 125 Watts
11F-3	Conducted Spurious Emissions, Close-In, Power Output at 350 Watts, 162 MHz
11F-4	Conducted Spurious Emissions, Close-In, Power Output at 125 Watts, 162 MHz

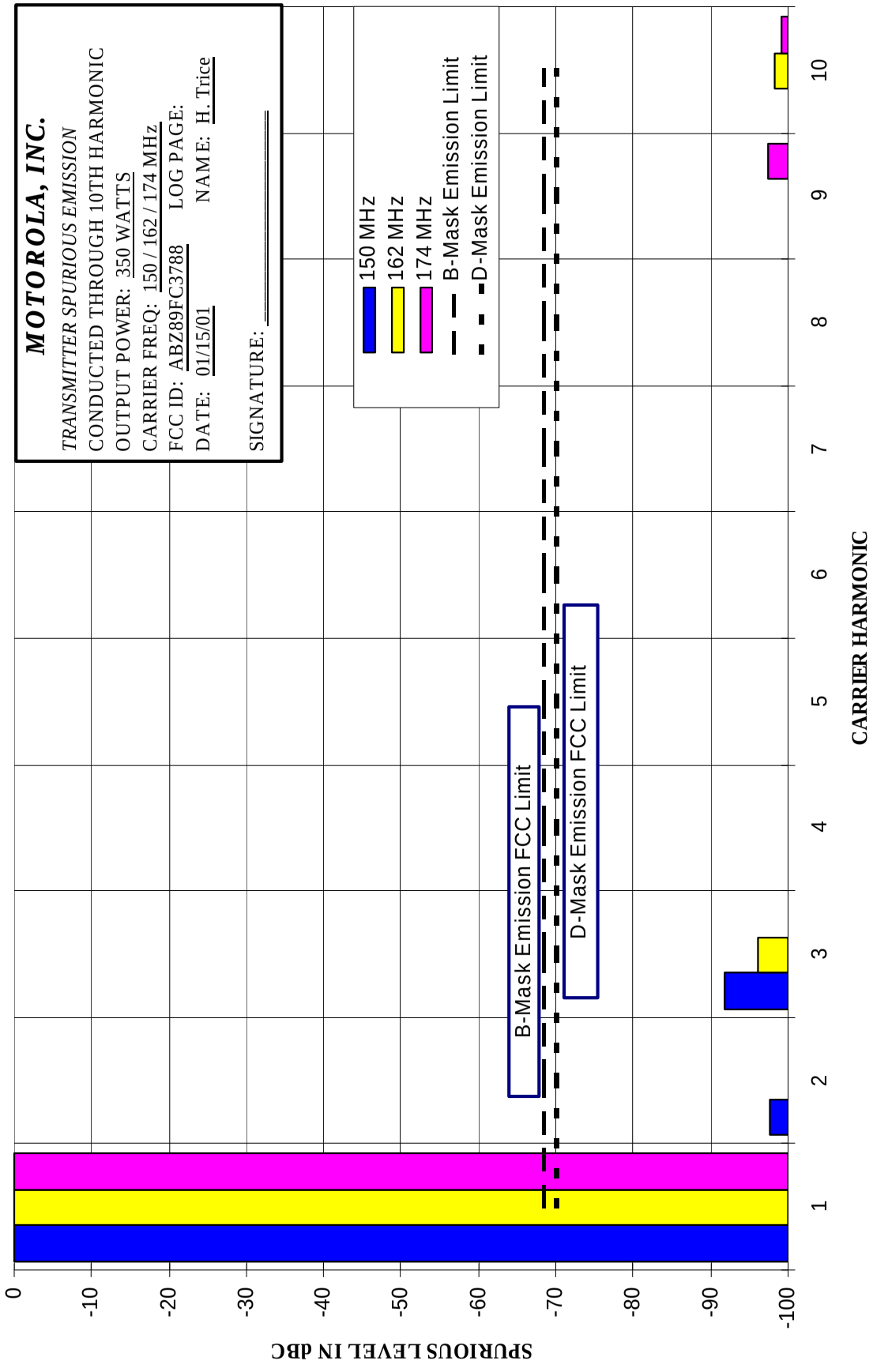


