

**Report on Test Measurements***Measurements Report*

The measurement report shows compliance information against the pertinent technical standards. Each parameter is measured generally at the low end, middle, and at the high end of the applicable frequency band. Each section of the report contains either verbiage or graphs which show compliance to applicable standards as required, explains testing method used, and indicates what the applicable specification is.

Information and performance relative to 25 kHz 'wideband' operation is included in the report. Although wideband operation in the 150-174 MHz and 421-512 MHz bands is no longer allowable for rule part 90 in the US, it is available for other FCC rule parts and in other countries, including Industry Canada.

The time division multiple access (TDMA) mode of operation provides two voice paths in a 12.5 kHz channel bandwidth and a data rate of 9600 bits per second or 12,000 bits per second in a channel bandwidth of 12.5 kHz. This is equivalent to one voice path per 6.25 kHz of channel bandwidth and 4800 bits per second or greater in a 6.25 kHz channel bandwidth. The GTR 8000 conforms to the spectrum efficiency requirements of FCC rule § 90.203 (j) (5).

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

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*Measurements Report*

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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 six parallel power transistors.

Linear Modulation Mode:

	<u>138 MHz</u>	<u>155 MHz</u>	<u>174 MHz</u>	
Measured RF output	<u>60</u>	<u>60</u>	<u>60</u>	Watts, Average
DC Voltage, final RF amplifier stage/stages	<u>19.8</u>	<u>19.8</u>	<u>19.8</u>	Volts
DC Current, final RF amplifier stage/stages	<u>9.0</u>	<u>10.0</u>	<u>8.5</u>	Amperes
Input power for final RF amplifying device(s)	<u>178</u>	<u>198</u>	<u>168</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	<u>120</u>	<u>120</u>	Volts AC
Minimum Measured RF output	<u>2</u>	<u>2</u>	<u>2</u>	Watts, Average
Normal DC Voltage	<u>19.0</u>	<u>19.0</u>	<u>19.0</u>	Volts
Normal DC Current	<u>3.1</u>	<u>3.2</u>	<u>3.1</u>	Amperes
Input power for final RF amplifying device(s)	<u>59</u>	<u>61</u>	<u>59</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	<u>120</u>	<u>120</u>	Volts AC

Frequency Modulation and Compatible 4-Level Frequency Modulation Mode:

	<u>138 MHz</u>	<u>155 MHz</u>	<u>174 MHz</u>	
Measured RF output	<u>100</u>	<u>100</u>	<u>100</u>	Watts
DC Voltage, final RF amplifier stage/stages	<u>20.3</u>	<u>20.3</u>	<u>20.3</u>	Volts
DC Current, final RF amplifier stage/stages	<u>12.5</u>	<u>14.0</u>	<u>11.5</u>	Amperes
Input power for final RF amplifying device(s)	<u>254</u>	<u>284</u>	<u>233</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	<u>120</u>	<u>120</u>	Volts AC
Minimum Measured RF output	<u>2</u>	<u>2</u>	<u>2</u>	Watts, Average
Normal DC Voltage	<u>19.0</u>	<u>19.0</u>	<u>19.0</u>	Volts
Normal DC Current	<u>3.1</u>	<u>3.2</u>	<u>3.1</u>	Amperes
Input power for final RF amplifying device(s)	<u>59</u>	<u>61</u>	<u>59</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	<u>120</u>	<u>120</u>	Volts AC

## Report on Test Measurements

Occupied Bandwidth – Linear Simulcast Modulation (LSM), 12.5 kHz Channel Spacing

Linear Simulcast Modulation can be used in a system configuration based upon channel usage as described in Exhibit B. The 'D1E' emission designator provides usage for telephony, the 'D1D' provides usage for data / telecommand, and the 'D1W' provides for usage as a combination. All are spectrally identical. The occupied bandwidth chart references the following setup and specification requirements.

Modulation Type: Linear Simulcast Modulation, LSM  
 Emission Designator: 8K70D1E, 8K70D1D, 8K70D1W  
 Channelization: 12.5 kHz  
 Power Setting: 60 Watts, Average

Specification Requirement § 90.210(d) Emission Limits – “D-Mask”:

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  $7.27 * (f_d - 2.88 \text{ kHz})$  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  $10 \log_{10}(P)$  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: The necessary bandwidth of the modulation signal is not calculable per the formulas defined in 47 CFR 2.202 (b). Specifically, although the modulation for this emission is a composite modulation, the equations given in the composite tables in 2.202 are not applicable since none of them adequately approximate the form of digital modulation used. The necessary bandwidth of 8.70 kHz is based upon a 99% power measurement of the transmitter spectrum, per 2.202 (a).

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		

Test Procedure:

- 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**

E1-2.1	Occupied Bandwidth - Linear Simulcast Modulation (LSM), Low End of Band
E1-2.2	Occupied Bandwidth - Linear Simulcast Modulation (LSM), Middle of Band
E1-2.3	Occupied Bandwidth - Linear Simulcast Modulation (LSM), High End of Band

## Report on Test Measurements

Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM), 12.5 kHz Channel Spacing

C4FM can be used in a system configuration based upon channel usage as described in Exhibit B. The 'F1E' emission designator provides usage for telephony, the 'F1D' provides usage for data / telecommand, and the 'F1W' provides for usage as a combination. All are spectrally identical. The occupied bandwidth chart references the following setup and specification requirements.

Modulation Type: Compatible 4-Level Frequency Modulation, C4FM  
 Emission Designator: 8K10F1E, 8K10F1D, 8K10F1W  
 Channelization: 12.5 kHz  
 Power Setting: 100 Watts

Specification Requirement § 90.210(d) Emission Limits – “D-Mask”:

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  $7.27 * (f_d - 2.88 \text{ kHz})$  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  $10 \log_{10}(P)$  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: An occupied bandwidth of 8.10 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 8K10.

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		

Test Procedure:

- 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
E1-2.4	Occupied Bandwidth - Compatible 4-Level Frequency Modulation (C4FM), Low End of Band
E1-2.5	Occupied Bandwidth - Compatible 4-Level Frequency Modulation (C4FM), Middle of Band
E1-2.6	Occupied Bandwidth - Compatible 4-Level Frequency Modulation (C4FM), High End of Band

### Report on Test Measurements

#### Occupied Bandwidth –H-DQPSK, P25 Two Slot TDMA Digital Modulation, 12.5 kHz Channel Spacing

H-DQPSK modulation can be used in a system configuration based upon channel usage as described in Exhibit B. The 'D7E' emission designator provides usage for telephony, the 'D7D' provides usage for data / telecommand, and the 'D7W' provides for usage as a combination. All are spectrally identical. The occupied bandwidth chart references the following setup and specification requirements.

Modulation Type: H-DQPSK, P25 Two Slot TDMA Digital Modulation  
 Emission Designator: 9K80D7E, 9K80D7D, 9K80D7W  
 Channelization: 12.5 kHz  
 Power Setting: 60 Watts, Average

#### Specification Requirement § 90.210(d) Emission Limits – “D-Mask”:

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:

(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  $7.27 * (f_d - 2.88 \text{ kHz})$  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  $10 \log_{10}(P)$  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: The necessary bandwidth of the modulation signal is not calculable per the formulas defined in 47 CFR 2.202 (b). Specifically, although the modulation for this emission is a composite modulation, the equations given in the composite tables in 2.202 are not applicable since none of them adequately approximate the form of digital modulation used. The necessary bandwidth of 8.70 kHz is based upon a 99% power measurement of the transmitter spectrum, per 2.202 (a).

#### 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		

##### Test Procedure:

- 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

E1-2.7	Occupied Bandwidth - H-DQPSK P25 Two Slot TDMA Digital Modulation, Low End of Band
E1-2.8	Occupied Bandwidth - H-DQPSK P25 Two Slot TDMA Digital Modulation, Middle of Band
E1-2.9	Occupied Bandwidth - H-DQPSK P25 Two Slot TDMA Digital Modulation, High End of Band

## Report on Test Measurements

Occupied Bandwidth –3600 bps High Speed Trunking Control Data, 25 kHz Channel Spacing

There is one exhibit shown for 3600 bps high speed control data in 25 kHz channels. It can be used in a trunked system configuration based upon channel usage as described in Exhibit B. The occupied bandwidth chart references the following setup and specification requirements.

Modulation Type: Frequency Shift Keying Digital Modulation  
 Emission Designator: 16K0F1D  
 Channelization: 25 kHz  
 Power Setting: 100 Watts

Specification Requirement § 90.210(d) Emission Limits – “C-Mask”:

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

(1) On any frequency from the center of the authorized bandwidth (f0) to 5.625 kHz removed from f0: 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 kHz but not more than 10 kHz:  $At least 83 * \log_{10}(f_d / 5) \text{ dB}$

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz but not more than 250 percent of the authorized bandwidth:  $At least 29 * \log_{10}(f_d^2 / 11) \text{ dB or } 50 \text{ dB, whichever is the lesser attenuation}$

(4) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth:  $At least 43 \text{ plus } 10 \log_{10}(P) \text{ dB}$

Necessary Bandwidth Calculation (Analog Emission):

The necessary bandwidth of the modulation 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>
1.8 kHz	6.2 kHz	16 kHz	16K0

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:

- 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 carrier power value from the previous step to generate the emission mask limit.
- 4) Plot the resulting analyzer trace and the emission mask limit, add text and labeling as appropriate.

EXHIBIT	DESCRIPTION
E1-2.10	Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels, Low End of Band
E1-2.11	Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels, Middle of Band
E1-2.12	Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels, High End of Band

## Report on Test Measurements

Occupied Bandwidth –3600 bps High Speed Trunking Control Data, 12.5 kHz Channel Spacing

There is one exhibit shown for 3600 bps high speed control data in 12.5 kHz channels. It can be used in a trunked system configuration based upon channel usage as described in Exhibit B. The occupied bandwidth chart references the following setup and specification requirements.

Modulation Type: Frequency Shift Keying Digital Modulation  
 Emission Designator: 10K0F1D  
 Channelization: 12.5 kHz  
 Power Setting: 100 Watts

Specification Requirement § 90.210(d) Emission Limits – “D-Mask”:

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  $7.27 * (f_d - 2.88 \text{ kHz})$  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  $10 \log_{10}(P)$  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><math>2*(M+D)</math></i>	<i>Nec BW</i>
1.8 kHz	3.2 kHz	10 kHz	10K0

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		

Test Procedure:

- 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 carrier power value from the previous step to generate the emission mask limit.
- 4) Plot the resulting analyzer trace and the emission mask limit, add text and labeling as appropriate.

EXHIBIT DESCRIPTION

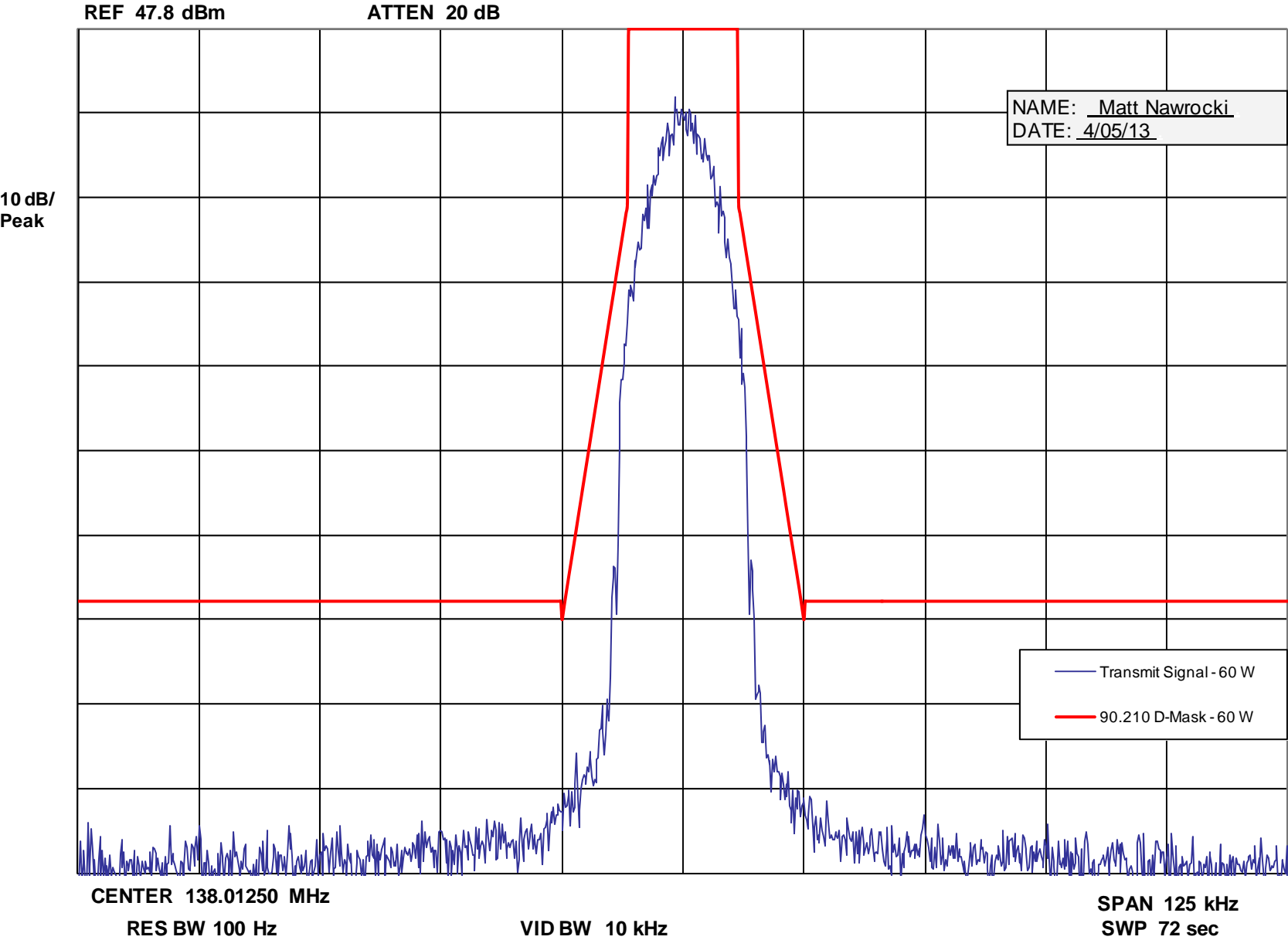
E1-2.13	Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels, Low End of Band
E1-2.14	Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels, Middle of Band
E1-2.15	Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels, High End of Band



Report on Test Measurements

Occupied Bandwidth – Linear Simulcast Modulation (LSM) – Emission Designator: 8K70D1E, 8K70D1D, 8K70D1W – Low End of Band

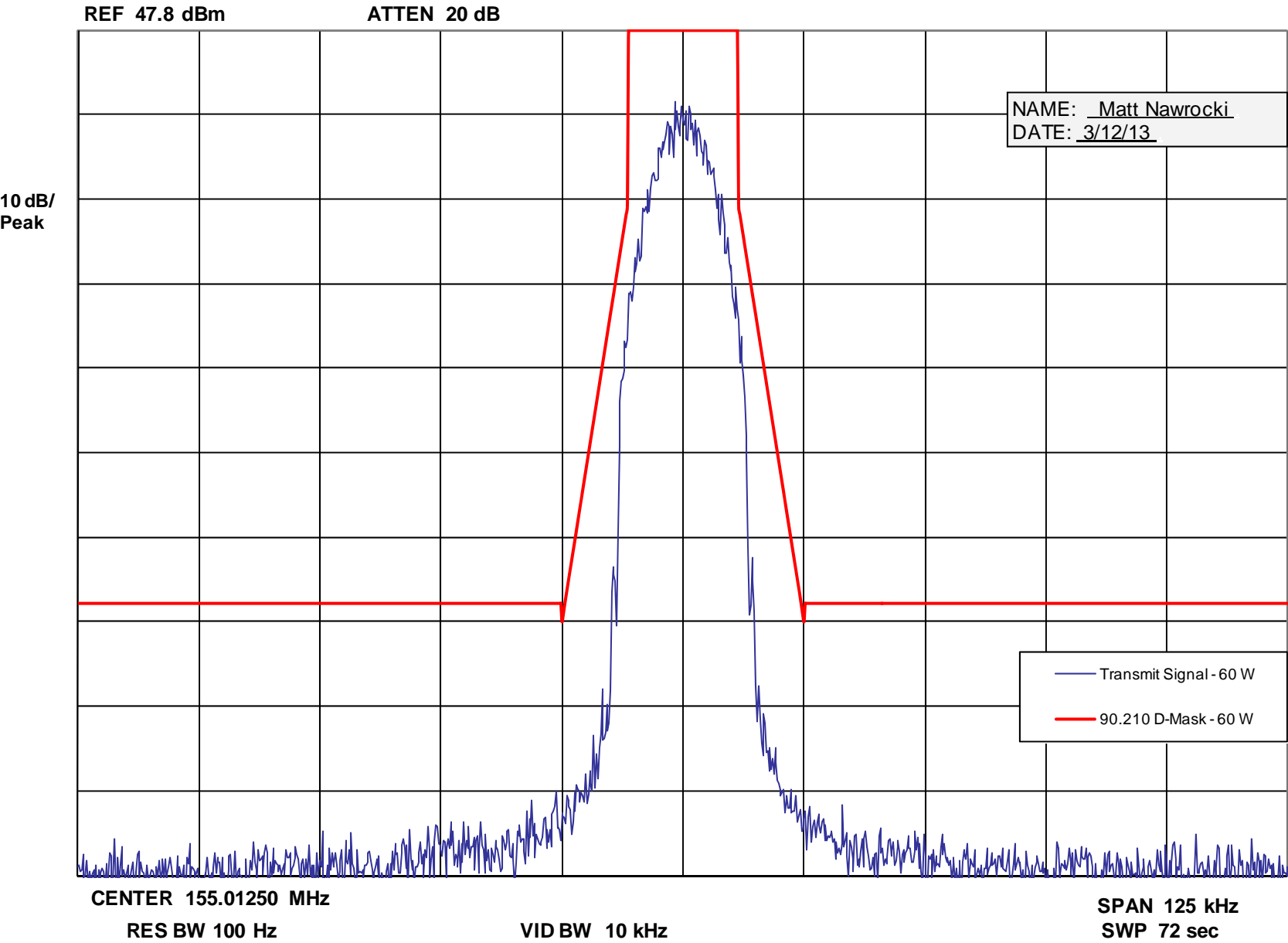
Occupied Bandwidth -- Linear Simulcast Modulation - 60 Watts (Average)



Report on Test Measurements

Occupied Bandwidth – Linear Simulcast Modulation (LSM) – Emission Designator: 8K70D1E, 8K70D1D, 8K70D1W – Middle of Band

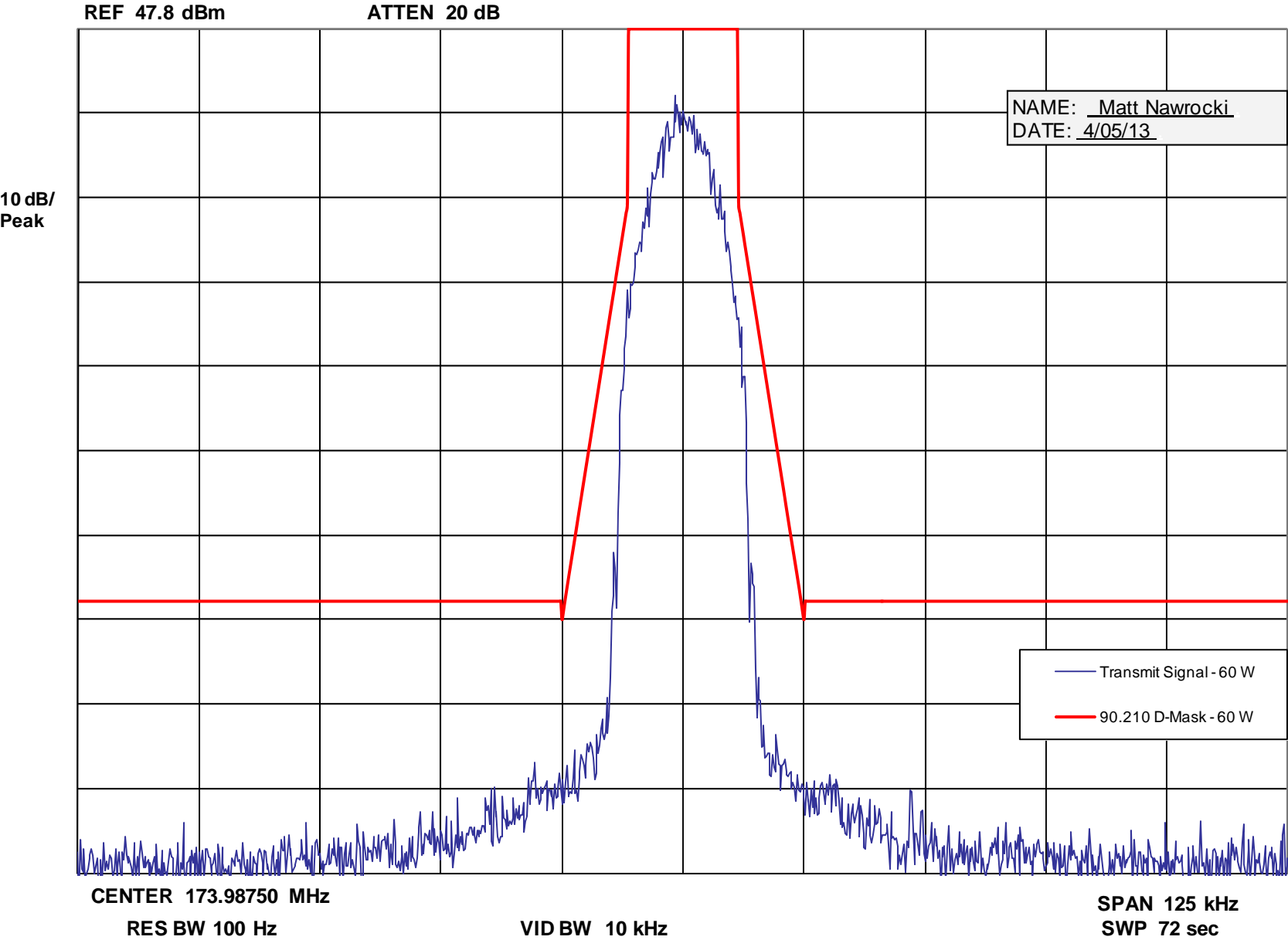
Occupied Bandwidth -- Linear Simulcast Modulation - 60 Watts (Average)



Report on Test Measurements

Occupied Bandwidth – Linear Simulcast Modulation (LSM) – Emission Designator: 8K70D1E, 8K70D1D, 8K70D1W – High End of Band

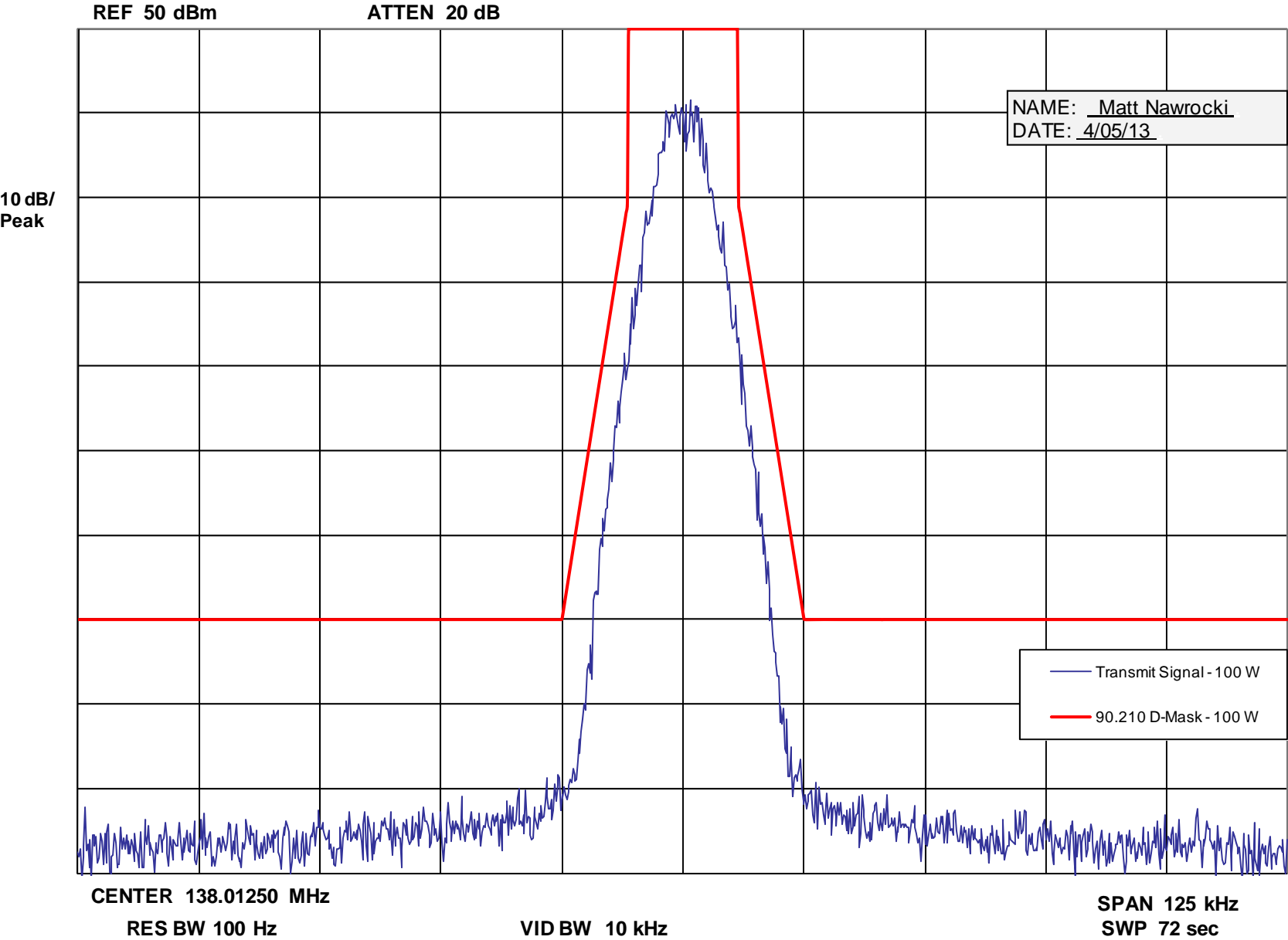
Occupied Bandwidth -- Linear Simulcast Modulation - 60 Watts (Average)



Report on Test Measurements

Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM) – Emission Designator: 8K10D1E, 8K10D1D, 8K10D1W, Low End of Band

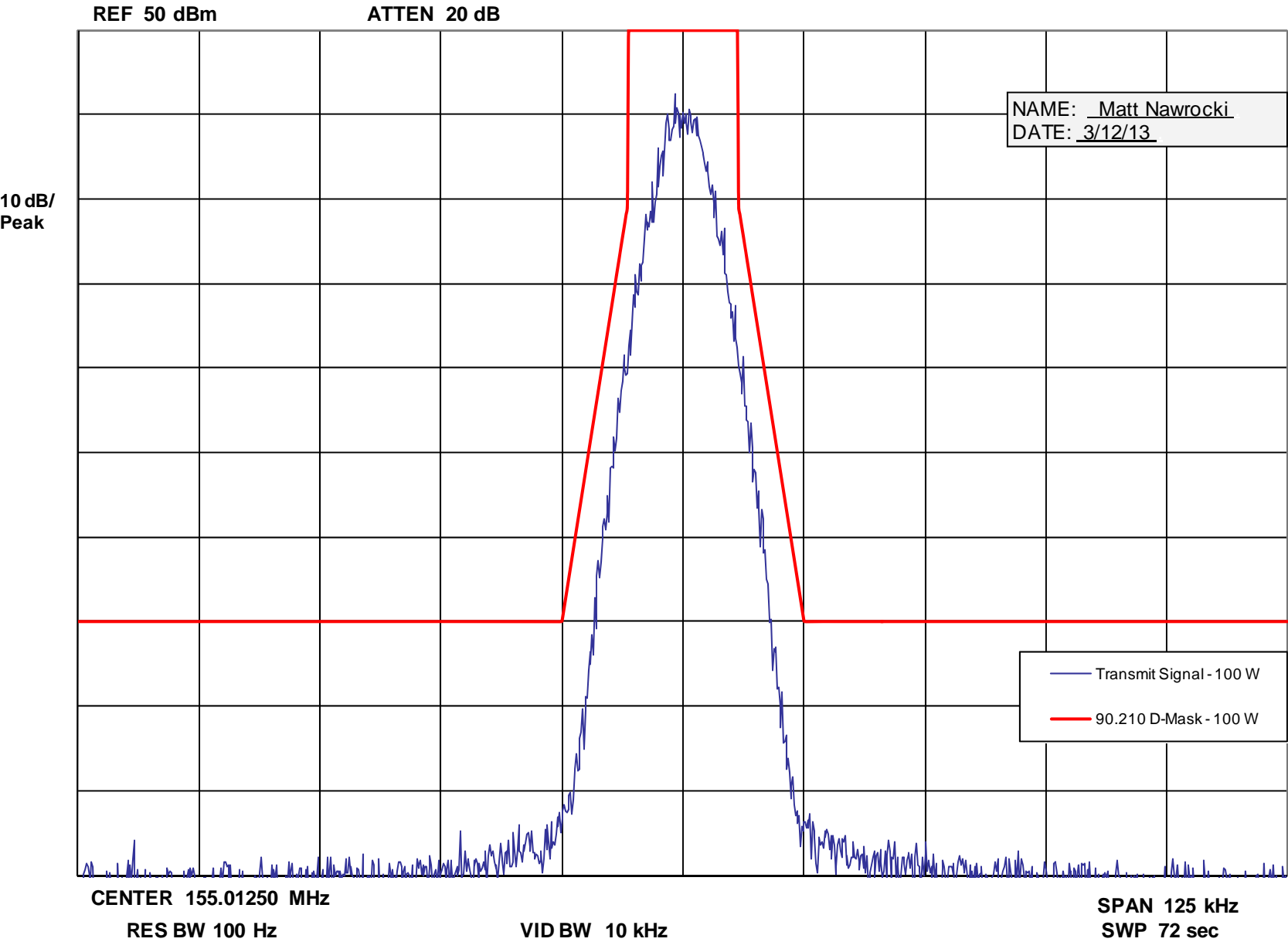
Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM) – Emission Designator: 8K10D1E, 8K10D1D, 8K10D1W, Middle of Band

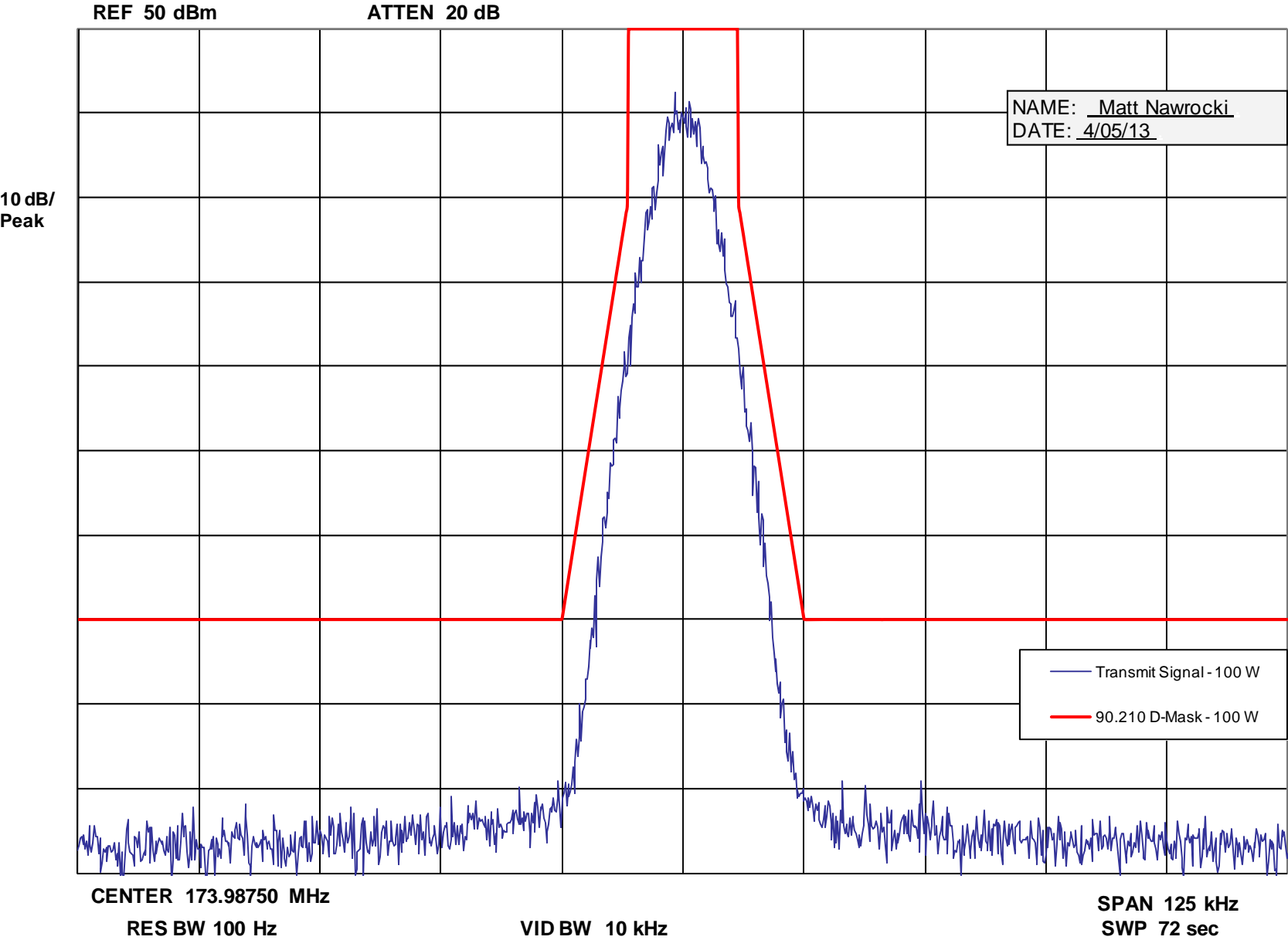
Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM) – Emission Designator: 8K10D1E, 8K10D1D, 8K10D1W, High End of Band

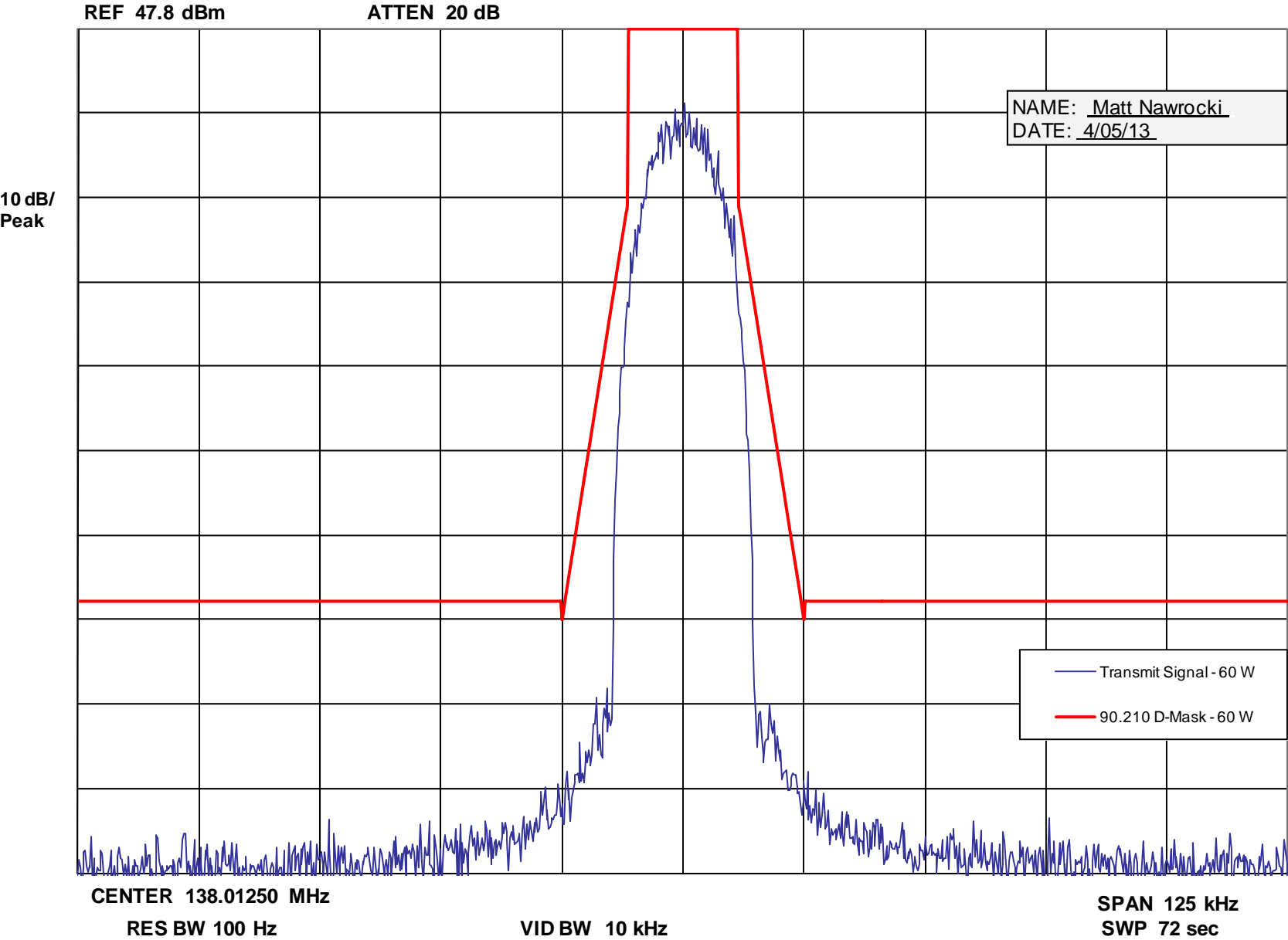
Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – H-DQPSK, P25 Two Slot TDMA Digital Modulation – Emission Designator: 9K80D7E, 9K80D7D, 9K80D7W, Low End of Band

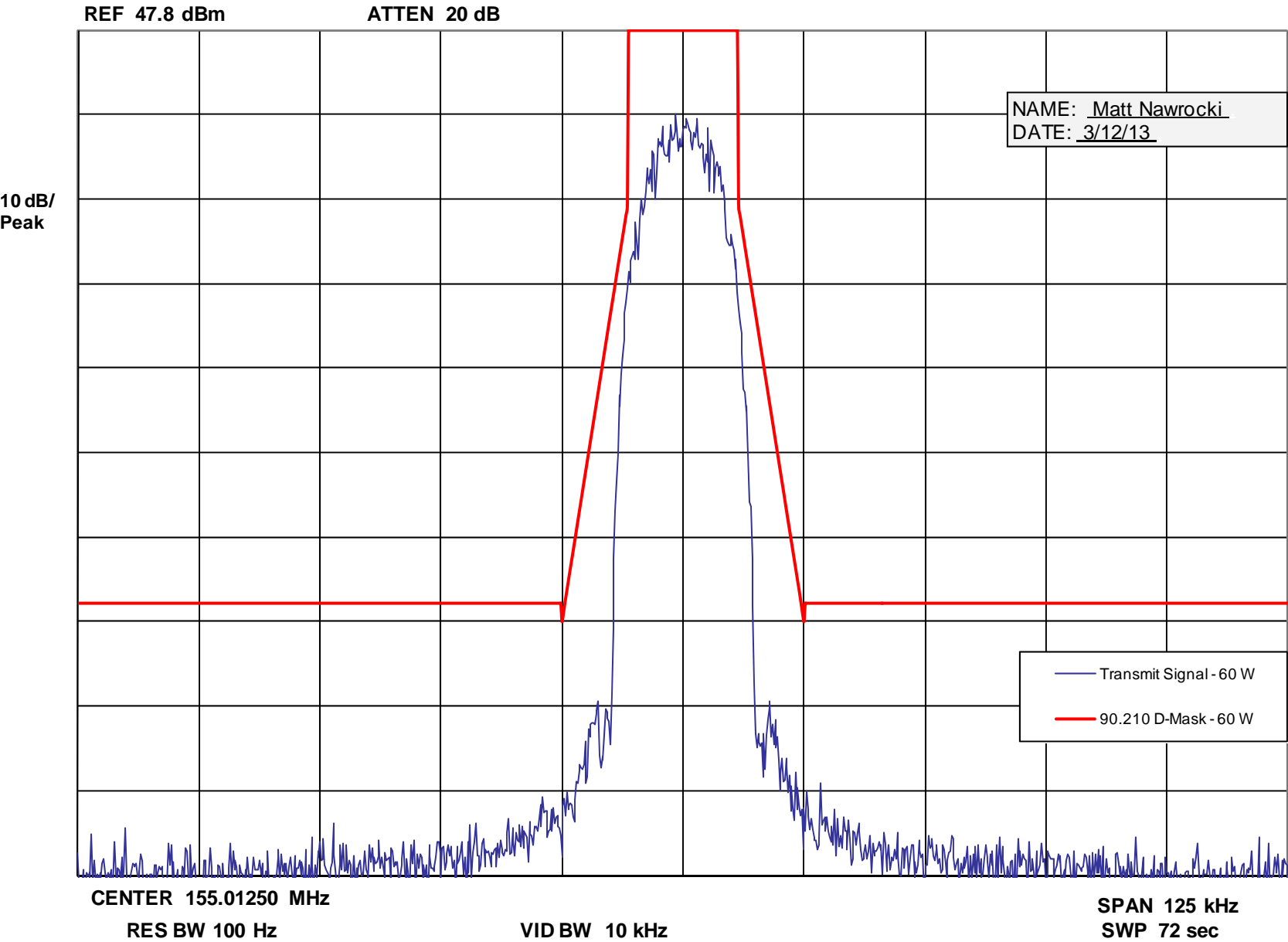
Occupied Bandwidth -- H-DQPSK P25 Two Slot TDMA Digital Modulation - 60 Watts (Average)



Report on Test Measurements

Occupied Bandwidth – H-DQPSK, P25 Two Slot TDMA Digital Modulation – Emission Designator: 9K80D7E, 9K80D7D, 9K80D7W, Middle of Band

Occupied Bandwidth -- H-DQPSK P25 Two Slot TDMA Digital Modulation - 60 Watts (Average)

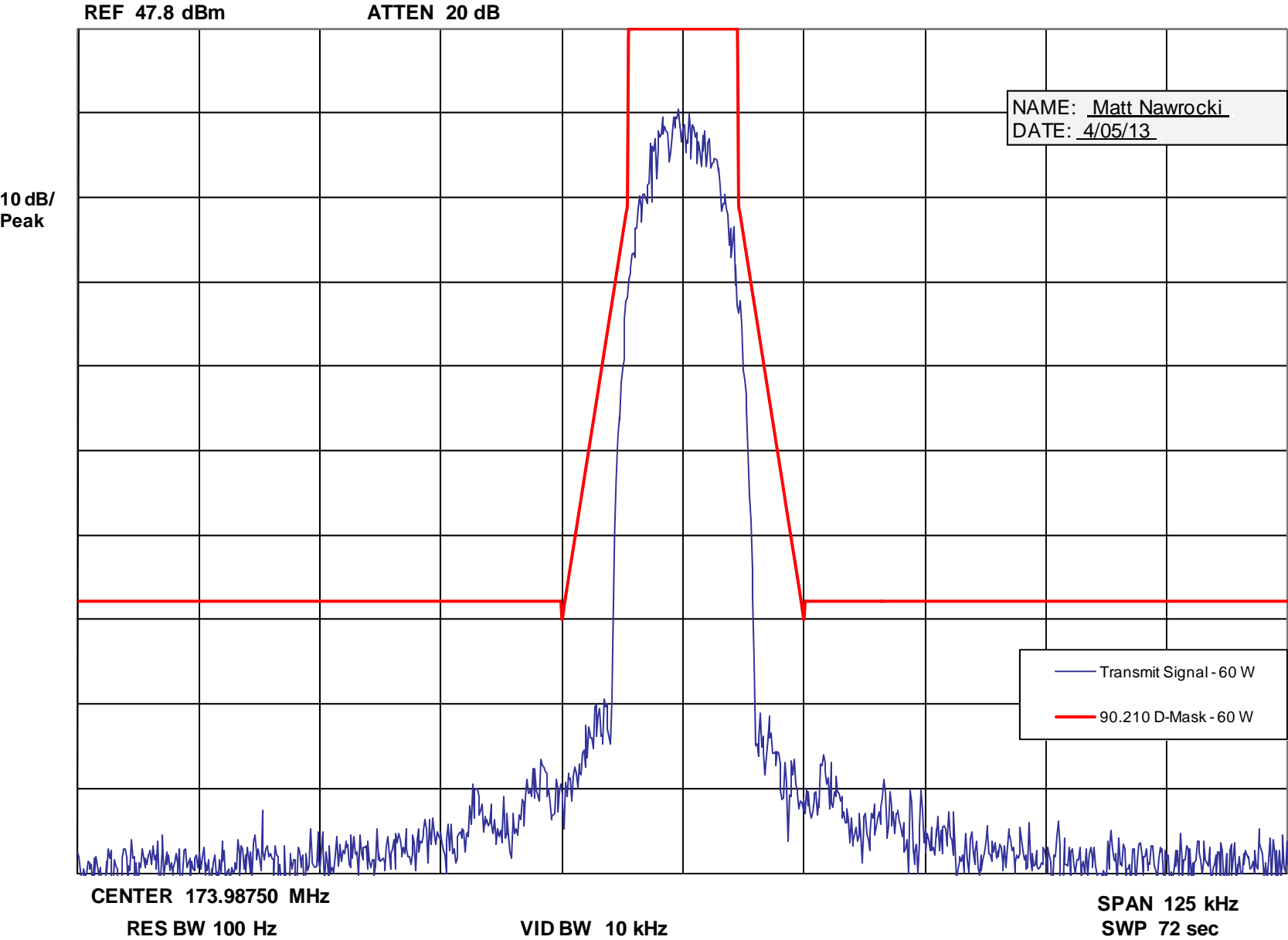




Report on Test Measurements

Occupied Bandwidth – H-DQPSK, P25 Two Slot TDMA Digital Modulation – Emission Designator: 9K80D7E, 9K80D7D, 9K80D7W, High End of Band

