

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.

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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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 stages.

Frequency Modulation and Compatible 4-Level Frequency Modulation Mode:

	<u>851 MHz</u>	<u>860 MHz</u>	<u>869 MHz</u>	
Measured RF output	<u>150</u>	<u>150</u>	<u>150</u>	Watts
DC Voltage, final RF amplifier stage/stages	<u>17.5</u>	<u>17.5</u>	<u>17.5</u>	Volts
DC Current, final RF amplifier stage/stages	<u>16.5</u>	<u>17.2</u>	<u>18.0</u>	Amperes
Input power for final RF amplifying device(s)	<u>290</u>	<u>300</u>	<u>315</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	<u>120</u>	<u>120</u>	Volts AC
Minimum Measured RF output	<u>15</u>	<u>15</u>	<u>15</u>	Watts, Average
Normal DC Voltage	<u>17.5</u>	<u>17.5</u>	<u>17.5</u>	Volts
Normal DC Current	<u>4.0</u>	<u>4.0</u>	<u>4.0</u>	Amperes
Input power for final RF amplifying device(s)	<u>70</u>	<u>70</u>	<u>70</u>	Watts
Primary Radio Input Supply Voltage	<u>120</u>	<u>120</u>	<u>120</u>	Volts AC

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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 charts reference 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: 150 Watts

Specification Requirement 47 CFR §90.210(d) and IC RSS-119 section 5.8.3 - 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 per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 is as follows:

<i>Max Mod Freq, $M = \frac{1}{2}B$</i>	<i>Max Deviation, D</i>	<i>$2M+2DK (K=1)$</i>	<i>Nec BW</i>
1.2 kHz	2.85 kHz	8.10 kHz	8K10

Measurement Procedure and Instrument Settings:

<u>Emission Measurement Analyzer Settings</u>				<u>Measured Occupied Bandwidth</u>	
Horizontal:	12.5 kHz per Division	Resolution BW:	100 Hz	Resolution BW:	150 Hz
Vertical:	10 dB per Division	Video BW:	10 kHz	Span:	15 kHz
Sweep Time:	72 Seconds (<2 kHz/Sec)	Span:	125 kHz	Number of Points:	1601
Detector:	Peak			Integration Time:	14.8 ms

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. 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.
- 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.
- 6) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW
E1-2.1	Occupied Bandwidth - Compatible 4-Level Frequency Mod (C4FM), Low End of Band	7.83 kHz
E1-2.2	Occupied Bandwidth - Compatible 4-Level Frequency Mod (C4FM), Middle of Band	7.92 kHz
E1-2.3	Occupied Bandwidth - Compatible 4-Level Frequency Mod (C4FM), High End of Band	7.81 kHz

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Occupied Bandwidth – Four-Level Frequency Modulation Widepulse Astro, 25 kHz Channel Spacing

Widepulse Astro is generally used in a simulcast 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 charts reference the following setup and specification requirements.

Modulation Type: Four-Level Frequency Modulation Widepulse Astro
Emission Designator: 10K0F1E, 10K0F1D, 10K0F1W
Channelization: 25 kHz
Power Setting: 150 Watts

Specification Requirement 47 CFR §90.210(c) and IC RSS-119 section 5.8.6 - Emission Limits – “G-Mask”:

Emission Mask G. 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 (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 10 kHz, but no more than 250 percent of the authorized bandwidth:

*At least $116 \log(f_d/6.1)$ dB, or $50 + 10 \log(P)$ dB, or 70 dB
(whichever is the lesser attenuation);*

- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth:

At least $43 + 10 \log(P)$ dB.

Necessary Bandwidth Calculation:

The necessary bandwidth of the modulation per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 is as follows:

<i>Max Mod Freq, $M = \frac{1}{2}B$</i>	<i>Max Deviation, D</i>	<i>$2M + 2DK$ ($K=1$)</i>	<i>Nec BW</i>
1.2 kHz	3.8 kHz	10.0 kHz	10K0

Measurement Procedure and Instrument Settings:Emission Measurement Analyzer Settings

Horizontal: 12.5 kHz per Division	Resolution BW: 300 Hz
Vertical: 10 dB per Division	Video BW: 10 kHz
Sweep Time: 72 Seconds (<2 kHz/Sec)	Span: 125 kHz
Detector: Peak	

Measured Occupied Bandwidth

Resolution BW: 300 Hz
Span: 30 kHz
Number of Points: 1601
Integration Time: 7.4 ms

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. 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.
- 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.
- 6) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW
E1-2.4	Occupied Bandwidth - Four-Level Frequency Mod Widepulse Astro, Low End of Band	9.18 kHz
E1-2.5	Occupied Bandwidth - Four-Level Frequency Mod Widepulse Astro, Middle of Band	9.33 kHz
E1-2.6	Occupied Bandwidth - Four-Level Frequency Mod Widepulse Astro, High End of Band	9.21 kHz

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

The exhibits shown are for 3600 bps high speed control data in 25 kHz channels. Trunking control data can be used in a trunked system configuration based upon channel usage as described in Exhibit B. The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Type: Frequency Shift Keying Digital Modulation
Emission Designator: 16K0F1D
Channelization: 25 kHz
Power Setting: 150 Watts

Specification Requirement 47 CFR §90.210(c) and IC RSS-119 section 5.8.6 - Emission Limits – “G-Mask”:

Emission Mask G. 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 (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 10 kHz, but no more than 250 percent of the authorized bandwidth:
At least $116 \log (f_d/6.1)$ dB, or $50 + 10 \log (P)$ dB, or 70 dB (whichever is the lesser attenuation);
- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth:
At least $43 + 10 \log (P)$ dB.

Necessary Bandwidth Calculation:

The necessary bandwidth of the modulation per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 is as follows:

<i>Max Mod Freq, $M = \frac{1}{2}B$</i>	<i>Max Deviation, D</i>	<i>$2M+2DK$ ($K=1.2$ typ)</i>	<i>Nec BW</i>
1.8 kHz	5.0 kHz	15.6 kHz	16K0

Measurement Procedure and Instrument Settings:

<u>Emission Measurement Analyzer Settings</u>				<u>Measured Occupied Bandwidth</u>	
Horizontal:	12.5 kHz per Division	Resolution BW:	300 Hz	Resolution BW:	300 Hz
Vertical:	10 dB per Division	Video BW:	10 kHz	Span:	30 kHz
Sweep Time:	72 Seconds (<2 kHz/Sec)	Span:	125 kHz	Number of Points:	1601
Detector:	Peak			Integration Time:	7.4 ms

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. 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.
- 5) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW
E1-2.8	Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels, Low End of Band	7.86 kHz
E1-2.9	Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels, Middle of Band	7.89 kHz
E1-2.10	Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels, High End of Band	7.93 kHz

Report on Test Measurements

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

The exhibits shown are for 3600 bps high speed control data in 12.5 kHz channels. Trunking control data can be used in a trunked system configuration based upon channel usage as described in Exhibit B. The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Type: Frequency Shift Keying Digital Modulation
Emission Designator: 10K0F1D
Channelization: 12.5 kHz
Power Setting: 150 Watts

Specification Requirement 47 CFR §90.210(d) and IC RSS-119 section 5.8.3 - 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 per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 is as follows:

<u>Max Mod Freq, $M = \frac{1}{2}B$</u>	<u>Max Deviation, D</u>	<u>$2M+2DK$ ($K=1.2$ typ)</u>	<u>Nec BW</u>
1.8 kHz	2.5 kHz	9.6 kHz	10K0

Measurement Procedure and Instrument Settings:Emission Measurement Analyzer Settings

Horizontal: 12.5 kHz per Division	Resolution BW: 100 Hz
Vertical: 10 dB per Division	Video BW: 10 kHz
Sweep Time: 72 Seconds (<2 kHz/Sec)	Span: 125 kHz
Detector: Peak	

Measured Occupied Bandwidth

Resolution BW: 150 Hz
Span: 15 kHz
Number of Points: 1601
Integration Time: 14.8 ms

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. 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.
- 5) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW
E1-2.11	Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels, Low End of Band	5.31 kHz
E1-2.12	Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels, Middle of Band	5.33 kHz
E1-2.13	Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels, High End of Band	5.44 kHz

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Occupied Bandwidth –Digital Modulations, NPSPAC Channels

Each of the digital modulations discussed in the previous sections are shown here using the H-mask for NPSPAC channels. They can be used in a trunked system configuration based upon channel usage as described in Exhibit B. All of the emission designators for these modulations in the NPSPAC band are unchanged from what has been previously described, with the exception of the 3600 bps high speed control data. The occupied bandwidth charts reference the following setup and specification requirements.

Modulation Type:	C4FM	Widepulse C4FM	3600 bps (wide)	3600 bps (narrow)
Emission Designator:	8K10F1E/D/W	10K0F1E/D/W	14K0F1D	10K0F1D
Channelization:	NPSPAC	NPSPAC	NPSPAC	NPSPAC
Power Setting:	150 Watts	150 Watts	150 Watts	150 Watts

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

Emission Mask H. 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 removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of 4 kHz or less: 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 4 kHz but no more than 8.5 kHz: $At least 107 * \log_{10}(f_d / 4) \text{ dB}$
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 8.5 kHz, but no more than 15 kHz: $At least 40.5 \log_{10}(f_d / 1.16) \text{ dB};$
- (4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 15 kHz, but no more than 25 kHz: $At least 116 \log_{10}(f_d / 6.1) \text{ dB};$
- (5) On any frequency removed from the center of the authorized bandwidth by more than 25 kHz: $At least 43 \text{ plus } 10 \log_{10}(P) \text{ dB}$

Necessary Bandwidth Calculation – for 3600 bps high speed control data:

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

<u>Max Mod Freq, $M = \frac{1}{2}B$</u>	<u>Max Deviation, D</u>	<u>$2M+2DK$ ($K=1.3 \text{ typ}$)</u>	<u>Nec BW</u>
1.8 kHz	4.0 kHz	14.0 kHz	14K0

Measurement Procedure and Instrument Settings:

<u>Emission Measurement Analyzer Settings</u>				<u>Measured Occupied Bandwidth</u>	
Horizontal:	12.5 kHz per Division	Resolution BW:	300 Hz	Resolution BW:	300 Hz
Vertical:	10 dB per Division	Video BW:	10 kHz	Span:	30 kHz
Sweep Time:	72 Seconds (<2 kHz/Sec)	Span:	125 kHz	Number of Points:	1601
Detector:	Peak			Integration Time:	7.4 ms

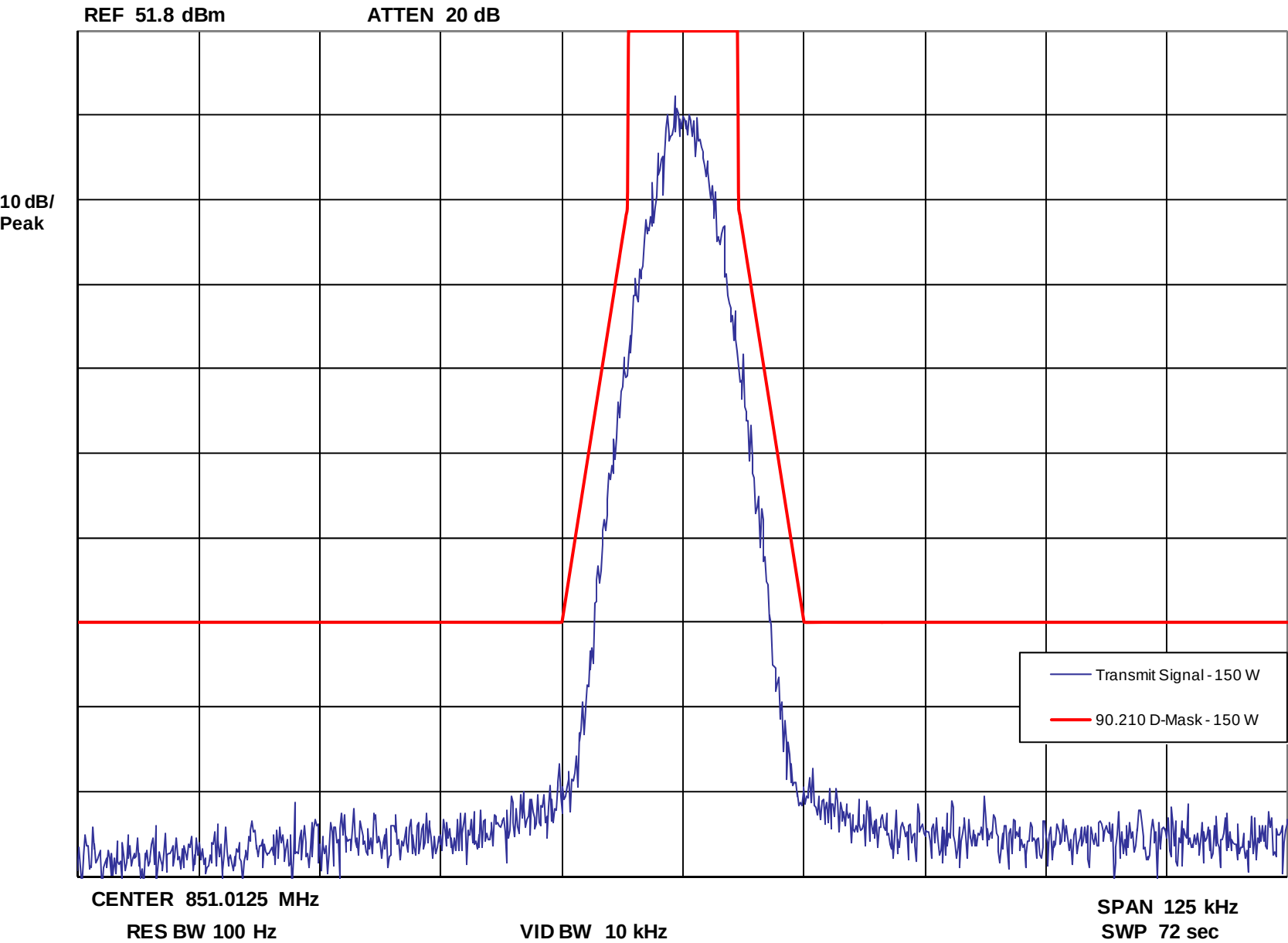
Test Procedure:

- 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. 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.
- 5) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW
E1-2.13	Compatible Four-Level Frequency Modulation (C4FM), NPSPAC Channels	7.69 kHz
E1-2.14	Four-Level Frequency Modulation Widepulse Astro, NPSPAC Channels	9.12 kHz
E1-2.15	Trunking Control Data 3600 bps FSK Modulation (25 kHz Wideband), NPSPAC Channels	7.22 kHz
E1-2.16	Trunking Control Data 3600 bps FSK Mod, (12.5 kHz Narrowband), NPSPAC Channels	5.35 kHz

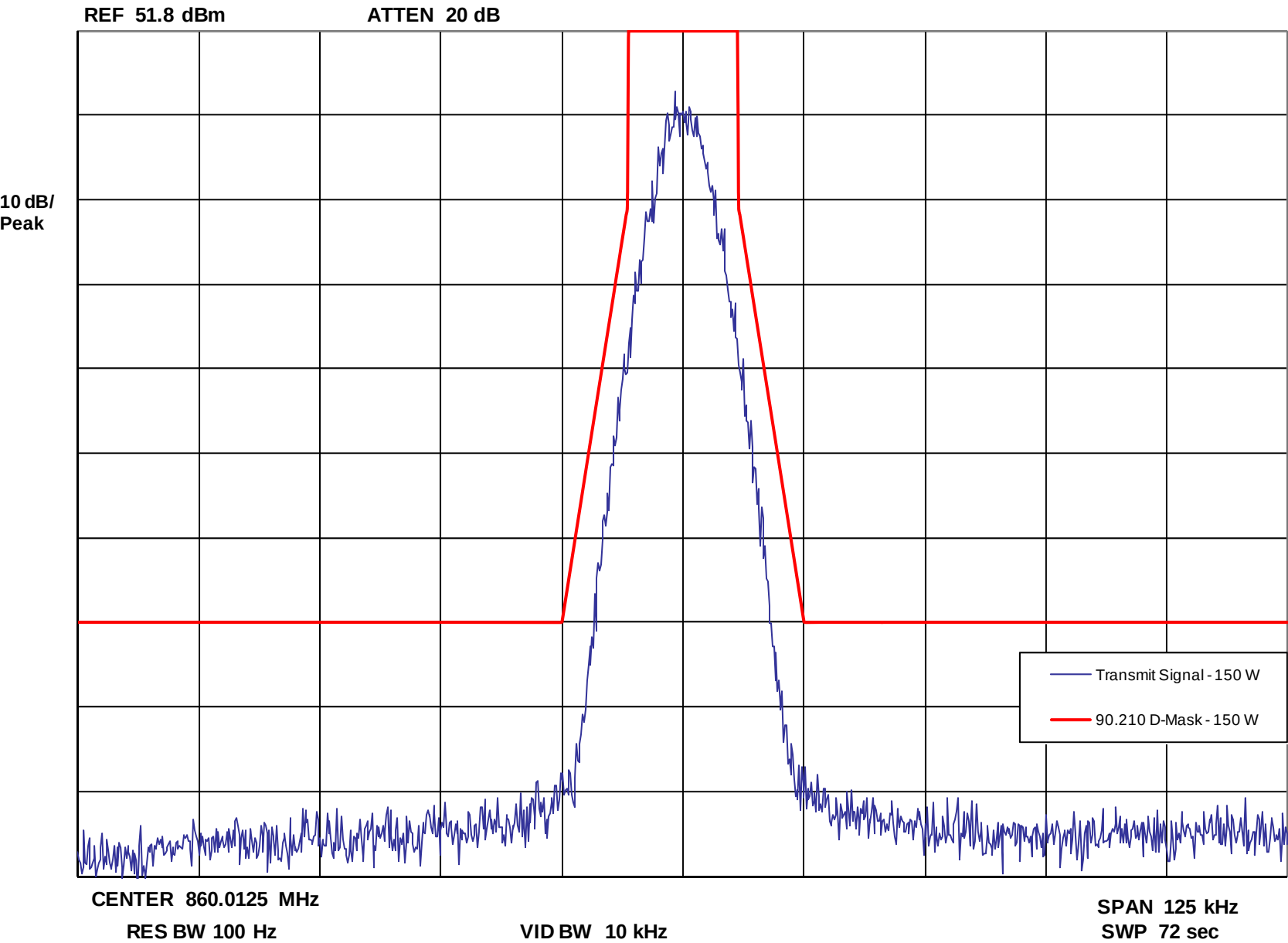
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 Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM) – Emission Designator: 8K10D1E, 8K10D1D, 8K10D1W, Low End of Band

Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 150 Watts



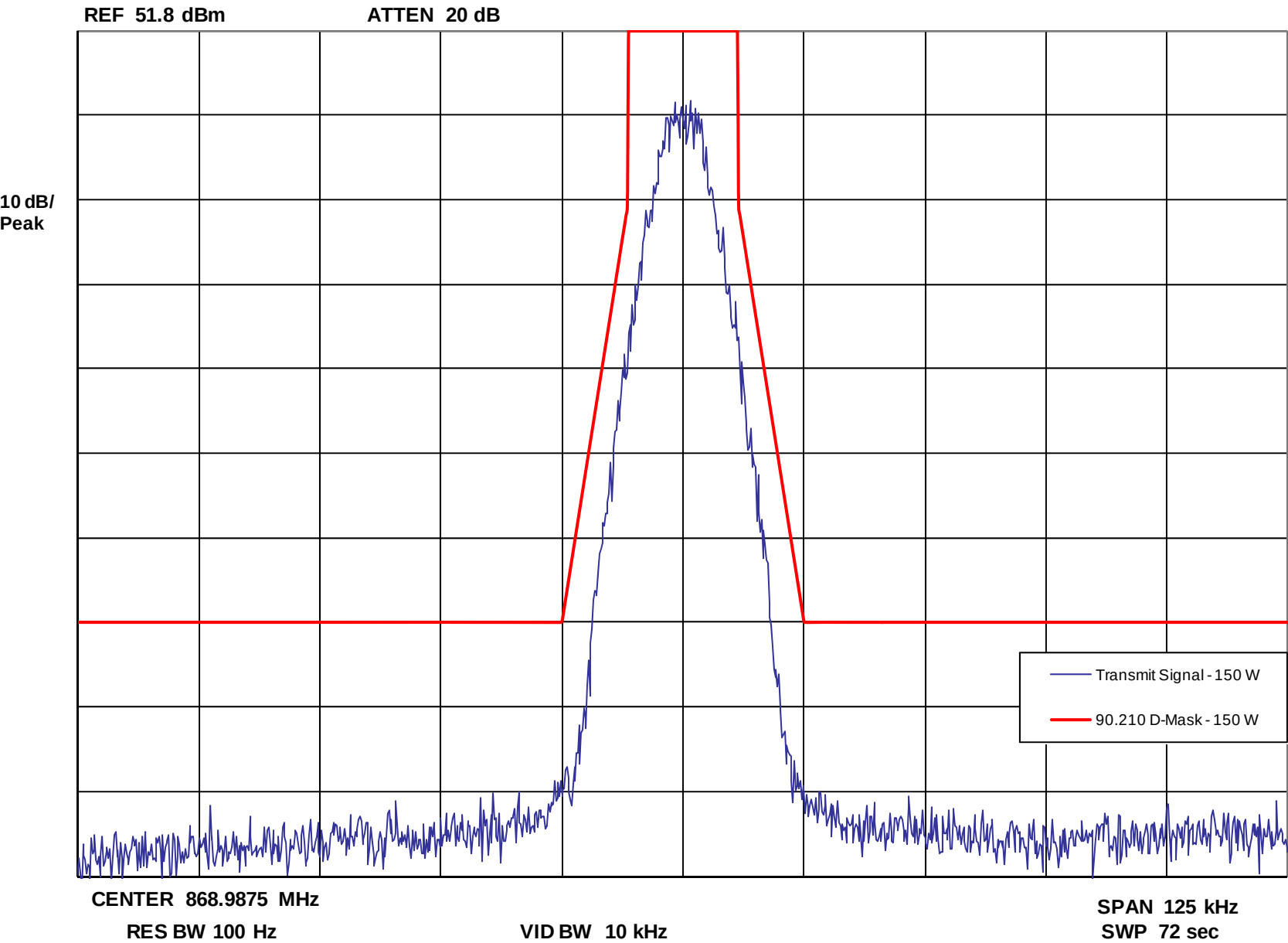
Report on Test Measurements
 Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM) – Emission Designator: 8K10D1E, 8K10D1D, 8K10D1W, Middle of Band

Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 150 Watts



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

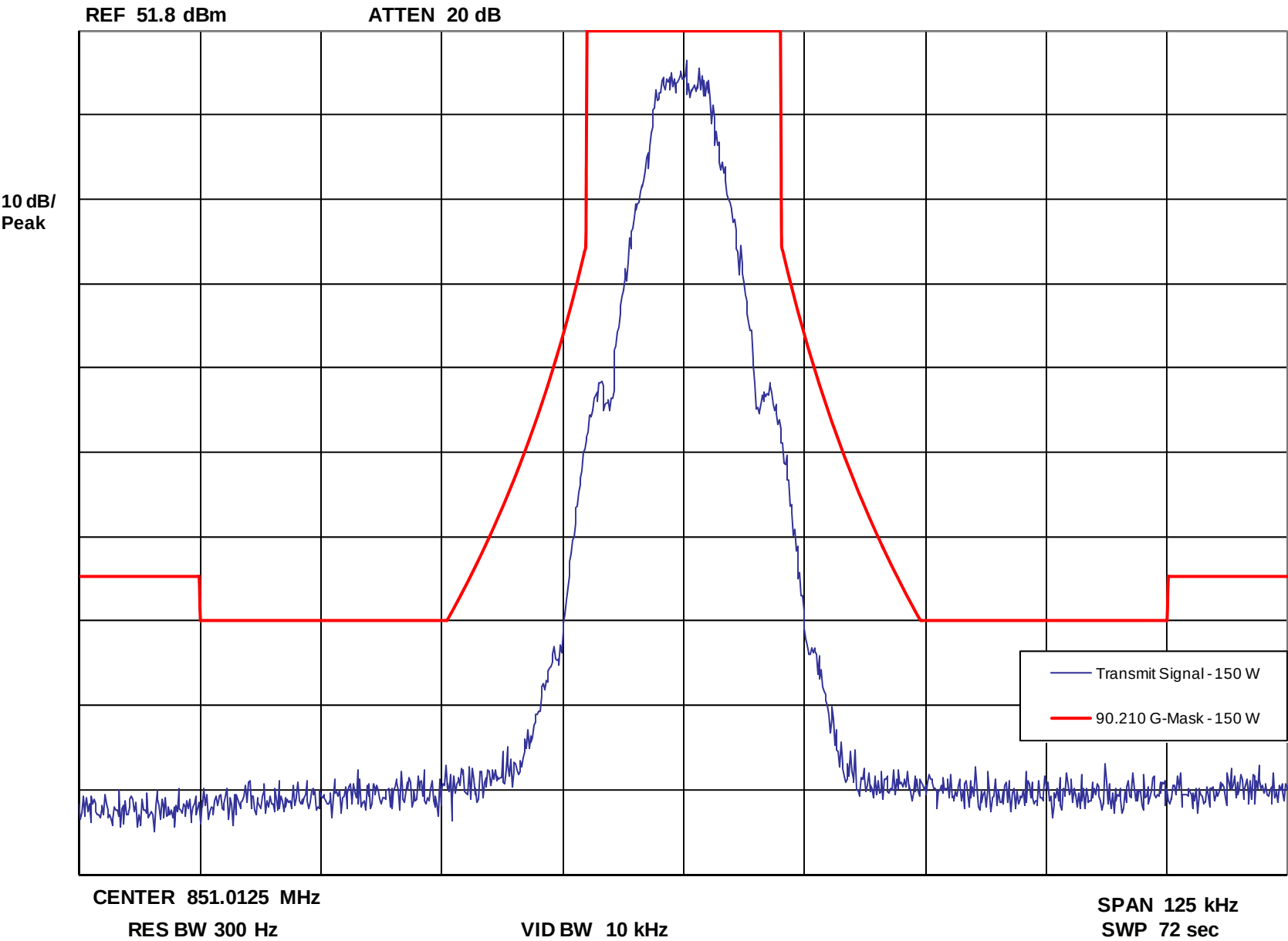
Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 150 Watts



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Occupied Bandwidth – Four-Level Frequency Modulation Widepulse Astro – Emission Designator: 10K0F1E, 10K0F1D, 10K0F1W, Low End of Band

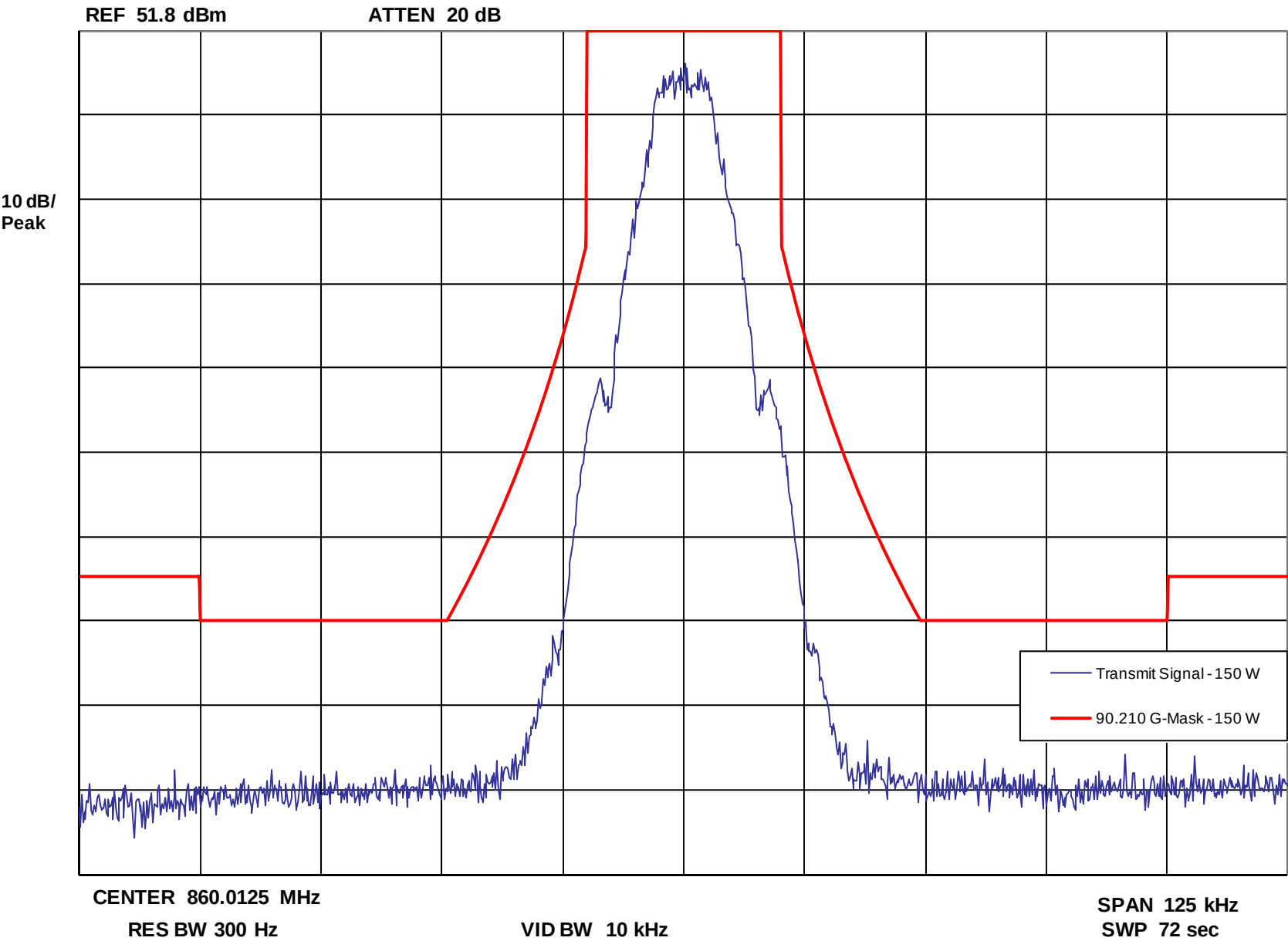
Occupied Bandwidth -- Four-Level FM Widepulse Astro - 150 Watts



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Occupied Bandwidth – Four-Level Frequency Modulation Widepulse Astro – Emission Designator: 10K0F1E, 10K0F1D, 10K0F1W, Middle of Band

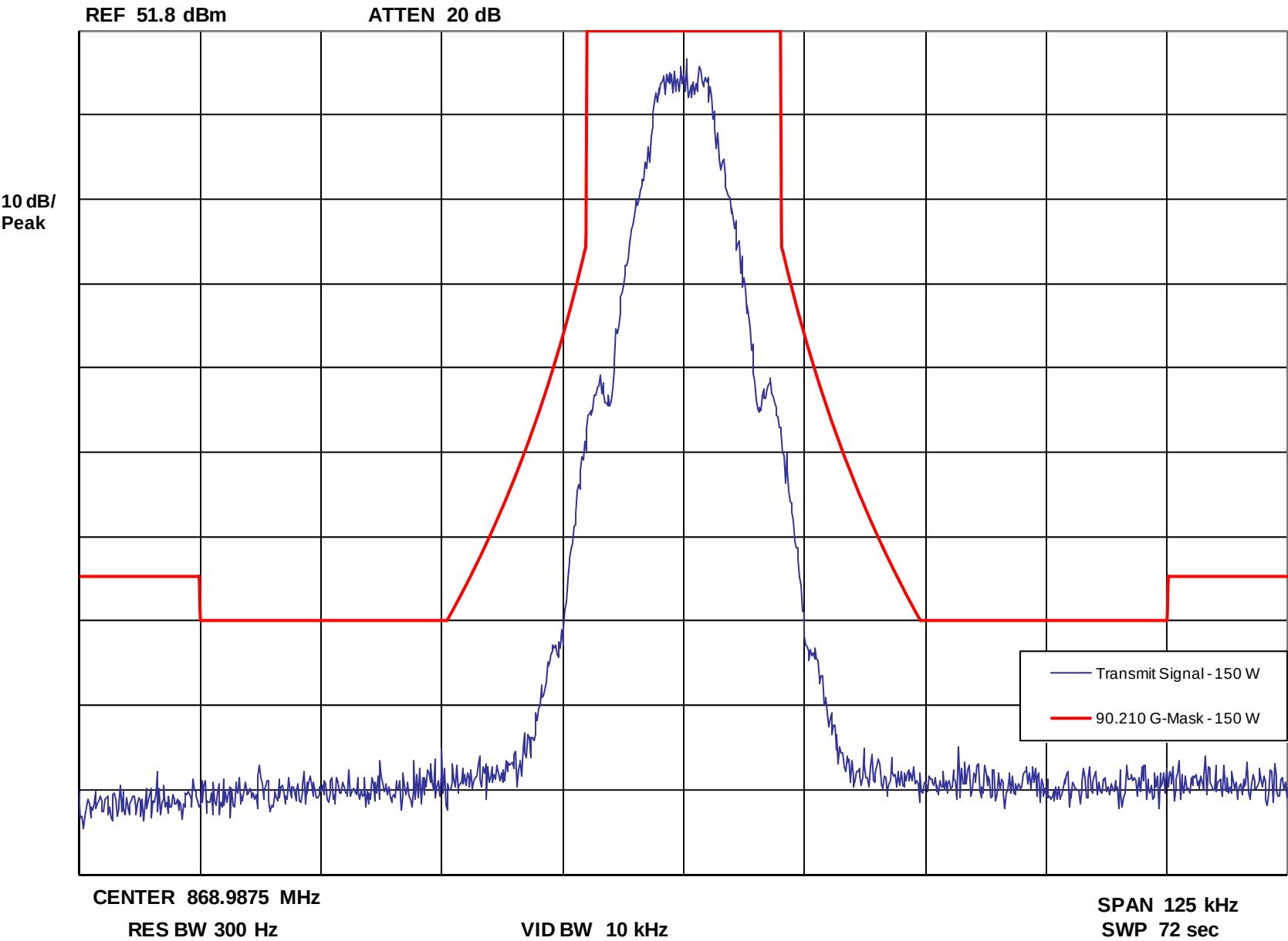
Occupied Bandwidth -- Four-Level FM Widepulse Astro - 150 Watts



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Occupied Bandwidth – Four-Level Frequency Modulation Widepulse Astro – Emission Designator: 10K0F1E, 10K0F1D, 10K0F1W, High End of Band

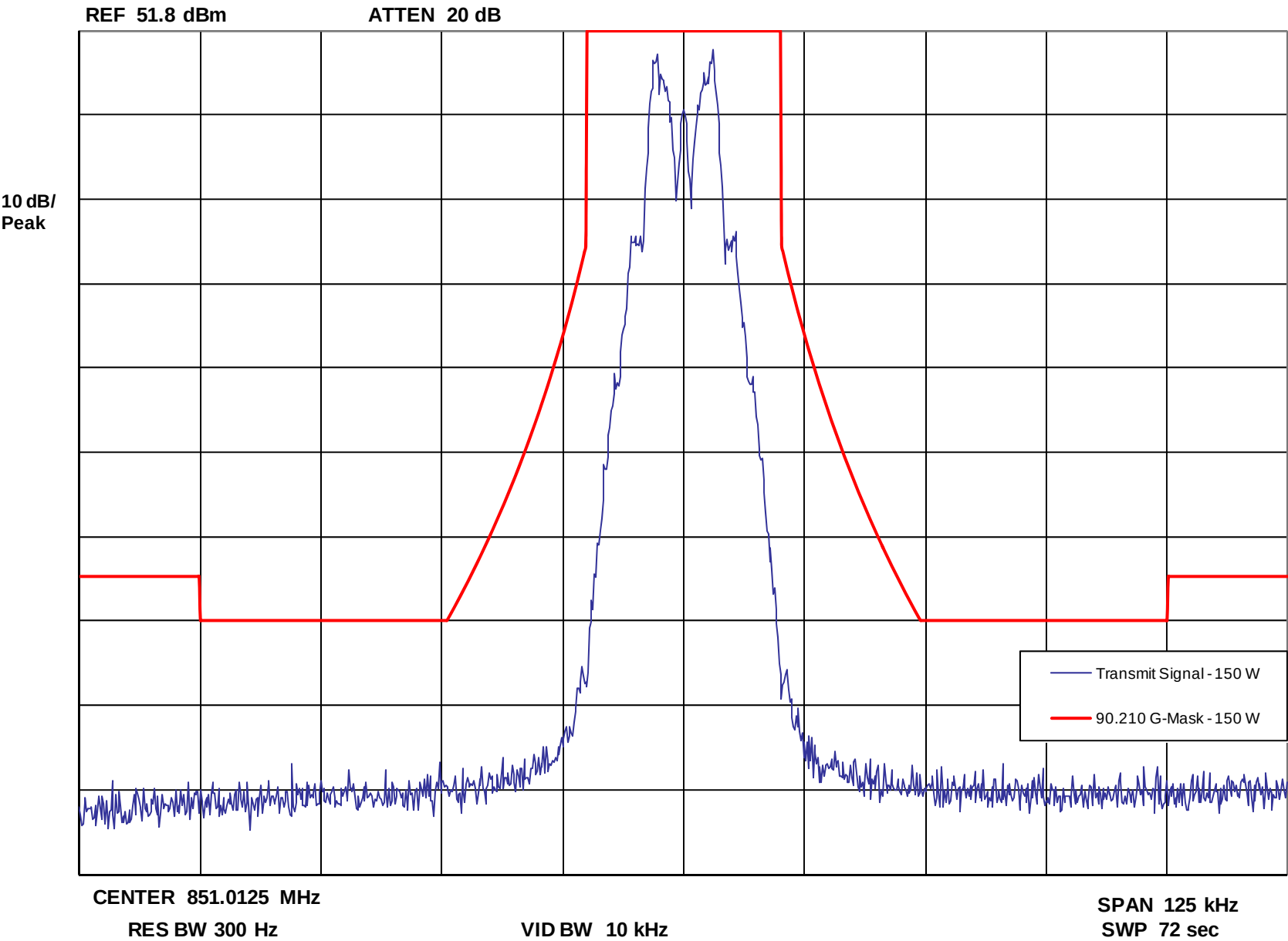
Occupied Bandwidth -- Four-Level FM Widepulse Astro - 150 Watts



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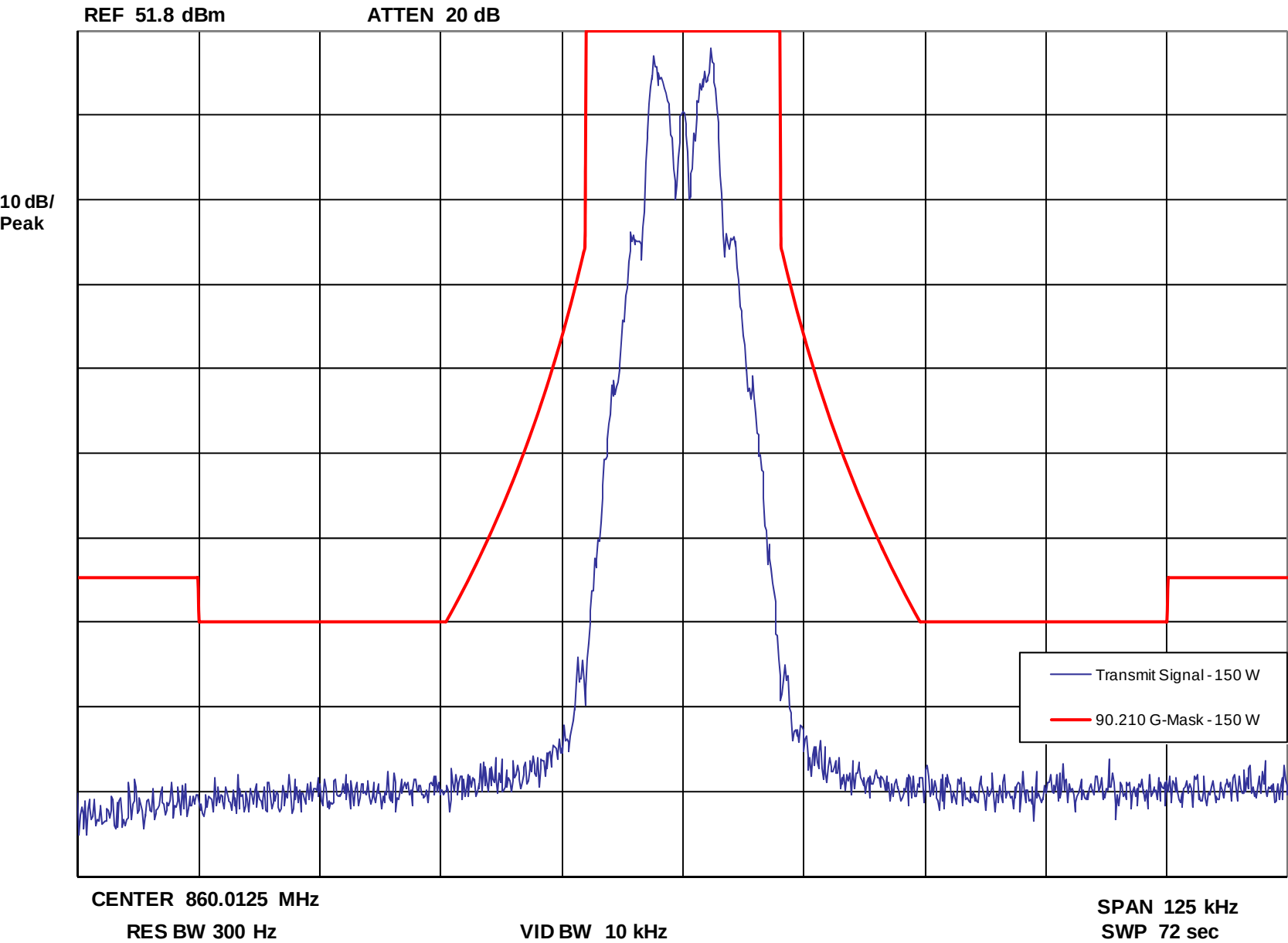
Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 25 kHz Channels – Emission Designator: 16K0F1D, Low End of Band

Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



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

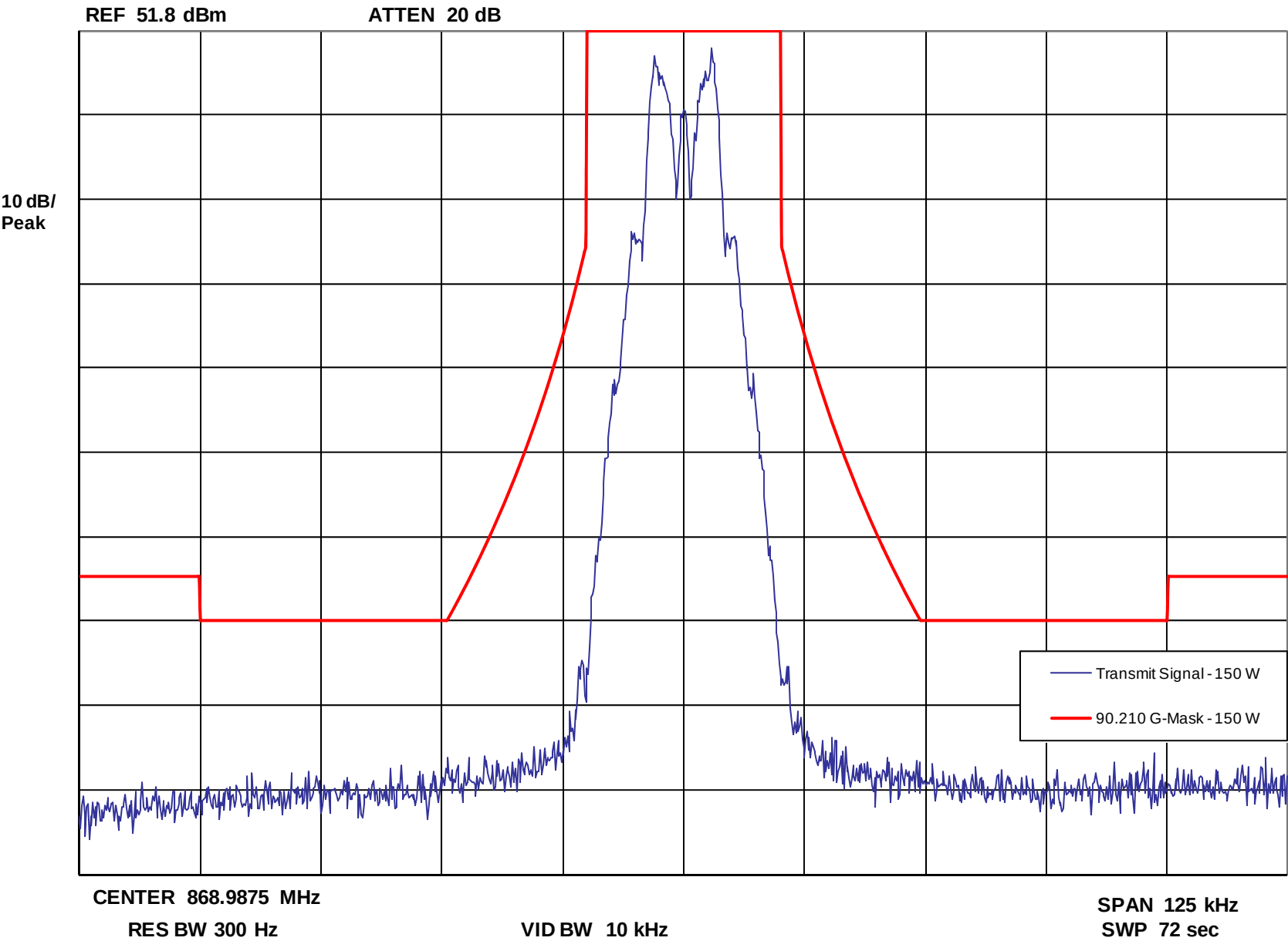
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements

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

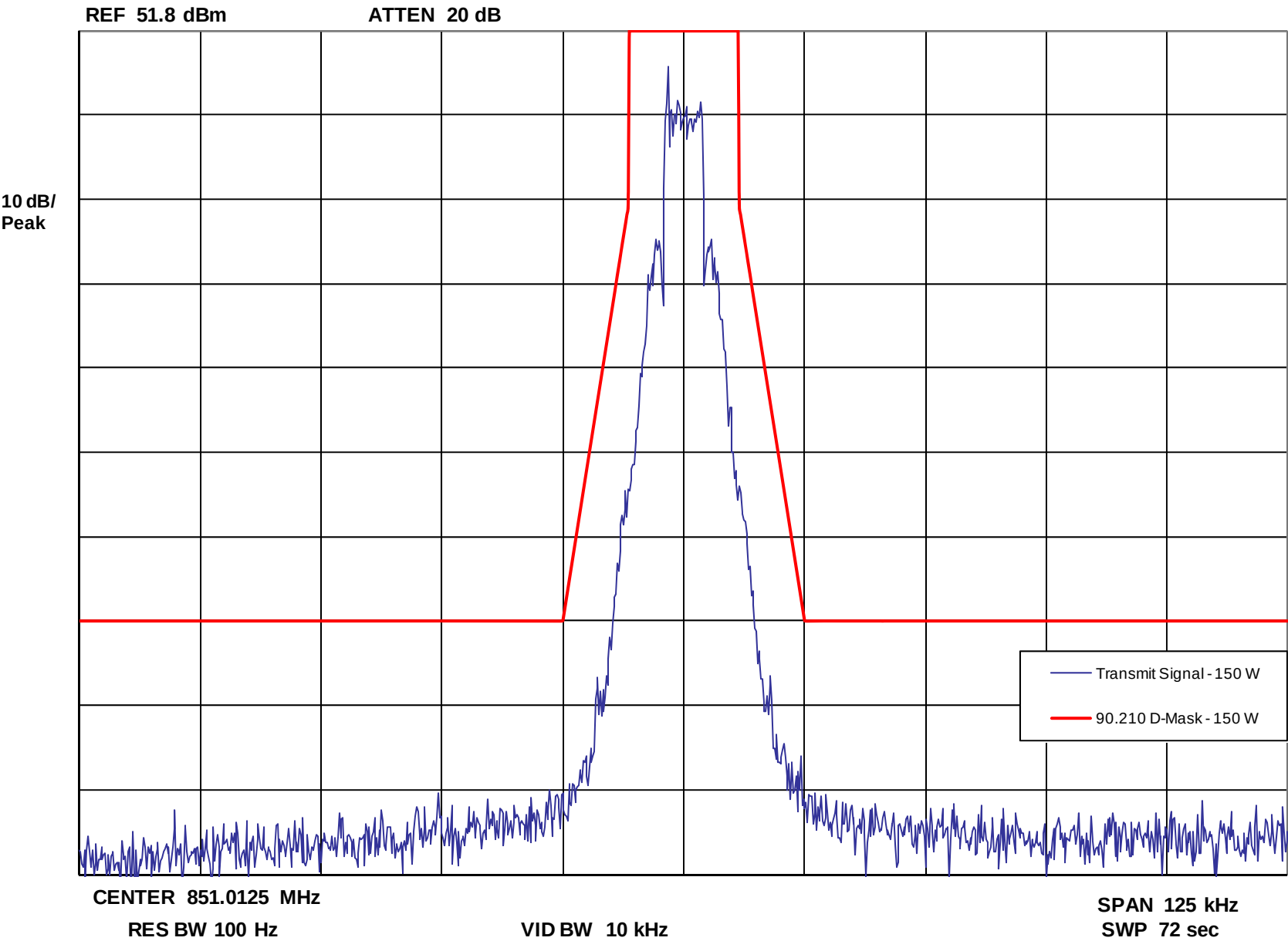
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements

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

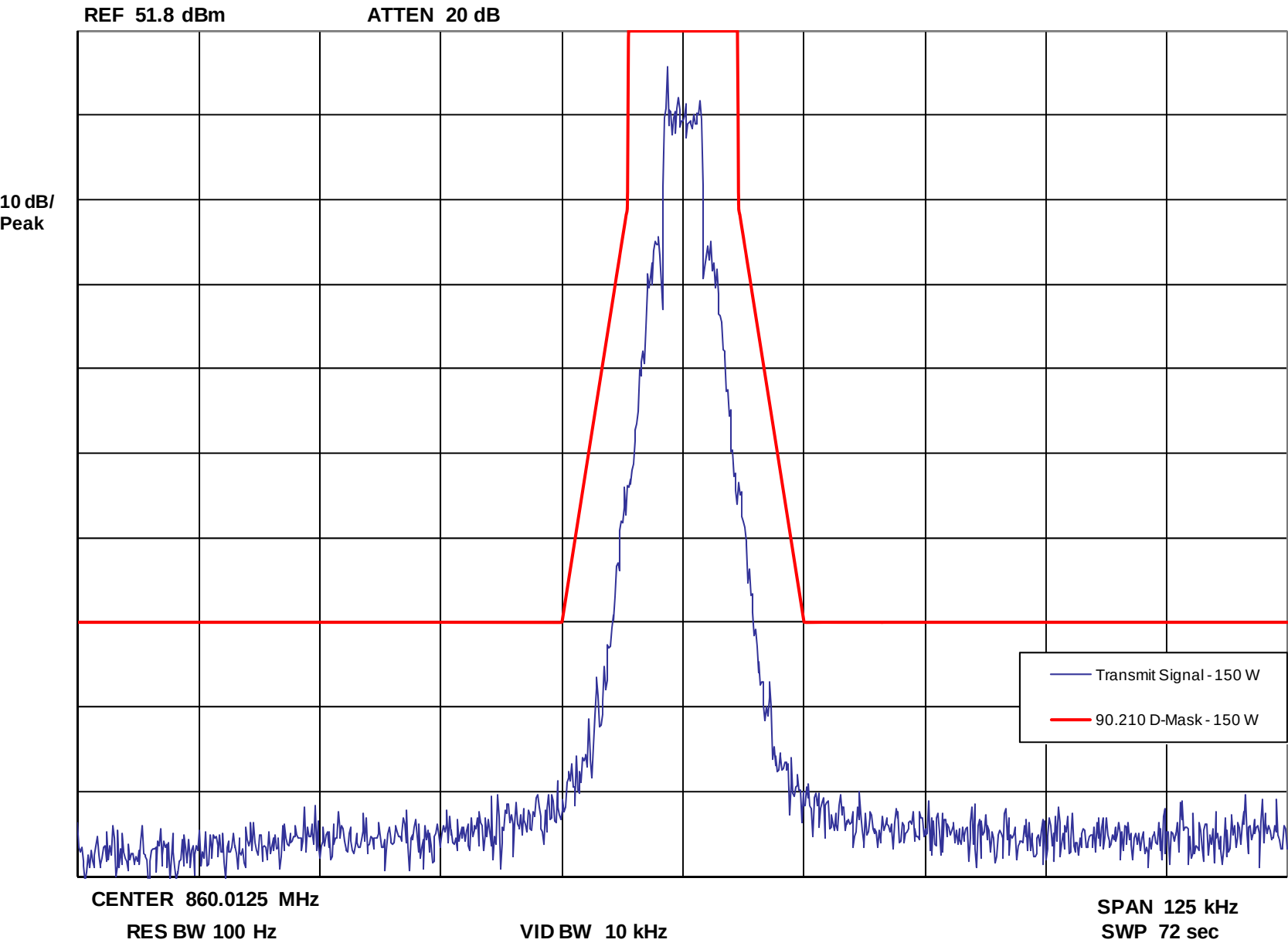
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements

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

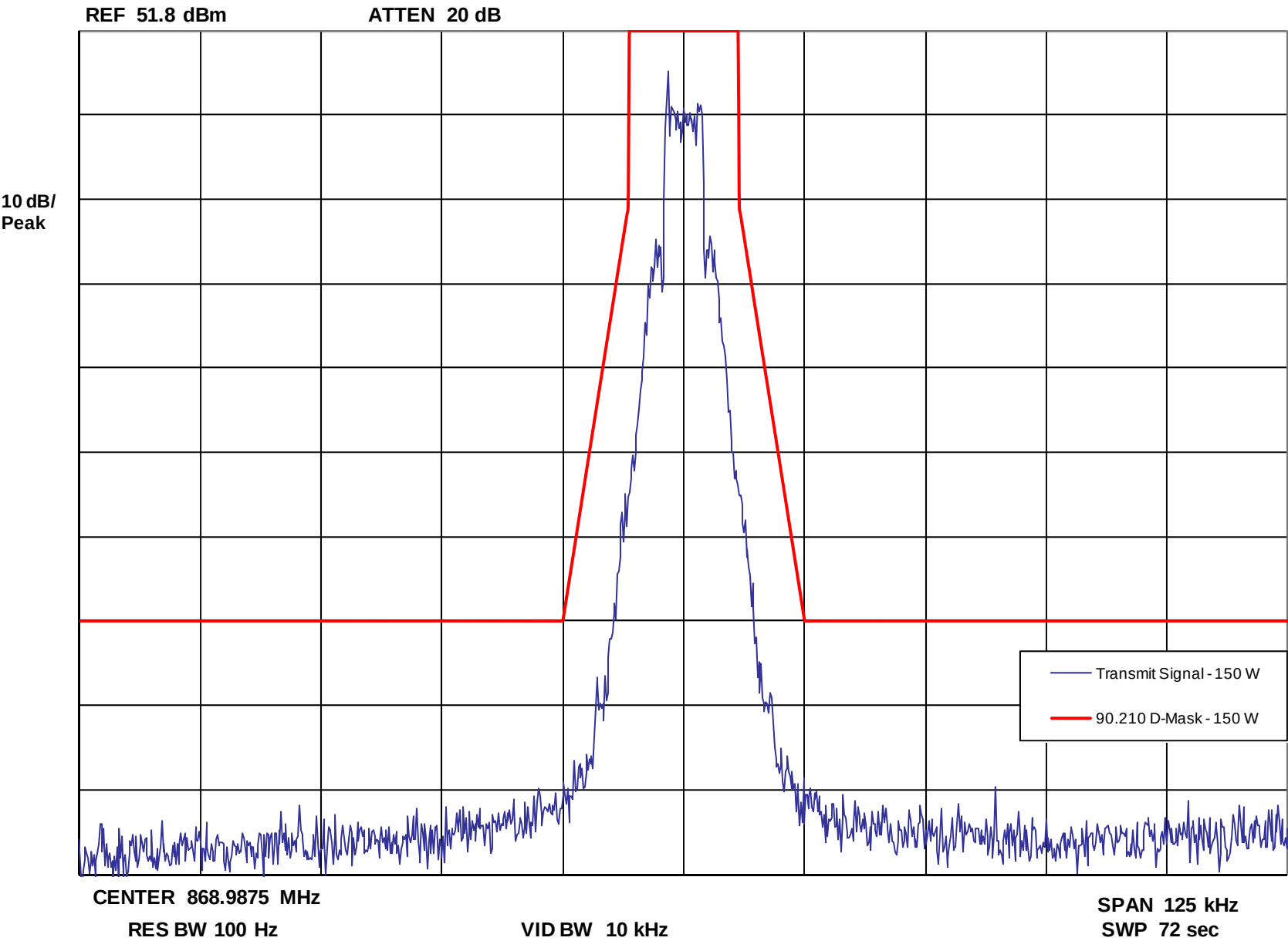
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements

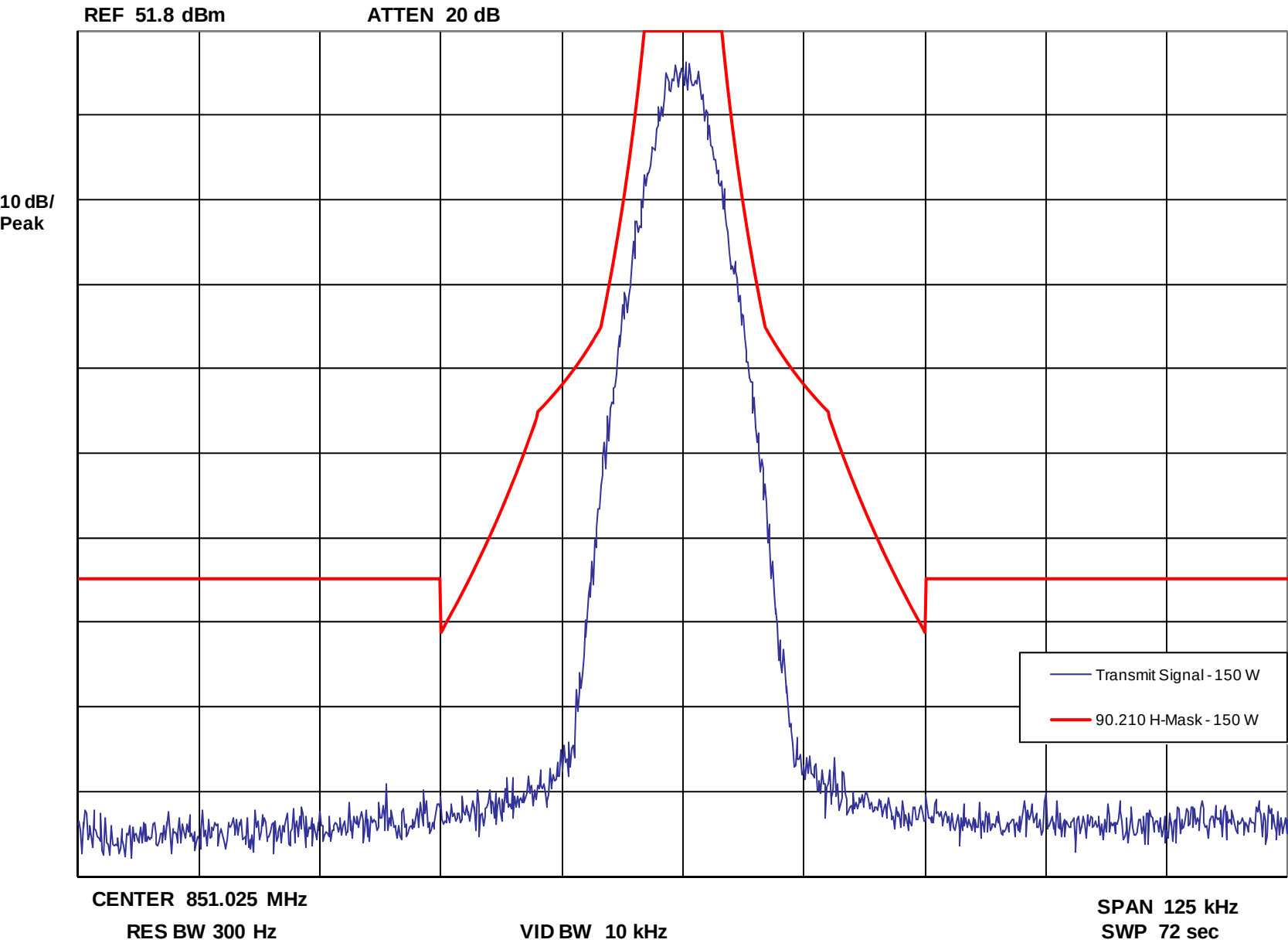
Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, 12.5 kHz Channels – Emission Designator: 10K0F1D, High End of Band

Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements
 Occupied Bandwidth – Compatible 4-Level Frequency Modulation (C4FM) – Emission Designator: 8K10D1E, 8K10D1D, 8K10D1W, NPSPAC Band

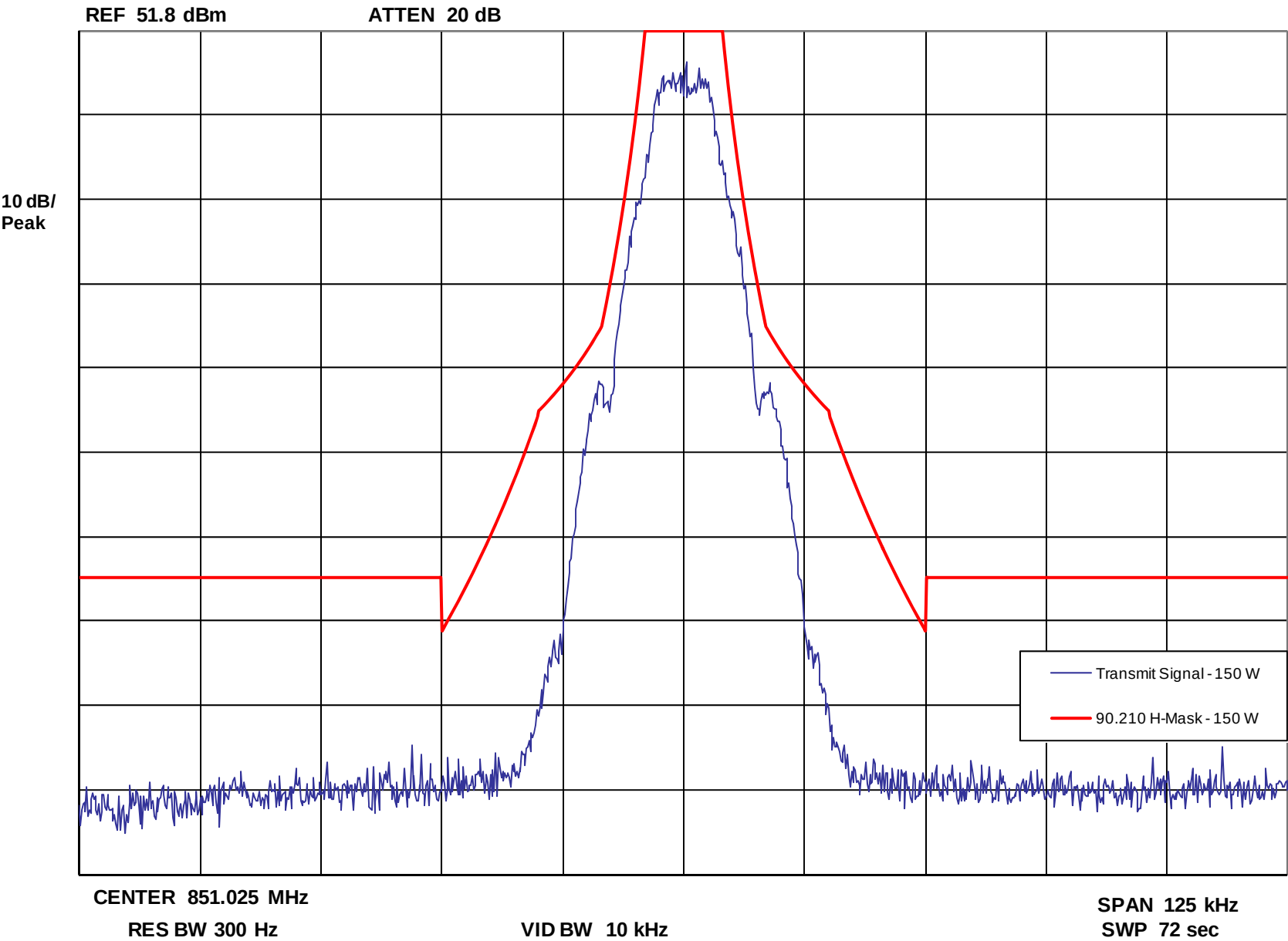
Occupied Bandwidth -- Compatible 4-Level Frequency Modulation - 150 Watts



Report on Test Measurements

Occupied Bandwidth – Four-Level Frequency Modulation Widepulse Astro – Emission Designator: 10K0F1E, 10K0F1D, 10K0F1W, NPSPAC Band

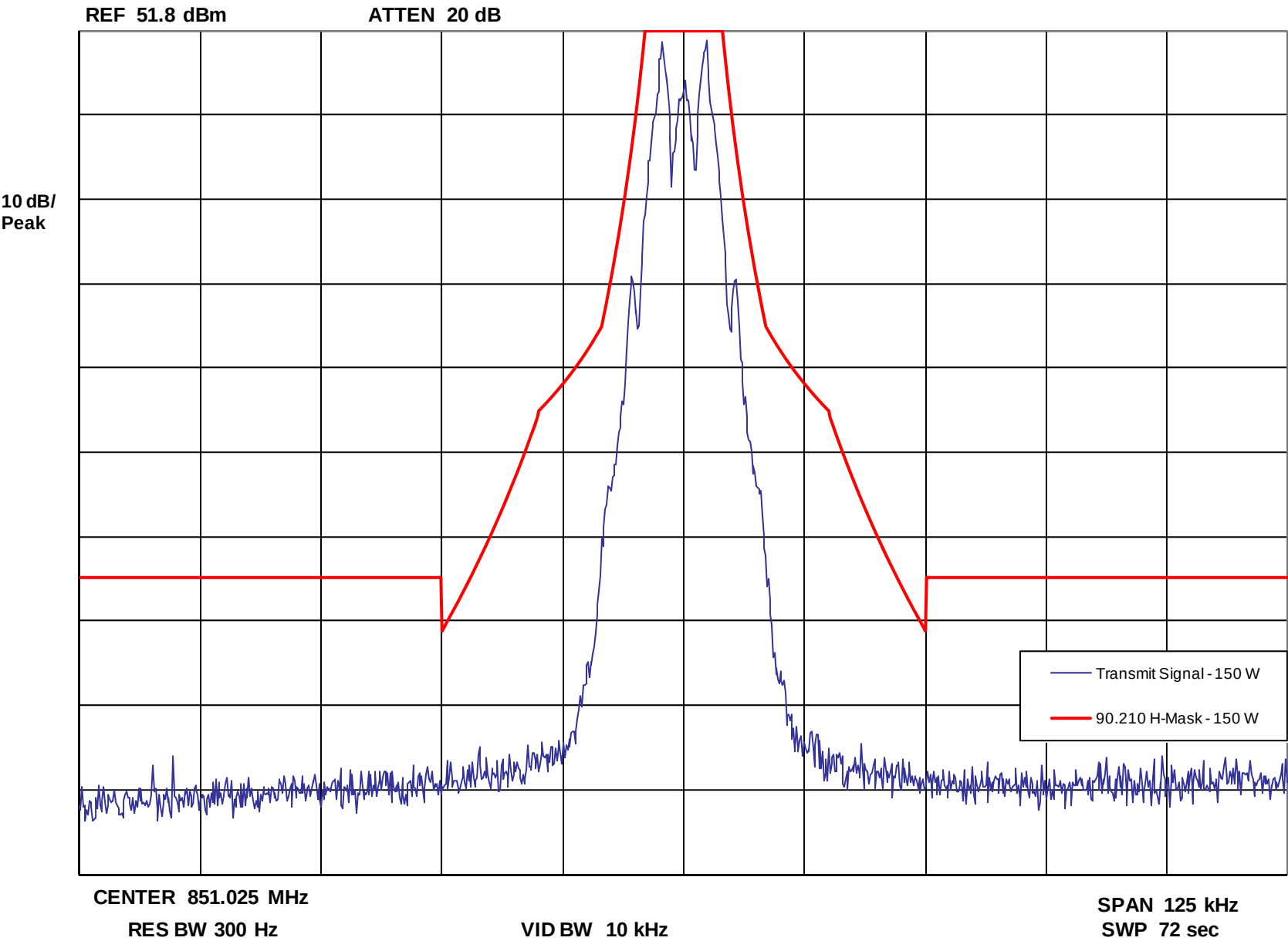
Occupied Bandwidth -- Four-Level FM Widepulse Astro - 150 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, (Wideband), NPSPAC Channels – Emission Designator: 14K0F1D

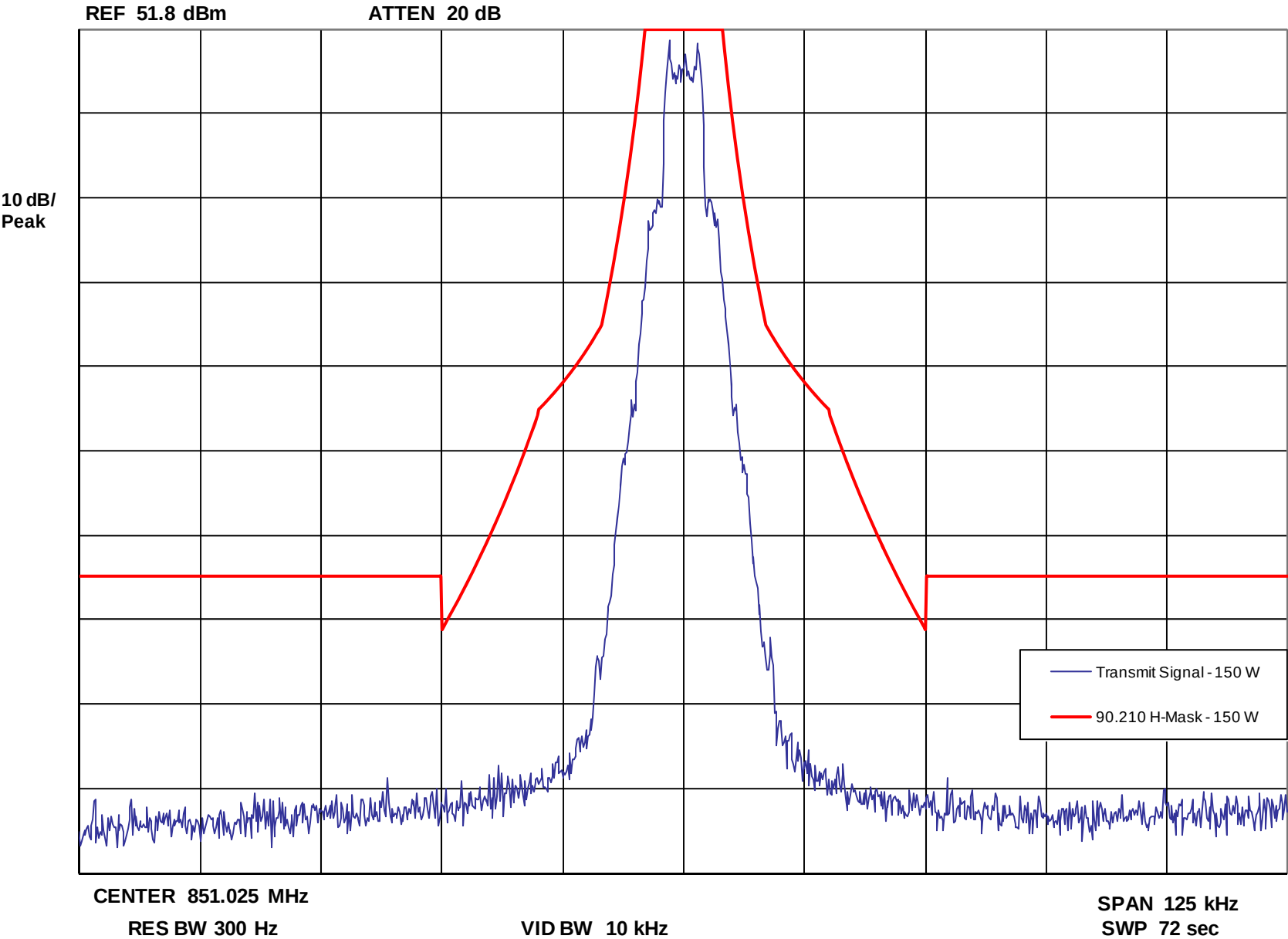
Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements

Occupied Bandwidth – Trunking Control Data 3600 bps FSK Modulation, (Narrowband), NPSPAC Channels – Emission Designator: 10K0F1D

Occupied Bandwidth -- Trunking Control Data - 3600 bps FSK Modulation - 150 Watts



Report on Test Measurements

*Conducted Spurious Emissions – Harmonics and Emission Spectrum*Specification Requirement 47 CFR §90.210(b) and IC RSS-119 section 5.8.1 - 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:

- c) >50 kHz *at least $43 + 10 * \log_{10}(P)$ dB.*

Specification Requirement 47 CFR §90.210(d) and IC RSS-119 section 5.8.3 - 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:

- (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(g) and IC RSS-119 section 5.8.6 - Emission Limits – “G-Mask”:

Emission Mask G. 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 (P) as follows:

- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: *At least $43 + 10 \log(P)$ dB.*

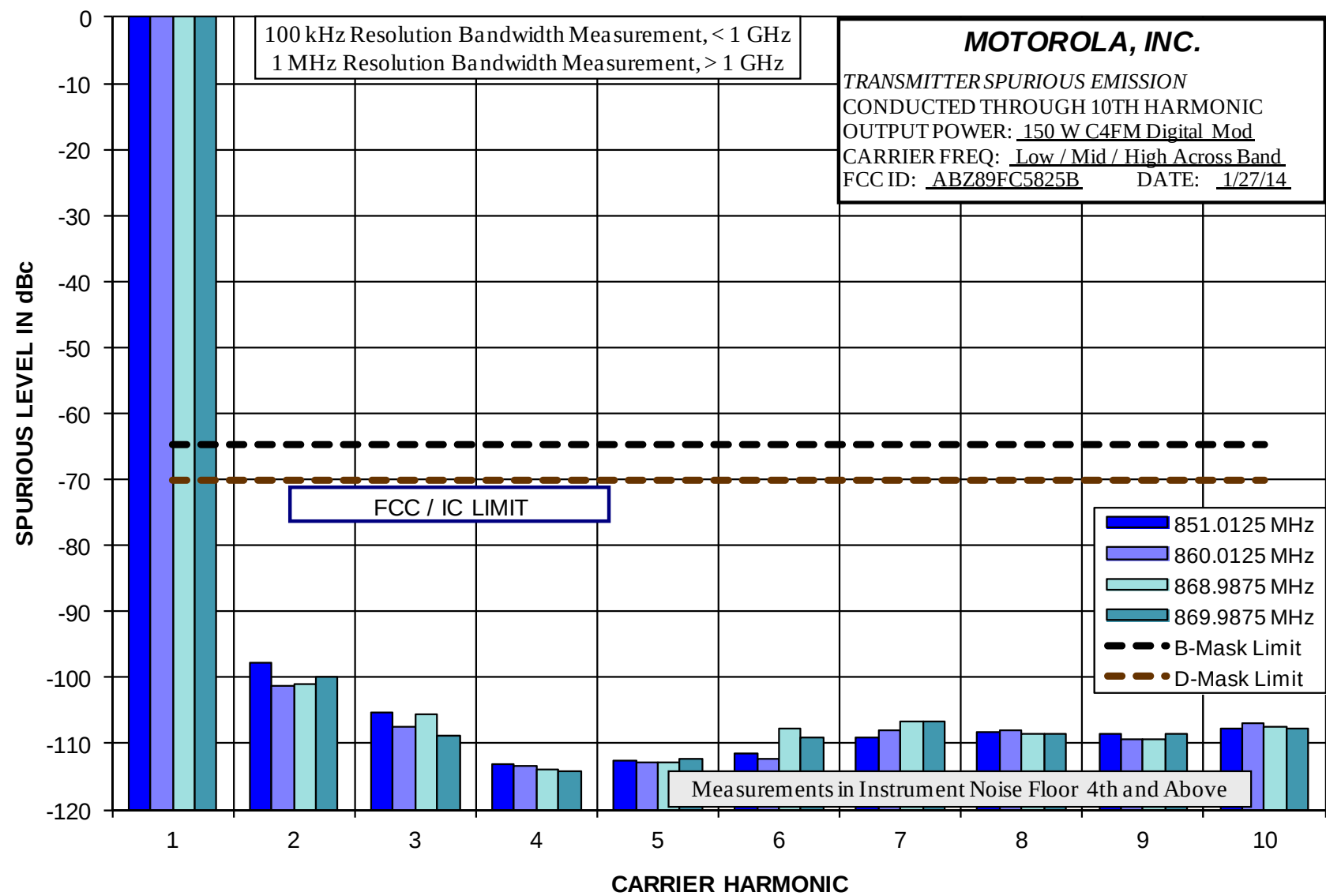
Modulation: Compatible 4-Level Frequency Modulation (C4FM) or Analog Frequency Modulation as indicated

Carrier Frequencies: Carrier frequencies of 851.0125, 860.0125, 868.9875, and 869.9875 MHz were measured for conducted carrier harmonics and conducted emission. These frequencies represent the low end, center, and high end of the 851-870 MHz band, and are representative of the full operating band.

