

Report on Test Measurements*Measurements Report*

The measurement report shows compliance information against the pertinent technical standards. Each section of the report contains either verbiage or graphs which show compliance to applicable standards as required. Each section also explains testing method and indicates what the applicable specification is.

A list of test equipment for all sections, and certification signoff page are included at the end of the measurement report.

SUBMITTED MEASURED DATA – INDEX**EXHIBIT DESCRIPTION**

- E1-1 RF Output-Data
- E1-2 Audio Frequency Response – Modulation Characteristics: Setup, Specifications, Index
 - E1-2.1 Audio Frequency Response – Modulation Characteristics, 25 kHz Channels, 800 MHz
 - E1-2.2 Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels, 800 MHz
 - E1-2.3 Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels, 900 MHz
- E1-3 Audio Modulation Limiting – Modulation Characteristics: Setup, Specifications, Index
 - E1-3.1 Audio Modulation Limiting – Modulation Characteristics, 25 kHz Channels, 800 MHz
 - E1-3.2 Audio Modulation Limiting – Modulation Characteristics, 12.5 kHz Channels, 800 MHz
 - E1-3.3 Audio Modulation Limiting – Modulation Characteristics, 12.5 kHz Channels, 900 MHz
- E1-4 Occupied Bandwidth: Setup, Specifications, and Index
 - Measurements for 25 kHz Channels, 800 MHz Operation:
 - E1-4.1 Carrier with 2500 Hz Audio Tone, 800 MHz
 - E1-4.2 Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 800 MHz
 - E1-4.3 Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 800 MHz
 - Measurements for 12.5 kHz Channels, 800 MHz Operation:
 - E1-4.4 Carrier with 2500 Hz Audio Tone, 800 MHz
 - E1-4.5 Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 800 MHz
 - E1-4.6 Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 800 MHz
 - Measurements for 12.5 kHz Channels, 900 MHz Operation:
 - E1-4.8 Carrier with 2500 Hz Audio Tone, 900 MHz
 - E1-4.9 Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 900 MHz
 - E1-4.10 Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 900 MHz
 - E1-4.11 Carrier with Digitized Voice / Data, 800 MHz

Report on Test Measurements*Measurements Report*

SUBMITTED MEASURED DATA – INDEX (Continued)

EXHIBIT DESCRIPTION

E1-5 Conducted Spurious Emissions: Setup, Specifications, and Index
 Measurements for 800 MHz Operation:
E1-5.1 Conducted Spurious Emissions, Harmonics, Power 100 Watts, Across the Band, 800 MHz
E1-5.2 Conducted Spurious Emissions, Harmonics, Power 5 Watts, Across the Band, 800 MHz
E1-5.3 Conducted Spurious Emissions, Close-In, 200 MHz Span, Power Output at 100 Watts, 800 MHz
E1-5.4 Conducted Spurious Emissions, Close-In, 20 MHz Span, Power Output at 100 Watts, 800 MHz
 Measurements for 900 MHz Operation:
E1-5.5 Conducted Spurious Emissions, Harmonics, Power 100 Watts, Across the Band, 900 MHz
E1-5.6 Conducted Spurious Emissions, Harmonics, Power 5 Watts, Across the Band, 900 MHz
E1-5.7 Conducted Spurious Emissions, Close-In, 200 MHz Span, Power Output at 100 Watts, 900 MHz
E1-5.8 Conducted Spurious Emissions, Close-In, 20 MHz Span, Power Output at 100 Watts, 900 MHz

E1-6 Radiated Spurious Emissions: Setup, Specifications, and Index
 Measurements for 800 MHz Operation:
E1-6.1 Radiated Spurious Emissions, Harmonics, Power 100 Watts, Middle of Band, 800 MHz
E1-6.2 Radiated Spurious Emissions, Harmonics, Power 8 Watts, Middle of Band, 800 MHz
 Measurements for 900 MHz Operation:
E1-6.3 Radiated Spurious Emissions, Harmonics, Power 100 Watts, Middle of Band, 900 MHz
E1-6.4 Radiated Spurious Emissions, Harmonics, Power 8 Watts, Middle of Band, 900 MHz

E1-7 Frequency Stability: Setup, Specifications, and Index
E1-7.1 Frequency Stability Vs Temperature
E1-7.2 Frequency Stability Vs Voltage

E1-11 Test Equipment Used

E1-12 Statement of Certification

Report on Test Measurements

RF Power Output Data

The RF power output was measured with the indicated voltage applied to and current into the final RF amplifying device. The DC current indicated is the total for the final RF amplifier stage, consisting of four parallel power transistors.

Analog Voice Frequency Modulation Mode:

Measured RF output	<u>100</u>	Watts
DC Voltage	<u>28.2</u>	Volts
DC Current	<u>9.5</u>	Amperes
Input power for final RF amplifying device(s)	<u>268</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	Volts AC
Minimum Measured RF output	<u>8</u>	Watts, Average
Normal DC Voltage	<u>28.5</u>	Volts
Normal DC Current	<u>2.8</u>	Amperes
Input power for final RF amplifying device(s)	<u>80</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	Volts AC

Digital 4-Level Frequency Shift Key Modulation Mode:

Measured RF output	<u>100</u>	Watts
DC Voltage	<u>28.2</u>	Volts
DC Current	<u>9.5</u>	Amperes
Input power for final RF amplifying device(s)	<u>268</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	Volts AC
Minimum Measured RF output	<u>8</u>	Watts, Average
Normal DC Voltage	<u>28.5</u>	Volts
Normal DC Current	<u>2.8</u>	Amperes
Input power for final RF amplifying device(s)	<u>80</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	Volts AC

Report on Test Measurements

*Audio Frequency Response*Specification Requirement per TIA 603:

Audio Frequency Response, 25 kHz Channels: The audio frequency response from 300 Hz to 3000 Hz shall not vary more than +1 dB or -3 dB from a true 6 dB per octave pre-emphasis characteristic as referenced to the 1000 Hz level, with an additional 6 dB per octave attenuation allowed from 500 Hz to 300 Hz, and an additional 6 dB per octave attenuation is allowed from 2500 Hz to 3000 Hz in equipment operating in the 25 MHz to 869 MHz range.

Audio Frequency Response, 12.5 kHz Channels: The audio frequency response from 300 Hz to 3000 Hz shall not vary more than +1 dB or -3 dB from a true 6 dB per octave pre-emphasis characteristic as referenced to the 1000 Hz level, with an additional 6 dB per octave attenuation allowed from 500 Hz to 300 Hz. An additional 6 dB per octave rolloff is allowed from 2300 Hz to 2700 Hz, and an additional 12 dB per octave is allowed from 2700 Hz to 3000 Hz in equipment operating in the 896 MHz to 940 MHz range or for 12.5 kHz channel operation.

Modulation: Audio Test Tone

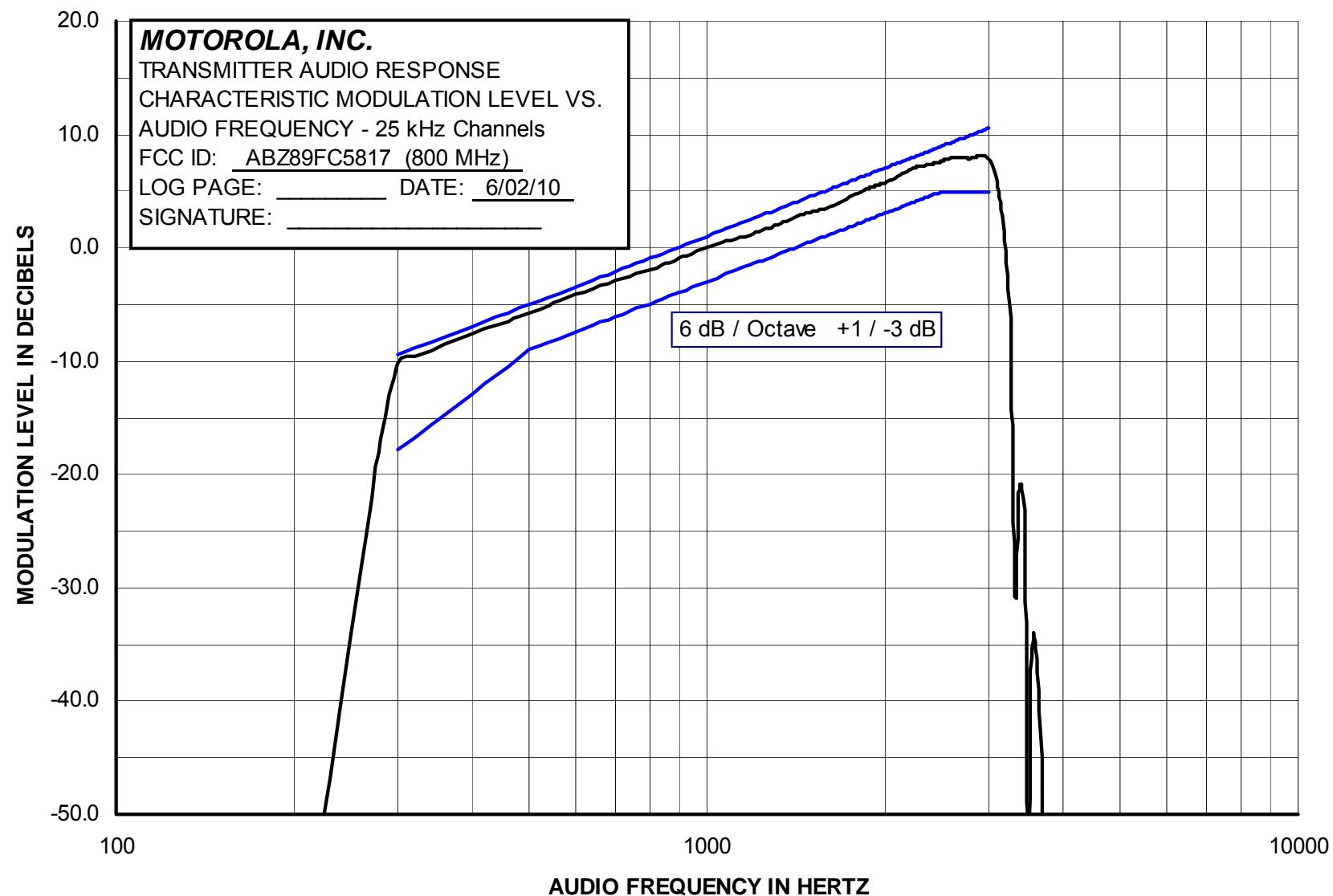
Carrier Frequency: For 800 MHz operation, a carrier at 860.0125 MHz was measured. This frequency is near the center of the operating band 851-870 MHz.
For 900 MHz operation, a carrier at 938.0125 MHz was measured. This frequency is near the center of the operating band 935-941 MHz

EXHIBIT	DESCRIPTION
E1-2.1	Audio Frequency Response – Modulation Characteristics, 25 kHz Channels, 800 MHz
E1-2.2	Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels, 800 MHz
E1-2.3	Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels, 900 MHz

The specification limit is shown on the response plots

Report on Test Measurements

Audio Frequency Response – 25 kHz Channels – 800 MHz Operation



APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Audio Frequency Response – 12.5 kHz Channels – 800 MHz Operation

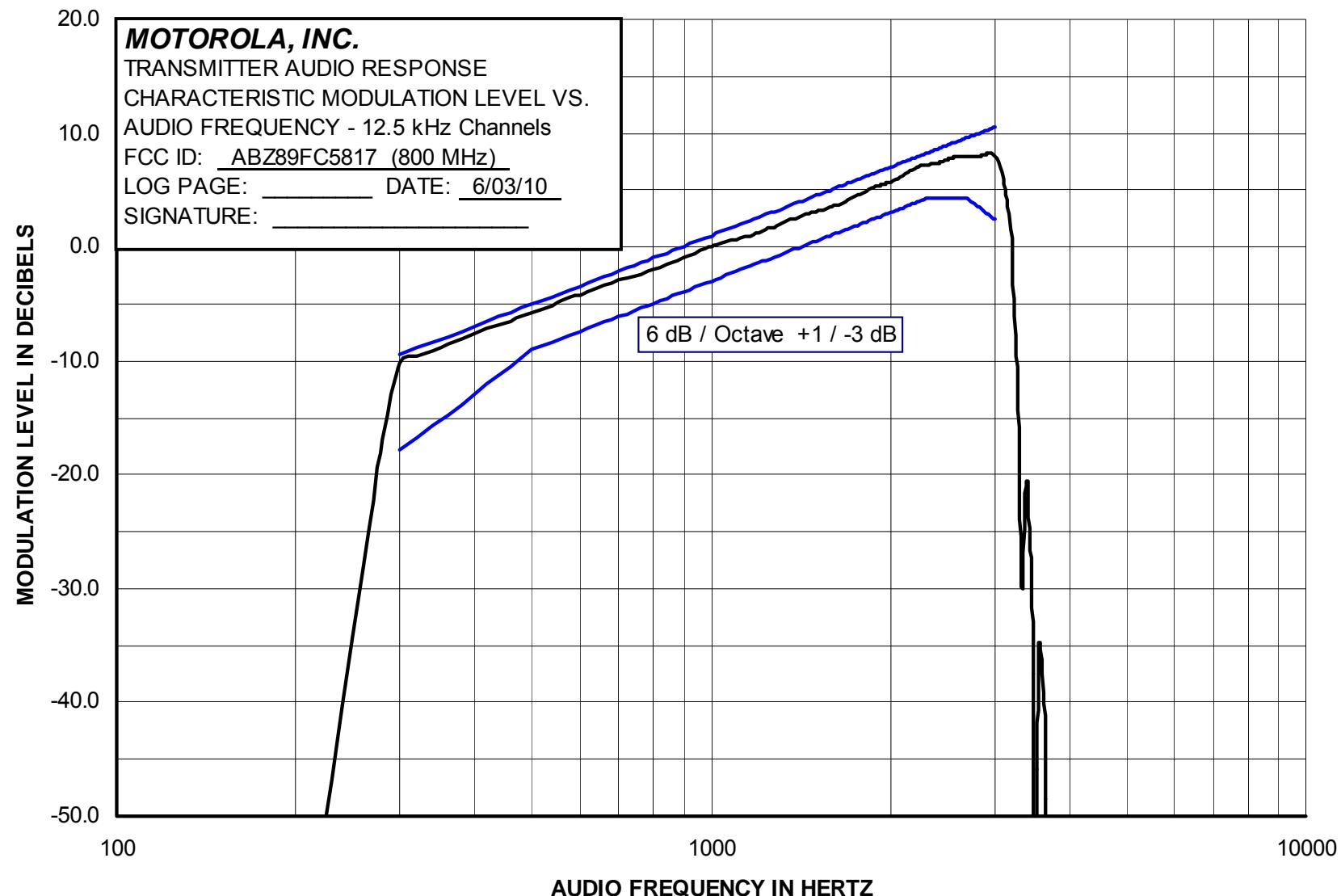


EXHIBIT E1-2.2

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Audio Frequency Response – 12.5 kHz Channels – 900 MHz Operation

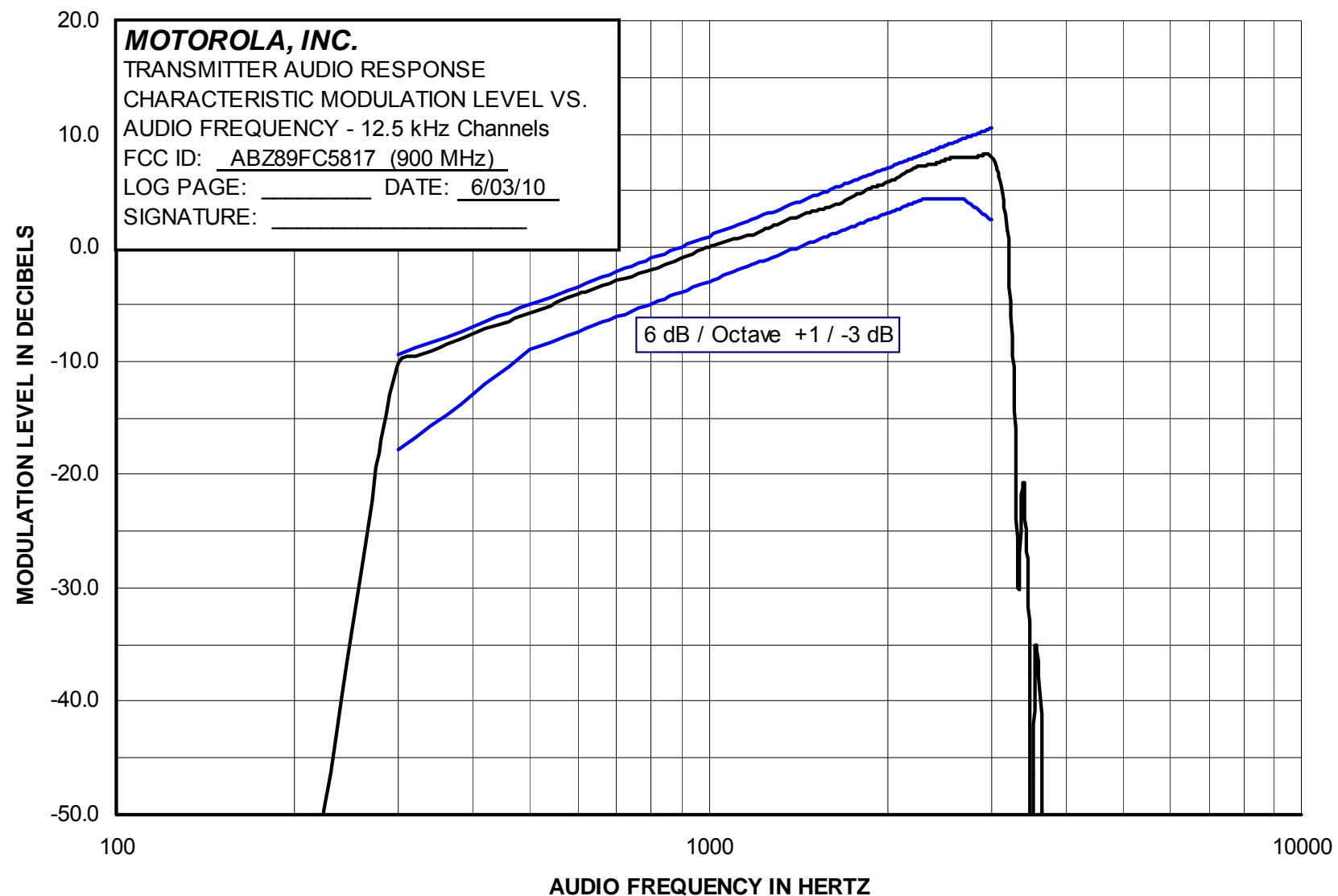


EXHIBIT E1-2.3

Report on Test Measurements*Modulation Limiting*Specification Requirement per TIA 603:

Modulation Limiting, 25 kHz Channels: The maximum instantaneous peak and steady state deviations shall not exceed the rated system deviation of +/- 5 kHz at any audio frequency or change in level as specified in the method of measurement.