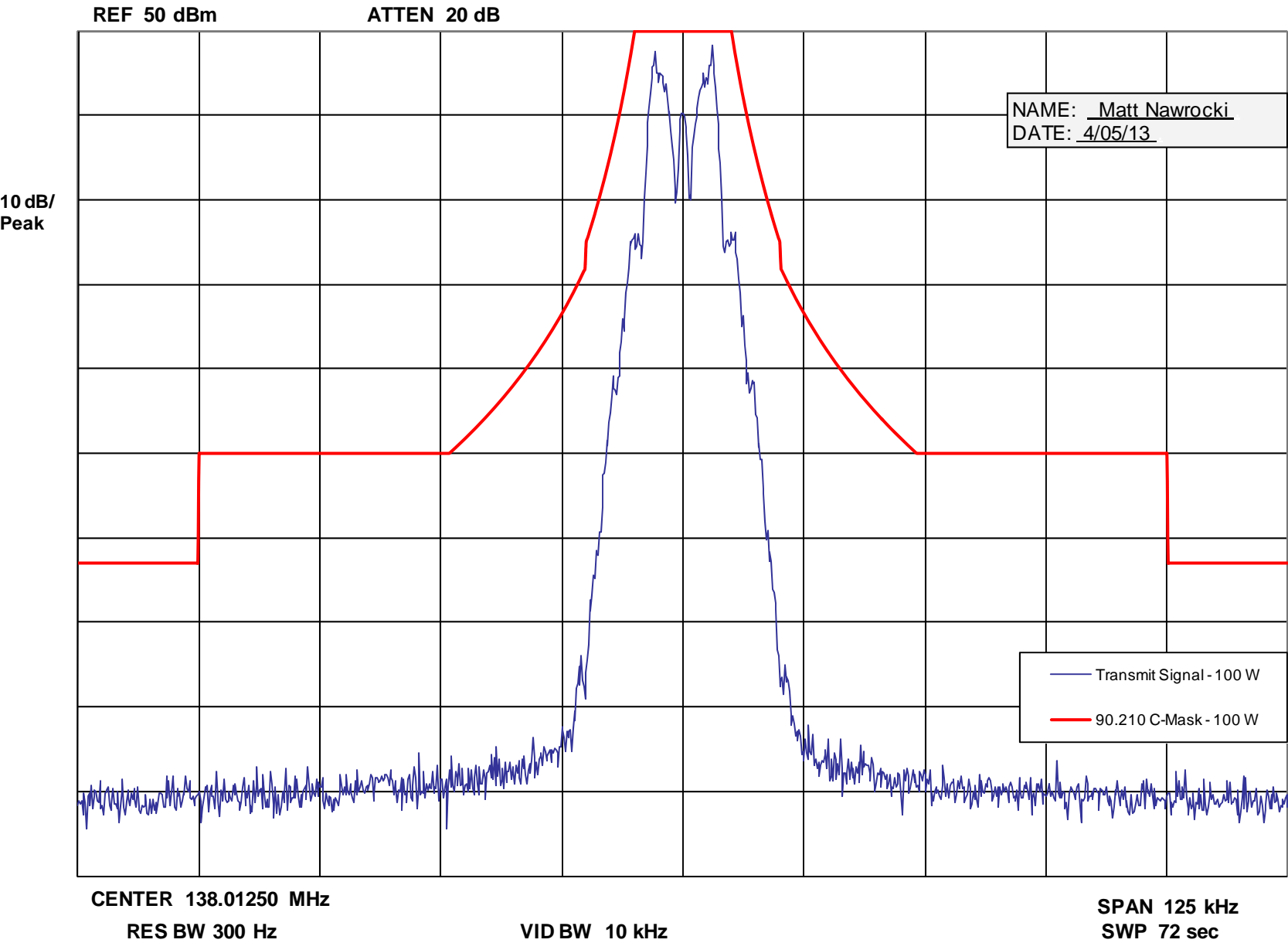
Occupied Bandwidth -- H-DQPSK P25 Two Slot TDMA Digital Modulation - 60 Watts (Average)



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels – Emission Designator: 16K0F1D, Low End of Band

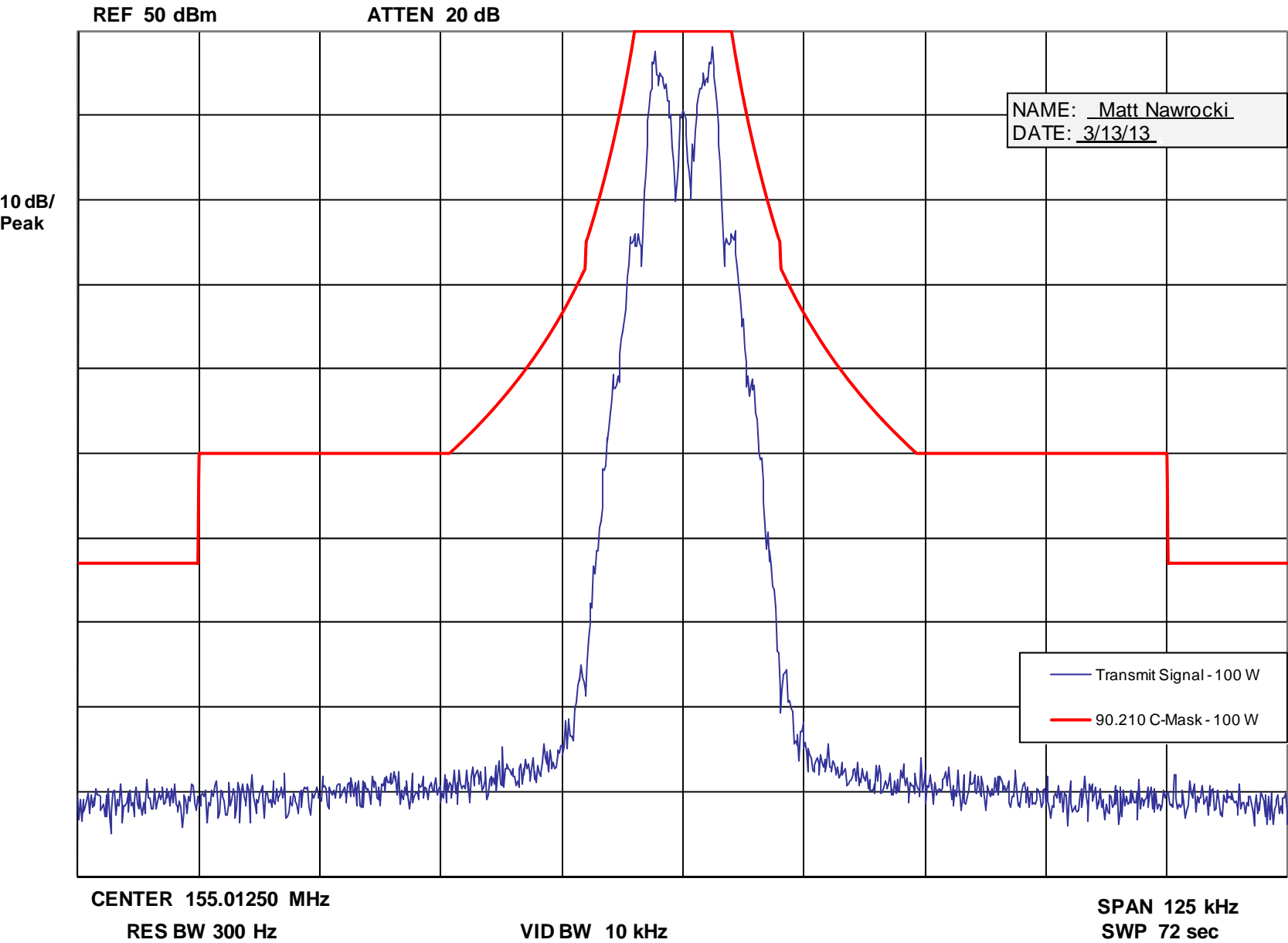
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels – Emission Designator: 16K0F1D, Middle of Band

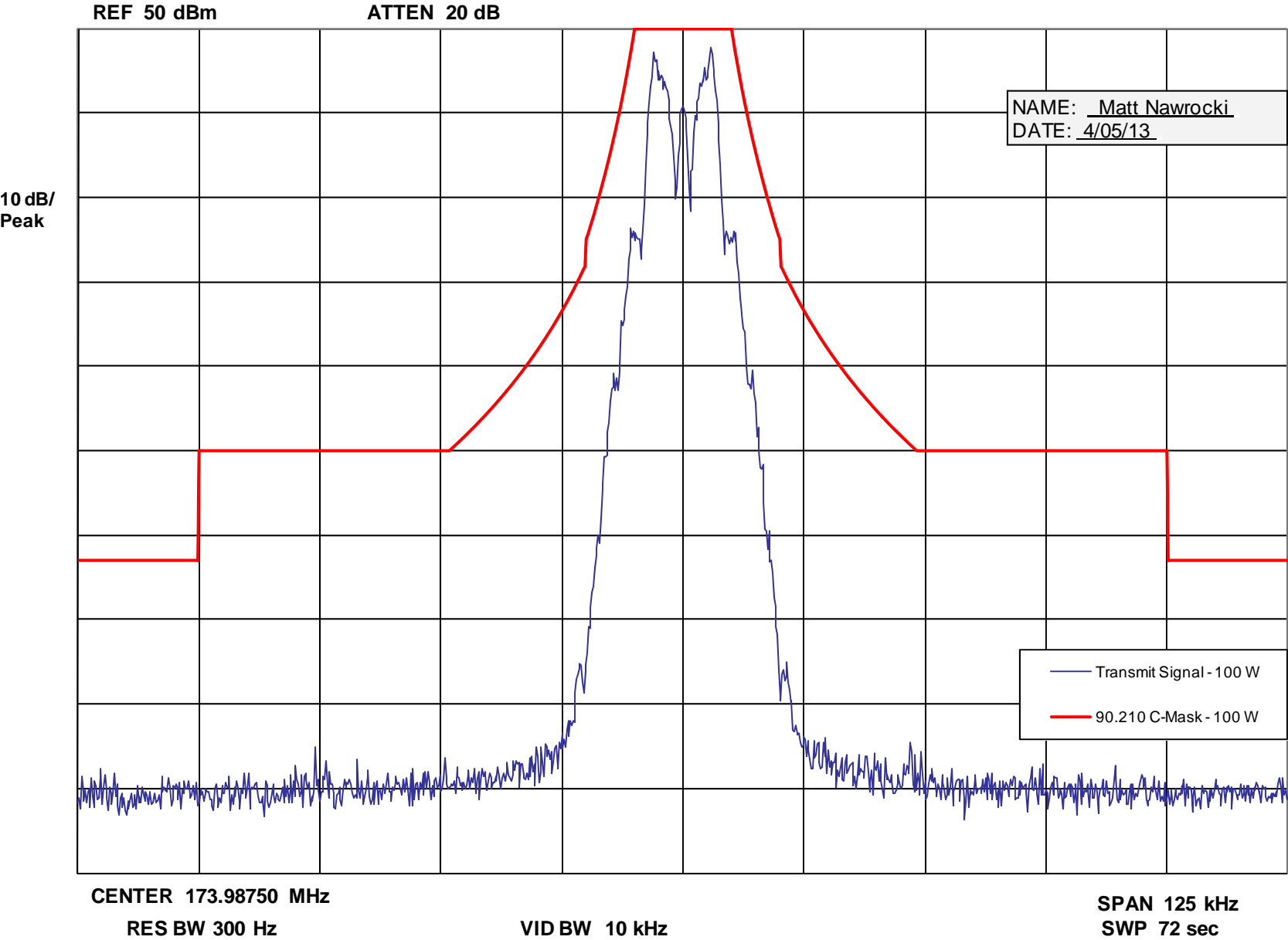
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels – Emission Designator: 16K0F1D, High End of Band

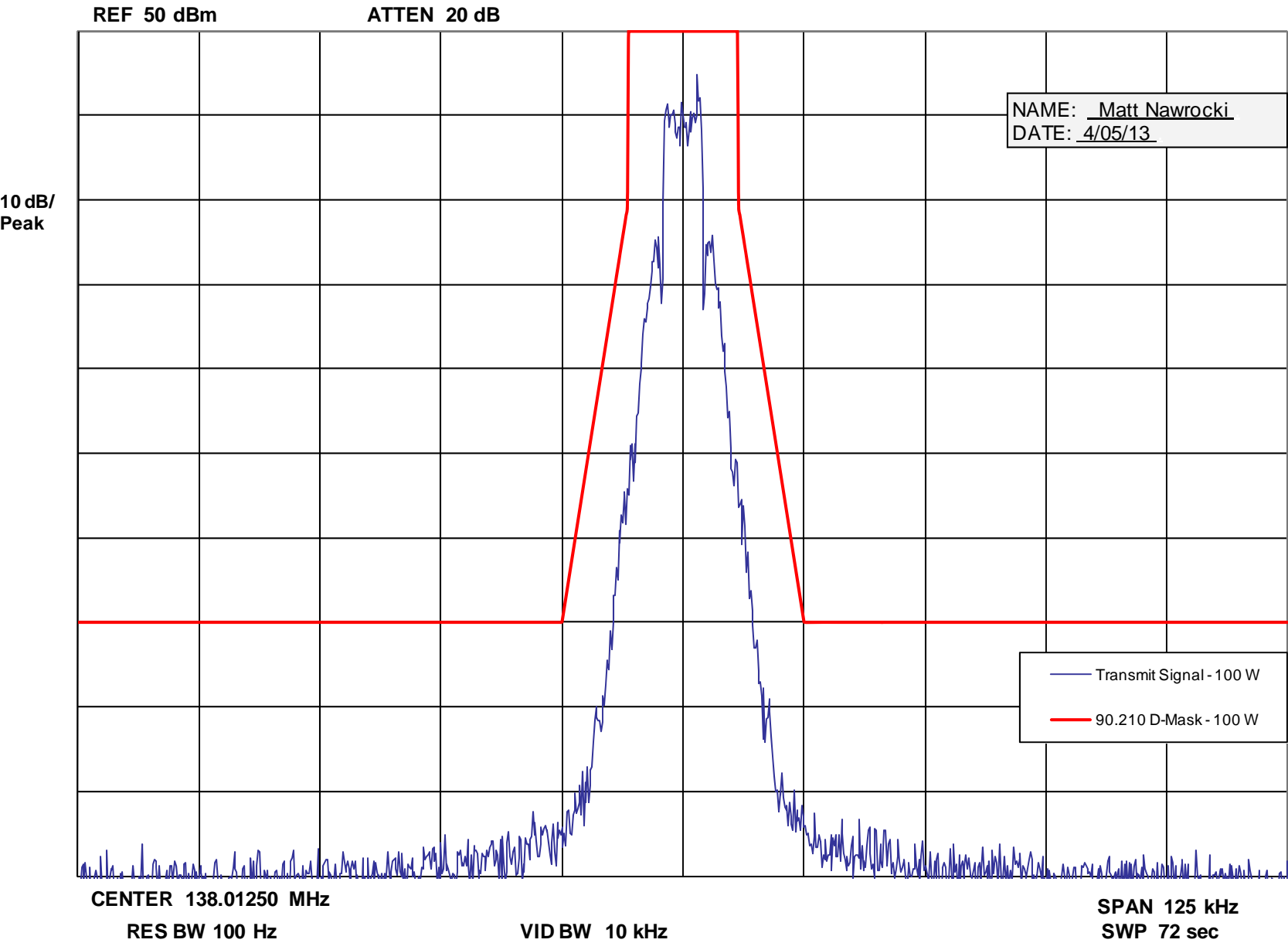
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels – Emission Designator: 10K0F1D, Low End of Band

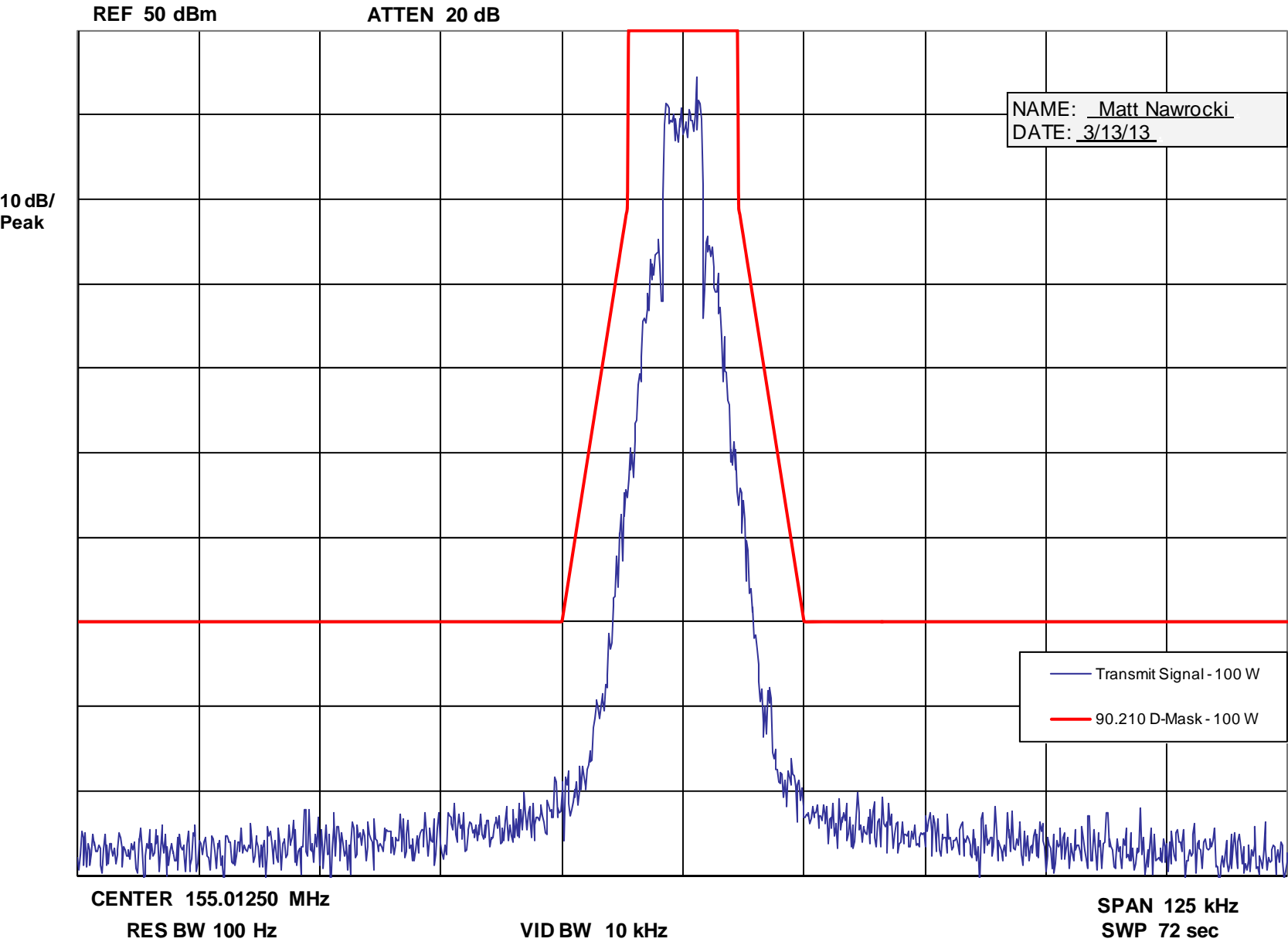
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels – Emission Designator: 10K0F1D, Middle of Band

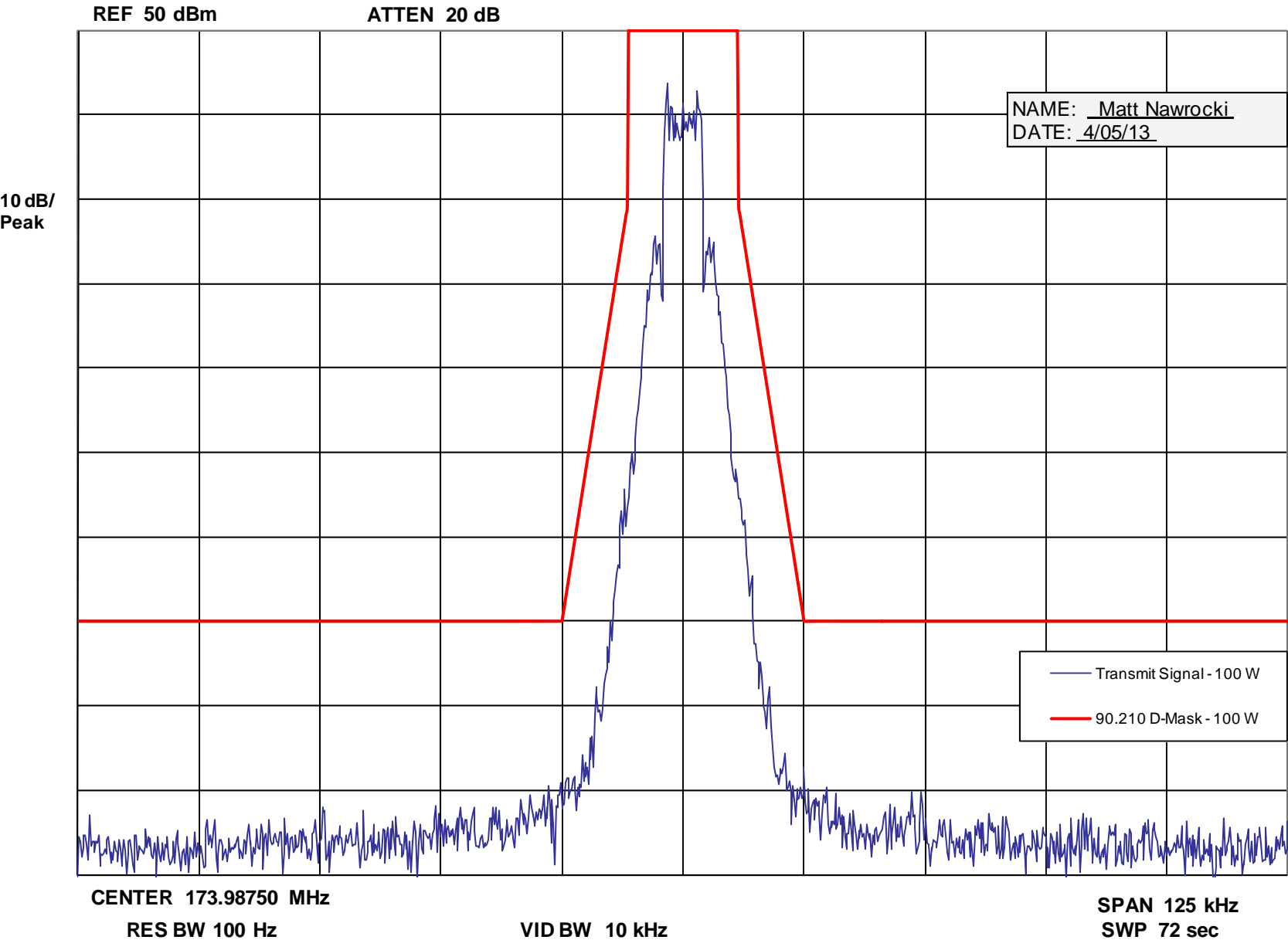
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 100 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels – Emission Designator: 10K0F1D, High End of Band

Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 100 Watts



## Report on Test Measurements

## Conducted Spurious Emissions – Harmonics and Emission Spectrum

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.*

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 | <i>At least 25 dB;</i>  |
| b) >20 kHz up to and including 50 kHz | <i>At least 35 dB;</i>  |
| c) >50 kHz                            | <i>least 50 plus <math>10 \log_{10}(P)</math> dB or 80 dB;<br/>(whichever is the lesser attenuation).</i> |

Modulation: Linear Simulcast Modulation (LSM), or Compatible 4-Level Frequency Modulation (C4FM)–Pseudorandom data, or Analog Frequency Modulation as indicated

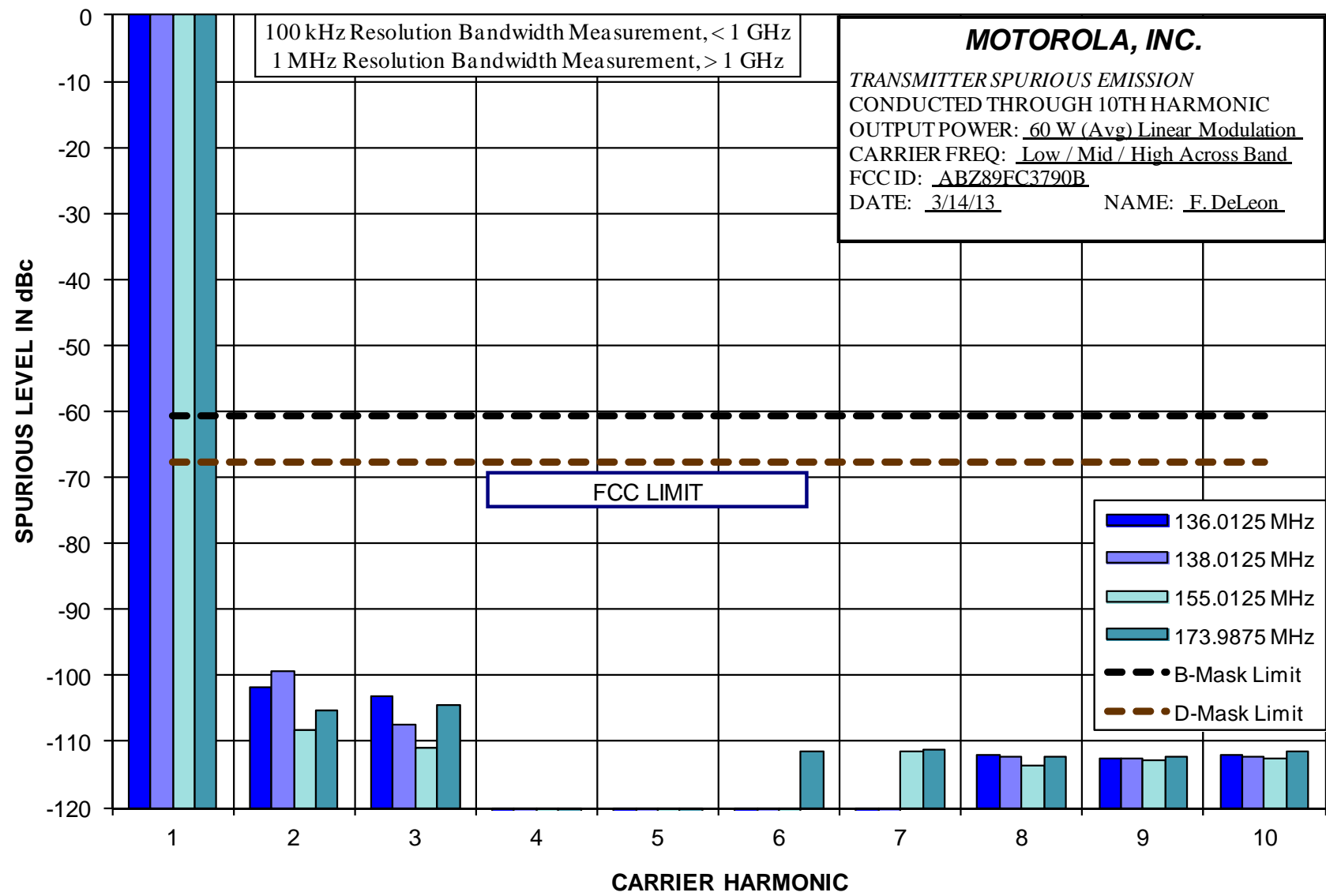
Carrier Frequencies: Carrier frequencies of 136.0125, 138.0125, 155.0125, and 173.9875 MHz were measured for conducted carrier harmonics. These frequencies represent the low end, center, and high end of the 136-174 MHz band, and are representative of the full 136-174 MHz operating band. Carrier frequencies of 138.0125, 155.0125, and 173.9875 MHz were measured for conducted emission measurements.

EXHIBIT	DESCRIPTION
E1-3.1	Conducted Spurious Harmonic Emissions, Power Output 60 Watts, LSM The specification limit is -67.8 dBc
E1-3.2	Conducted Spurious Harmonic Emissions, Power Output 2 Watts, LSM The specification limit is -53.0 dBc
E1-3.3	Conducted Spurious Harmonic Emissions, Power Output 100 Watts, C4FM The specification limit is -70.0 dBc
E1-3.4	Conducted Spurious Harmonic Emissions, Power Output 2 Watts, C4FM The specification limit is -53.0 dBc
E1-3.5	Conducted Spurious Harmonic Emissions, Power Output 100 Watts, Analog The specification limit is -70.0 dBc
E1-3.6	Conducted Spurious Harmonic Emissions, Power Output 2 Watts, Analog The specification limit is -53.0 dBc
E1-3.7, 8, 9	Conducted Spurious Emission Spectrum, 200 MHz Span, Power Output at 60 Watts, LSM The specification limit is -67.8 dBc
E1-3.10, 11, 12	Conducted Spurious Emission Spectrum, 200 MHz Span, Power Output at 100 Watts, C4FM The specification limit is -70.0 dBc
E1-3.13, 14, 15	Conducted Spurious Emission Spectrum, 200 MHz Span, Power Output at 100 Watts, Analog The specification limit is -70.0 dBc



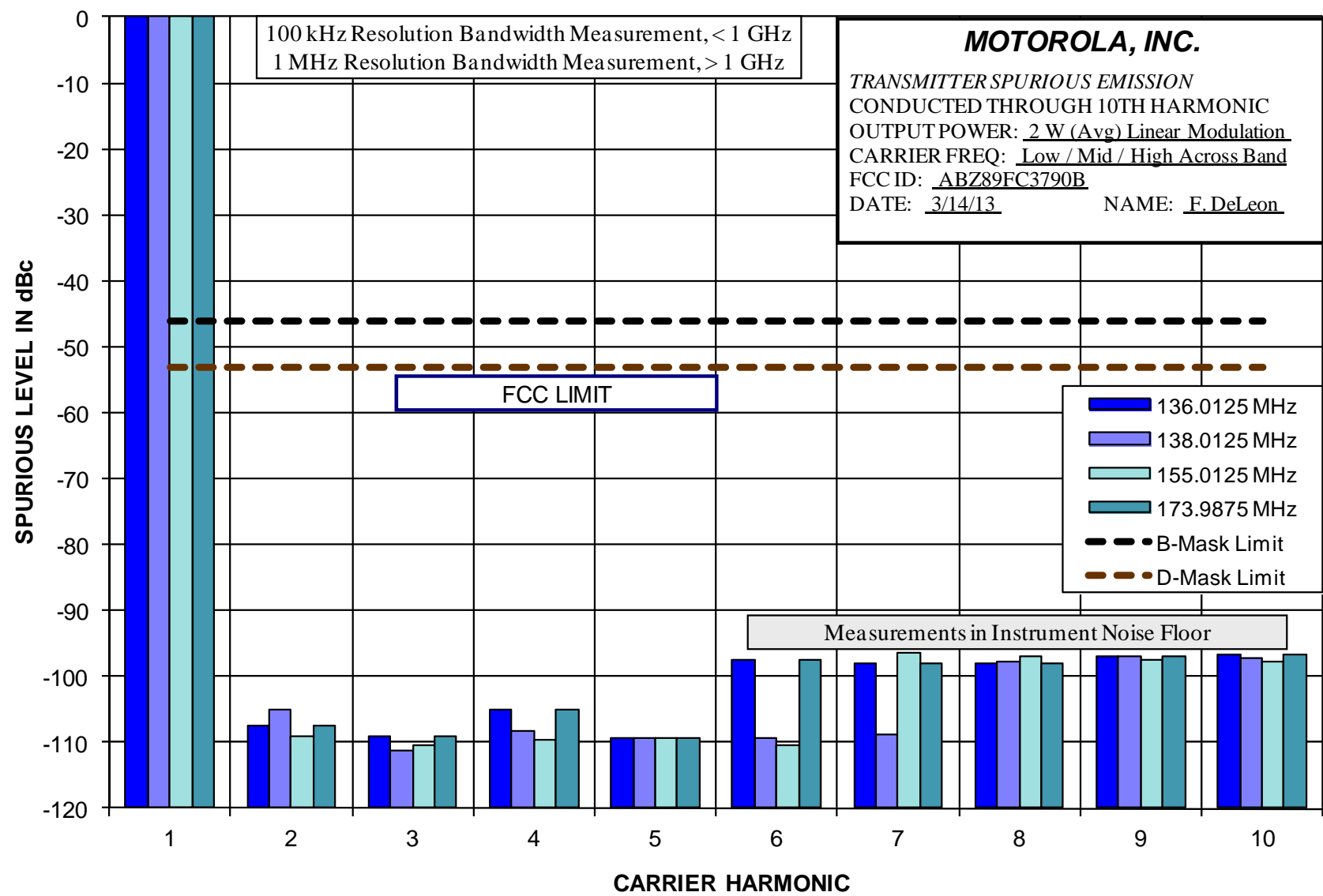
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 60 Watts LSM



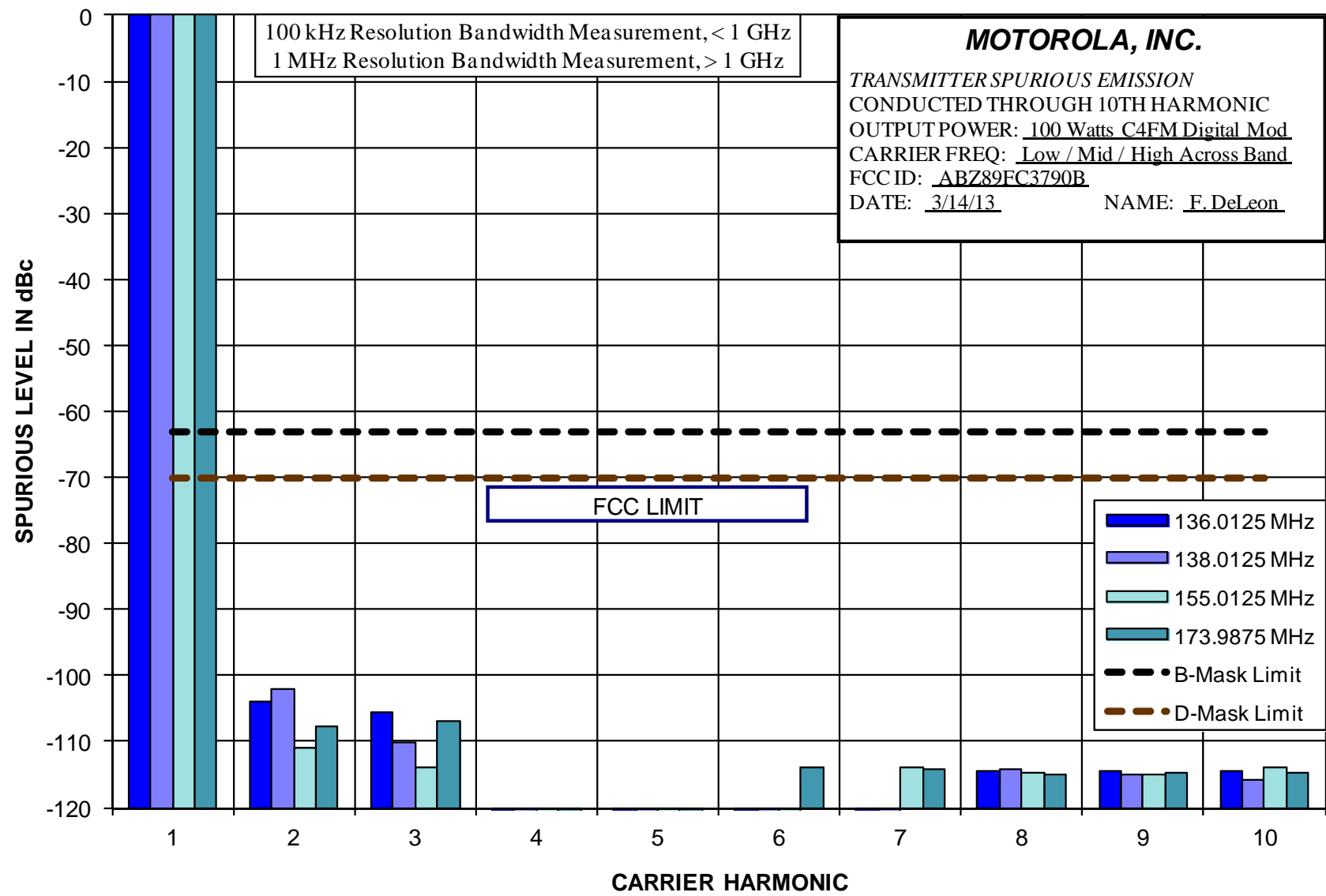
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 2 Watts LSM



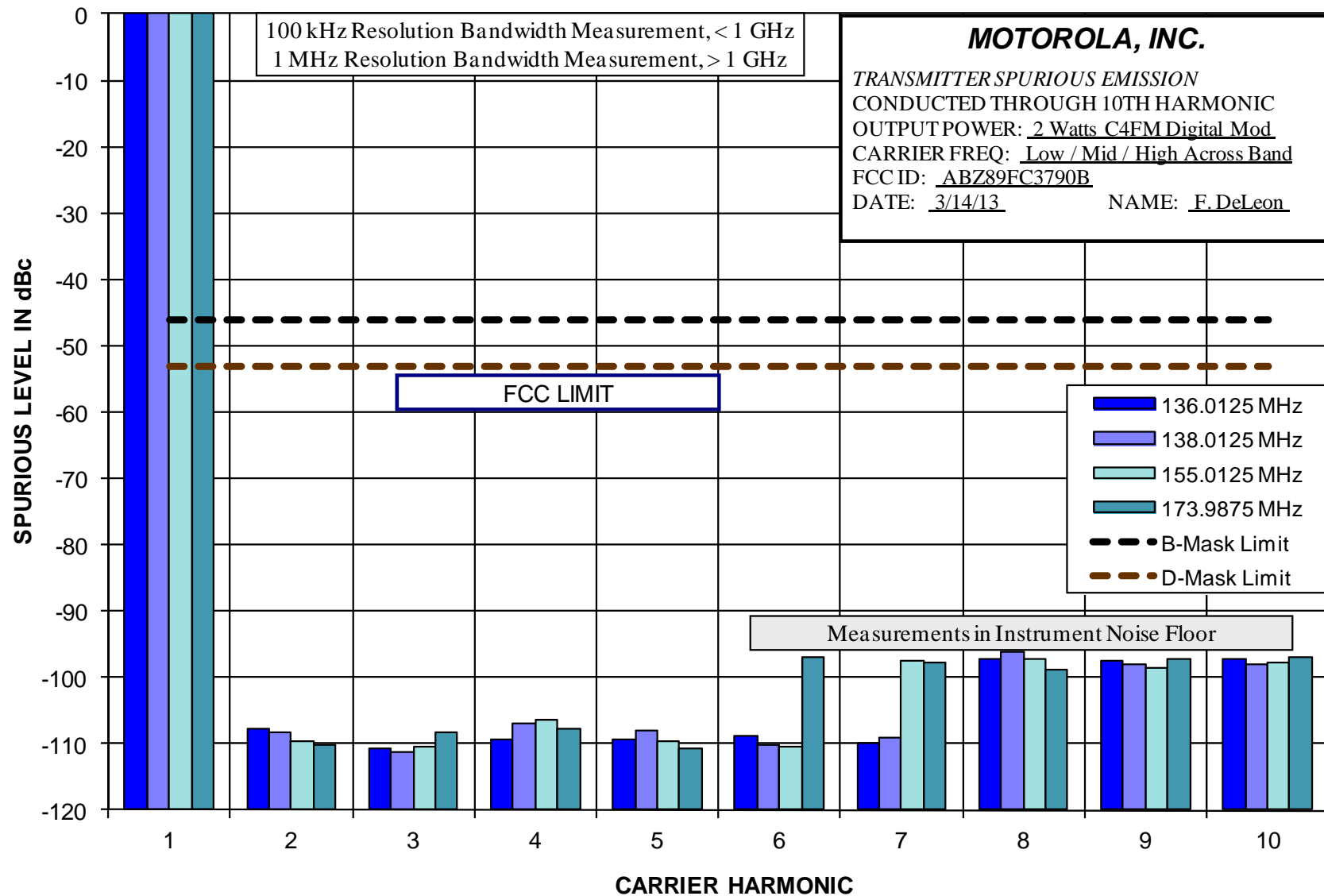
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 100 Watts C4FM



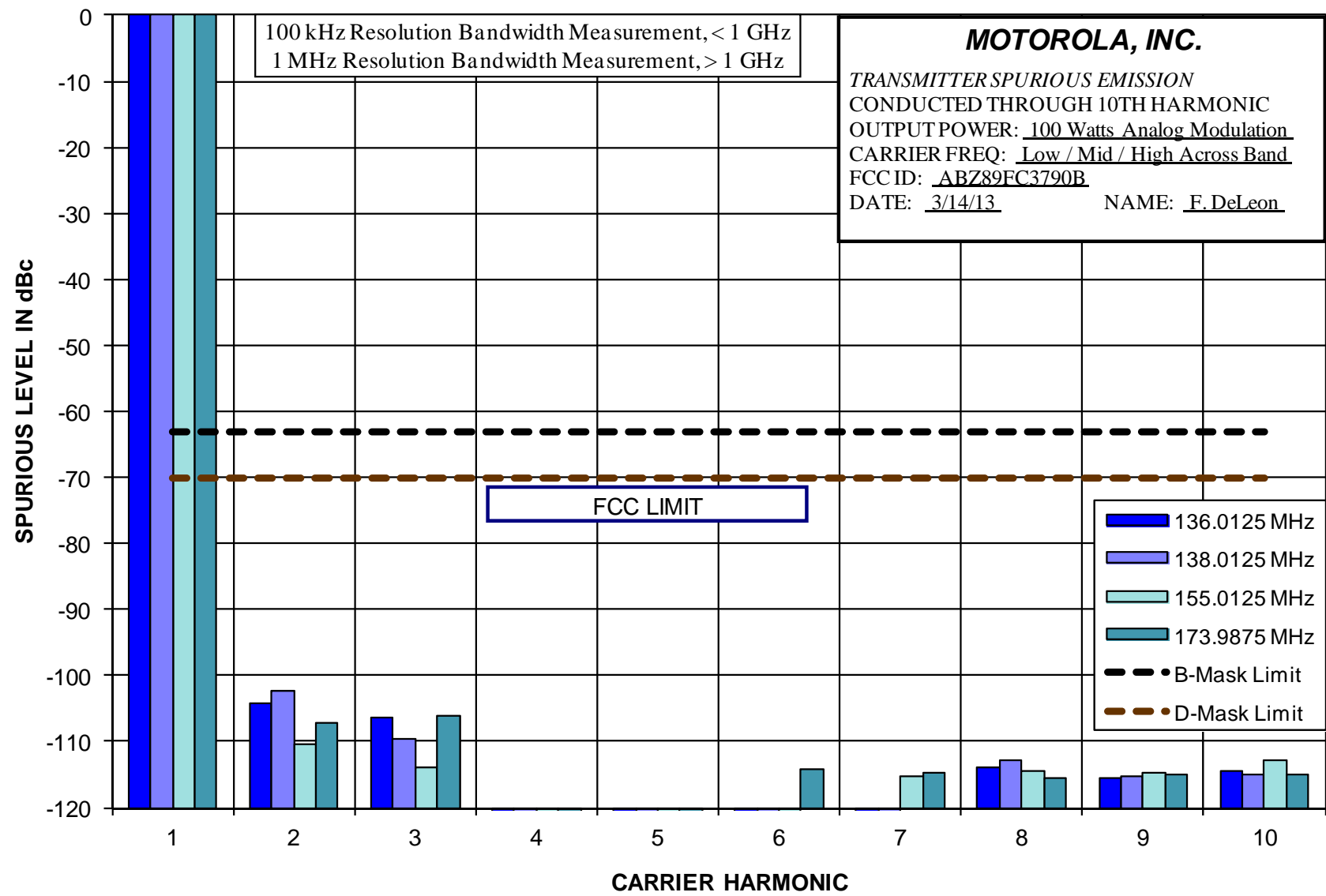
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 2 Watts C4FM