EXHIBIT	DESCRIPTION
E1-3.1	Conducted Spurious Harmonic Emissions, Power Output 150 Watts, C4FM The specification limit is -70.0 dBc
E1-3.2	Conducted Spurious Harmonic Emissions, Power Output 15 Watts, C4FM The specification limit is -61.8 dBc
E1-3.3	Conducted Spurious Harmonic Emissions, Power Output 150 Watts, Analog The specification limit is -70.0 dBc
E1-3.4	Conducted Spurious Harmonic Emissions, Power Output 15 Watts, Analog The specification limit is -61.8 dBc
E1-3.5, 6, 7	Conducted Spurious Emission Spectrum, 200 MHz Span, Power Output at 150 Watts, C4FM The specification limit is -70.0 dBc
E1-3.8, 9, 10	Conducted Spurious Emission Spectrum, 200 MHz Span, Power Output at 150 Watts, Analog The specification limit is -70.0 dBc

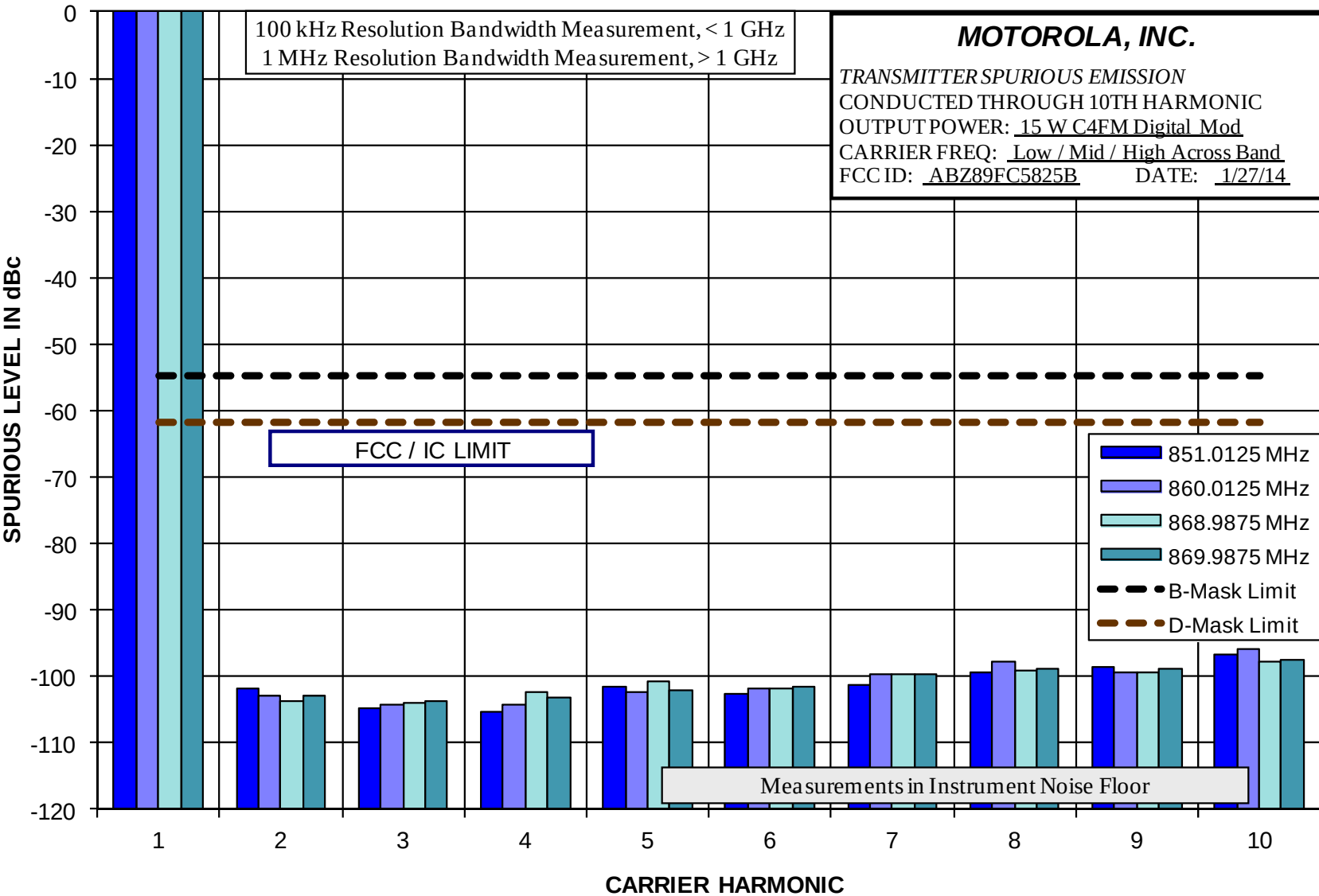
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 150 Watts C4FM



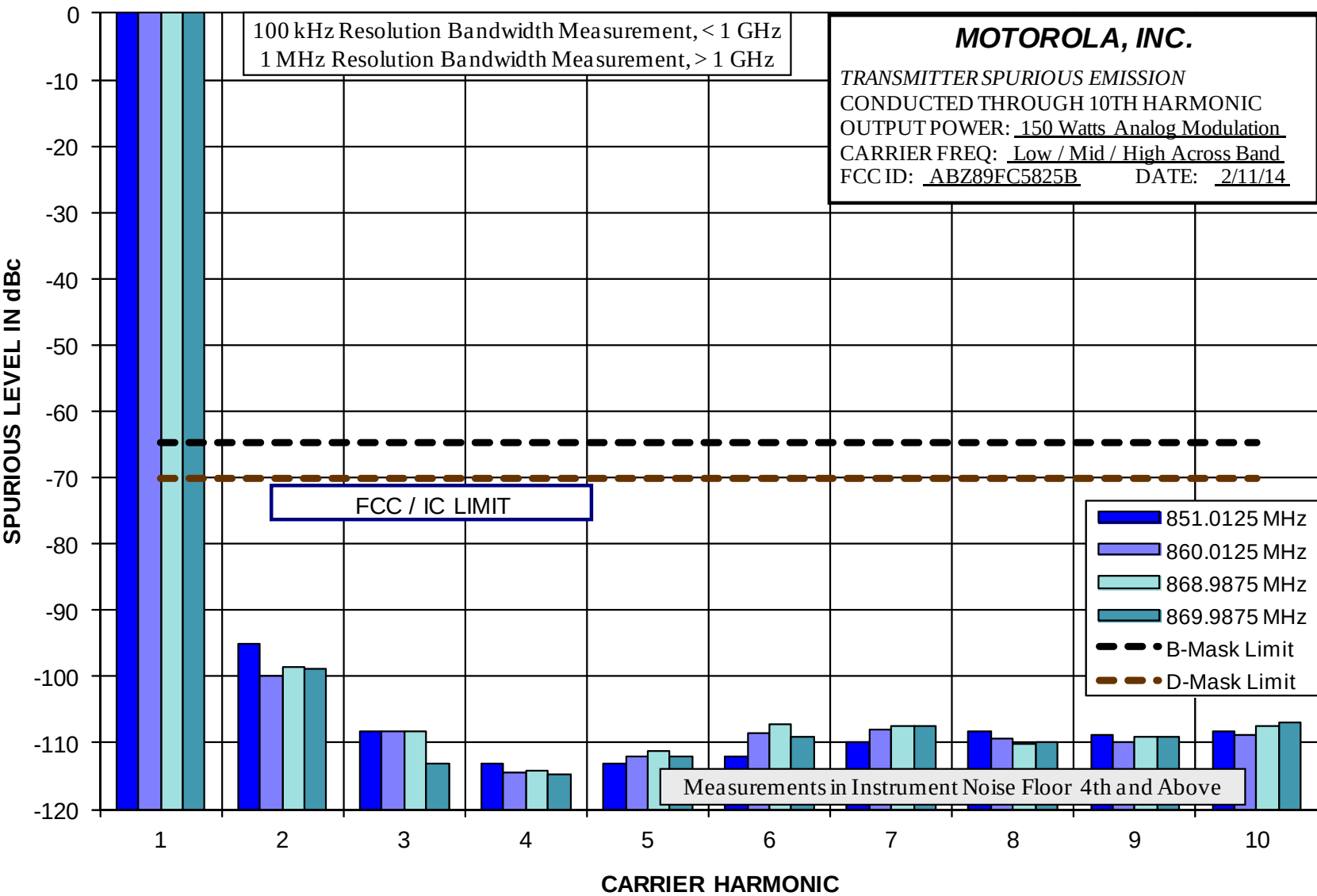
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 15 Watts C4FM



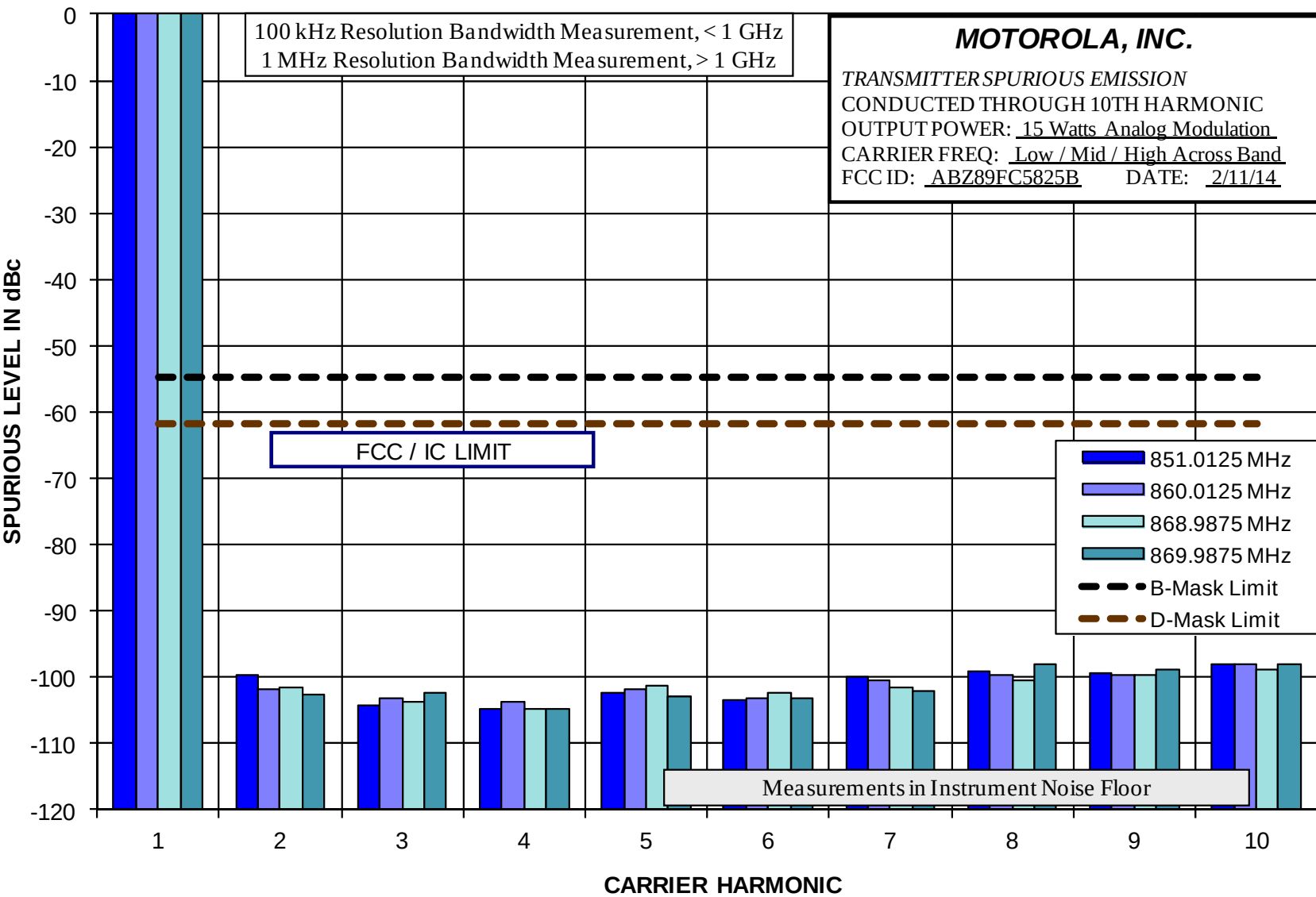
Report on Test Measurements

Conducted Spurious Harmonic Emissions – 150 Watts Analog

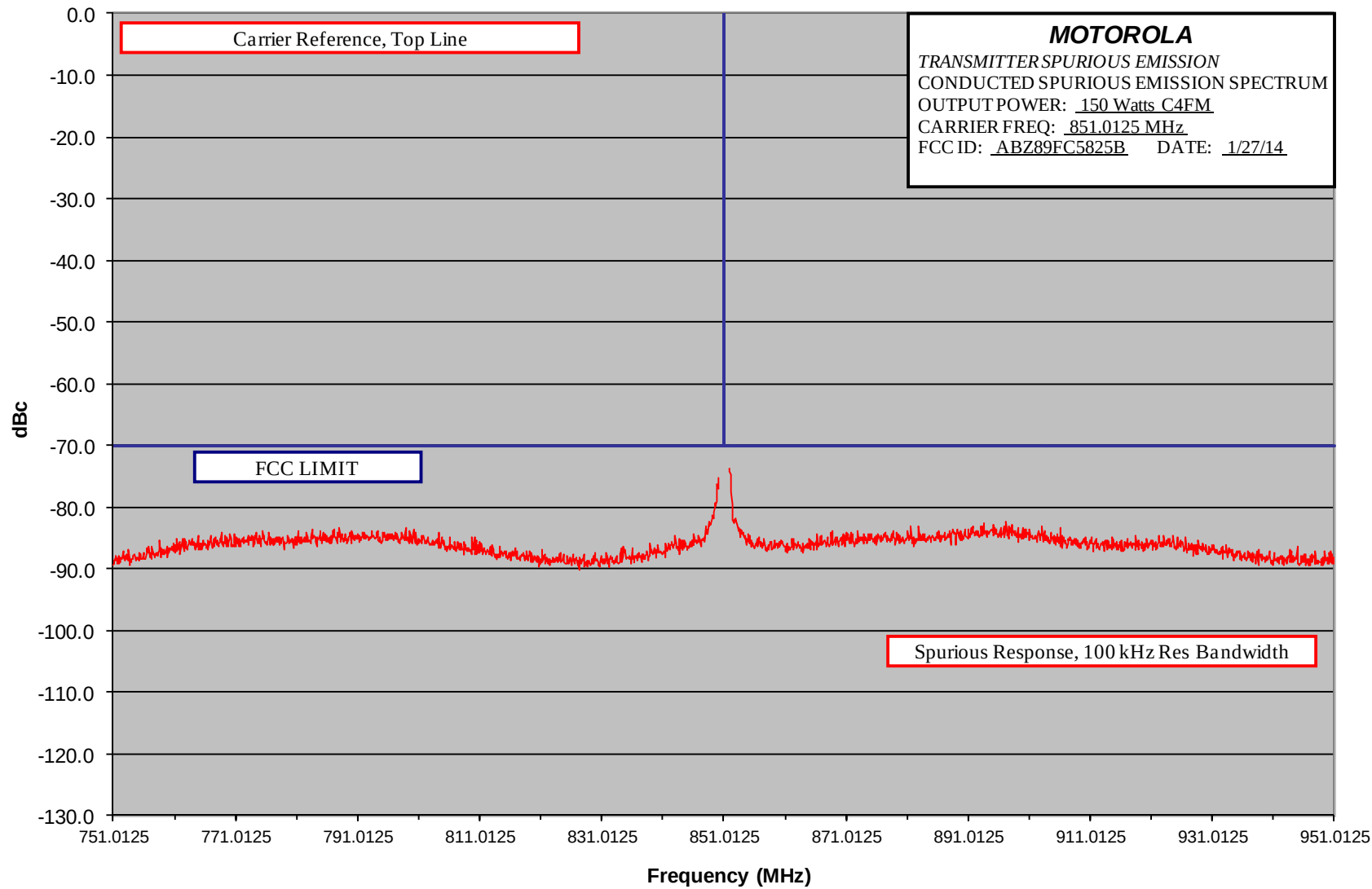


Report on Test Measurements

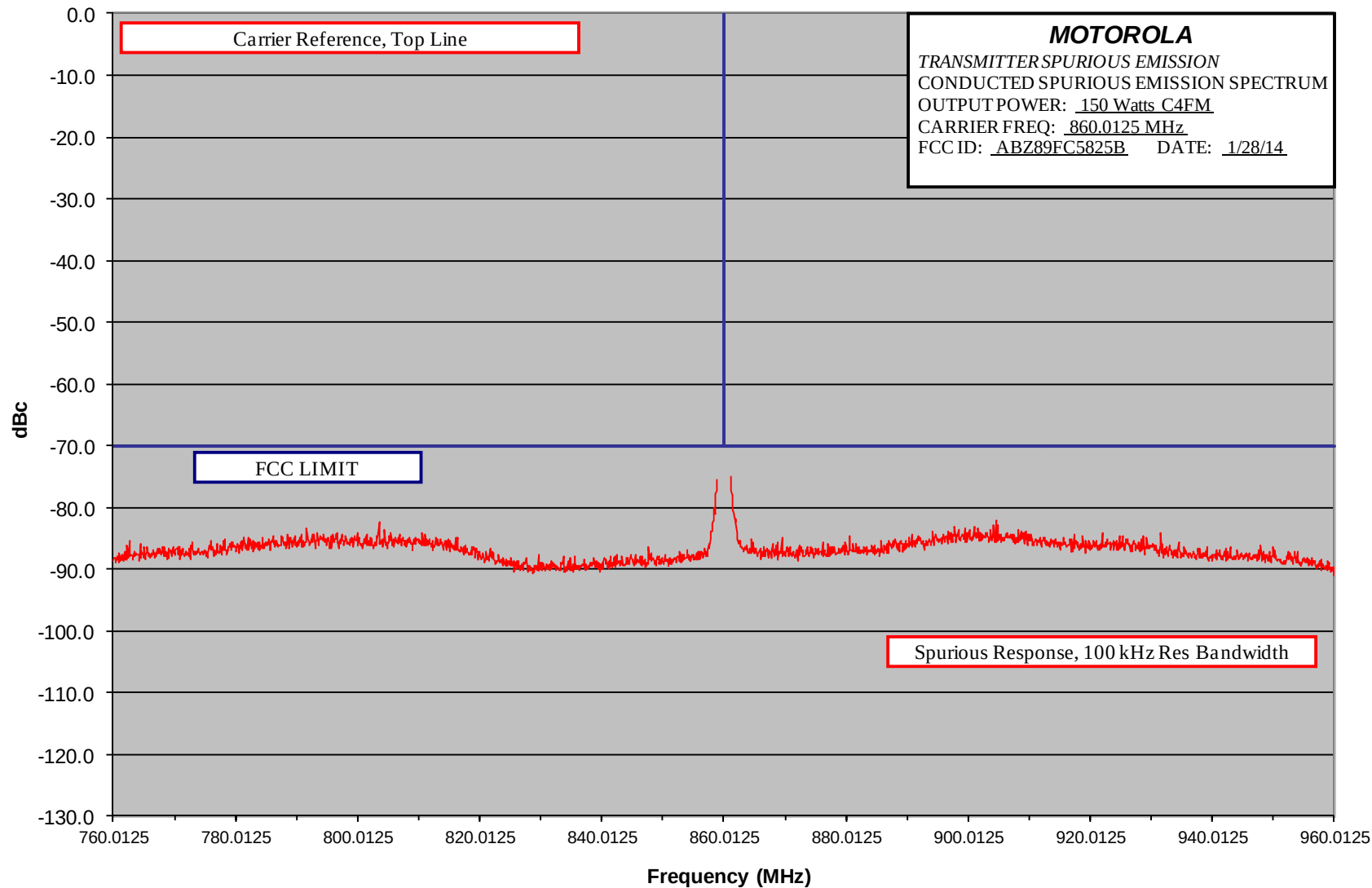
Conducted Spurious Harmonic Emissions – 15 Watts Analog



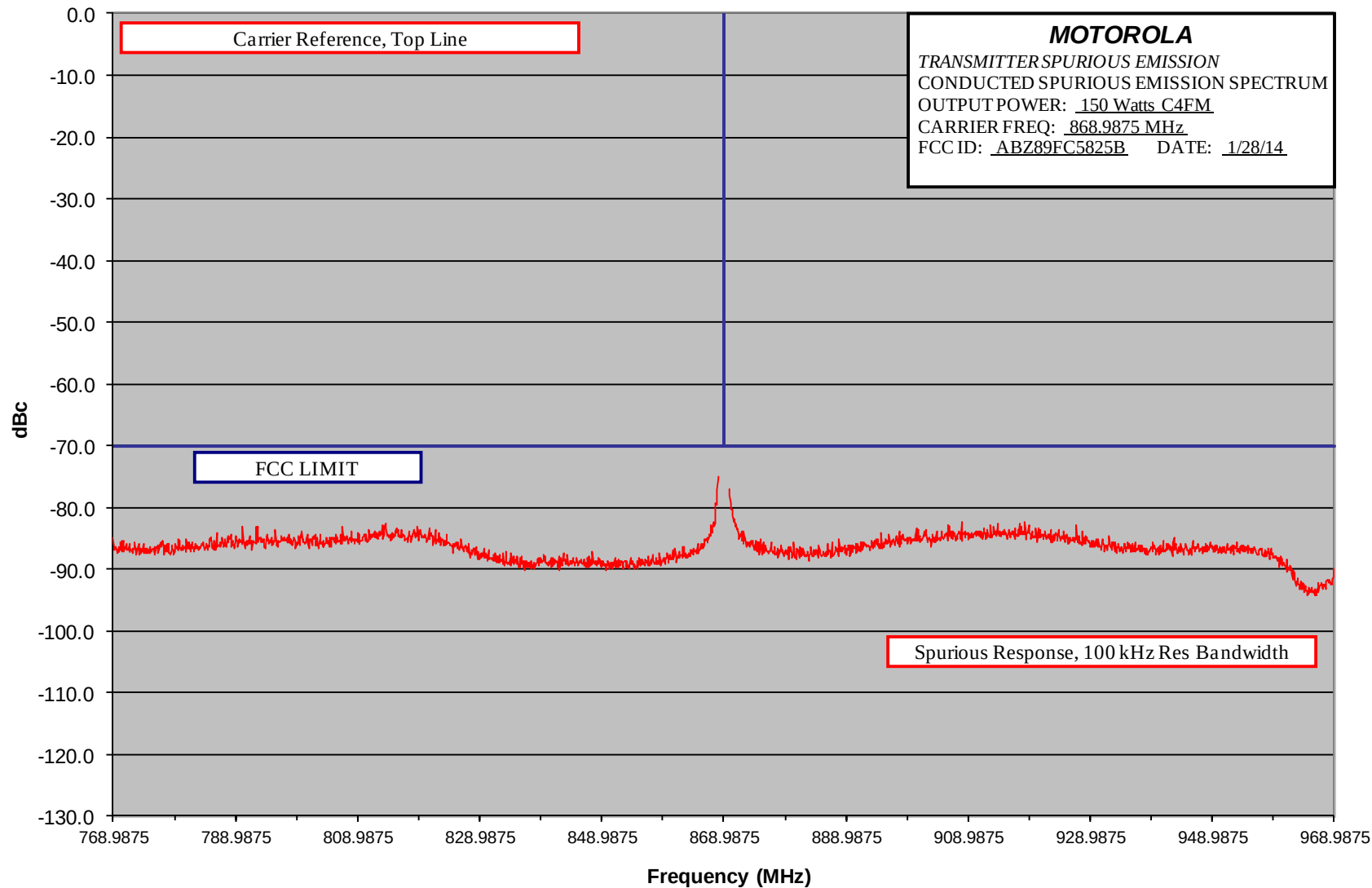
Report on Test Measurements
 Conducted Spurious Emission Spectrum – 150 Watts C4FM – 200 MHz Span – Low End of Band



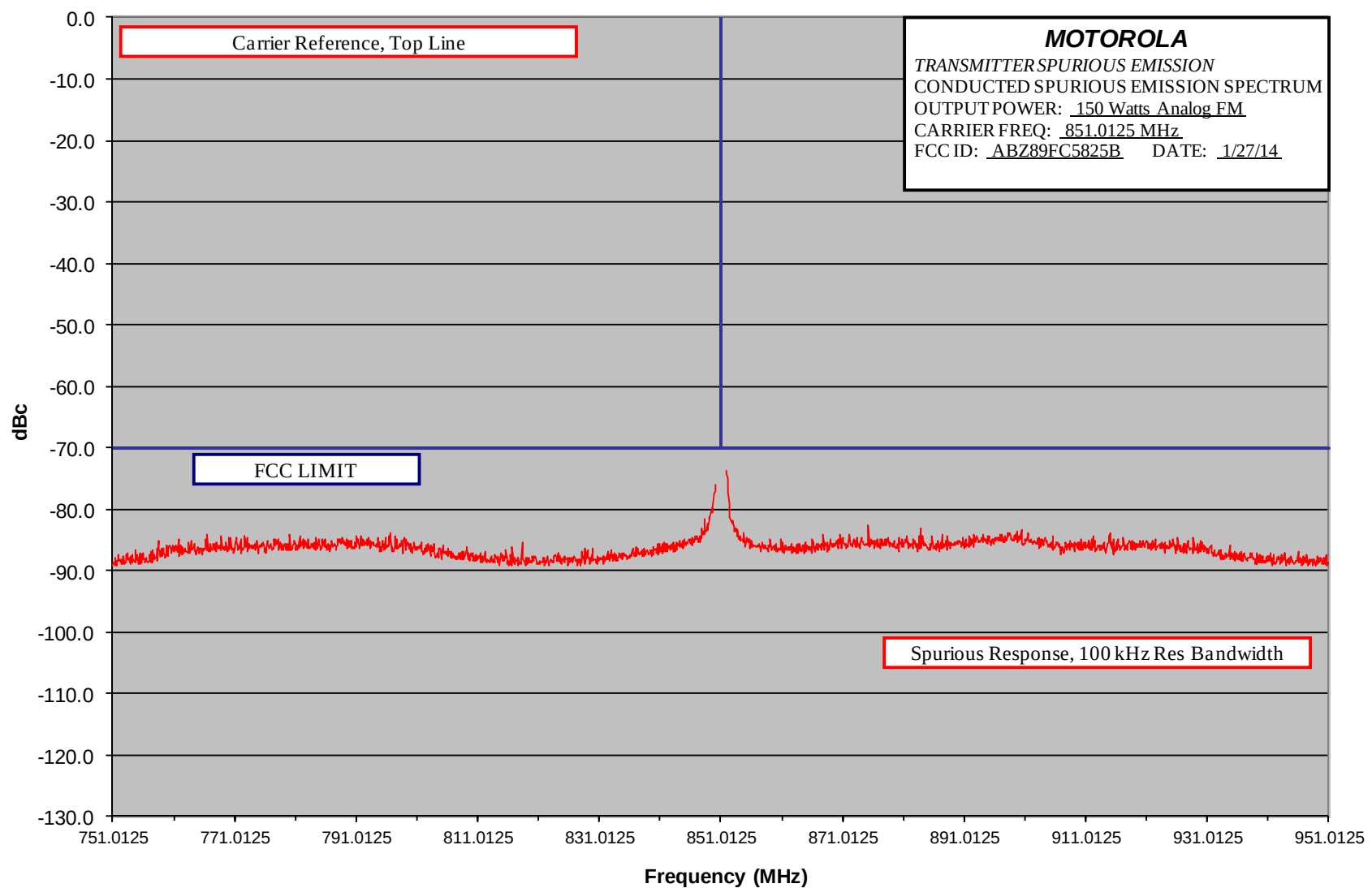
Report on Test Measurements
 Conducted Spurious Emission Spectrum – 150 Watts C4FM – 200 MHz Span – Middle of Band



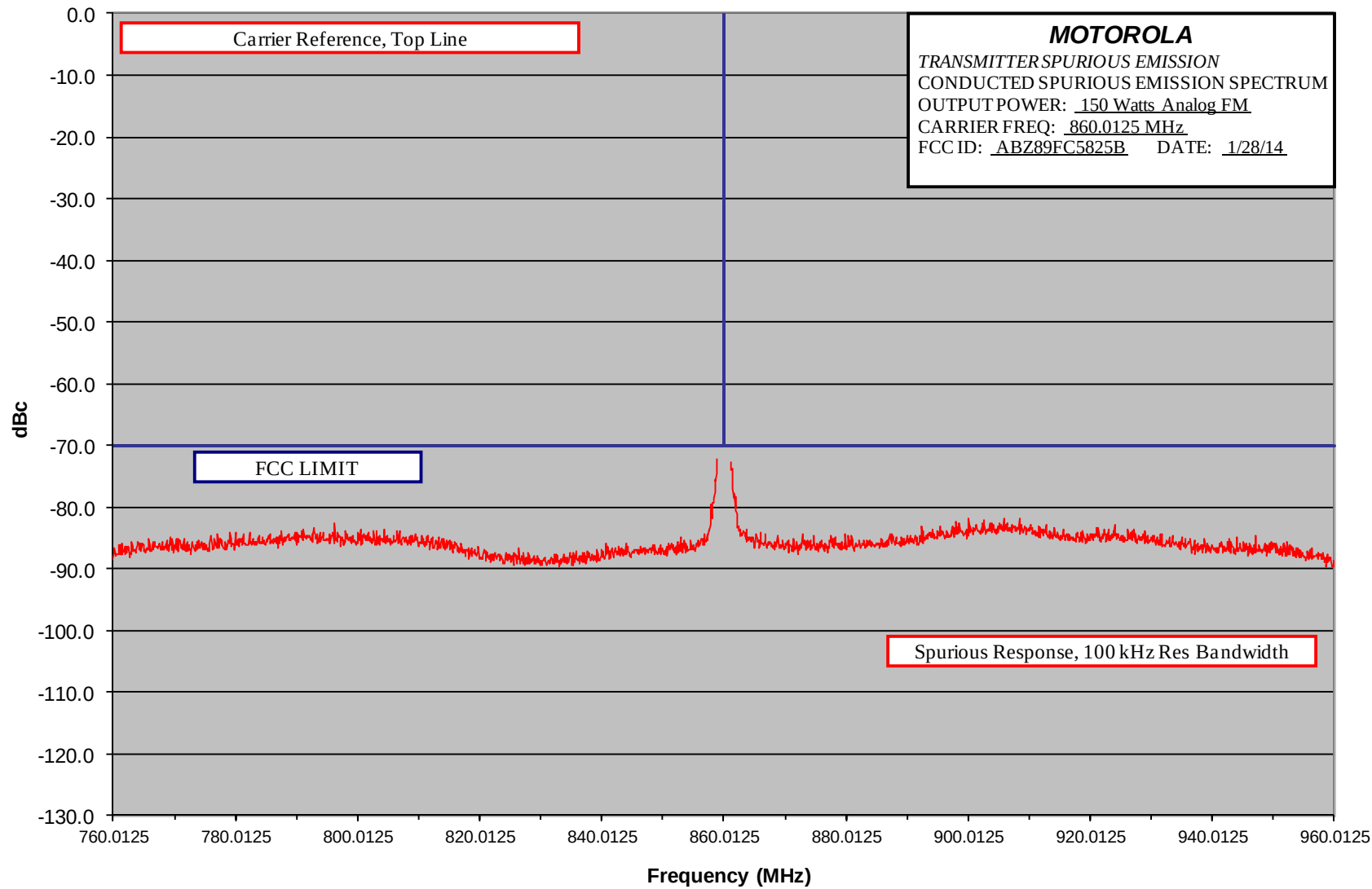
Report on Test Measurements
 Conducted Spurious Emission Spectrum – 150 Watts C4FM – 200 MHz Span – High End of Band



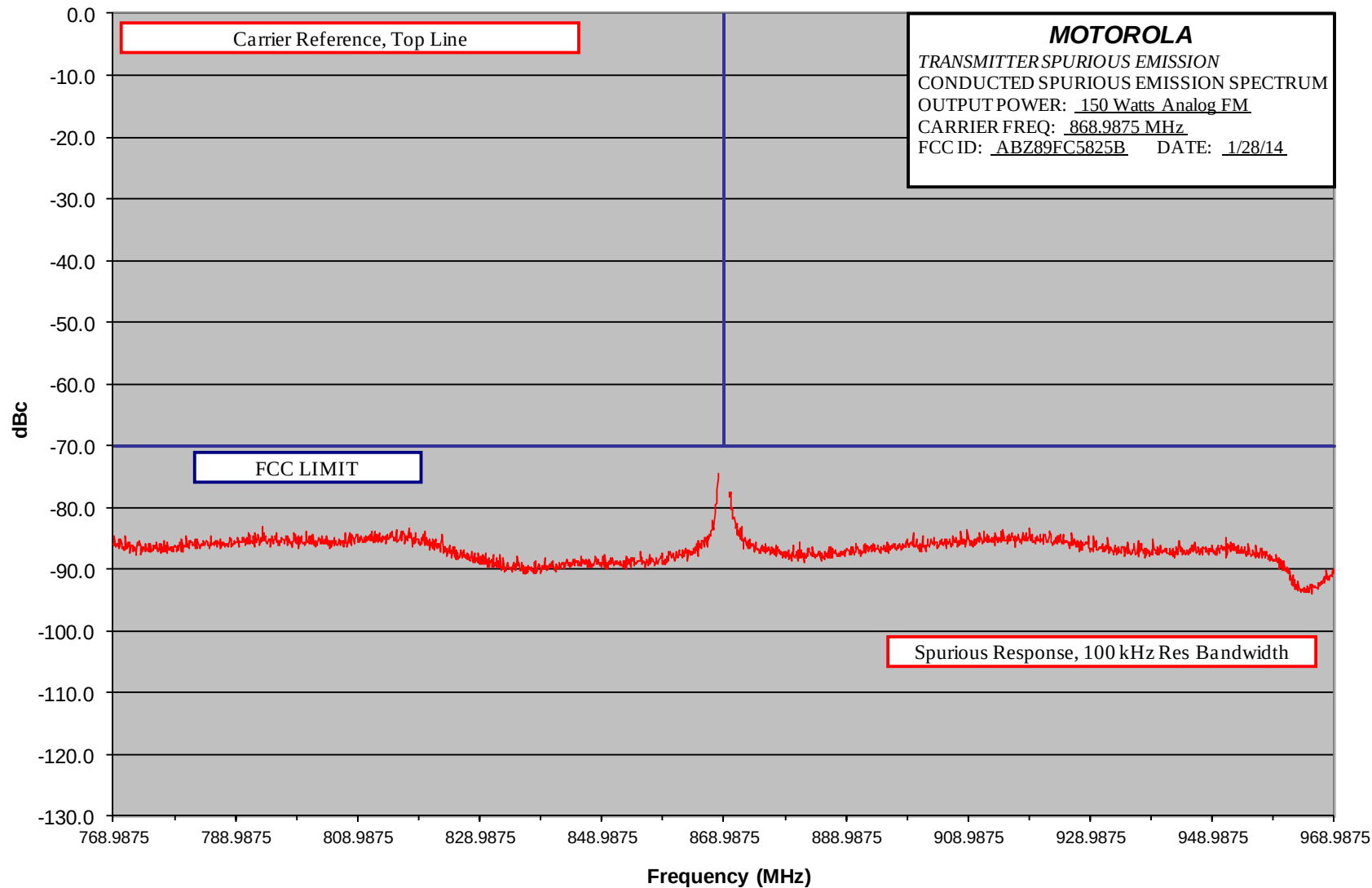
Report on Test Measurements
Conducted Spurious Emission Spectrum – 150 Watts Analog – 200 MHz Span – Low End of Band



Report on Test Measurements
 Conducted Spurious Emission Spectrum – 150 Watts Analog – 200 MHz Span – Middle of Band



Report on Test Measurements
 Conducted Spurious Emission Spectrum – 150 Watts Analog – 200 MHz Span – High End of Band



Report on Test Measurements

*Radiated Spurious Emissions, Harmonics*Specification Requirement 47 CFR §90.210(b) and IC RSS-119 section 5.8.1 - 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:

- c) >50 kHz *at least $43 + 10 * \log_{10}(P)$ dB.*

Specification Requirement 47 CFR §90.210(d) and IC RSS-119 section 5.8.3 - 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:

- (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(g) and IC RSS-119 section 5.8.6 - Emission Limits – “G-Mask”:

Emission Mask G. 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 (P) as follows:

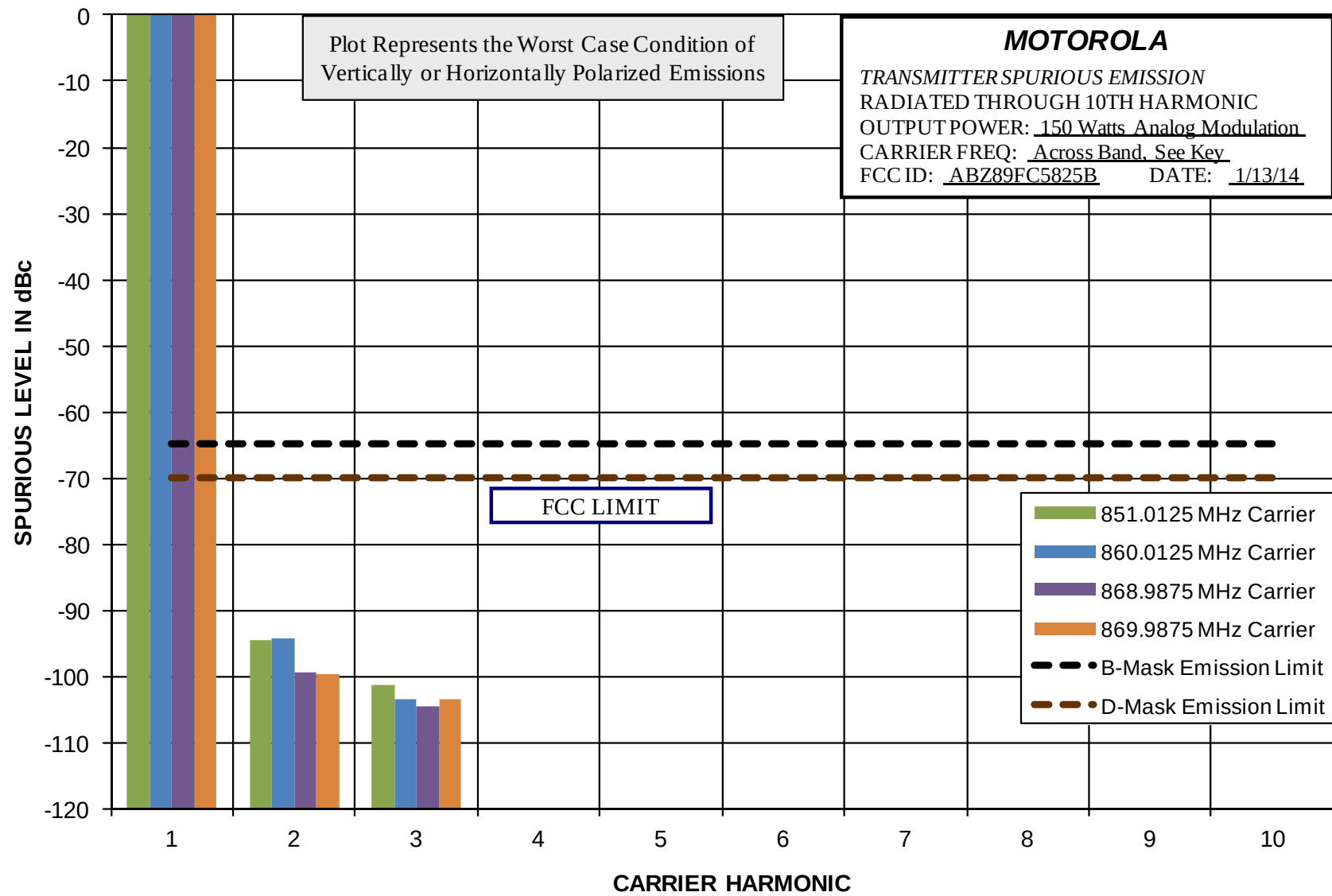
- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: *At least $43 + 10 \log(P)$ dB.*

Modulation: Analog Frequency Modulation. The performance data for analog mode is representative of digital Compatible 4-Level Frequency Modulation (C4FM).

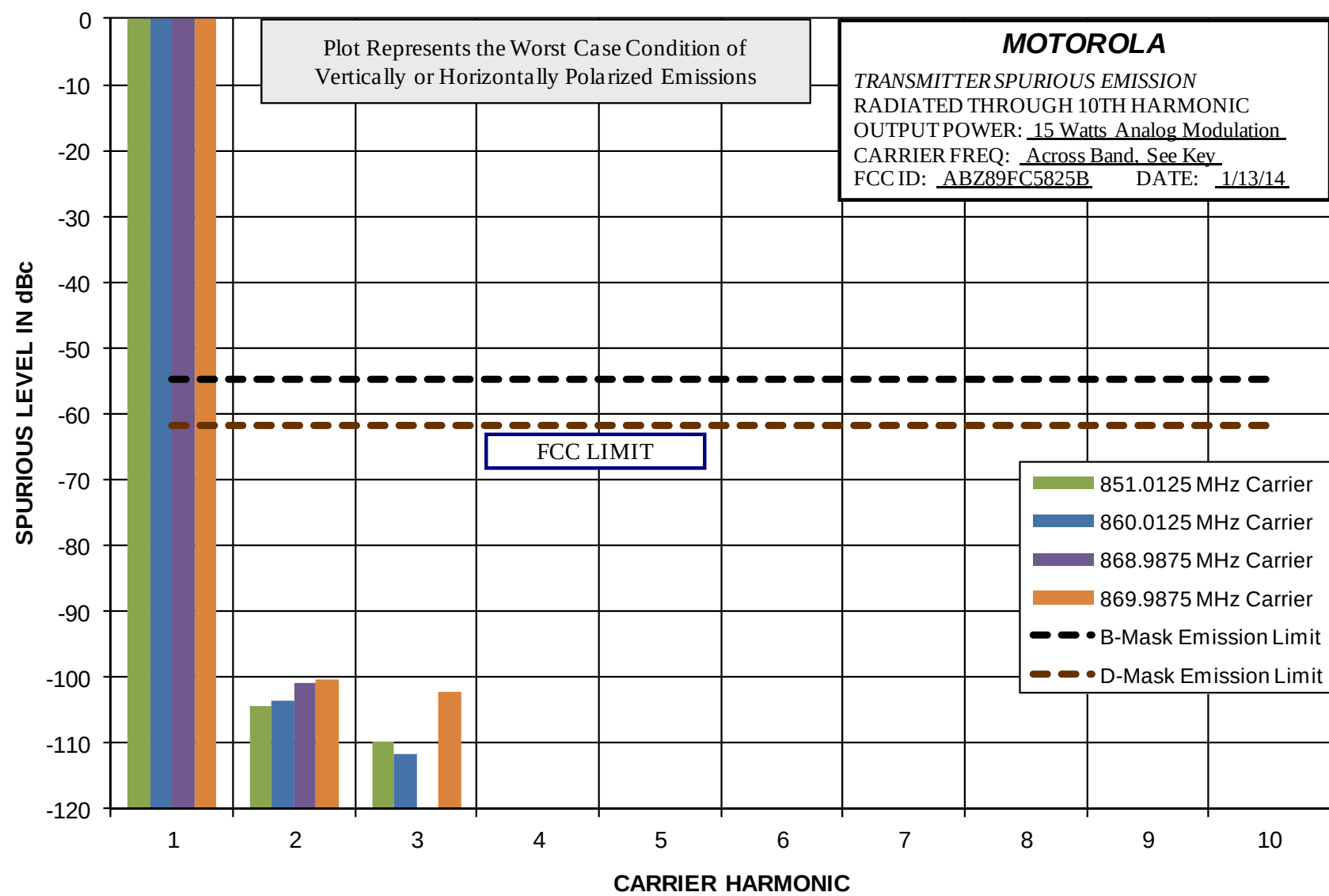
Carrier Frequencies: Carrier frequencies of 851.0125, 860.0125, 868.9875, and 869.9875 MHz were measured for radiated carrier harmonics and radiated emission. These frequencies represent the low end, center, and high end of the 851-870 MHz band, and are representative of the full operating band.

EXHIBIT	DESCRIPTION
E1-3.1	Radiated Spurious Harmonic Emissions, Power Output 150 Watts, Analog The specification limit is -70.0 dBc
E1-3.2	Radiated Spurious Harmonic Emissions, Power Output 15 Watts, Analog The specification limit is -61.8 dBc

Report on Test Measurements
 Radiated Spurious Harmonic Emissions – 150 Watts – Analog Frequency Modulation



Report on Test Measurements
 Radiated Spurious Harmonic Emissions – 15 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 RSS-119 Section 5.3

Fixed and Base stations operating at 851-866 MHz and 866-869 MHz must have a frequency stability of better than +/- 1.0 PPM for 12.5 kHz channel spacing and +/- 1.5 PPM for 25 kHz channel spacing.

Specification Requirement: Reference Part 90.213

Fixed and Base stations operating at 851-854 must have a frequency stability of better than +/- 1.0 PPM.

Fixed and Base stations operating at 854-869 must have a frequency stability of better than +/- 1.5 PPM.