EXHIBIT 11F-1

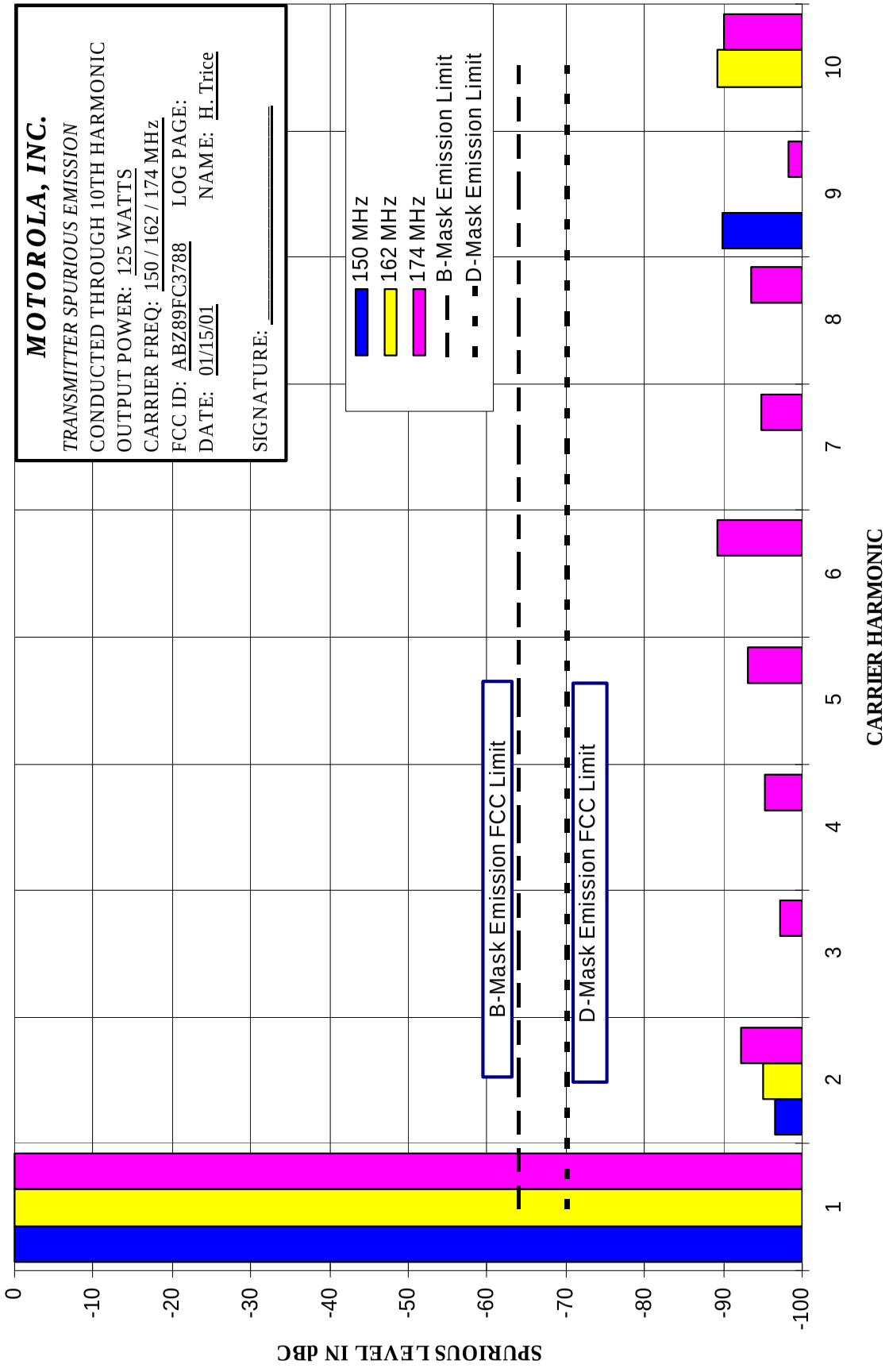
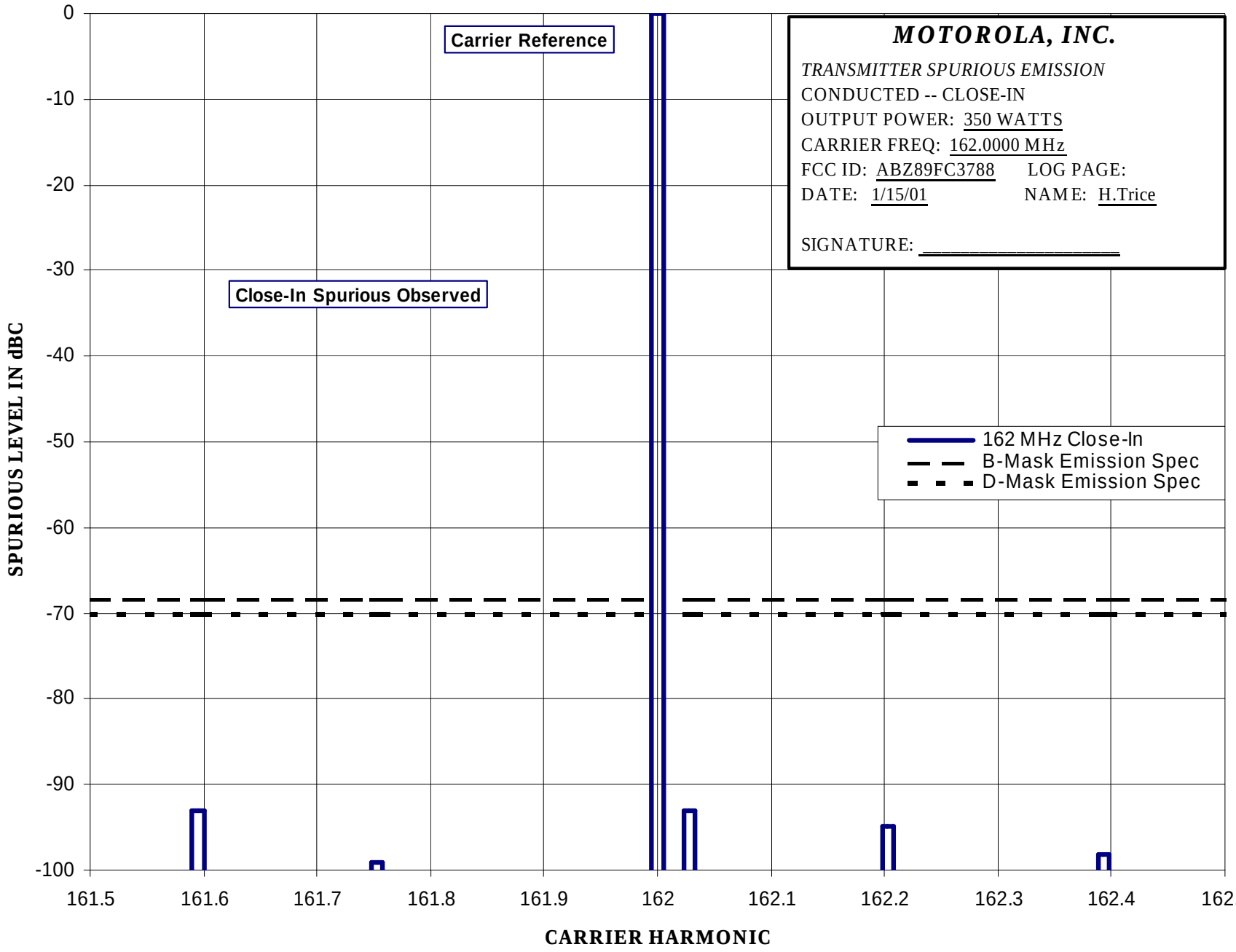