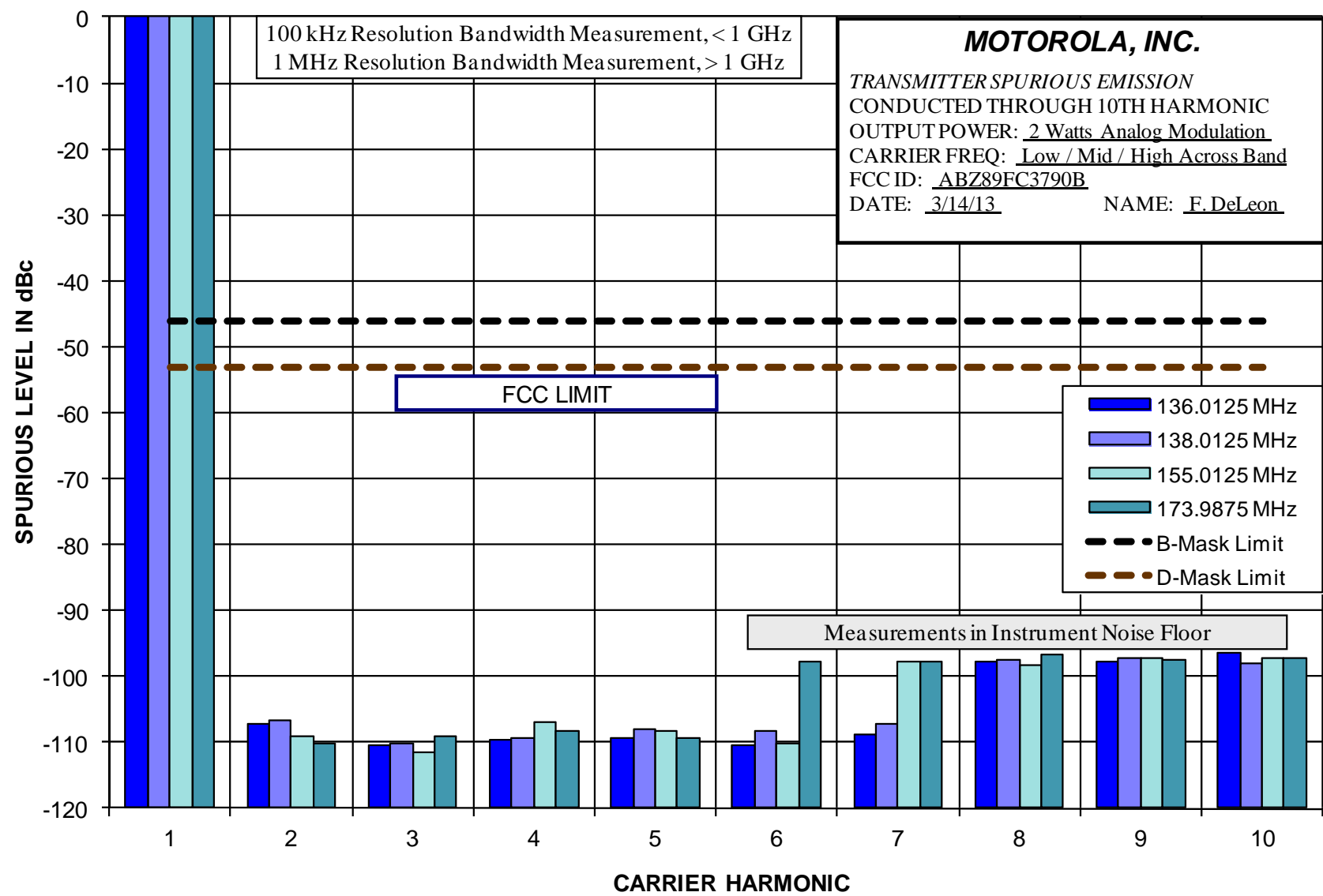
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 100 Watts Analog



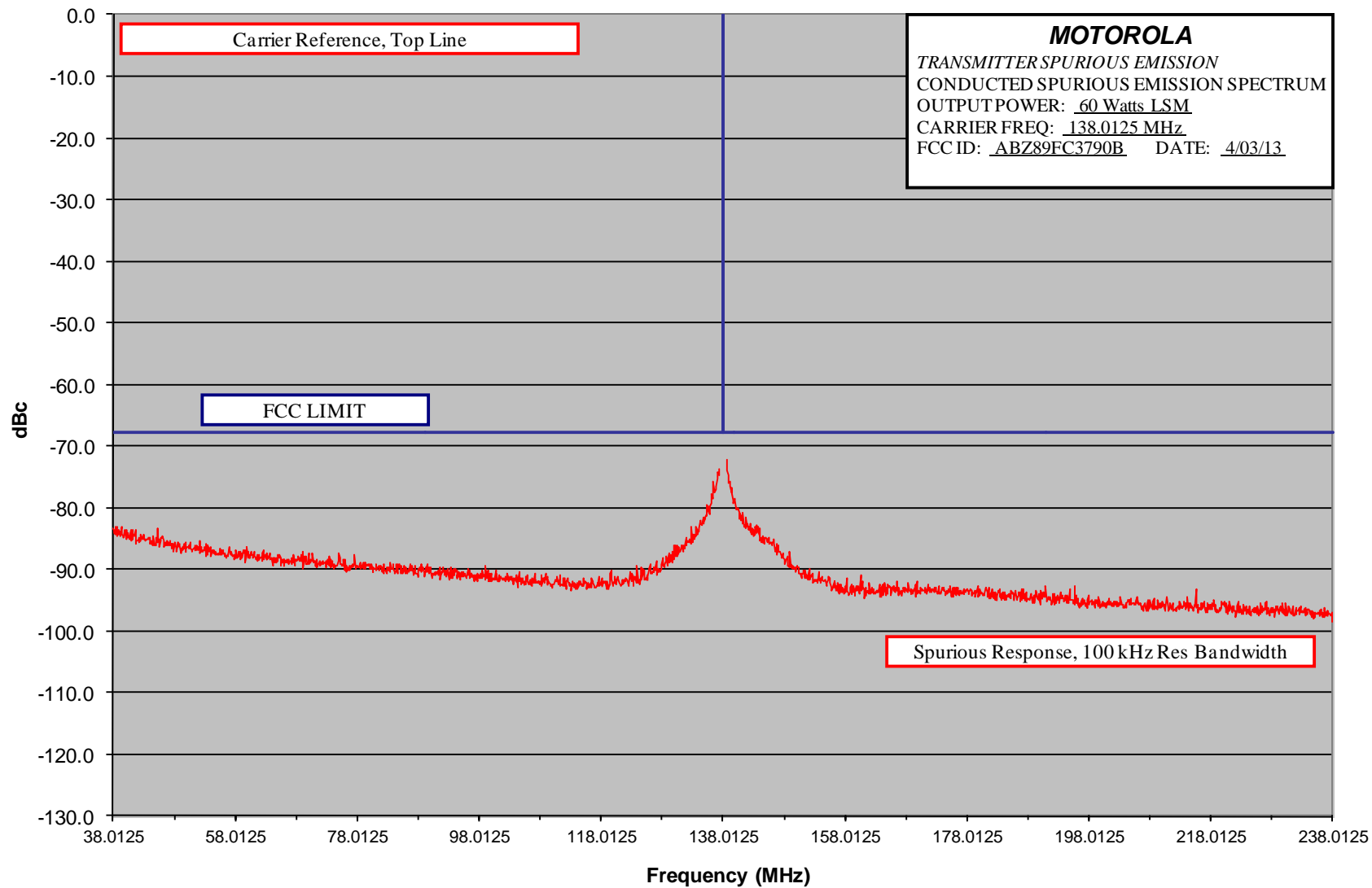
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 2 Watts Analog



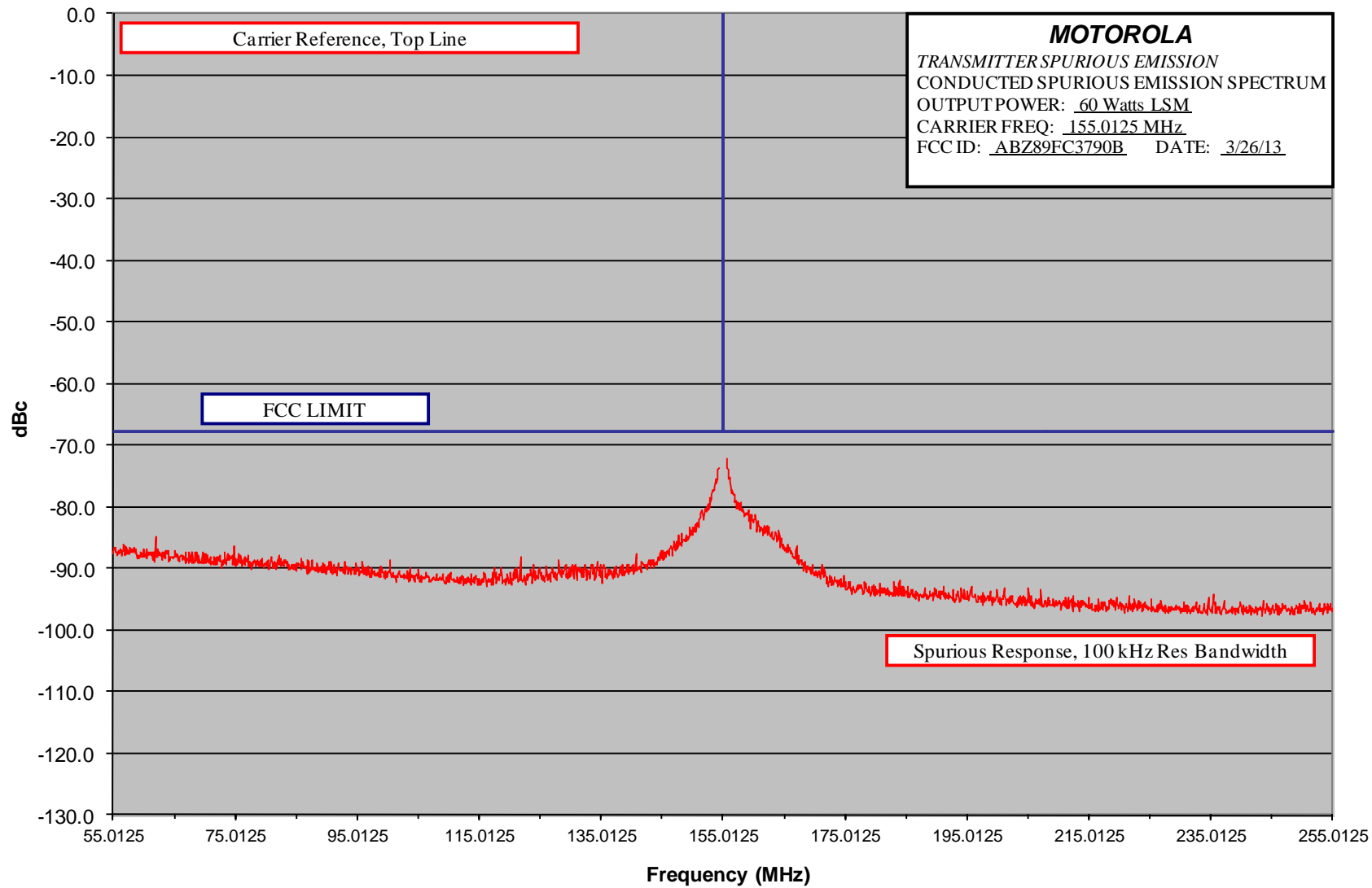
Report on Test Measurements

Conducted Spurious Emission Spectrum – 60 Watts LSM – 200 MHz Span – Low End of Band



Report on Test Measurements

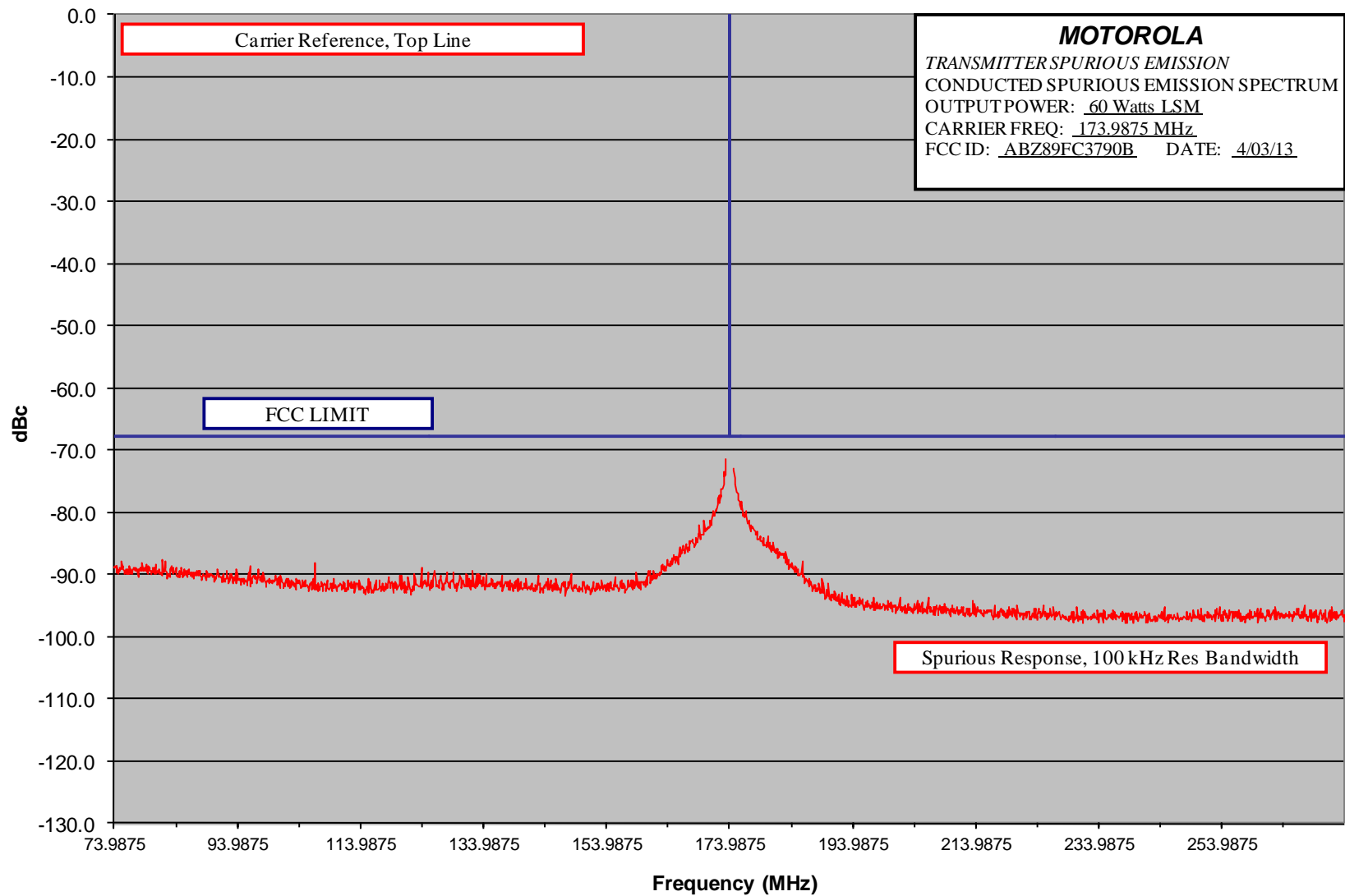
Conducted Spurious Emission Spectrum – 60 Watts LSM – 200 MHz Span – Middle of Band





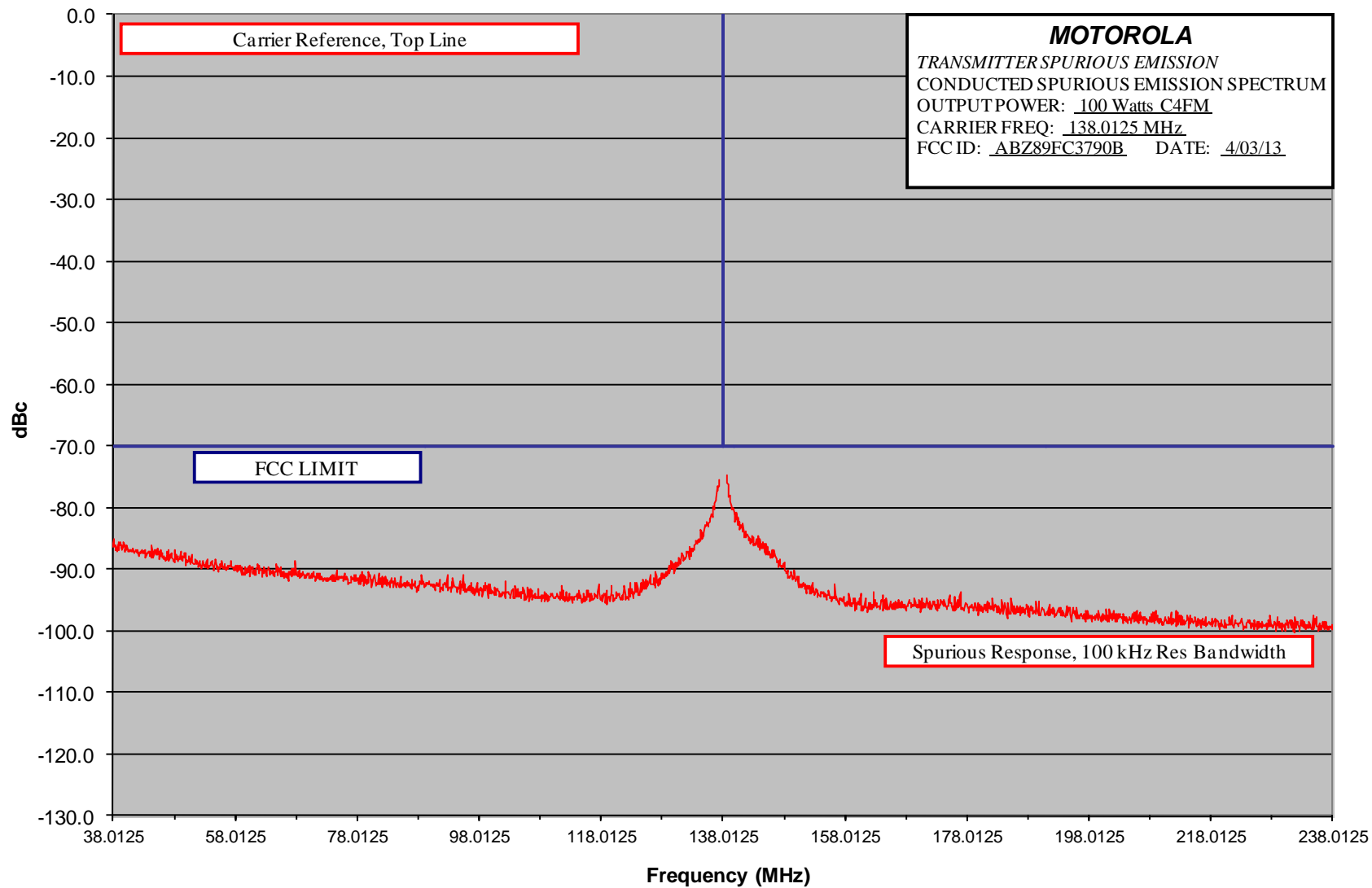
Report on Test Measurements

Conducted Spurious Emission Spectrum – 60 Watts LSM – 200 MHz Span – High End of Band



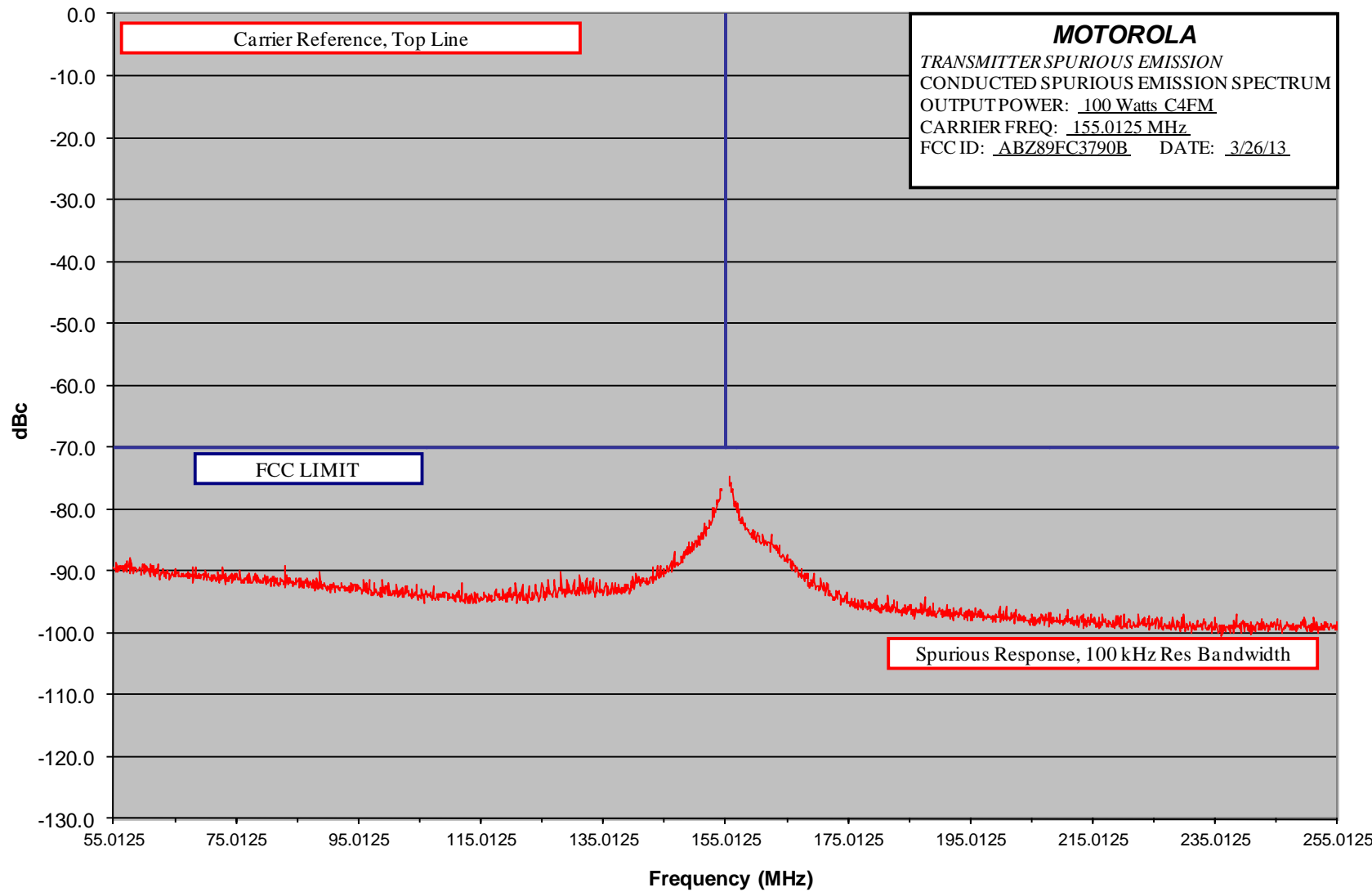
Report on Test Measurements

Conducted Spurious Emission Spectrum – 100 Watts C4FM – 200 MHz Span – Low End of Band



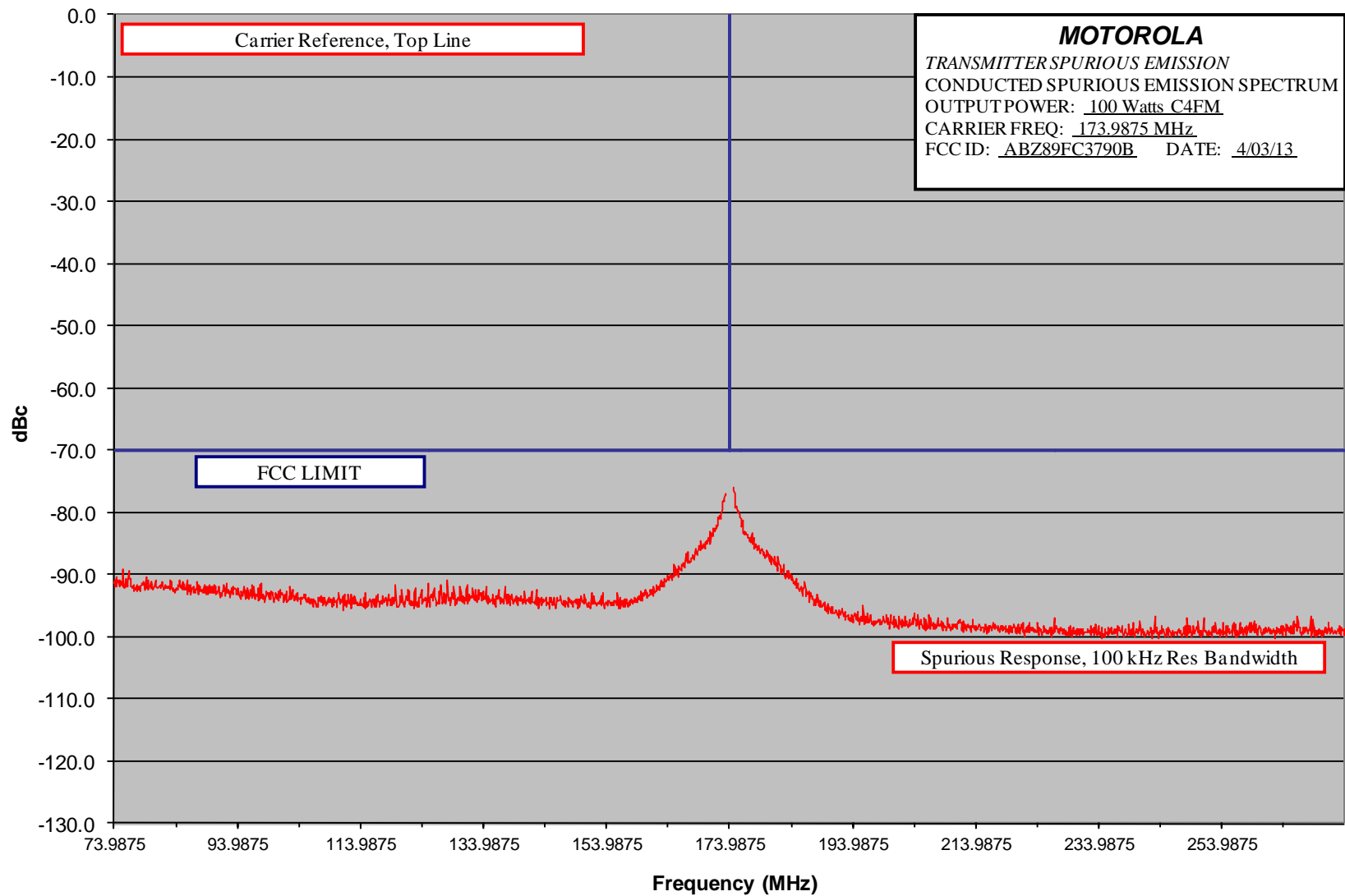
Report on Test Measurements

Conducted Spurious Emission Spectrum – 100 Watts C4FM – 200 MHz Span – Middle of Band



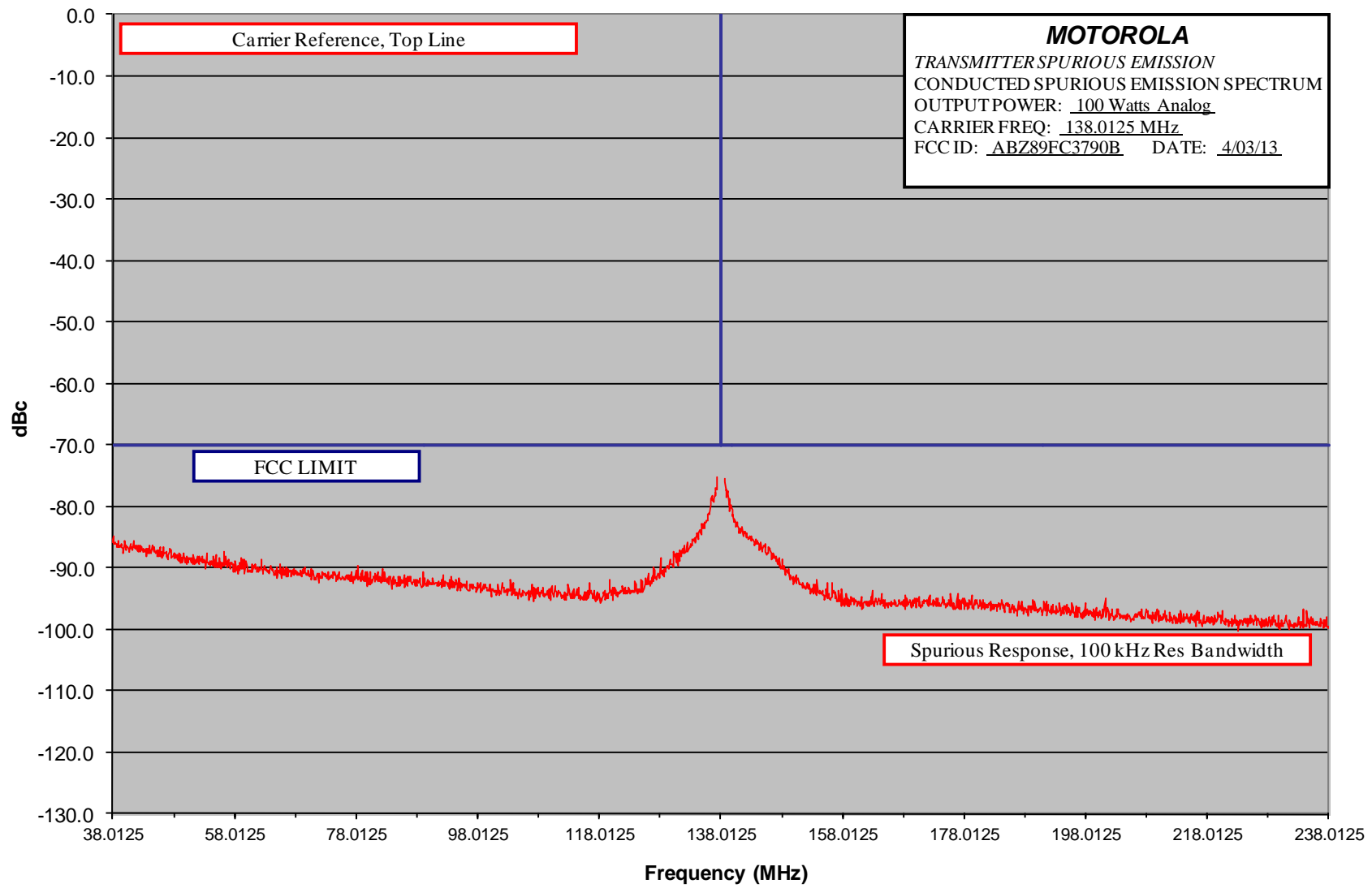
Report on Test Measurements

Conducted Spurious Emission Spectrum – 100 Watts C4FM – 200 MHz Span – High End of Band



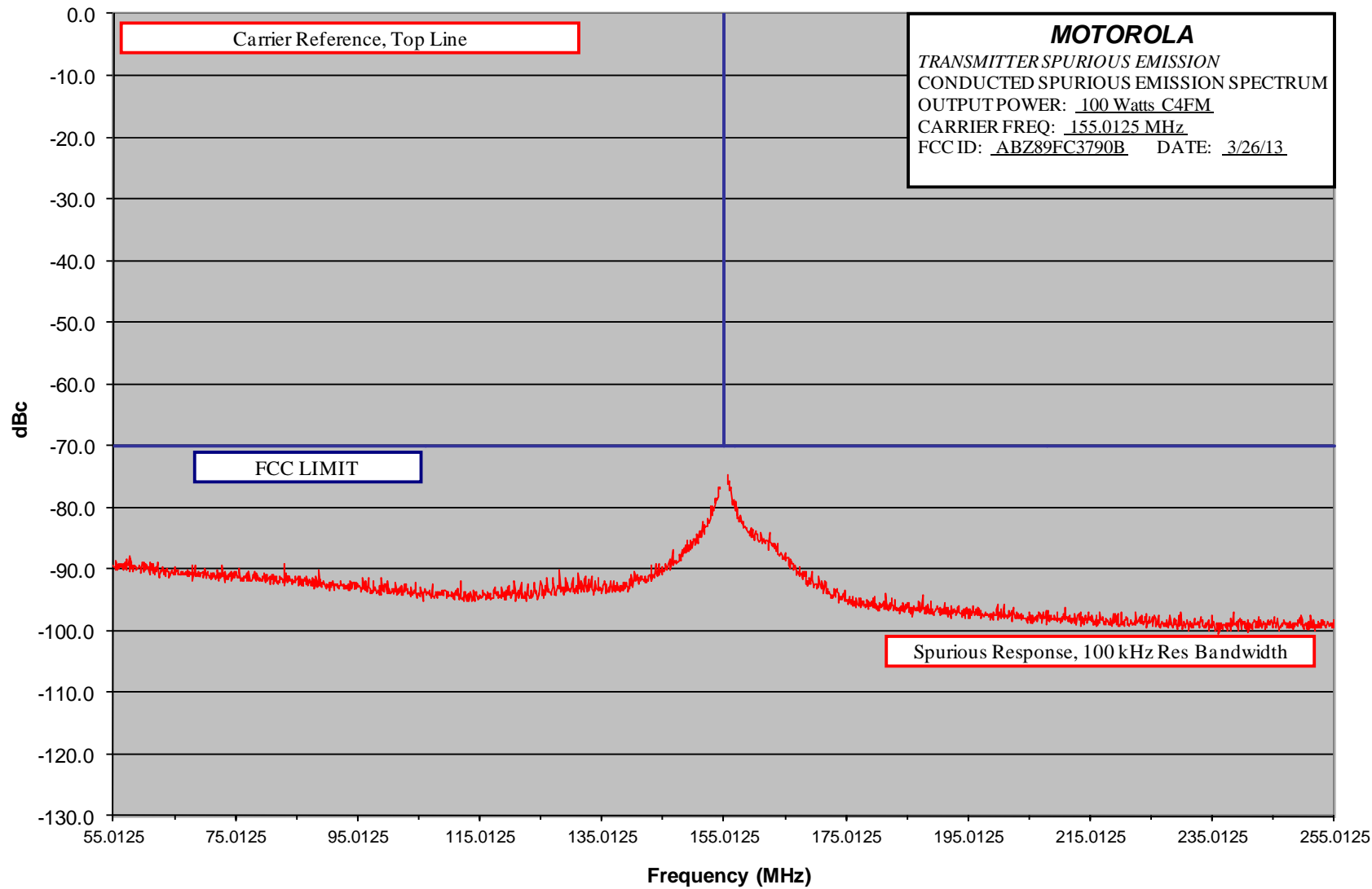
Report on Test Measurements

Conducted Spurious Emission Spectrum – 100 Watts Analog – 200 MHz Span – Low End of Band



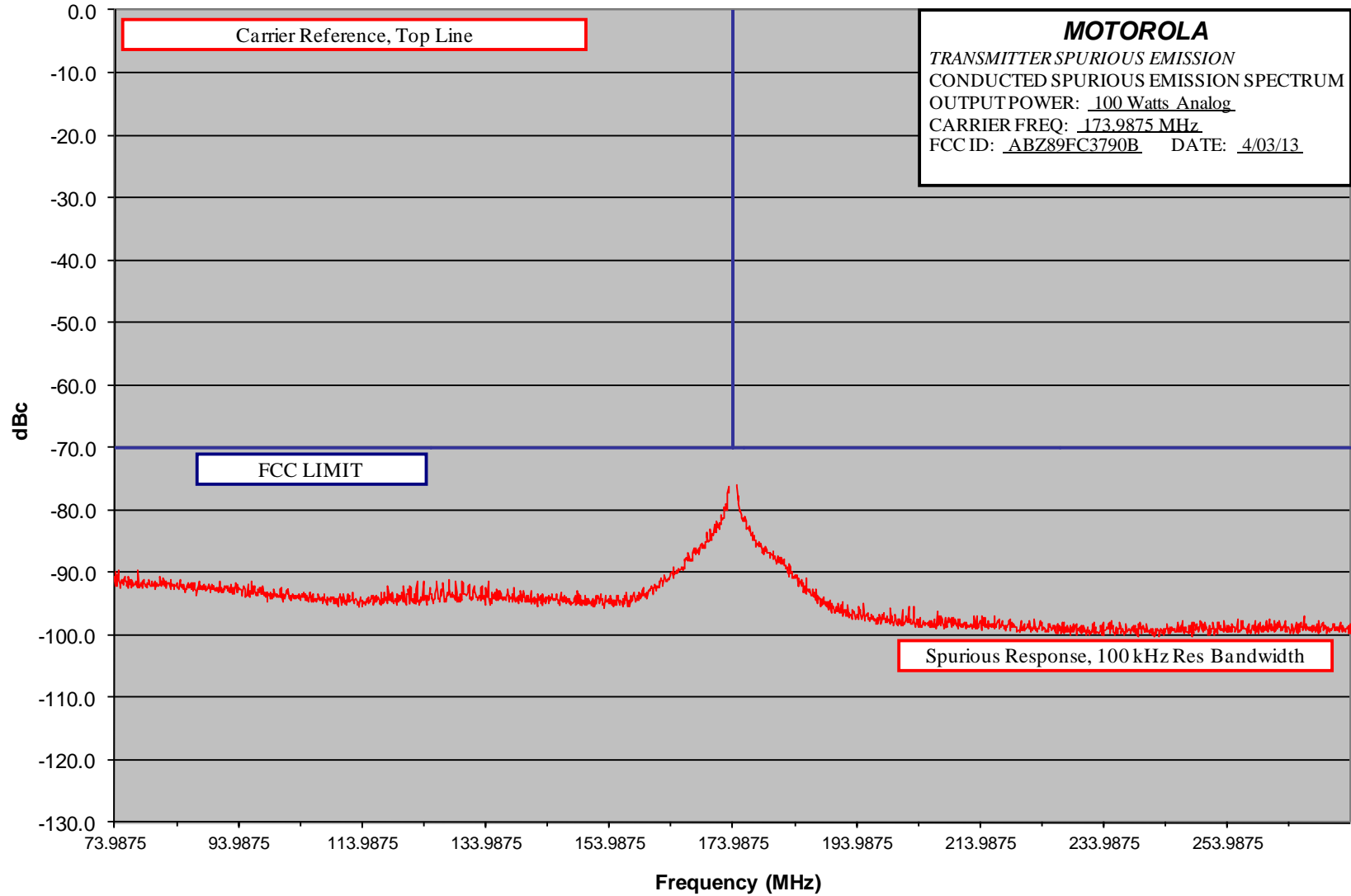
Report on Test Measurements

Conducted Spurious Emission Spectrum – 100 Watts Analog – 200 MHz Span – Middle of Band



Report on Test Measurements

Conducted Spurious Emission Spectrum – 100 Watts Analog – 200 MHz Span – High End of Band



## Report on Test Measurements

*Radiated Spurious Emissions, Harmonics*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.*

Modulation: Linear Simulcast Modulation (LSM) Pseudorandom data or Frequency Modulation (Analog) as indicated

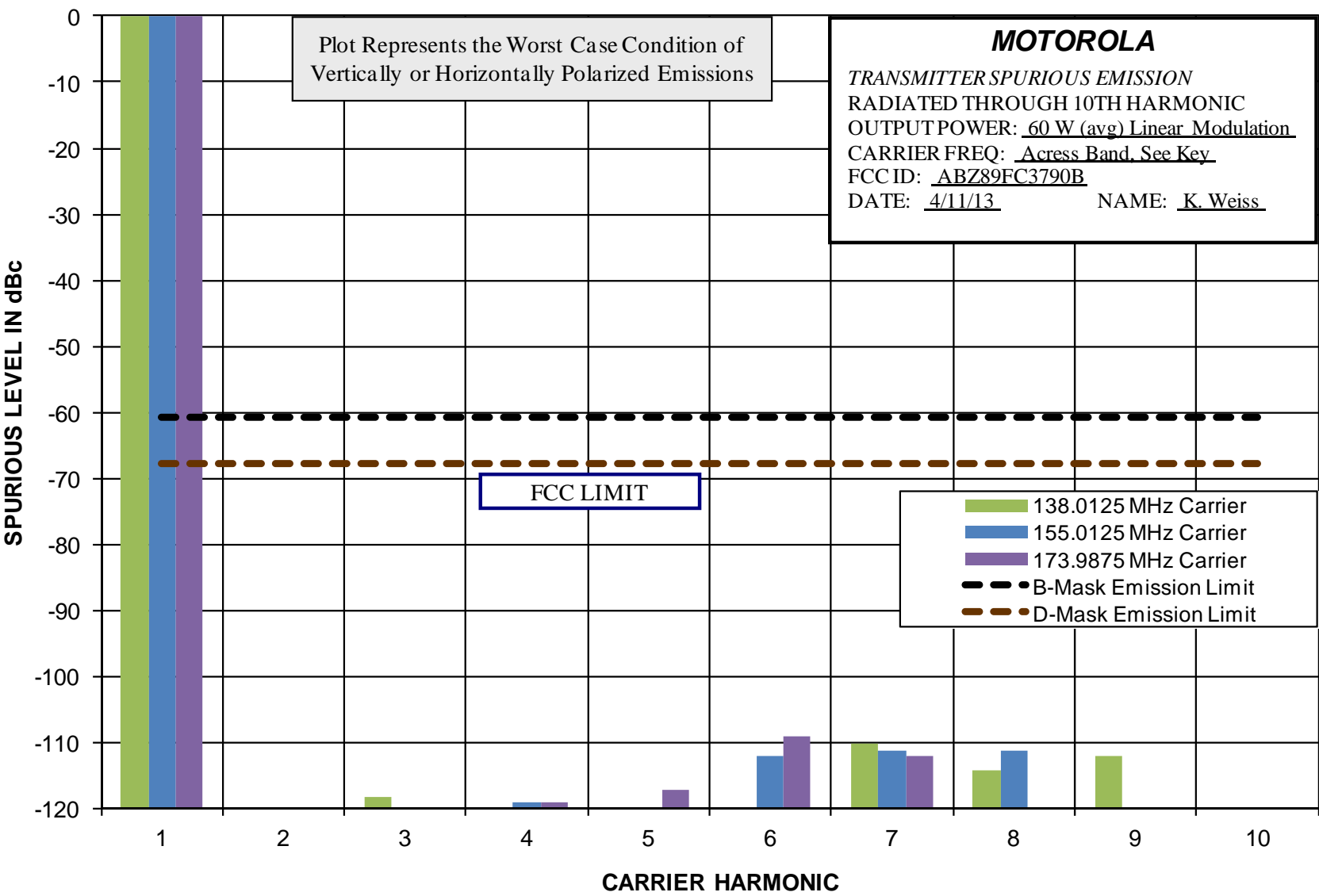
Carrier Frequencies: Carrier frequencies of 138.0125, 155.0125, and 173.9875 MHz were measured for radiated carrier harmonics. These frequencies represent the low end, center, and high end of the 136-174 MHz band, and are representative of the full 136-174 MHz operating band.