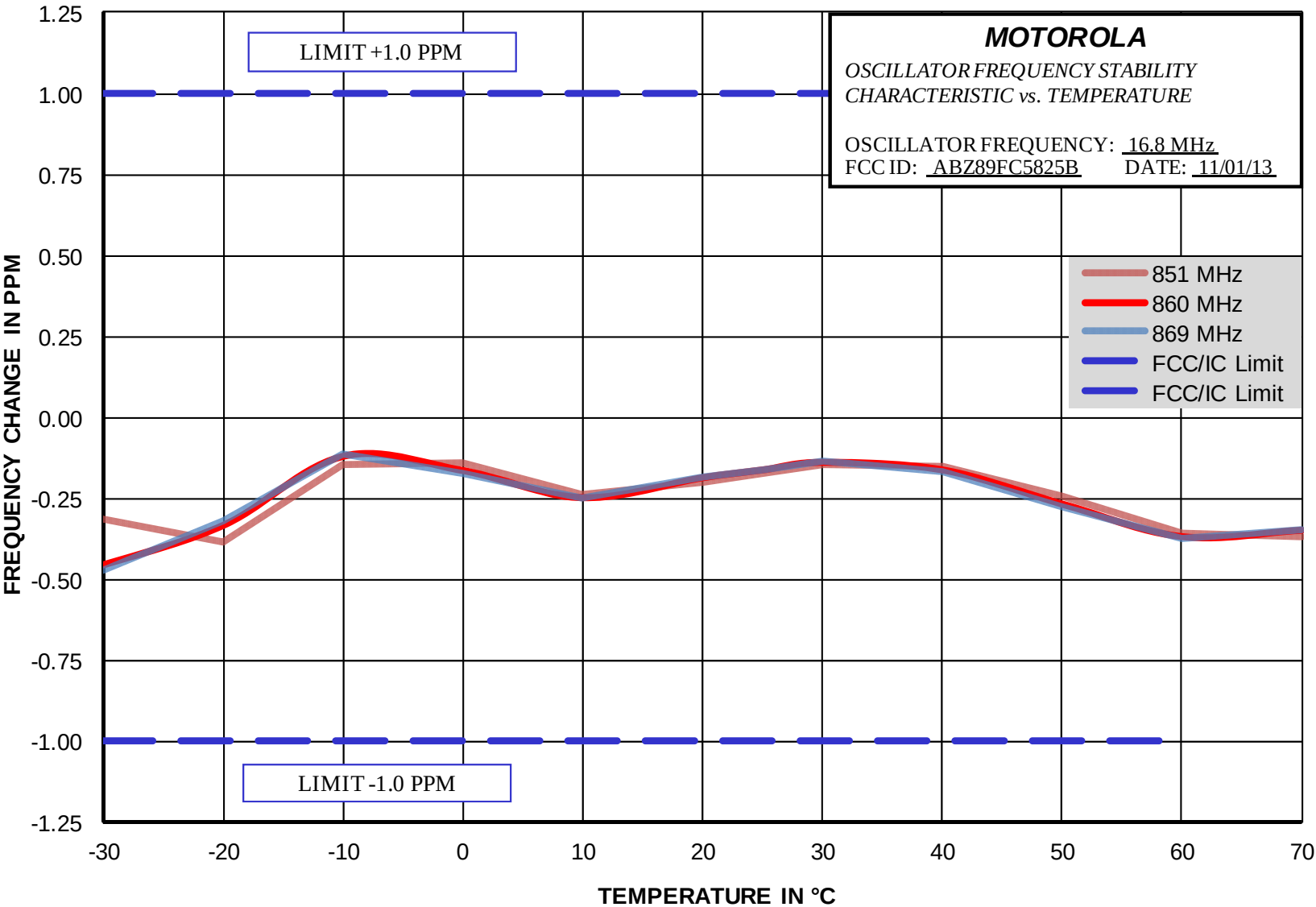
Only the more stringent specification limit is shown on the frequency stability exhibits.

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

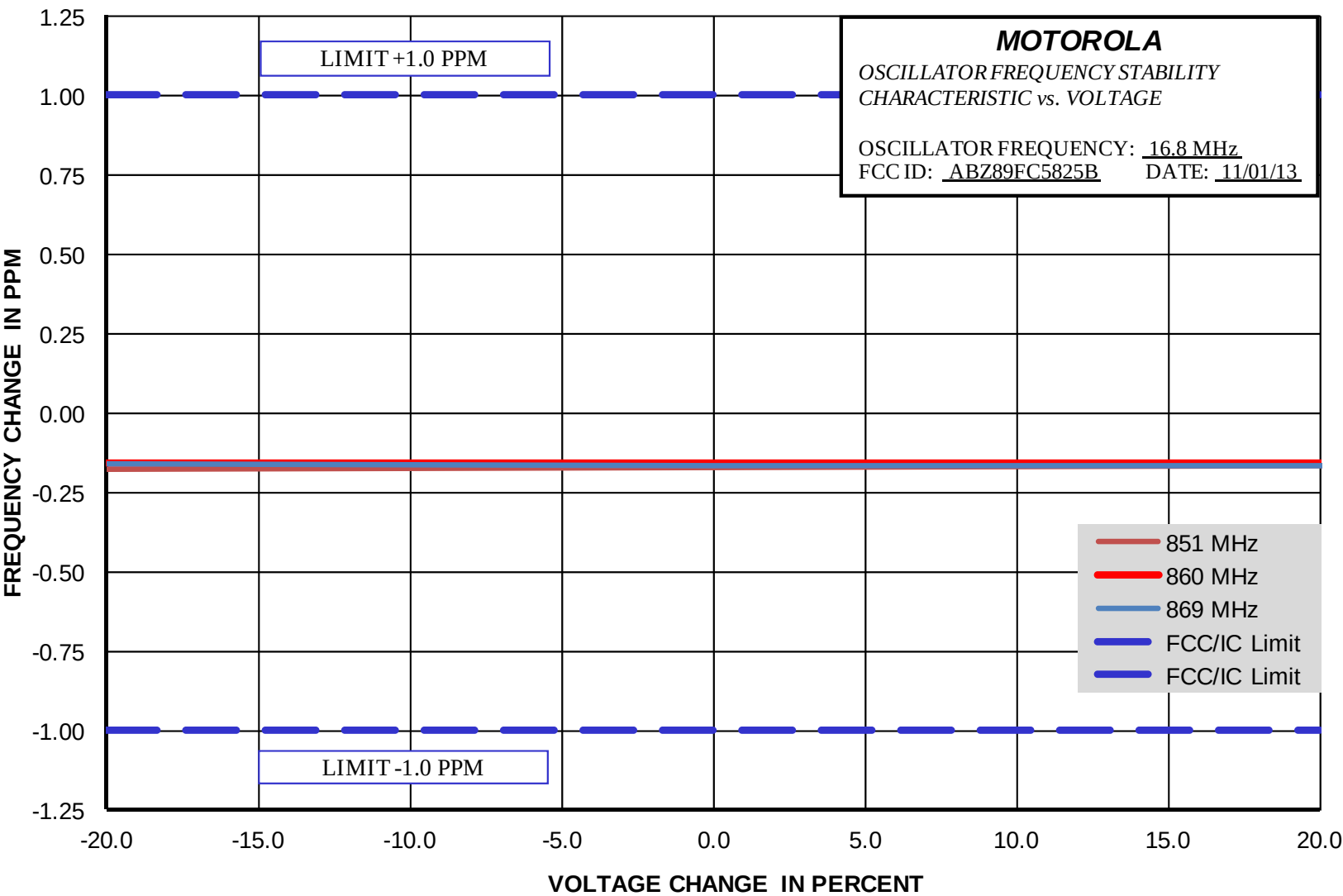
EXHIBIT	DESCRIPTION
E1-5.1	Frequency Stability Vs Temperature
E1-5.2	Frequency Stability Vs Voltage

Report on Test Measurements

Frequency Stability Vs Temperature



Report on Test Measurements
 Frequency Stability Vs Voltage



Report on Test Measurements

*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.

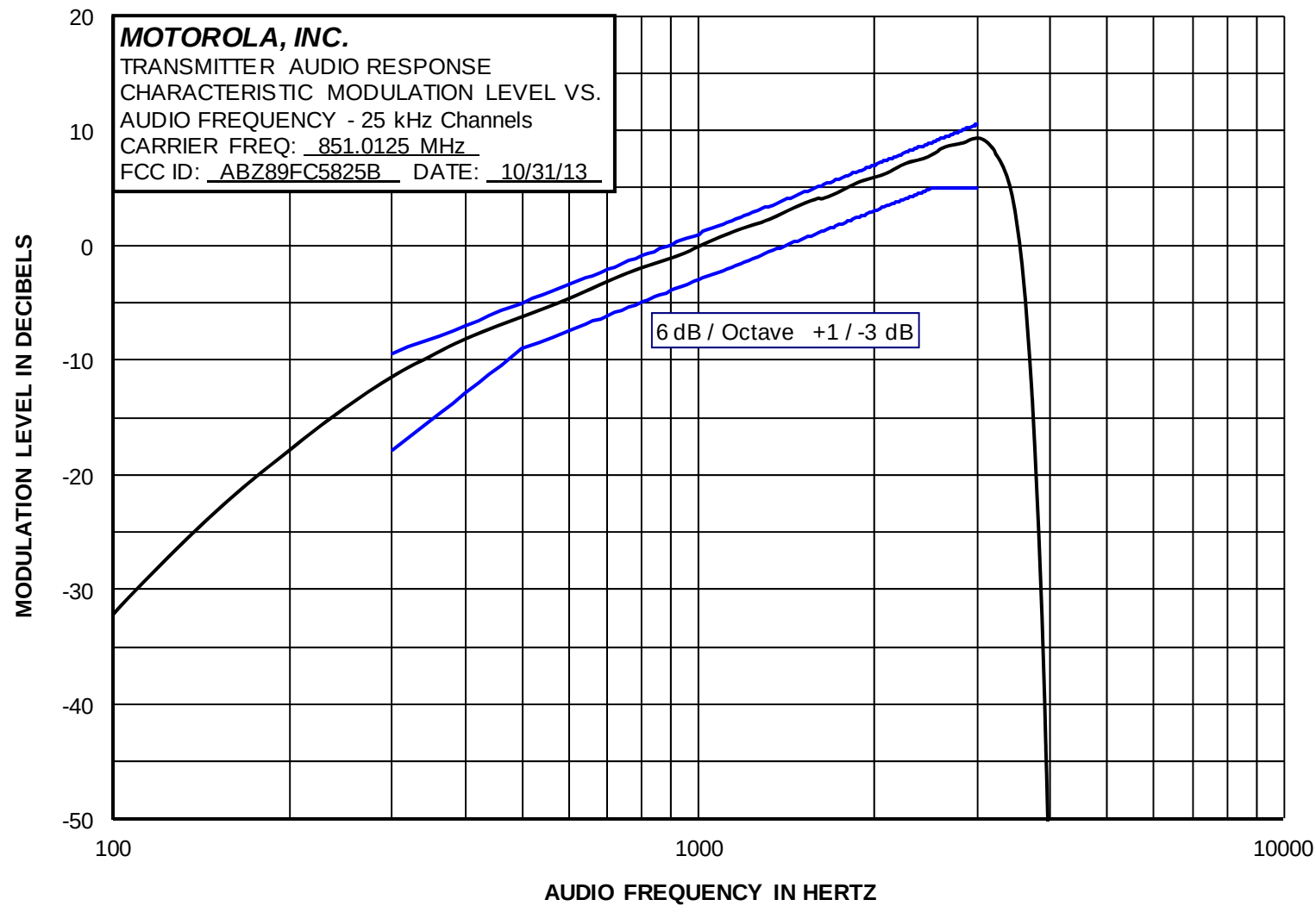
Modulation: Audio Test Tone

Carrier Frequency: Performance was measured at carrier frequencies at the low end, middle, and high end of the 851-869 MHz operating band. For performance in the FCC NPSPAC band, a carrier frequency in the 851-854 MHz range was also measured.

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
E1-7.7	Audio Frequency Response – Modulation Characteristics, NPSPAC Channels
	The specification limit is shown on the response plots

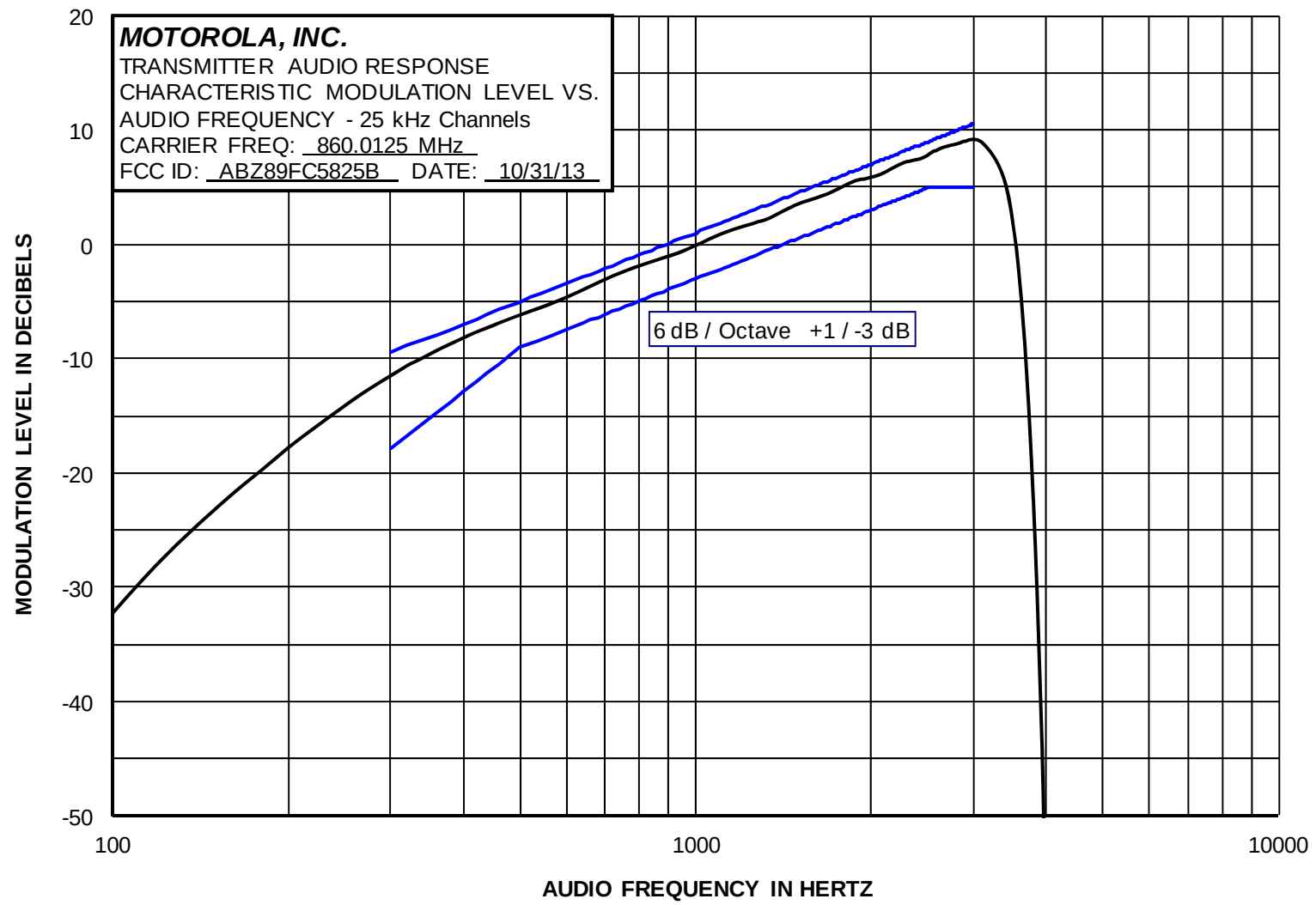
Report on Test Measurements

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



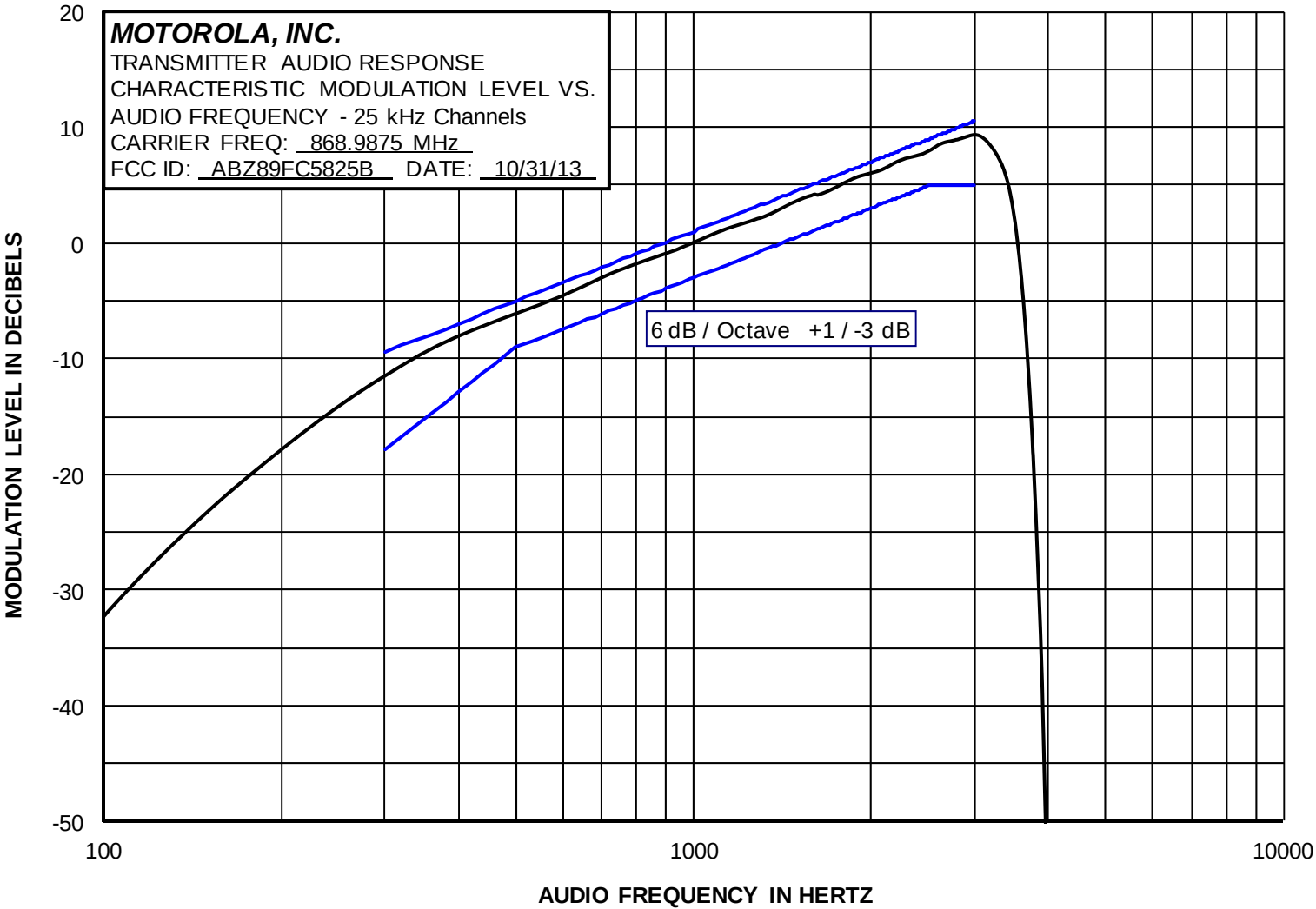
Report on Test Measurements

Audio Frequency Response – 25 kHz Channels – Middle of Band



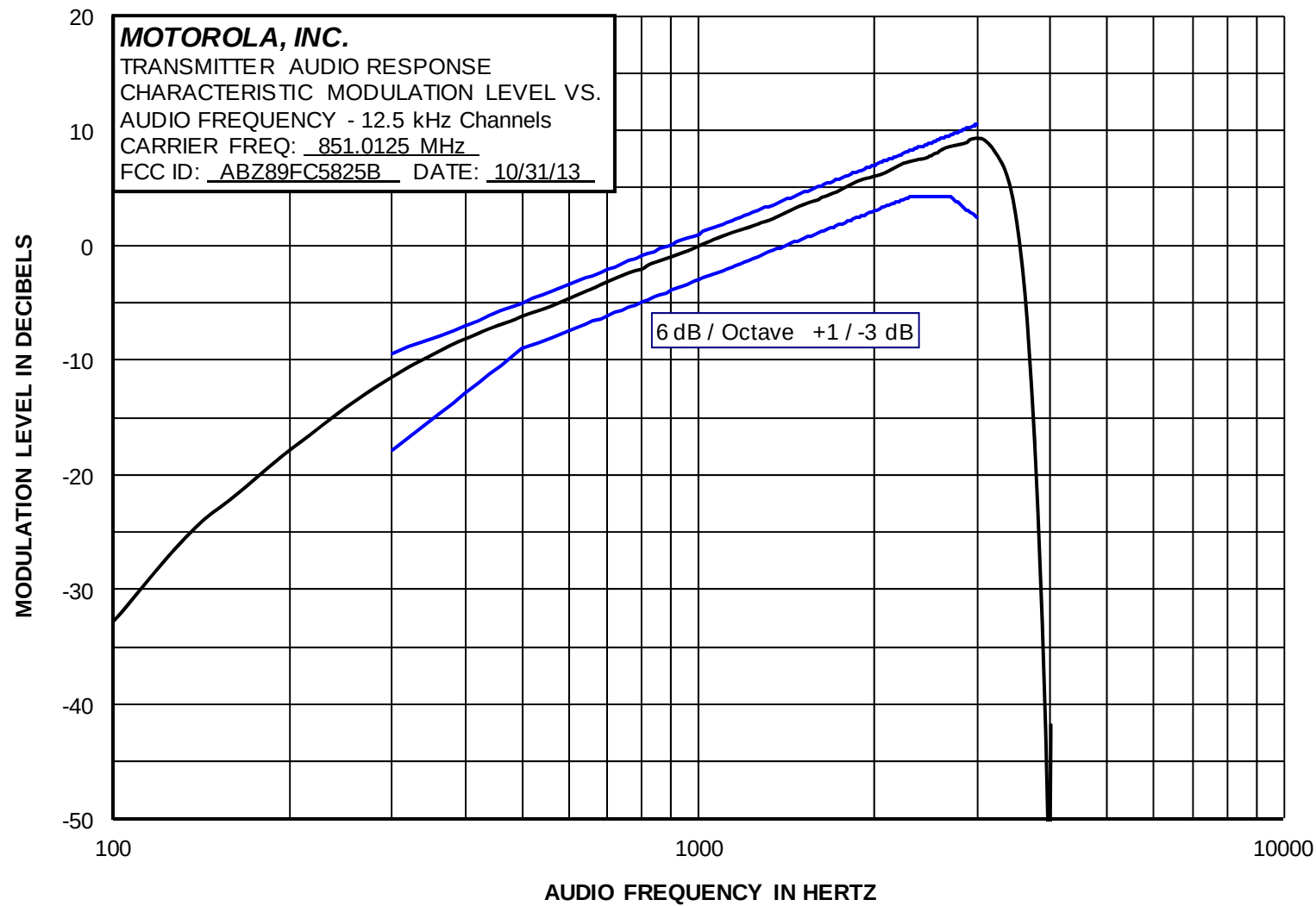
Report on Test Measurements

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



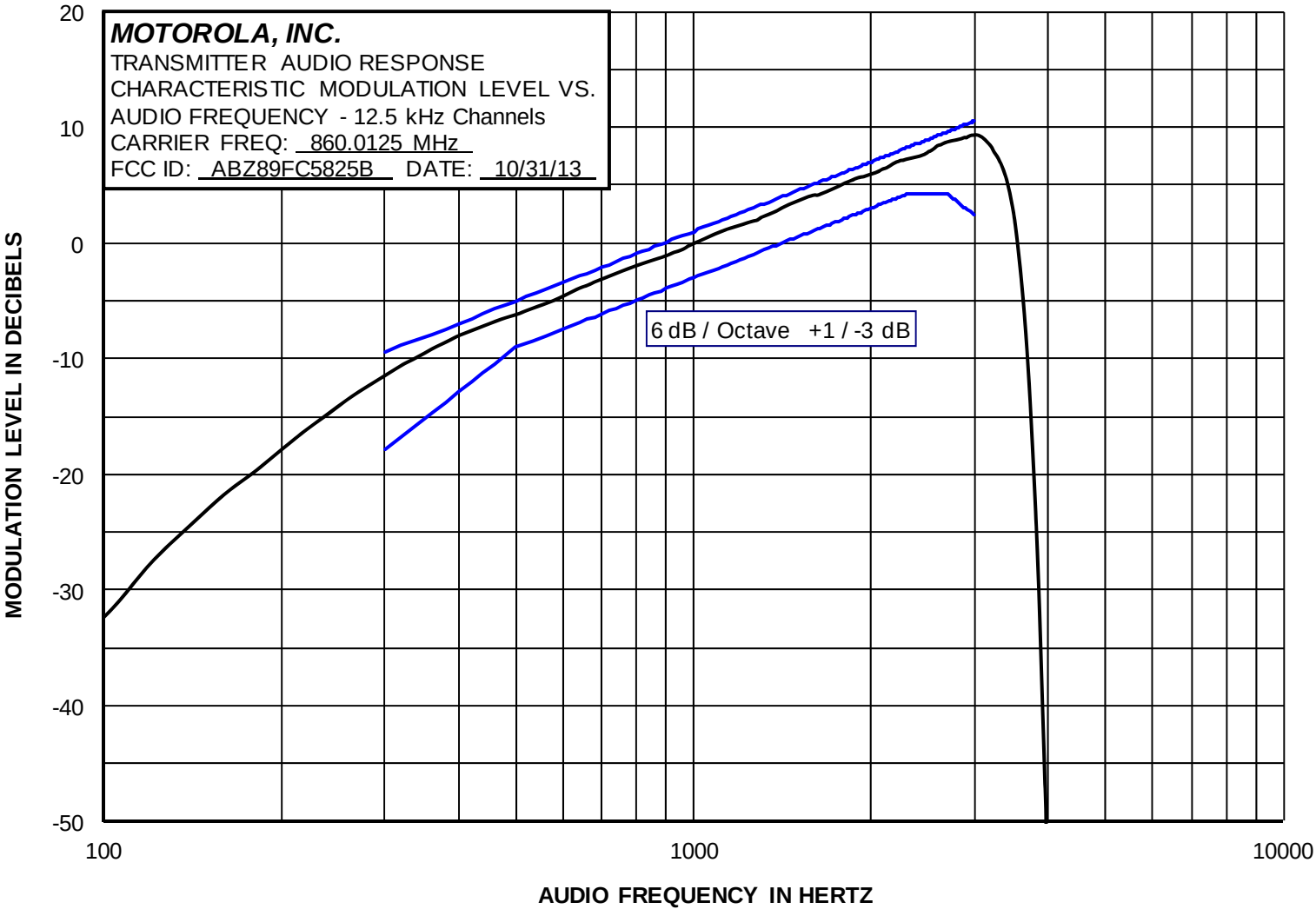
Report on Test Measurements

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



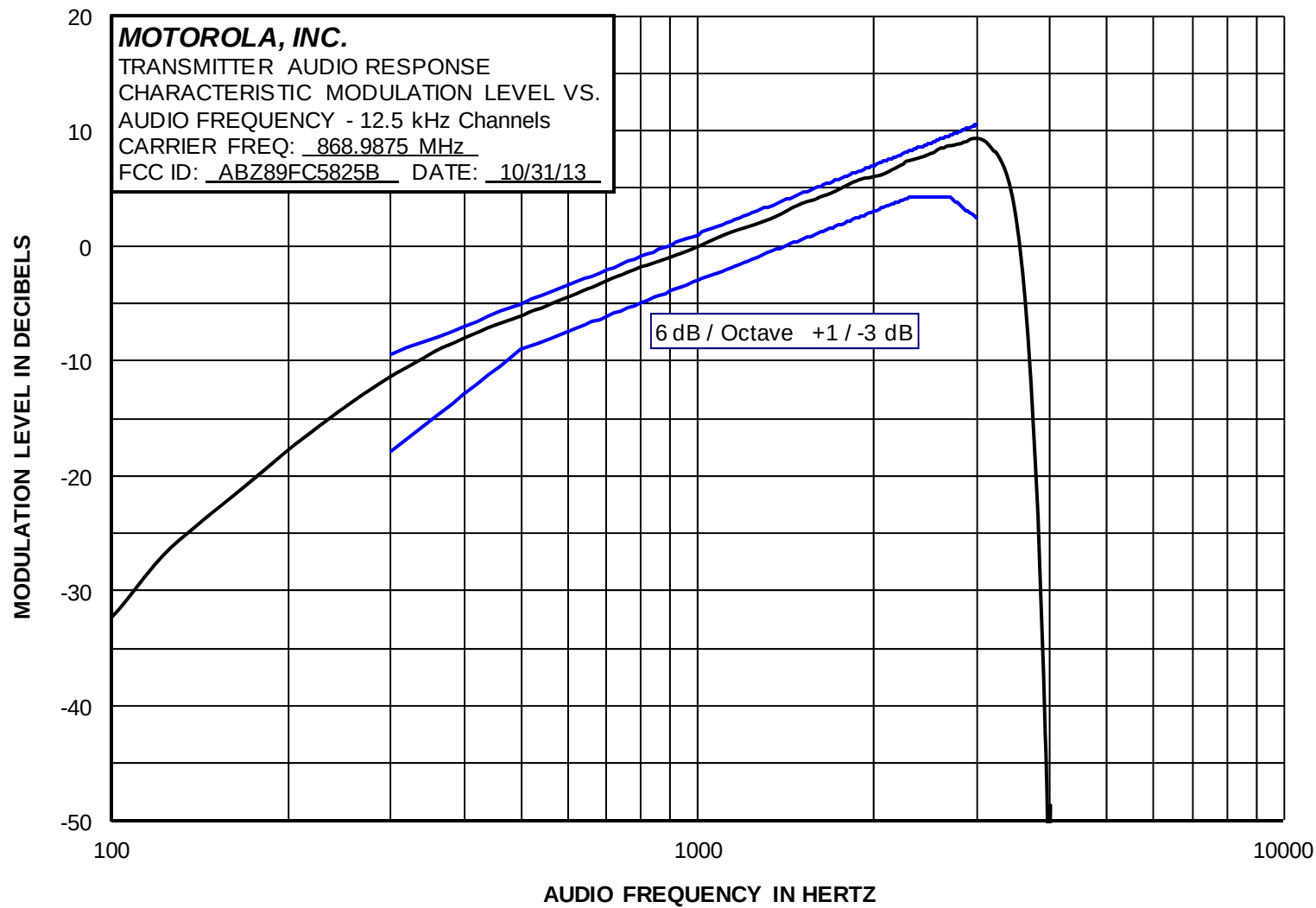
Report on Test Measurements

Audio Frequency Response – 12.5 kHz Channels – Middle of Band



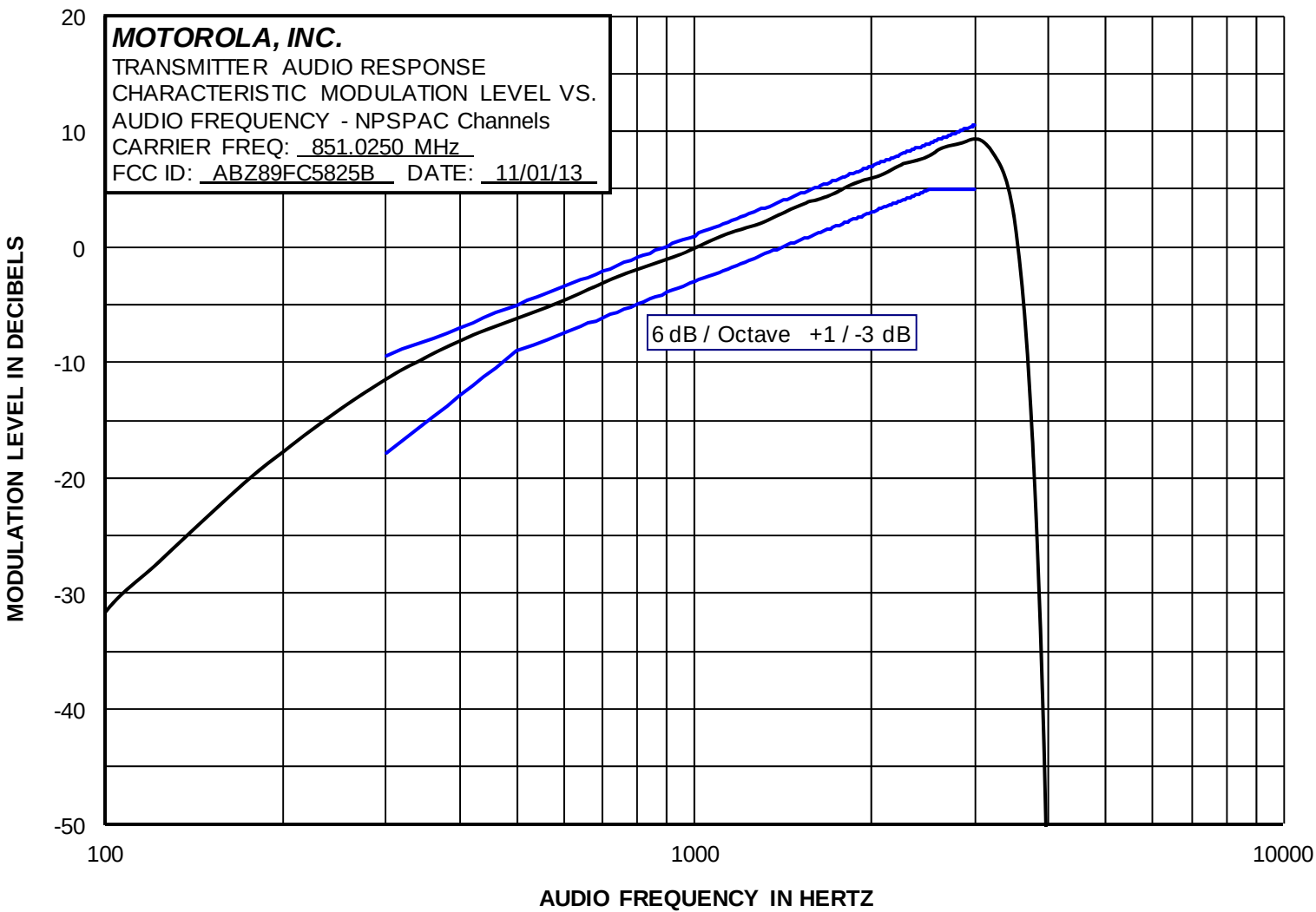
Report on Test Measurements

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



Report on Test Measurements

Audio Frequency Response – NPSPAC Channels



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 Limiting, NPSPAC Channels: The maximum instantaneous peak and steady state deviations shall not exceed the rated system deviation of +/- 4 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 2.4 kHz.

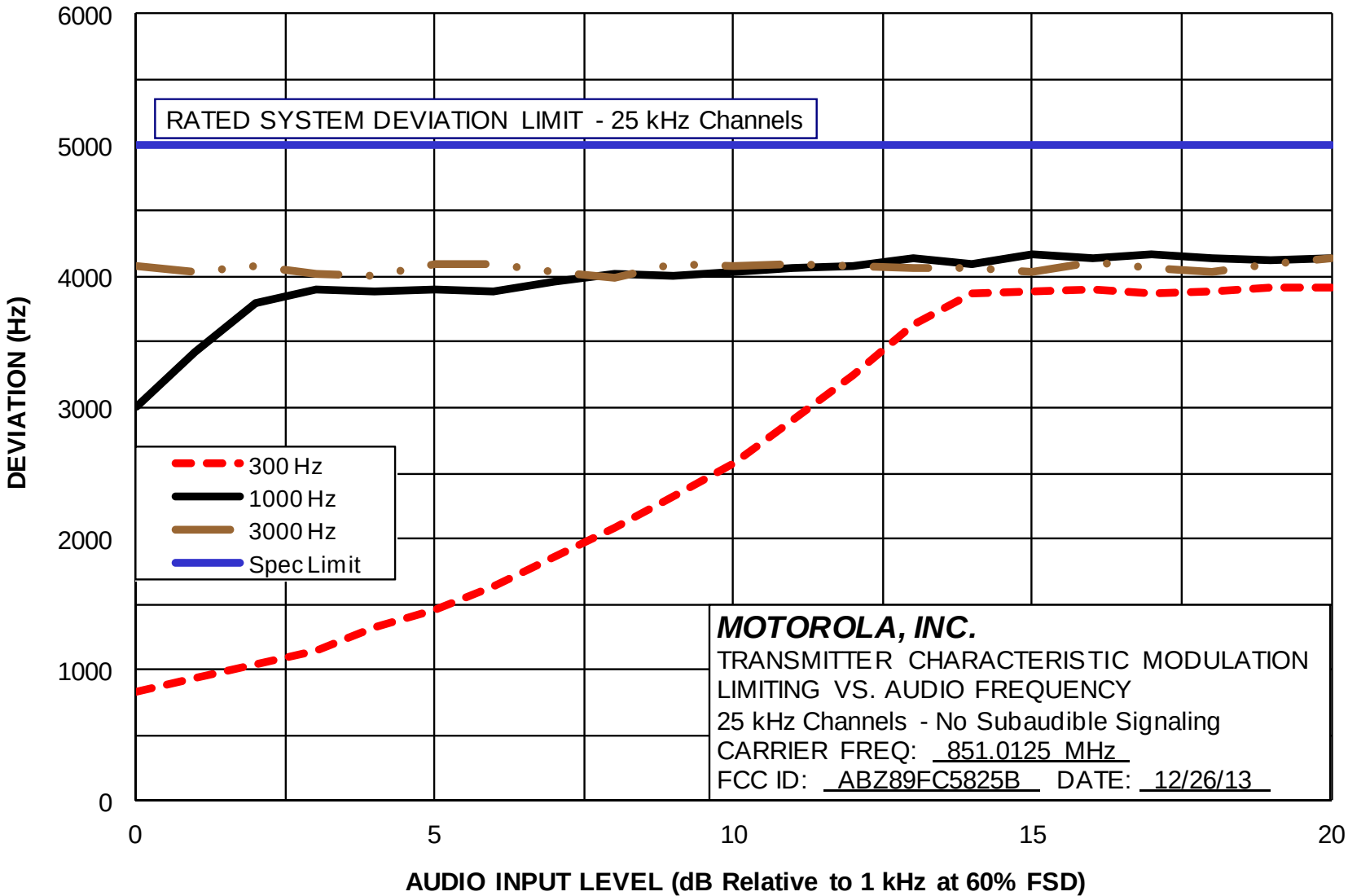
Modulation: Audio Test Tone, Varying Frequency between 300 Hz and 3000 Hz
Carrier Frequency: Performance was measured at carrier frequencies at the low end, middle, and high end of the 851-869 MHz operating band. For performance in the FCC NPSPAC band, a carrier frequency in the 851-854 MHz range was also measured.