The minimum value of modulation limiting shall be at least 60% of the rated system deviation, or 3 kHz.

Modulation Limiting, 12.5 kHz Channels: The maximum instantaneous peak and steady state deviations shall not exceed the rated system deviation of +/- 2.5 kHz at any audio frequency or change in level as specified in the method of measurement.

The minimum value of modulation limiting shall be at least 60% of the rated system deviation, or 1.5 kHz.

Modulation: Audio Test Tone, Varying Frequency between 300 Hz and 3000 Hz

Carrier Frequency: For 800 MHz operation, a carrier at 860.0125 MHz was measured. This frequency is near the center of the operating band 851-870 MHz.
For 900 MHz operation, a carrier at 938.0125 MHz was measured. This frequency is near the center of the operating band 935-941 MHz

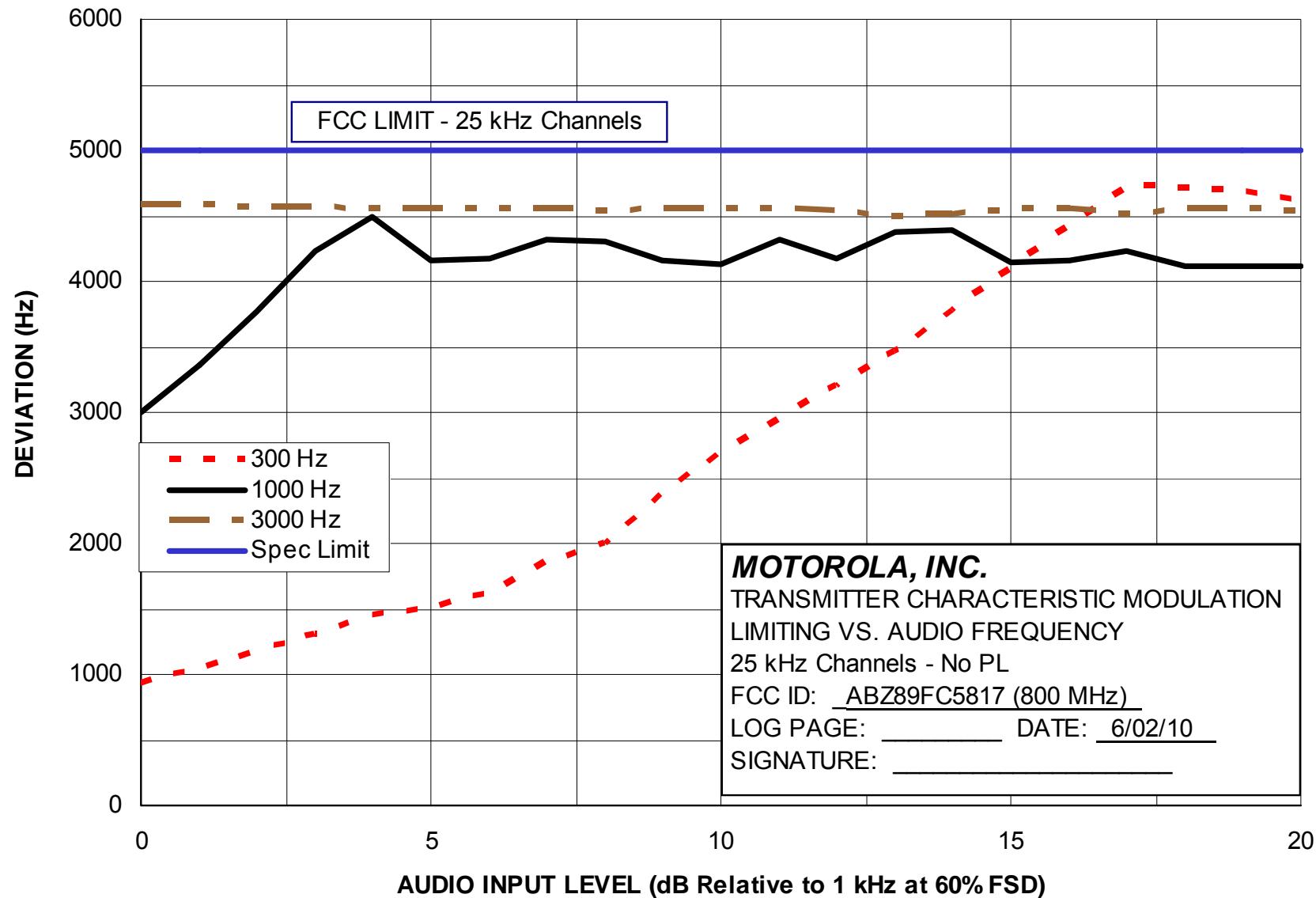
Modulation Limiting Response Plots:

<u>EXHIBIT</u>	<u>DESCRIPTION</u>
E1-3.1	Audio Modulation Limiting – Modulation Characteristics, 25 kHz Channels, 800 MHz
E1-3.2	Audio Modulation Limiting – Modulation Characteristics, 12.5 kHz Channels, 800 MHz
E1-3.3	Audio Modulation Limiting – Modulation Characteristics, 12.5 kHz Channels, 900 MHz

The specification limit is shown on the response plots

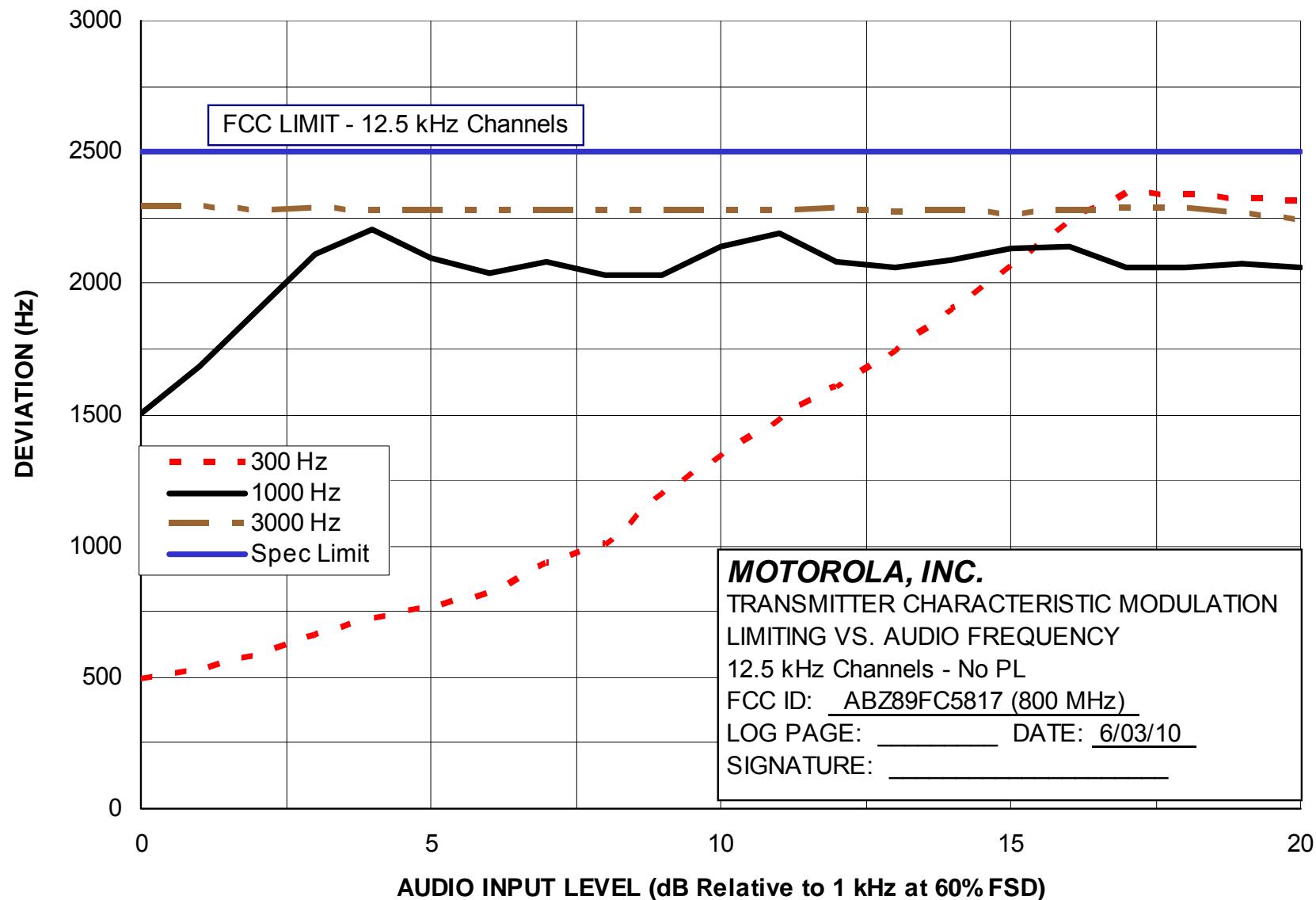
Modulation Limiting – 25 kHz Channels – 800 MHz Operation

Report on Test Measurements



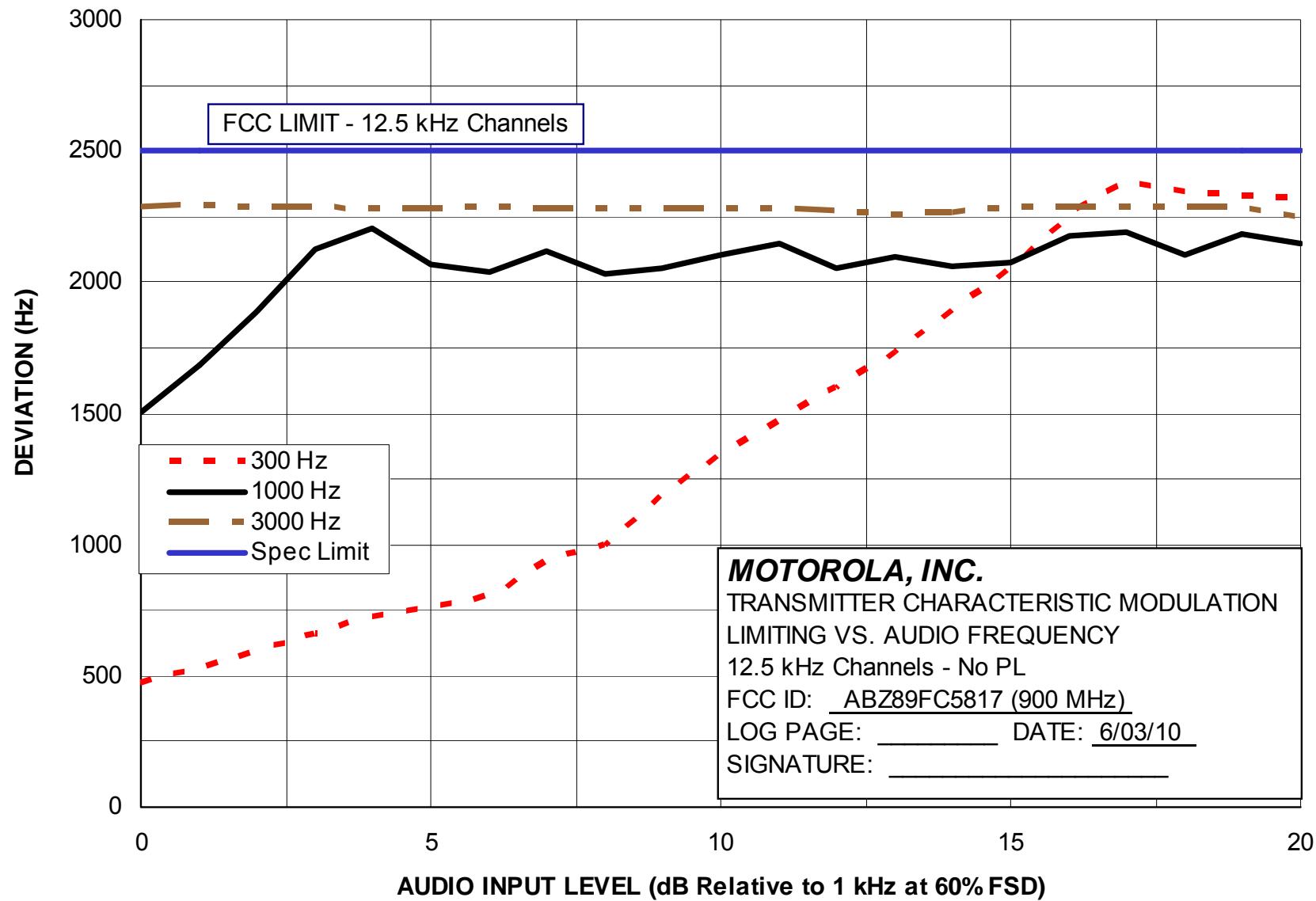
Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – 800 MHz Operation



Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – 900 MHz Operation



Report on Test Measurements

Occupied Bandwidth – Analog Voice Frequency Modulation, 25 kHz Channel Spacing – 800 MHz Operation
 The exhibits in this section show occupied bandwidth plots for analog voice modulation. Data is shown with the modulating audio tone itself, the tone plus Private Line (PL) sub-audible tone signaling, and tone plus Digital Private Line (DPL) sub-audible signaling.

The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Type: Analog Voice
 Emission Designator: 16K0F3E
 Channelization: 25 kHz
 Deviation Limit: ± 5.0 kHz Max
 Power Setting: 100 Watts

Specification Requirement § 90.210(b) 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:

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

Emission Measurement Analyzer Settings:

Horizontal:	12.5 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	3 kHz
Sweep Time:	72 Seconds (<2000 Hz / Second)	Span:	125 kHz
Detector Mode:	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 analyzer trace. The occupied bandwidth mask is then added along with additional labeling as appropriate.

EXHIBIT	DESCRIPTION
E1-4.1	Carrier with 2500 Hz Audio, 25 kHz Channels, 800 MHz
E1-4.2	Carrier with 2500 Hz Audio and Private Line (PL) Signaling, 25 kHz Channels, 800 MHz
E1-4.3	Carrier with 2500 Hz Audio and Digital Private Line (DPL) Signaling, 25 kHz Channels, 800 MHz

Report on Test Measurements

Occupied Bandwidth – Analog Voice, Digitized Voice / Data Modulation, 12.5 kHz Channels – 800 MHz Operation
 The exhibits in this section show occupied bandwidth plots for analog voice modulation. Data is shown with the modulating audio tone itself, the tone plus Private Line (PL) sub-audible tone signaling, and tone plus Digital Private Line (DPL) sub-audible signaling.

There is also an exhibit showing the occupied bandwidth plot for digitized voice or data modulation. The signaling utilized is 4-level frequency shift keying of the carrier frequency.

The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Type:	Analog Voice	Digitized Voice, Data
Emission Designator:	11K0F3E	7K60FXE, 7K60FXD
Channelization:	12.5 kHz	12.5 kHz
Deviation Limit:	±2.5 kHz Max	
Power Setting:	100 Watts	100 Watts

Specification Requirement § 90.210(d) Emission Limits:

Emission Mask D. 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 log₁₀(P) dB or 70 dB, 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. In order to show compliance with the emissions mask up to and including 50 kHz removed from the edge of the authorized bandwidth, adjust the resolution bandwidth to 100 Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps must be measured to ensure that the emission profile is developed.

Necessary Bandwidth Calculation (Analog Emission):

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

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

Necessary Bandwidth Calculation (Digital Emission): An occupied bandwidth of 7.60 kHz was measured for this emission, per 2.202 paragraph (a) of the Rules and Regulations, as that bandwidth which contains 99% of the power in the transmitted signal. For this system, the necessary bandwidth has been chosen to be the same as the occupied bandwidth, thereby per paragraph (b) (2), the necessary bandwidth is 7K60.

Measurement Procedure and Instrument Settings:

Emission Measurement Analyzer Settings:

Horizontal:	12.5 kHz per Division	Resolution Bandwidth:	100 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	72 Seconds (<2000 Hz / Second)	Span:	125 kHz
Detector Mode:	Peak		

Report on Test Measurements*Occupied Bandwidth –12.5 kHz Channel Spacing – 800 MHz Operation (continued)*Test Procedure (Analog Voice):

- 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 analyzer trace. The occupied bandwidth mask is then added along with additional labeling as appropriate.

Test Procedure (Digitized Voice or Data):

- 1) Adjust the spectrum analyzer per the values specified in the Emission Measurement Analyzer Settings.
- 2) Modulate the transmitter with the appropriate signaling pattern, (pseudorandom data) and key the transmitter at the full power rating. Use the analyzer controls to set this signal to the full-scale reference line. Allow the analyzer to sweep fully and store the sweep.
- 3) Use the band power marker function of the spectrum analyzer to measure the power of the carrier in a 12.5 kHz bandwidth.
- 4) Use the carrier power value from the previous step to generate the emission mask limit.
- 5) Plot the resulting analyzer trace and the emission mask limit, add text and labeling as appropriate.

EXHIBIT	DESCRIPTION
E1-4.4	Carrier with 2500 Hz Audio, 12.5 kHz Channels, 800 MHz
E1-4.5	Carrier with 2500 Hz Audio and Private Line (PL) Signaling, 12.5 kHz Channels, 800 MHz
E1-4.6	Carrier with 2500 Hz Audio and Digital Private Line (DPL) Signaling, 12.5 kHz Channels, 800 MHz
E1-4.7	Carrier with Digitized Voice / Data, 12.5 kHz Channels, 800 MHz

Report on Test Measurements

Occupied Bandwidth – Analog Voice, Digitized Voice / Data Modulation, 12.5 kHz Channels – 900 MHz Operation
 The exhibits in this section show occupied bandwidth plots for analog voice modulation. Data is shown with the modulating audio tone itself, the tone plus Private Line (PL) sub-audible tone signaling, and tone plus Digital Private Line (DPL) sub-audible signaling.

There is also an exhibit showing the occupied bandwidth plot for digitized voice or data modulation. The signaling utilized is 4-level frequency shift keying of the carrier frequency.