EXHIBIT	DESCRIPTION
E1-4.1	Radiated Spurious Harmonic Emissions, Power Output 60 Watts, LSM The specification limit is -67.8 dBc
E1-4.2	Radiated Spurious Harmonic Emissions, Power Output 2 Watts, LSM The specification limit is -53.0 dBc
E1-4.3	Radiated Spurious Harmonic Emissions, Power Output 100 Watts, Analog The specification limit is -70.0 dBc
E1-4.4	Radiated Spurious Harmonic Emissions, Power Output 2 Watts, Analog The specification limit is -53.0 dBc



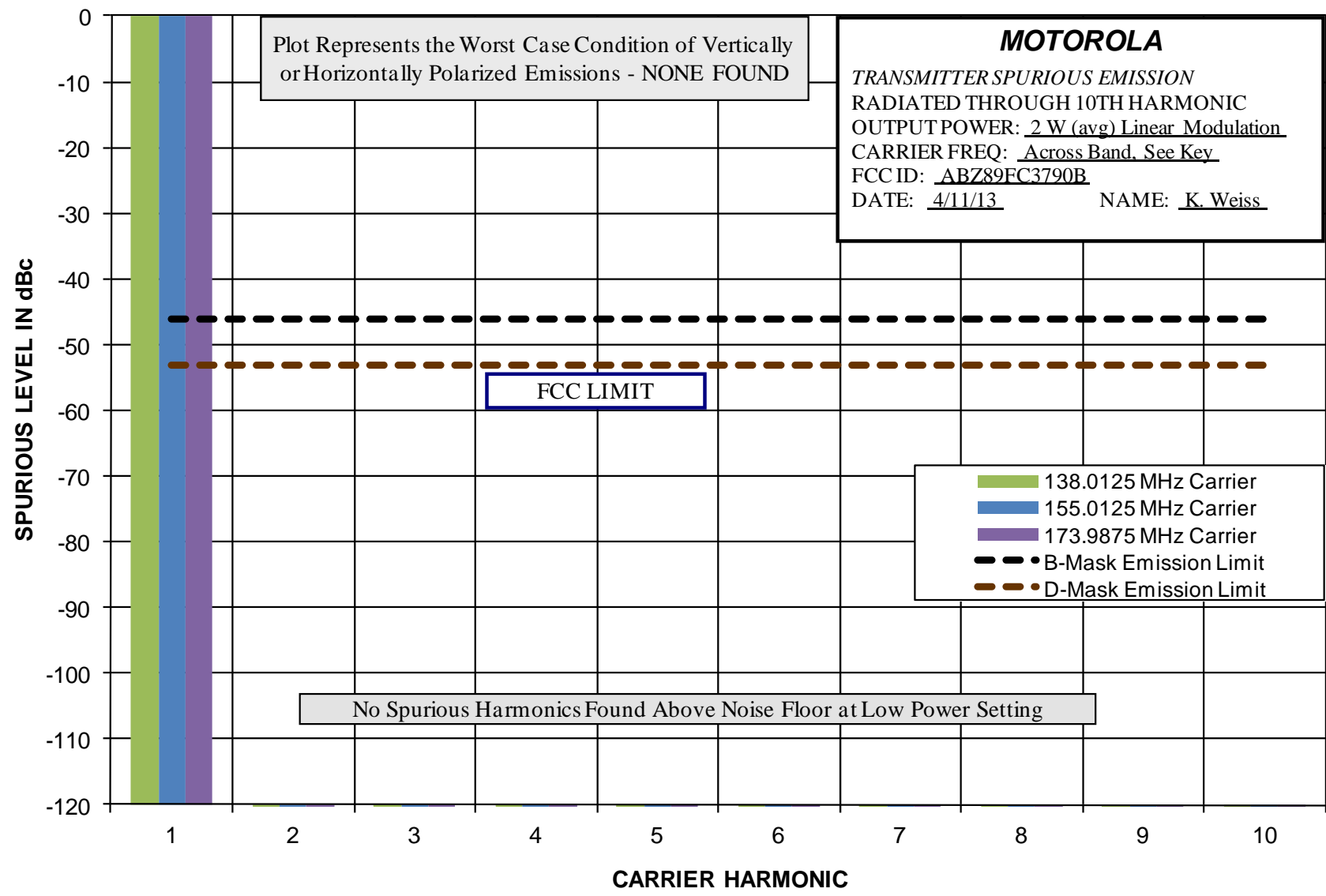
Report on Test Measurements

Radiated Spurious Harmonic Emissions — 60 Watts – Linear Simulcast Modulation (LSM)



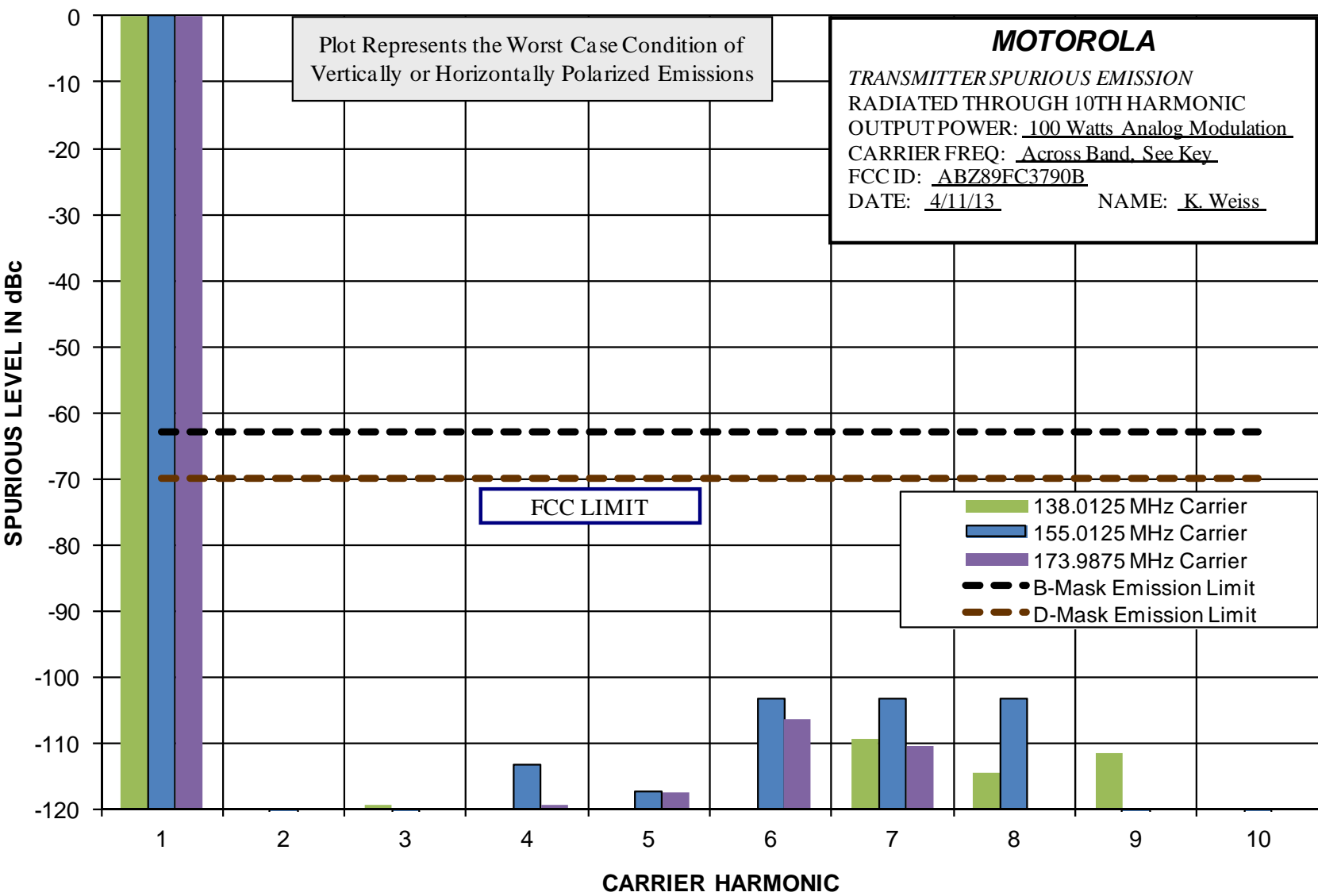
Report on Test Measurements

Radiated Spurious Harmonic Emissions – 2 Watts – Linear Simulcast Modulation (LSM)



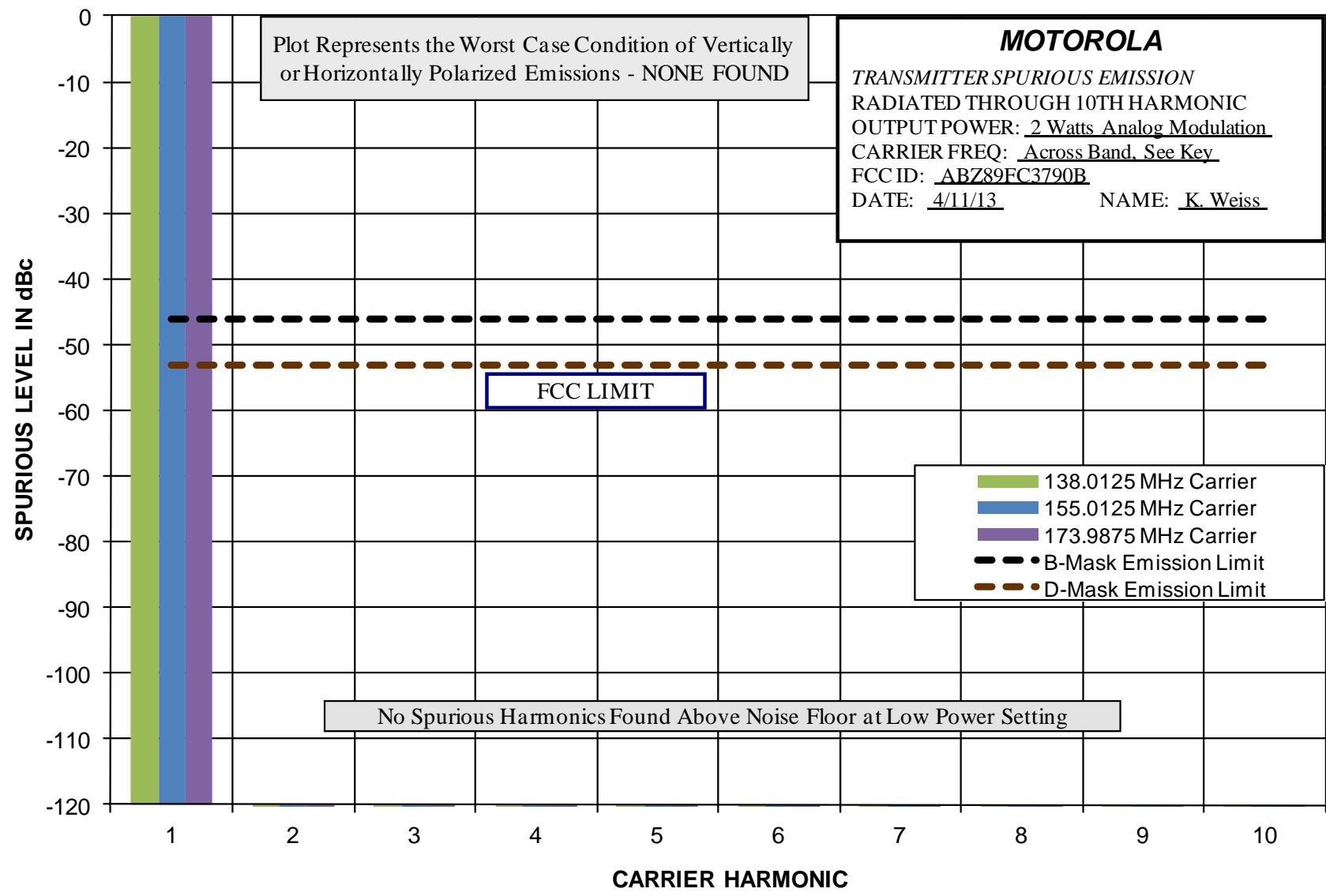
Report on Test Measurements

Radiated Spurious Harmonic Emissions – 100 Watts – Analog Frequency Modulation



Report on Test Measurements

Radiated Spurious Harmonic Emissions – 2 Watts – Analog Frequency Modulation



**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

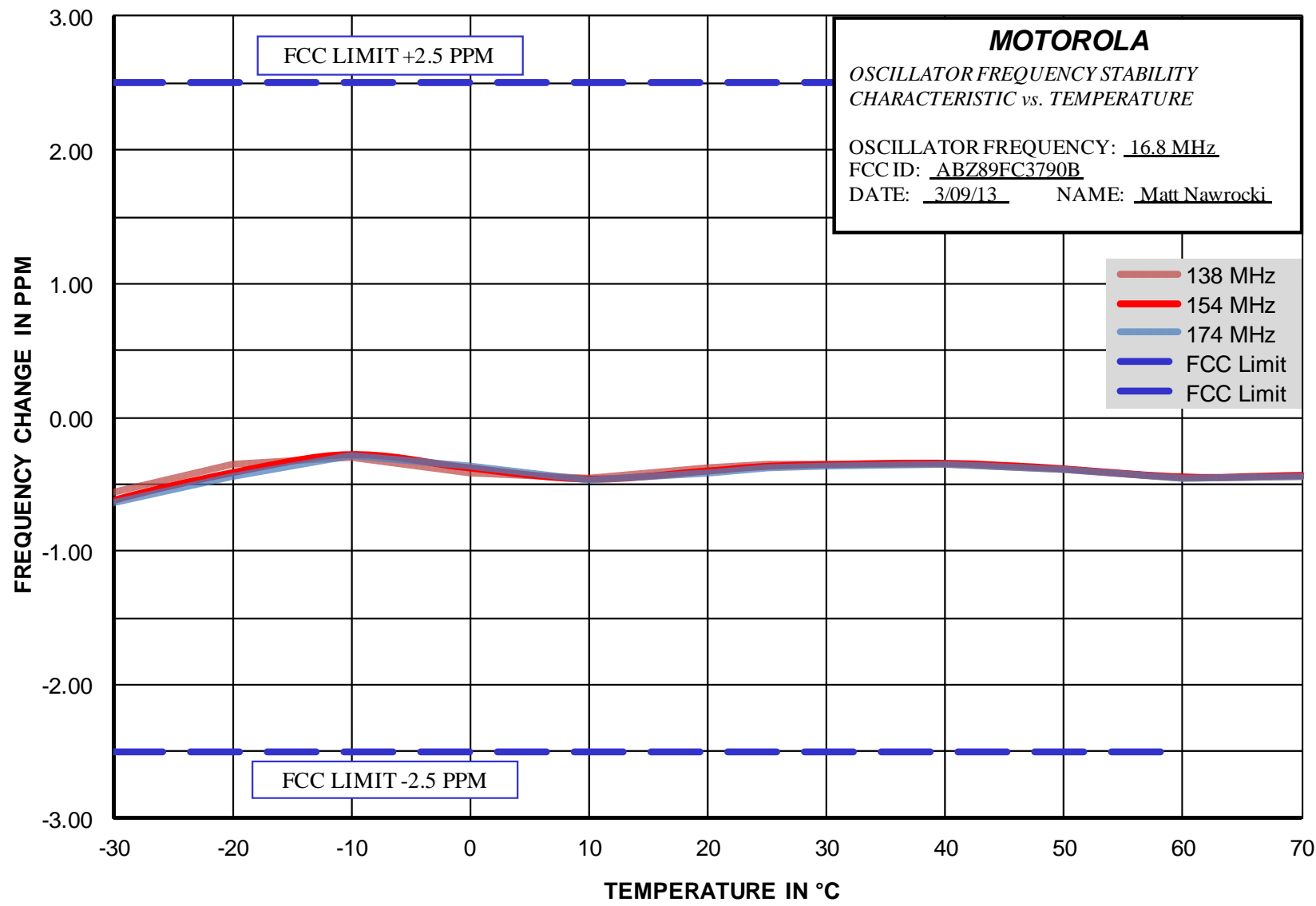
Fixed and Base stations operating at 150-174 MHz and 12.5 kHz channel bandwidth must have a frequency stability of better than +/- 2.5 PPM.

Performance was measured at carrier frequencies at the low end, middle, and high end of the operating band.

<b>EXHIBIT</b>	<b>DESCRIPTION</b>
E1-5.1	Frequency Stability Vs Temperature
E1-5.2	Frequency Stability Vs Voltage

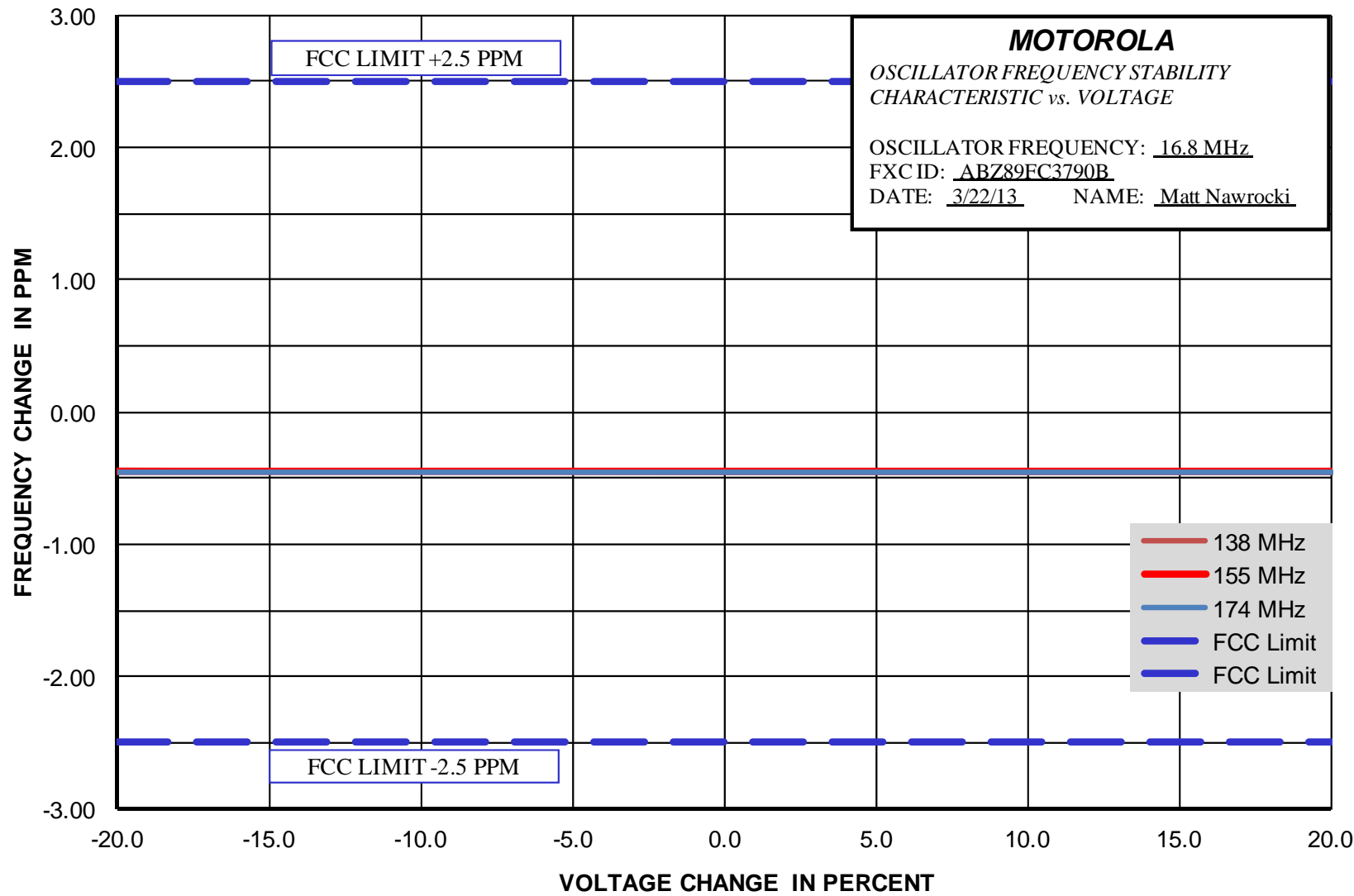
Report on Test Measurements

Frequency Stability Vs Temperature



Report on Test Measurements

Frequency Stability Vs Voltage



**Report on Test Measurements***Frequency Transient Behavior*Specification Requirement: Reference Part 90.214

Transmitters designed to operate in the 150-174 MHz frequency band must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated below:

Transient Frequency Behavior 25 kHz Channels

For time intervals:

- a.  $t_1 = 5$  ms            Maximum Frequency Difference  $\pm 25$  kHz
- b.  $t_2 = 20$  ms           Maximum Frequency Difference  $\pm 12.5$  kHz
- c.  $t_3 = 5$  ms            Maximum Frequency Difference  $\pm 25$  kHz

Transient Frequency Behavior 12.5 kHz Channels

For time intervals:

- a.  $t_1 = 5$  ms            Maximum Frequency Difference  $\pm 12.5$  kHz
- b.  $t_2 = 20$  ms           Maximum Frequency Difference  $\pm 6.25$  kHz
- c.  $t_3 = 5$  ms            Maximum Frequency Difference  $\pm 12.5$  kHz

Where  $t_1$  and  $t_2$  are times immediately following when the transmitter is turned on, and  $t_3$  is the time from when the transmitter is turned off.

During the time from the end of  $t_2$  to the beginning of  $t_3$ , the frequency difference must not exceed the limits specified in §90.213.

Modulation:            Analog Mode Frequency Modulation

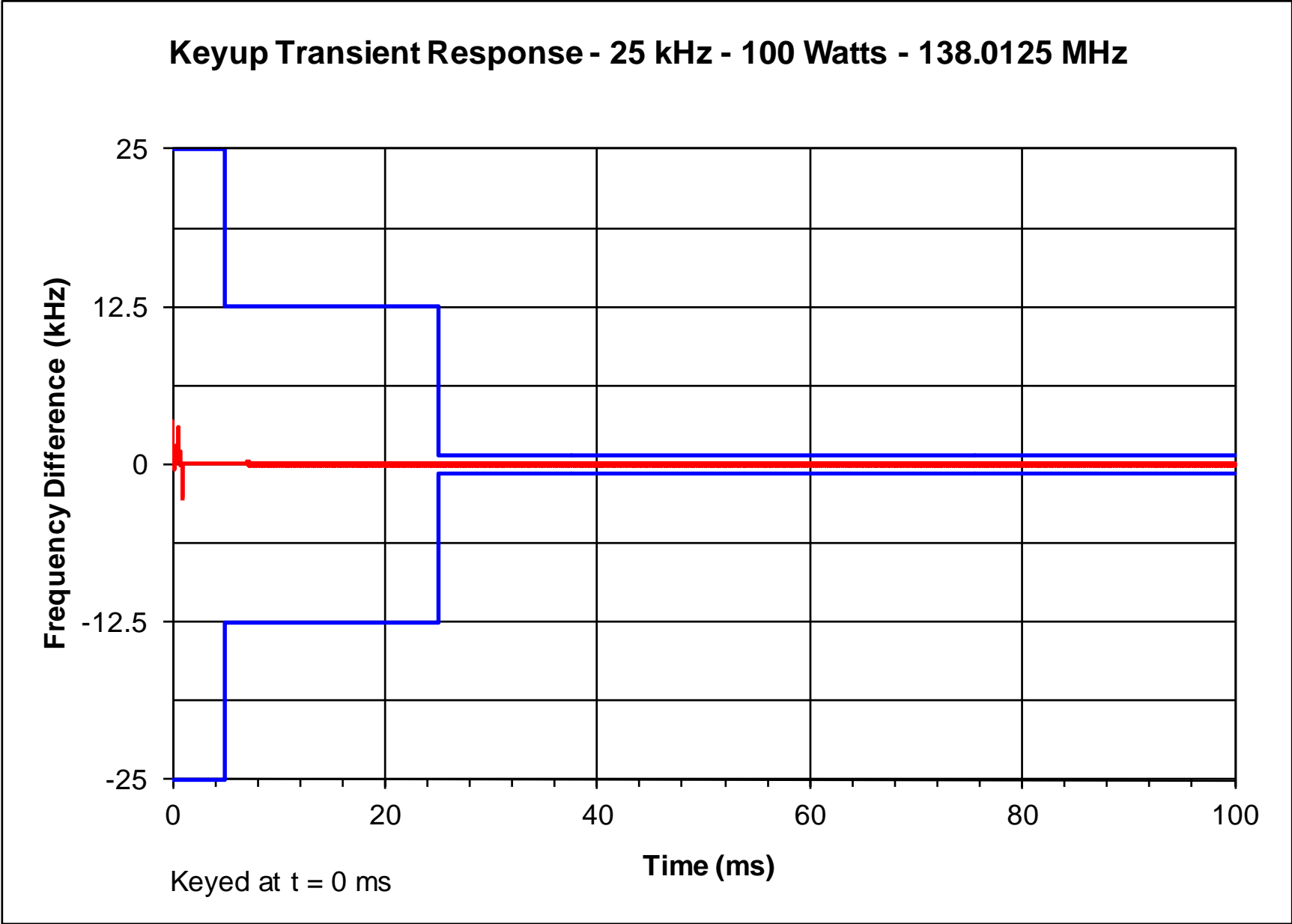
Carrier Frequencies: Performance was measured at carrier frequencies at the low end, middle, and high end of the operating band.

<b>EXHIBIT</b>	<b>DESCRIPTION</b>
E1-6.1, 2, 3	Frequency Transient Behavior, 25 kHz Channel Key-Up
E1-6.4, 5, 6	Frequency Transient Behavior, 25 kHz Channel De-Key
E1-6.7, 8, 9	Frequency Transient Behavior, 12.5 kHz Channel Key-Up
E1-6.10, 11, 12	Frequency Transient Behavior, 12.5 kHz Channel De-key