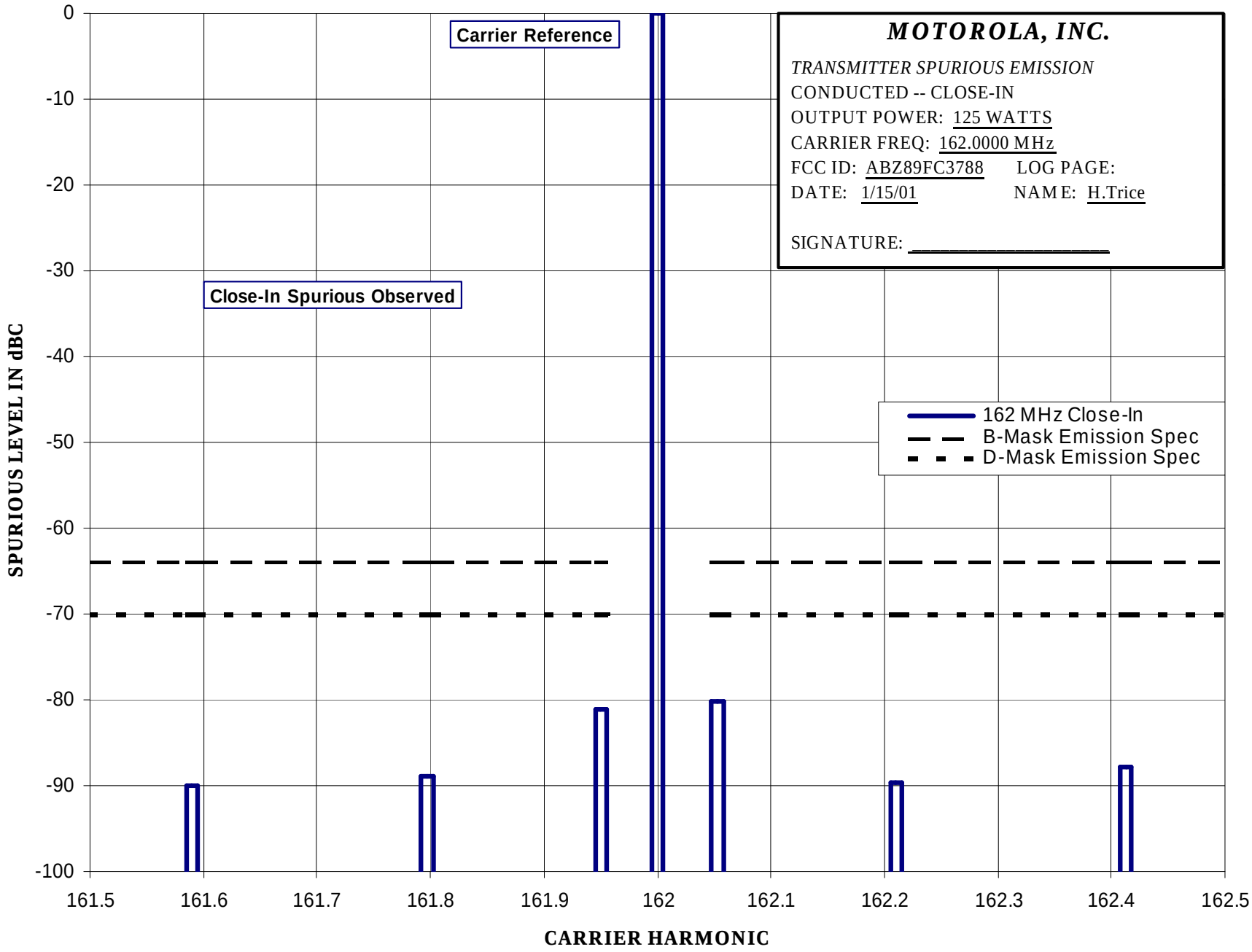
EXHIBIT 11F-2

APPLICANT: MOTOROLA, INC.



EQUIPMENT TYPE: ABZ89FC3788

EXHIBIT 11F-3


MOTOROLA, INC.
TRANSMITTER SPURIOUS EMISSION
CONDUCTED -- CLOSE-IN
OUTPUT POWER: 125 WATTS
CARRIER FREQ: 162.0000 MHz
FCC ID: ABZ89FC3788 LOG PAGE:
DATE: 1/15/01 NAME: H.Trice
SIGNATURE: _____
Carrier Reference
Close-In Spurious Observed
162 MHz Close-In
B-Mask Emission Spec
D-Mask Emission Spec
SPURIOUS LEVEL IN dBC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
161.5
161.6
161.7
161.8
161.9
162
162.1
162.2
162.3
162.4
162.5
CARRIER HARMONIC

RADIATED SPURIOUS EMISSIONS

SPECIFICATION REQUIREMENT:

Reference: Part 90.210 (Emission Mask B, C)

For transmitters operating on 25 kHz channels, that are equipped with an audio low pass filter (Mask B) or that are not equipped with an audio low pass filter (Mask C), the power of any emission must be below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: *at least 43 plus 10 log_{10}(P) dB*.

For this transmitter operating at the full power setting of 350 Watts, this specification limit is: *-68.4 dBC*.

For this transmitter operating at the low power setting of 125 Watts, this specification limit is: *-64.0 dBC.*

Reference: Part 90.210 (Emission Mask D)

For transmitters designed to operate on 12.5 kHz channels, the power of any emission must be below the unmodulated carrier power (P) as follows:

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz, the lesser attenuation of: *at least 50 plus 10 log_{10}(P) or 70 dB*.

For this transmitter operating at the full power setting of 350 Watts, this specification limit is: *-70.0 dBC*.