The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Type:	Analog Voice	Digitized Voice, Data
Emission Designator:	11K0F3E	7K60FXE, 7K60FXD
Channelization:	12.5 kHz	12.5 kHz
Deviation Limit:	±2.5 kHz Max	
Power Setting:	100 Watts	100 Watts

Specification Requirement § 90.210(i) Emission Limits (Analog Voice):

Emission Mask I. For transmitters that are equipped with an audio low pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 6.8 kHz, but no more than 9.0 kHz: *At least 25 dB;*
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 9.0 kHz, but no more than 15 kHz: *At least 35 dB;*
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency of more than 15 kHz: *At least 43 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.*

Specification Requirement § 90.210(j) Emission Limits (Digitized Voice / Data):

Emission Mask J. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_{d,in}$ kHz) of more than 2.5 kHz, but no more than 6.25 kHz: *At least 53 log (f_d/2.5) dB;*
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_{d,in}$ kHz) of more than 6.25 kHz, but no more than 9.5 kHz: *At least 103 log (f_d/3.9) dB;*
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ($f_{d,in}$ kHz) of more than 9.5 kHz: *At least 157 log (f_d/5.3) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation.*

Necessary Bandwidth Calculation (Analog Emission):

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

Necessary Bandwidth Calculation (Digital Emission): An occupied bandwidth of 7.60 kHz was measured for this emission, per 2.202 paragraph (a) of the Rules and Regulations, as that bandwidth which contains 99% of the power in the transmitted signal. For this system, the necessary bandwidth has been chosen to be the same as the occupied bandwidth, thereby per paragraph (b) (2), the necessary bandwidth is 7K60.

Report on Test Measurements*Occupied Bandwidth – 12.5 kHz Channel Spacing – 900 MHz Operation (continued)*Measurement Procedure and Instrument Settings:Emission Measurement Analyzer Settings:

Horizontal:	12.5 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	10 kHz
Sweep Time:	72 Seconds (<2000 Hz / Second)	Span:	125 kHz
Detector Mode:	Peak		

Test Procedure (Analog Voice):

- 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 analyzer trace. The occupied bandwidth mask is then added along with additional labeling as appropriate.

Test Procedure (Digitized Voice or Data):

- 1) Adjust the spectrum analyzer per the values specified in the Emission Measurement Analyzer Settings.
- 2) Modulate the transmitter with the appropriate signaling pattern, (pseudorandom data) and key the transmitter at the full power rating. Use the analyzer controls to set this signal to the full-scale reference line. Allow the analyzer to sweep fully and store the sweep.
- 3) Use the band power marker function of the spectrum analyzer to measure the power of the carrier in a 12.5 kHz bandwidth.
- 4) Use the carrier power value from the previous step to generate the emission mask limit.
- 5) Plot the resulting analyzer trace and the emission mask limit, add text and labeling as appropriate.

EXHIBIT	DESCRIPTION
E1-4.8	Carrier with 2500 Hz Audio, 12.5 kHz Channels, 900 MHz
E1-4.9	Carrier with 2500 Hz Audio and Private Line (PL) Signaling, 12.5 kHz Channels, 900 MHz
E1-4.10	Carrier with 2500 Hz Audio and Digital Private Line (DPL) Signaling, 12.5 kHz Channels, 900 MHz
E1-4.11	Carrier with Digitized Voice / Data, 12.5 kHz Channels, 900 MHz

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 25 kHz Channels, 800 MHz Operation

Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio Tone - 16K0F3E

REF 50 dBm

ATTEN 20 dB

10 dB/
Peak

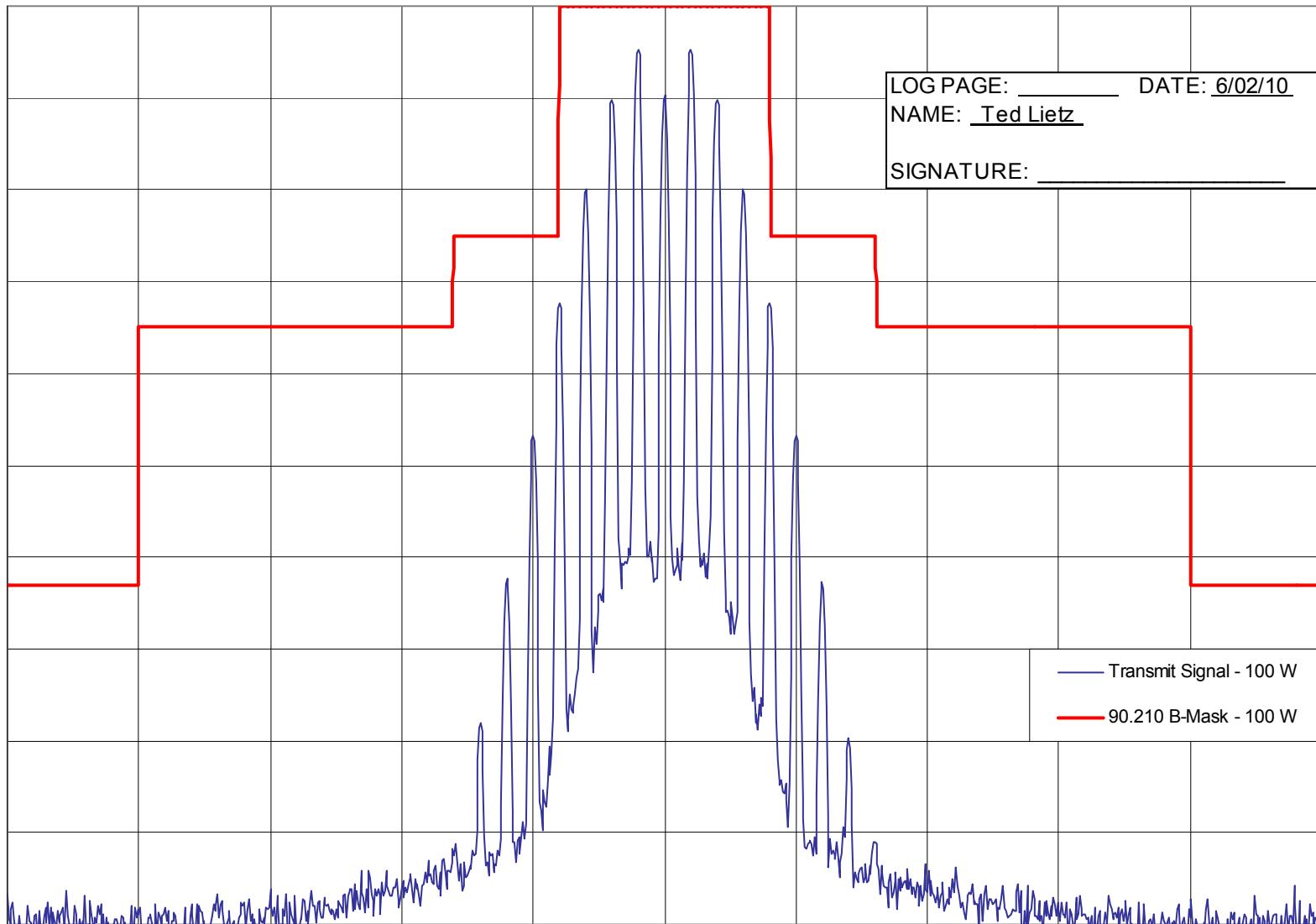


EXHIBIT E1-4.1

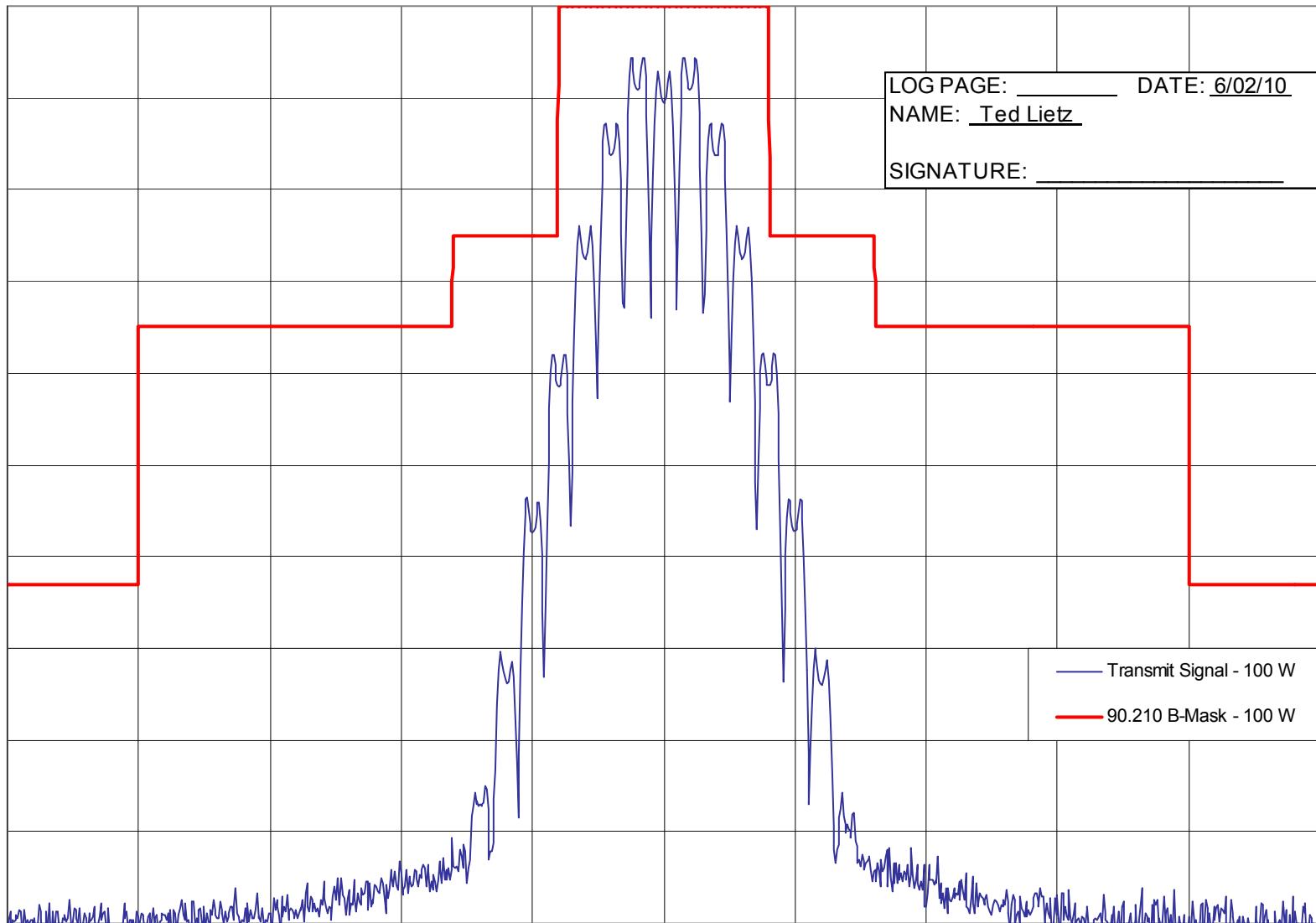
Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 25 kHz Channels, 800 MHz Operation

Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL - 16K0F3E

REF 50 dBm

ATTEN 20 dB

10 dB/
Peak

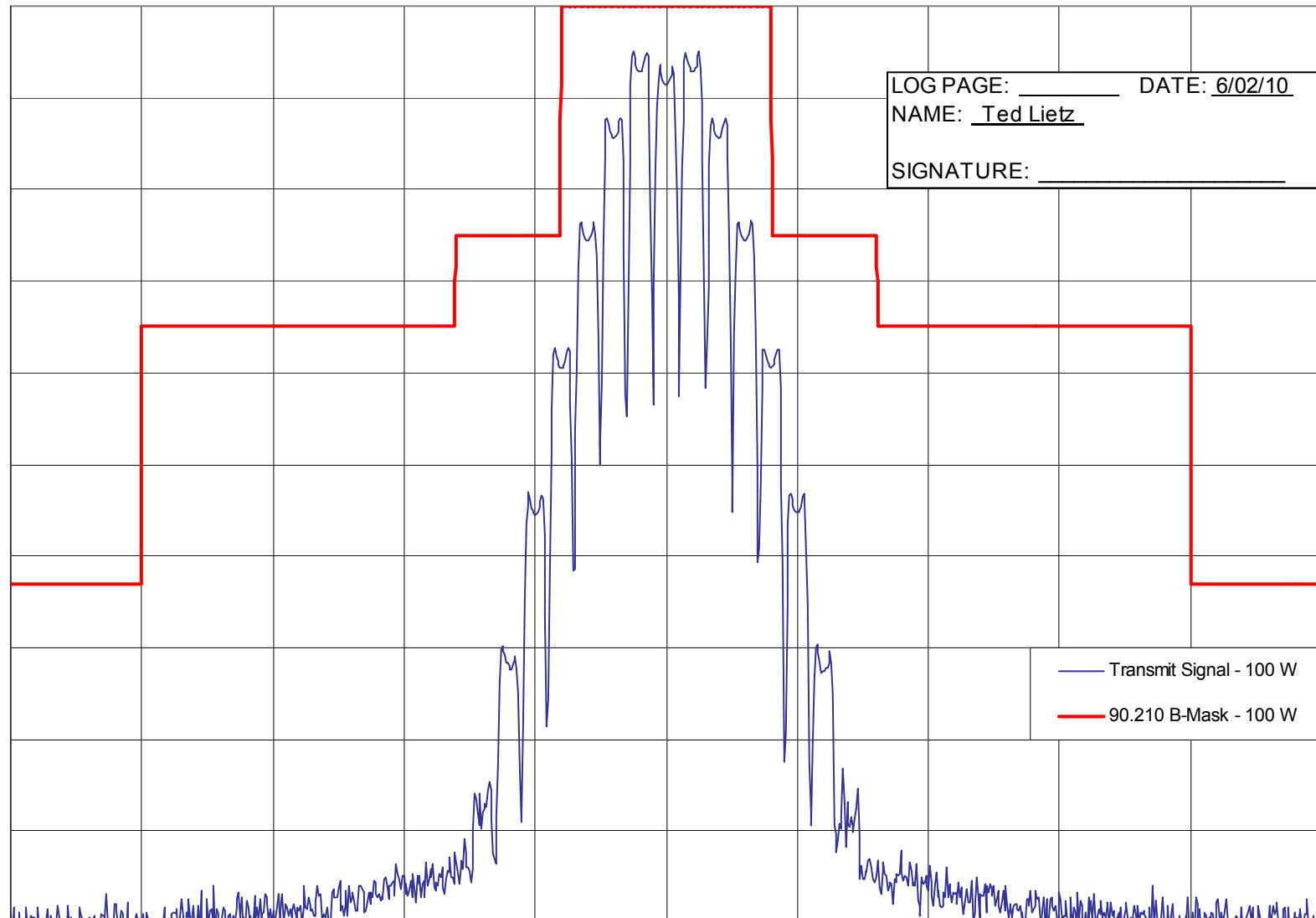
Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 25 kHz Channels, 800 MHz Operation

Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL - 16K0F3E

REF 50 dBm

ATTEN 20 dB

10 dB/
Peak

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels, 800 MHz Operation

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone - 11K0F3E

REF 50 dBm

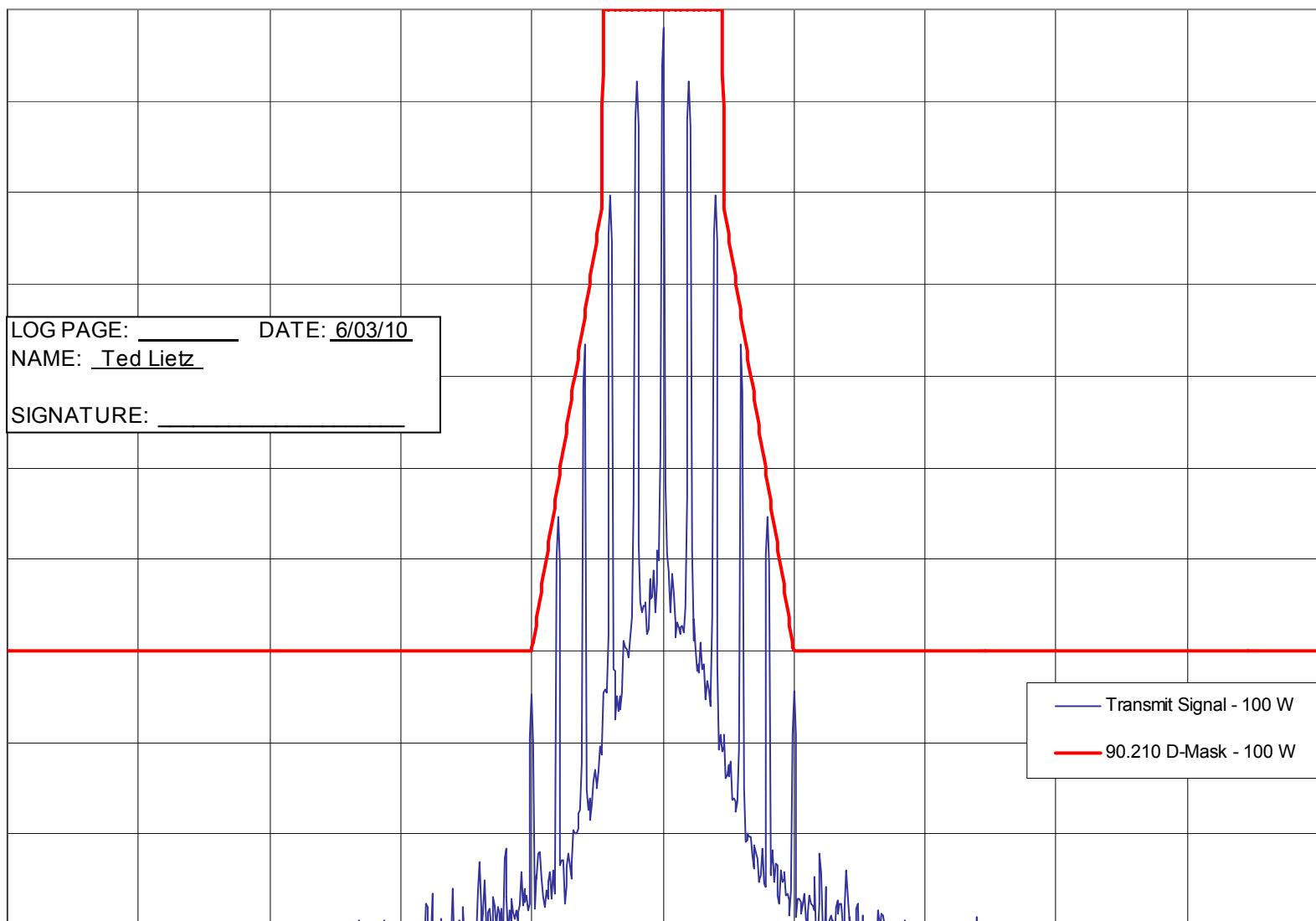
ATTEN 20 dB

10 dB/
Peak

LOG PAGE: _____ DATE: 6/03/10

NAME: Ted Lietz

SIGNATURE: _____



CENTER 860.01250 MHz

RES BW 100 Hz

VID BW 3 kHz

SPAN 125 kHz

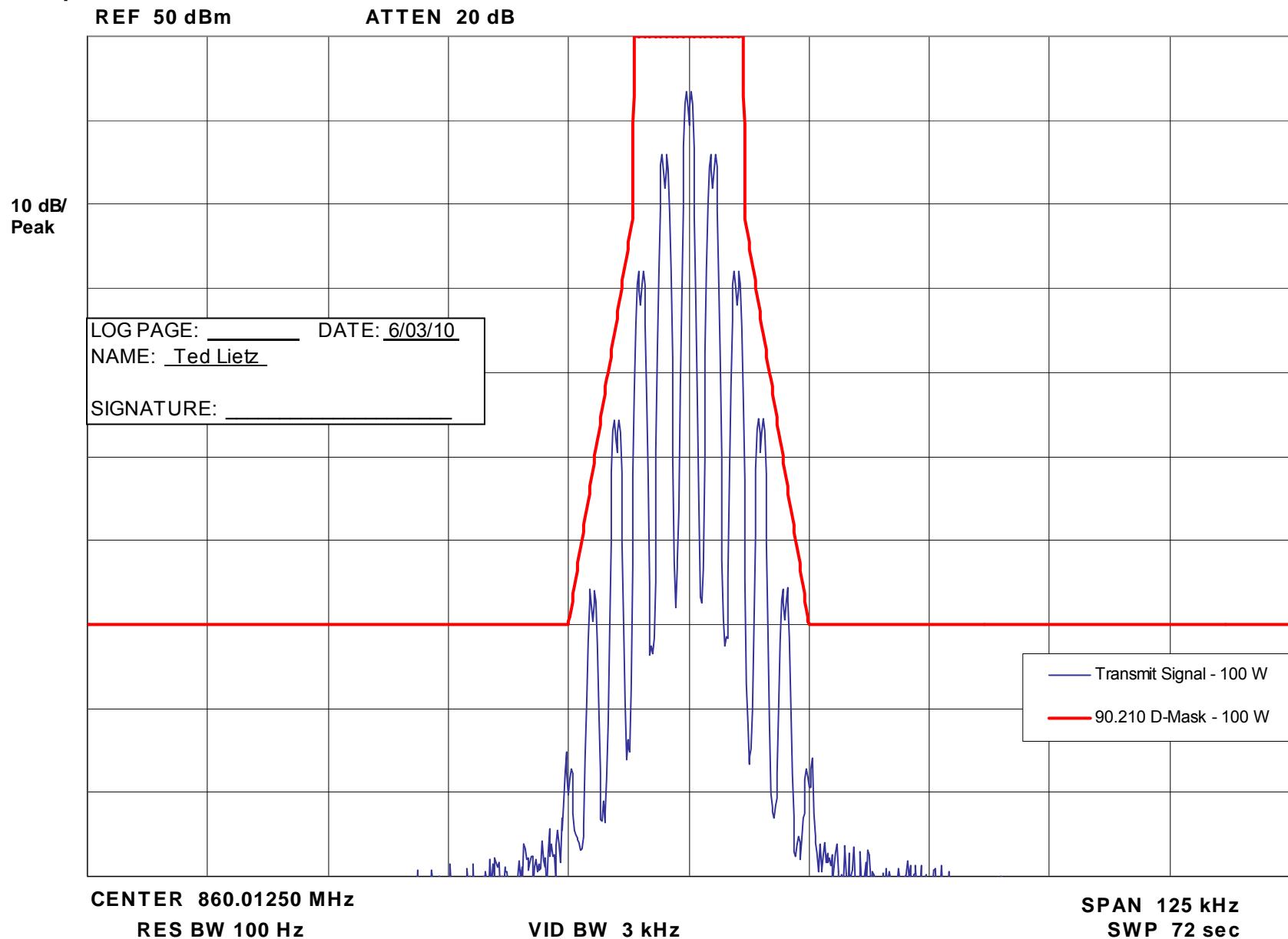
SWP 72 sec

EXHIBIT E1-4.4

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 12.5 kHz Channels, 800 MHz Operation

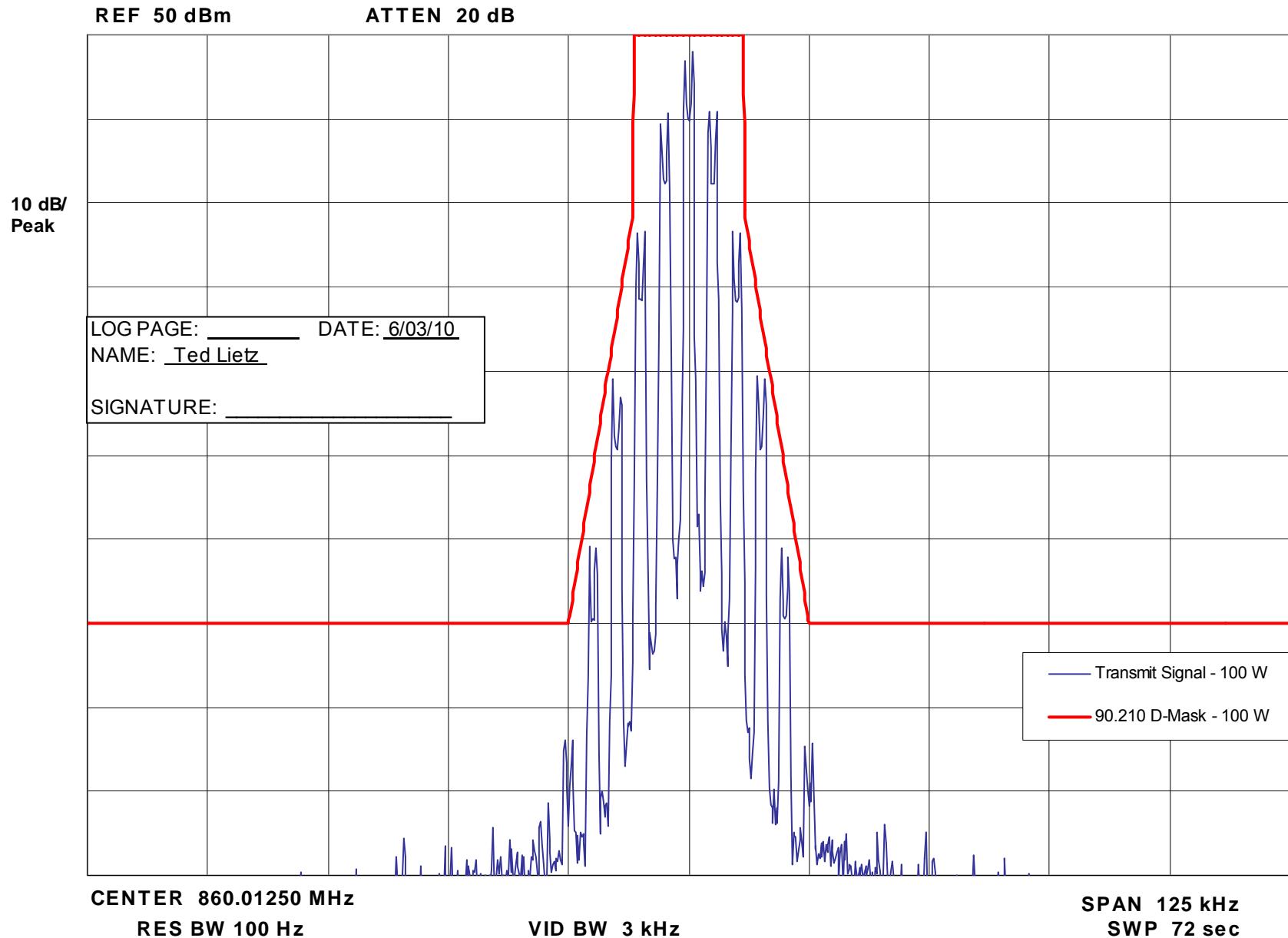
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL - 11K0F3E



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 12.5 kHz Channels, 800 MHz Operation

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL - 11K0F3E

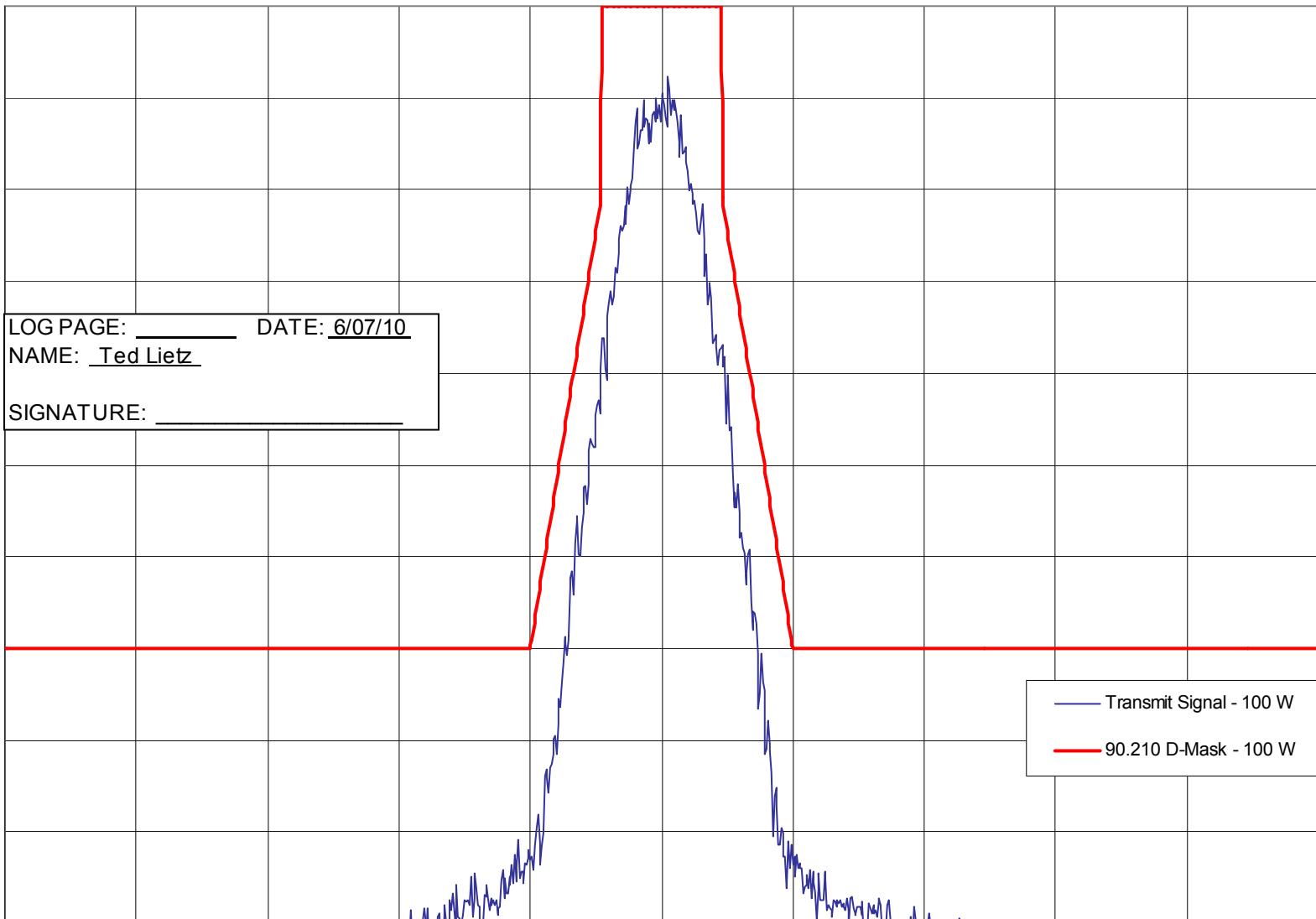


Report on Test Measurements

Occupied Bandwidth – Carrier with Digitized Voice / Data, 12.5 kHz Channels, 800 MHz Operation

Occupied Bandwidth - 4-Level Frequency Shift Keying Modulation - 7K60FXD, 7K60FXE - 100 Watts

REF 50 dBm ATTEN 20 dB

10 dB/
Peak

CENTER 860.01250 MHz

RES BW 100 Hz

VID BW 10 kHz

SPAN 125 kHz

SWP 72 sec

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels, 900 MHz Operation

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone - 11K0F3E

REF 50 dBm

ATTEN 20 dB

10 dB/
Peak

LOG PAGE: _____ DATE: 6/03/10

NAME: Ted Lietz

SIGNATURE: _____

CENTER 938.01250 MHz

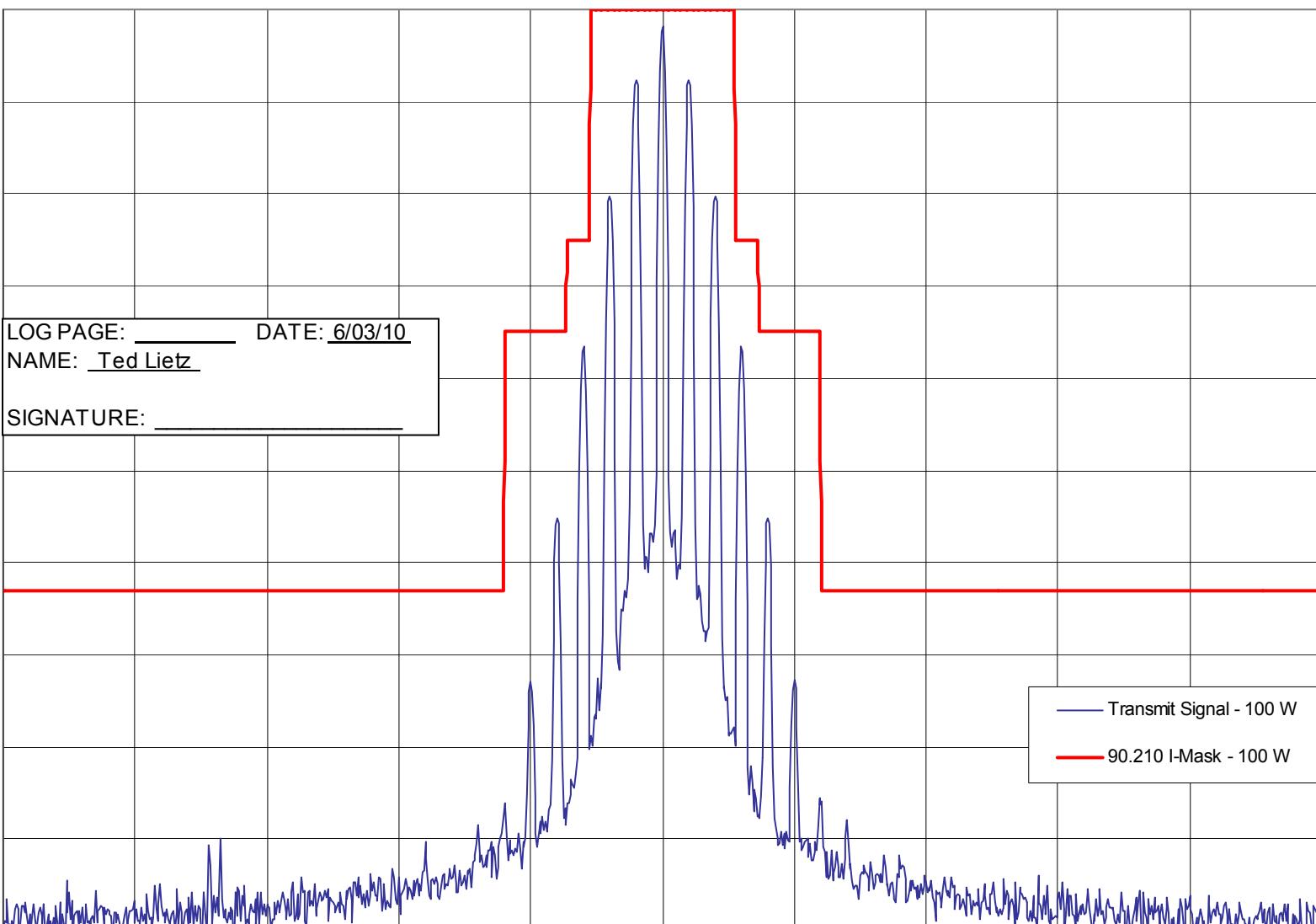
RES BW 300 Hz

VID BW 3 kHz

SPAN 125 kHz

SWP 72 sec

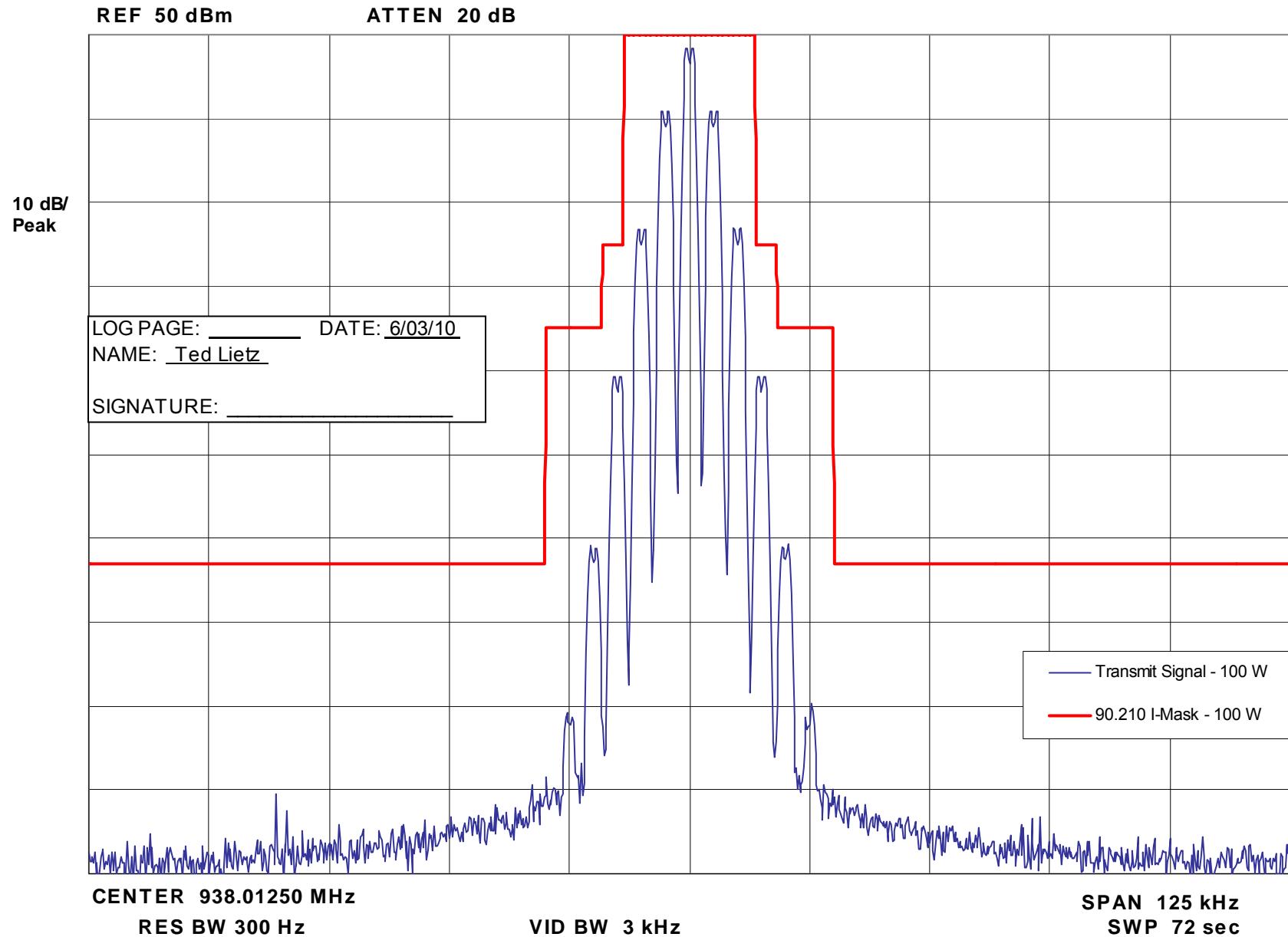
EXHIBIT E1-4.8



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 12.5 kHz Channels, 900 MHz Operation