Modulation Limiting Response Plots:

EXHIBIT	DESCRIPTION
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
E1-8.7	Modulation Limiting Response – Modulation Characteristics, NPSPAC Channels

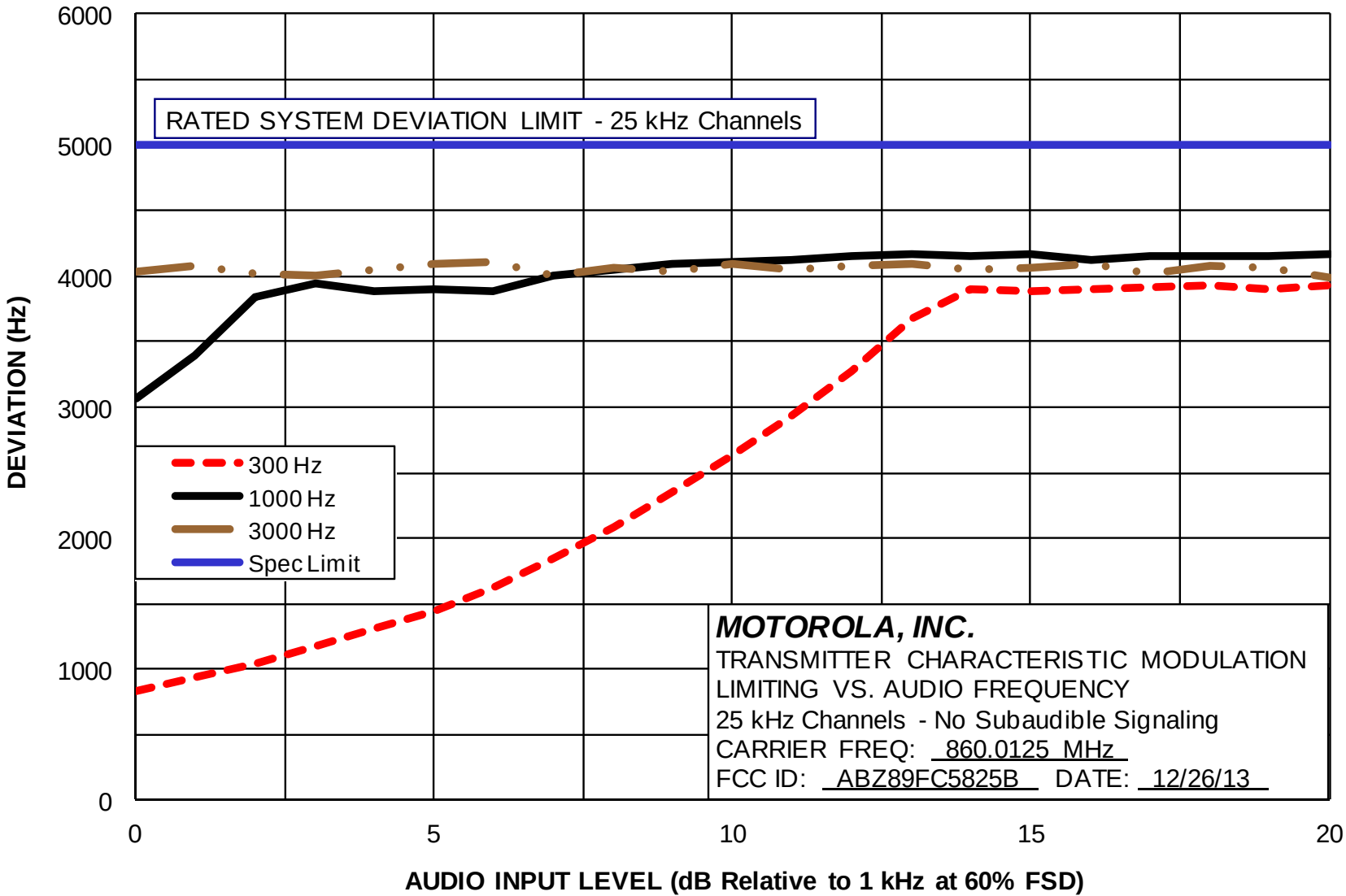
Report on Test Measurements

Modulation Limiting – 25 kHz Channels – Low End of Band



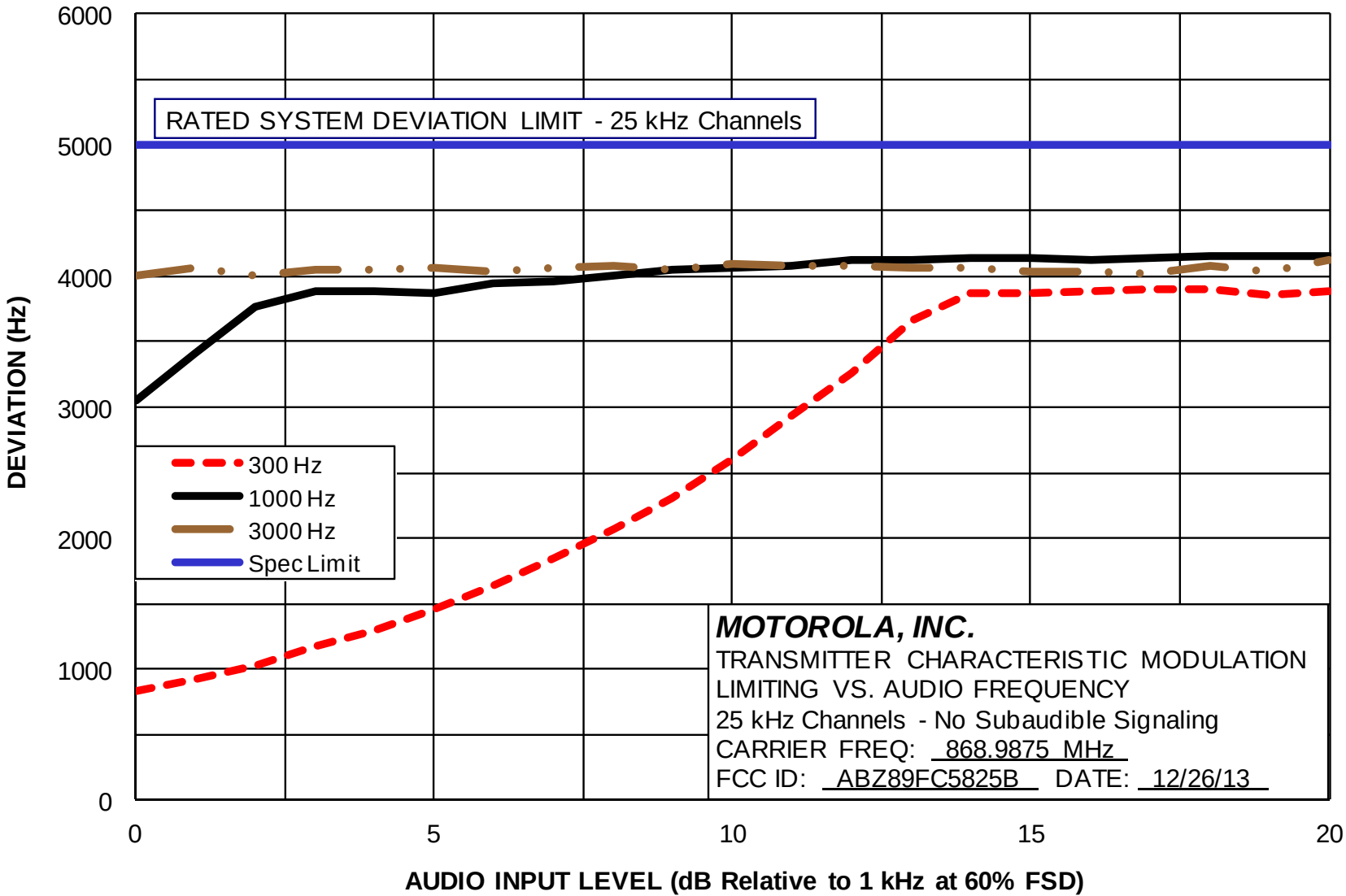
Report on Test Measurements

Modulation Limiting – 25 kHz Channels – Middle of Band



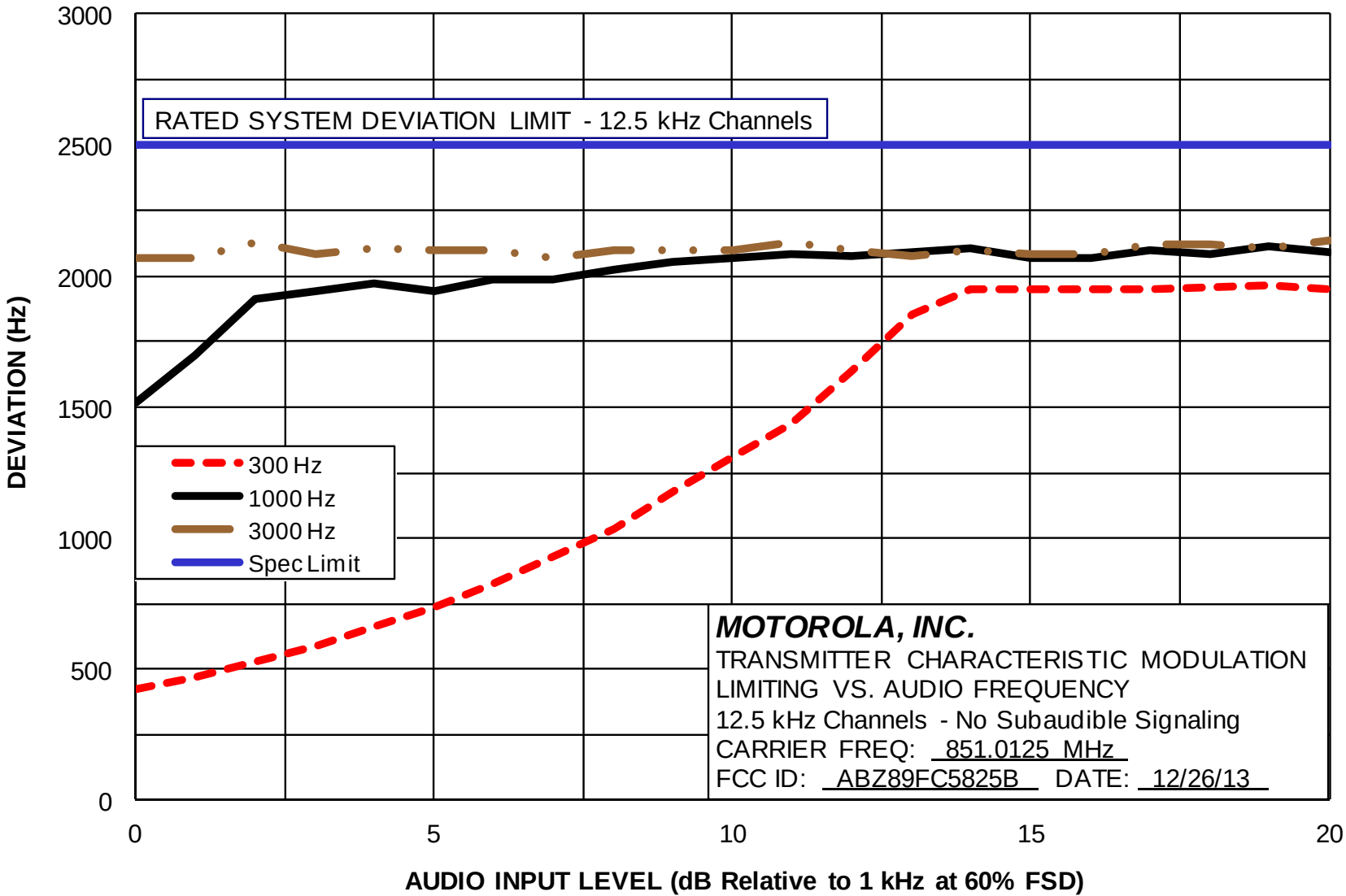
Report on Test Measurements

Modulation Limiting – 25 kHz Channels – High End of Band



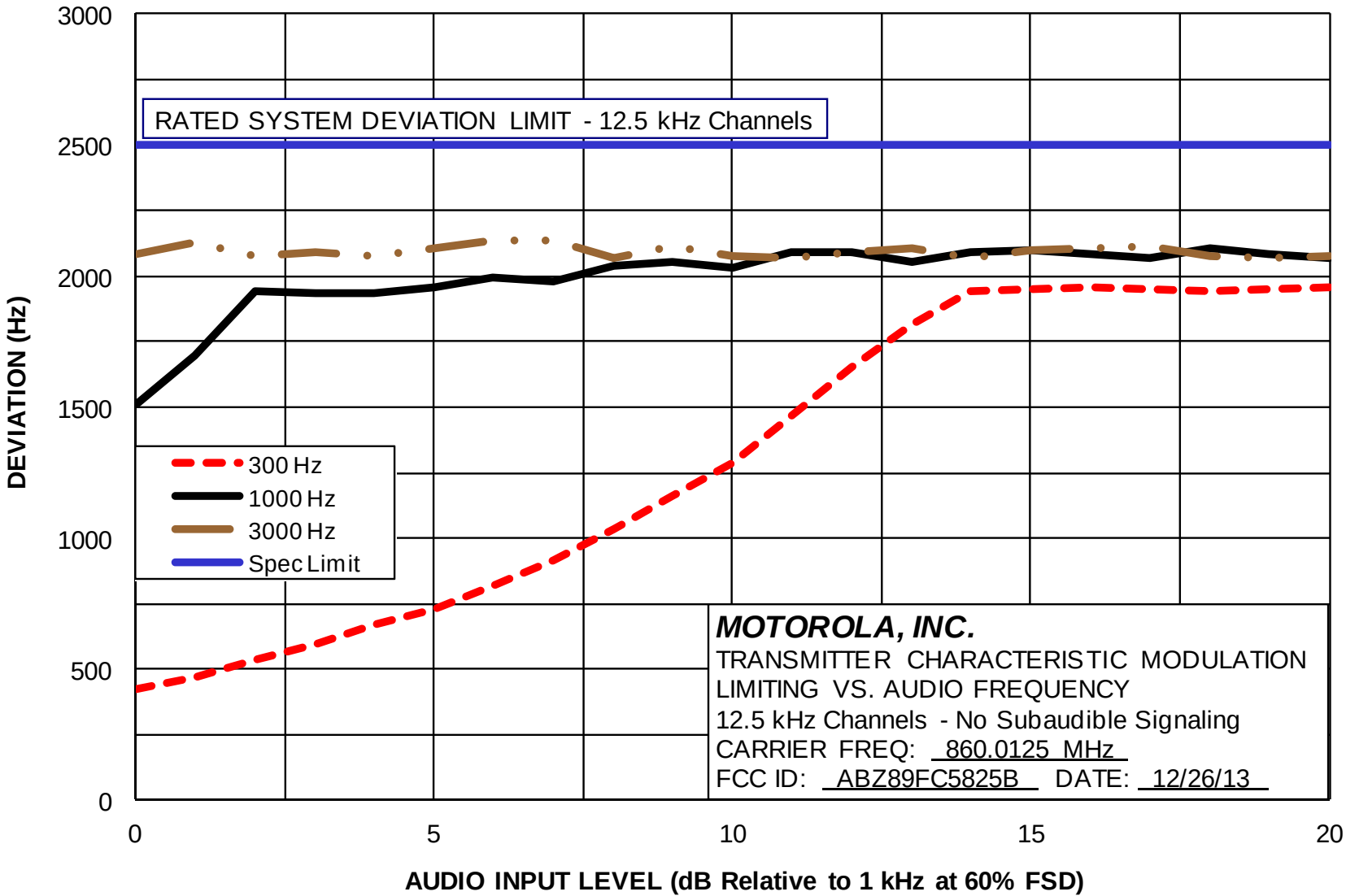
Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – Low End of Band



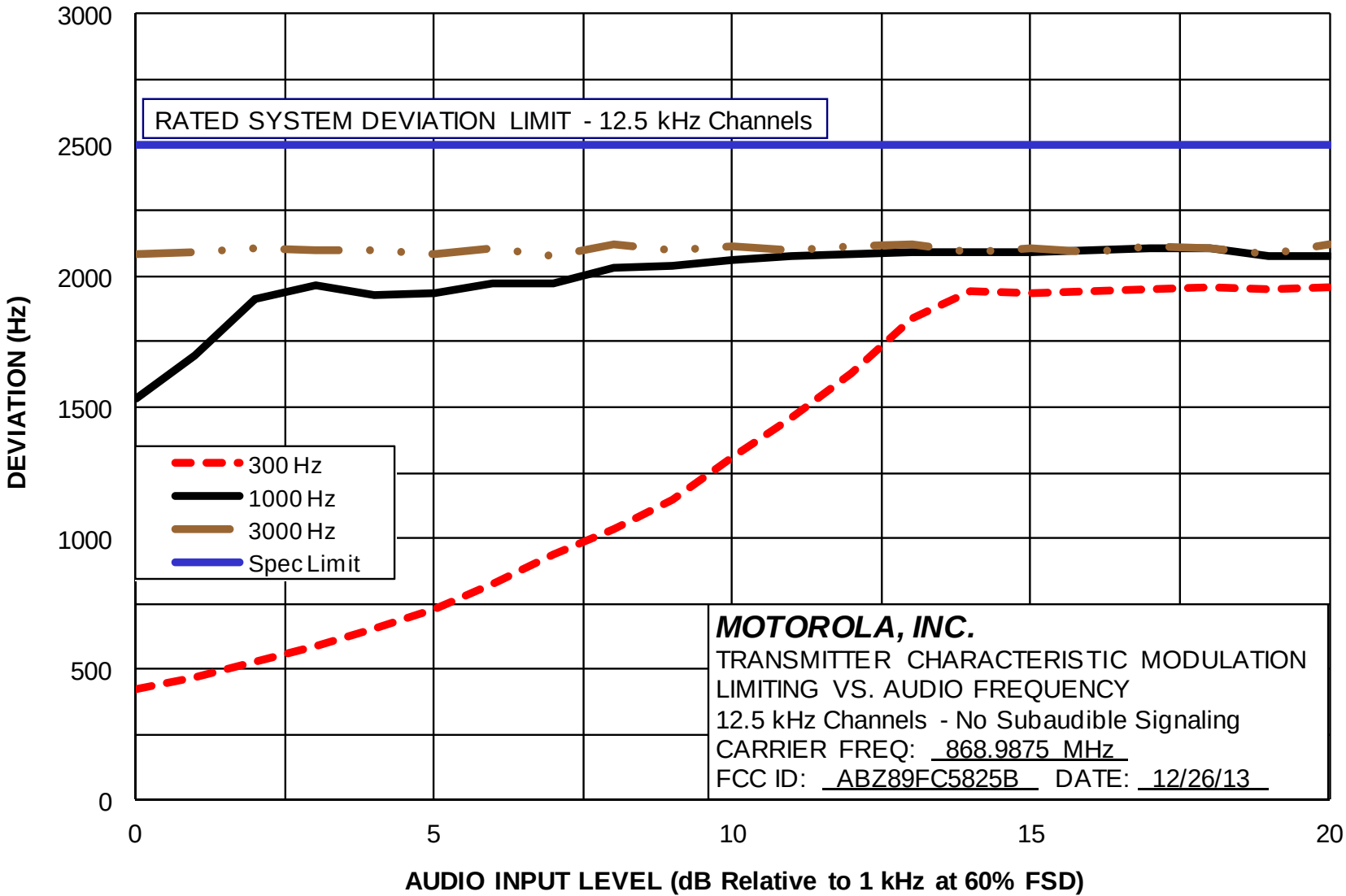
Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – Middle of Band



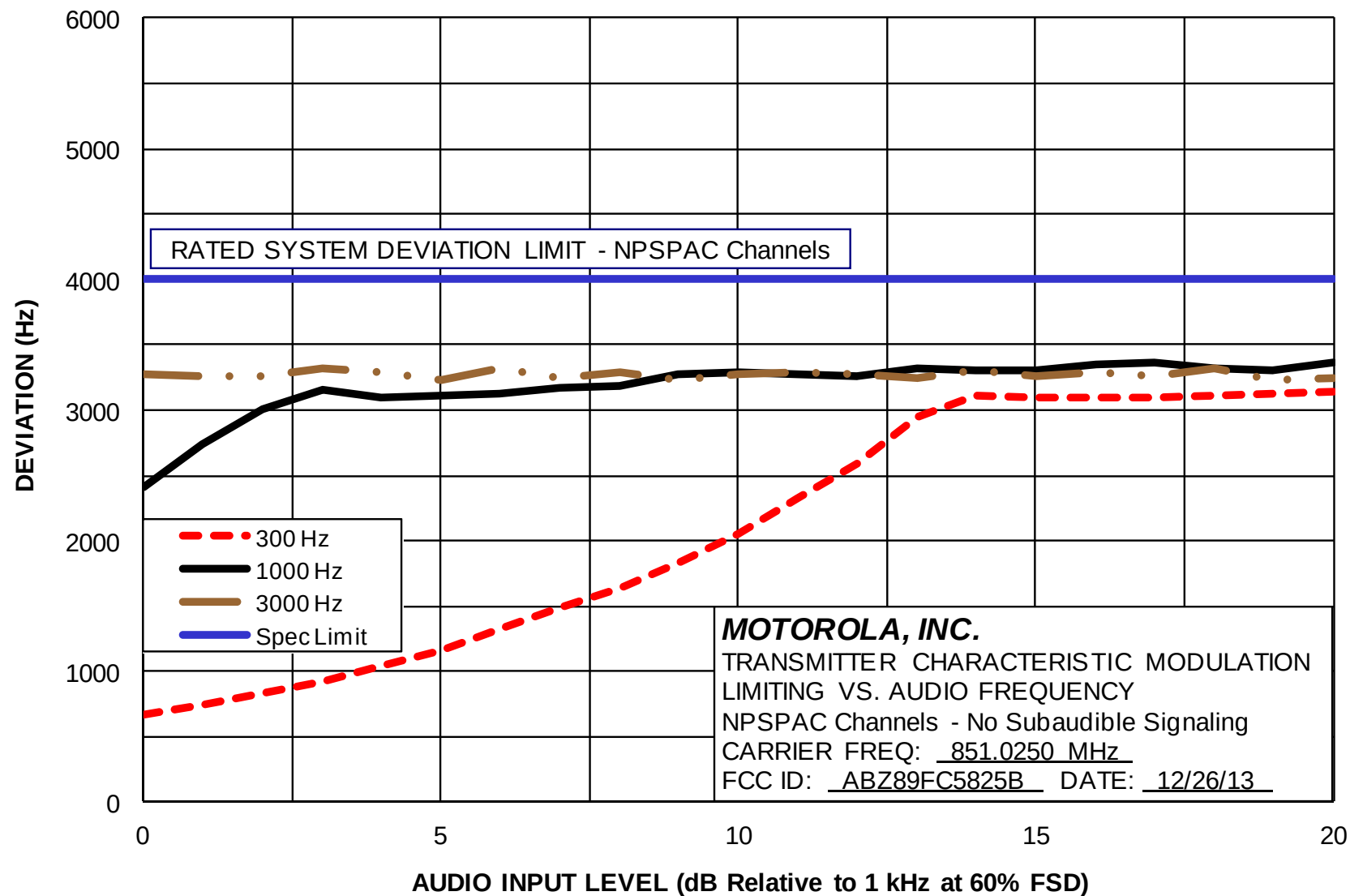
Report on Test Measurements

Modulation Limiting – 12.5 kHz Channels – High End of Band



Report on Test Measurements

Modulation Limiting – NPSPAC Channels



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, tone plus Private Line (PL) sub-audible tone signaling, tone plus Digital Private Line (DPL) sub-audible signaling, tone plus 150 bps low speed data, and tone plus 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: ± 5.0 kHz Max
Power Setting: 150 Watts

Specification Requirement 47 CFR §90.210(b) and IC RSS-119 section 5.8.1 - 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 per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 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

Measurement Procedure and Instrument Settings:Emission Measurement Analyzer Settings

Horizontal:	12.5 kHz per Division	Resolution BW:	300 Hz
Vertical:	10 dB per Division	Video BW:	10 kHz
Sweep Time:	72 Seconds (<2 kHz/Sec)	Span:	125 kHz
Detector:	Peak		

Measured Occupied Bandwidth

Resolution BW:	300 Hz
Span:	30 kHz
Number of Points:	1601
Integration Time:	7.4 ms

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.
- 5) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW Low, Mid, High
E1-9.1, 2, 3	Carrier with 2500 Hz Audio Tone, 25 kHz Channels	14.85, 14.85, 14.86 kHz
E1-9.4, 5, 6	Carrier, 2500 Hz Audio, Private Line (PL), 25 kHz Channels	11.67, 11.65, 11.68 kHz
E1-9.7, 8, 9	Carrier, 2500 Hz Audio, Digital Private Line (DPL), 25 kHz Channels	11.90, 11.88, 11.89 kHz
E1-9.10, 11, 12	Carrier, 2500 Hz Audio, 150 bps Low Speed Data, 25 kHz Channels	11.82, 11.77, 11.75 kHz
E1-9.13, 14, 15	Carrier, 2500 Hz Audio, 300 bps Low Speed Data, 25 kHz Channels	11.66, 11.63, 11.70 kHz

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, tone plus Private Line (PL) sub-audible tone signaling, tone plus Digital Private Line (DPL) sub-audible signaling, tone plus 150 bps low speed data, and tone plus 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: ± 5.0 kHz Max
Power Setting: 150 Watts

Specification Requirement 47 CFR §90.210(d) and IC RSS-119 section 5.8.3 - 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 per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 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

Measurement Procedure and Instrument Settings:

Emission Measurement Analyzer Settings

Horizontal:	12.5 kHz per Division	Resolution BW:	100 Hz
Vertical:	10 dB per Division	Video BW:	10 kHz
Sweep Time:	72 Seconds (<2 kHz/Sec)	Span:	125 kHz
Detector:	Peak		

Measured Occupied Bandwidth

Resolution BW:	150 Hz
Span:	15 kHz
Number of Points:	1601
Integration Time:	14.8 ms

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.
- 5) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW Low, Mid, High
E1-9.16, 17, 18	Carrier with 2500 Hz Audio Tone, 12.5 kHz Channels	9.95, 9.95, 9.95 kHz
E1-9.19, 20, 21	Carrier, 2500 Hz Audio, Private Line (PL), 12.5 kHz Channels	6.06, 6.05, 6.05 kHz
E1-9.22, 23, 24	Carrier, 2500 Hz Audio, Digital Private Line (DPL), 12.5 kHz Channels	6.06, 6.06, 6.06 kHz
E1-9.25, 26, 27	Carrier, 2500 Hz Audio, 150 bps Low Speed Data, 12.5 kHz Channels	6.03, 6.04, 6.02 kHz
E1-9.28, 29, 30	Carrier, 2500 Hz Audio, 300 bps Low Speed Data, 12.5 kHz Channels	6.02, 6.01, 6.00 kHz

Report on Test Measurements

Occupied Bandwidth – Analog Voice Frequency Modulation, NPSPAC Channels

The exhibits in this section show occupied bandwidth plots for analog voice modulation. Data is shown with the modulating audio tone itself, tone plus Private Line (PL) sub-audible tone signaling, tone plus Digital Private Line (DPL) sub-audible signaling, tone plus 150 bps low speed data, and tone plus 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: 14K0F3E
Channelization: 25 kHz
Deviation Limit: ± 5.0 kHz Max
Power Setting: 150 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 per the formulas defined in 47 CFR §2.202(g) / TRC-43 section 8 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	4 kHz	14 kHz	14K0

Measurement Procedure and Instrument Settings:

<u>Emission Measurement Analyzer Settings</u>				<u>Measured Occupied Bandwidth</u>	
Horizontal:	12.5 kHz per Division	Resolution BW:	300 Hz	Resolution BW:	300 Hz
Vertical:	10 dB per Division	Video BW:	10 kHz	Span:	30 kHz
Sweep Time:	72 Seconds (<2 kHz/Sec)	Span:	125 kHz	Number of Points:	1601
Detector:	Peak			Integration Time:	7.4 ms

Test Procedure:

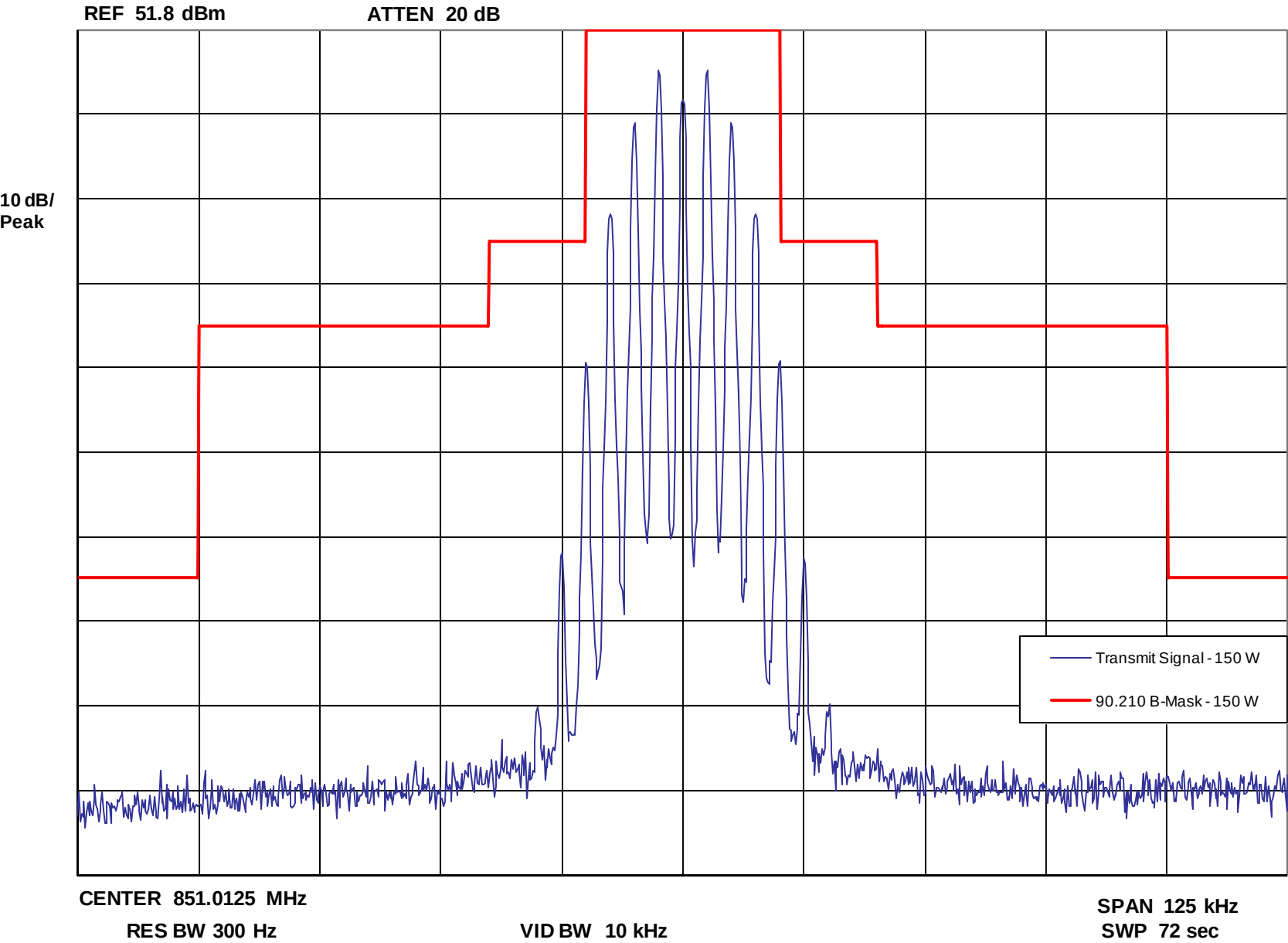
- 1) Key the station with no modulation to obtain the unmodulated carrier reference level on the analyzer. Use the analyzer controls to set this reference to a full-scale reference line. Store this analyzer trace in trace A.
- 2) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 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.
- 5) Adjust the signal analyzer resolution BW and span as indicated above, use the Occupied Bandwidth function to record the value.

EXHIBIT	DESCRIPTION	Meas Occ BW Low, Mid, High
E1-9.31	Carrier with 2500 Hz Audio Tone, NPSPAC Channels	10.34 kHz
E1-9.32	Carrier, 2500 Hz Audio Tone, Private Line (PL), NPSPAC Channels	10.98 kHz
E1-9.33	Carrier, 2500 Hz Audio Tone, Digital Private Line (DPL), NPSPAC Channels	11.29 kHz
E1-9.34	Carrier, 2500 Hz Audio Tone, 150 bps Low Speed Data, NPSPAC Channels	11.14 kHz
E1-9.35	Carrier, 2500 Hz Audio Tone, 300 bps Low Speed Data, NPSPAC Channels	11.01 kHz

Report on Test Measurements

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

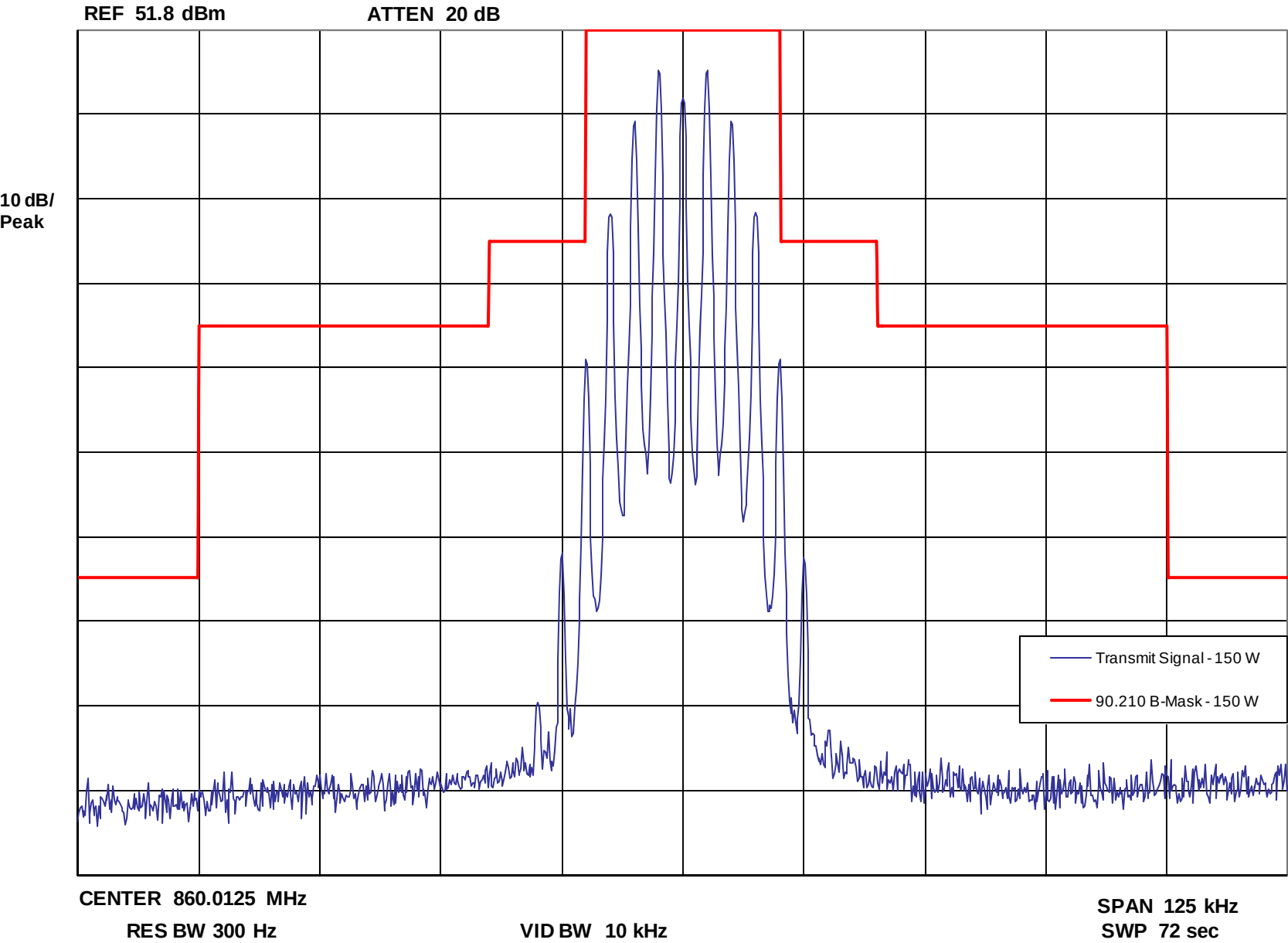
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

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

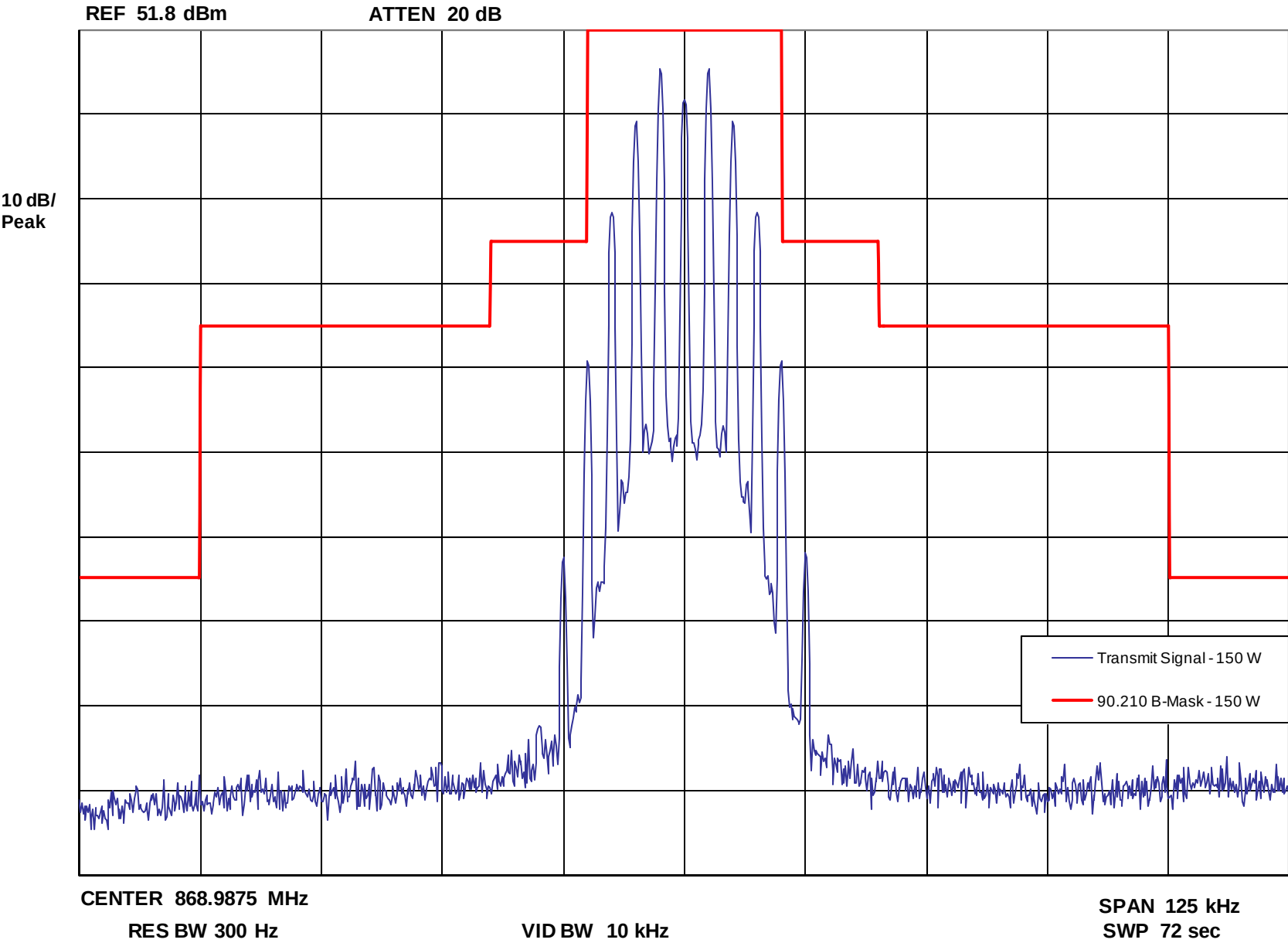
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

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

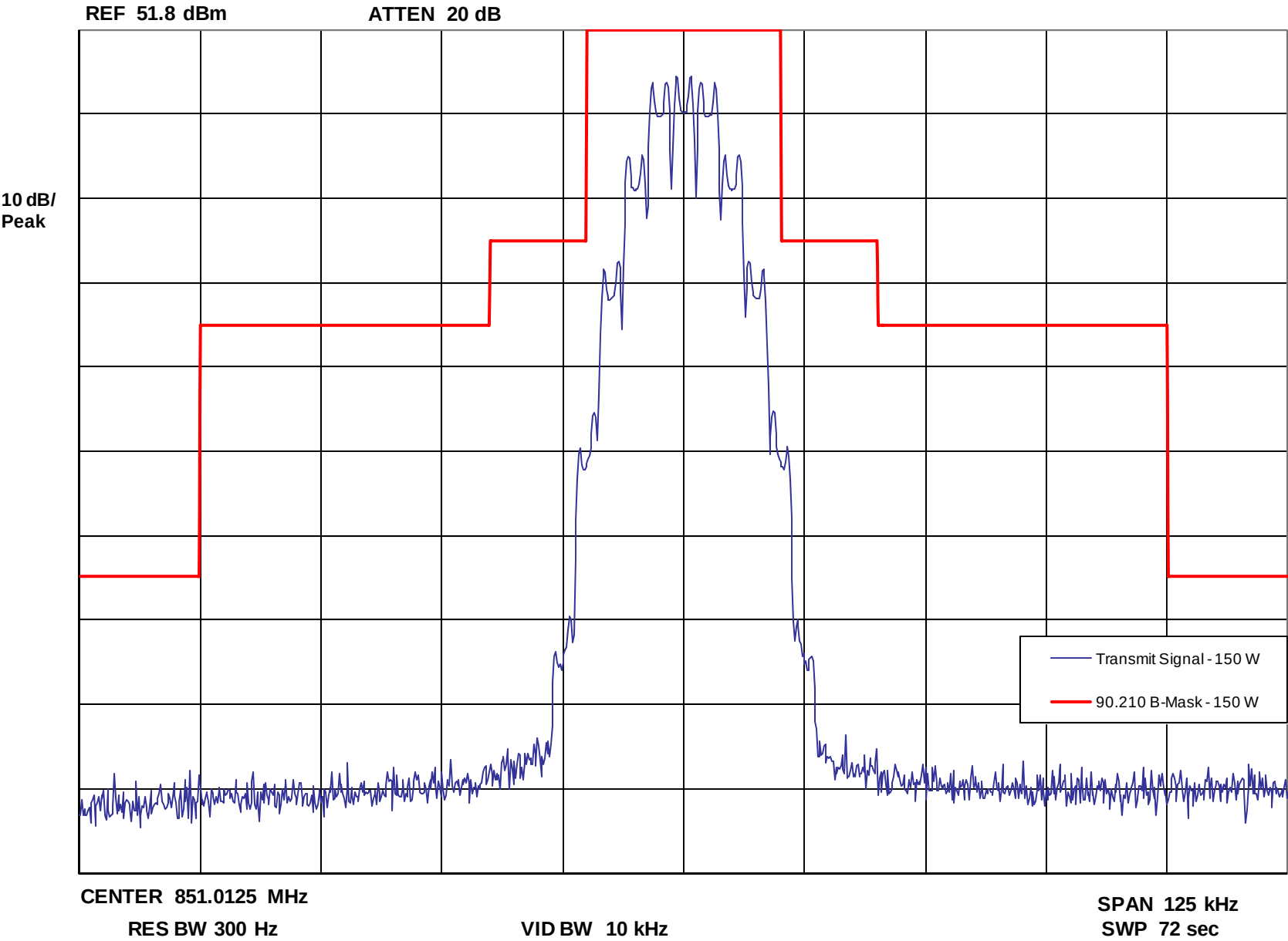
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