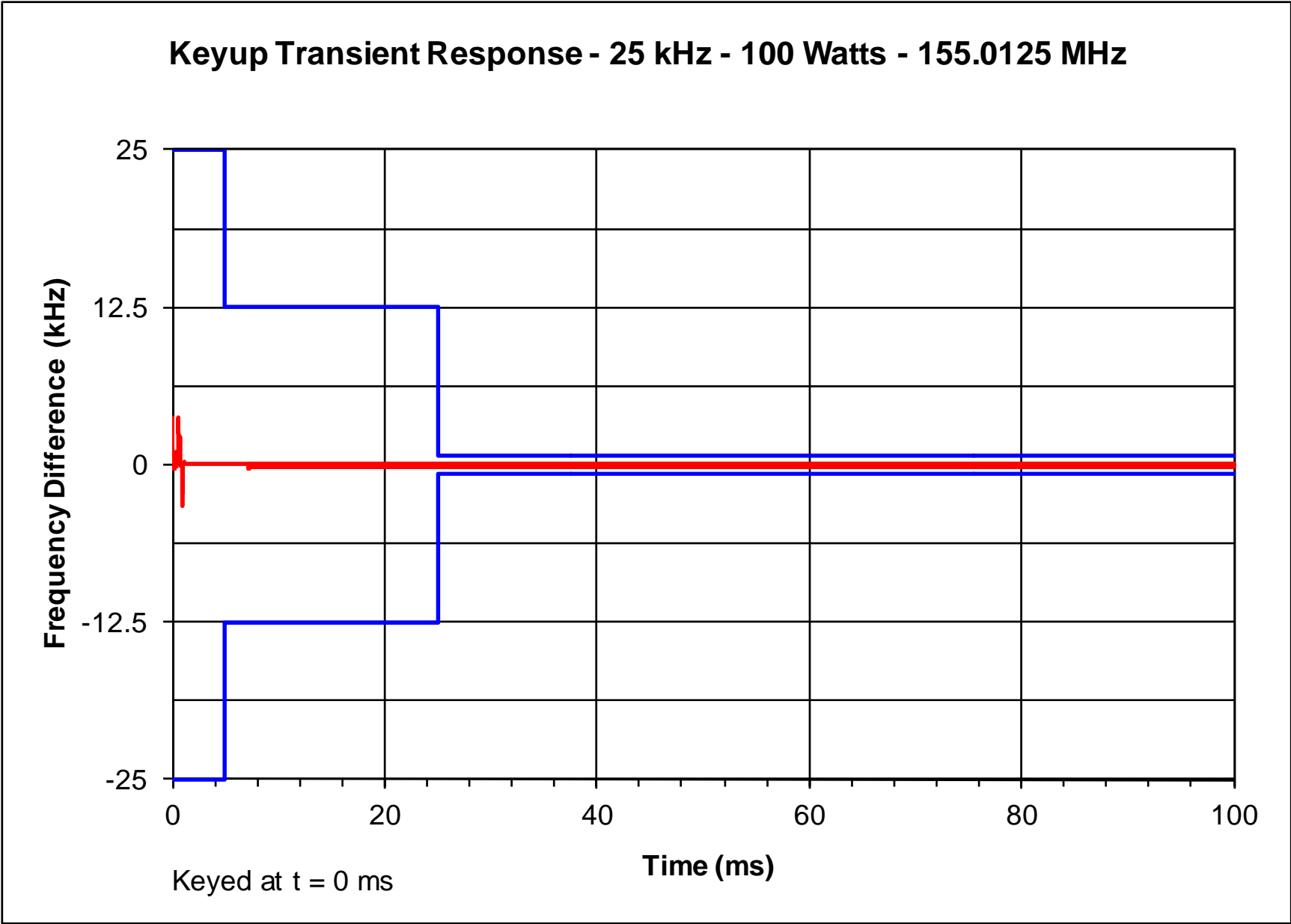
Report on Test Measurements

Frequency Transient – Key-up – 25 kHz Channels – Low End of Band



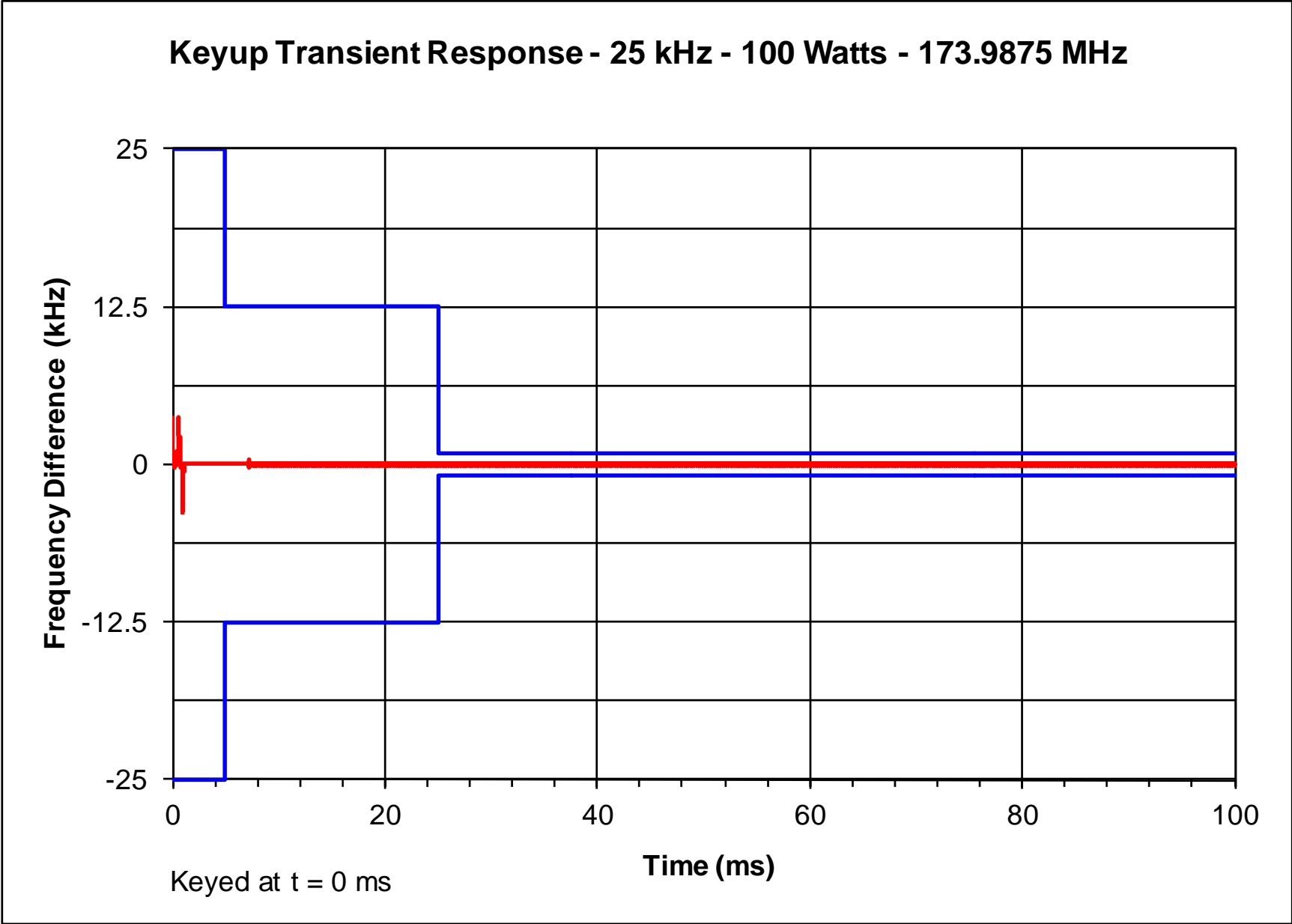
Report on Test Measurements

Frequency Transient – Key-up – 25 kHz Channels – Middle of Band



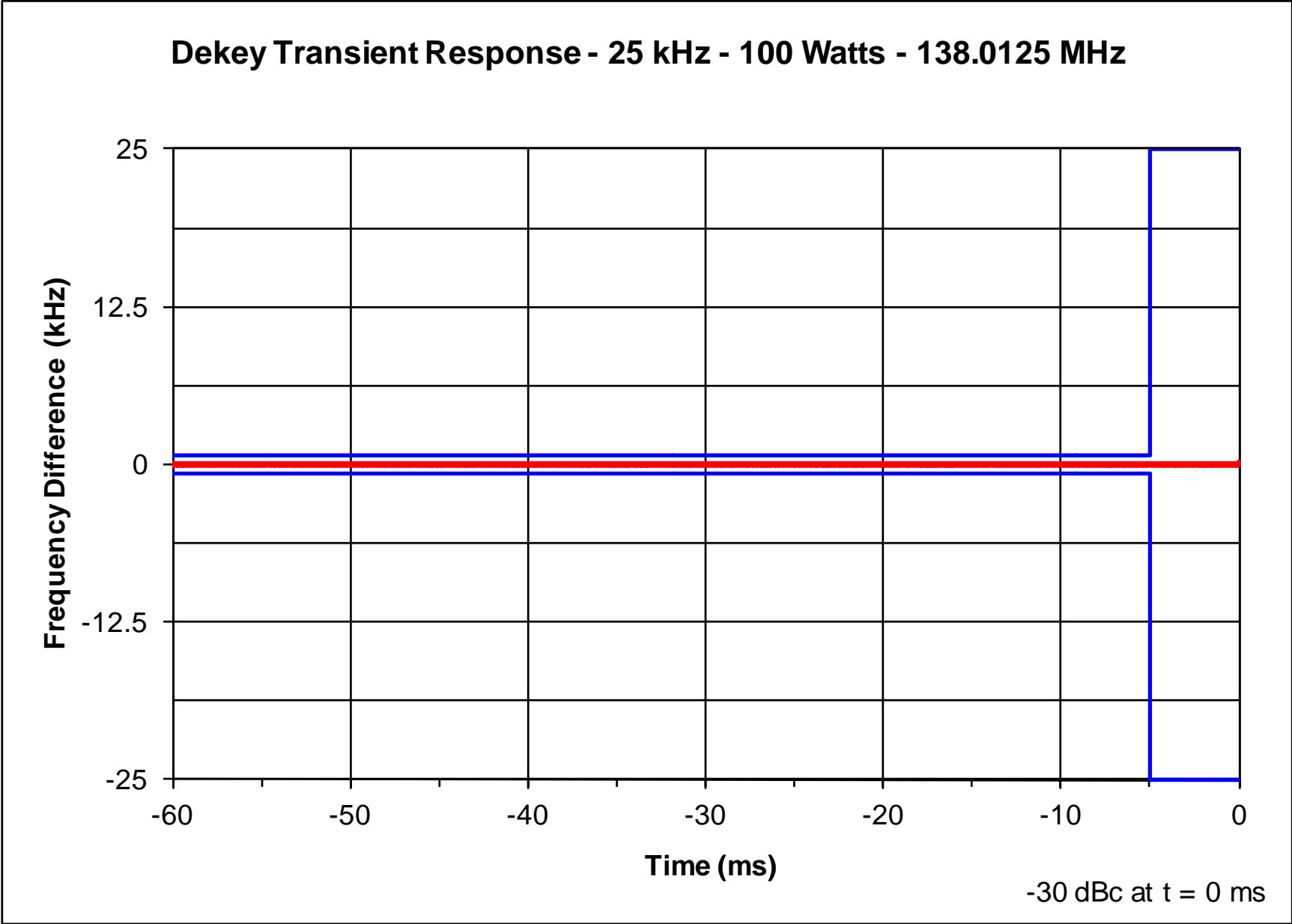
Report on Test Measurements

Frequency Transient – Key-up – 25 kHz Channels – High End of Band



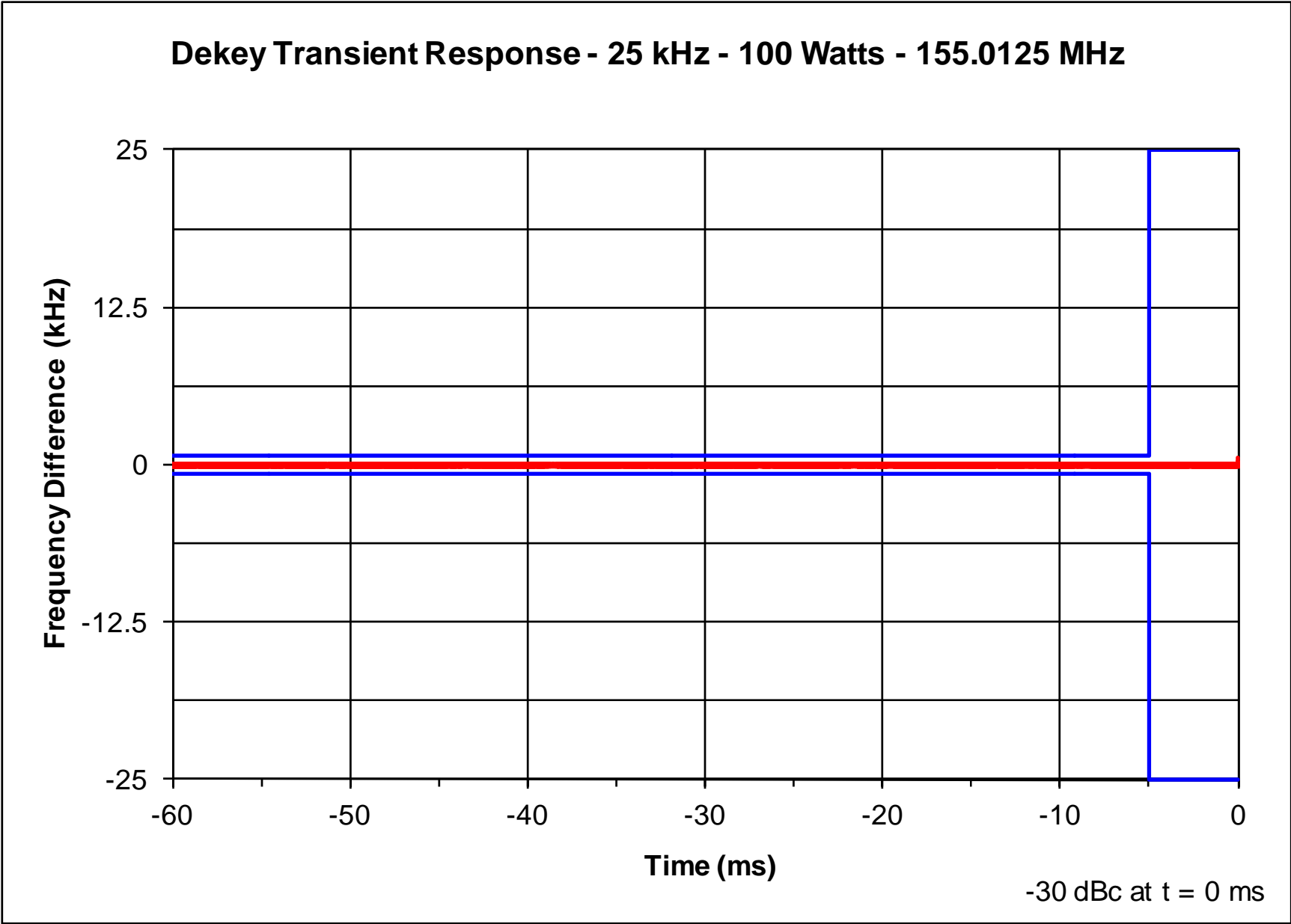
Report on Test Measurements

Frequency Transient – De-Key – 25 kHz Channels – Low End of Band



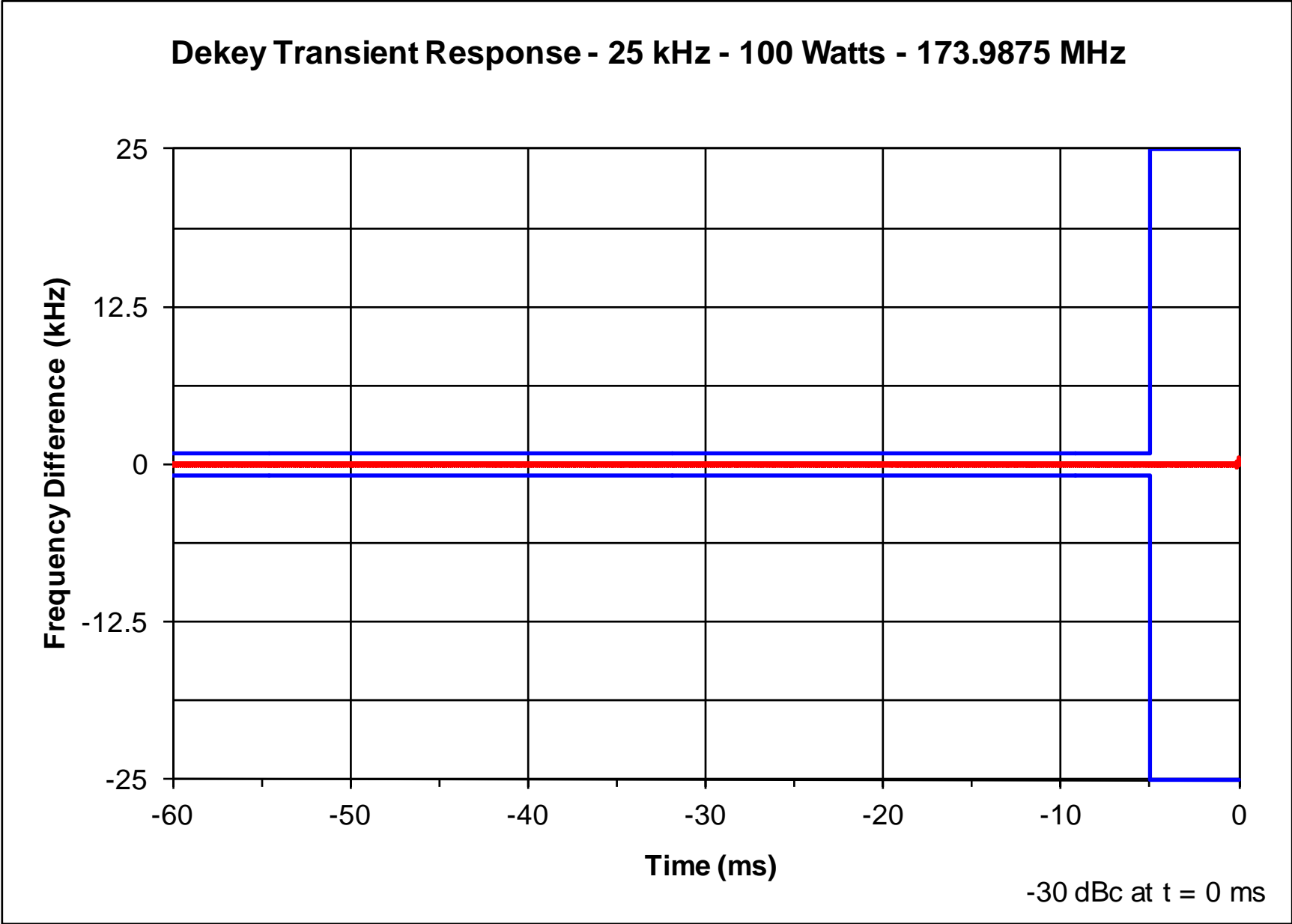
Report on Test Measurements

Frequency Transient – De-Key – 25 kHz Channels – Middle of Band



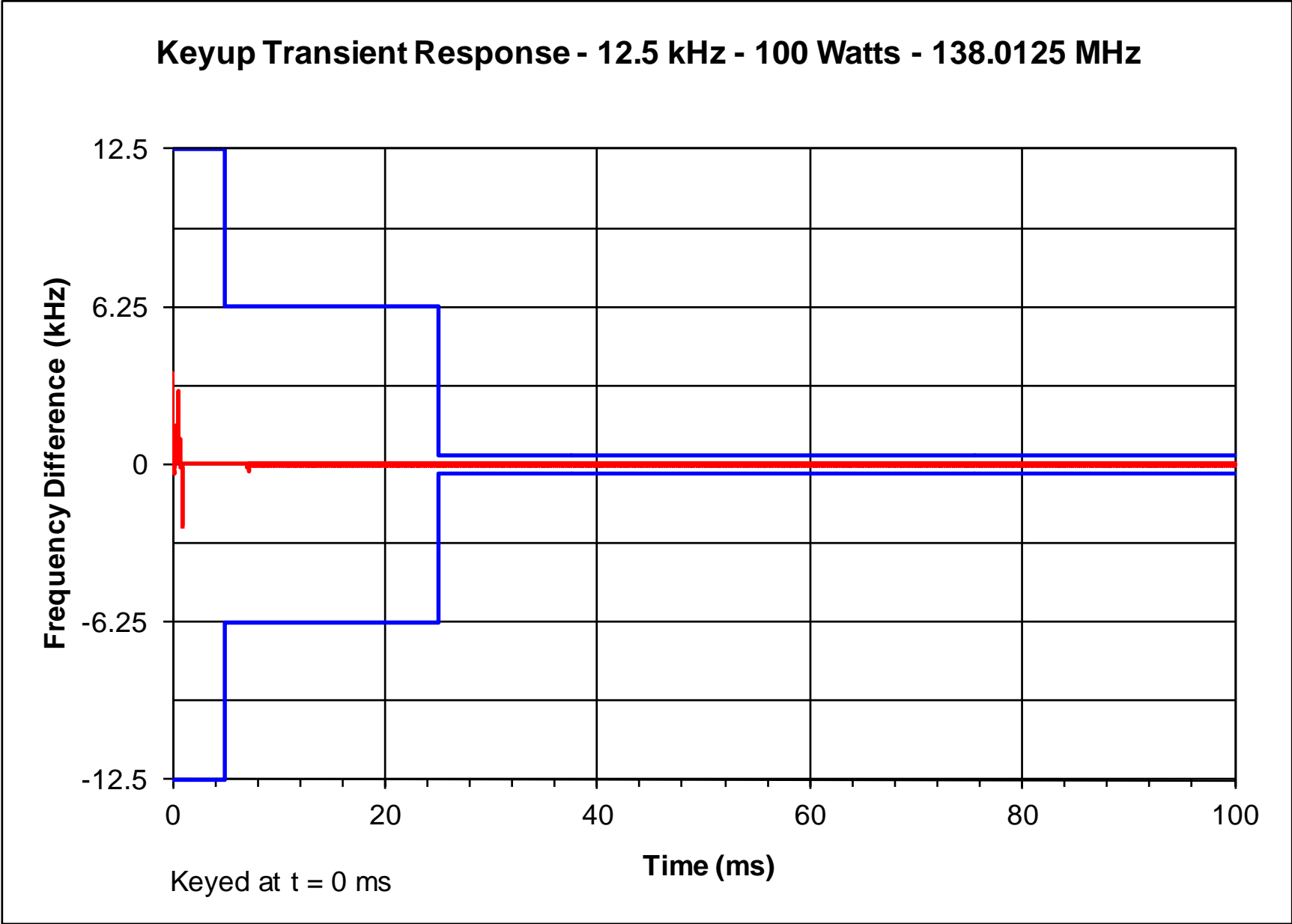
Report on Test Measurements

Frequency Transient – De-Key – 25 kHz Channels – High End of Band



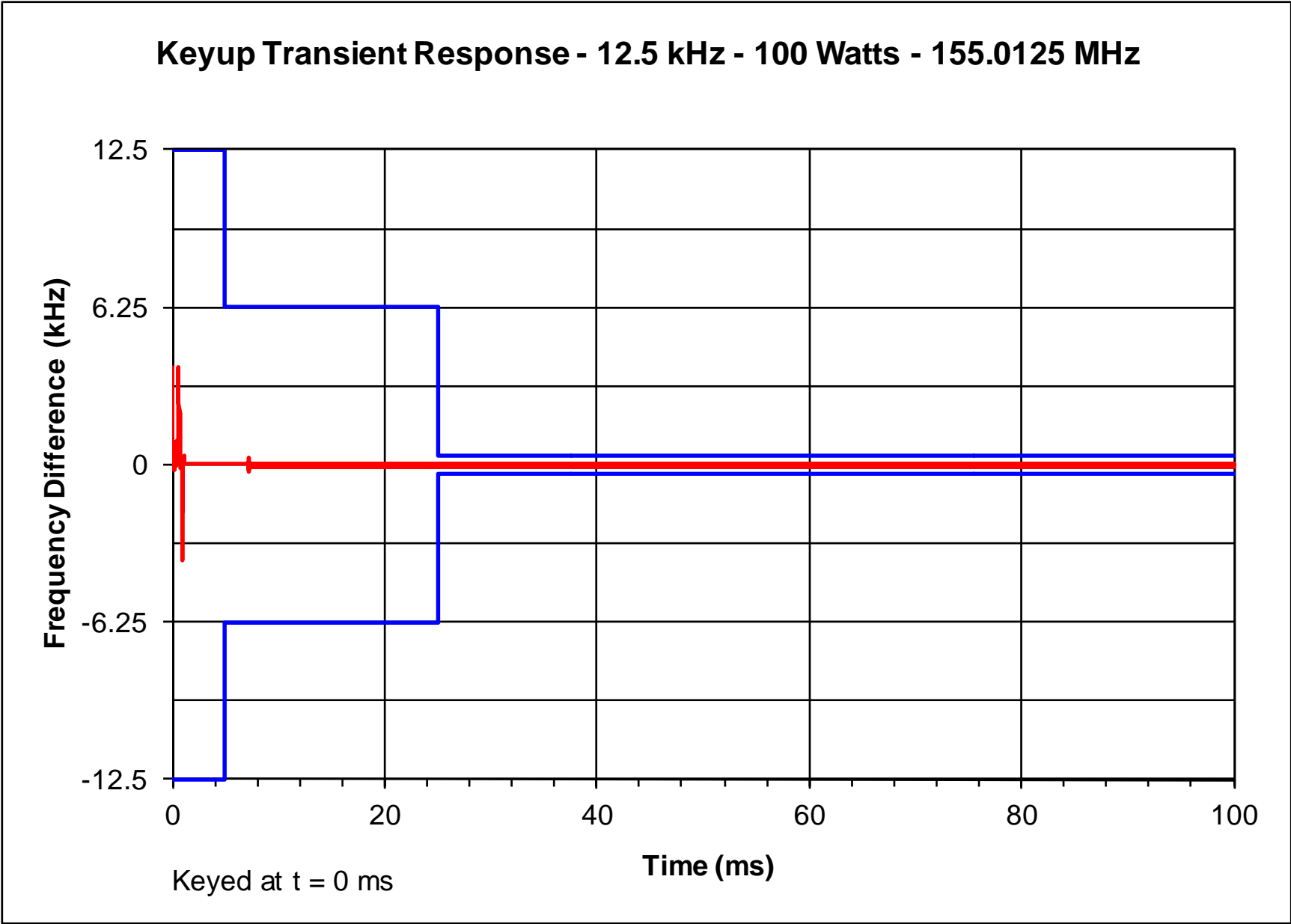
Report on Test Measurements

Frequency Transient – Key-up – 12.5 kHz Channels – Low End of Band



Report on Test Measurements

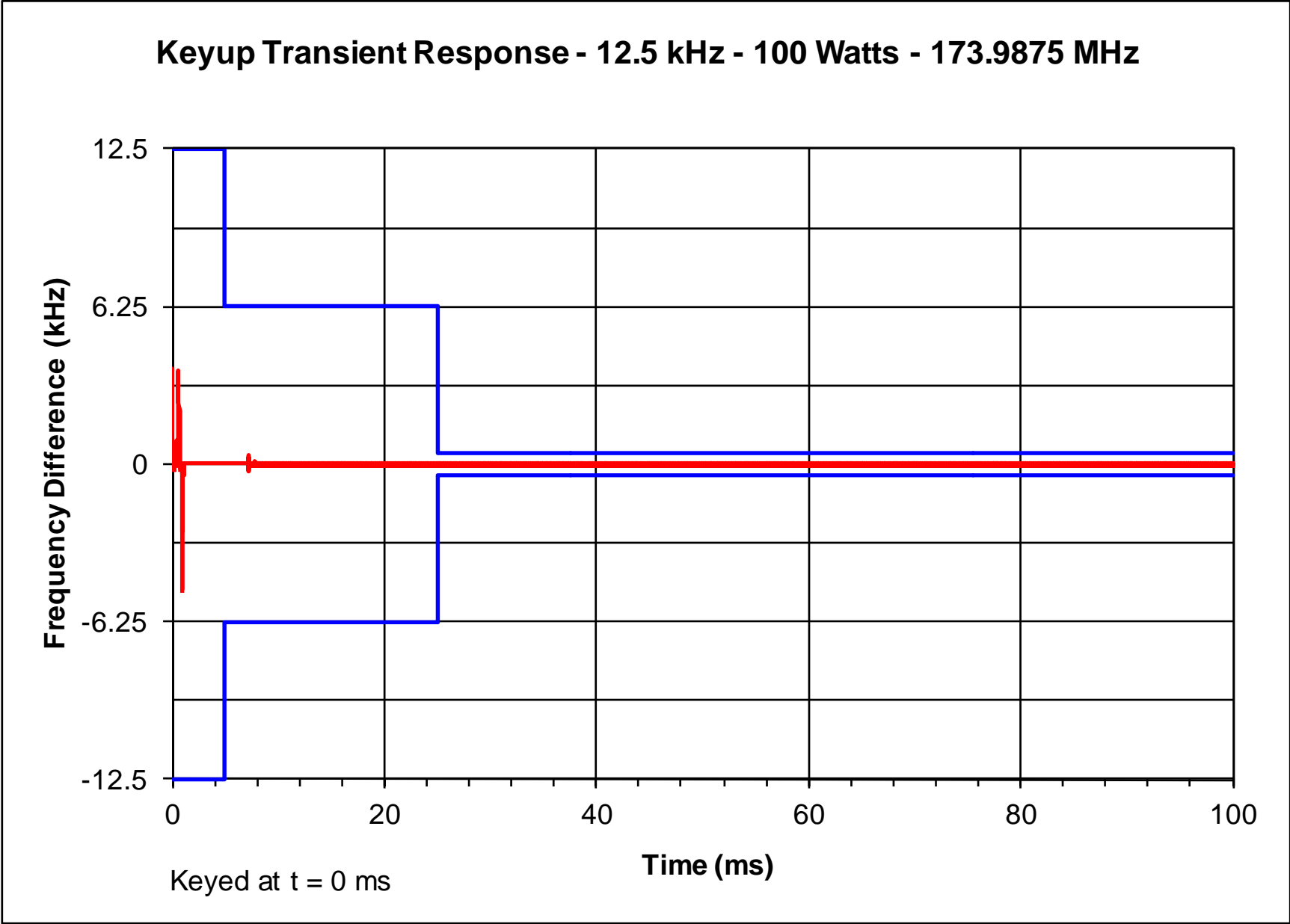
Frequency Transient – Key-up – 12.5 kHz Channels – Middle of Band





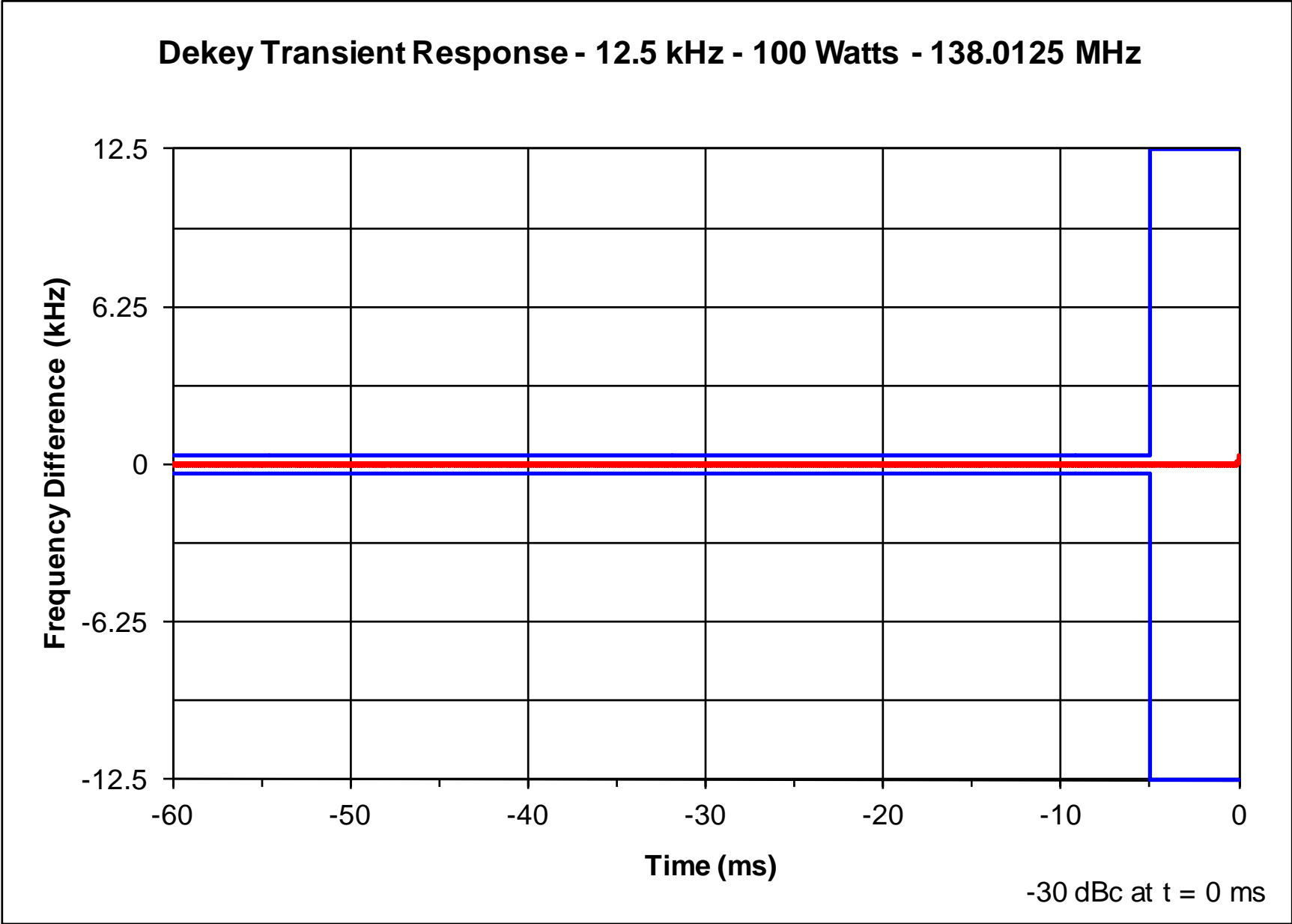
Report on Test Measurements

Frequency Transient – Key-up – 12.5 kHz Channels – High End of Band



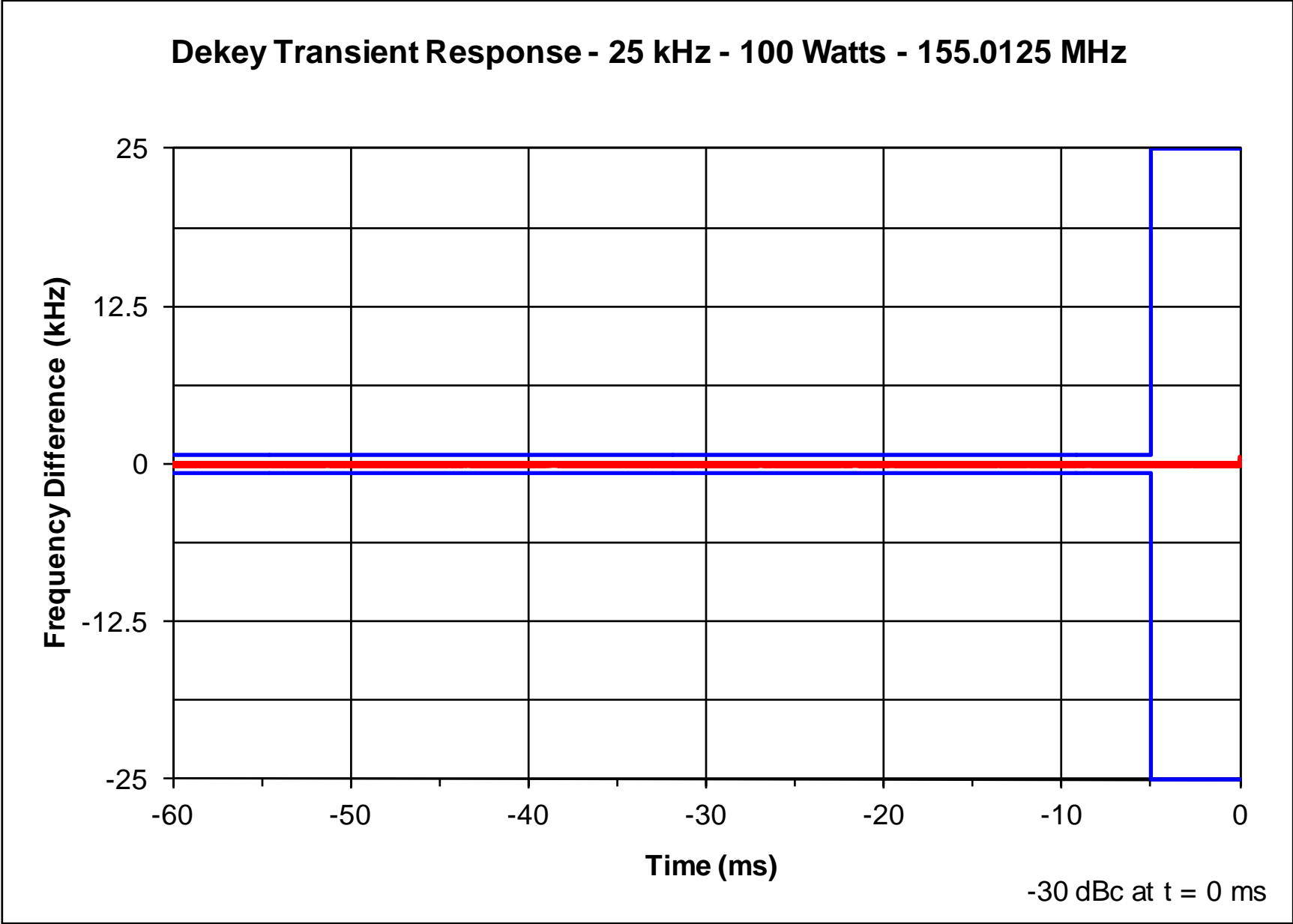
Report on Test Measurements

Frequency Transient – De-Key – 12.5 kHz Channels – Low End of Band



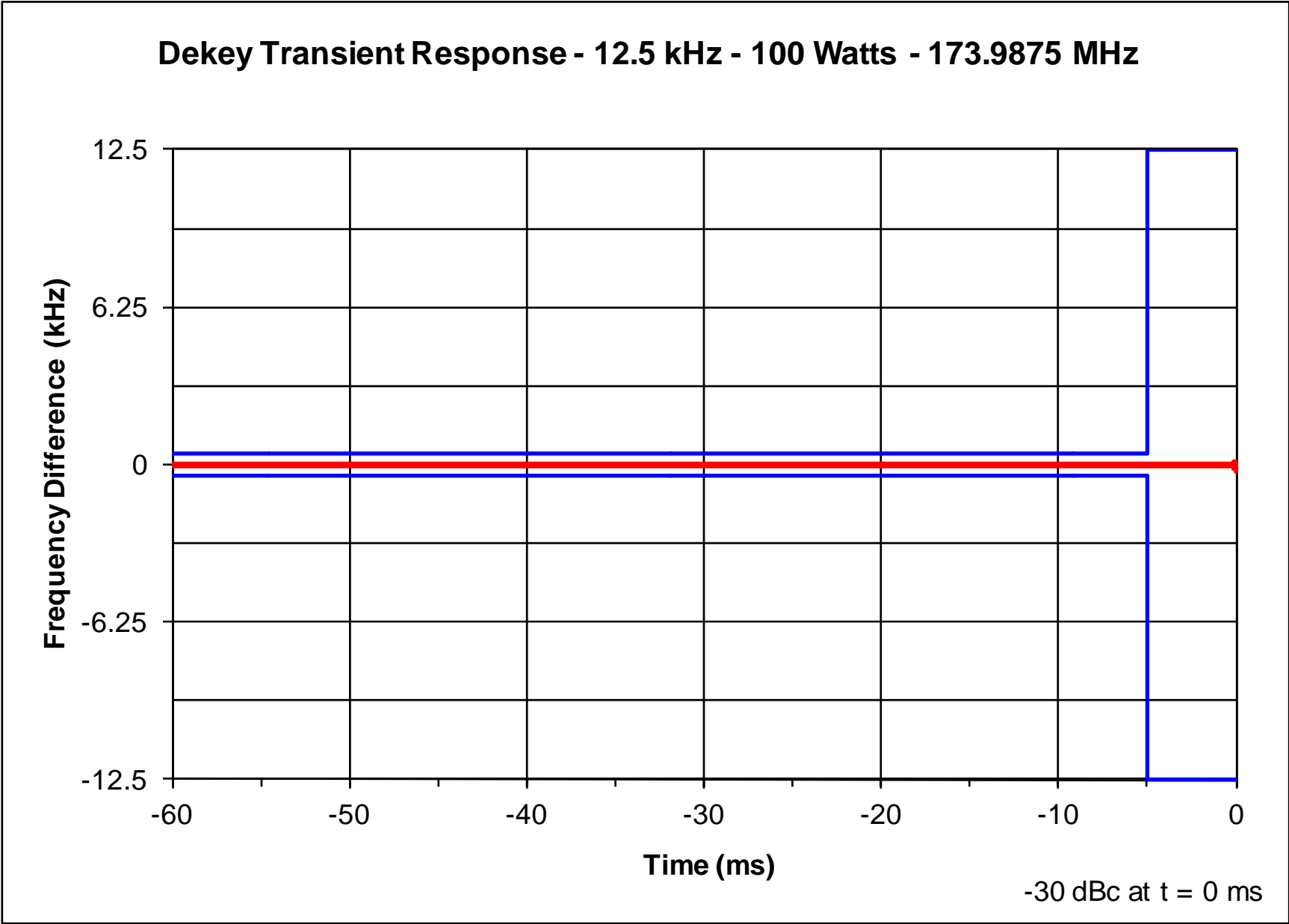
Report on Test Measurements

Frequency Transient – De-Key – 12.5 kHz Channels – Middle of Band



Report on Test Measurements

Frequency Transient – De-Key – 12.5 kHz Channels – High End of Band



## 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.

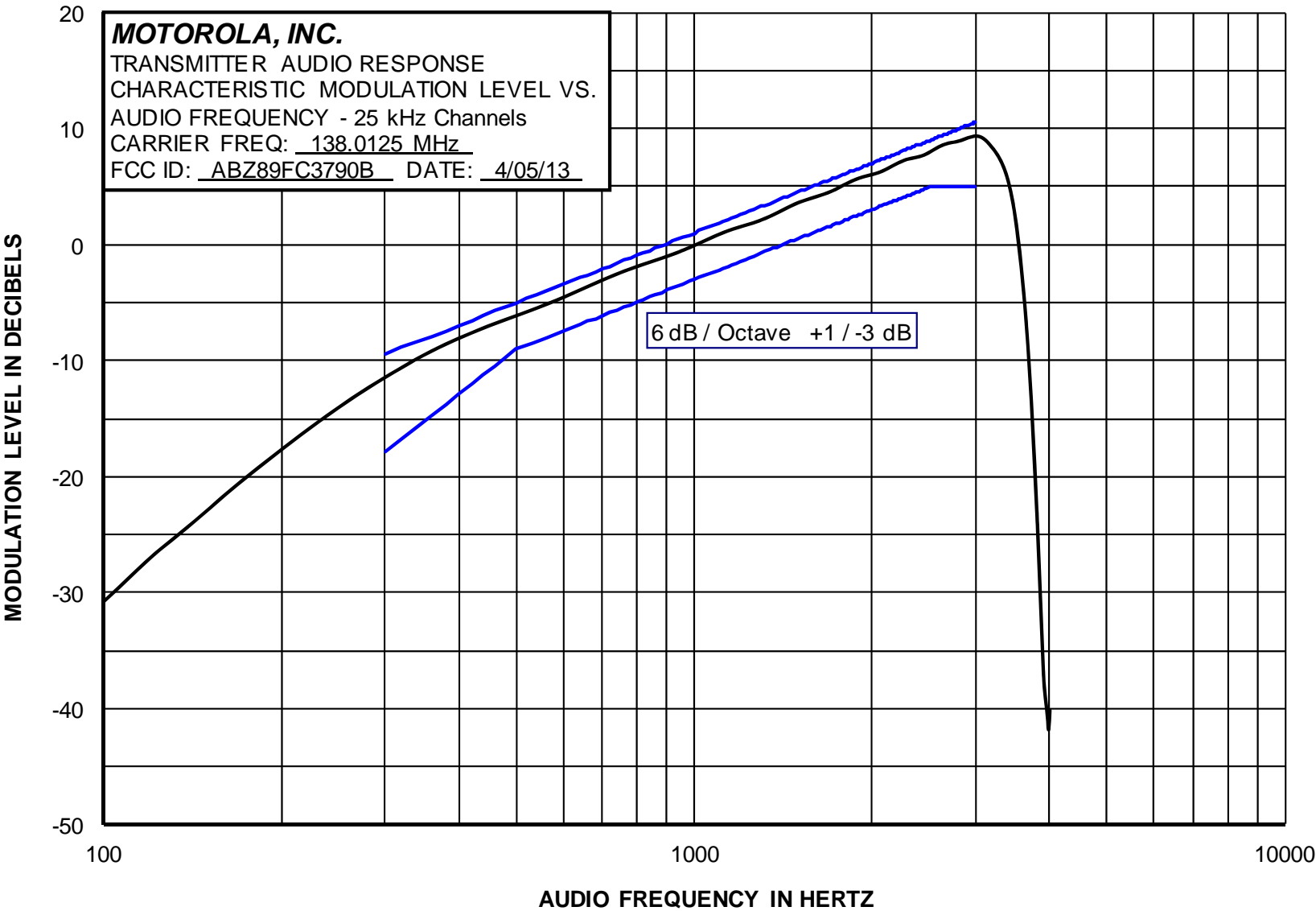
Modulation: Audio Test Tone

Carrier Frequency: Performance was measured at carrier frequencies at the low end, middle, and high end of the operating band.

EXHIBIT	DESCRIPTION
E1-7.1	Audio Frequency Response – Modulation Characteristics, 25 kHz Channels – Low End of Band
E1-7.2	Audio Frequency Response – Modulation Characteristics, 25 kHz Channels – Middle of Band
E1-7.3	Audio Frequency Response – Modulation Characteristics, 25 kHz Channels – High End of Band
E1-7.4	Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels– Low End of Band
E1-7.5	Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels– Middle of Band
E1-7.6	Audio Frequency Response – Modulation Characteristics, 12.5 kHz Channels– High End of Band
	The specification limit is shown on the response plots

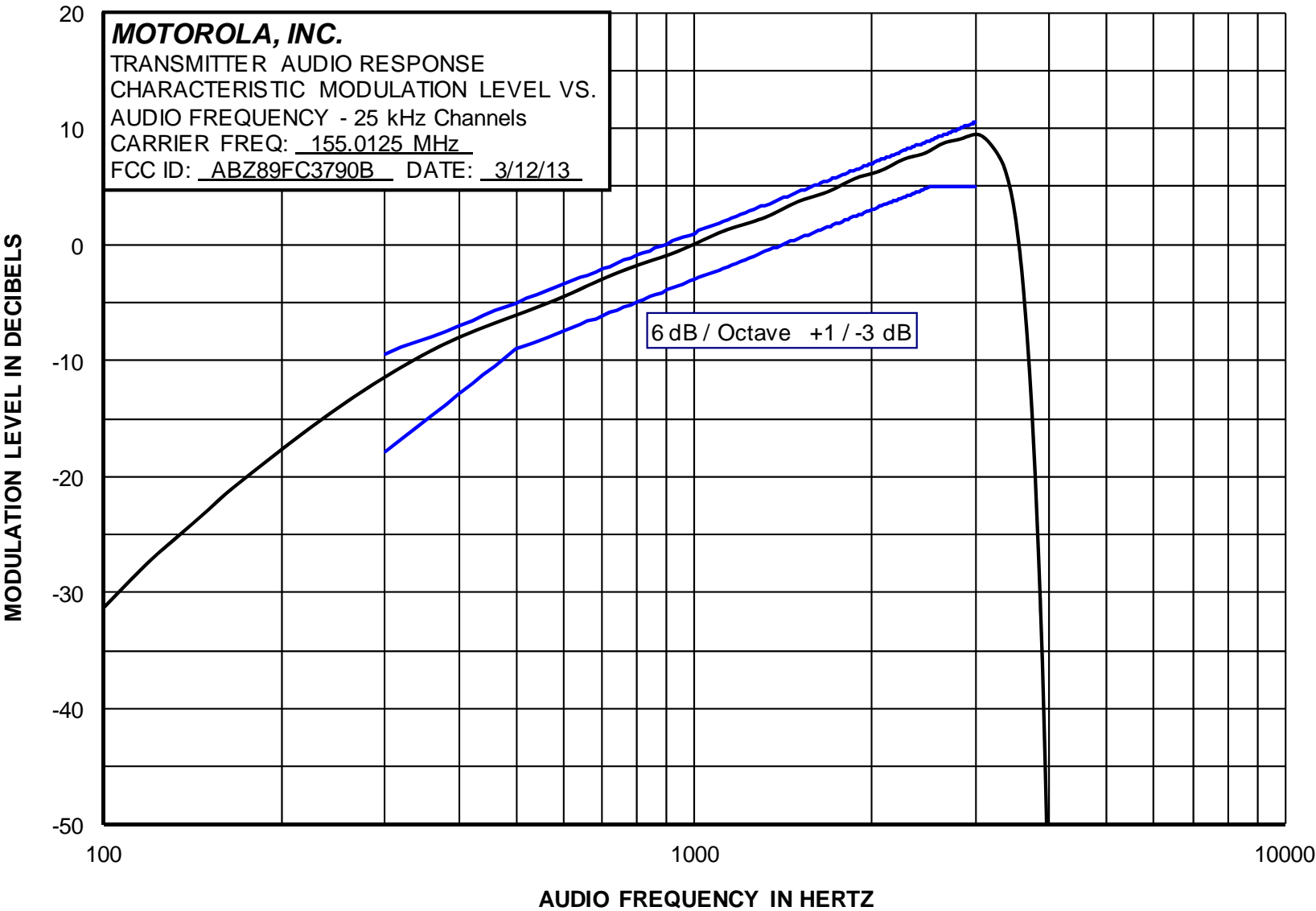
Report on Test Measurements

Audio Frequency Response – 25 kHz Channels – Low End of Band



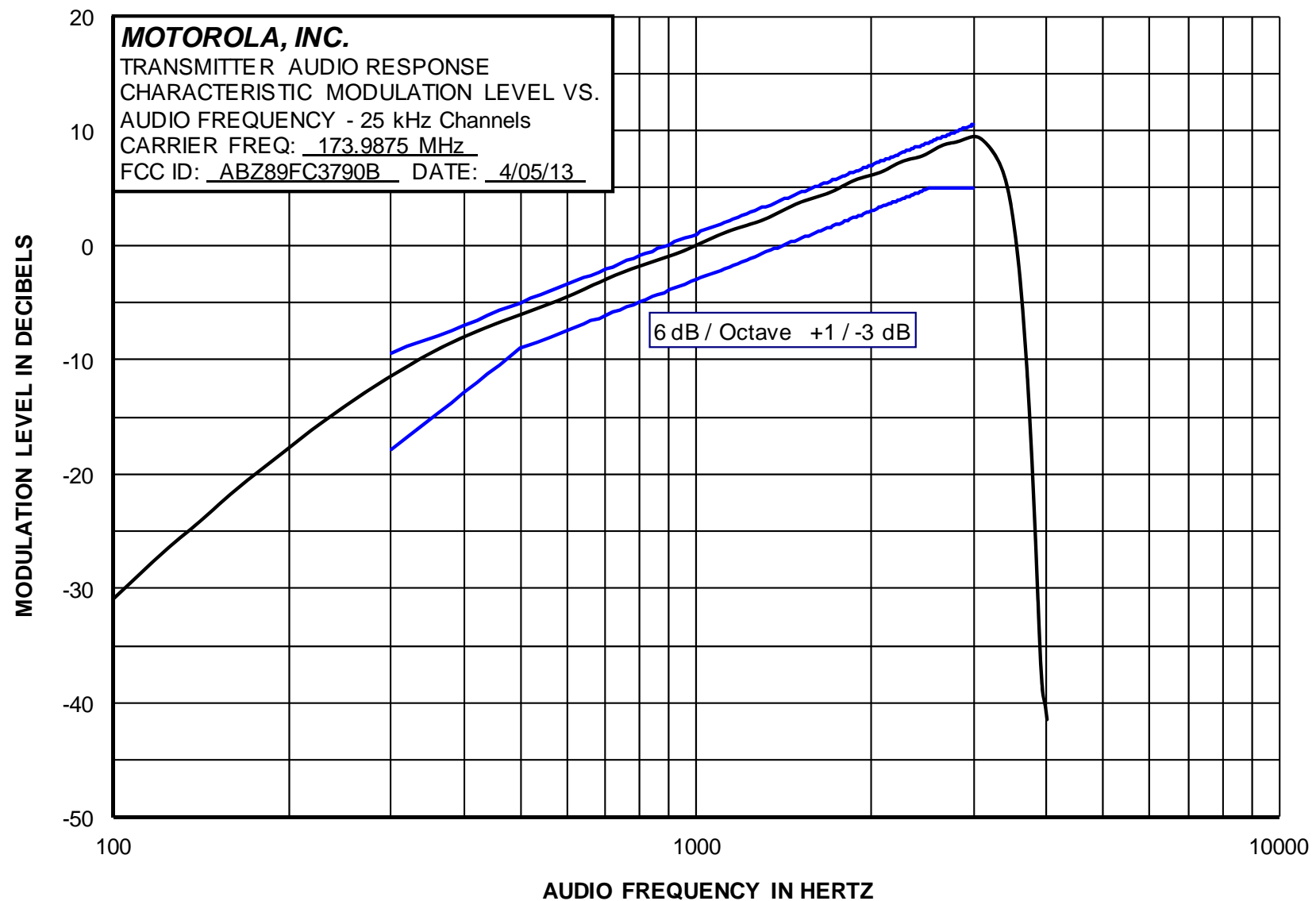
Report on Test Measurements

Audio Frequency Response – 25 kHz Channels – Middle of Band



Report on Test Measurements

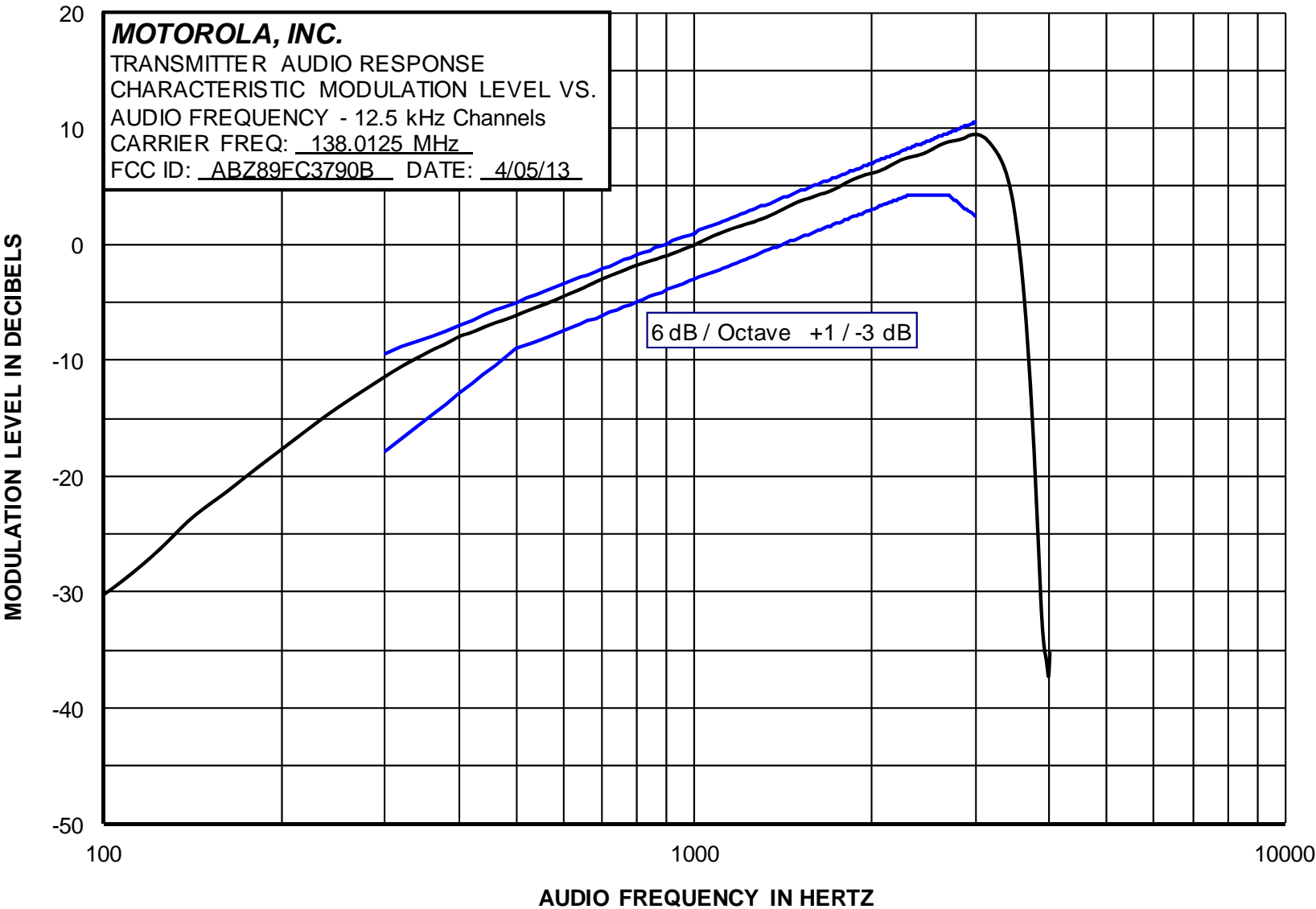
Audio Frequency Response – 25 kHz Channels – High End of Band





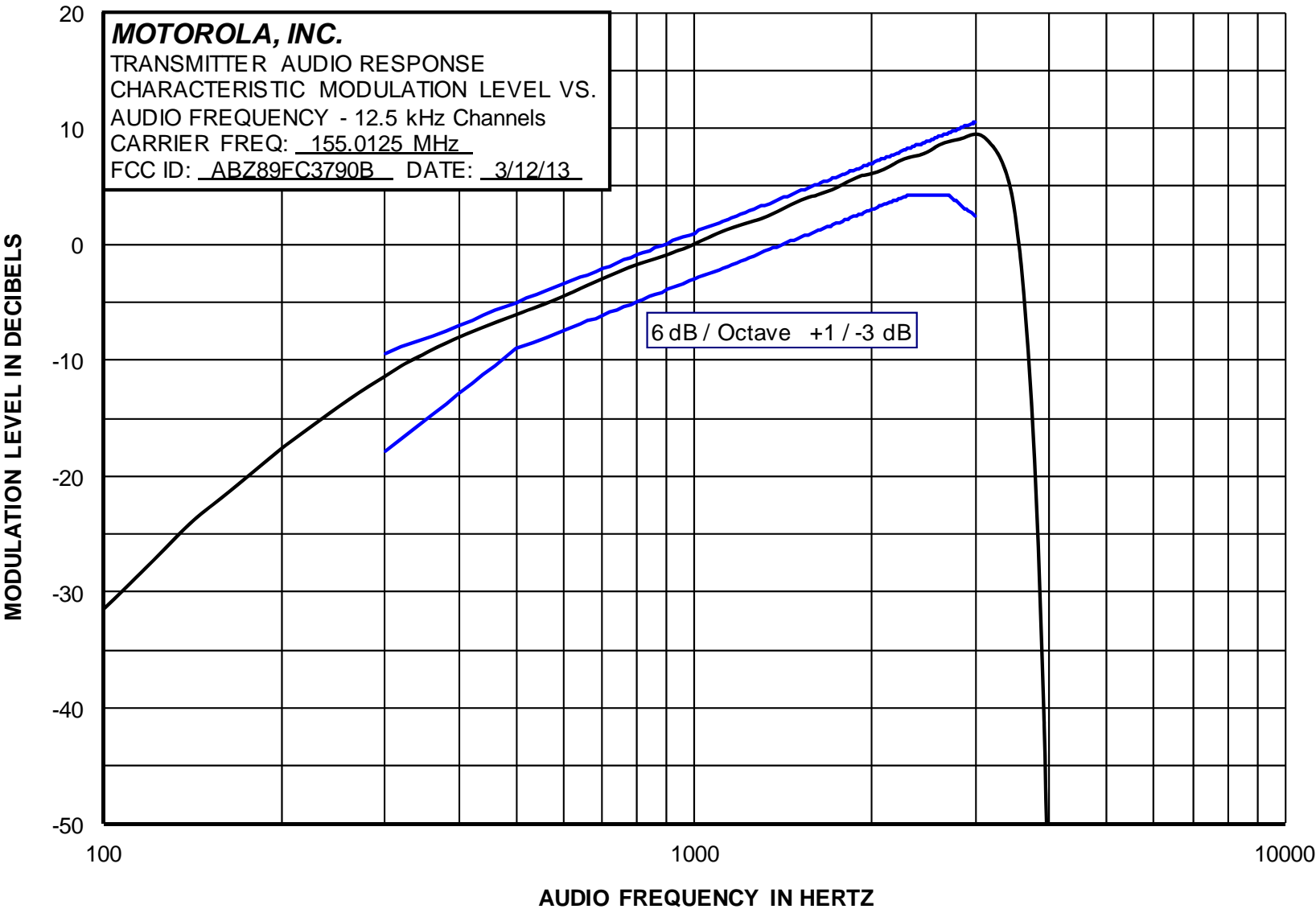
Report on Test Measurements

Audio Frequency Response – 12.5 kHz Channels – Low End of Band



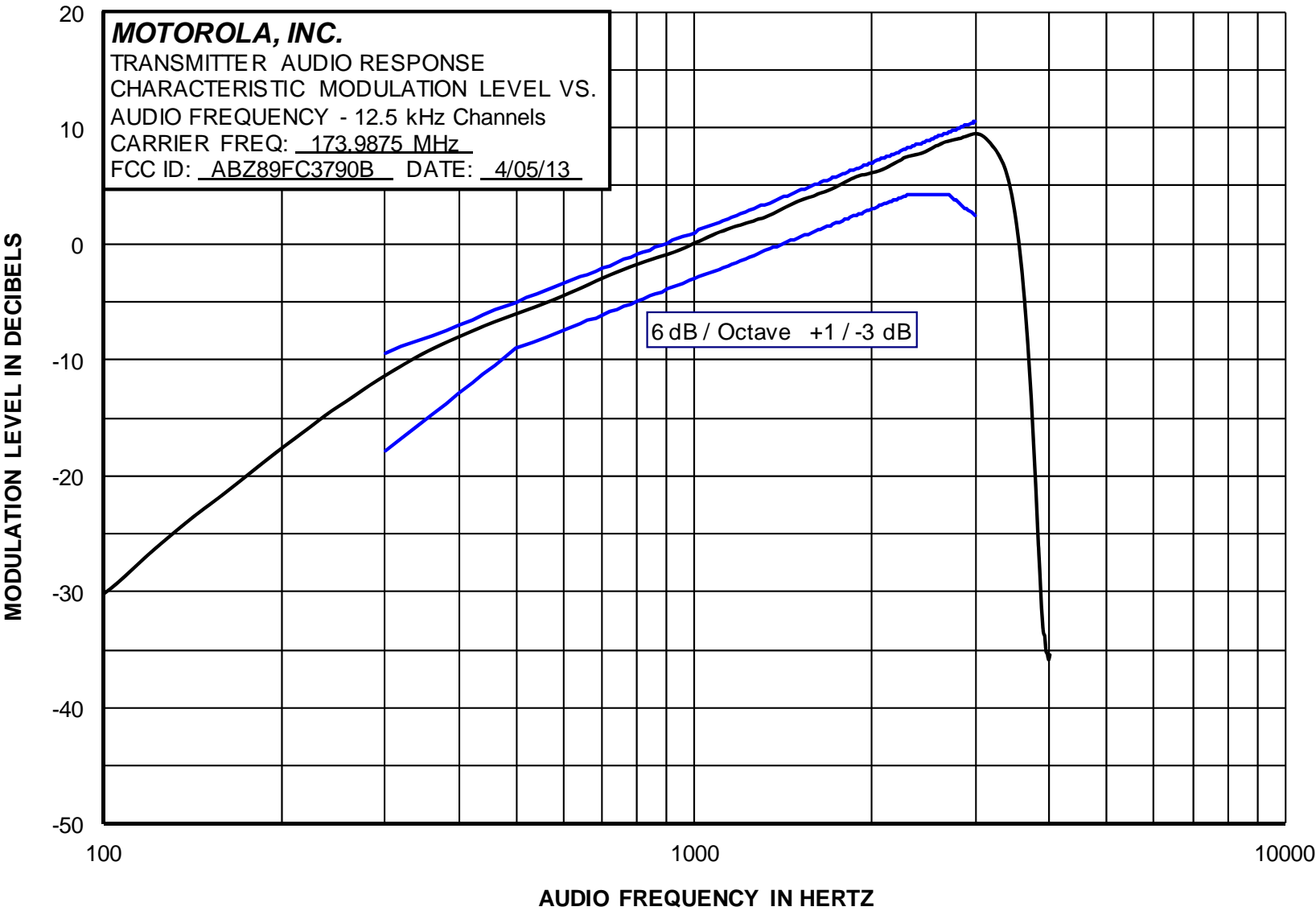
Report on Test Measurements

Audio Frequency Response – 12.5 kHz Channels – Middle of Band



Report on Test Measurements

Audio Frequency Response – 12.5 kHz Channels– High End of Band



**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: Performance was measured at carrier frequencies at the low end, middle, and high end of the operating band.