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL - 11K0F3E



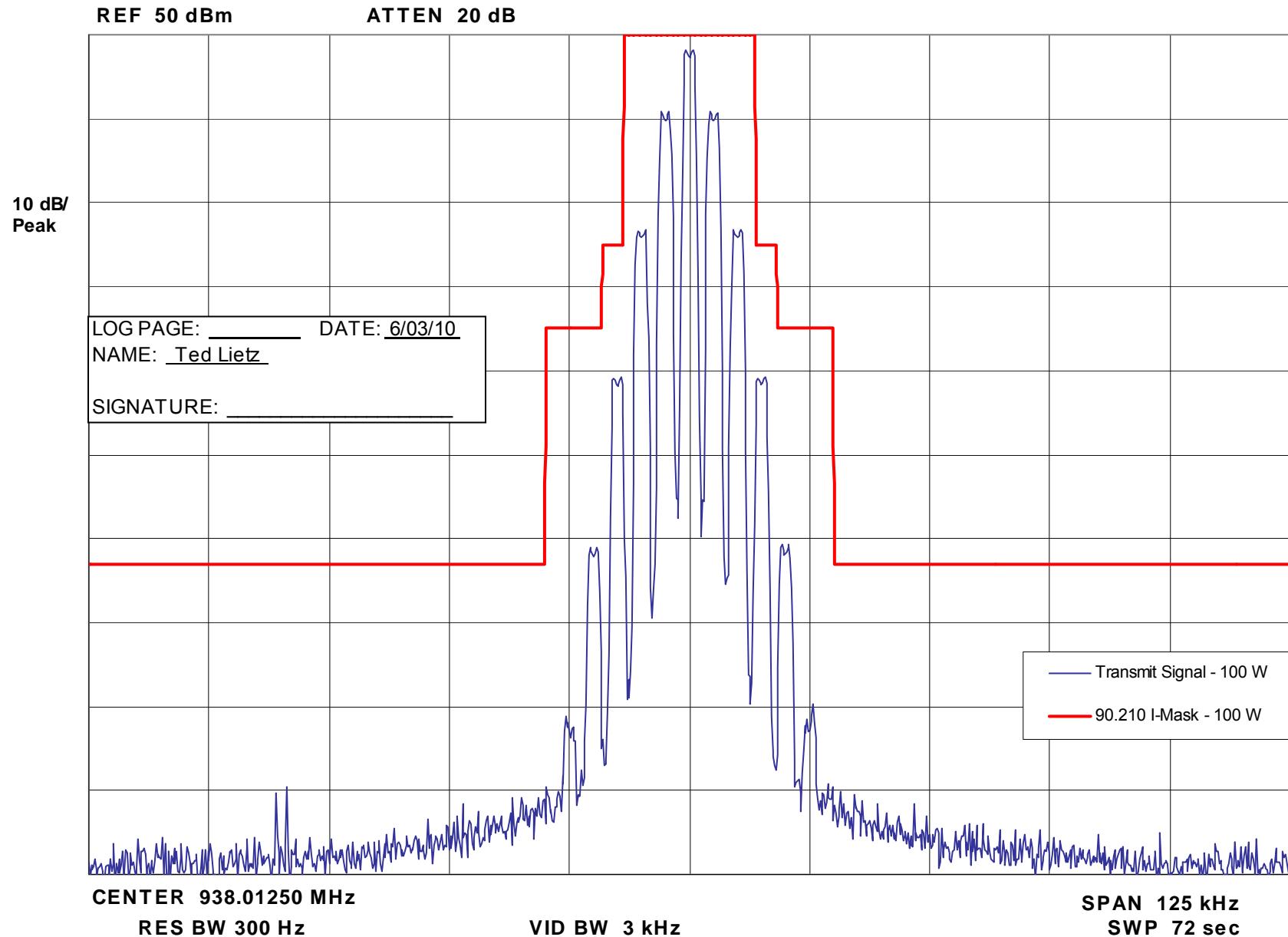
APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 12.5 kHz Channels, 900 MHz Operation

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL - 11K0F3E



APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

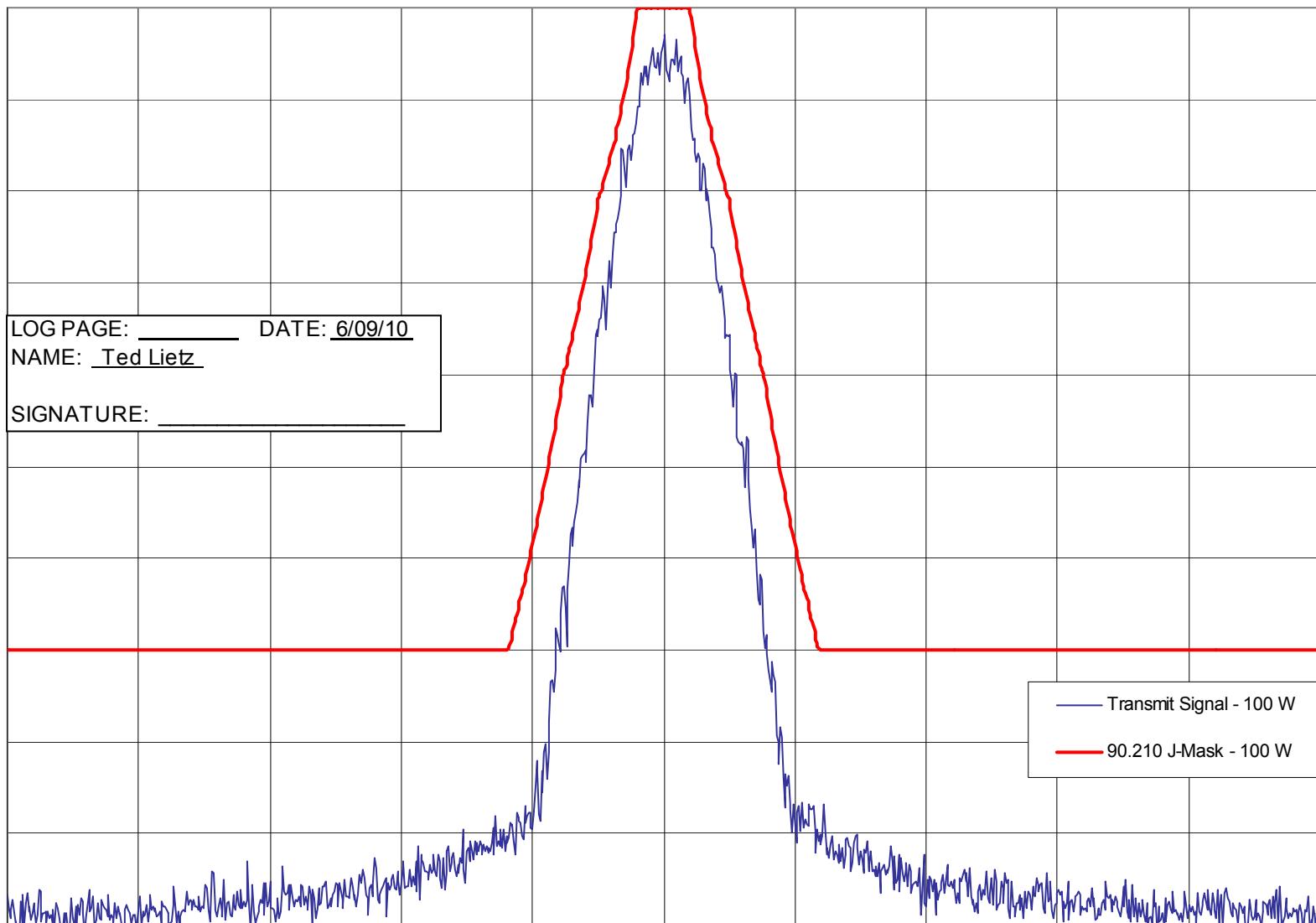
Report on Test Measurements

Occupied Bandwidth – Carrier with Digitized Voice / Data, 12.5 kHz Channels, 900 MHz Operation

Occupied Bandwidth - 4-Level Frequency Shift Keying Modulation - 7K60FXD, 7K60FXE - 100 Watts

REF 50 dBm ATTEN 20 dB

10 dB/
Peak



CENTER 938.01250 MHz

RES BW 300 Hz

VID BW 10 kHz

SPAN 125 kHz

SWP 72 sec

EXHIBIT E1-4.11

Report on Test Measurements*Conducted Spurious Emissions, Harmonics and Close-In, 800 MHz Operation*Specification Requirement § 90.210(b) Emission Limits:

Emission Mask B: 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 *least 50 plus $10 \log_{10}(P)$ dB or 80 dB; (whichever is the lesser attenuation).*

Specification Requirement § 90.210(d) Emission Limits:

Emission Mask D: 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:

- (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 $10 \log_{10}(P)$ dB or 70 dB, whichever is the lesser attenuation.*

Carrier Frequencies: For harmonics, carrier frequencies of 851, 855, 860, 865, and 870 MHz were measured.

These frequencies represent the low end, middle, and high end of the operating band. For Close-In, a carrier frequency in the middle of the operating band, of 860.0125 MHz, was used

EXHIBIT	DESCRIPTION
E1-5.1	Conducted Spurious Emissions, Harmonics, Power Output 100 Watts, 800 MHz The specification limit is -70.0 dBc (12.5 kHz channels) or -63 dBc (25 kHz channels)
E1-5.2	Conducted Spurious Emissions, Harmonics, Power Output 8 Watts, 800 MHz The specification limit is -59.0 dBc (12.5 kHz channels) or -52 dBc (25 kHz channels)
E1-5.3	Conducted Spurious Emissions, Close-In, 200 MHz Span, Power Output at 100 Watts, 800 MHz The specification limit is -70.0 dBc (12.5 kHz channels) or -63 dBc (25 kHz channels)
E1-5.4	Conducted Spurious Emissions, Close-In, 20 MHz Span, Power Output at 100 Watts, 800 MHz The specification limit is -70.0 dBc (12.5 kHz channels) or -63 dBc (25 kHz channels)

Report on Test Measurements*Conducted Spurious Emissions, Harmonics and Close-In, 900 MHz Operation*Specification Requirement § 90.210(i) Emission Limits:

Emission Mask I: For transmitters that are equipped with an audio low pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

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

1) >6.8 kHz up to and including 9.0 kHz	<i>At least 25 dB;</i>
2) >9.0 kHz up to and including 15 kHz	<i>At least 35 dB;</i>
3) >15 kHz	<i>at least 43 plus $10 \log_{10}(P)$ dB or 70 dB; (whichever is the lesser attenuation).</i>

Specification Requirement § 90.210(j) Emission Limits:

Emission Mask J: For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

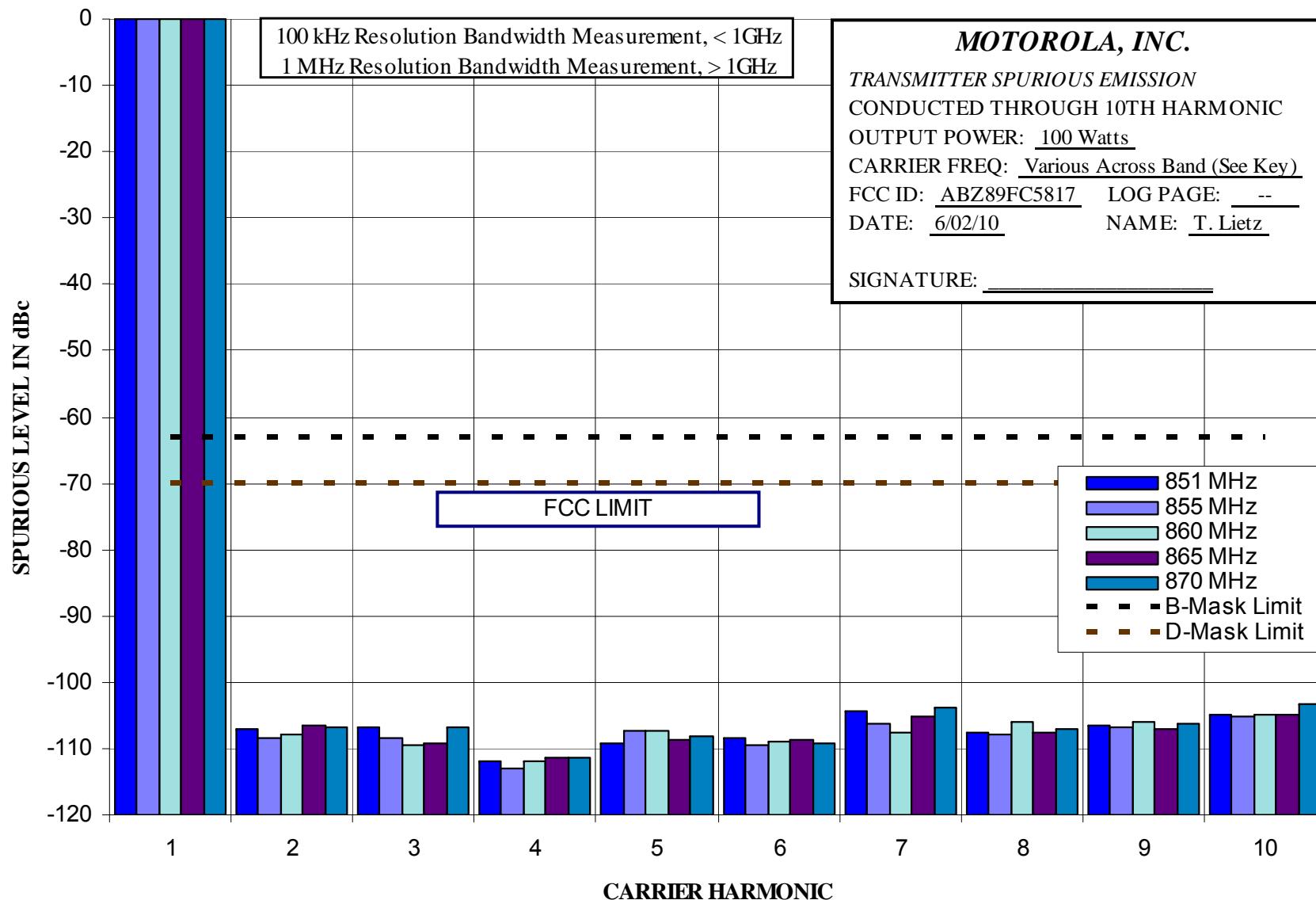
1) >2.5 kHz up to and including 6.25 kHz	<i>At least $53 \log(f_d/2.5)$ dB;</i>
2) >6.25 kHz up to and including 9.5 kHz	<i>At least $103 \log(f_d/3.9)$ dB;</i>
3) >9.5 kHz	<i>At least $157 \log(f_d/5.3)$ dB, or $50 + 10 \log(P)$ dB, or 70 dB, whichever is the lesser attenuation.</i>

Carrier Frequencies: For harmonics, carrier frequencies of 935, 937, 939, and 941 MHz were measured. These frequencies represent the low end, middle, and high end of the operating band. For Close-In, a carrier frequency in the middle of the operating band, of 938.0125 MHz, was used

EXHIBIT	DESCRIPTION
E1-5.5	Conducted Spurious Emissions, Harmonics, Power Output 100 Watts, 900 MHz The specification limit is -70.0 dBc (12.5 kHz channels)
E1-5.6	Conducted Spurious Emissions, Harmonics, Power Output 8 Watts, 900 MHz The specification limit is -59.0 dBc (12.5 kHz channels)
E1-5.7	Conducted Spurious Emissions, Close-In, 200 MHz Span, Power Output at 100 Watts, 900 MHz The specification limit is -70.0 dBc (12.5 kHz channels)
E1-5.8	Conducted Spurious Emissions, Close-In, 20 MHz Span, Power Output at 100 Watts, 900 MHz The specification limit is -70.0 dBc (12.5 kHz channels)