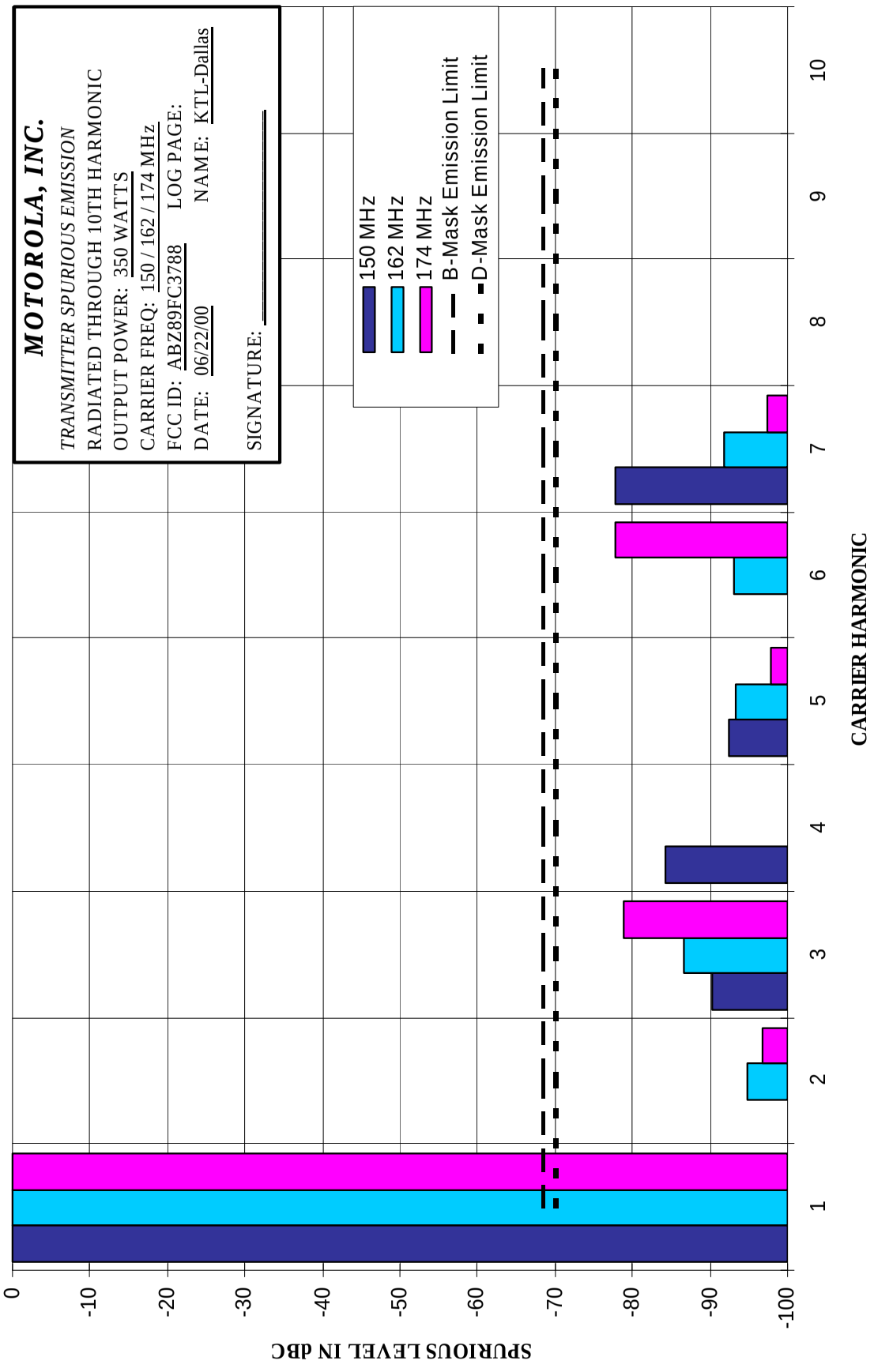
For this transmitter operating at the low power setting of 125 Watts, this specification limit is: *-70.0 dBC*.

Modulation: Tone modulation per TIA

Carrier Frequency: Carrier frequencies at the low end, middle and high end of the operating band 150-174 MHz were measured.

SPURIOUS EMISSION PLOTS:

EXHIBIT	DESCRIPTION
11G-1	Radiated Spurious Emissions, Power Output at 350 Watts


MOTOROLA, INC.
TRANSMITTER SPURIOUS EMISSION
RADIATED THROUGH 10TH HARMONIC
OUTPUT POWER: 350 WATTS
CARRIER FREQ: 150 / 162 / 174 MHz
FCC ID: ABZ89FC3788 LOG PAGE:
DATE: 06/22/00 NAME: KTL-Dallas
SIGNATURE:
150 MHz
162 MHz
174 MHz
B-Mask Emission Limit
D-Mask Emission Limit
SPURIOUS LEVEL IN dBC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
1
2
3
4
5
6
7
8
9
10
CARRIER HARMONIC