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

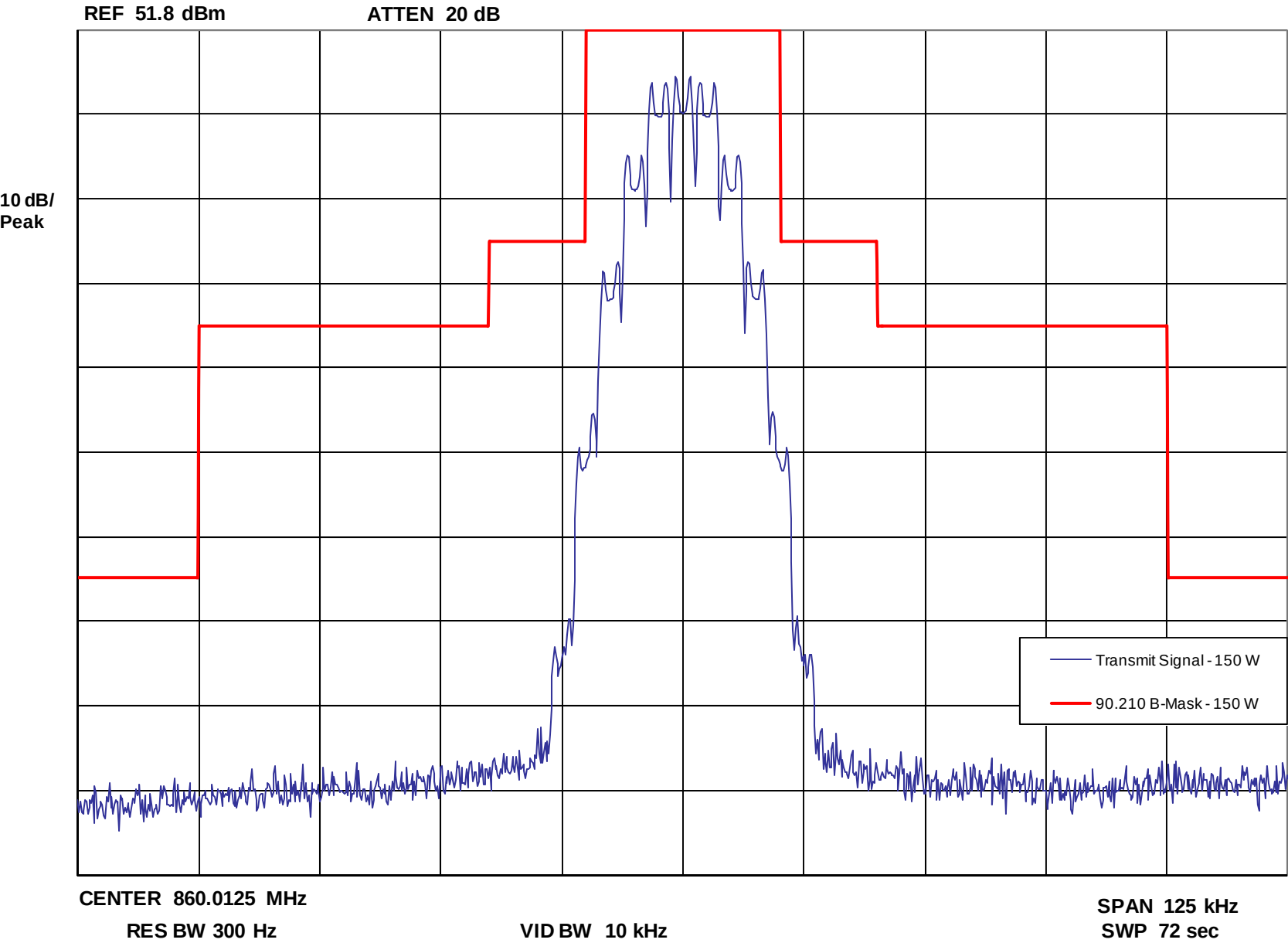
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



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

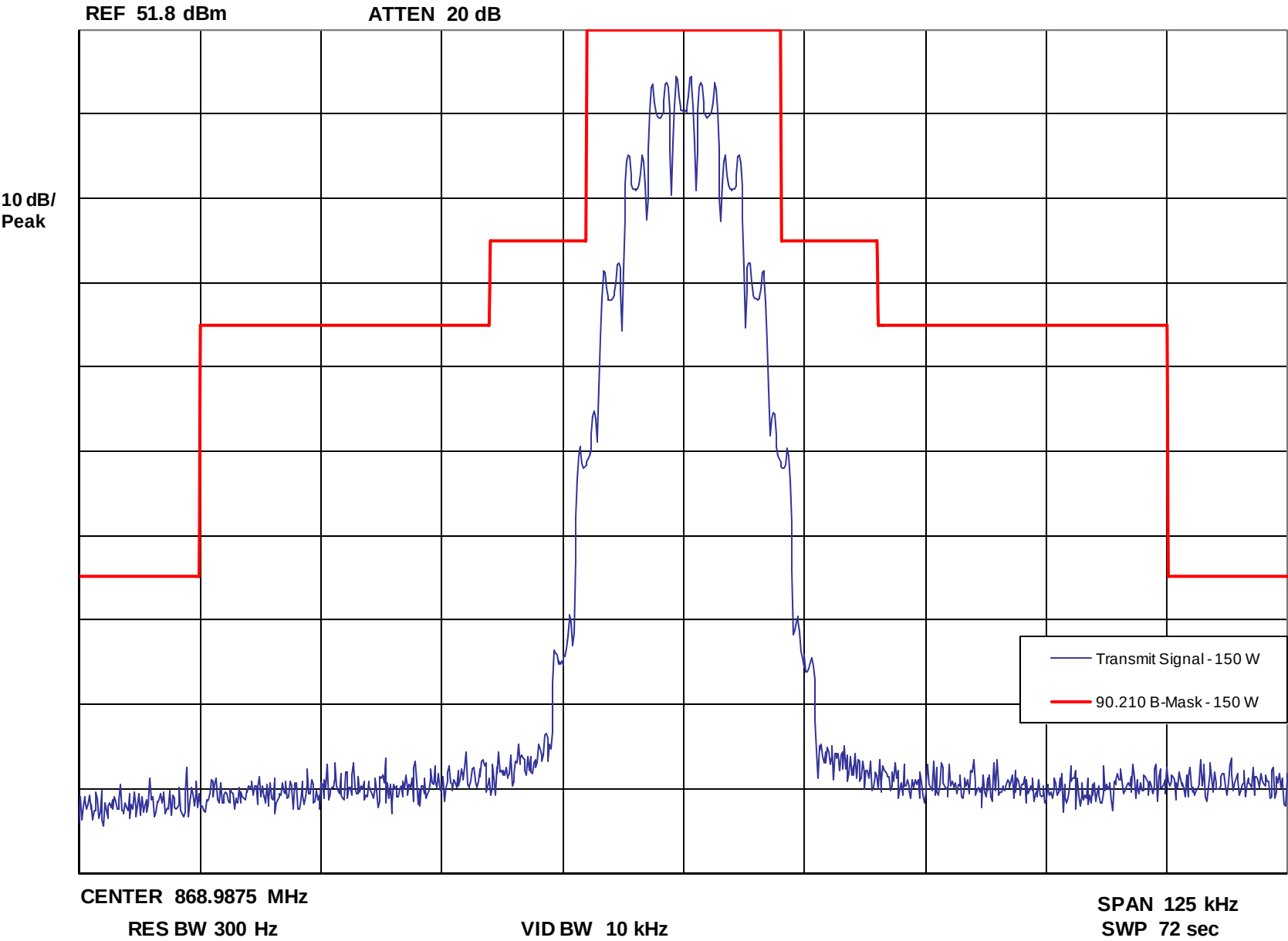
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



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

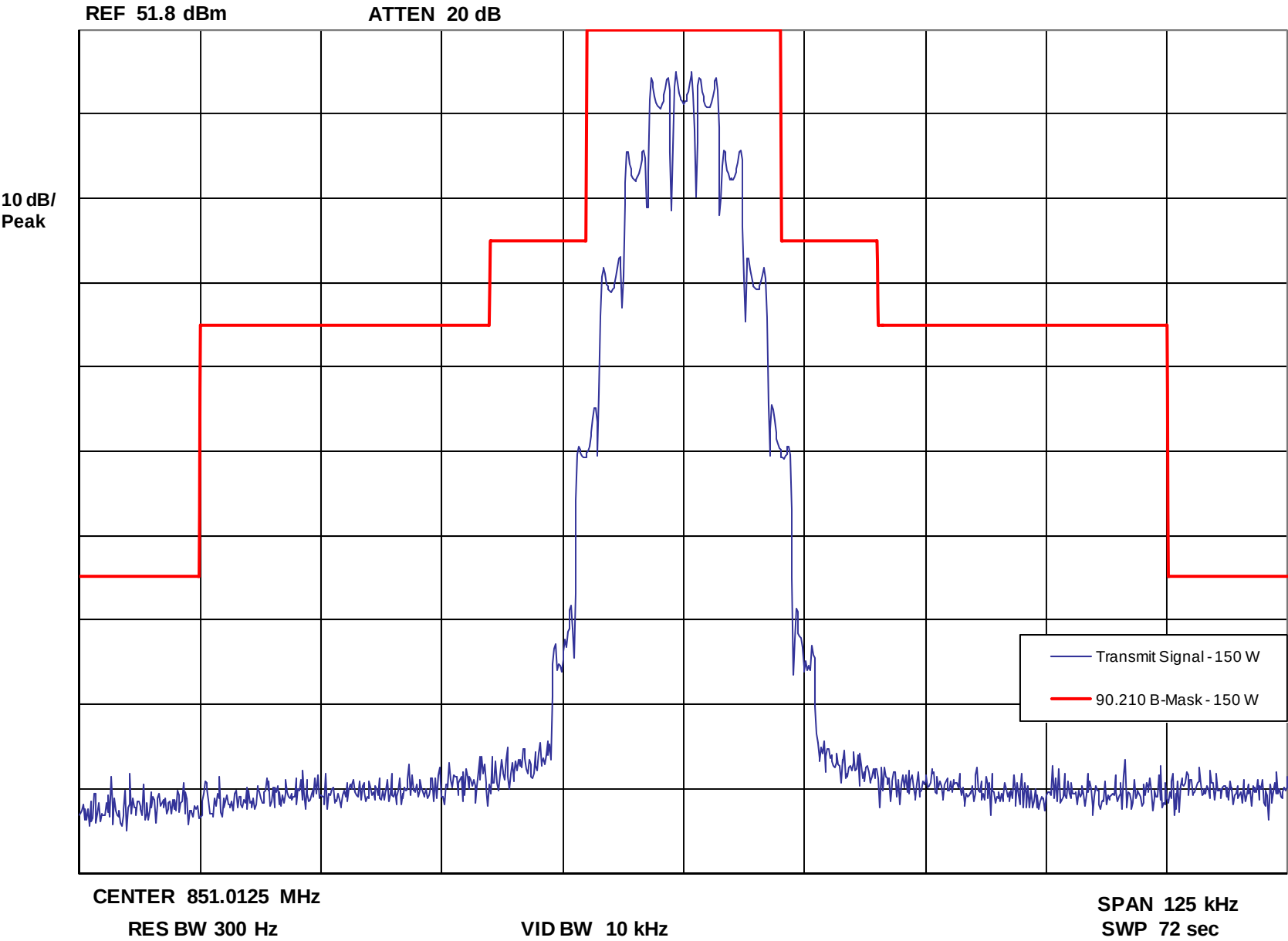
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



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

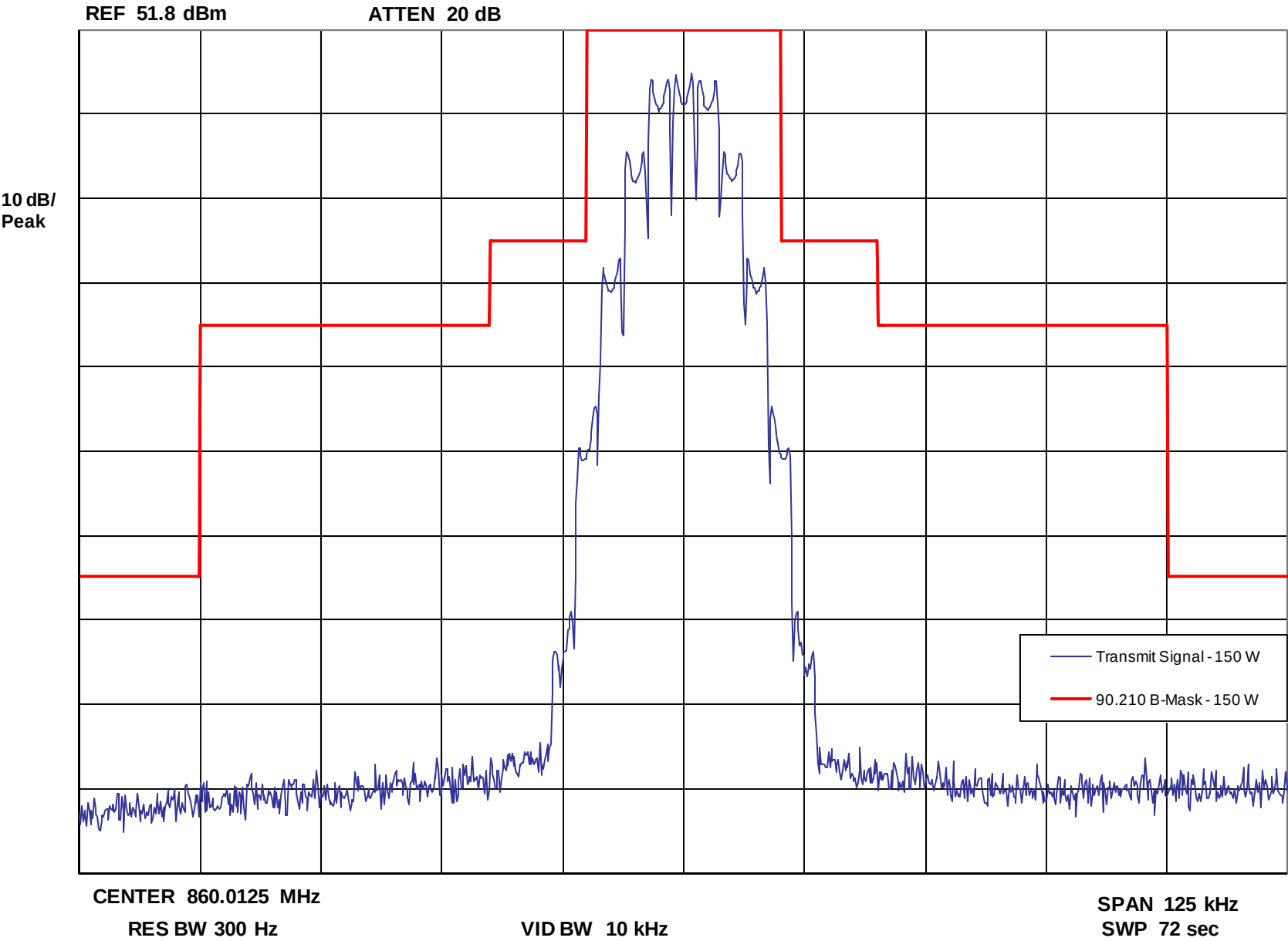
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



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

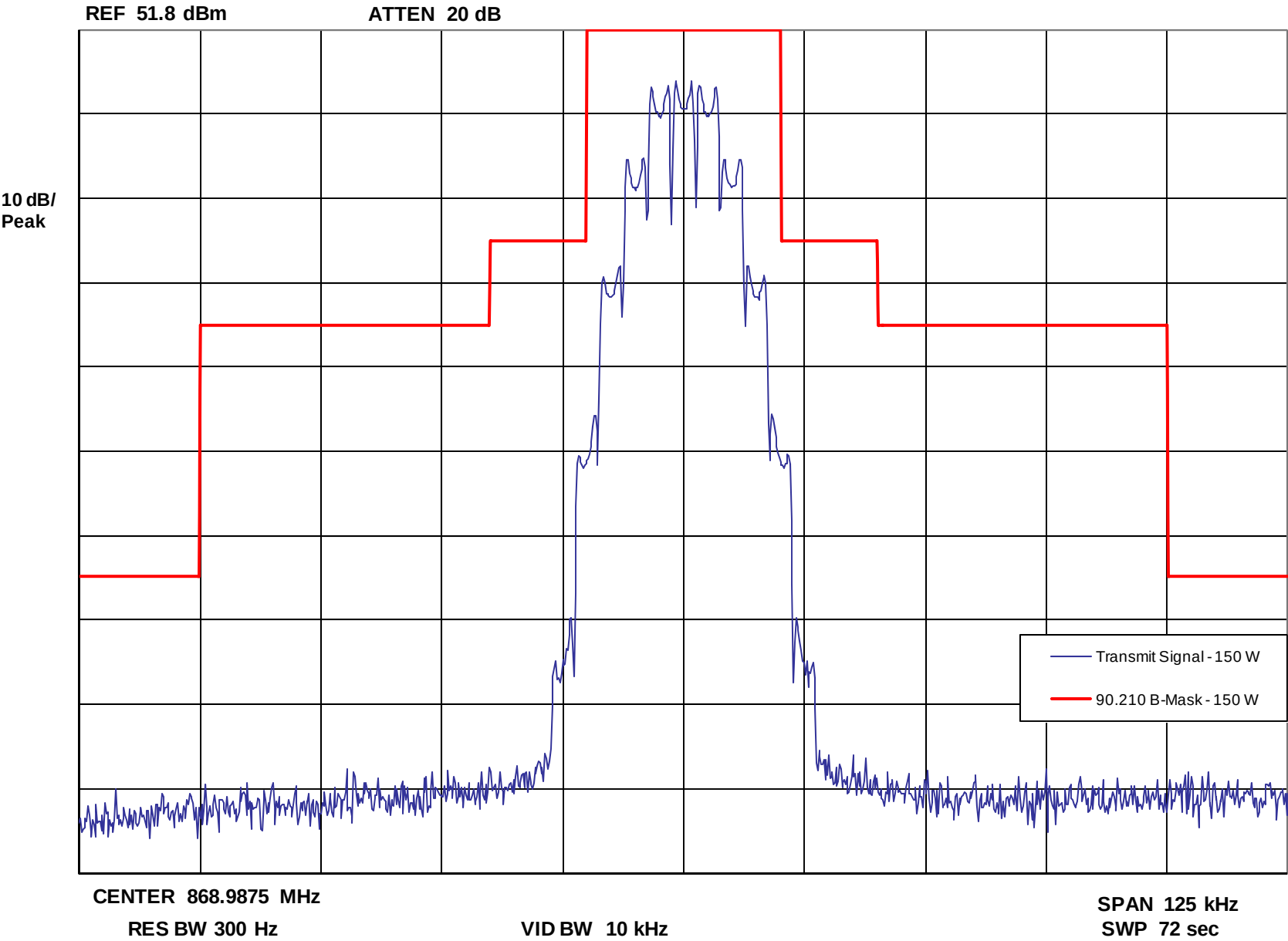
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



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

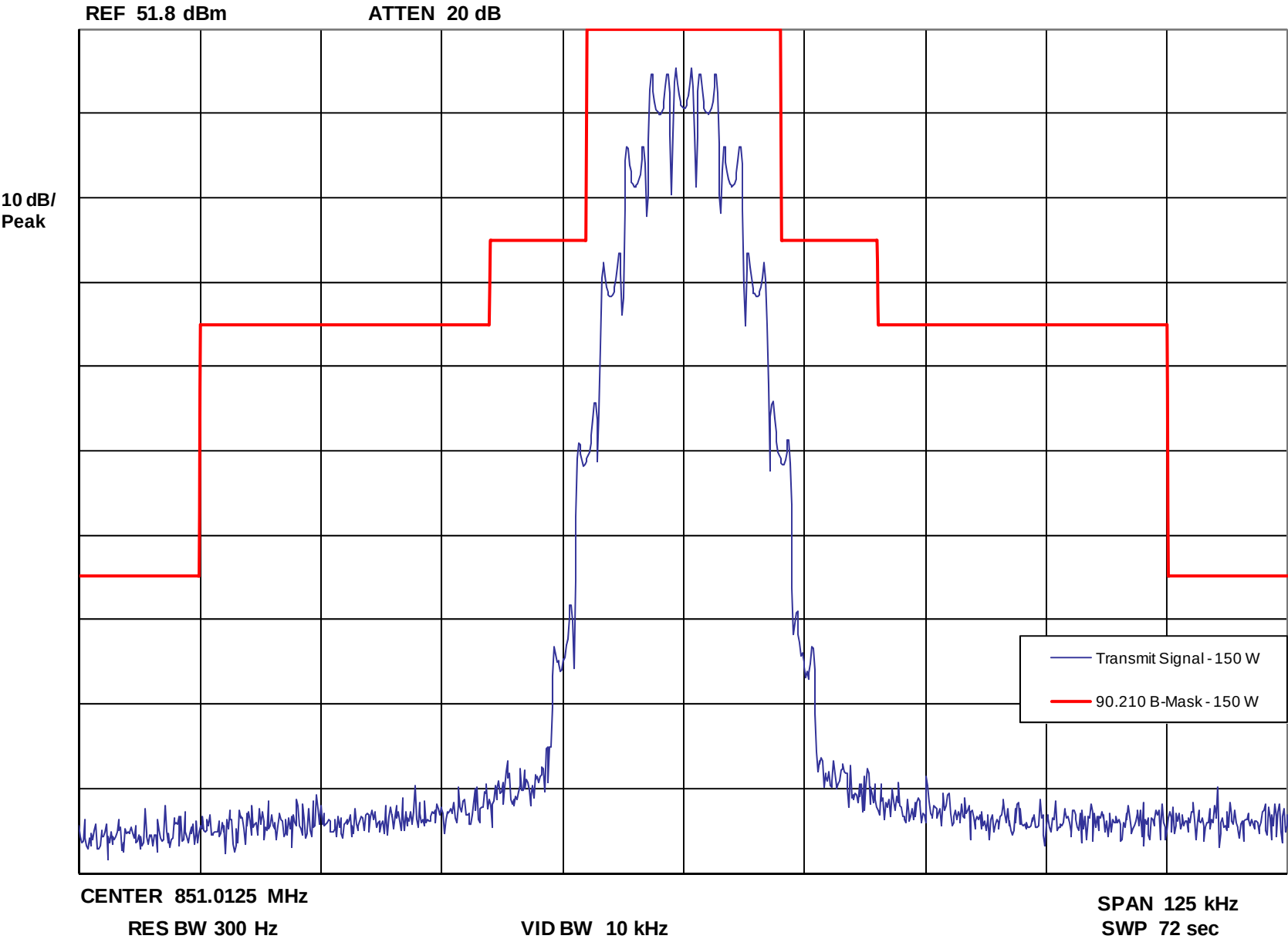
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



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

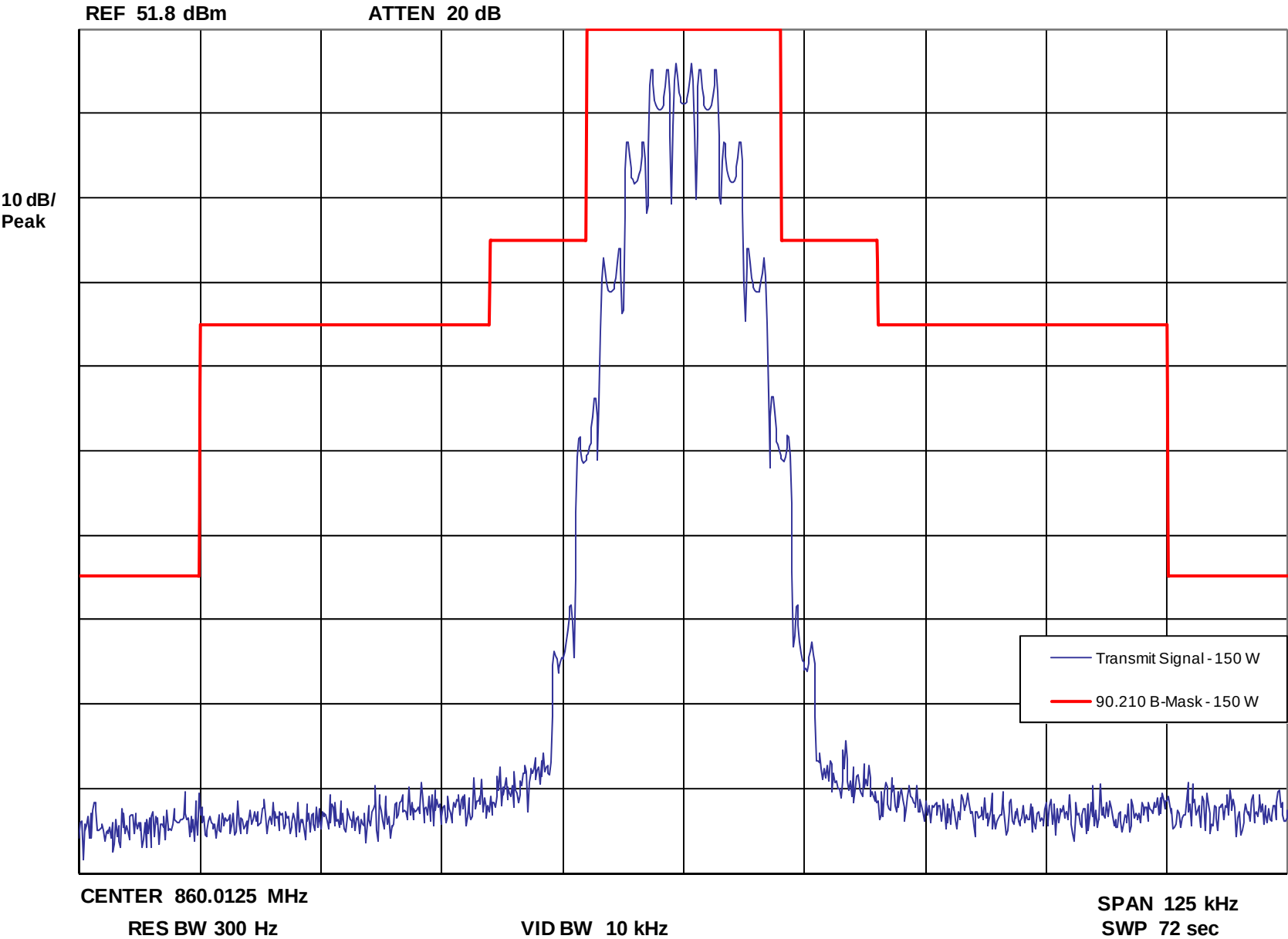
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



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

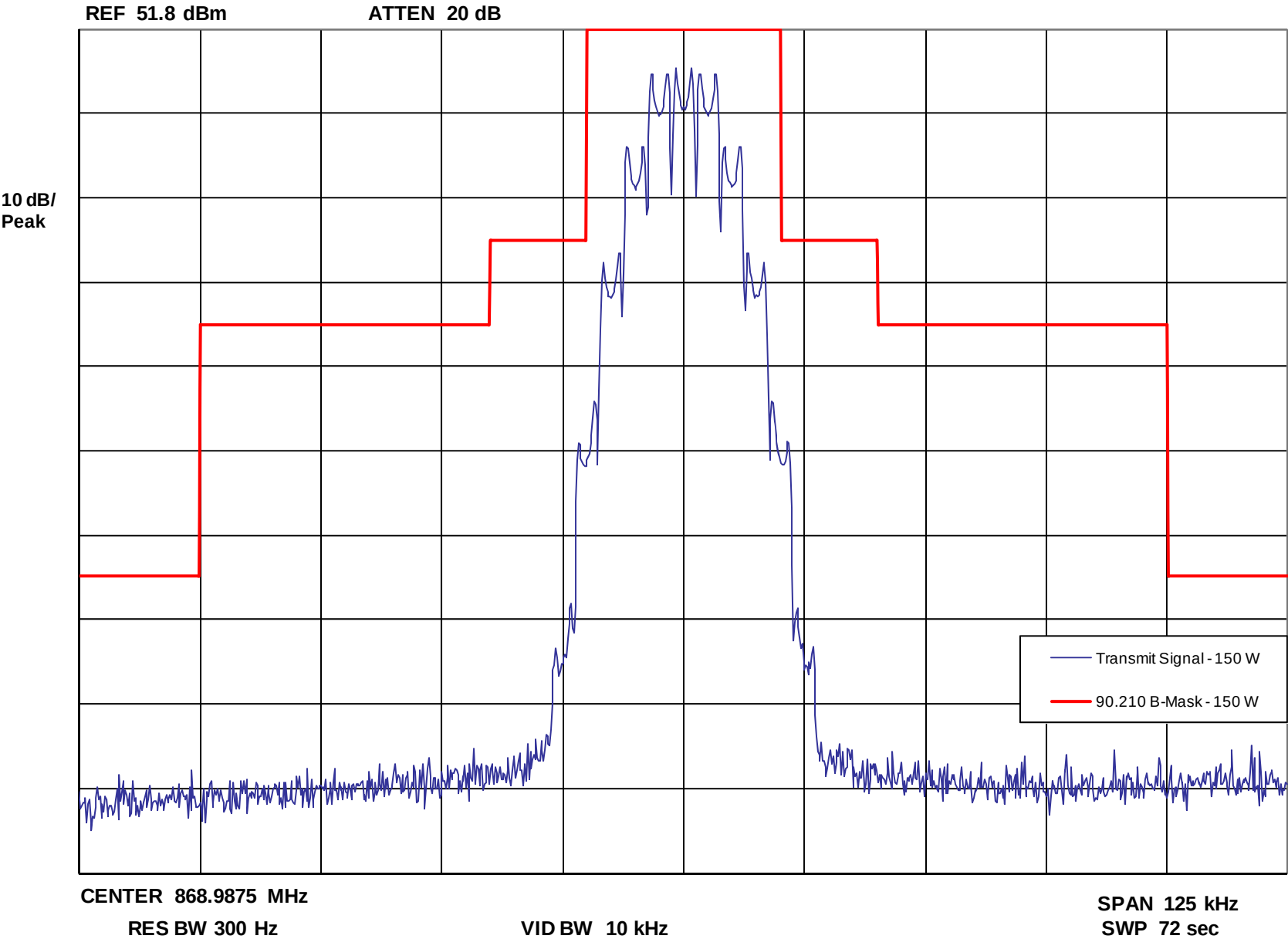
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



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

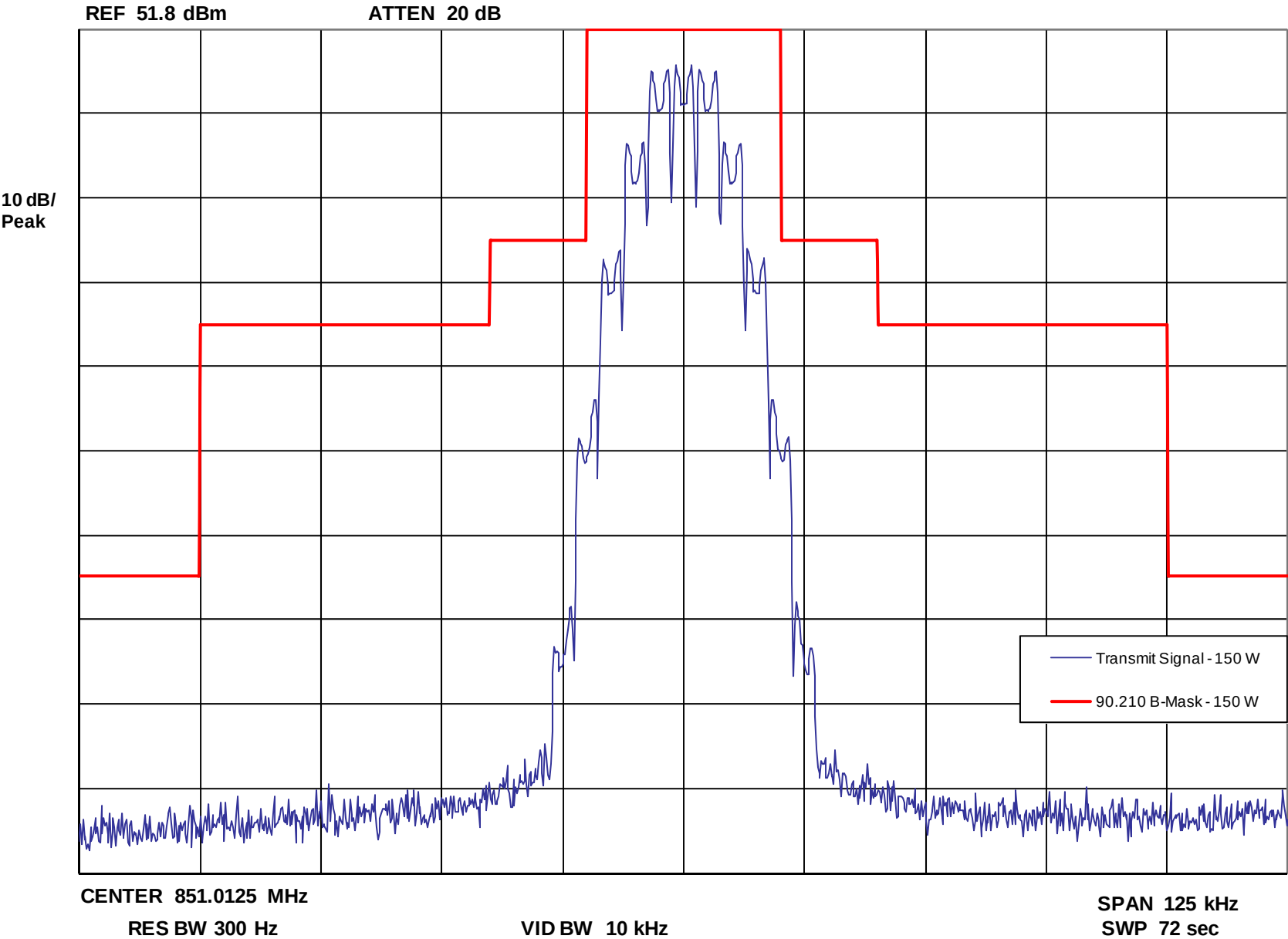
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



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

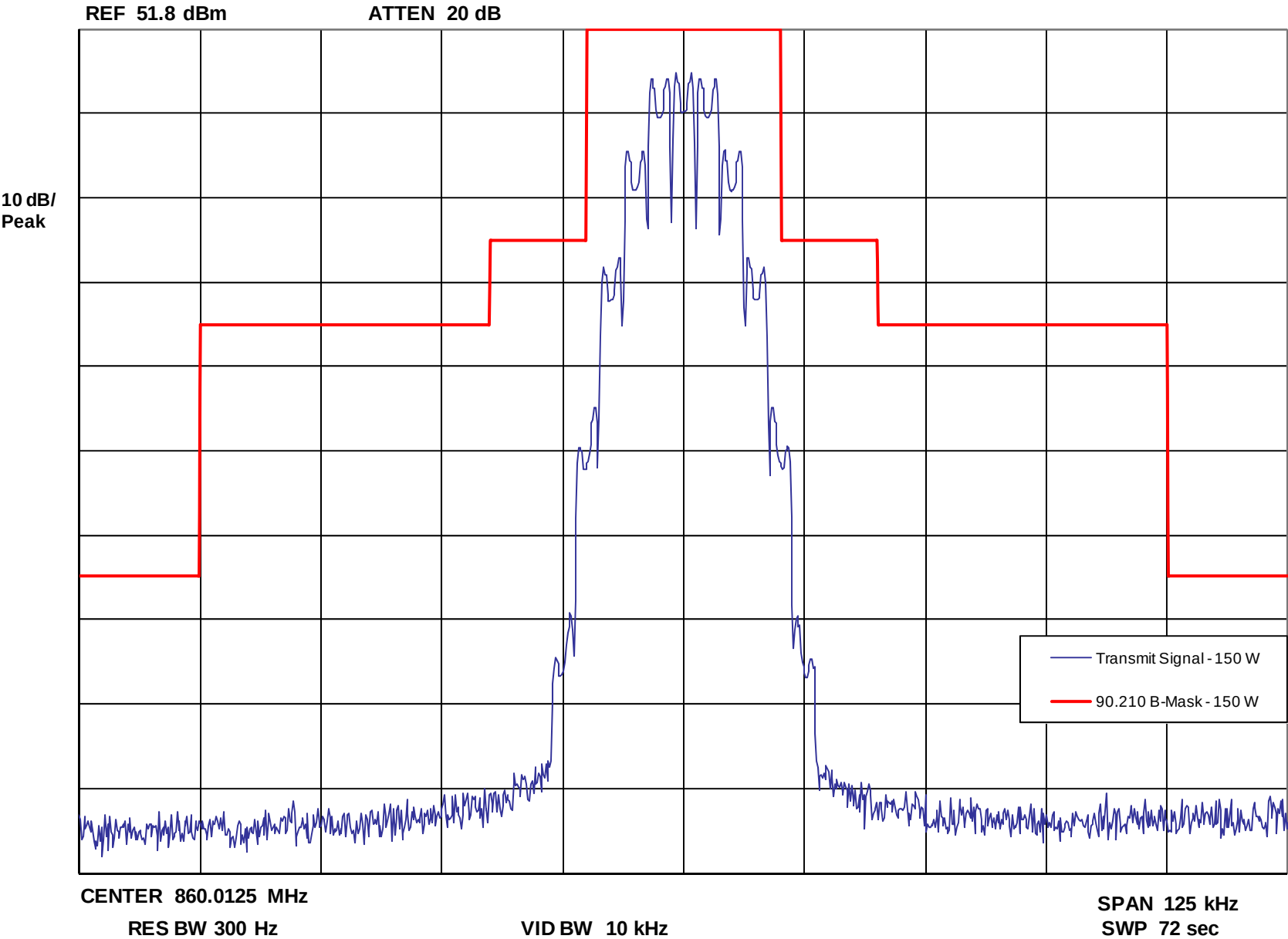
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



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

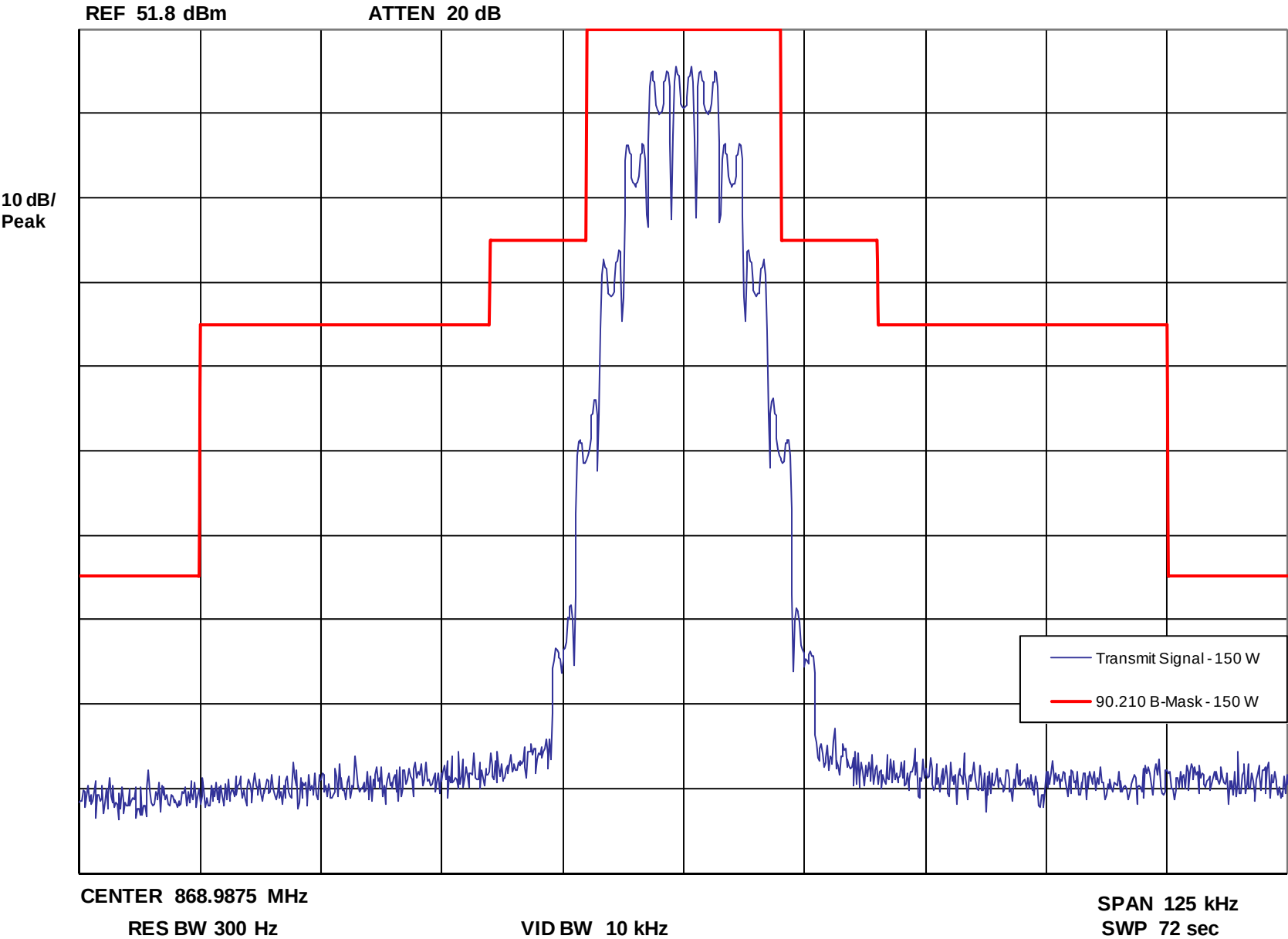
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