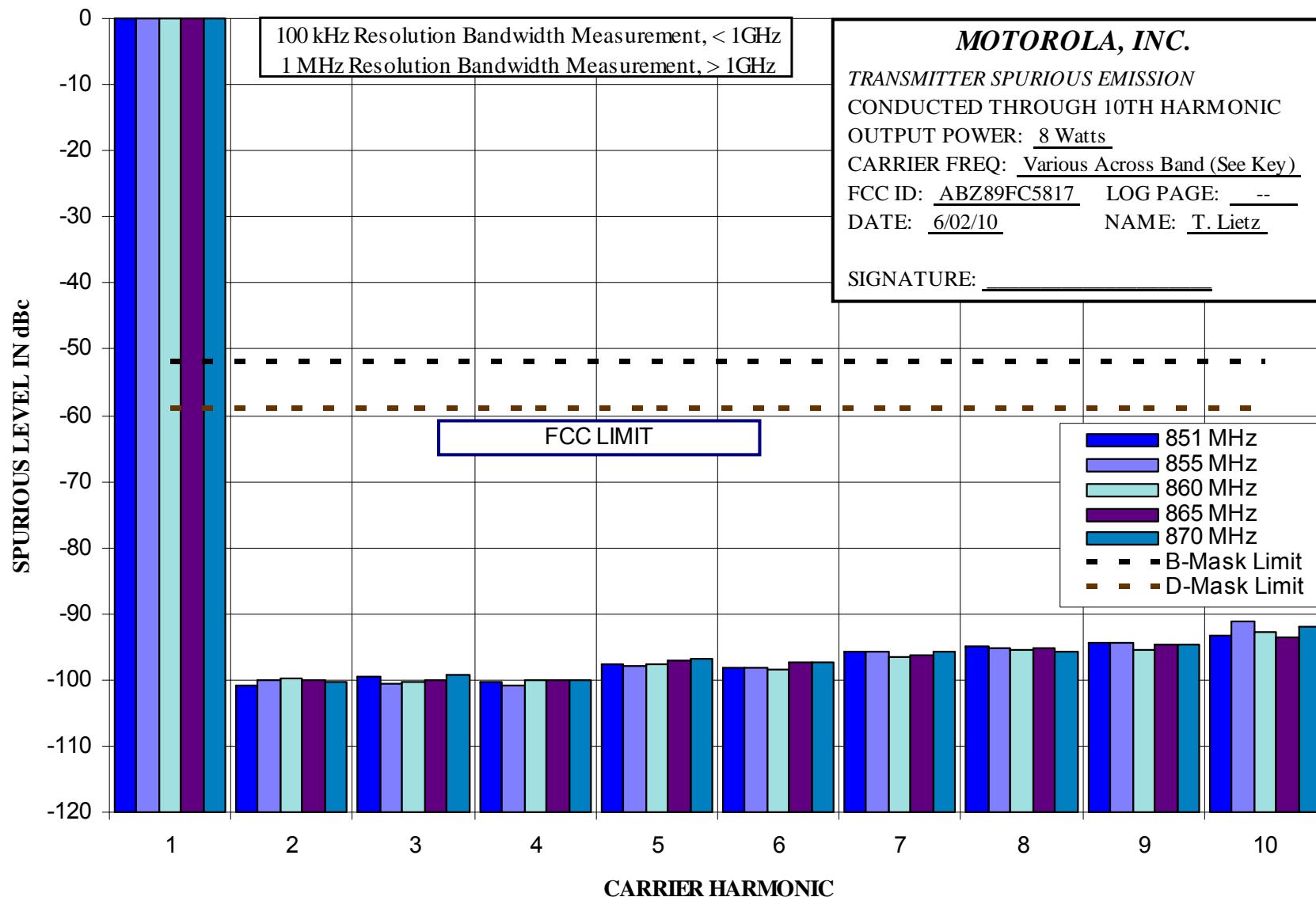
Report on Test Measurements

Conducted Emission – Harmonics – 100 Watts – 800 MHz Operation



Report on Test Measurements

Conducted Emission – Harmonics – 8 Watts – 800 MHz Operation



APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Conducted Emission – Close-In – 100 Watts – 200 MHz Span – 800 MHz Operation

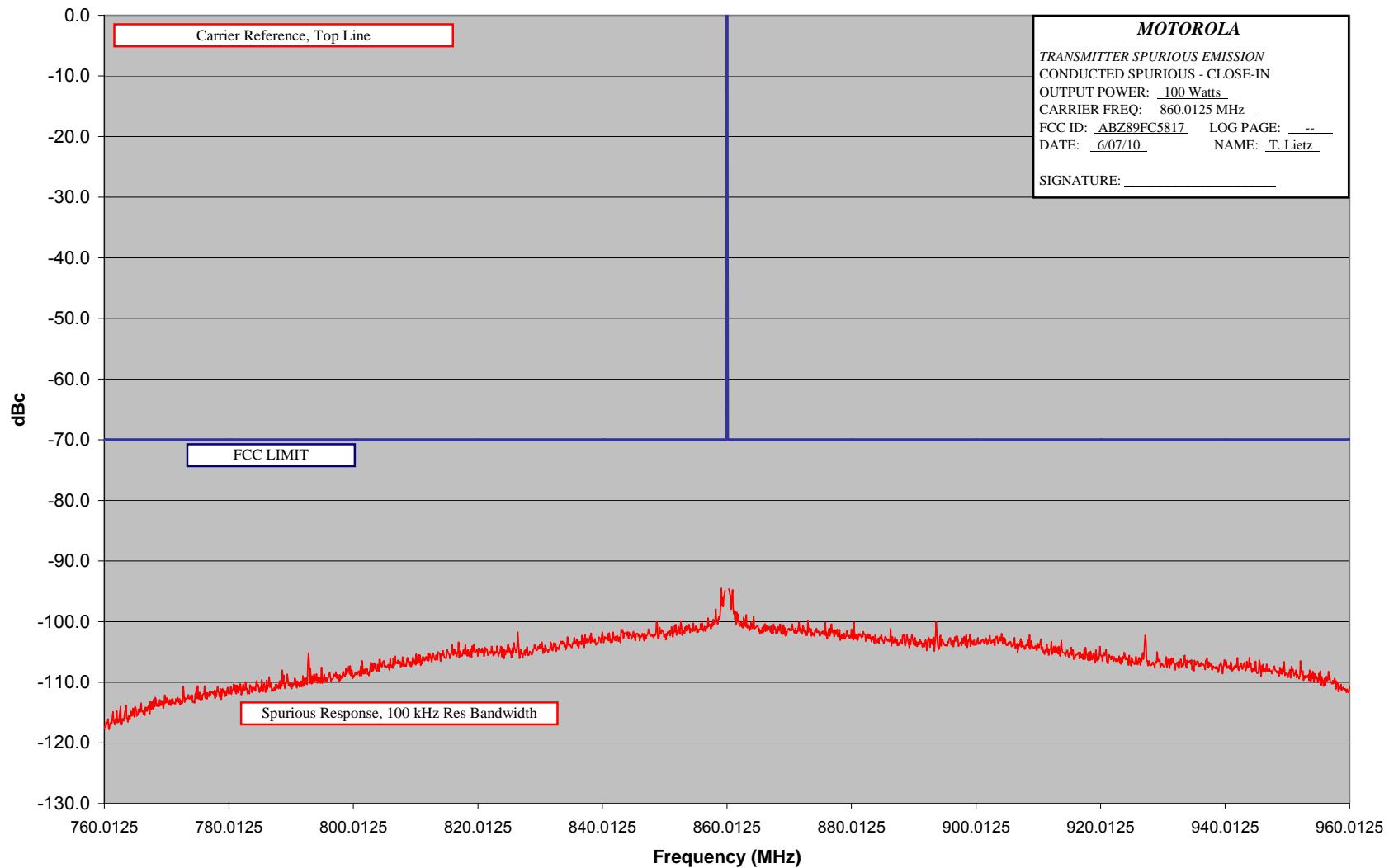


EXHIBIT E1-5.3

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Conducted Emission – Close-In – 100 Watts – 20 MHz Span – 800 MHz Operation

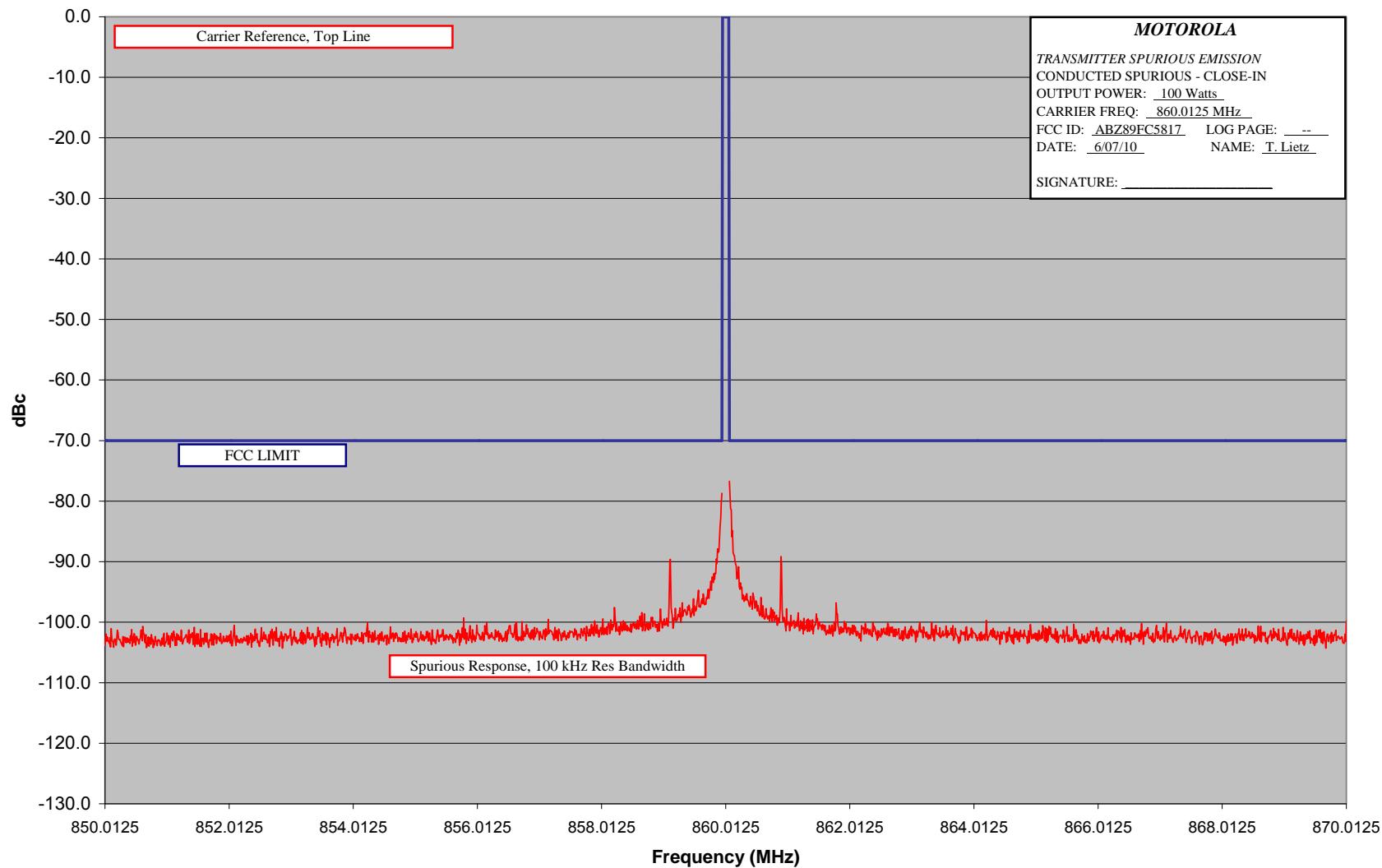
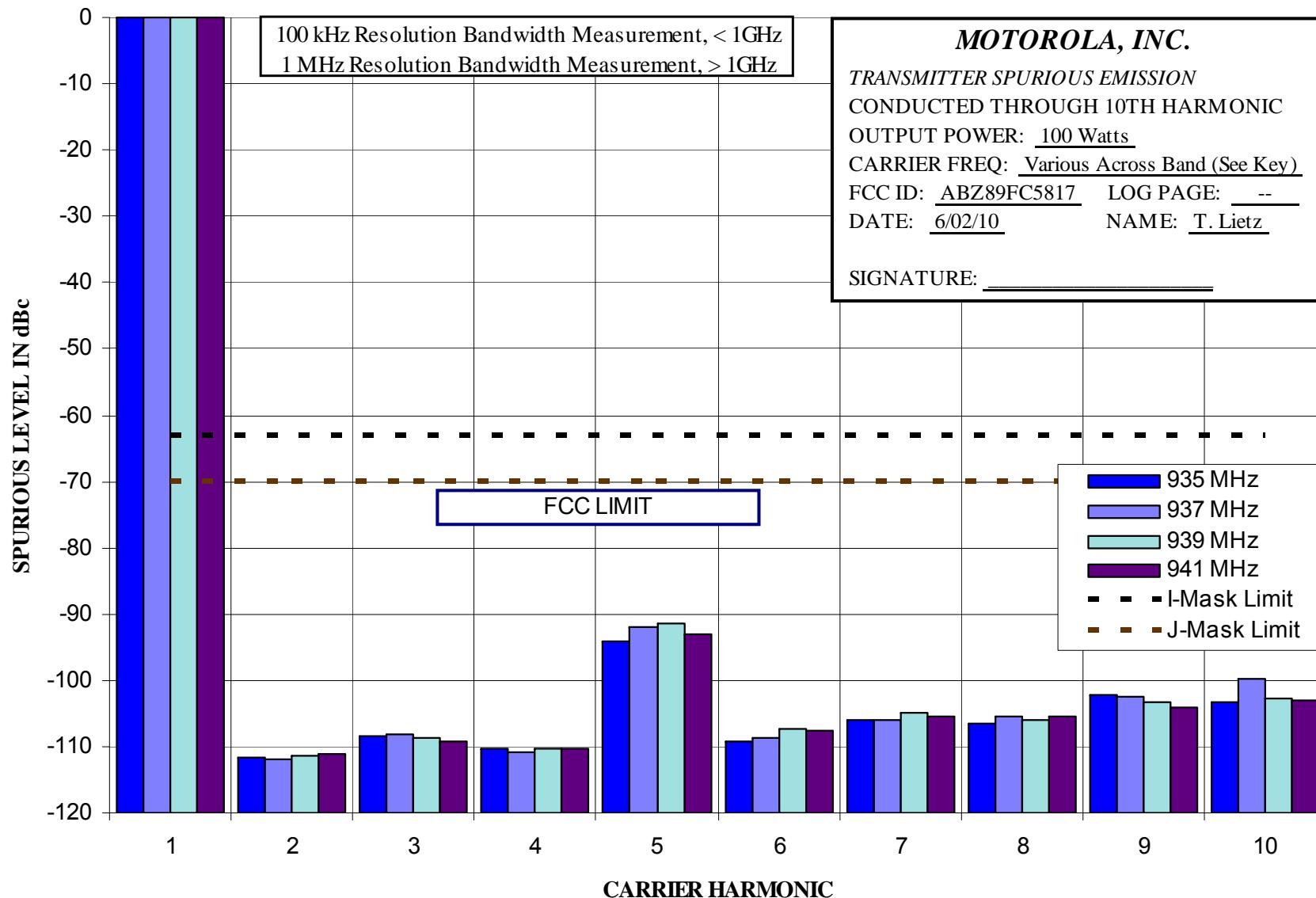


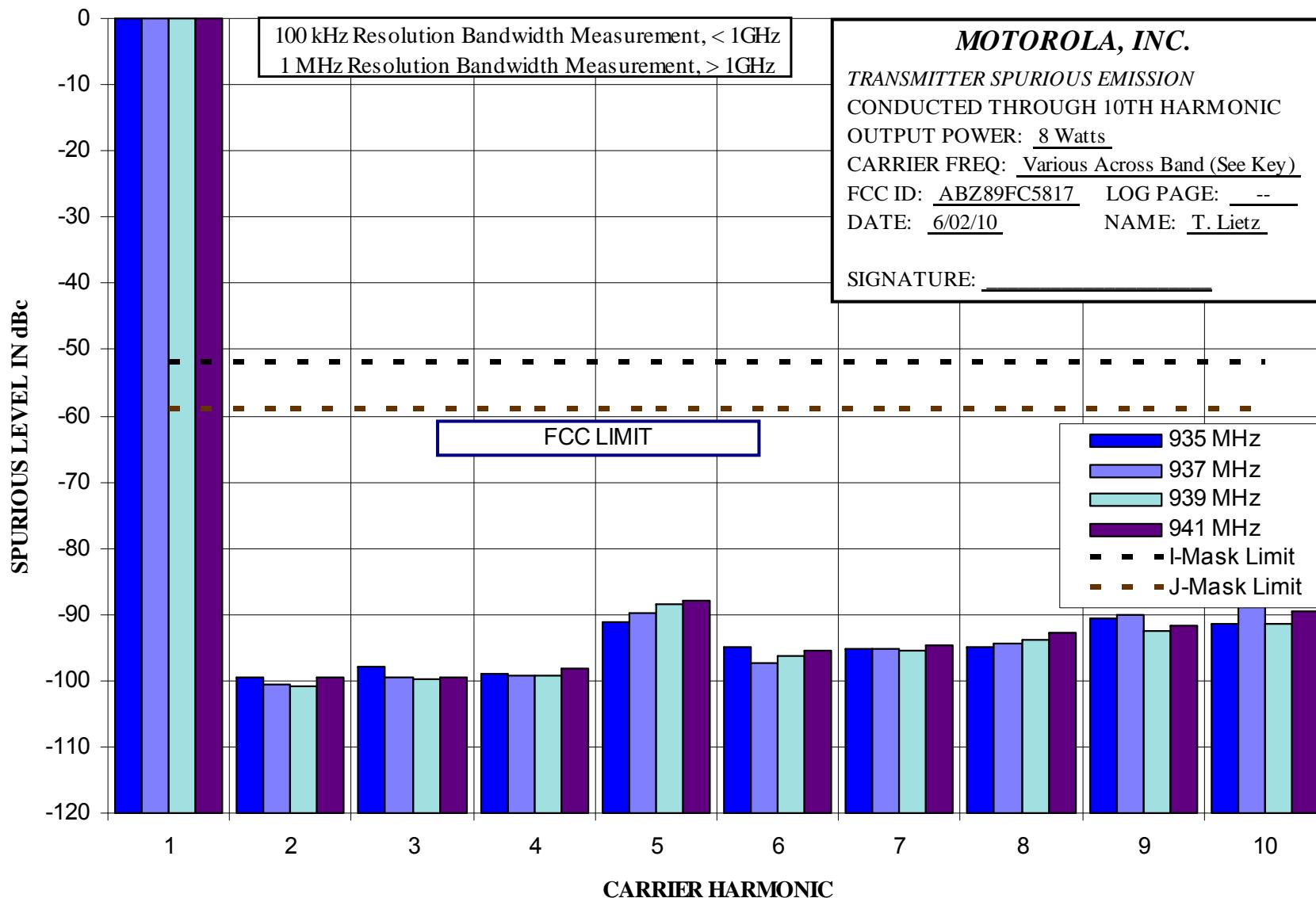
EXHIBIT E1-5.4

Report on Test Measurements
Conducted Emission – Harmonics – 100 Watts – 900 MHz Operation