**Modulation Limiting Response Plots:**

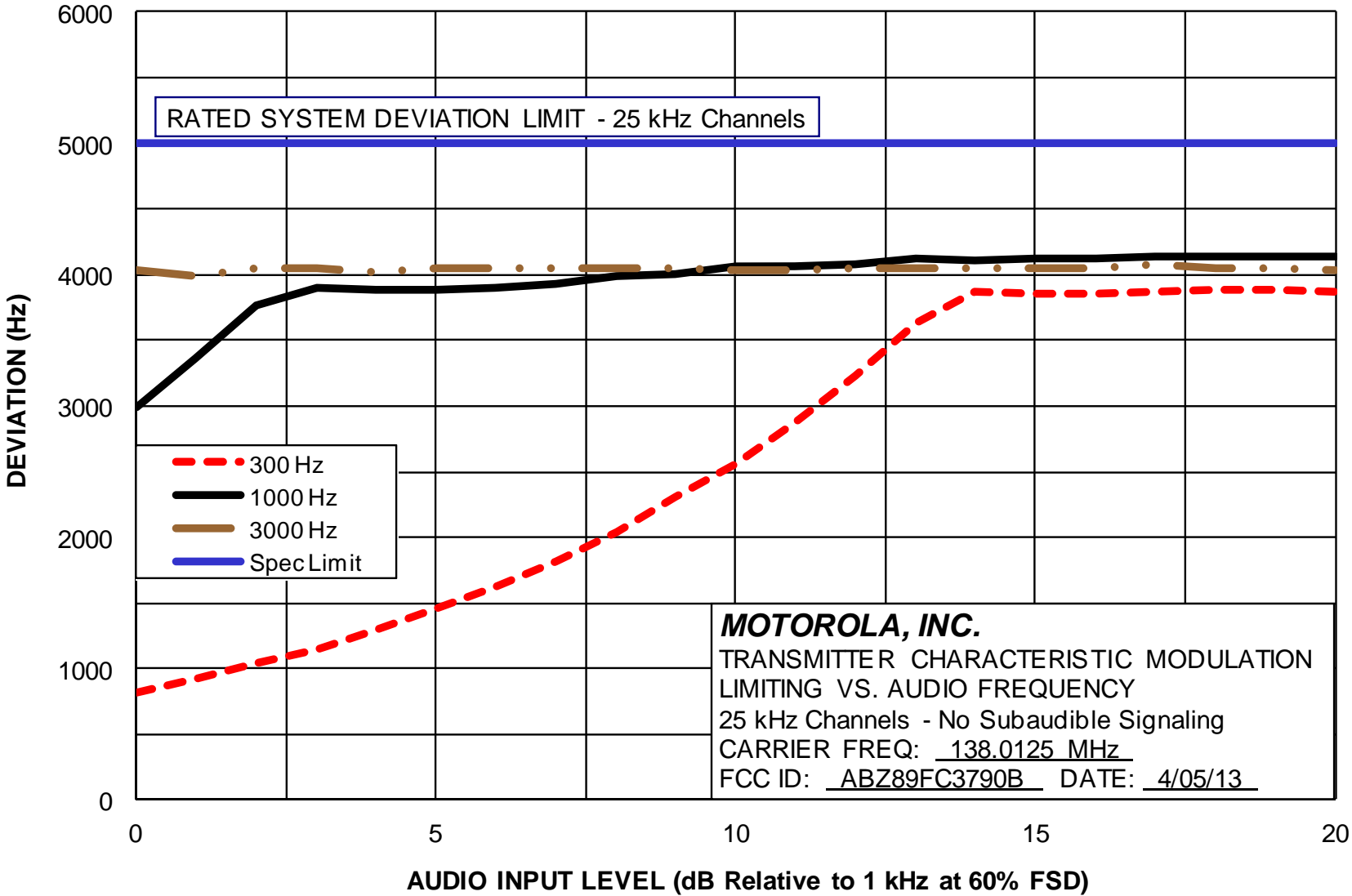
<b><u>EXHIBIT</u></b>	<b><u>DESCRIPTION</u></b>
E1-8.1	Modulation Limiting Response – Modulation Characteristics, 25 kHz Channels – Low End of Band
E1-8.2	Modulation Limiting Response – Modulation Characteristics, 25 kHz Channels – Middle of Band
E1-8.3	Modulation Limiting Response – Modulation Characteristics, 25 kHz Channels – High End of Band
E1-8.4	Modulation Limiting Response – Modulation Characteristics, 12.5 kHz Channels – Low End of Band
E1-8.5	Modulation Limiting Response – Modulation Characteristics, 12.5 kHz Channels – Middle of Band
E1-8.6	Modulation Limiting Response – Modulation Characteristics, 12.5 kHz Channels – High End of Band

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

Report on Test Measurements

Modulation Limiting – 25 kHz Channels – Low End of Band

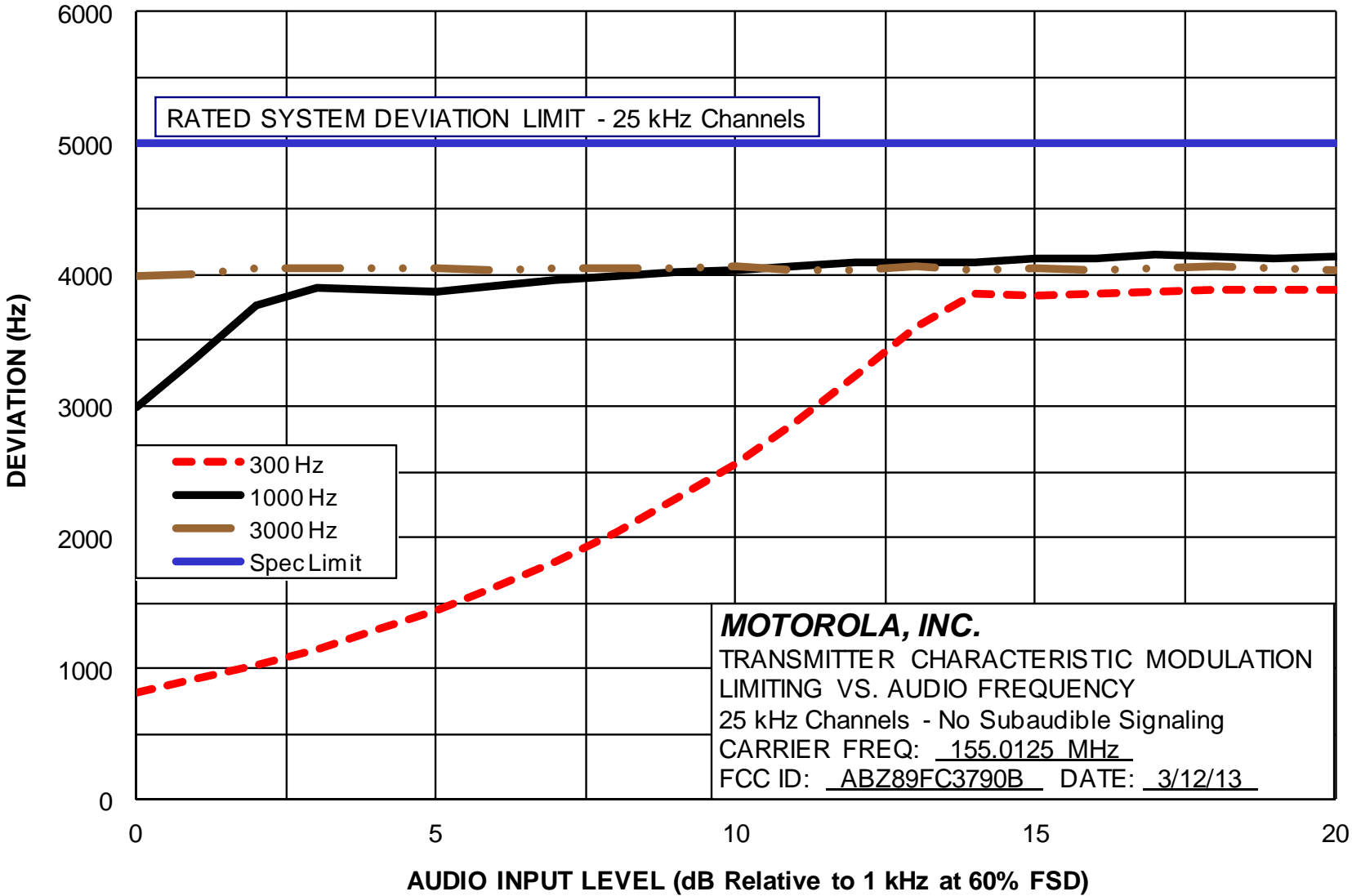


APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

Report on Test Measurements

Modulation Limiting – 25 kHz Channels – Middle of Band

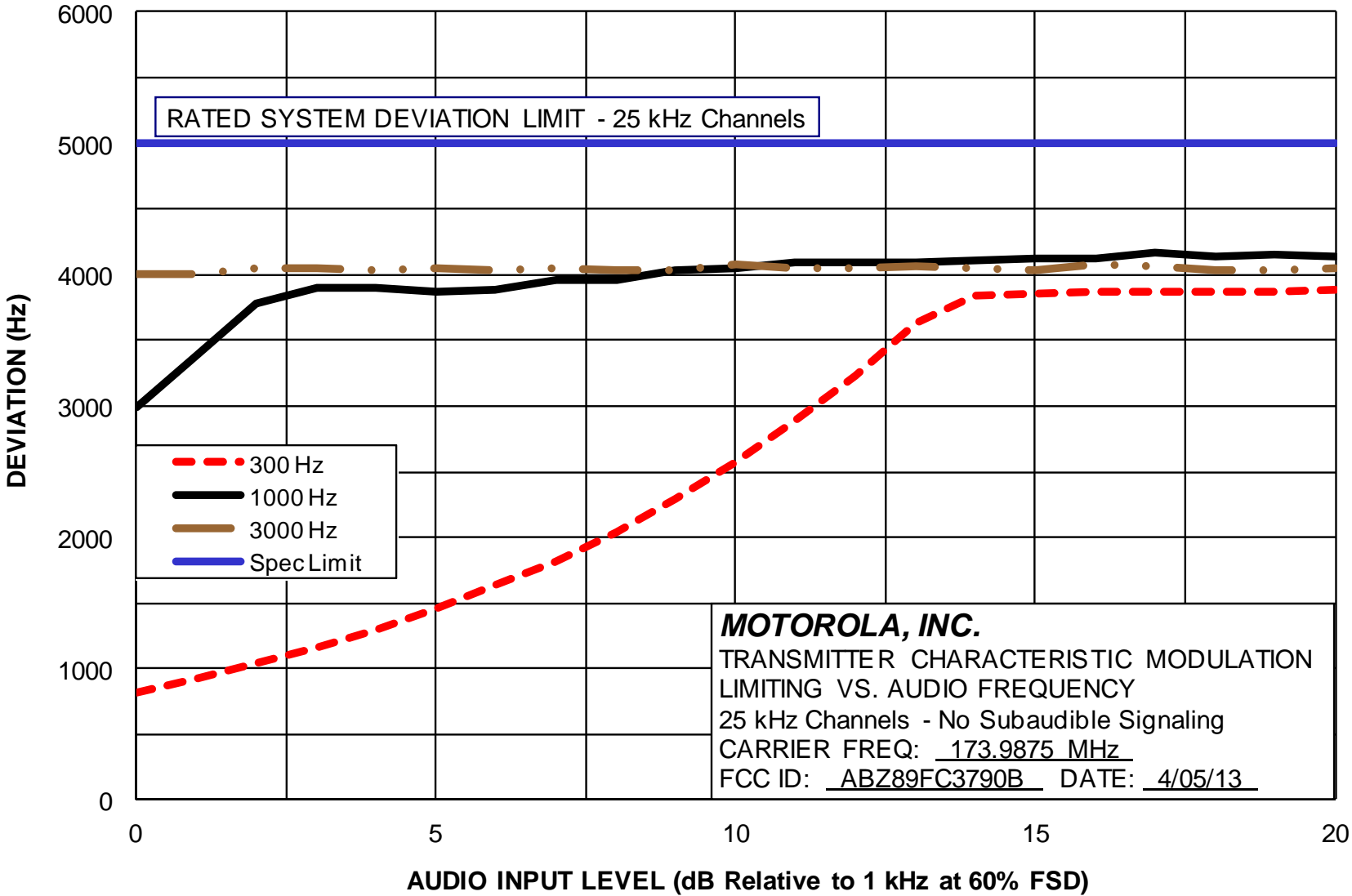


APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

Report on Test Measurements

Modulation Limiting – 25 kHz Channels – High End of Band

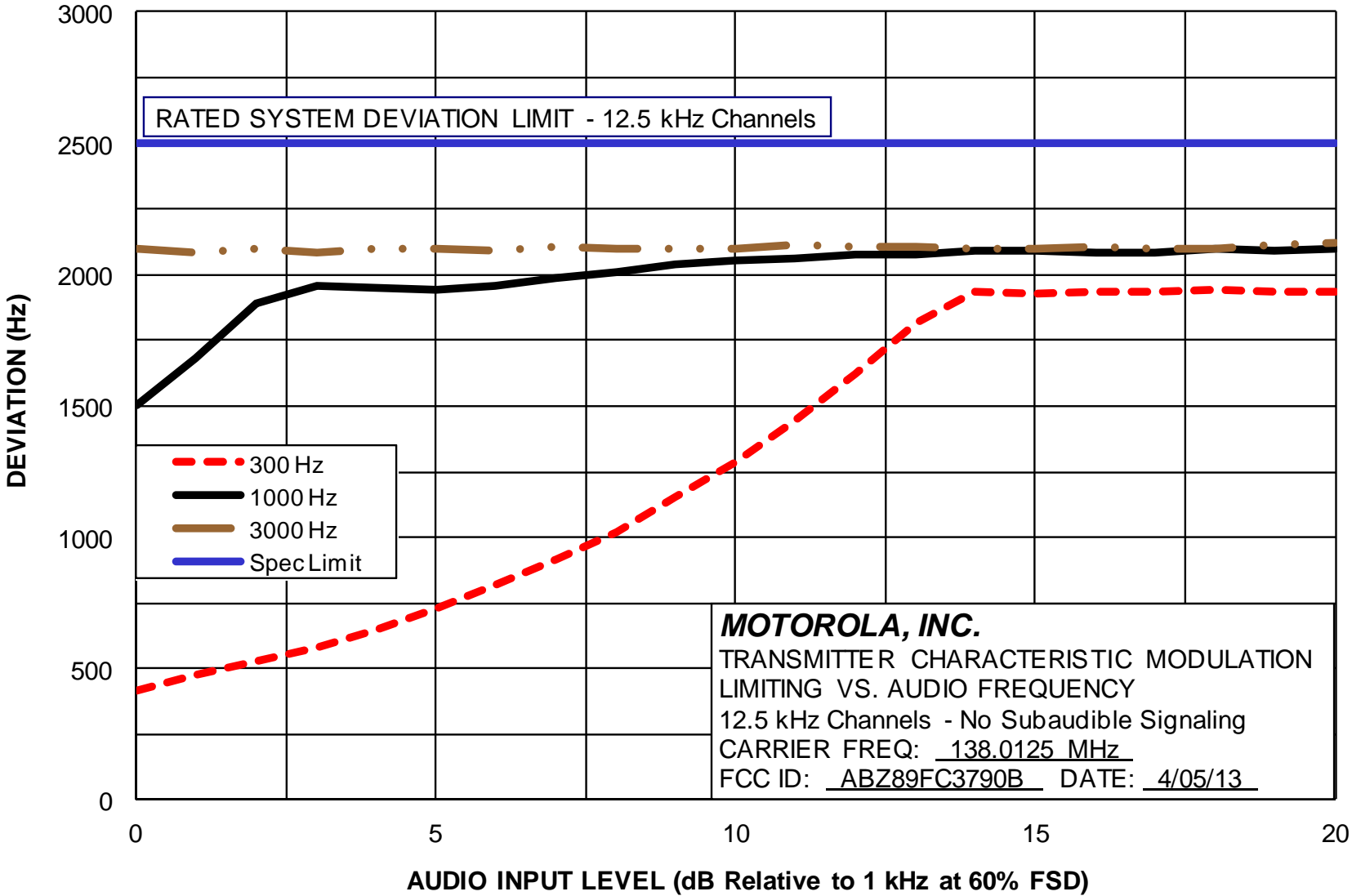


APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – Low End of Band



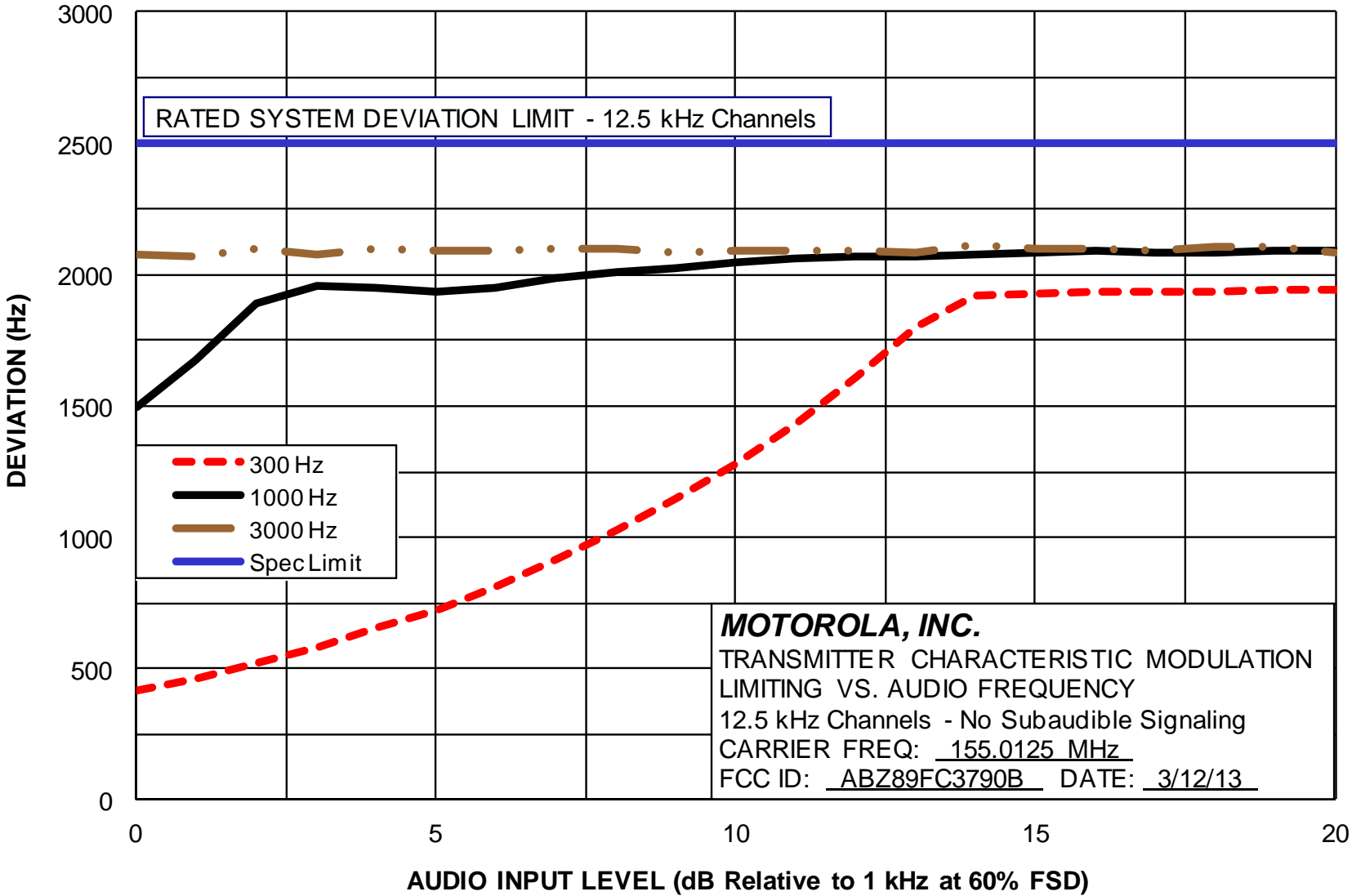


APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – Middle of Band

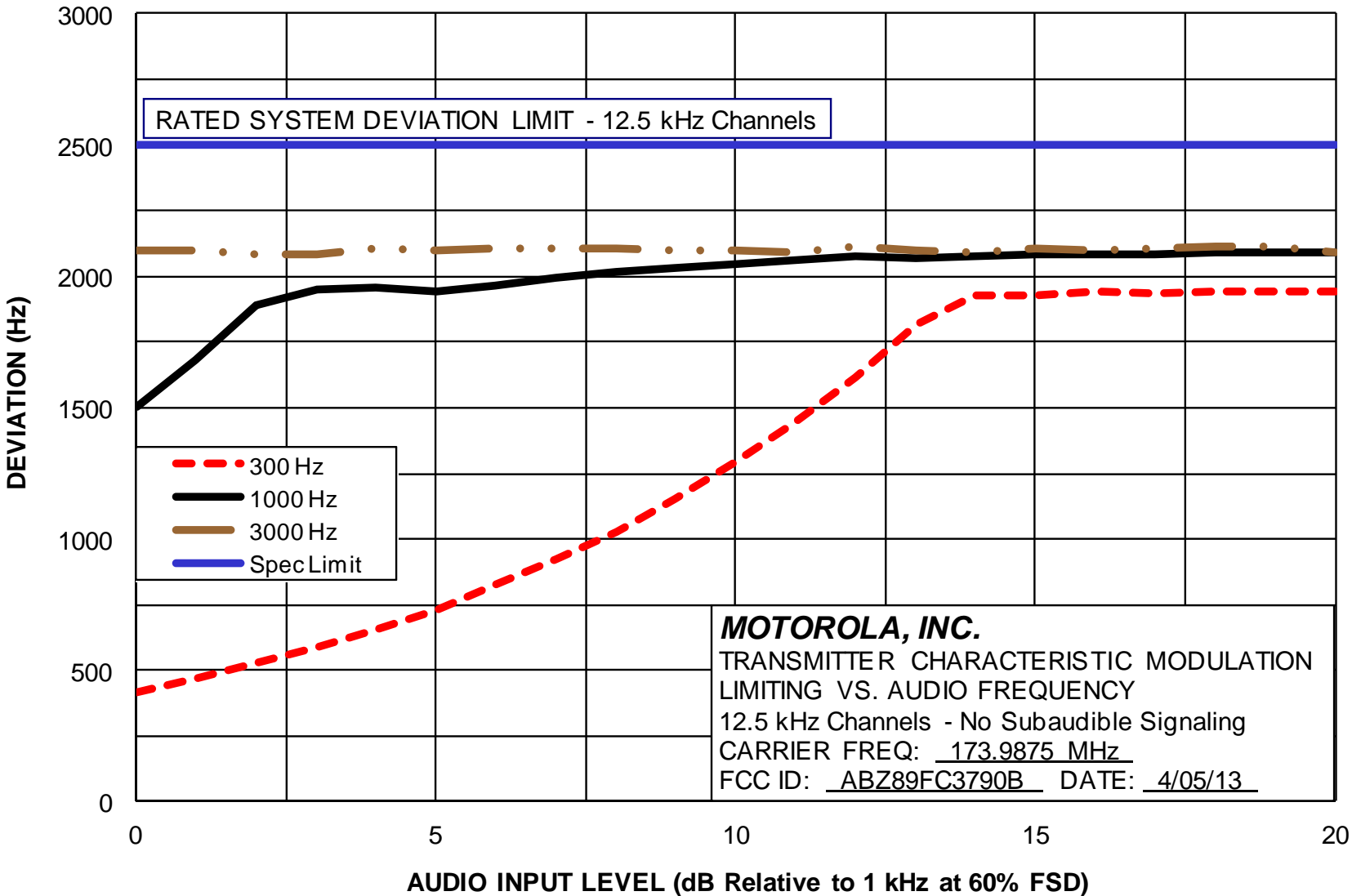


APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – High End of Band



**Report on Test Measurements**Occupied Bandwidth – Analog Voice Frequency Modulation, 25 kHz Channel Spacing

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, 150 bps low speed data, and 300 bps low speed data. PL and DPL are used in “Conventional” systems, whereas 150 bps and 300 bps low speed data are used in “Trunking” systems.

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

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

Specification Requirement § 90.210(b) Emission Limits – “B-Mask”:

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:

<u>Max Mod Freq, M</u>	<u>Max Deviation, D</u>	<u><math>2*(M+D)</math></u>	<u>Nec BW</u>
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:	10 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**

E1-9.1, 2, 3	Carrier with 2500 Hz Audio Tone, 25 kHz Channels
E1-9.4, 5, 6	Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 25 kHz Channels
E1-9.7, 8, 9	Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 25 kHz Channels
E1-9.10, 11, 12	Carrier with 2500 Hz Audio Tone and 150 bps Low Speed Data Signaling, 25 kHz Channels
E1-9.13, 14, 15	Carrier with 2500 Hz Audio Tone and 300 bps Low Speed Data Signaling, 25 kHz Channels

## Report on Test Measurements

*Occupied Bandwidth – Analog Voice Frequency Modulation, 12.5 kHz Channel Spacing*

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, 150 bps low speed data, and 300 bps low speed data. PL and DPL are used in “Conventional” systems, whereas 150 bps and 300 bps low speed data are used in “Trunking” systems.

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

Modulation Type: Analog Voice  
 Emission Designator: 11K0F3E  
 Channelization: 12.5 kHz  
 Deviation Limit:  $\pm 5.0$  kHz Max  
 Power Setting: 100 Watts

Specification Requirement § 90.210(d) Emission Limits – “D-Mask”:

*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:

(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  $7.27 * (f_d - 2.88 \text{ kHz})$  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  $10 \log_{10}(P)$  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><math>2*(M+D)</math></i>	<i>Nec BW</i>
3 kHz	2.5 kHz	11 kHz	11K0

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 (continued)*Test Procedure (Analog Voice):

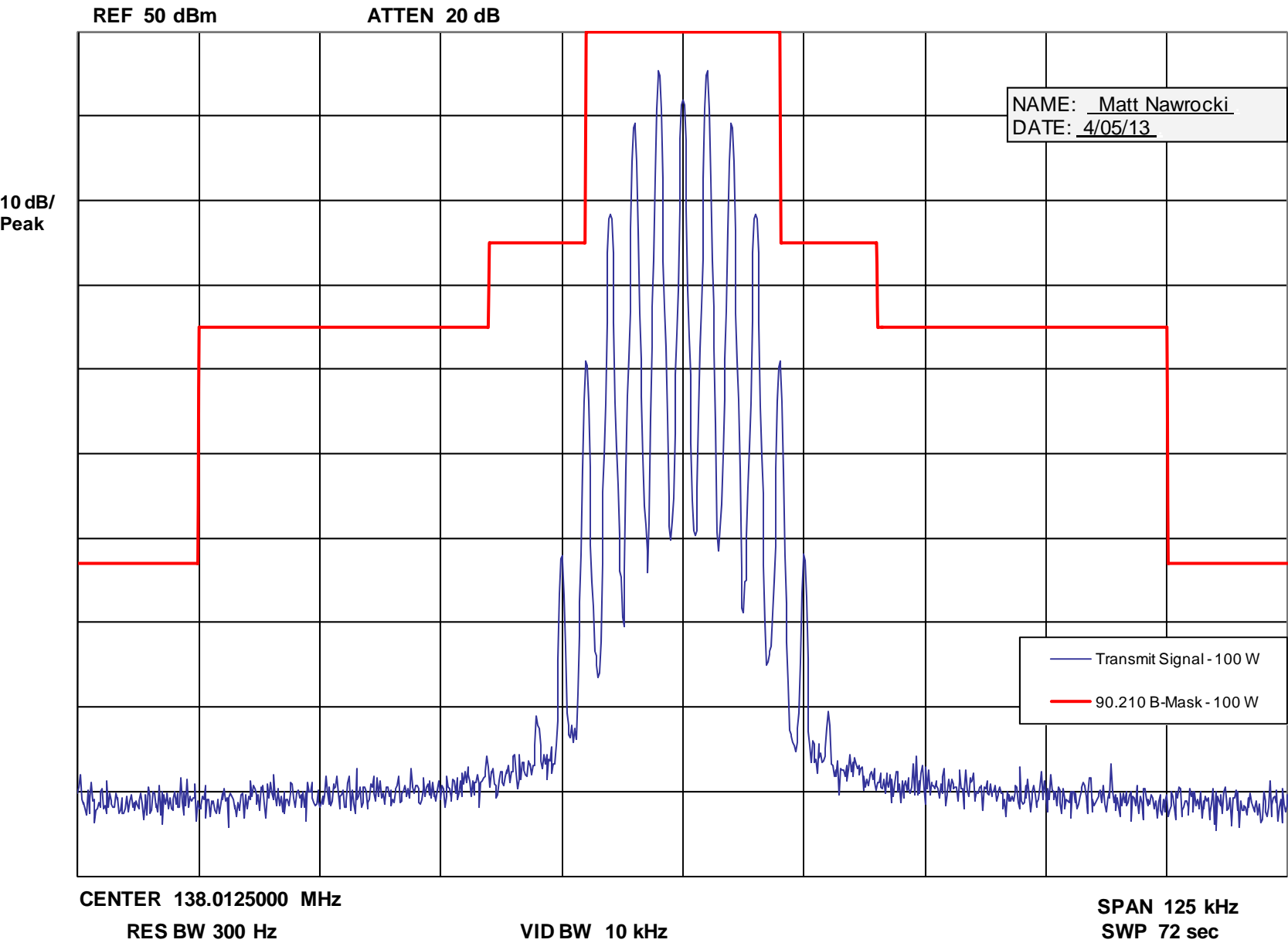
- 1) Key the station with no modulation to obtain the unmodulated carrier reference level on the analyzer. Use the analyzer controls to set this reference to a full-scale reference line. Store this analyzer trace in trace A.
- 2) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 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.

EXHIBIT	DESCRIPTION
E1-9.16, 17, 18	Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels
E1-9.19, 20, 21	Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 12.5 kHz Channels
E1-9.22, 23, 24	Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, 12.5 kHz Channels
E1-9.25, 26, 27	Carrier with 2500 Hz Audio Tone and 150 bps Low Speed Data Signaling, 12.5 kHz Channels
E1-9.28, 29, 30	Carrier with 2500 Hz Audio Tone and 300 bps Low Speed Data Signaling, 12.5 kHz Channels

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 25 kHz Channels – Emission Designator: 16K0F3E – Low End of Band

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



EQUIPMENT TYPE: ABZ89FC3790B

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 25 kHz Channels – Emission Designator: 16K0F3E – Middle of Band

NAME: Matt Nawrocki  
DATE: 3/12/13

10 dB/ Peak

REF 50 dBm  
ATTEN 20 dB

Transmit Signal - 100 W  
90.210 B-Mask - 100 W

CENTER 155.0125000 MHz  
RES BW 300 Hz  
VID BW 10 kHz  
SPAN 125 kHz  
SWP 72 sec

**EXHIBIT E1-9.2**

EQUIPMENT TYPE: ABZ89FC3790B

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 25 kHz Channels – Emission Designator: 16K0F3E – High End of Band

REF 50 dBm

ATTN 20 dB

10 dB/ Peak

NAME: Matt Nawrocki  
DATE: 4/05/13

Transmit Signal - 100 W

90.210 B-Mask - 100 W

CENTER 173.9875000 MHz

SPAN 125 kHz

RES BW 300 Hz

VID BW 10 kHz

SWP 72 sec

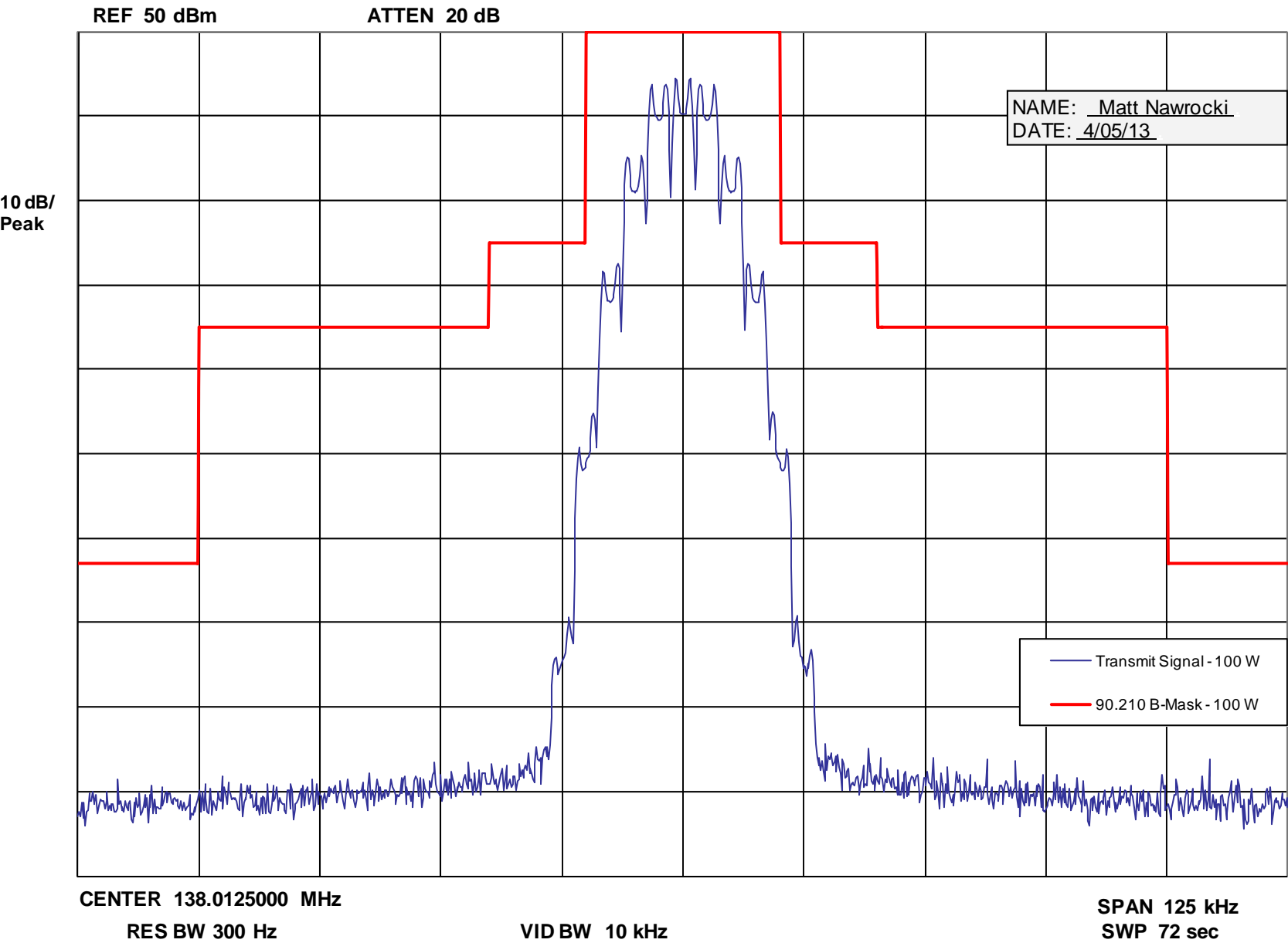
**EXHIBIT E1-9.3**



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Low End of Band

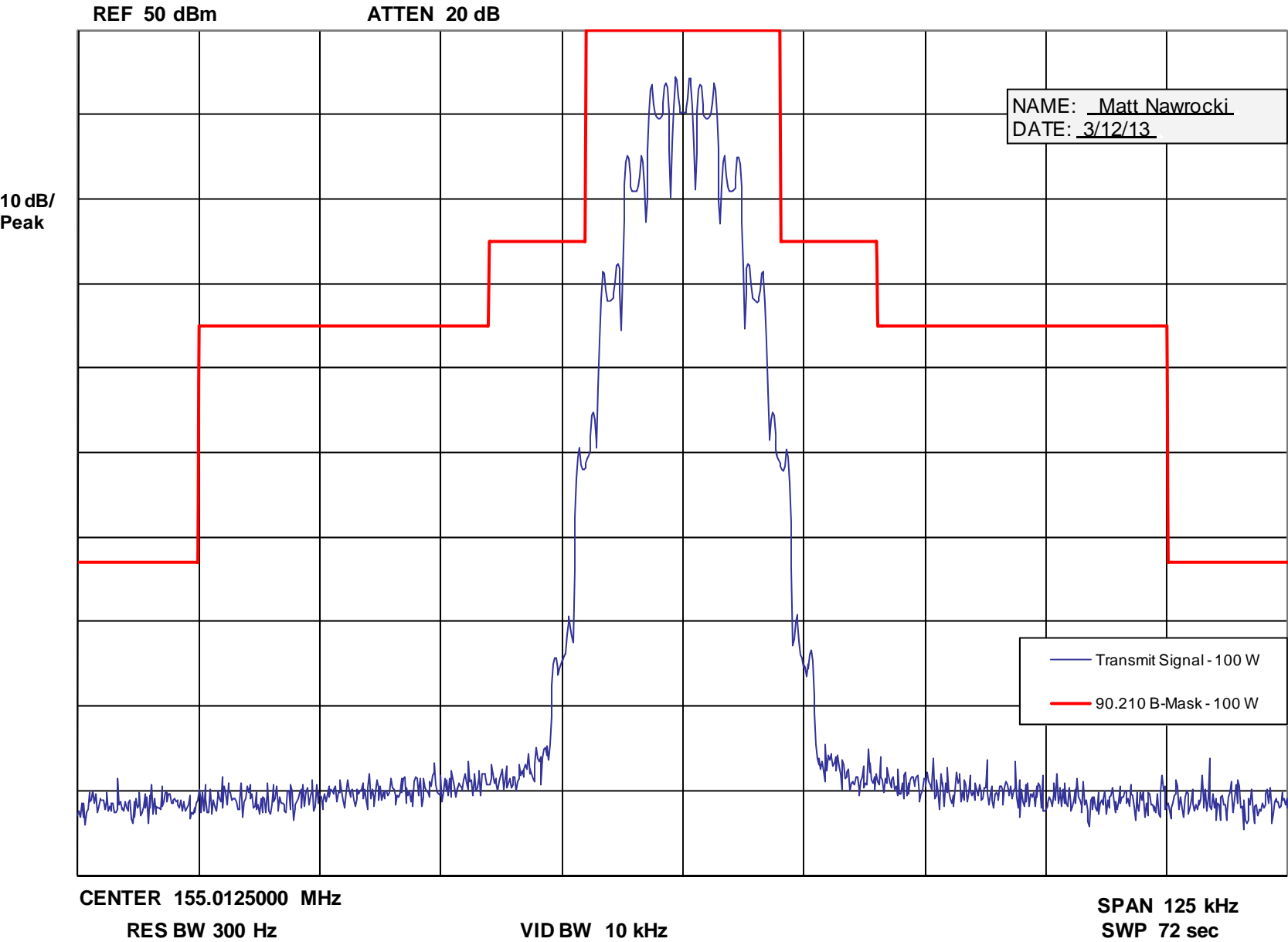
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Middle of Band

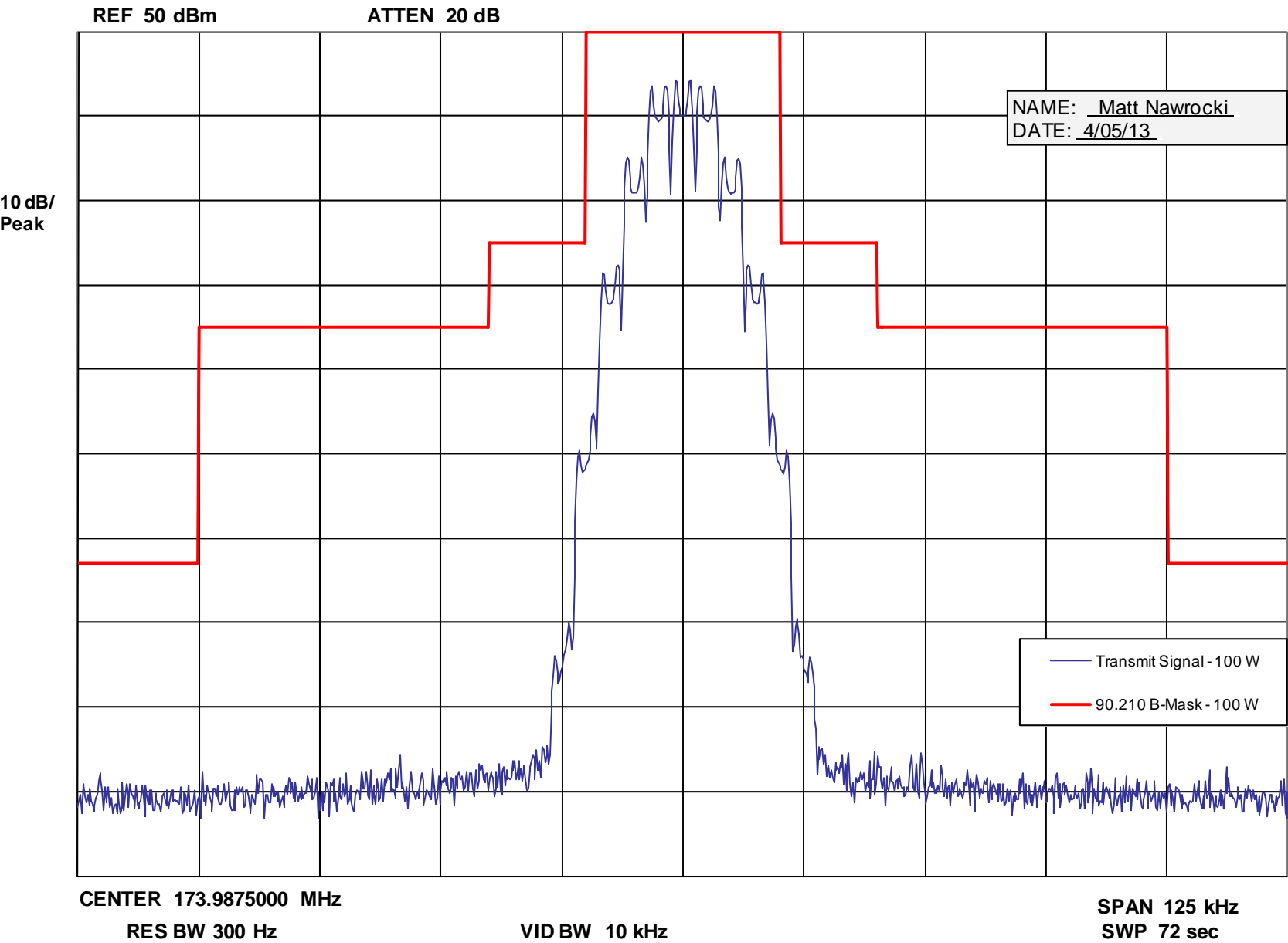
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – High End of Band