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

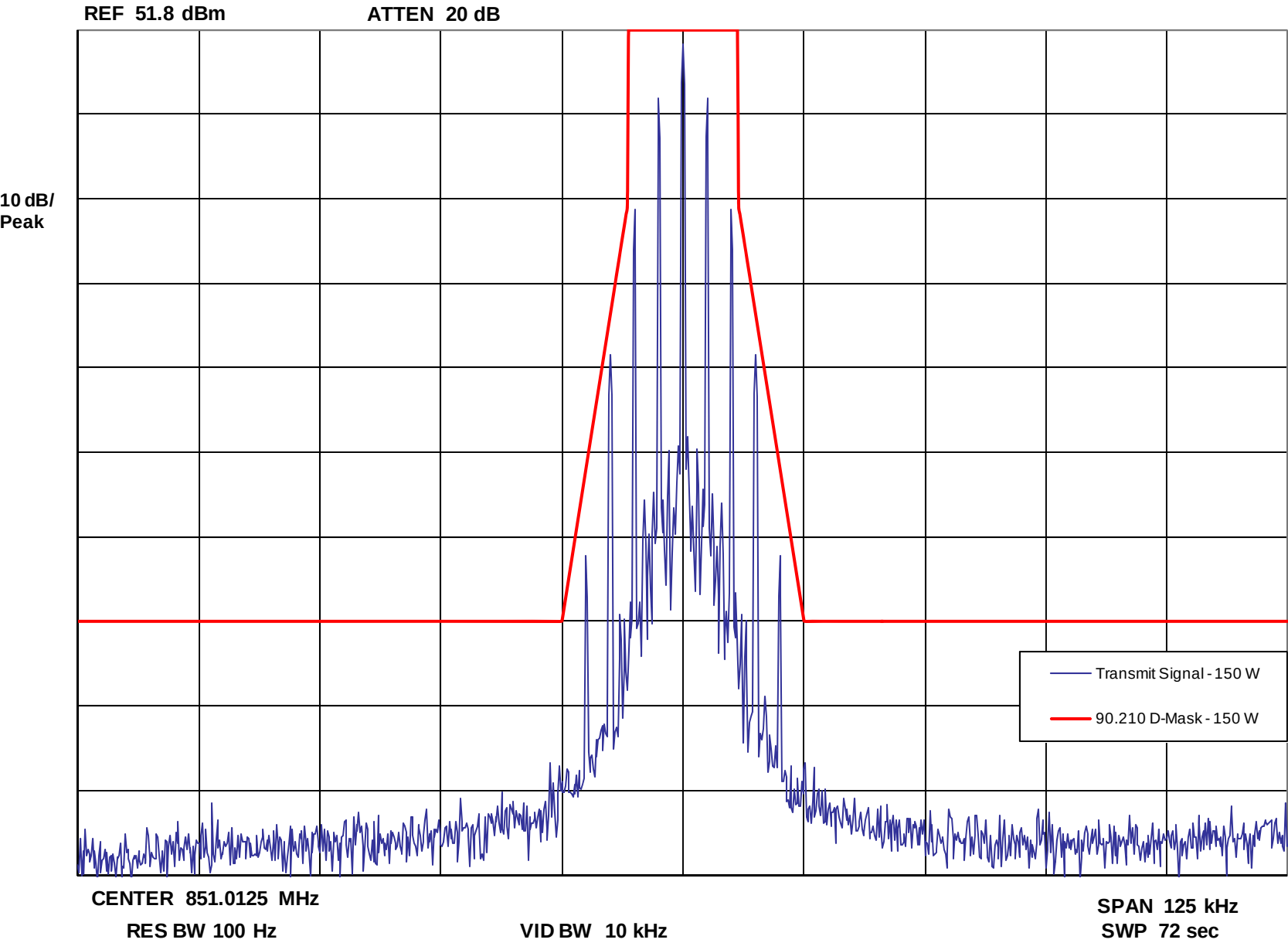
Occupied Bandwidth - 25 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

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

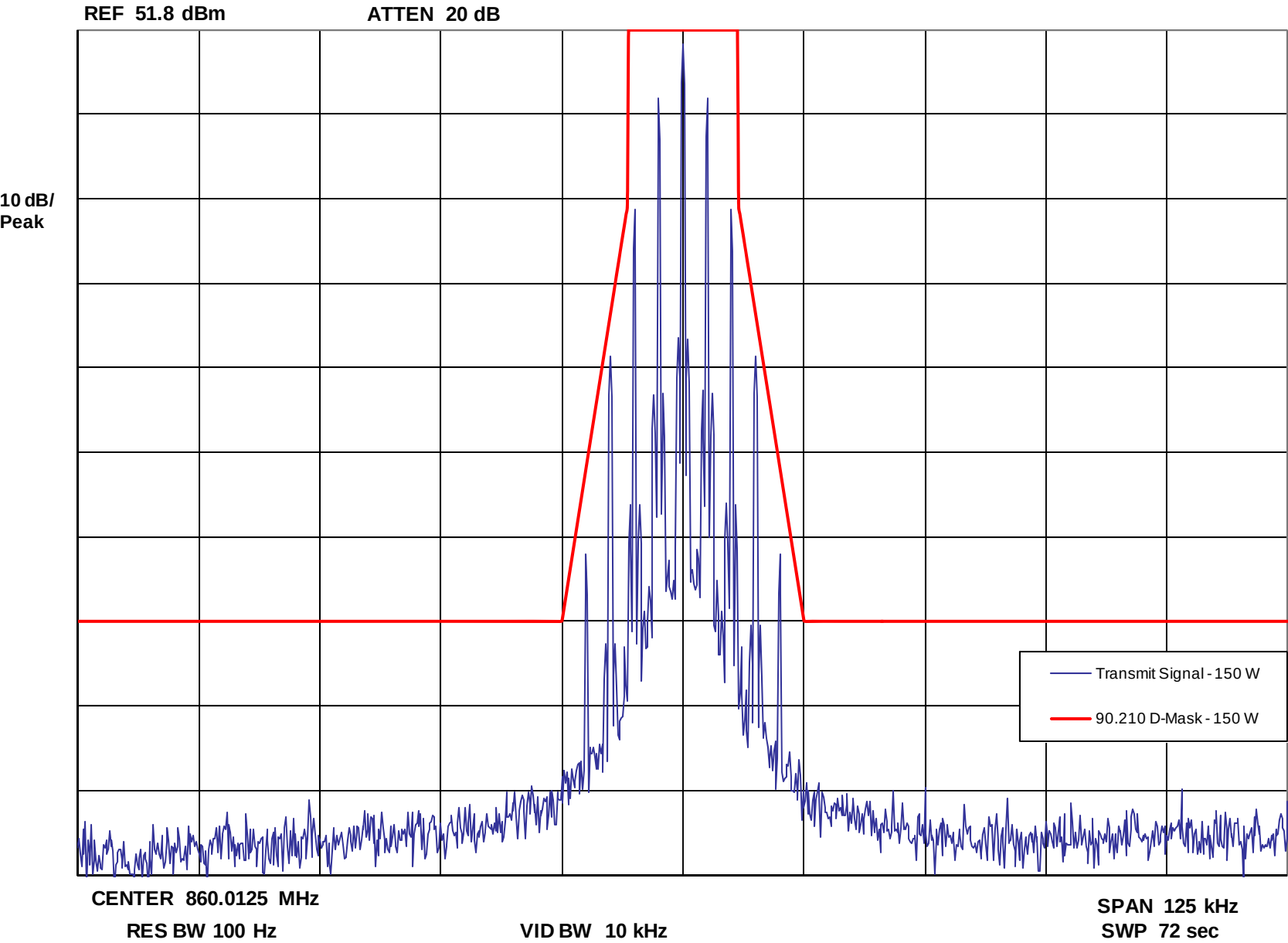
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

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

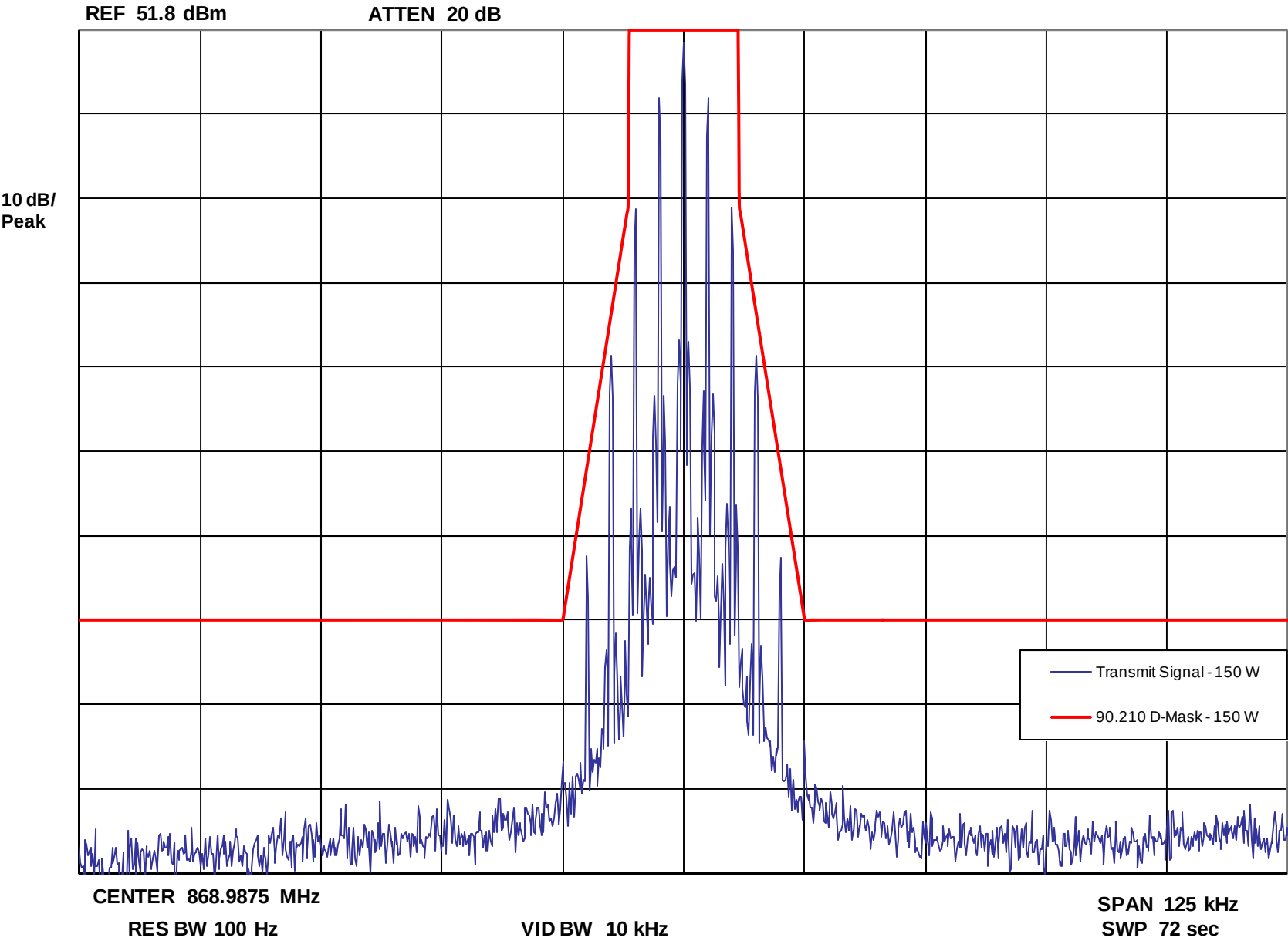
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements

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

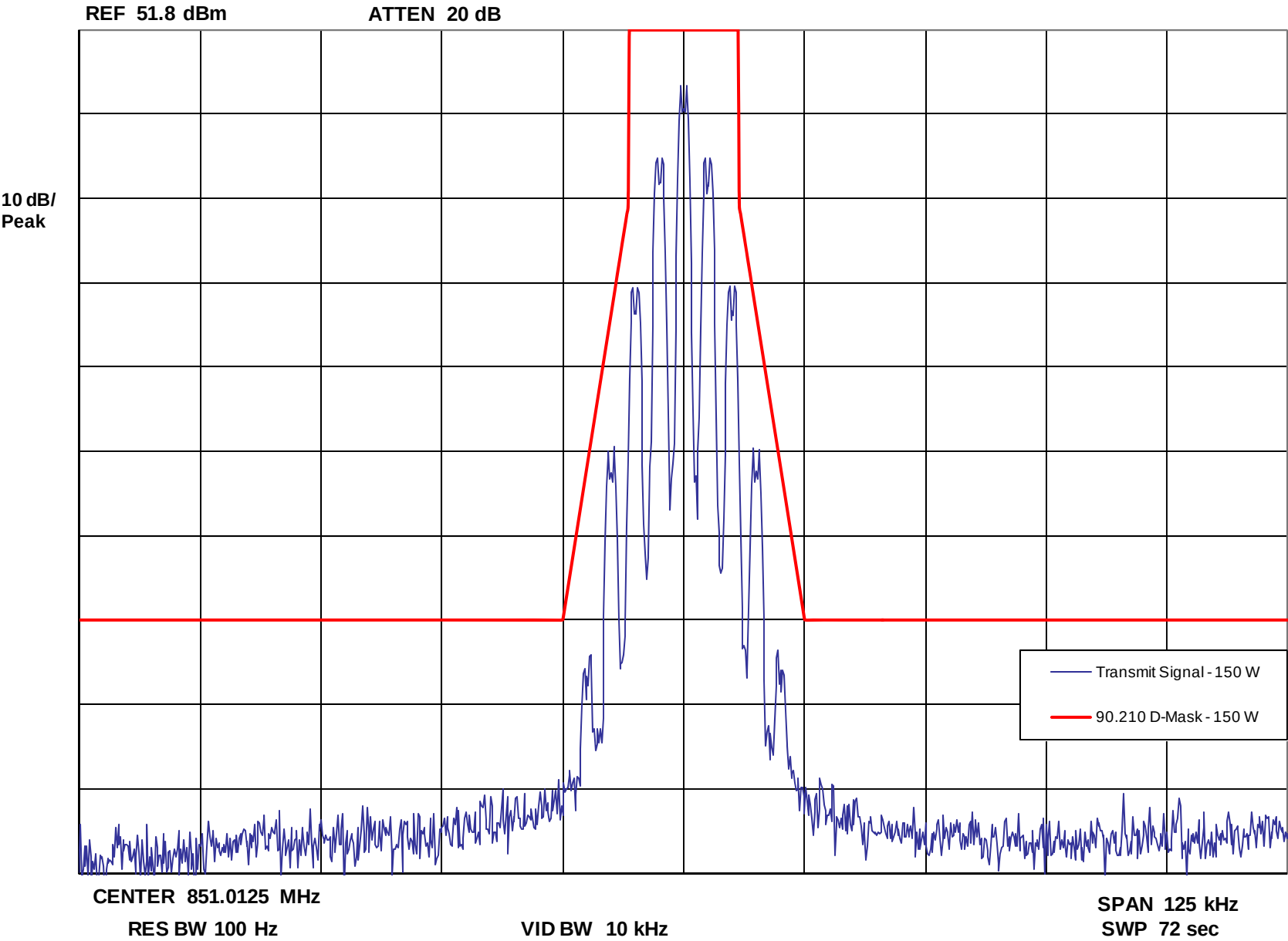
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio Tone



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

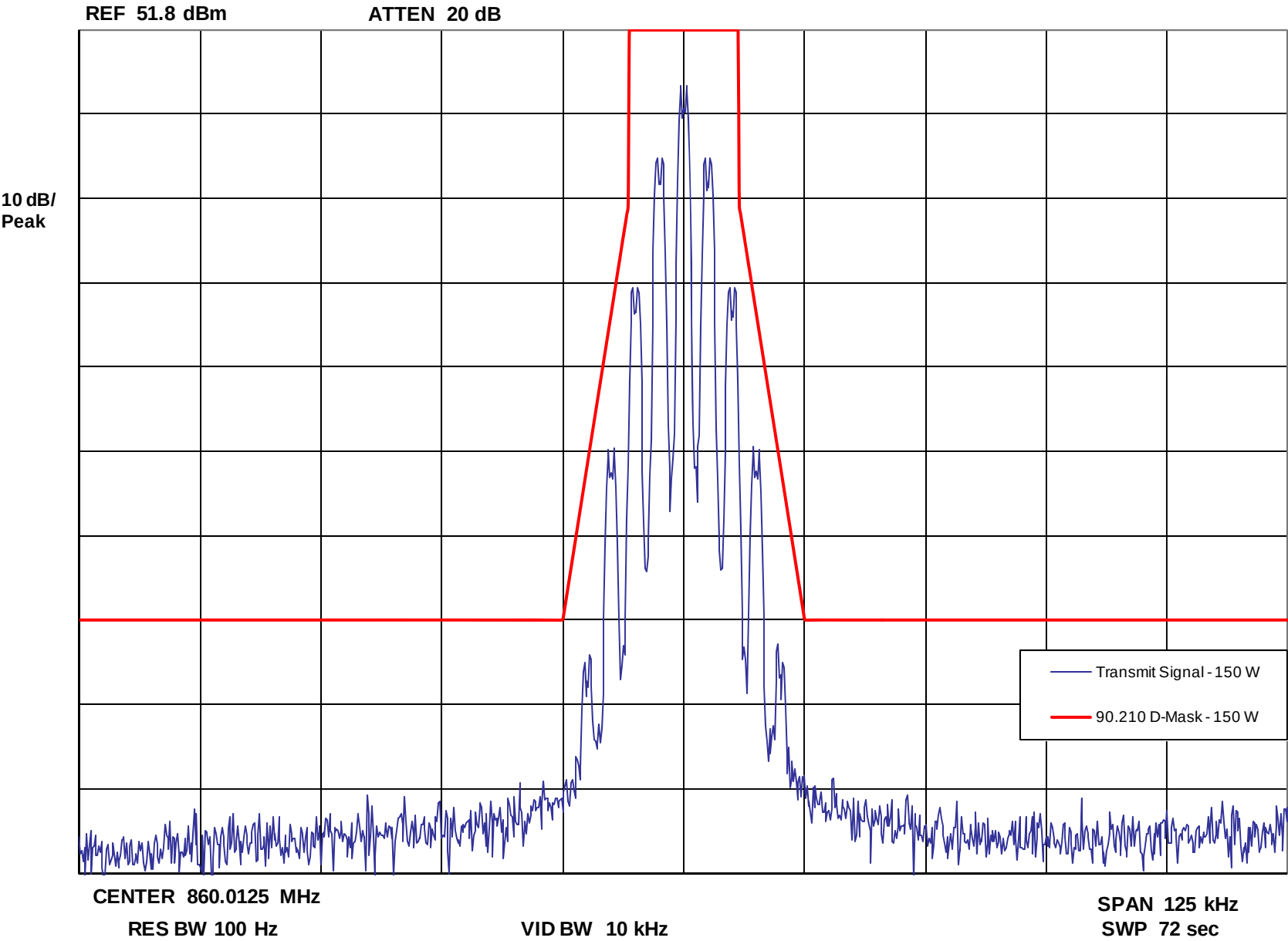
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



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

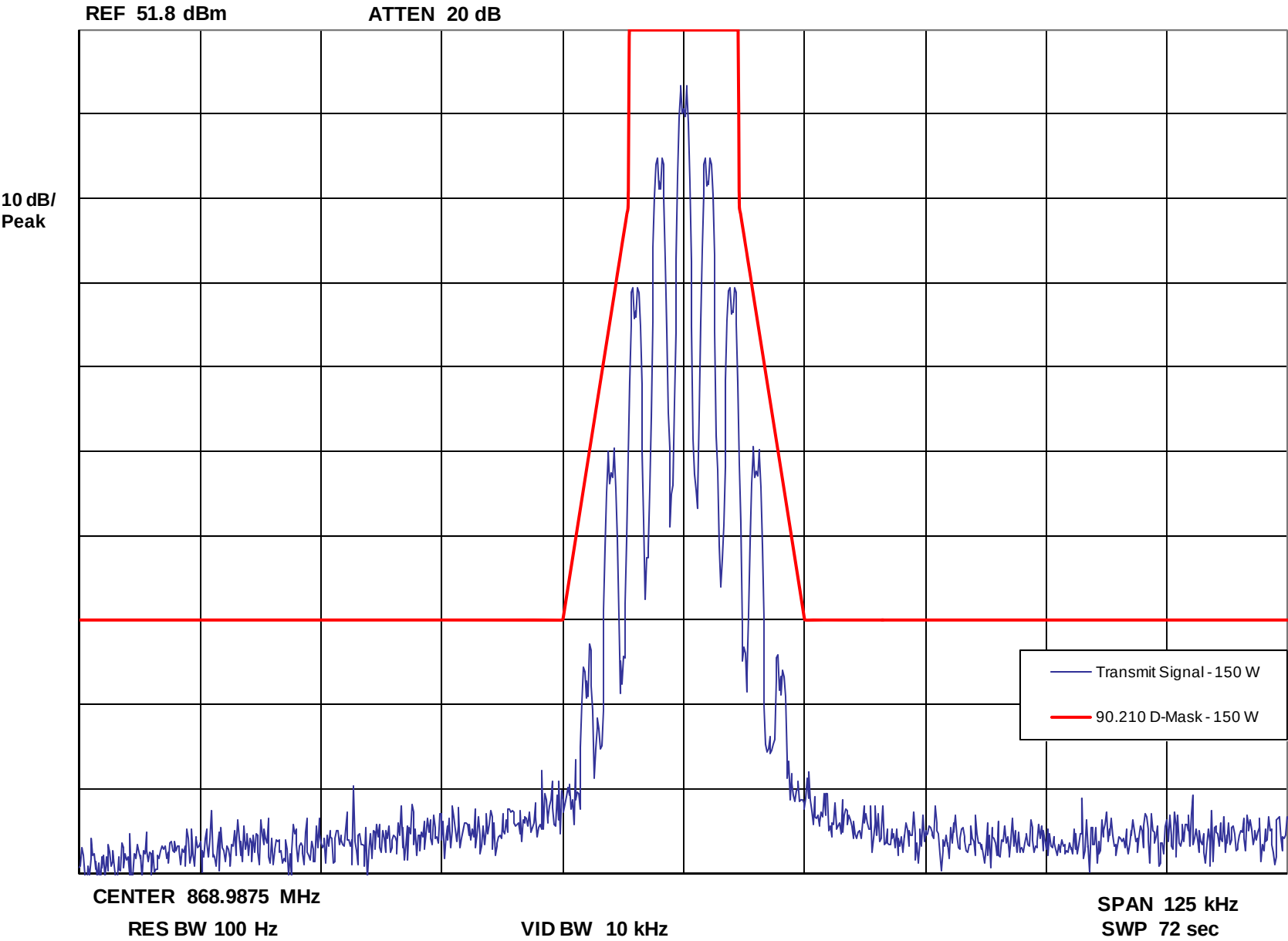
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



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

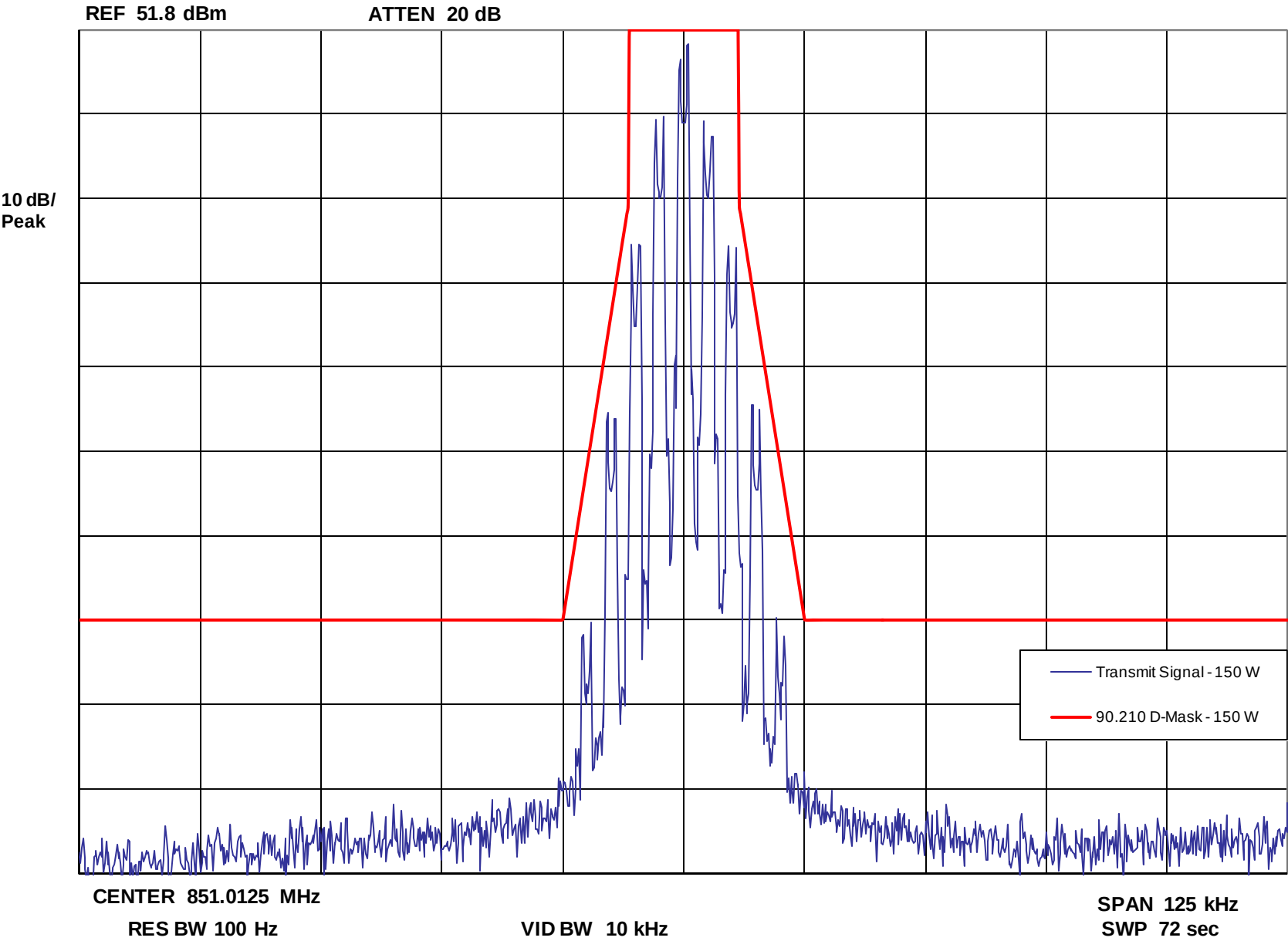
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 123 Hz PL



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

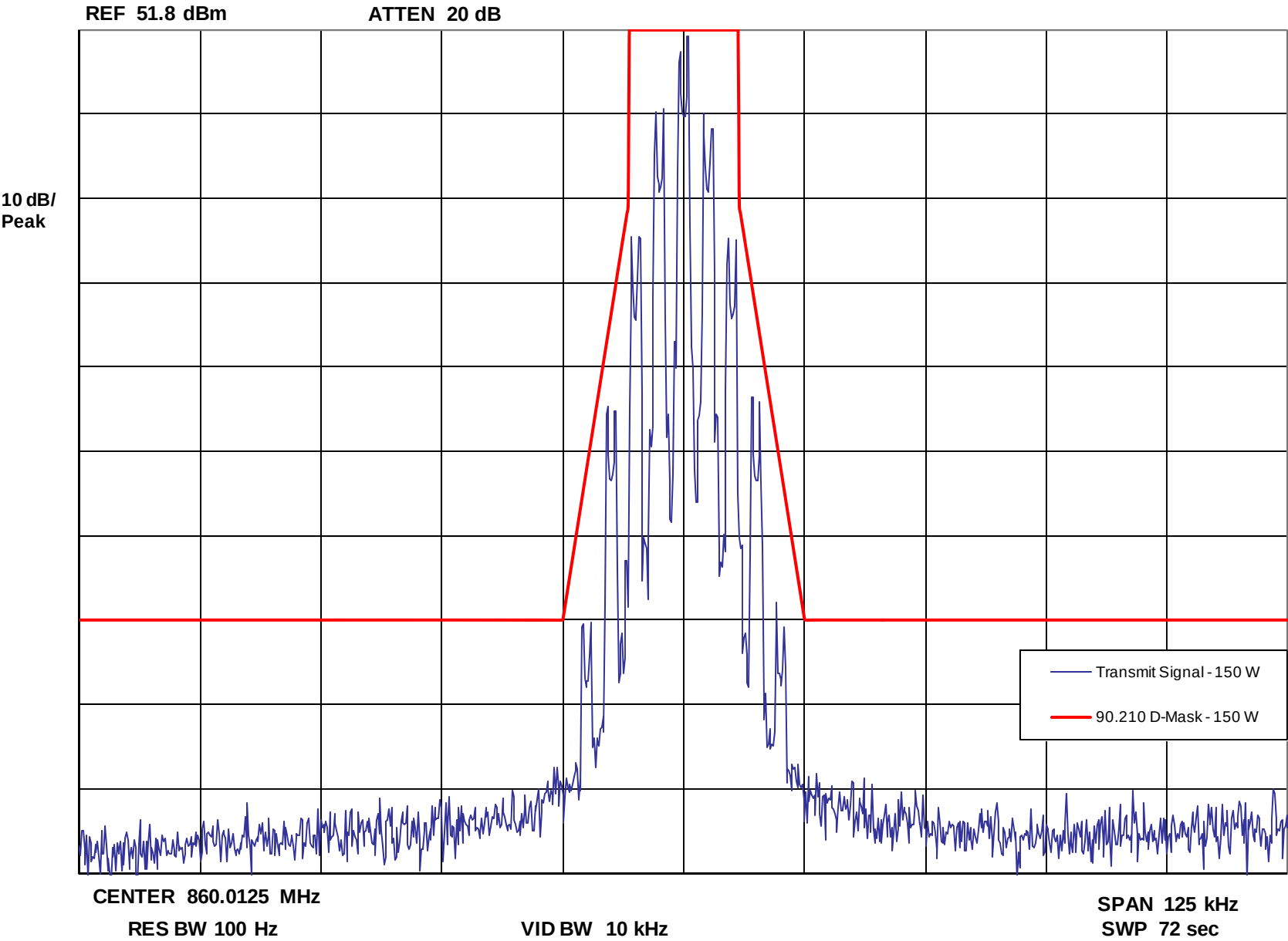
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



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

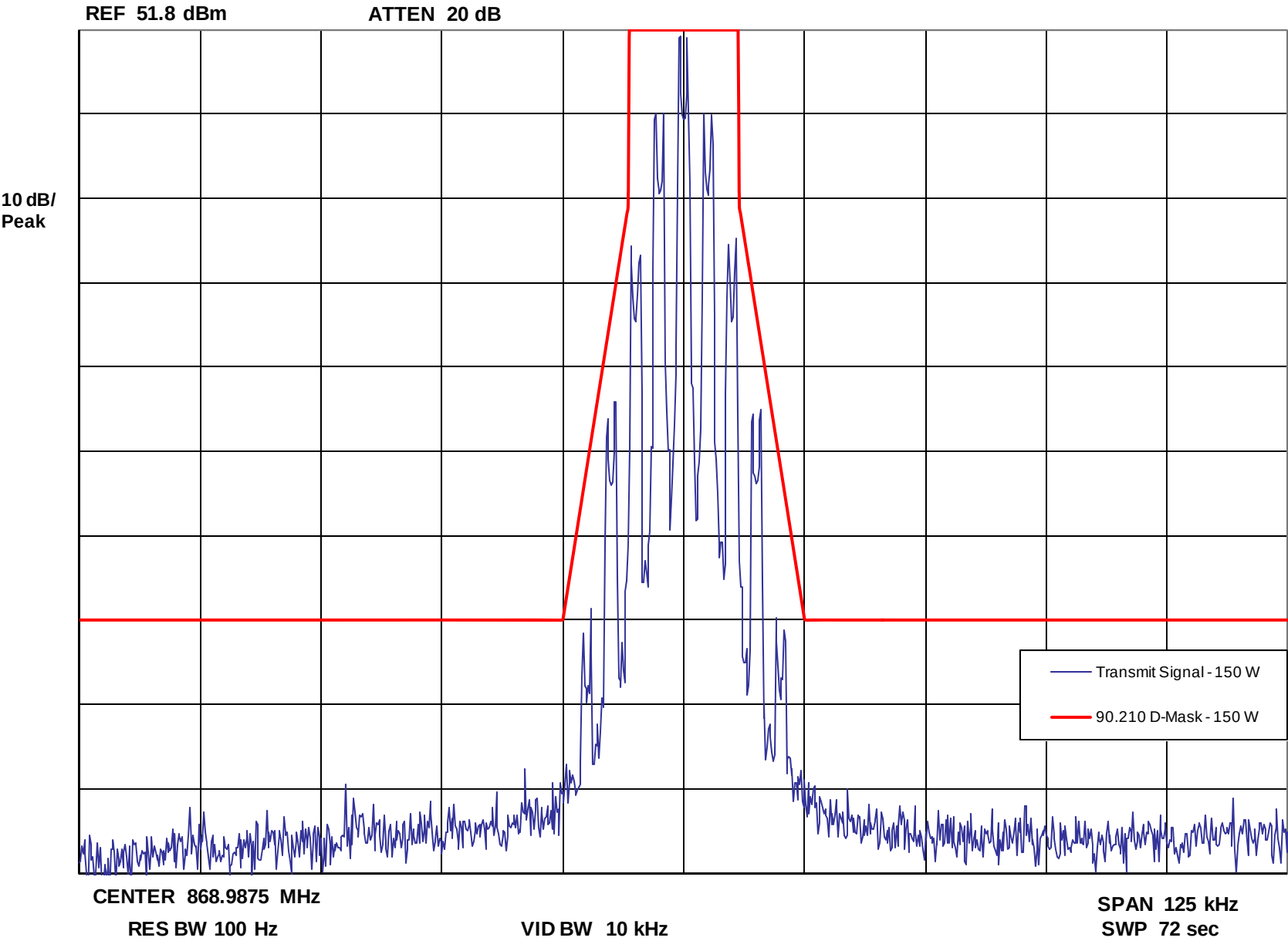
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



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

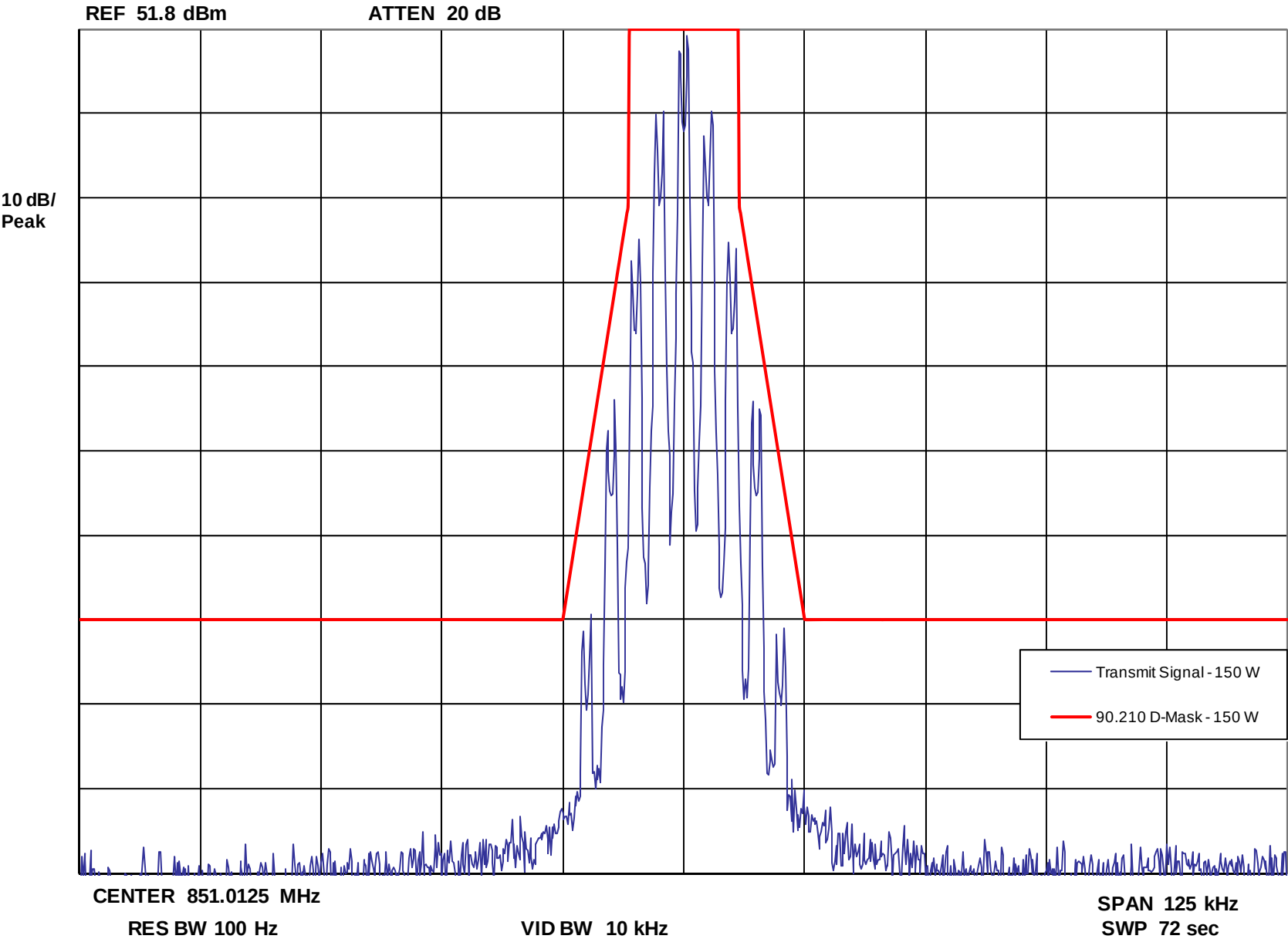
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 627 DPL