Report on Test Measurements

Conducted Emission – Harmonics – 8 Watts – 900 MHz Operation



APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Conducted Emission – Close-In – 100 Watts – 200 MHz Span – 900 MHz Operation

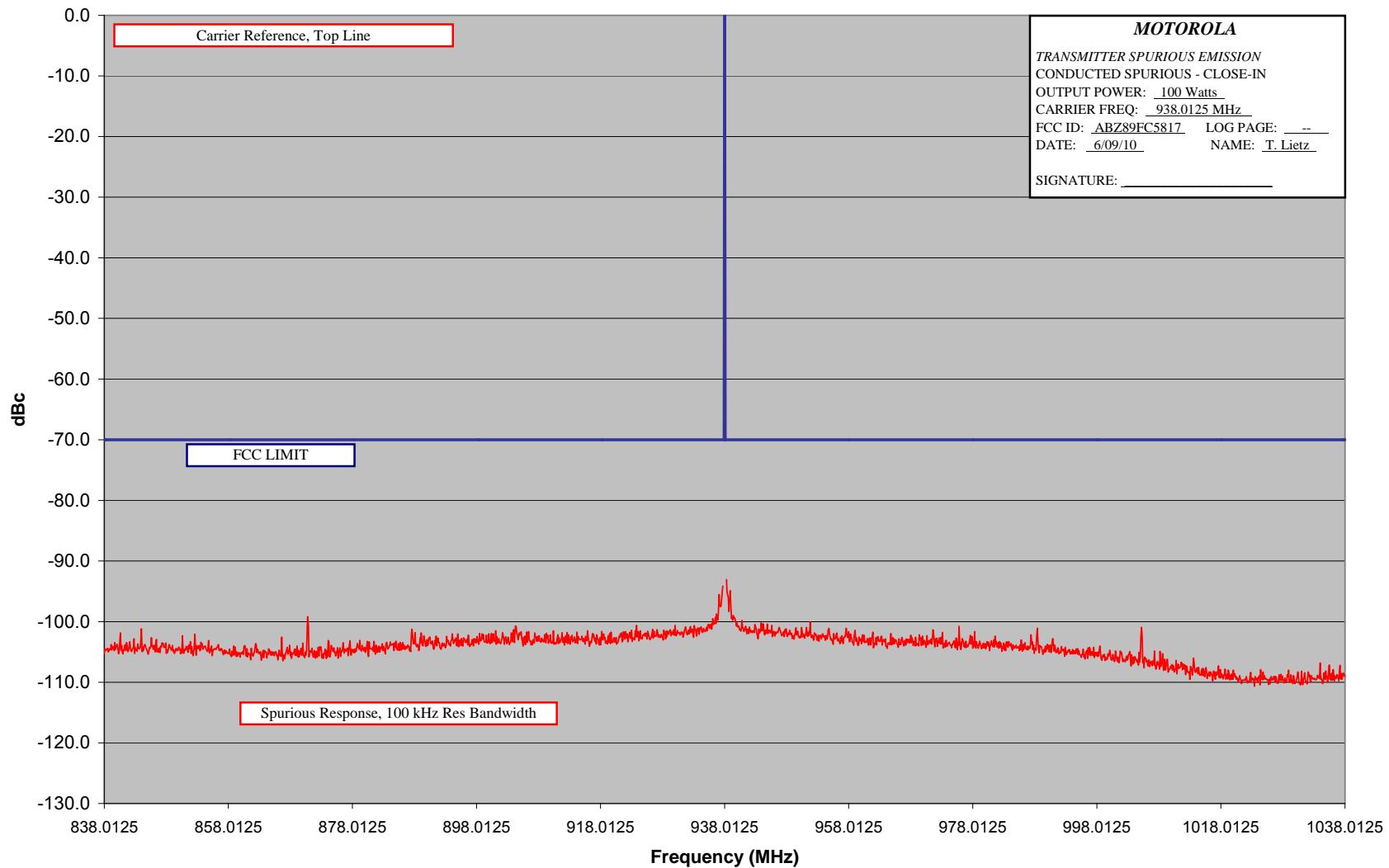


EXHIBIT E1-5.7

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Conducted Emission – Close-In – 100 Watts – 20 MHz Span – 900 MHz Operation

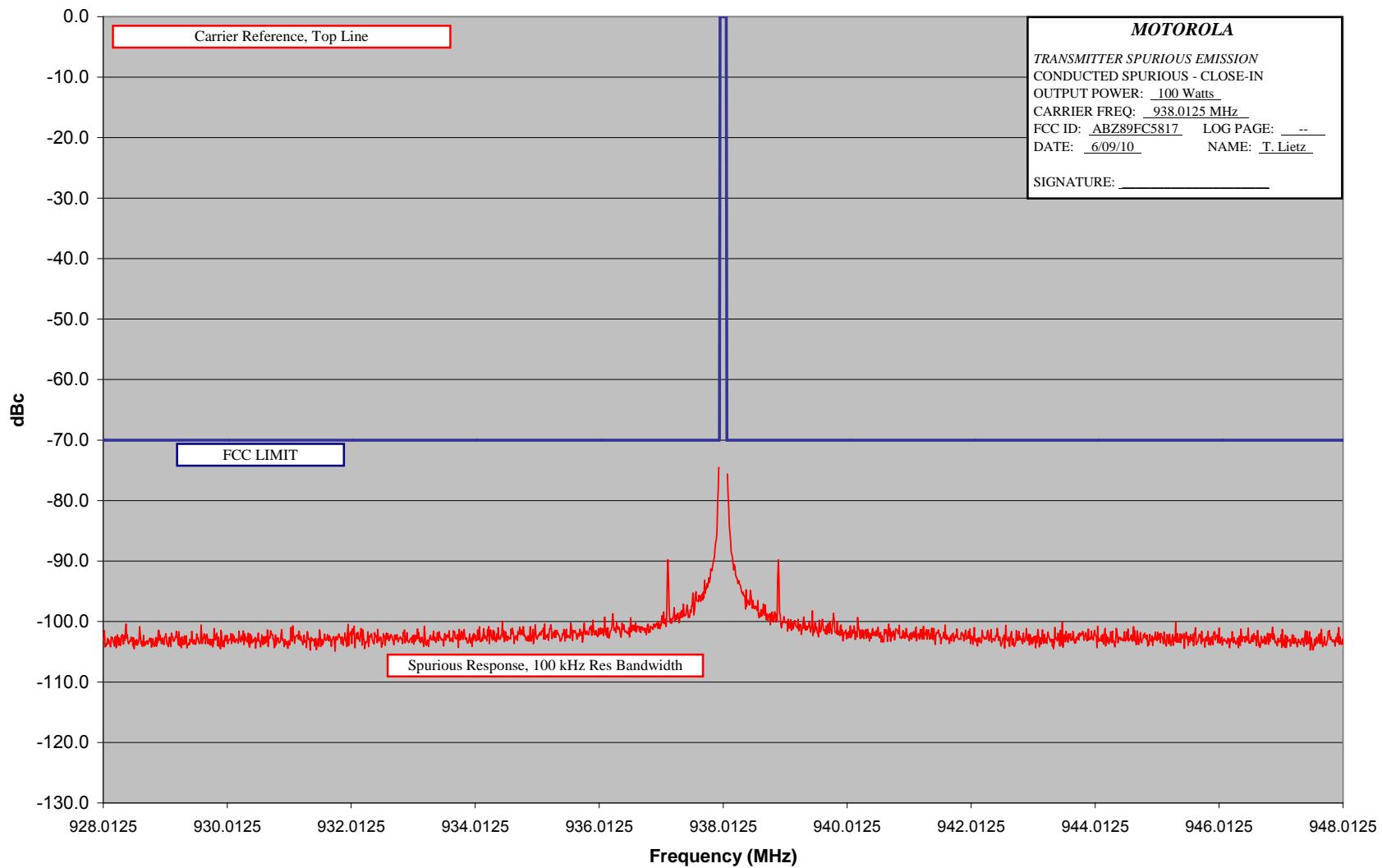


EXHIBIT E1-5.8

Report on Test Measurements

*Radiated Spurious Emissions, Harmonics*Specification Requirement § 90.210(b) Emission Limits:

Emission Mask B: 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 least 50 plus $10 \log_{10}(P)$ dB or 80 dB;
(whichever is the lesser attenuation).

Specification Requirement § 90.210(d) Emission Limits:

Emission Mask D: 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:

- (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 $10 \log_{10}(P)$ dB or 70 dB,
whichever is the lesser attenuation.

Carrier Frequencies: A carrier frequency of 860.0000 MHz was measured. This frequency represents the center of the operating band

Specification Requirement § 90.210(i) Emission Limits:

Emission Mask I: For transmitters that are equipped with an audio low pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

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

- 1) >6.8 kHz up to and including 9.0 kHz At least 25 dB;
- 2) >9.0 kHz up to and including 15 kHz At least 35 dB;
- 3) >15 kHz at least 43 plus $10 \log_{10}(P)$ dB or 70 dB;
(whichever is the lesser attenuation).

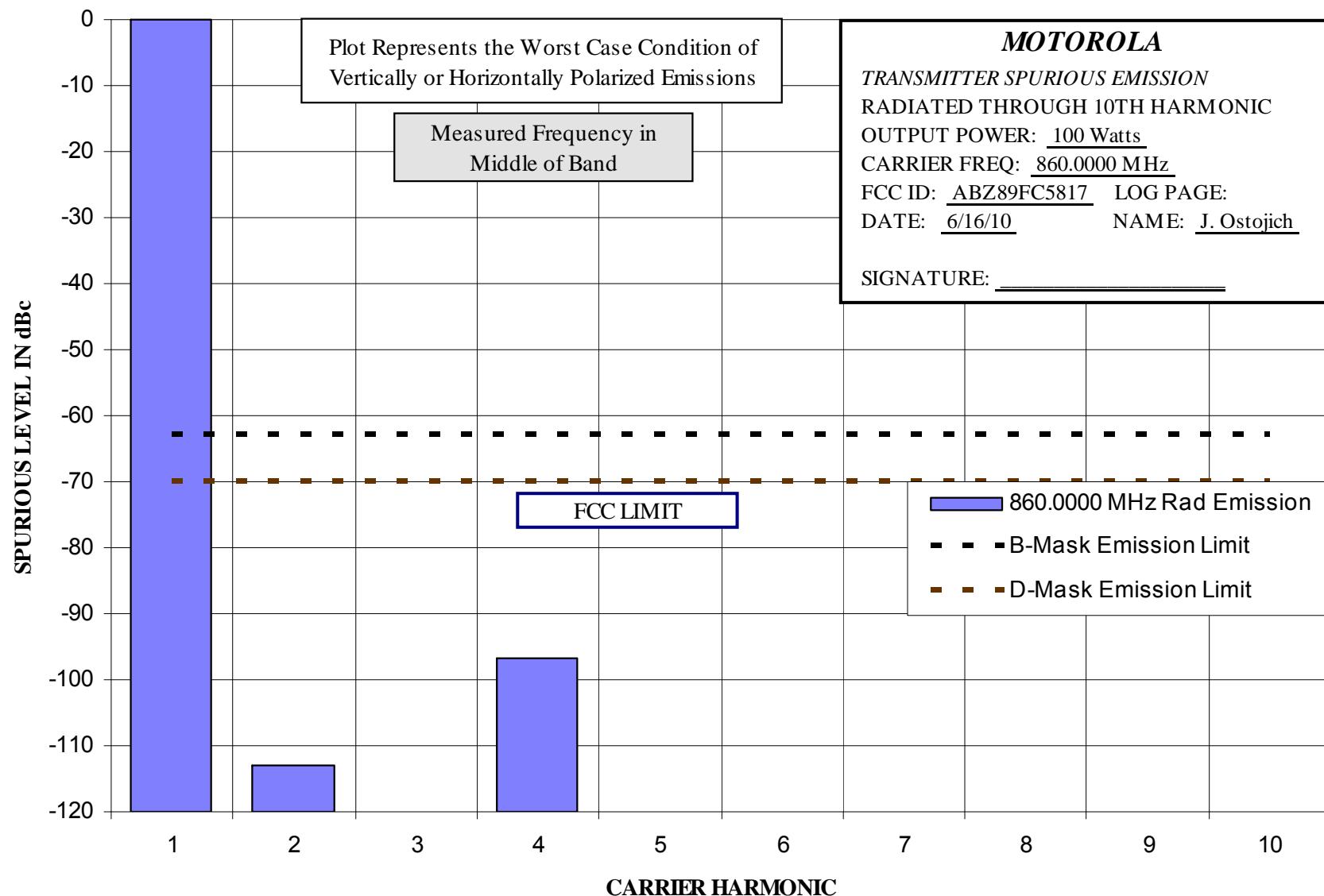
Specification Requirement § 90.210(j) Emission Limits:

Emission Mask J: For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) as follows:

- 1) >2.5 kHz up to and including 6.25 kHz At least $53 \log(f_d/2.5)$ dB;
- 2) >6.25 kHz up to and including 9.5 kHz At least $103 \log(f_d/3.9)$ dB;
- 3) >9.5 kHz At least $157 \log(f_d/5.3)$ dB, or $50 + 10 \log(P)$ dB, or 70 dB,
whichever is the lesser attenuation.

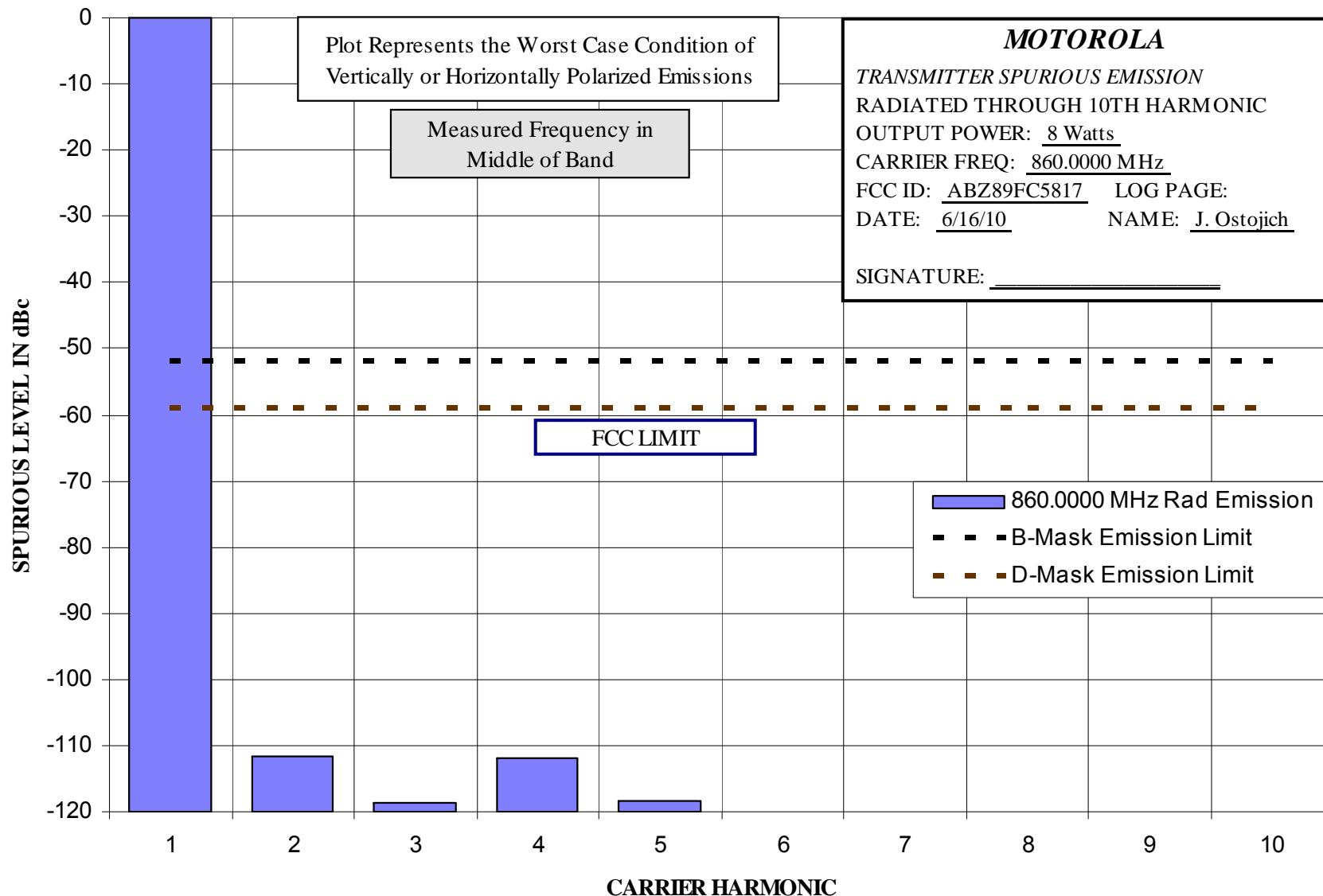
Carrier Frequencies: A carrier frequency of 935.0000 MHz was measured. This is a representative frequency in the operating band