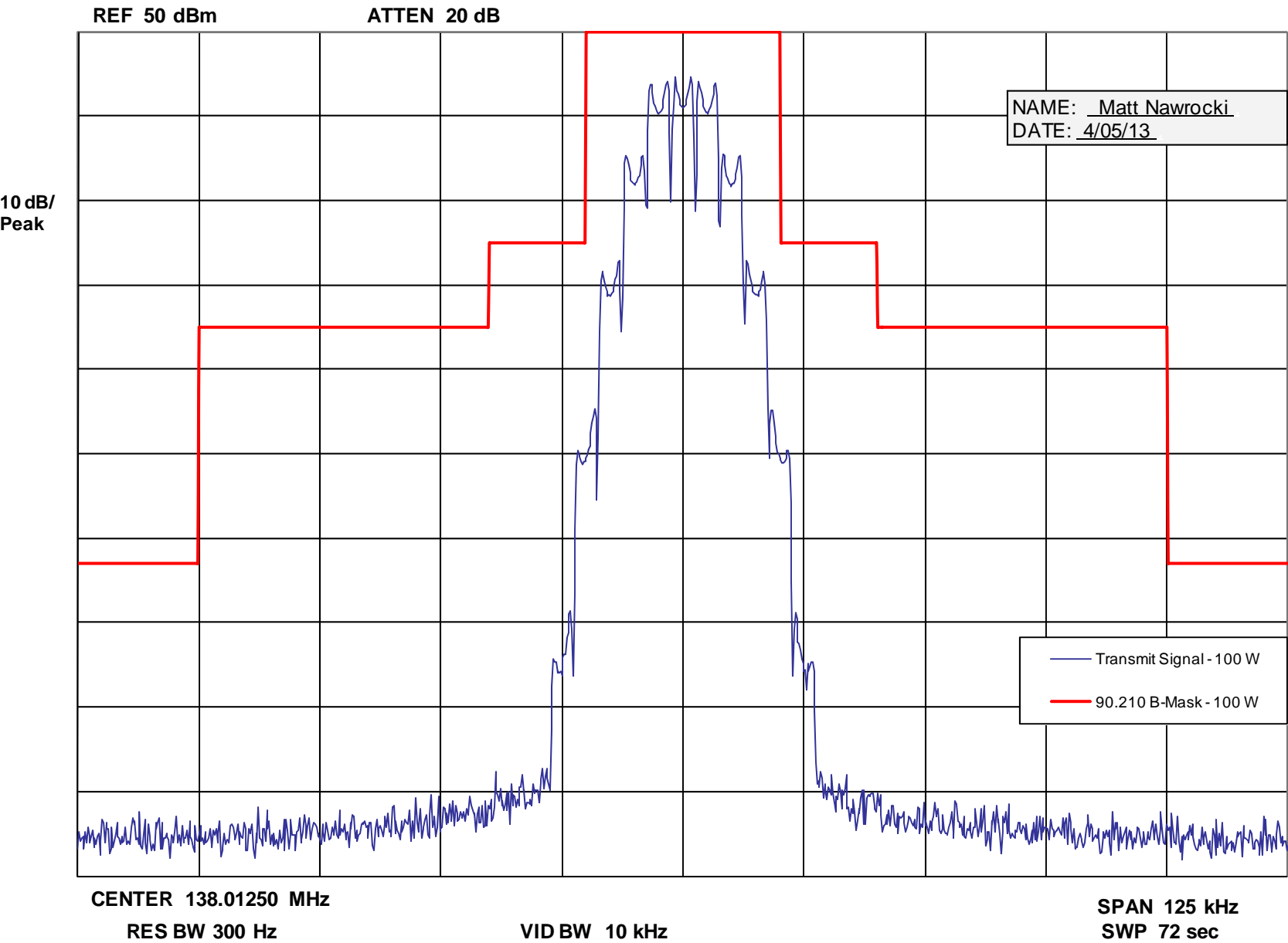
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and Digital Private Line (DPL) Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Low End of Band

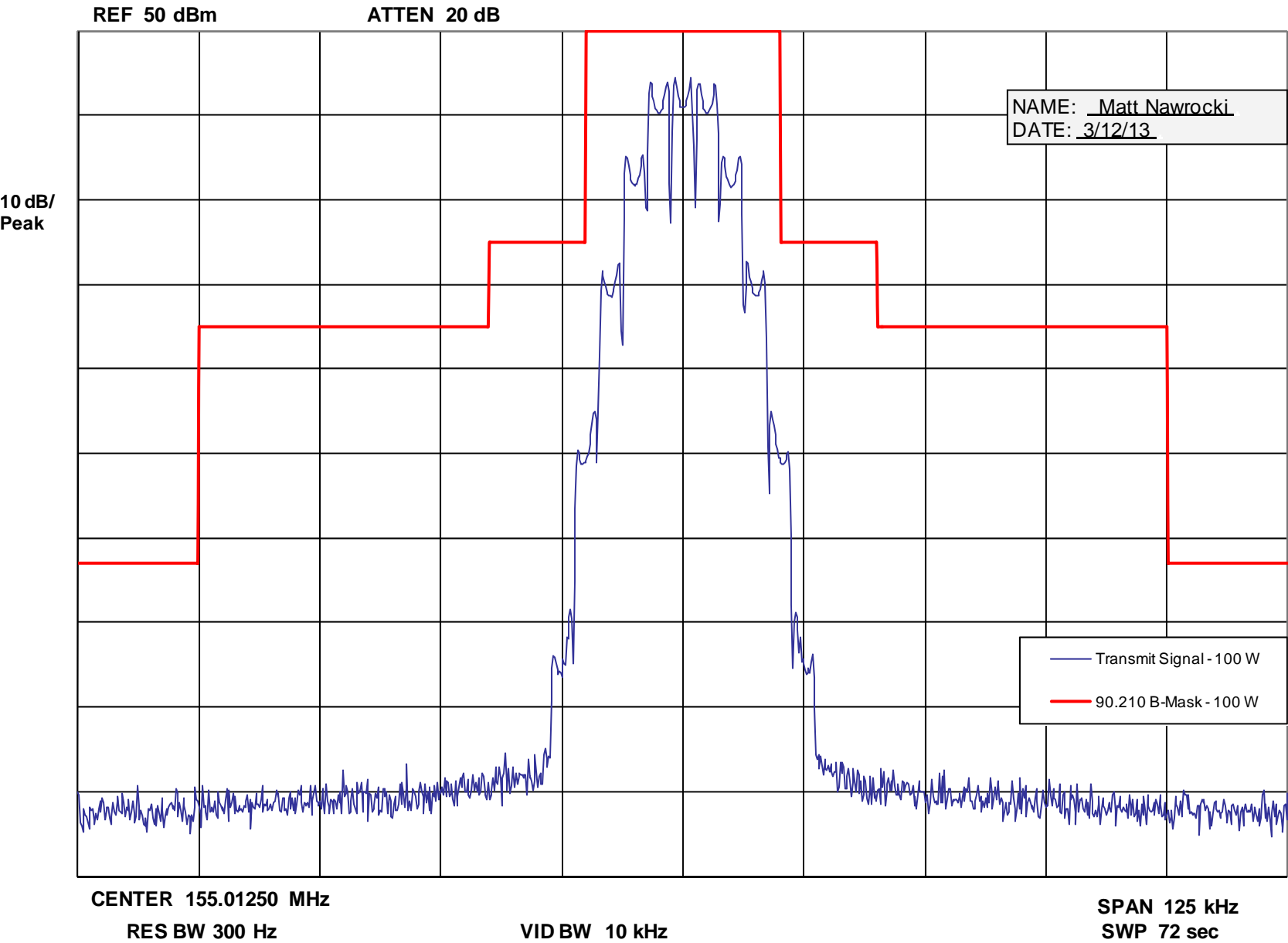
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and Digital Private Line (DPL) Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Middle of Band

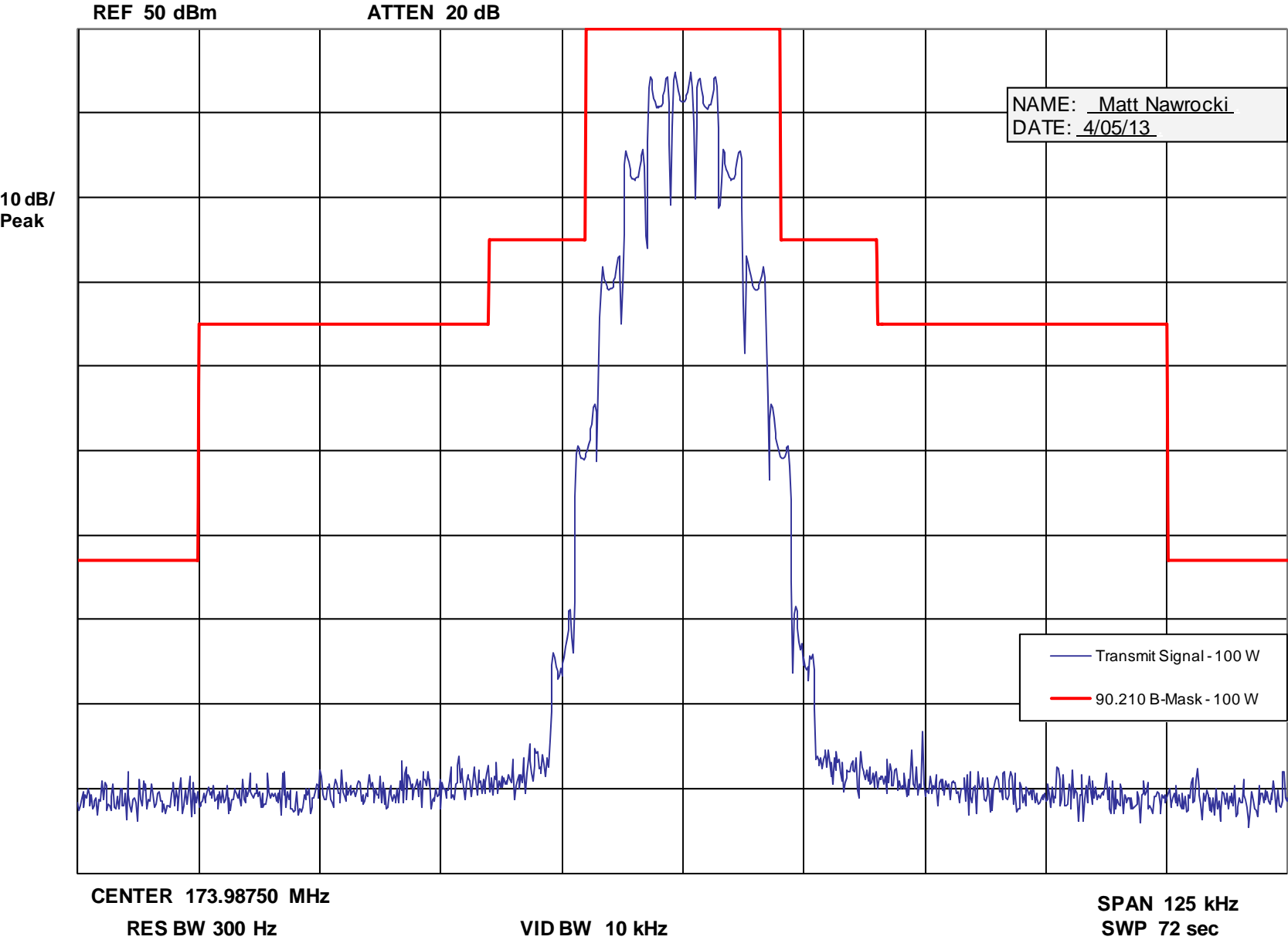
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and Digital Private Line (DPL) Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – High End of Band

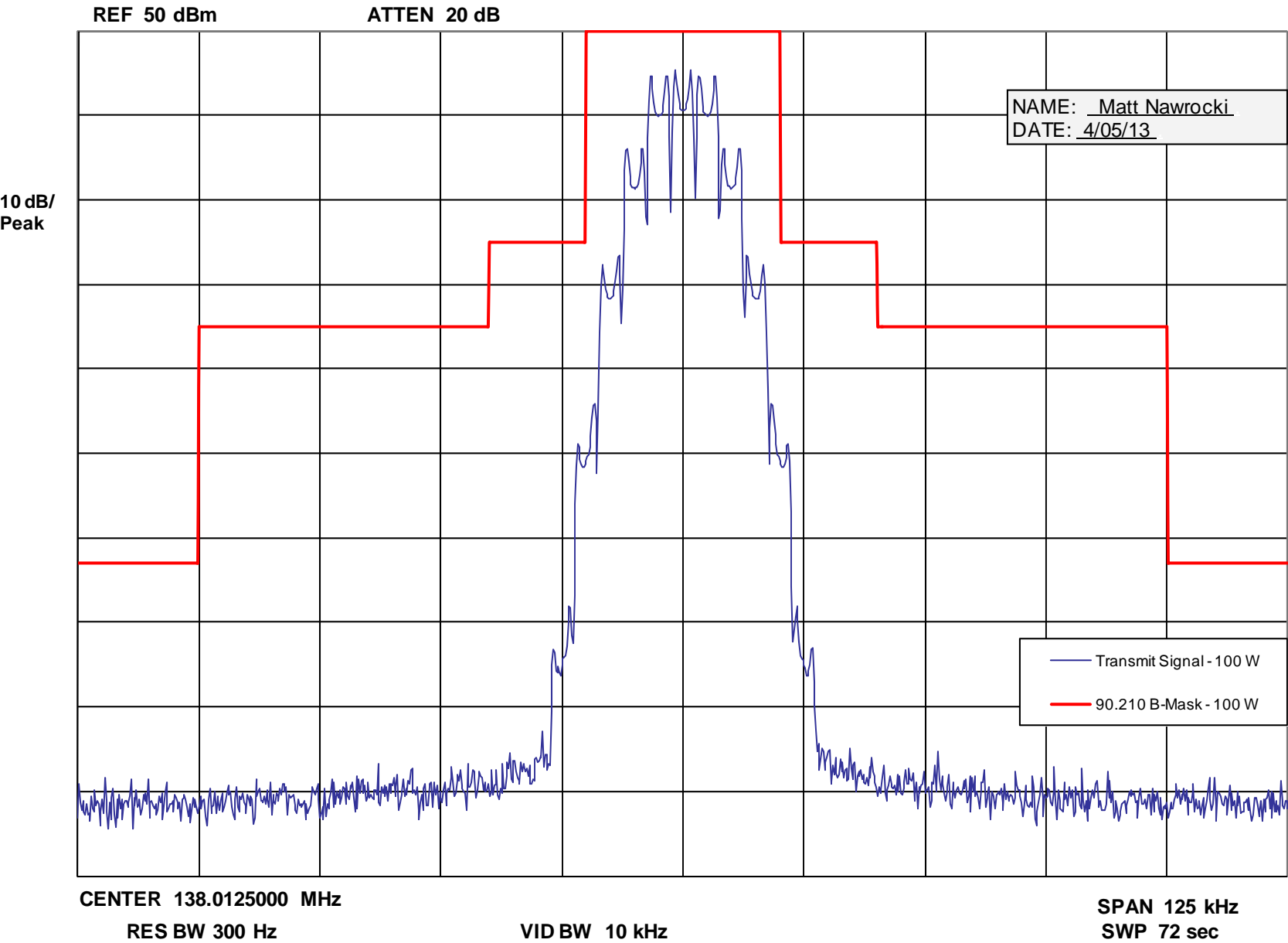
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and 150 bps Low Speed Data Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Low End of Band

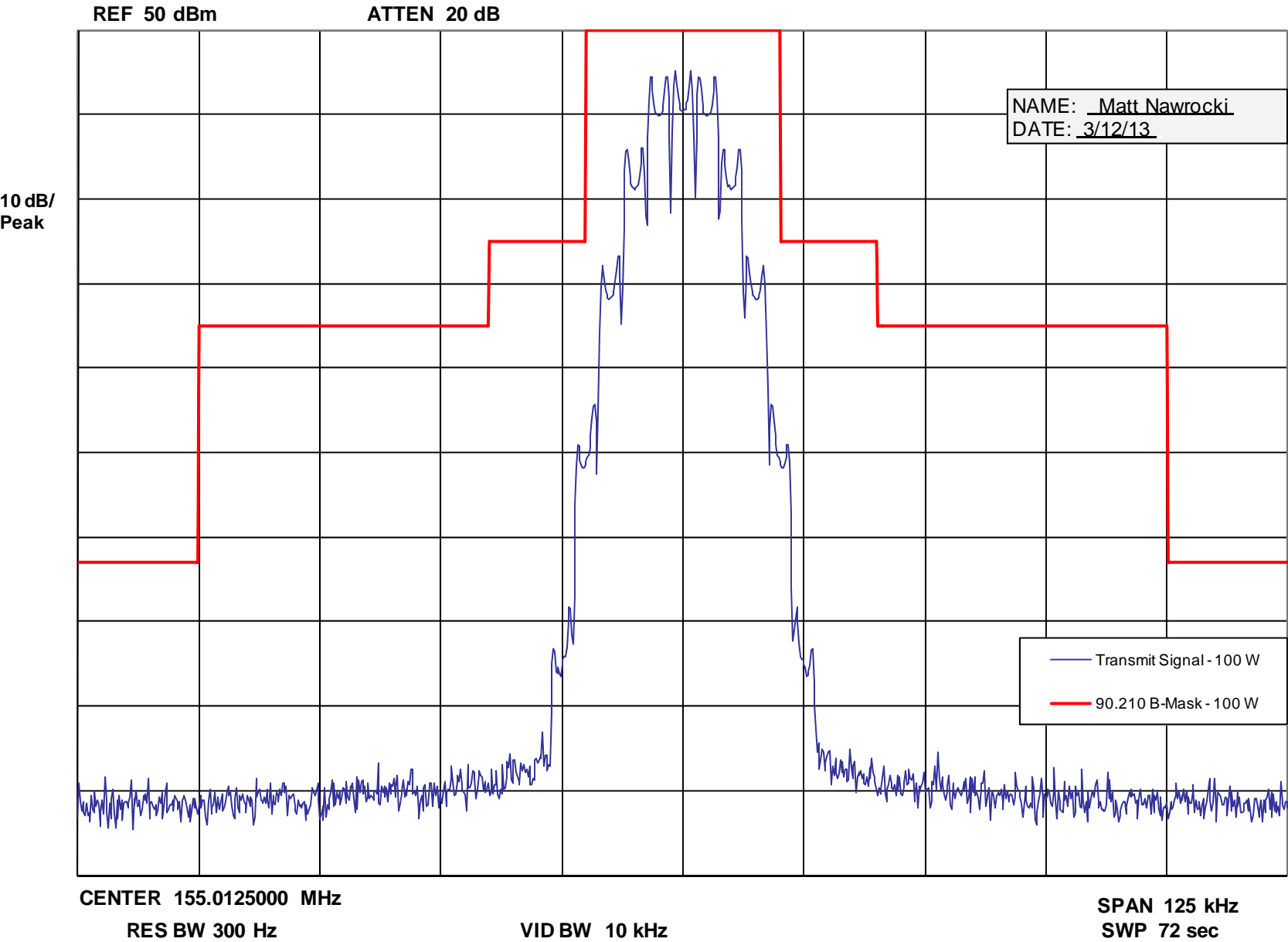
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and 150 bps Low Speed Data Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Middle of Band

Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 150 bps

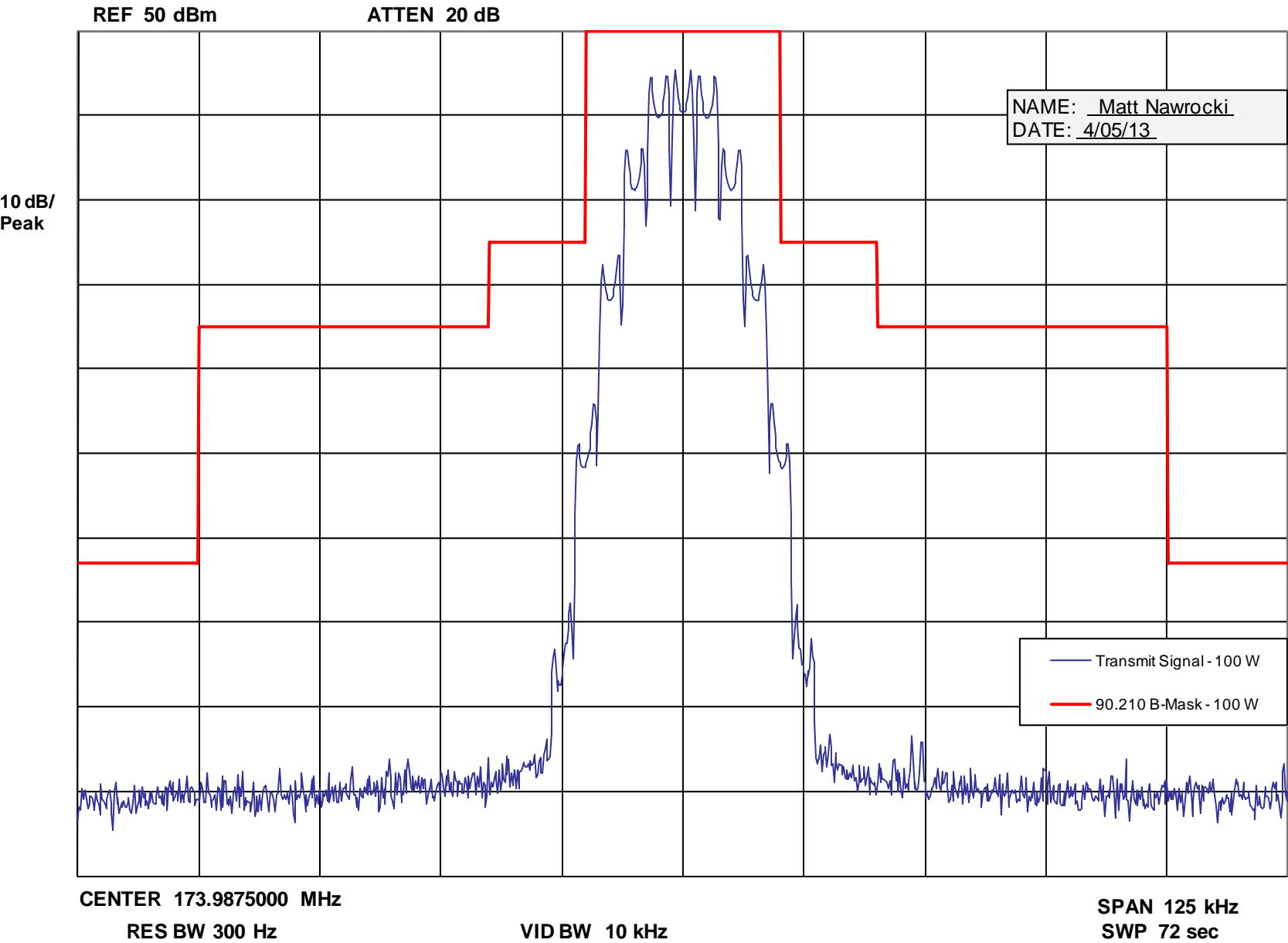




Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and 150 bps Low Speed Data Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – High End of Band

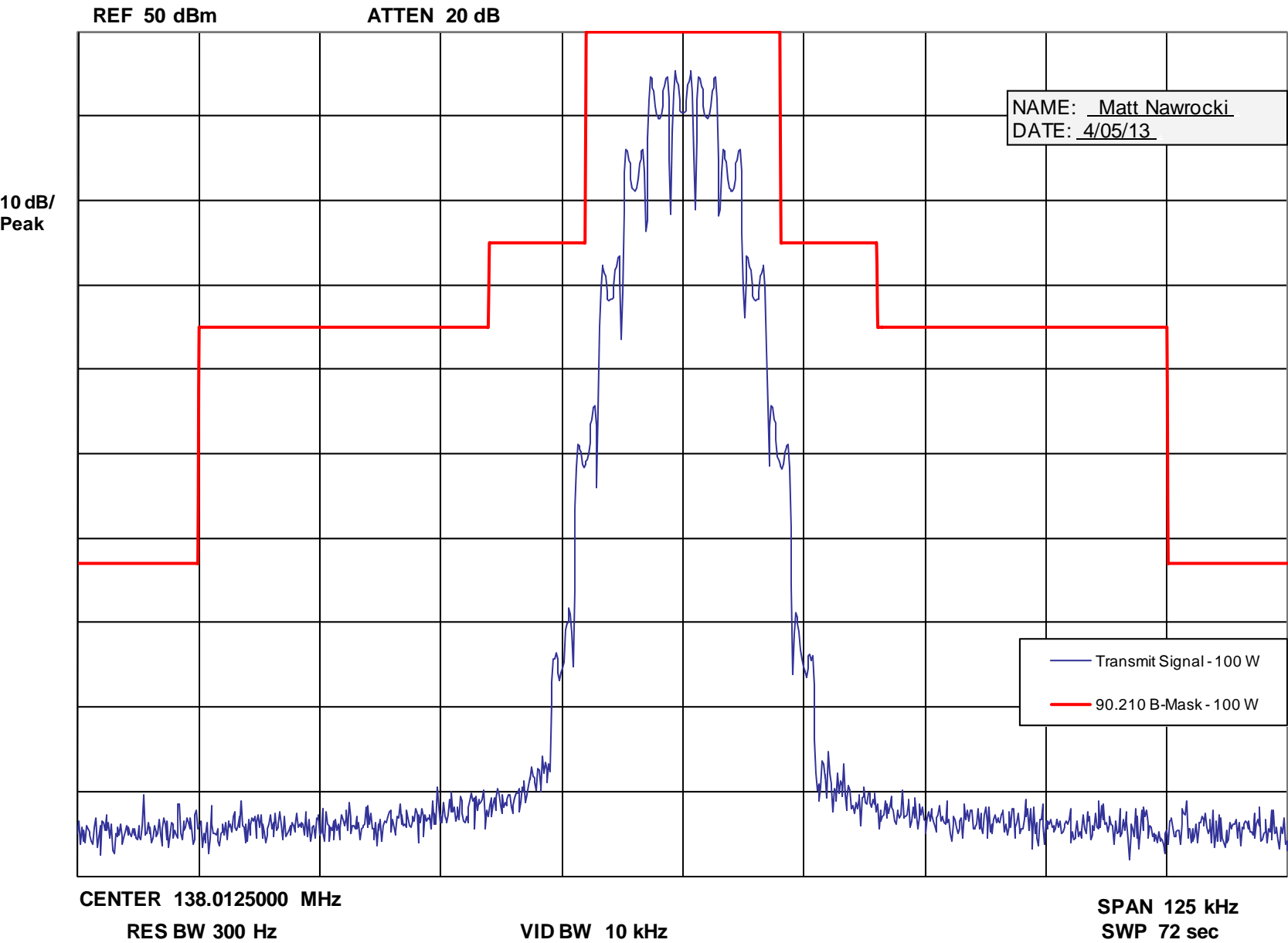
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and 300 bps Low Speed Data Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Low End of Band

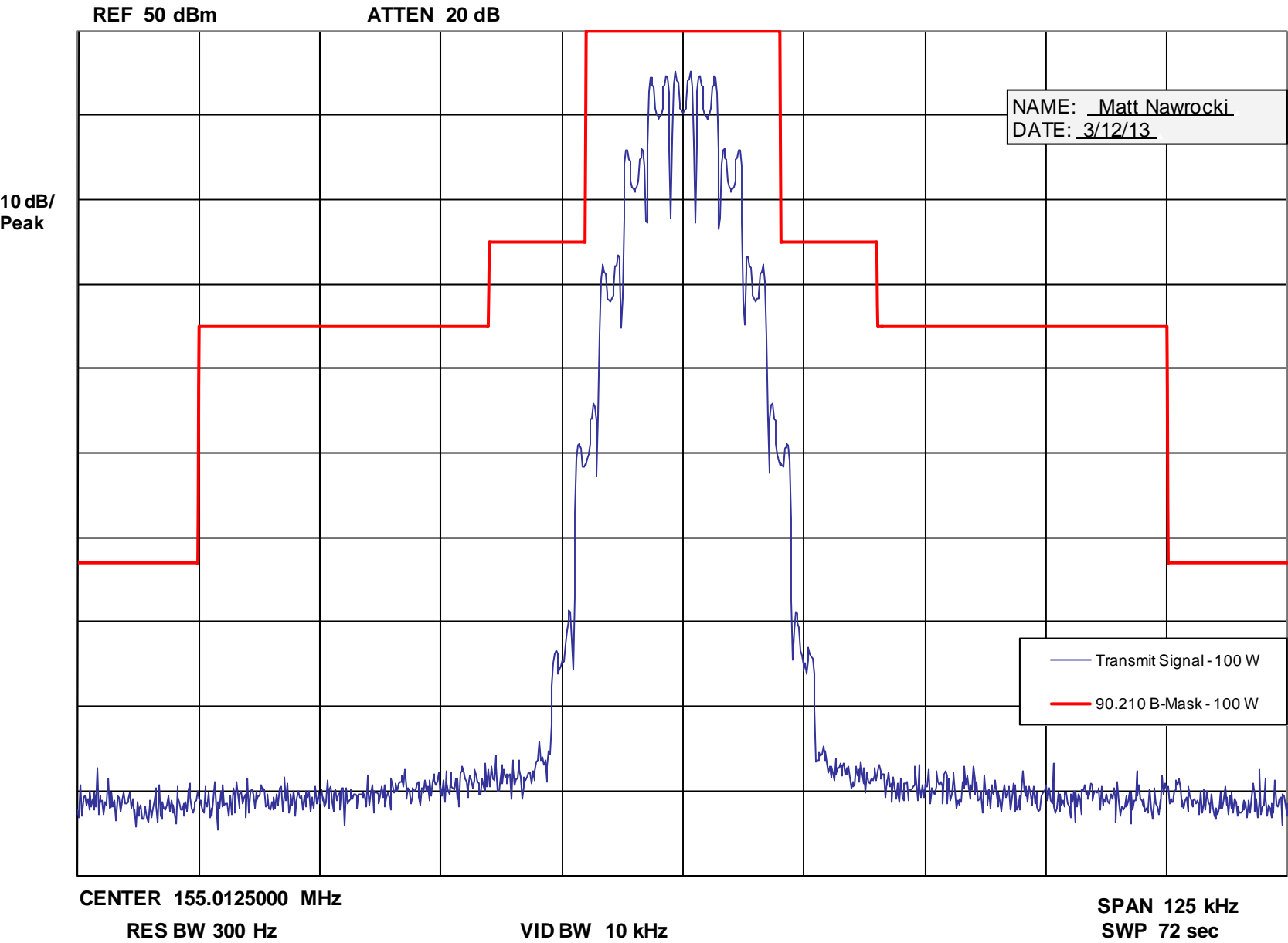
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and 300 bps Low Speed Data Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – Middle of Band

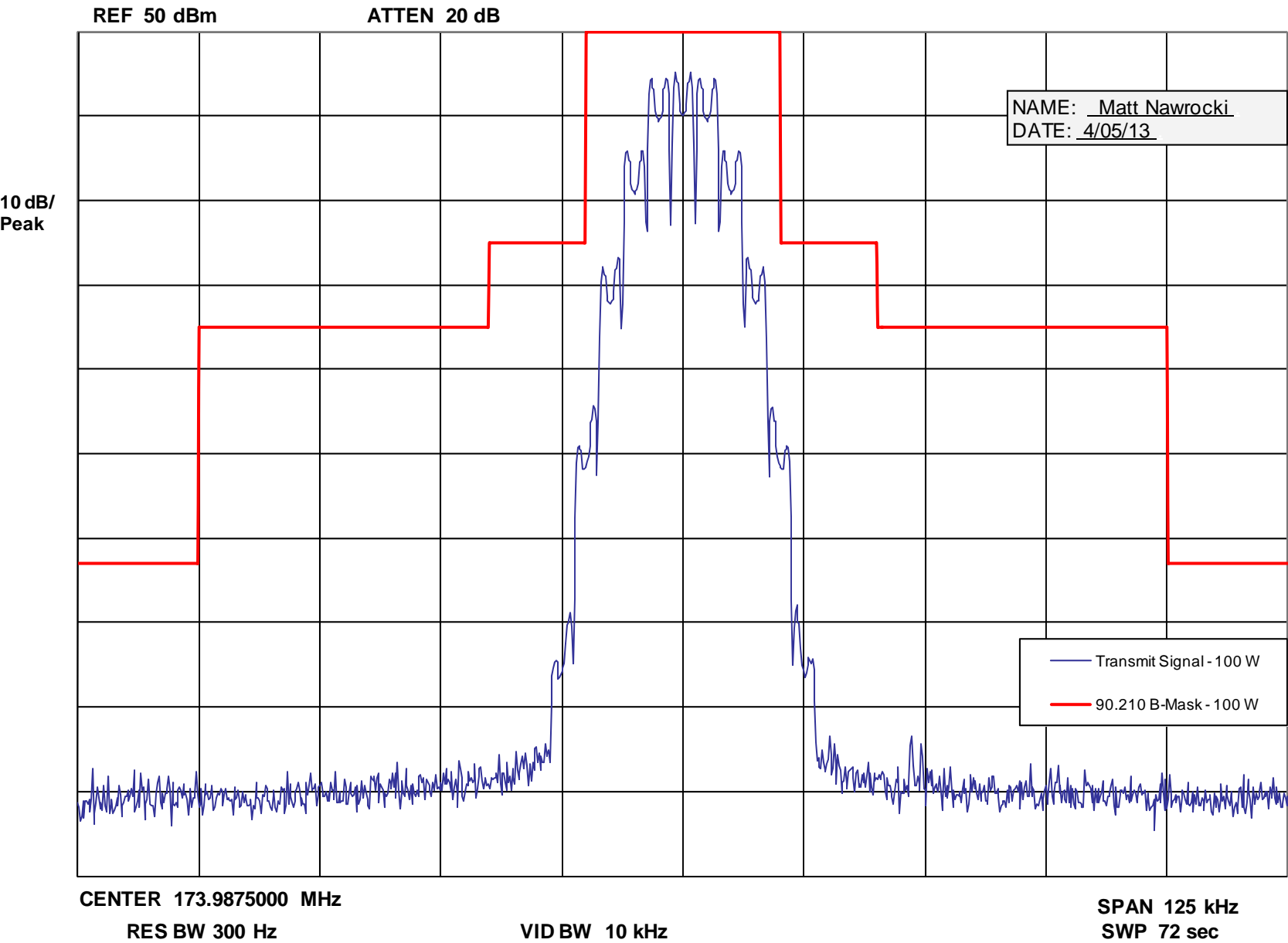
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone and 300 bps Low Speed Data Signaling, 25 kHz Channels – Emission Designator: 16K0F3E – High End of Band

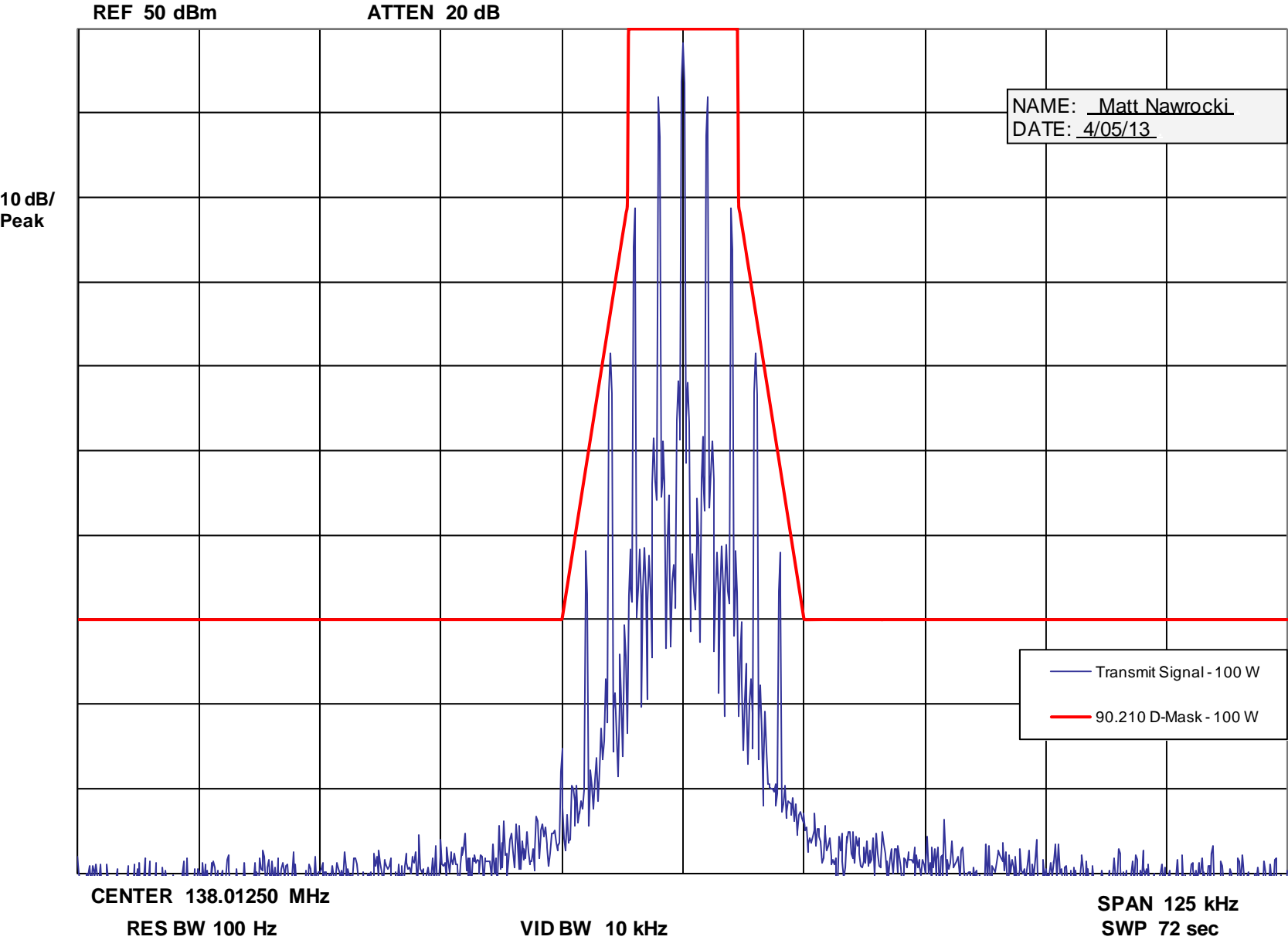
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels – Emission Designator: 11K0F3E – Low End of Band

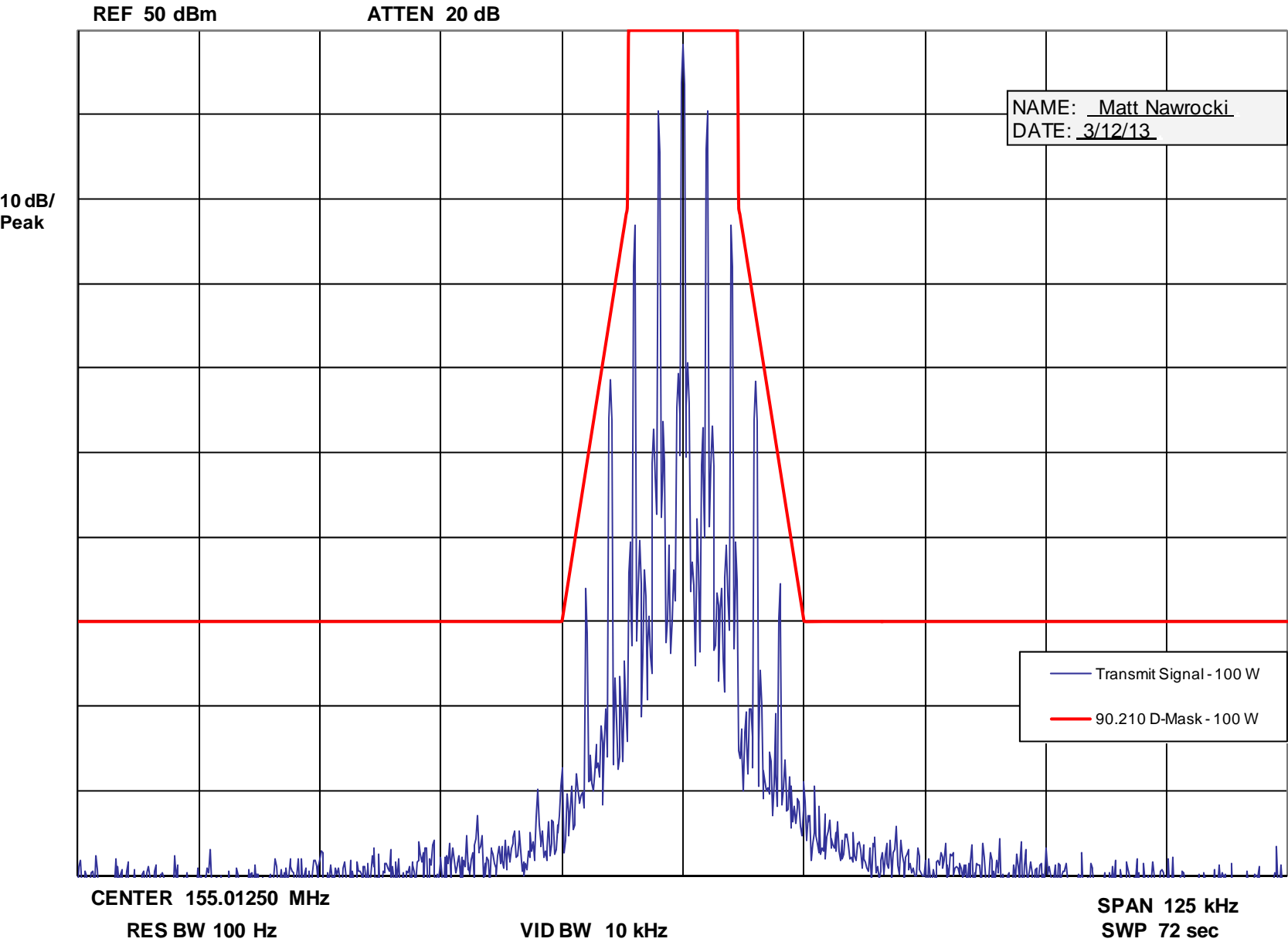
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels – Emission Designator: 11K0F3E – Middle of Band

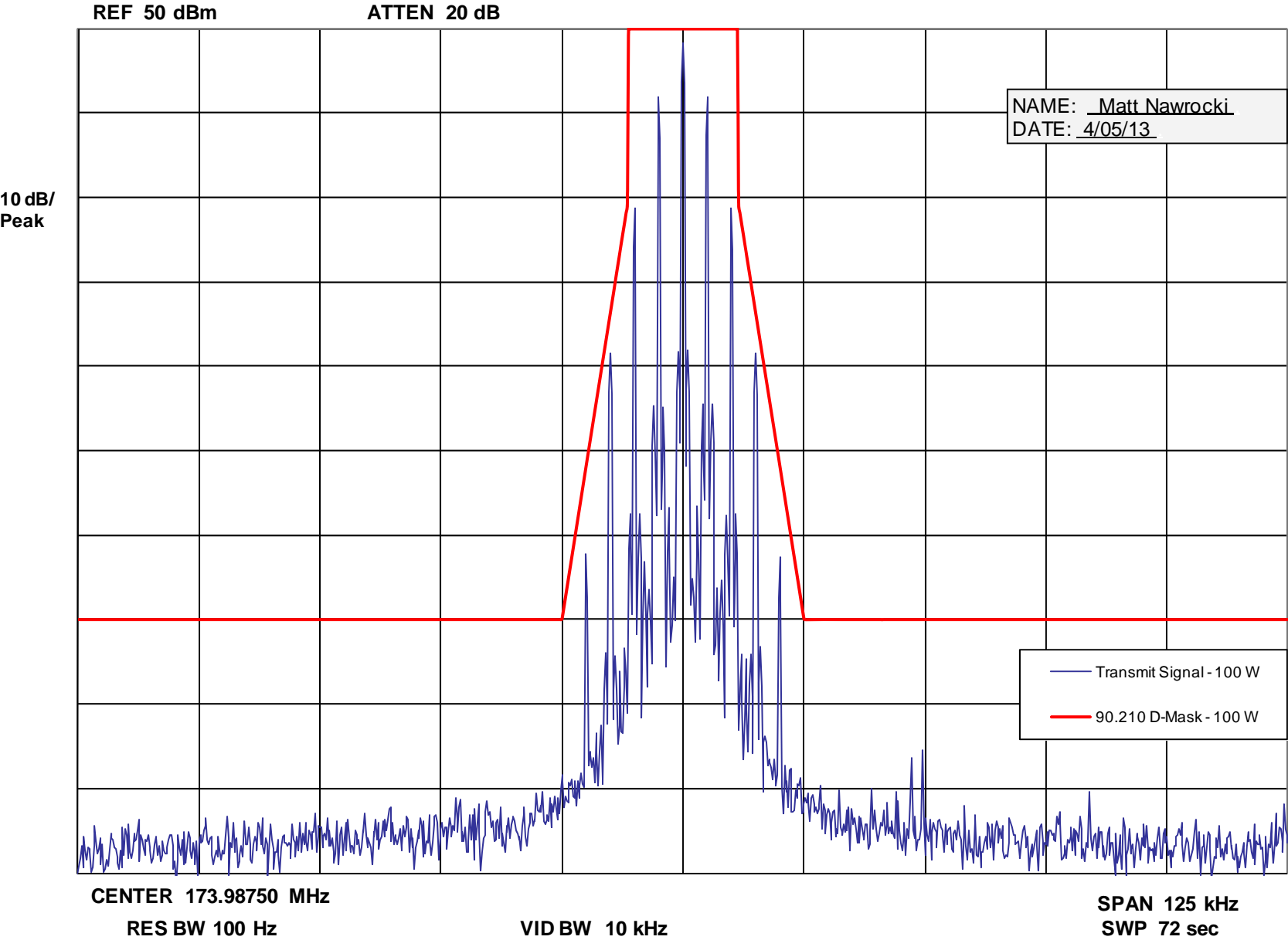
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels – Emission Designator: 11K0F3E – High End of Band