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

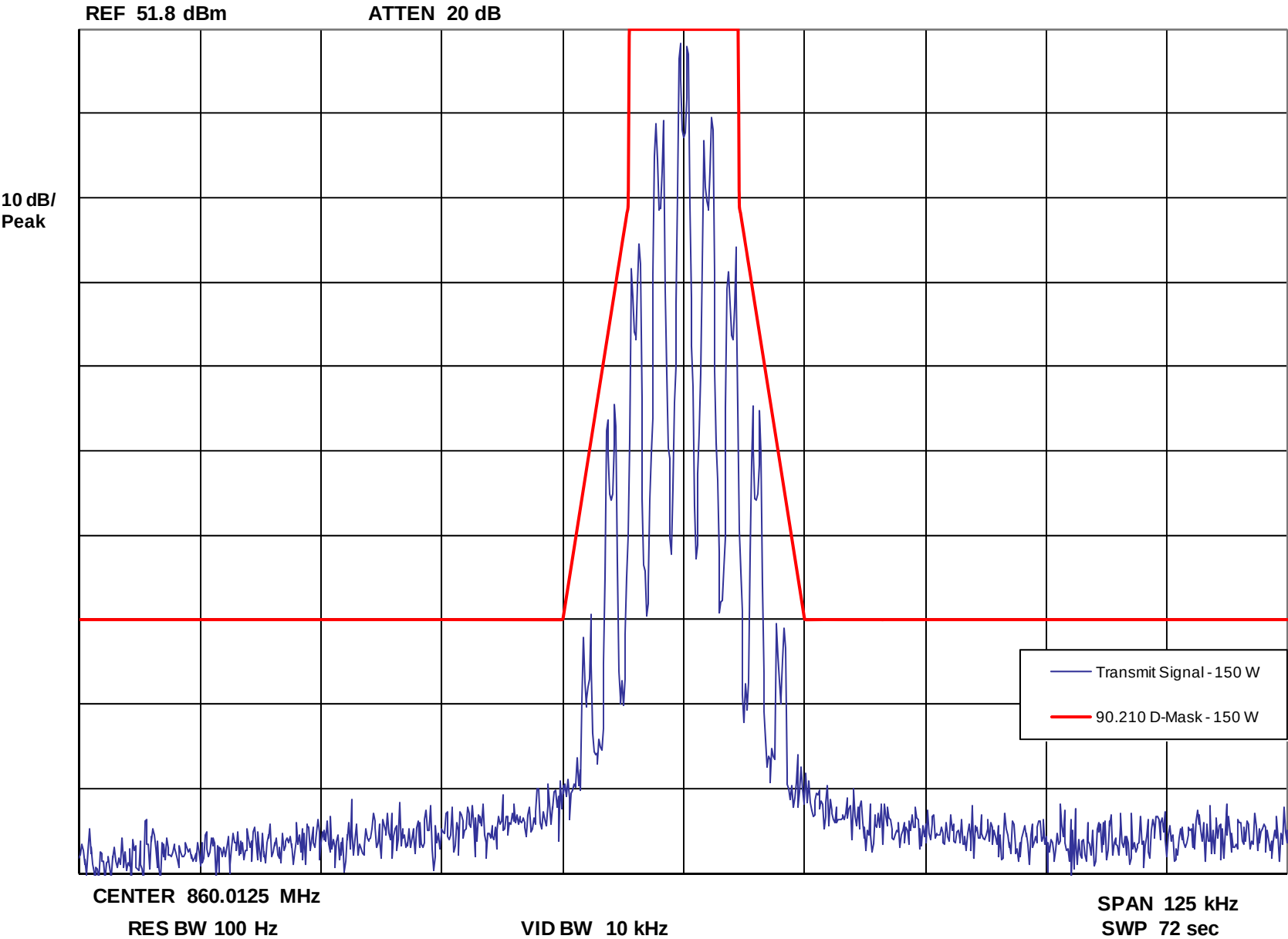
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



Report on Test Measurements

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

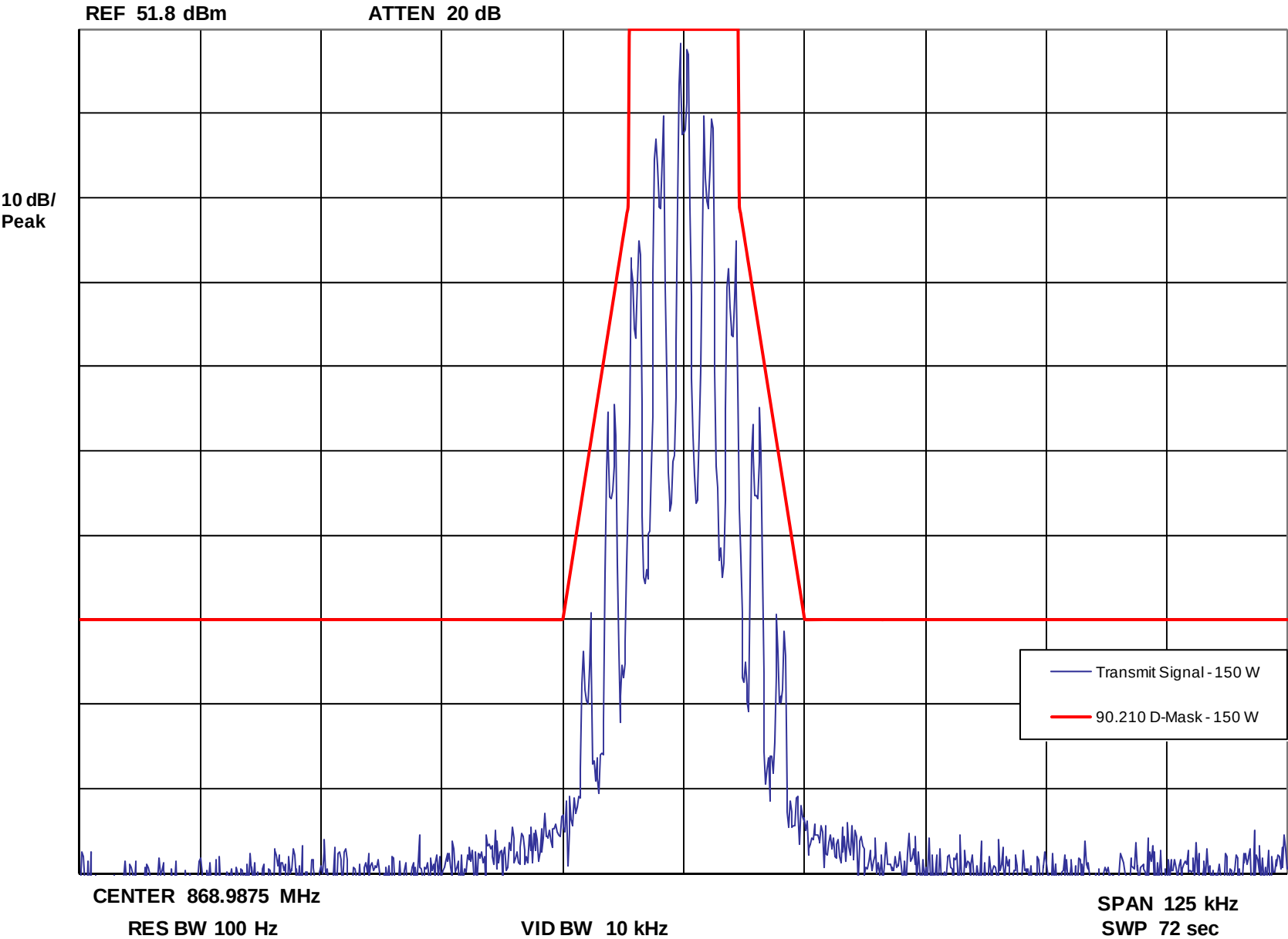
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



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

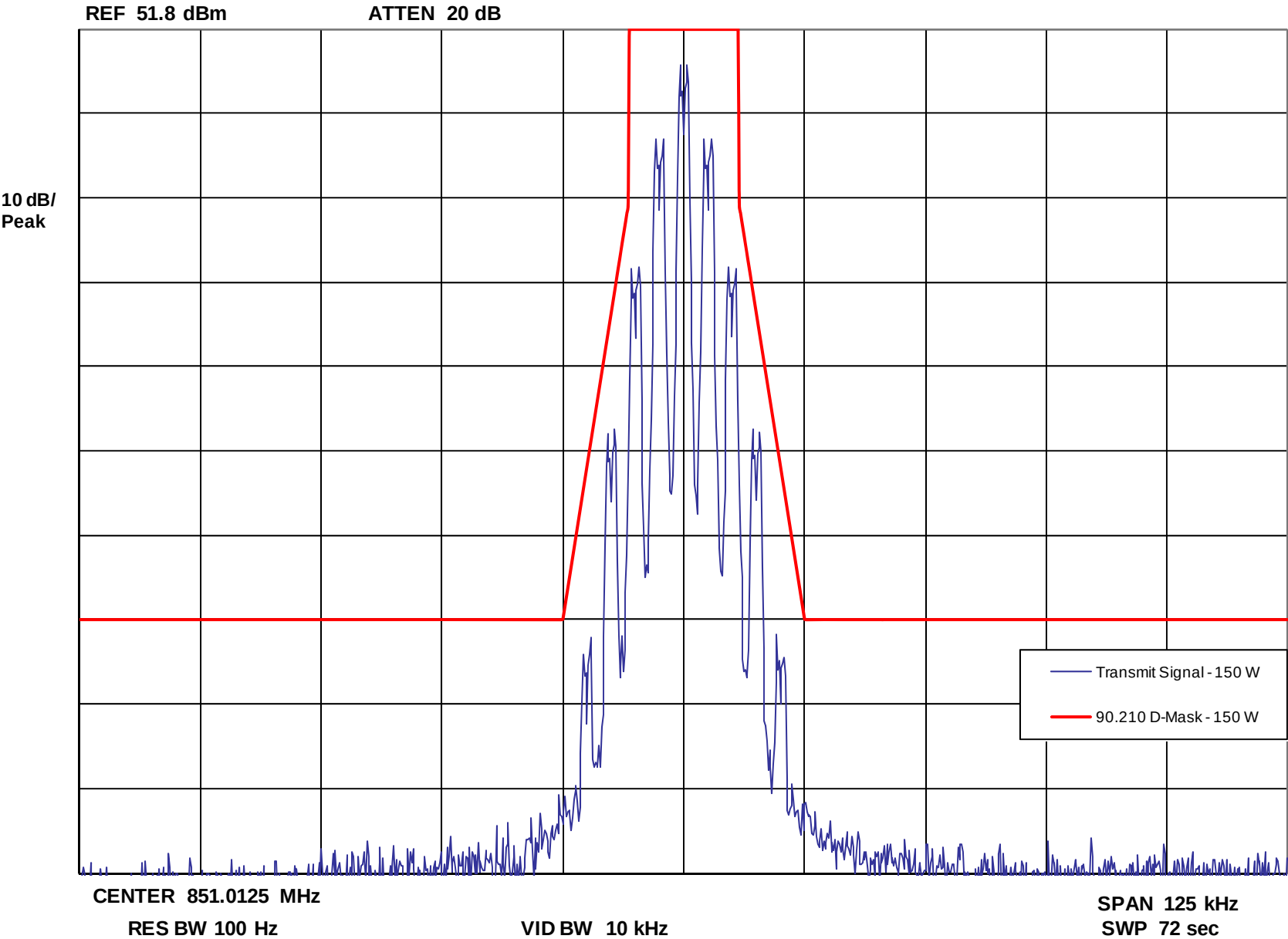
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 150 bps



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

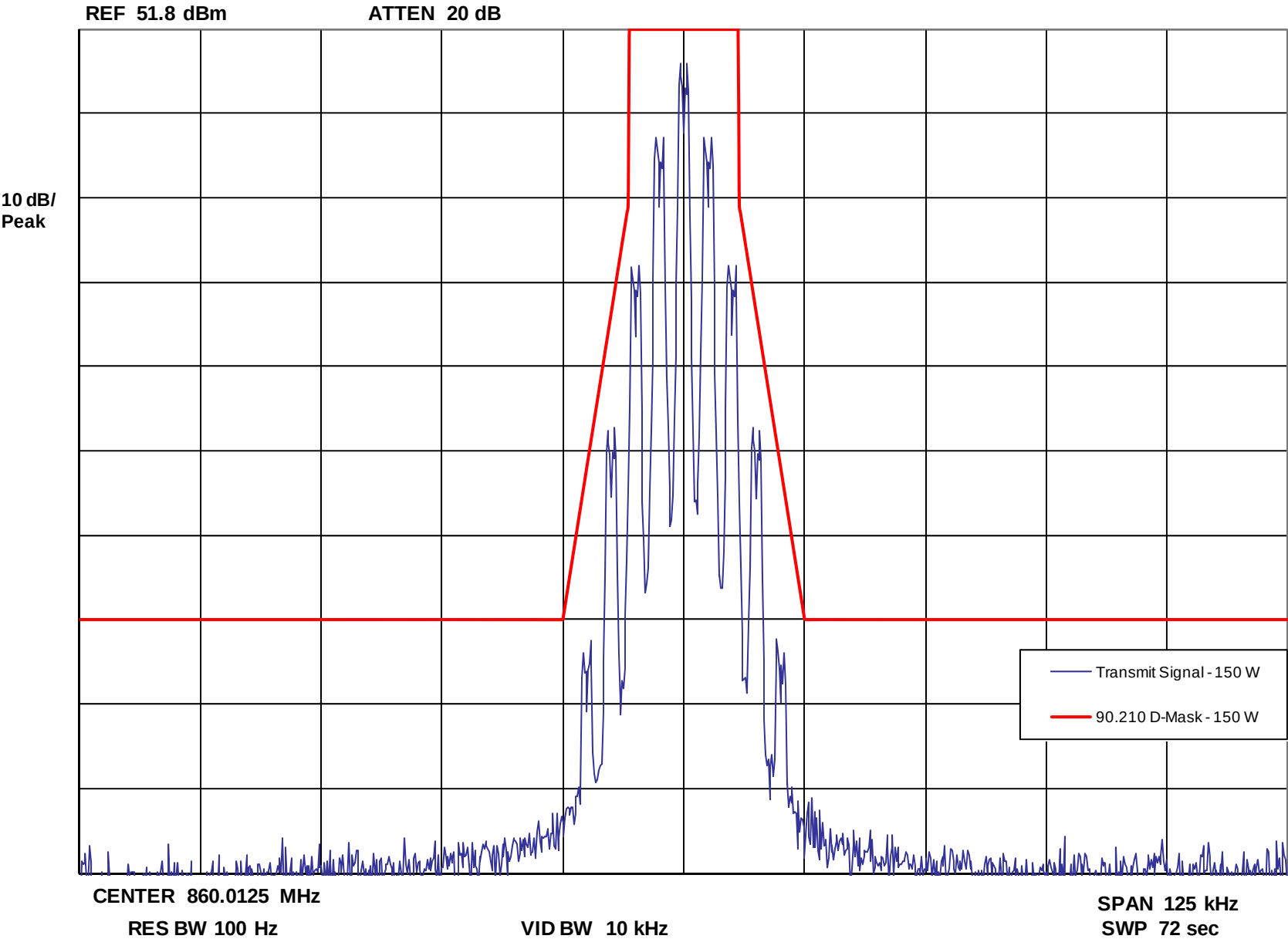
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



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

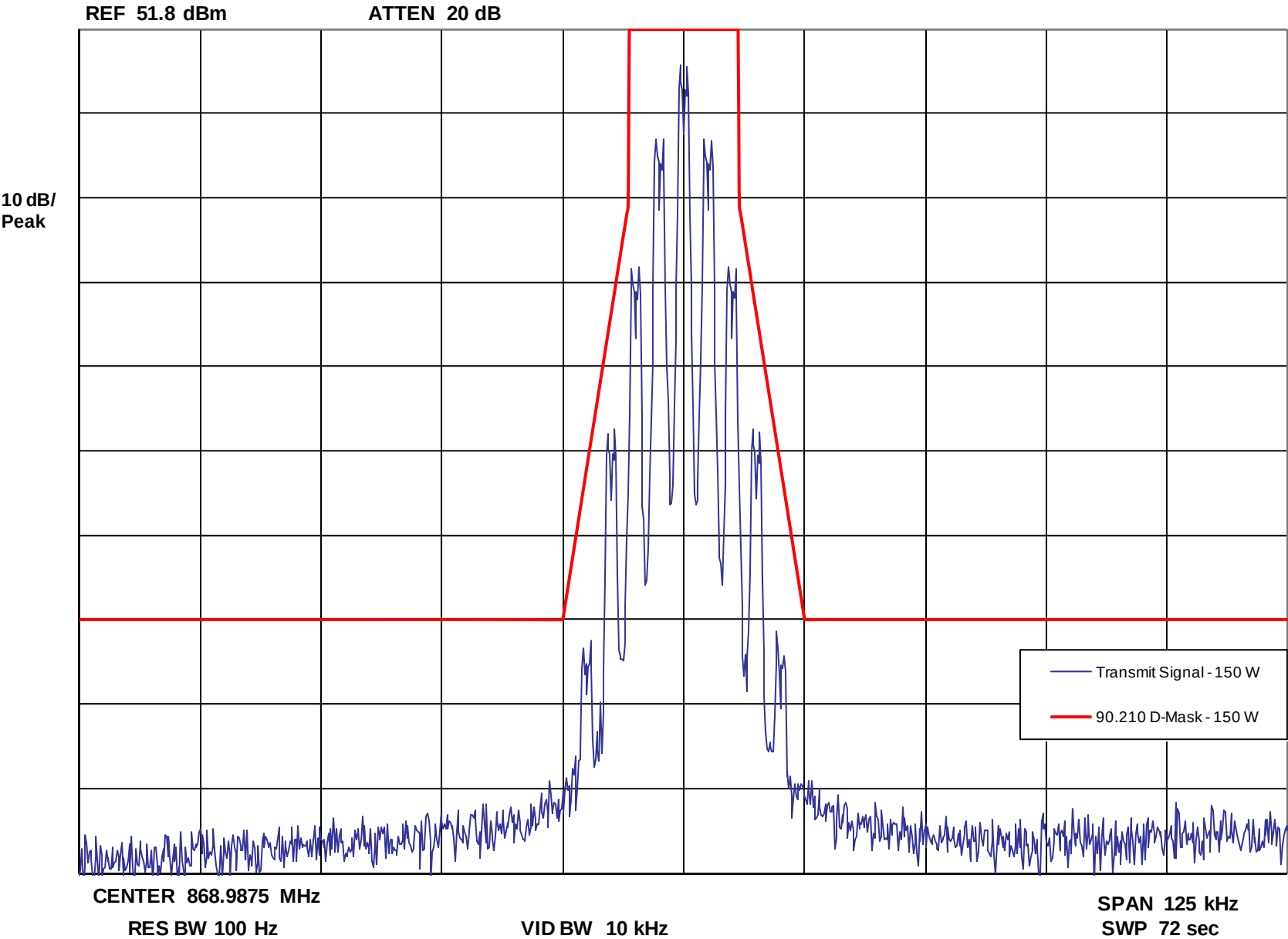
Occupied Bandwidth - 12.5 kHz Channels - Carrier with 2500 Hz Audio and 300 bps



Report on Test Measurements

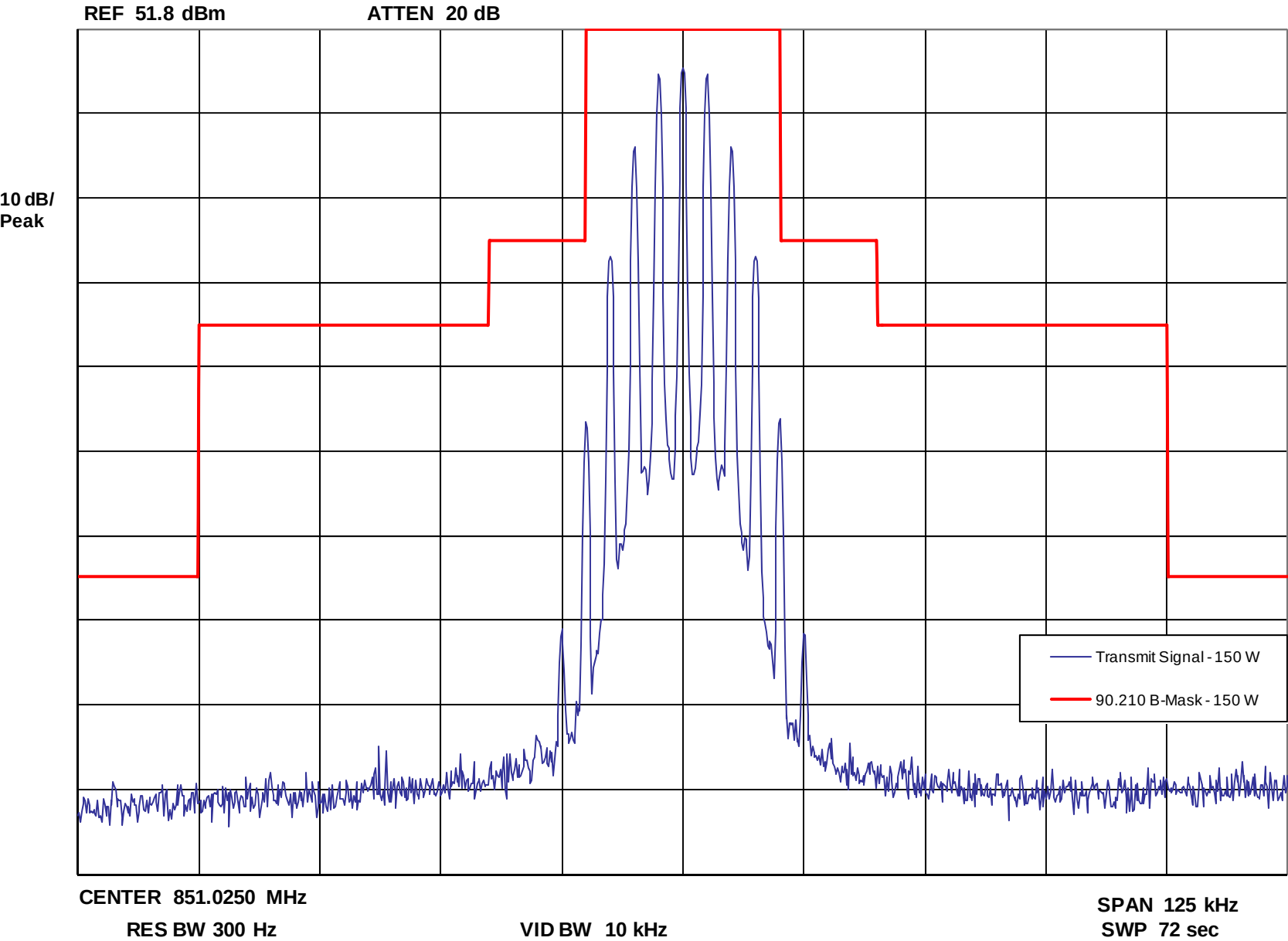
Occupied Bandwidth – Carrier with 2500 Hz Tone, 300 bps Low Speed Data Signaling, 12.5 kHz Channels – Emission Designator: 11K0F3E – High End of Band

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



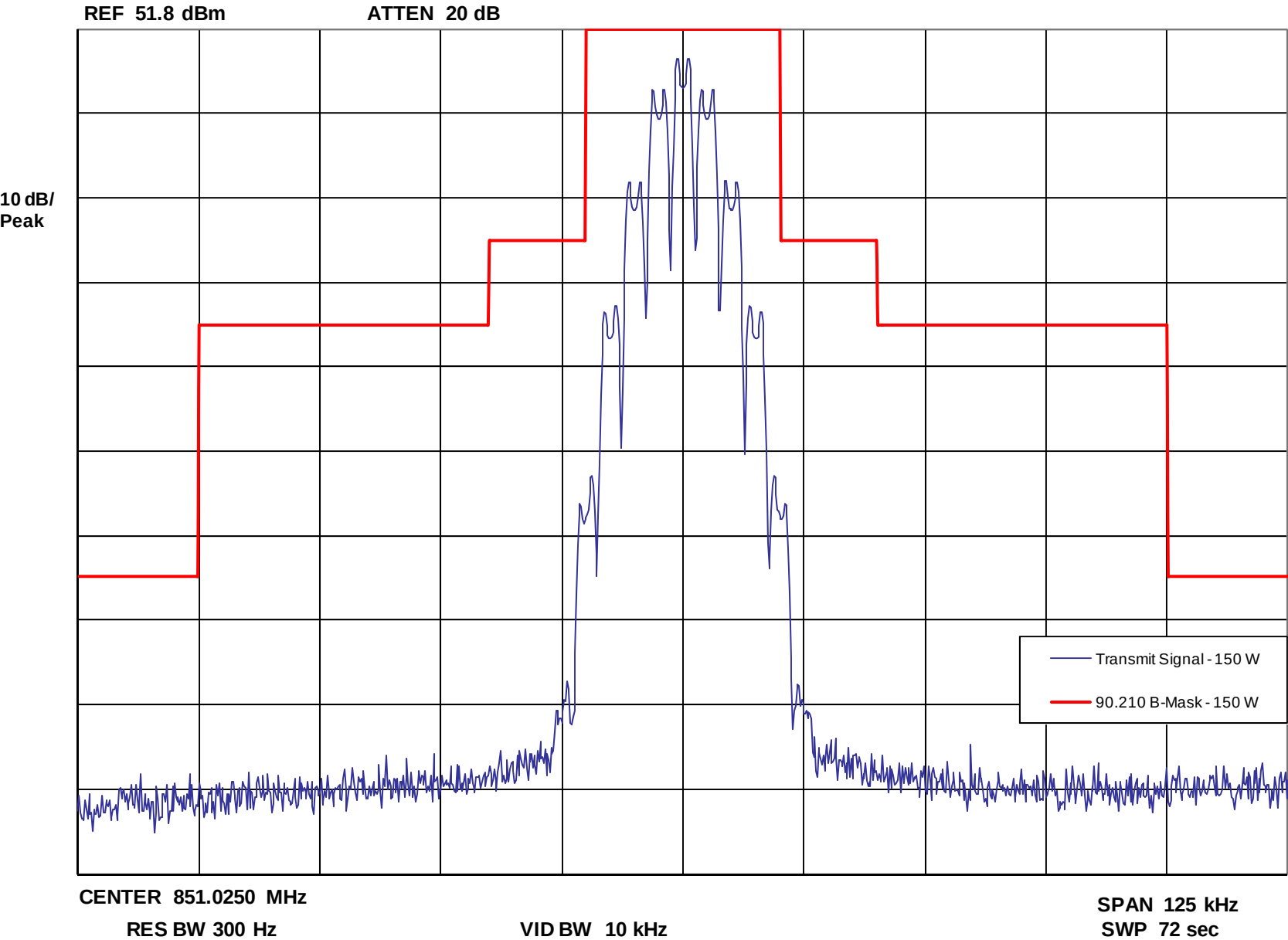
Report on Test Measurements
 Occupied Bandwidth – Carrier with 2500 Hz Audio Tone, NPSPAC Channels – Emission Designator: 14K0F3E

Occupied Bandwidth - NPSPAC Channels - Carrier with 2500 Hz Audio Tone



Report on Test Measurements
 Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Private Line (PL) Signaling, NPSPAC Channels – Emission Designator: 14K0F3E

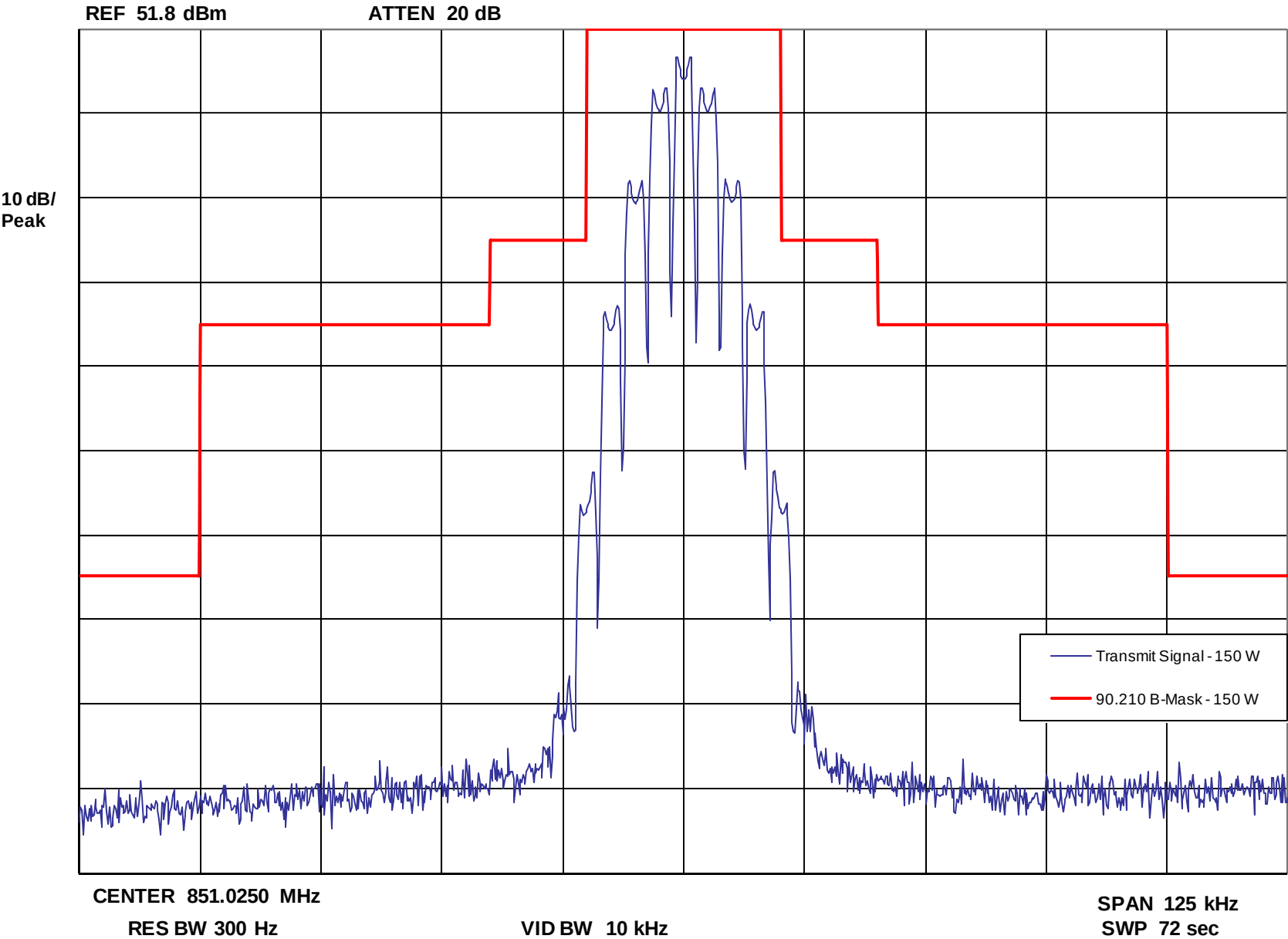
Occupied Bandwidth - NPSPAC Channels - Carrier with 2500 Hz Audio and 123 Hz PL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and Digital Private Line (DPL) Signaling, NPSPAC Channels – Emission Designator: 14K0F3E

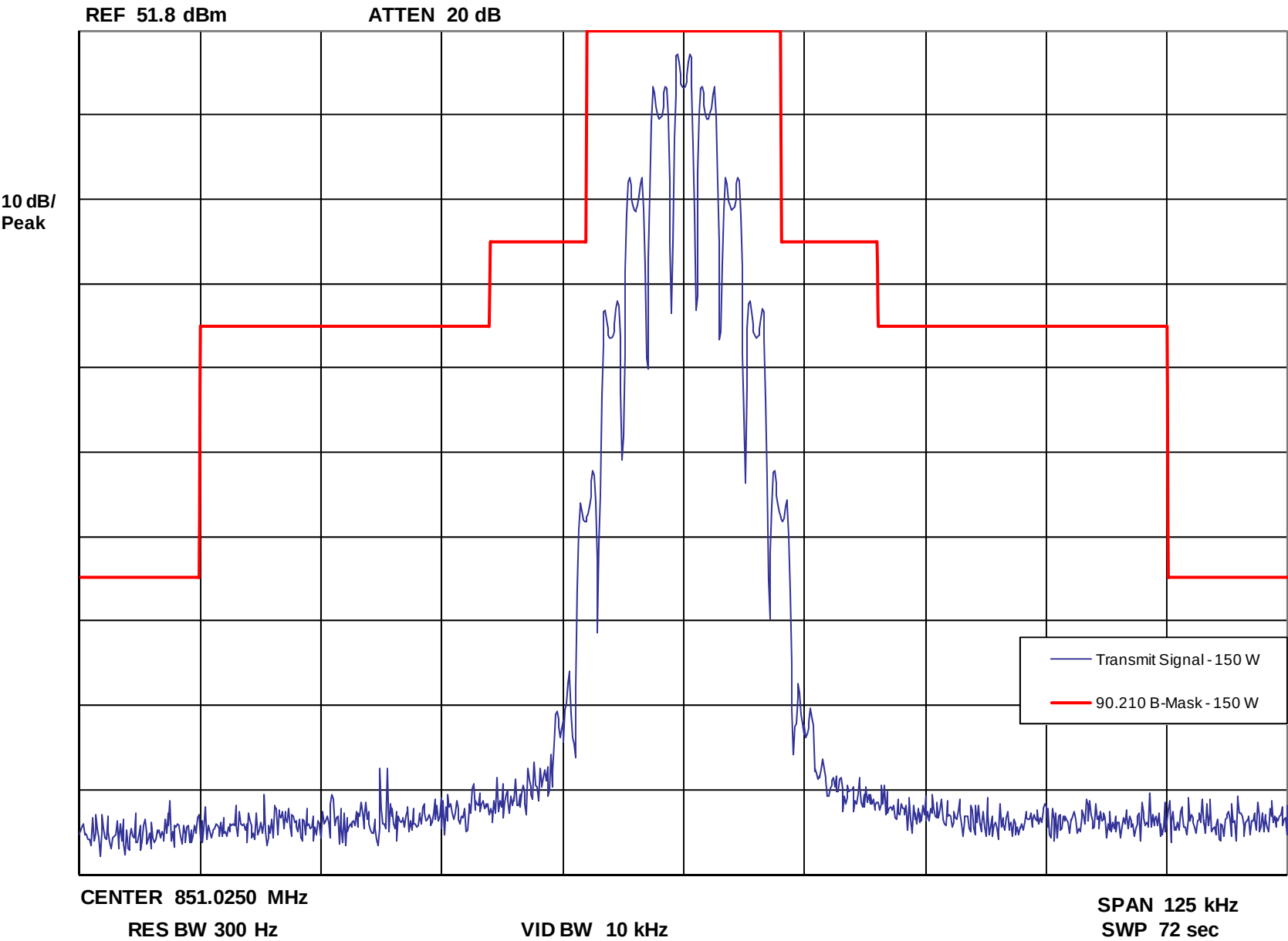
Occupied Bandwidth NPSPAC Channels - Carrier with 2500 Hz Audio and 627 DPL



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and 150 bps Low Speed Data Signaling – Emission Designator: 14K0F3E

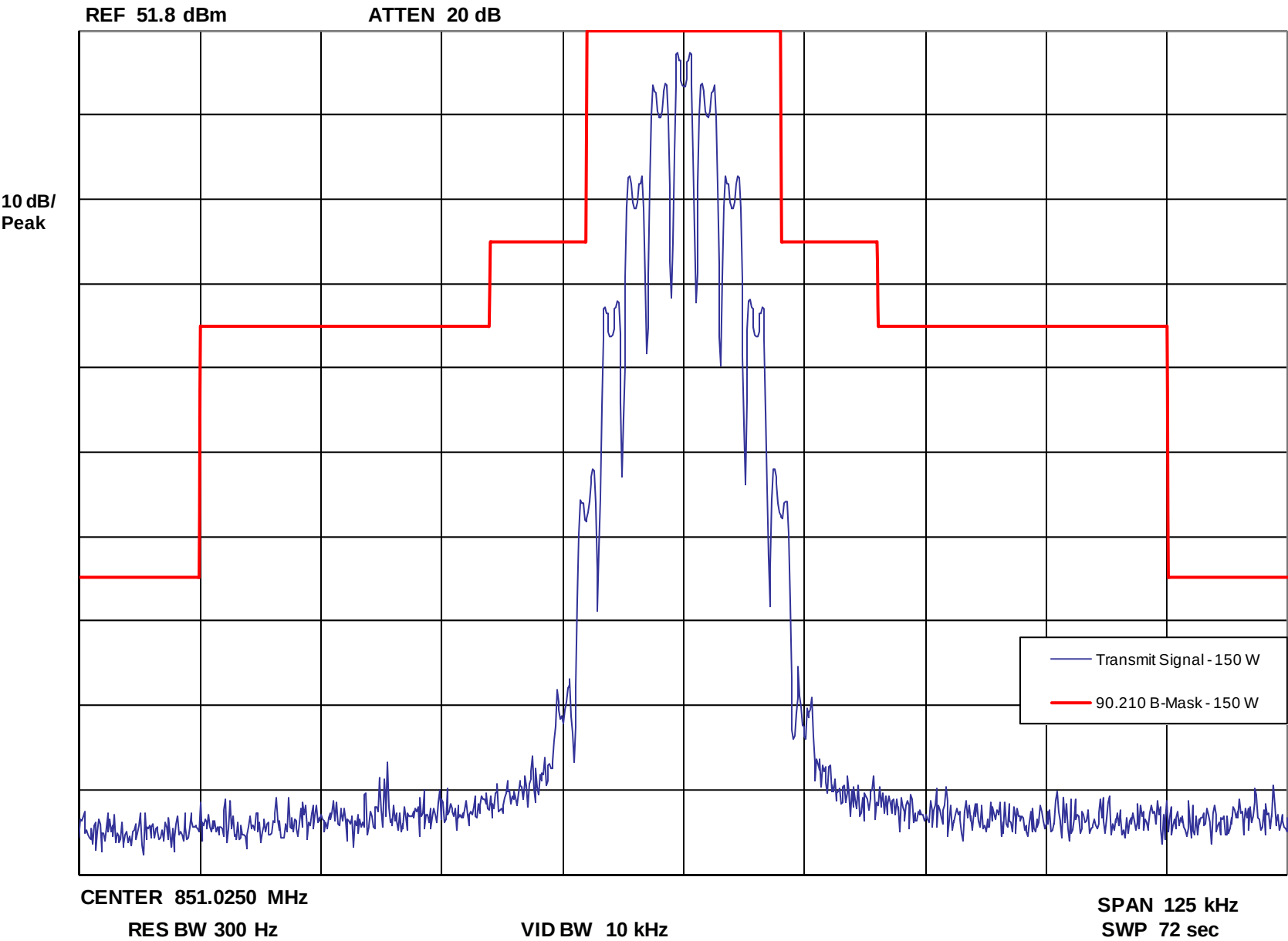
Occupied Bandwidth - NPSPAC Channels - Carrier with 2500 Hz Audio and 150 bps



Report on Test Measurements

Occupied Bandwidth – Carrier with 2500 Hz Audio Tone and 300 bps Low Speed Data Signaling – Emission Designator: 14K0F3E

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



Report on Test Measurements

Test Equipment List

MODEL	MANUFACTURER	DESCRIPTION	Serial No.	Last Cal	Next Cal
5087A	Hewlett Packard	Distribution Amp	2208A05776	no calibration required	
8903B	Agilent	Audio Analyzer	3413A14455	12/31/13	12/31/14
E4438C	Agilent	Signal Generator	MY49072394	2/24/12	2/24/14
E4438C	Agilent	Signal Generator	MY45090123	12/18/13	12/18/14
8644B	Hewlett Packard	Signal Generator	3147A00102	12/7/12	12/7/15
E8663D	Agilent	Signal Generator	MY50420108	11/12/13	11/12/14
3499C	Agilent	Switch/Control Unit	MY42000367	no calibration required	
E4438C	Agilent	Signal Generator	MY45090317	5/19/11	5/19/14
E4416A	Agilent	Power Meter	GB41293746	12/19/13	12/19/14
53131A	Hewlett Packard	Frequency Counter	3416A03458	2/1/13	2/1/14
E4412A	Agilent	Power Sensor	MY41498936	12/20/13	12/20/14
6813B	Agilent	AC Power Source	MY41000685	3/23/12	3/23/14
N9030A	Agilent	PXA Signal Analyzer	MY49431362	11/11/13	11/11/14
8904A	Hewlett Packard	Multifunction Synthesizer	3518A07620	12/20/13	12/20/14
6032A	Agilent	System Power Supply	MY41002063	6/17/13	6/17/14
SM-8-3800	Thermotron	SM-8-3800 Chamber	36242	3/3/13	3/3/14
Fluke 45	Fluke	Multimeter	6349005	12/25/13	12/25/14
N9030A	Agilent	PXA Signal Analyzer	MY51380397	2/1/13	2/1/14
CS	Hewlett Packard	High Pass Switch Box	CS003	9/4/13	9/4/14
3488A	NA	Switch / Control Unit	2719A29020	no calibration required	
6032A	Hewlett Packard	Power Supply	3232A-08410	8/16/13	8/16/14
(Various)	Weinschel, Kathrein, Bird	RF Loads	Various	no calibration required	
TWNC-1405-1	Telewave	Notch Cavity		no calibration required	
3020A, etc.	Narda	Directional Coupler	Various	no calibration required	
SMP 04	Rohde & Schwarz	Microwave Generator	100131	11-Apr-13	11-Apr-14
ESIB 26	Rohde & Schwarz	SpecAn / ESI Test Rcvr	100336	2-Aug-13	2-Aug-14
CBL6111	Schaffner-Chase	Bilog Antenna	1172	5-Feb-13	5-Feb-14
CBL6112B	Schaffner-Chase	Bilog Antenna	2863	5-Feb-13	5-Feb-14
CBL6112B	Schaffner-Chase	Bilog Antenna	2950	6-May-13	6-May-14
SAS-571	A.H. Systems	DRG Horn	1143	13-Dec-12	13-Dec-13
BBHA 9120D	Schwarzbeck	DRG Horn	201	5-Feb-13	5-Feb-14
SAS-571	A.H. Systems	DRG Horn	566	5-Feb-13	5-Feb-14
TM 320	Dickson	Temp/Humidity Monitor	12249298	8-Nov-13	8-Nov-14

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

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

NAME: Ken Weiss

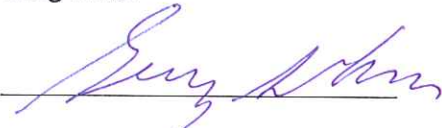
SIGNATURE: 

DATE: February 11, 2014

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: 

POSITION: Engineering Section Manager