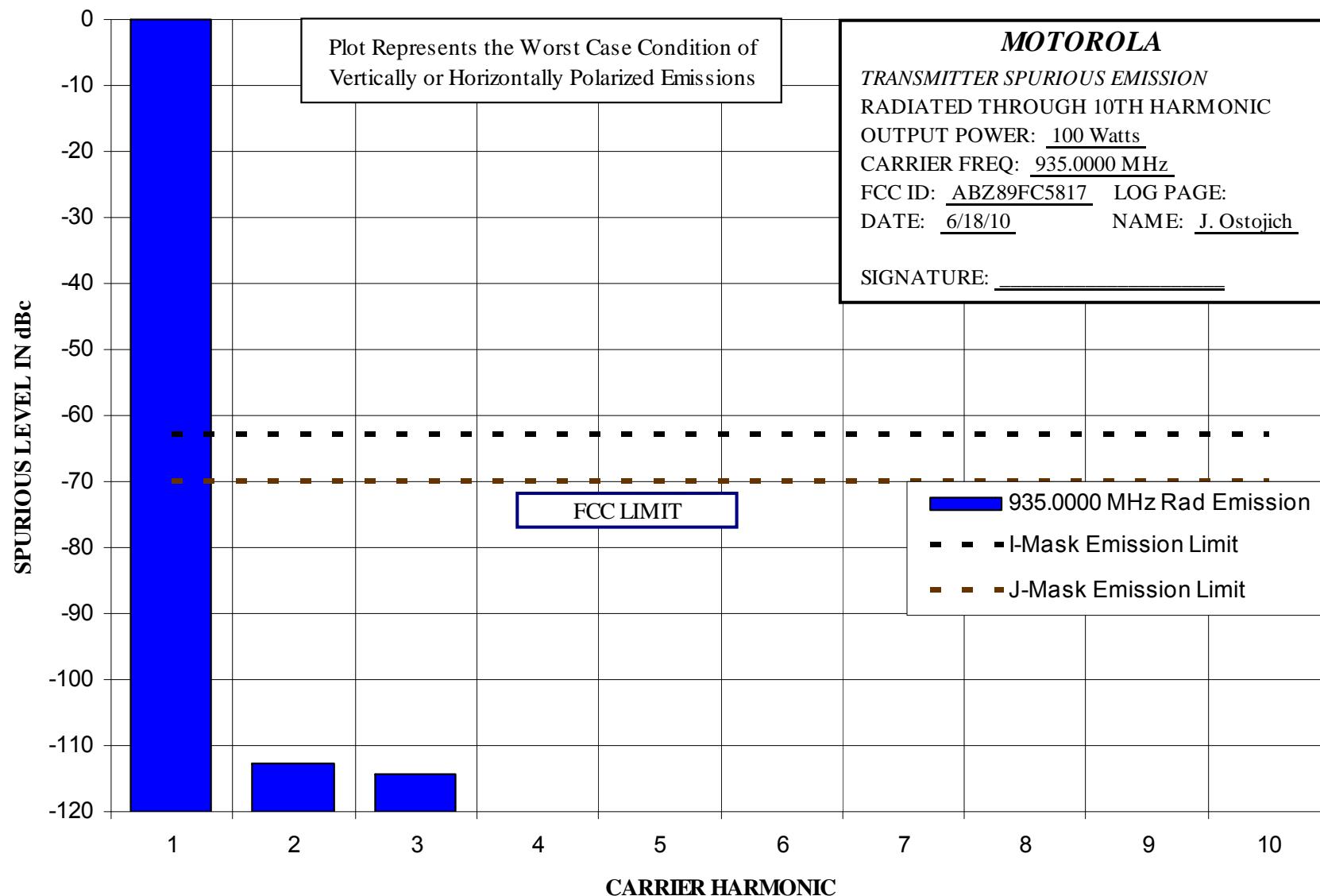
EXHIBIT	DESCRIPTION
E1-6.1	Radiated Spurious Emissions, Harmonics, Power Output 100 Watts, 800 MHz The specification limit is -70.0 dBc (12.5 kHz channels) or -63 dBc (25 kHz channels)
E1-6.2	Radiated Spurious Emissions, Harmonics, Power Output 8 Watts, 800 MHz The specification limit is -59.0 dBc (12.5 kHz channels) or -52 dBc (25 kHz channels)
E1-6.3	Radiated Spurious Emissions, Harmonics, Power Output 100 Watts, 900 MHz The specification limit is -70.0 dBc (12.5 kHz channels)
E1-6.4	Radiated Spurious Emissions, Harmonics, Power Output 8 Watts, 900 MHz The specification limit is -59.0 dBc (12.5 kHz channels)

Report on Test Measurements
Radiated Emission – Harmonics – 100 Watts – 800 MHz Operation

Report on Test Measurements

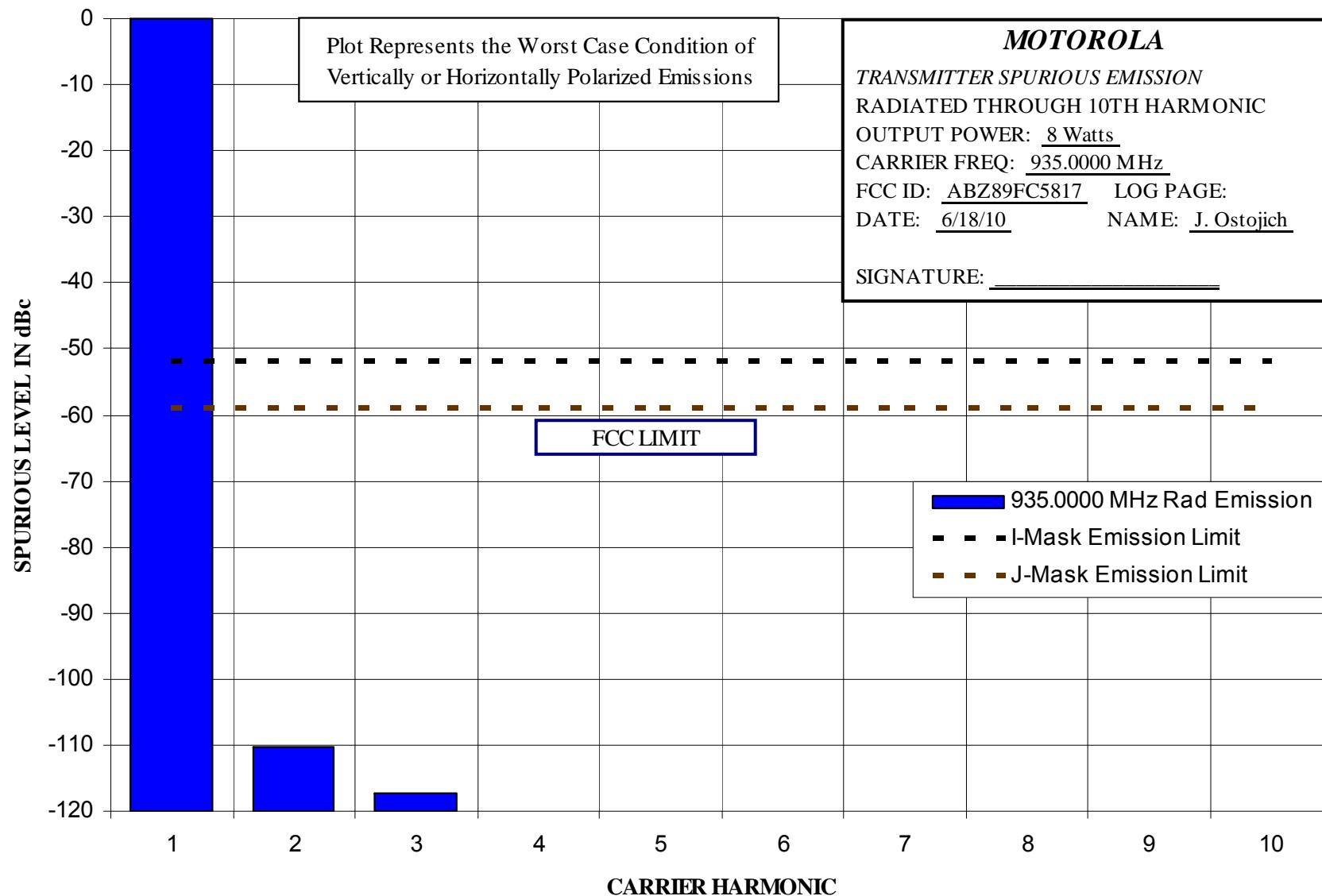
Radiated Emission – Harmonics – 8 Watts – 800 MHz Operation



Report on Test Measurements
Radiated Emission – Harmonics – 100 Watts – 900 MHz Operation

Report on Test Measurements

Radiated Emission – Harmonics – 8 Watts – 900 MHz Operation



Report on Test Measurements*Oscillator Frequency Stability*

Manufacturer data for the system site frequency standard was used in generation of the following frequency stability exhibits.

Specification Requirement: Reference Part 90.213

Fixed and Base stations, operating at 851-866 MHz, must have a frequency stability of better than +/- 1.5 PPM.

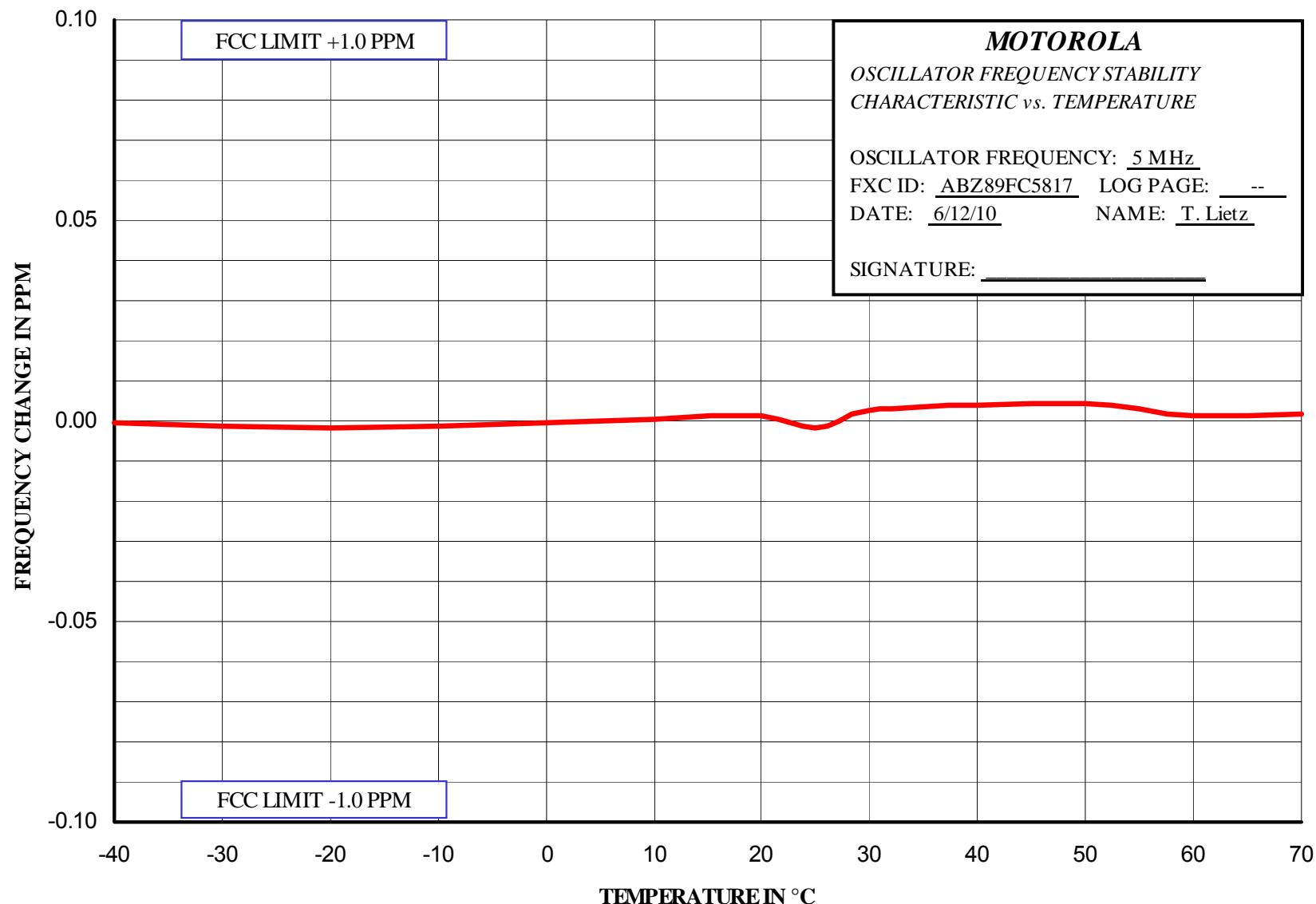
Fixed and Base stations, operating at 866-869 MHz, must have a frequency stability of better than +/- 1.0 PPM.

Fixed and Base stations, operating at 935-940 MHz, must have a frequency stability of better than +/- 0.1 PPM.

EXHIBIT	DESCRIPTION
E1-7.1	Frequency Stability Vs Temperature
E1-7.2	Frequency Stability Vs Voltage

Frequency Stability Vs Temperature

Report on Test Measurements



APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

Frequency Stability Vs Voltage

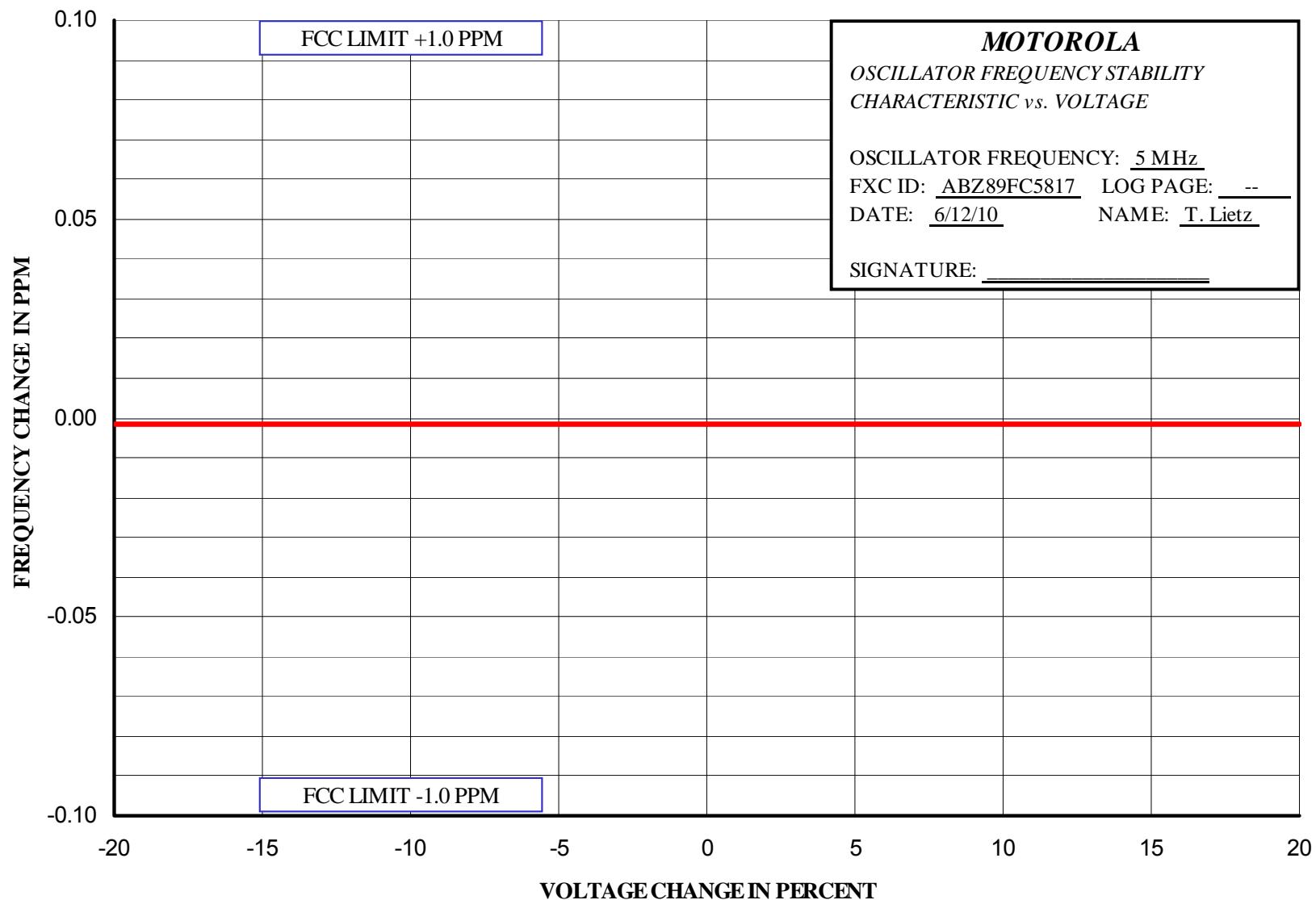


EXHIBIT E1-7.2

Report on Test Measurements

Test Equipment List

MODEL	MANUFACTURER	DESCRIPTION	Serial No.	Last Cal	Next Cal
437B	Hewlett Packard	RF Power Meter	2912A01517	05/13/08	05/13/11
8481A	Hewlett Packard	RF Power Sensor	2702A76706	07/25/08	07/25/11
E4443A	Agilent	Spectrum Analyzer	MY43360090	09/18/09	09/18/12
83712A	Hewlett Packard	Signal Generator	3429A00455	10/27/08	10/27/11
8671B	Hewlett Packard	Signal Generator	2611A00159	10/24/07	10/24/10
85460A	Hewlett Packard	EMI Analyzer, Filter	3704A00467	07/21/07	07/21/10
85462A	Hewlett Packard	EMI Analyzer, RF/Display	3906A00500	07/21/07	07/21/10
8593E	Hewlett Packard	EMI Analyzer	3513A01649	06/12/10	06/12/13
89441A	Agilent	Vector Signal Analyzer	3416A00835	05/27/09	05/27/12
89441A	Agilent	Vector Signal Analyzer	3509A01047	05/13/08	05/13/11
N9030A	Agilent	PXA Signal Analyzer	US49230267	01/17/10	01/17/11
(Various)	Weinschel, Kathrein, Bird	RF Loads	Various	no calibration required	
TWPC-4510-1	Telewave	Cavity	5244	no calibration required	
3020A, etc.	Narda	Directional Coupler	Various	no calibration required	

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC5817

Report on Test Measurements

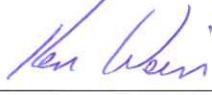
Statement of Certification

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

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

NAME: Ken Weiss

SIGNATURE: 

DATE: August 17, 2009

POSITION: Senior Staff 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: Greg Alms

SIGNATURE: 

DATE: August 17, 2009

POSITION: Engineering Section Manager