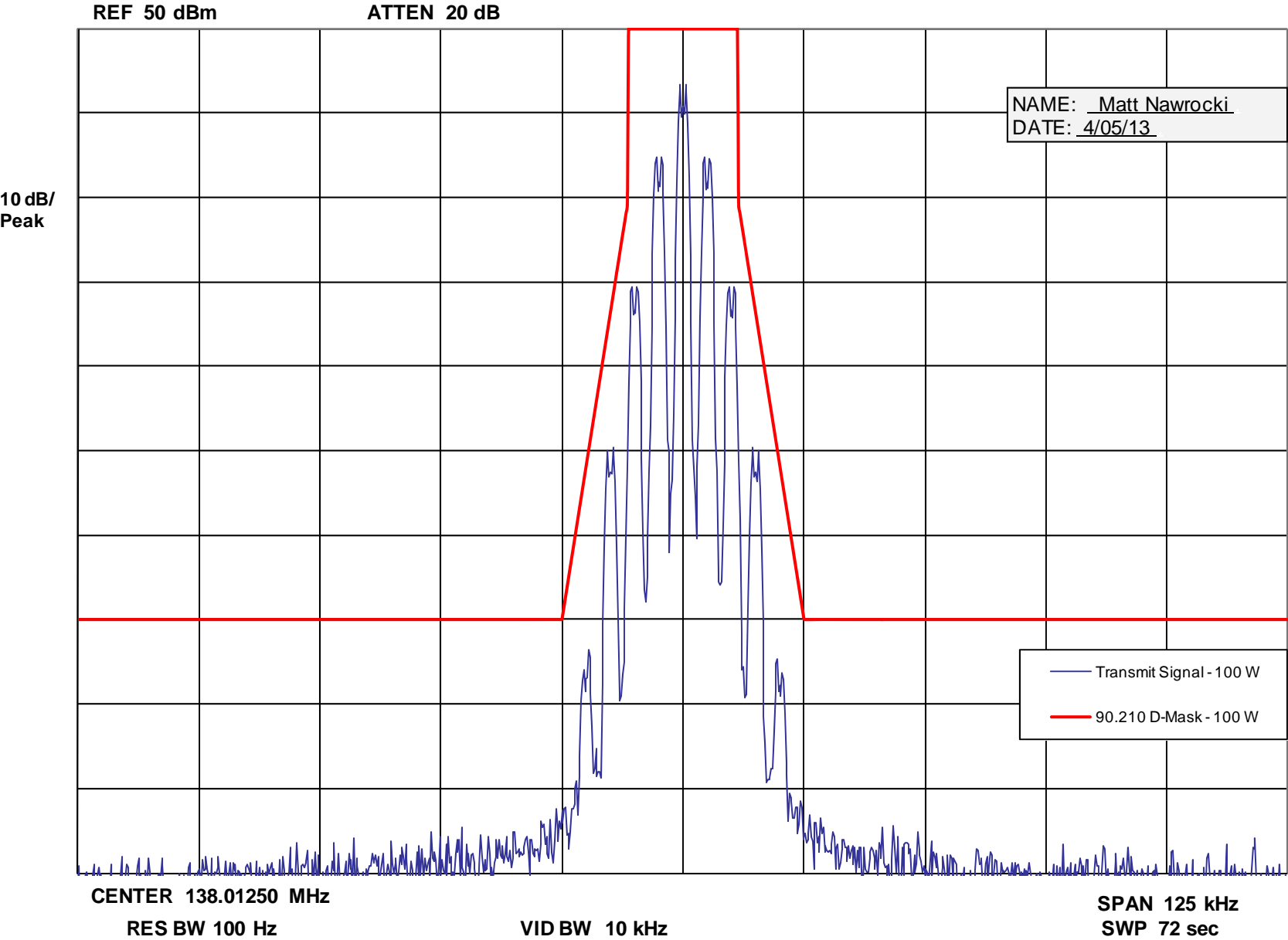
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Low End of Band

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

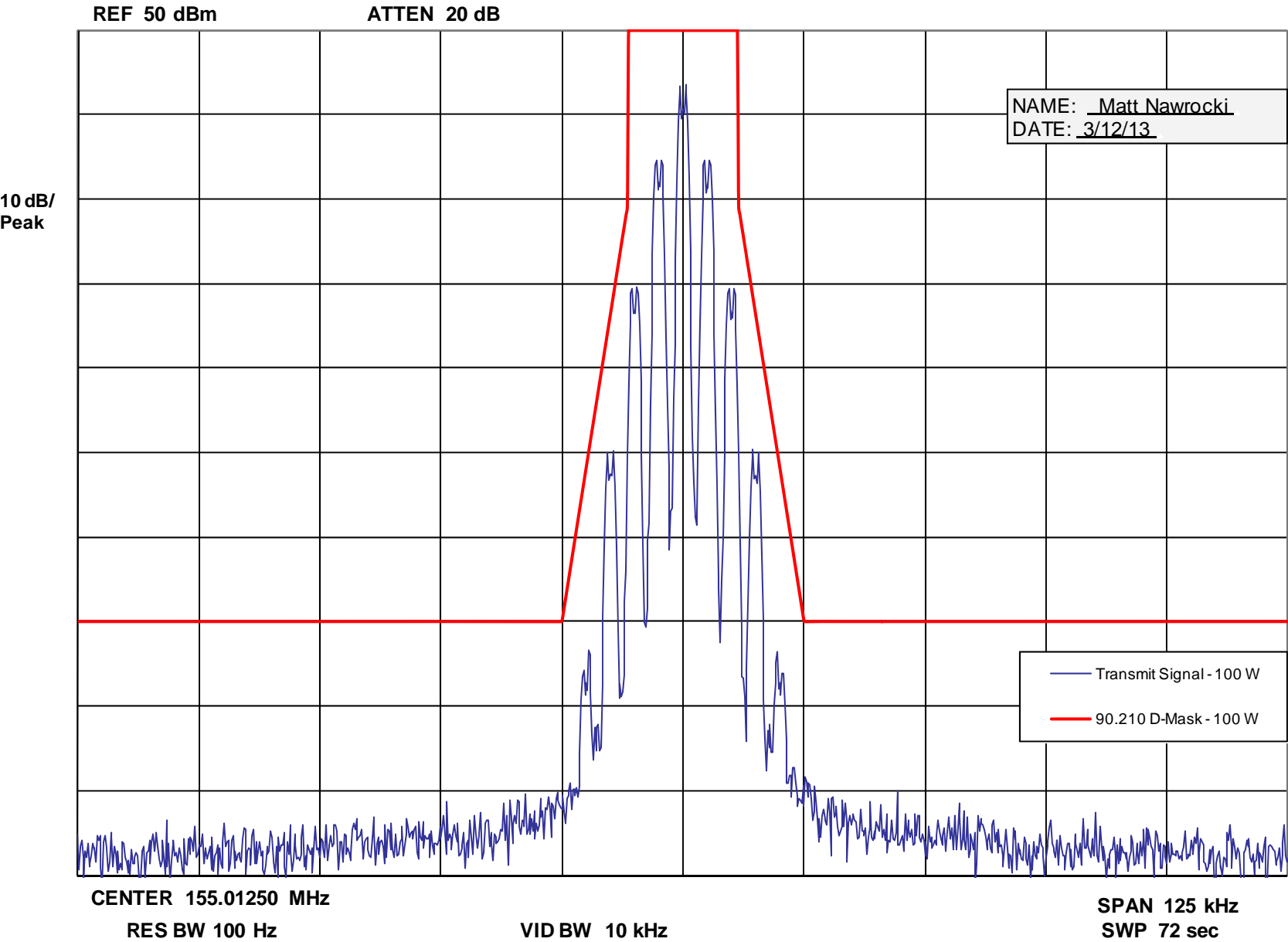




Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Middle of Band

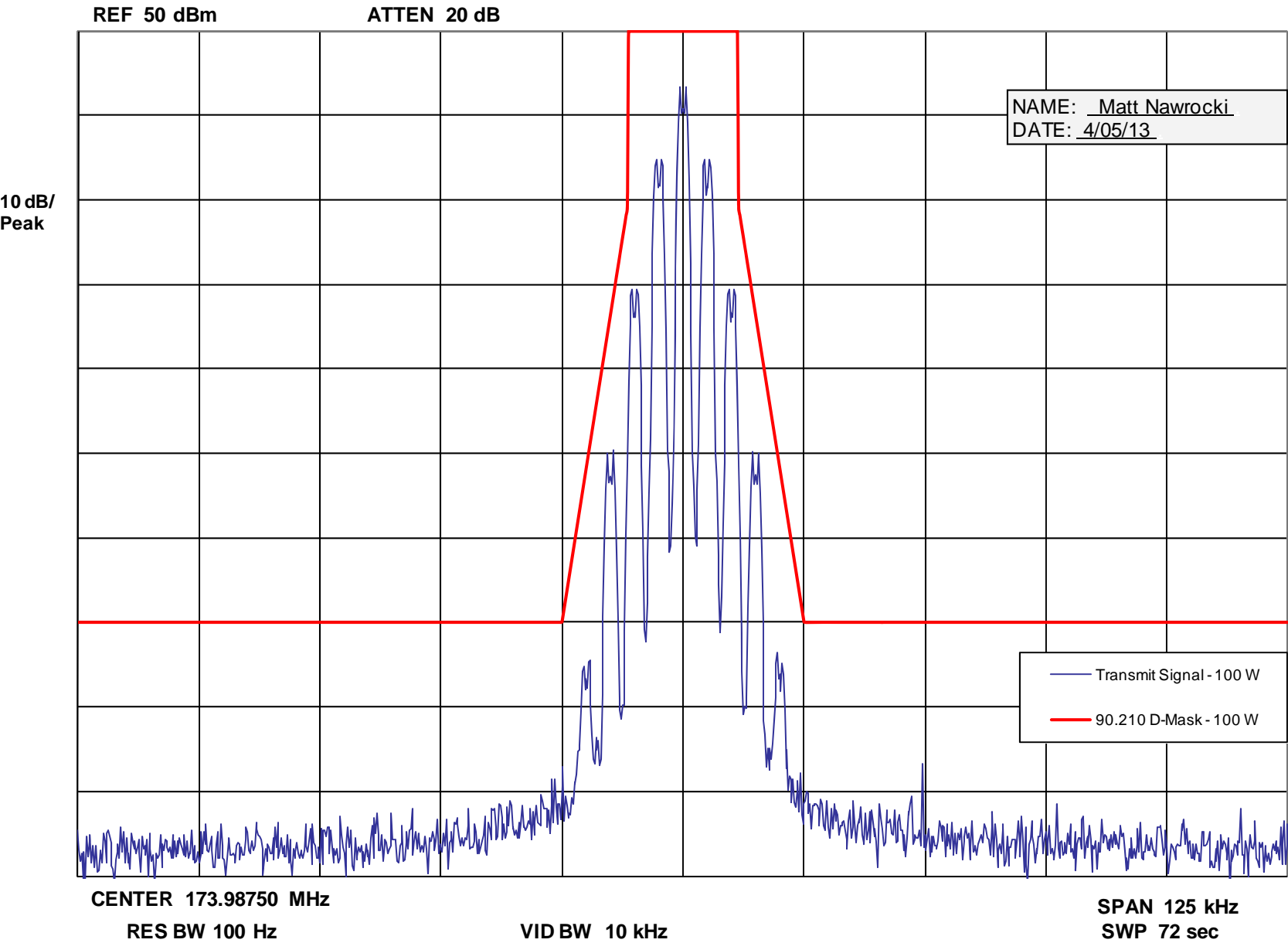
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – High End of Band

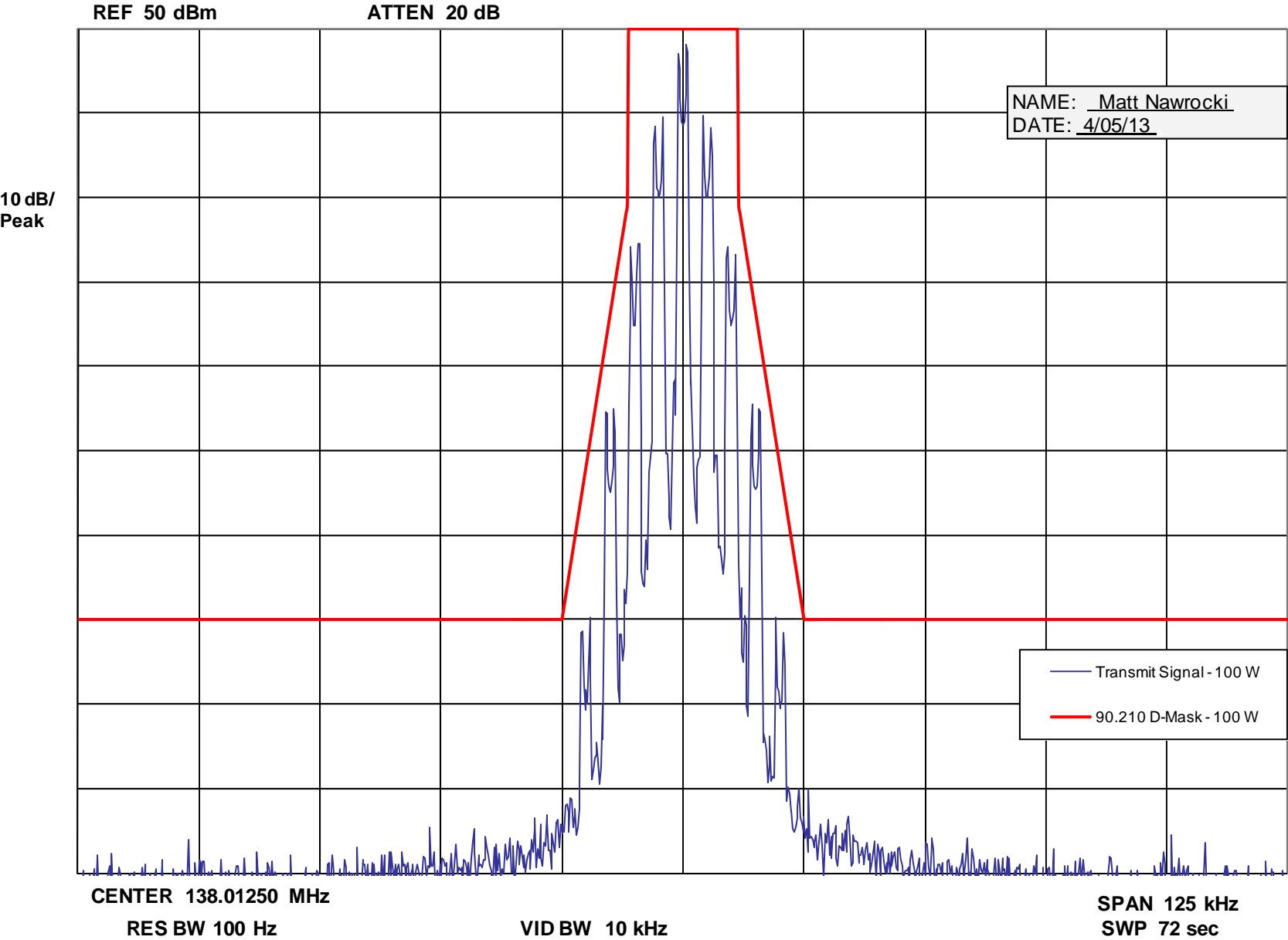
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, Digital Private Line (DPL) Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Low End of Band

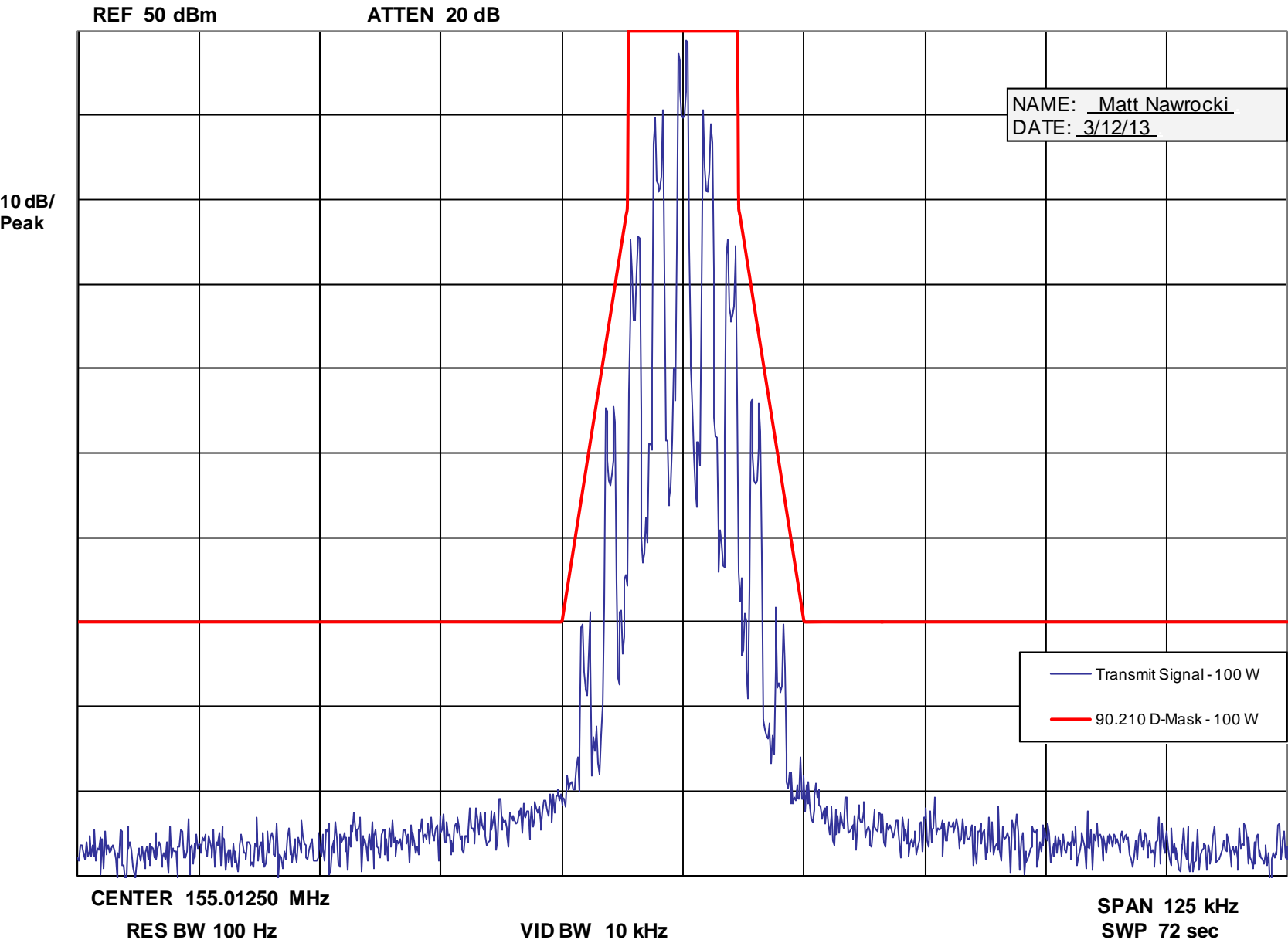
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, Digital Private Line (DPL) Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Middle of Band

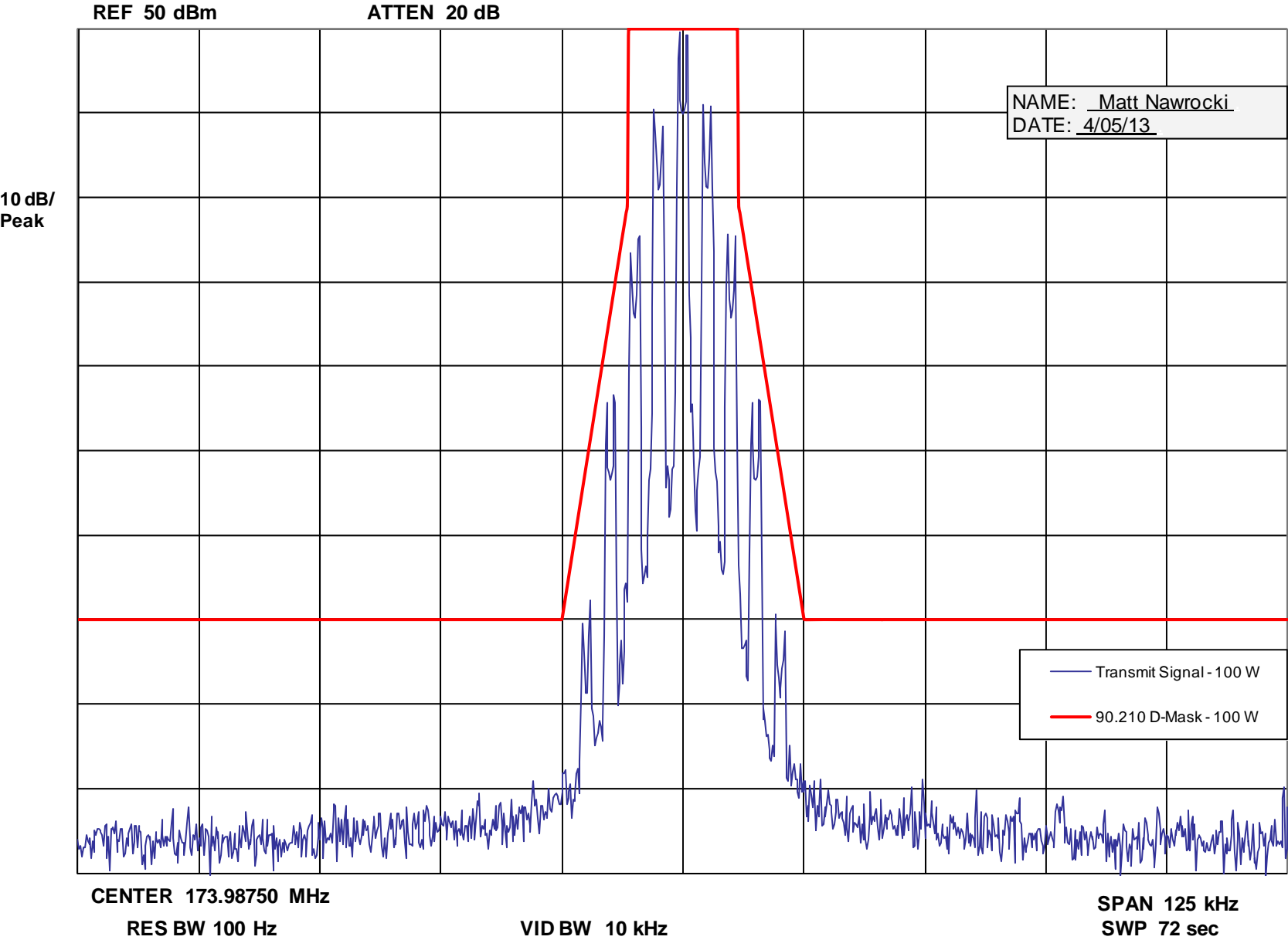
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, Digital Private Line (DPL) Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – High End of Band

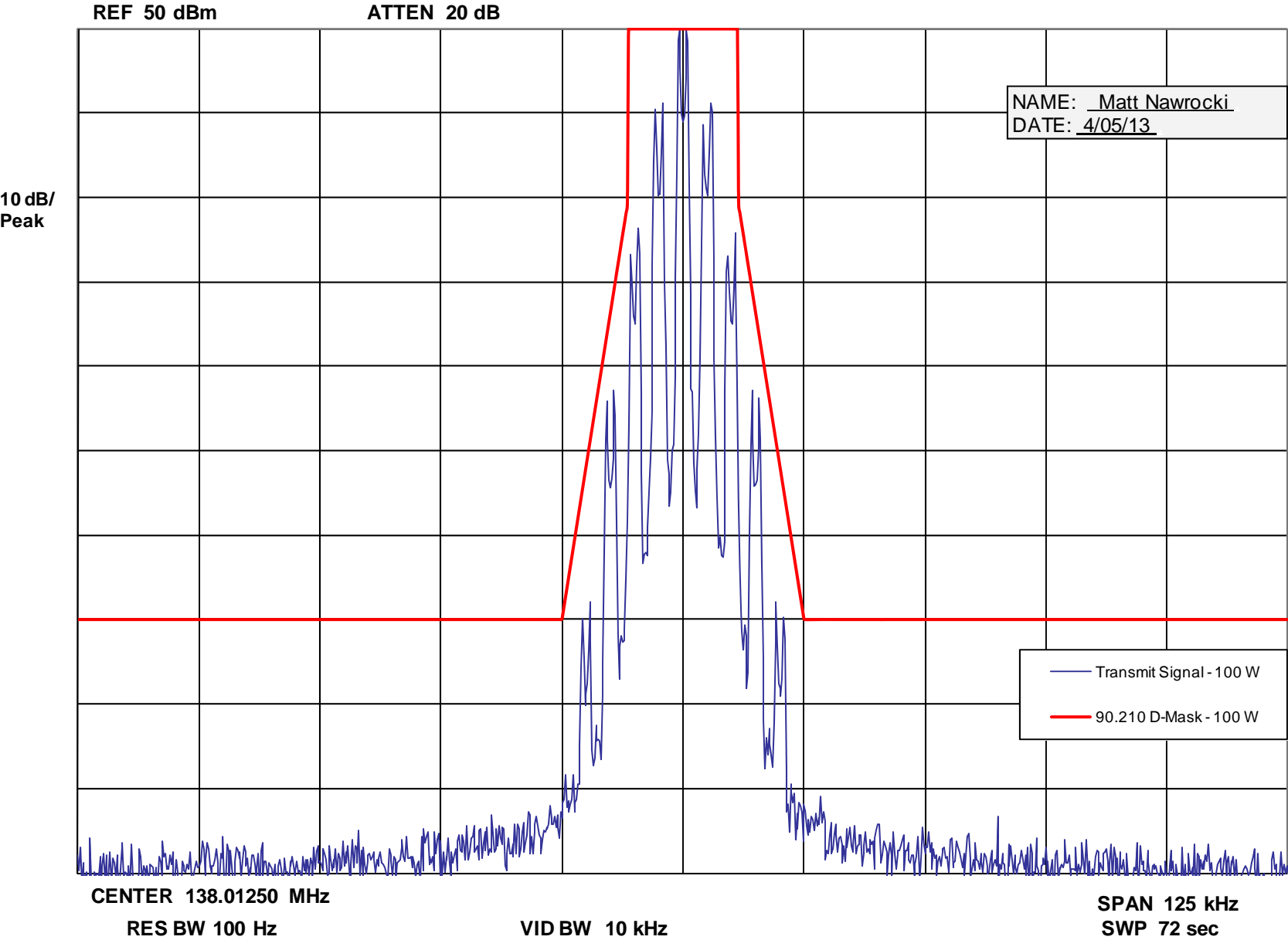
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, 150 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Low End of Band

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



EQUIPMENT TYPE: ABZ89FC3790B

Occupied Bandwidth – Carrier with 2500 Hz Tone, 150 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Middle of Band

A spectrum plot showing the frequency response of a 100 W transmit signal. The plot features a blue line representing the 'Transmit Signal - 100 W' and a red line representing the '90.210 D-Mask - 100 W'. The signal is centered at 155.01250 MHz with a span of 125 kHz and a resolution bandwidth of 100 Hz. The mask is a trapezoidal shape, indicating the allowed frequency components for the signal. The plot also includes a grid and a legend in the bottom right corner.

NAME: Matt Nawrocki  
DATE: 3/12/13

10 dB/ Peak

REF 50 dBm ATTEN 20 dB

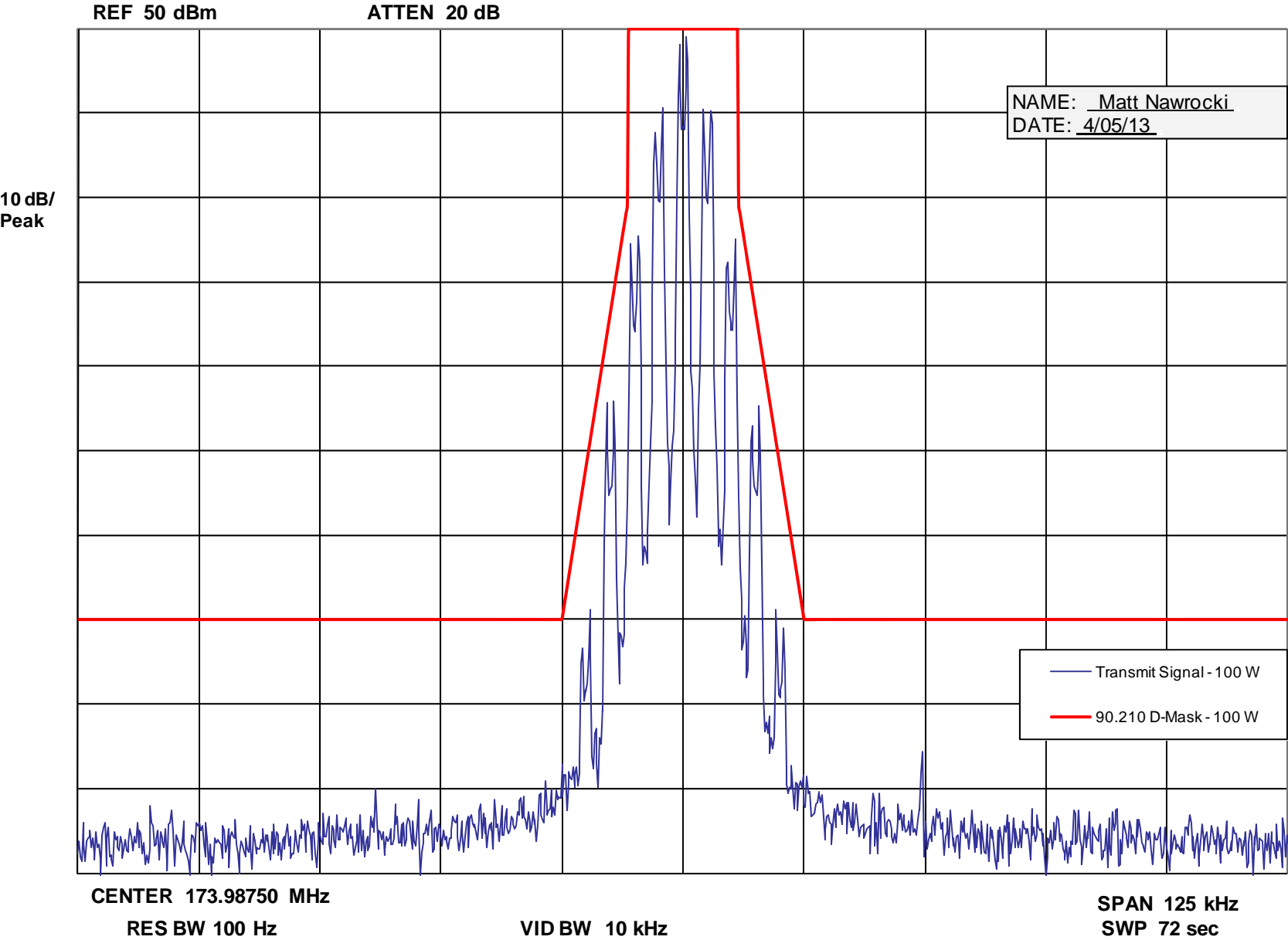
Transmit Signal - 100 W  
90.210 D-Mask - 100 W

CENTER 155.01250 MHz  
RES BW 100 Hz  
VID BW 10 kHz  
SPAN 125 kHz  
SWP 72 sec

Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, 150 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – High End of Band

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 150 bps

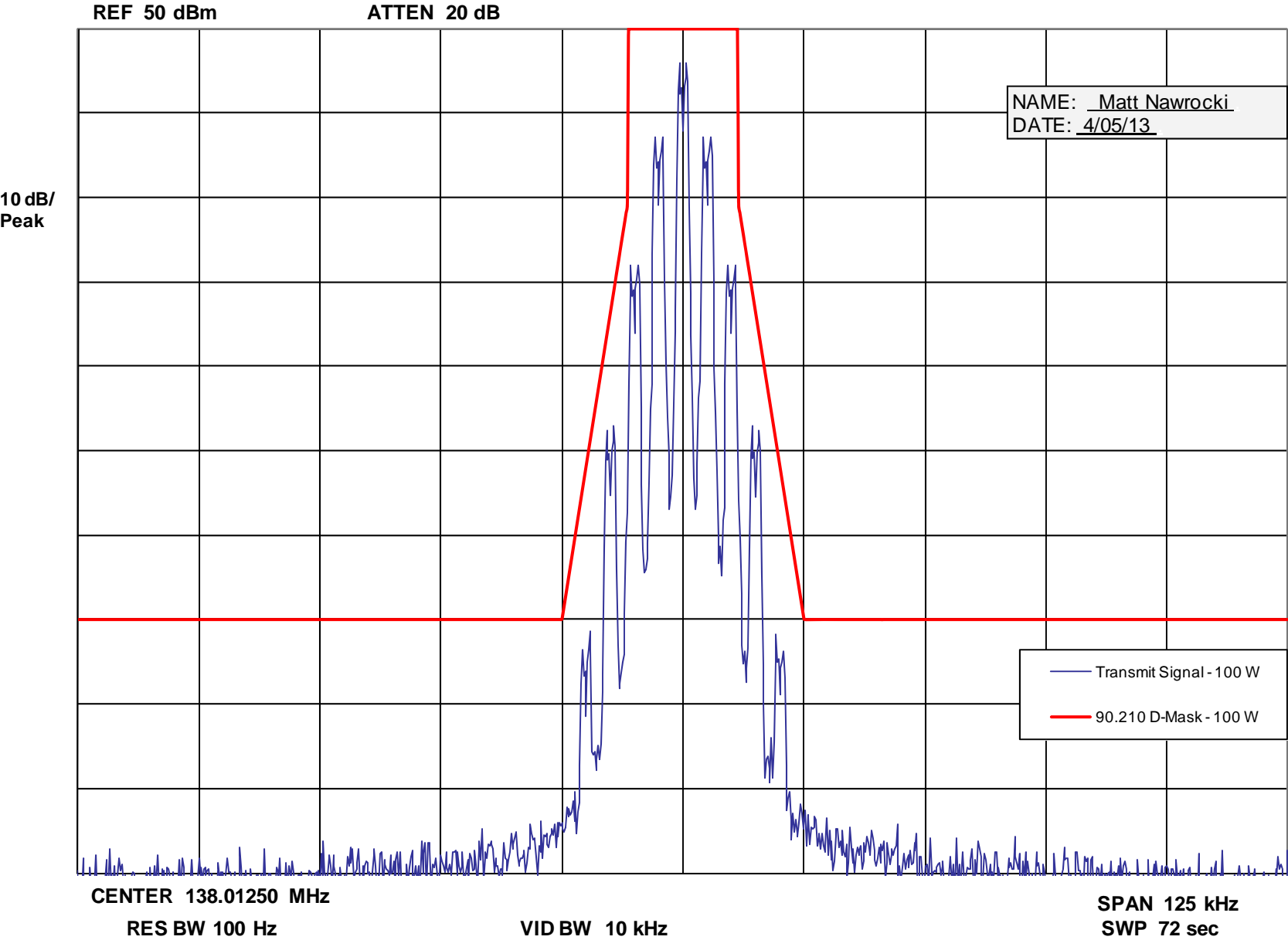




Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, 300 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Low End of Band

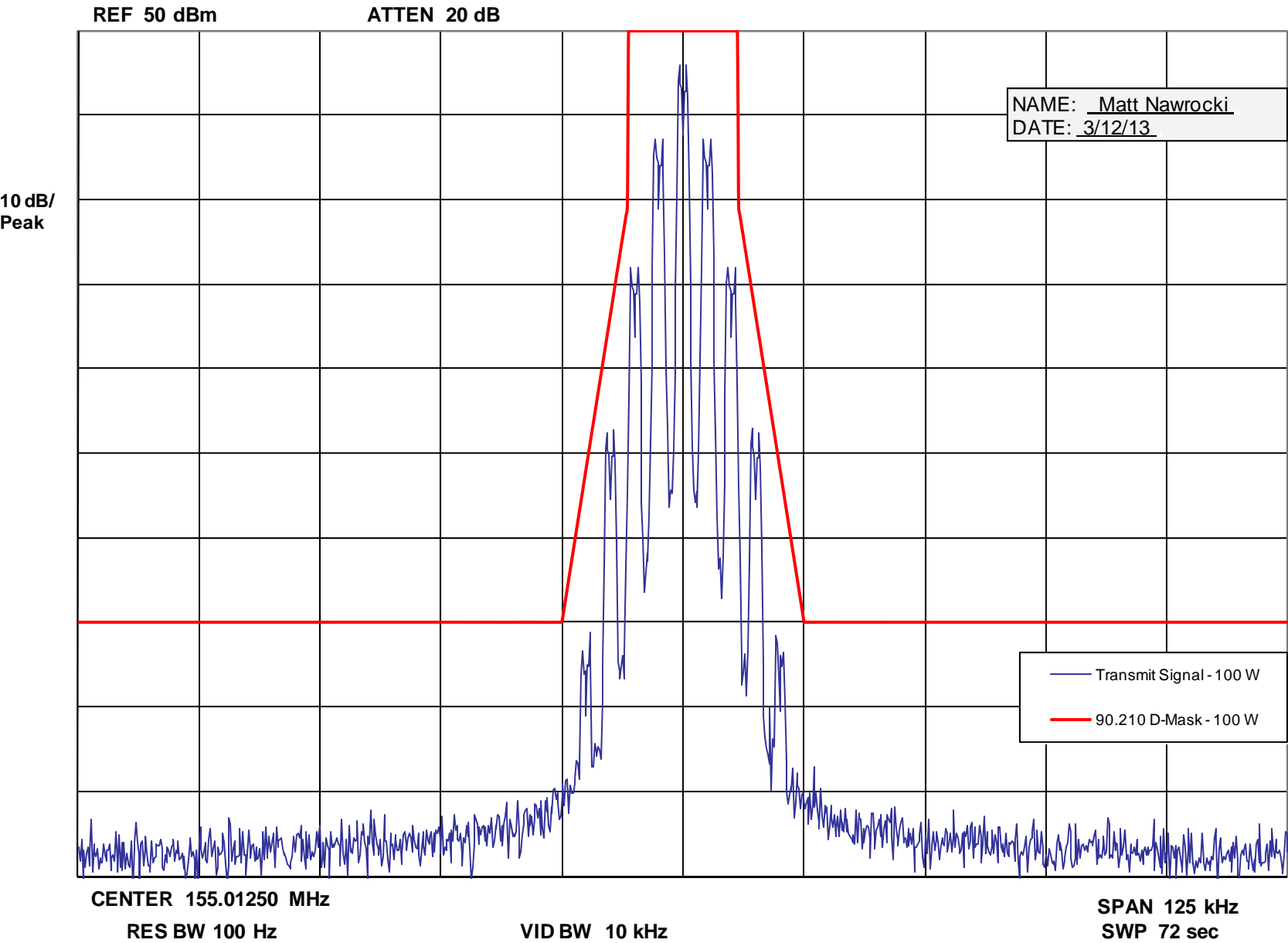
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, 300 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – Middle of Band

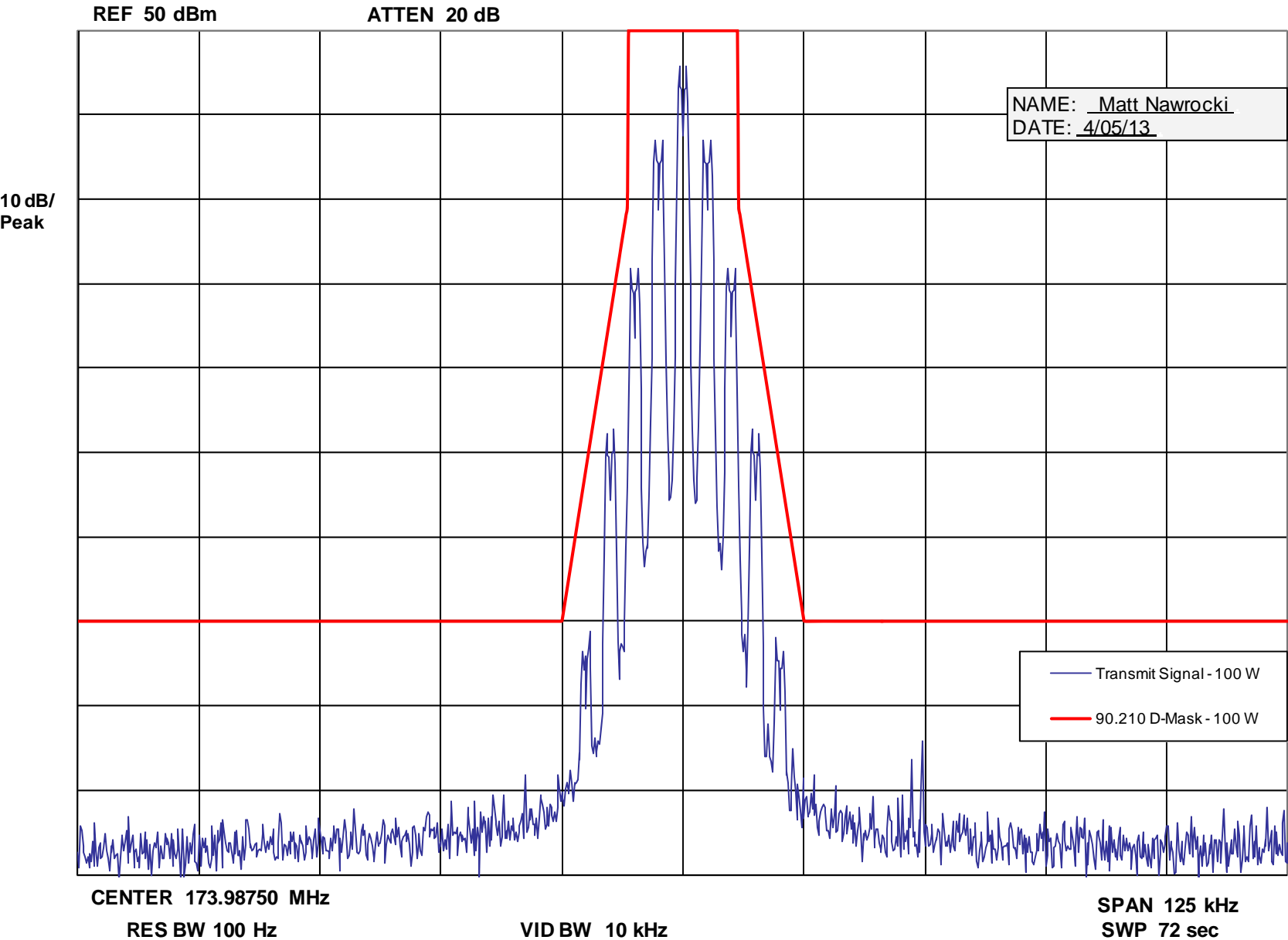
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Tone, 300 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – High End of Band

Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



## Report on Test Measurements

*Test Equipment List*

<b>MODEL</b>	<b>MANUFACTURER</b>	<b>DESCRIPTION</b>	<b>Serial No.</b>	<b>Last Cal</b>	<b>Next Cal</b>
438B	Hewlett Packard	RF Power Meter	3048002448	05/10/10	05/10/13
8482A	Hewlett Packard	RF Power Sensor	2349A09350	05/11/12	05/11/13
E4440A	Agilent	Spectrum Analyzer	MY461185813	10/10/12	10/10/15
83712A	Hewlett Packard	Signal Generator	3429A00455	10/10/11	10/10/14
85460A	Hewlett Packard	EMI Analyzer, Filter	3704A00467	09/10/10	09/10/13
85462A	Hewlett Packard	EMI Analyzer, RF/Display	3906A00500	09/10/10	09/10/13
8593E	Hewlett Packard	EMI Analyzer	3513A01649	05/12/10	05/12/13
U8903A	Agilent	Audio Analyzer	MY50490005	12/09/10	12/09/13
438B	Hewlett Packard	RF Power Meter	3513U05927	05/18/11	05/18/14
8482A	Hewlett Packard	RF Power Sensor	2652A16686	10/04/12	10/04/13
N9030A	Agilent	PXA Signal Analyzer	MY49430626	10/10/12	10/10/13
(Various)	Weinschel, Kathrein, Bird	RF Loads	Various	no calibration required	
TWNC-1405-1	Telewave	Notch Cavity	923	no calibration required	
3020A, etc.	Narda	Directional Coupler	Various	no calibration required	

APPLICANT: MOTOROLA

EQUIPMENT TYPE: ABZ89FC3790B

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

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

NAME: Ken Weiss

SIGNATURE: 

DATE: March 25, 2013

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: March 25, 2013

POSITION: Engineering Section Manager