

**STATEMENT OF CERTIFICATION**

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

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

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

NAME: Ken Weiss

SIGNATURE: \_\_\_\_\_

DATE: July 21, 2000

POSITION: Lead Electrical Engineer

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

NAME: Ron Wegner

SIGNATURE: \_\_\_\_\_

DATE: July 21, 2000

POSITION: Engineering Manager

**SUBMITTED MEASURED DATA -- INDEX**

| <b><u>EXHIBIT</u></b> | <b><u>DESCRIPTION</u></b>                                          |
|-----------------------|--------------------------------------------------------------------|
| 11A                   | RF Output-Data                                                     |
| 11B                   | Occupied Bandwidth                                                 |
| 11C                   | Conducted Spurious Emissions: Setup, Specifications, Index         |
| 11C-1                 | Conducted Spurious Emissions, Harmonics, Power Output at 100 Watts |
| 11C-2                 | Conducted Spurious Emissions, Harmonics, Power Output at 5 Watts   |
| 11C-3                 | Conducted Spurious Emissions, Close-In, Power Output at 100 Watts  |
| 11C-4                 | Conducted Spurious Emissions, Close-In, Power Output at 5 Watts    |
| 11D                   | Radiated Spurious Emissions: Setup, Specifications, Index          |
| 11D-1                 | Radiated Spurious Emissions, Power Output at 100 Watts             |
| 11D-2                 | Radiated Spurious Emissions, Power Output at 5 Watts               |
| 11E                   | Frequency Stability: Setup, Specifications, Index                  |
| 11E-1                 | Frequency Stability Vs Temperature                                 |
| 11E-2                 | Frequency Stability Vs Voltage                                     |

**RF POWER OUTPUT DATA**

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

|                                               |                     |          |
|-----------------------------------------------|---------------------|----------|
| Measured RF output                            | <b><u>100</u></b>   | Watts    |
| Normal DC Voltage                             | <b><u>28.5</u></b>  | Volts    |
| Normal DC Current                             | <b><u>14.29</u></b> | Amperes  |
| Input power for final RF amplifying device(s) | <b><u>407.3</u></b> | Watts    |
| Primary Supply Voltage                        | <b><u>48</u></b>    | Volts DC |

|                                               |                     |          |
|-----------------------------------------------|---------------------|----------|
| Minimum Measured RF output                    | <b><u>5</u></b>     | Watts    |
| Normal DC Voltage                             | <b><u>28.5</u></b>  | Volts    |
| Normal DC Current                             | <b><u>3.55</u></b>  | Amperes  |
| Input power for final RF amplifying device(s) | <b><u>101.2</u></b> | Watts    |
| Primary Supply Voltage                        | <b><u>48</u></b>    | Volts DC |

**OCCUPIED BANDWIDTH**

Modulation Type: Widepulse QPSK – 9600 bps Random Data  
 Emission Designator: 8K70D1W  
 Channelization: 12.5 kHz

**SPECIFICATION REQUIREMENT:****§ 90.210 Emission limits:**

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

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

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz:

*At least  $7.27 * (f_d - 2.88 \text{ kHz}) \text{ dB}$ .*

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz:

*At least  $50 \text{ plus } 10 \log_{10}(P) \text{ decibels}$  or  $70 \text{ decibels}$ , whichever is the lesser attenuation.*

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

**Necessary Bandwidth Calculation:**

The necessary bandwidth of the modulation signal 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 Setting and Procedure, per TIA/EIA-102.CAAA, Section 2.2.5:****Reference Calibration Analyzer Settings:**

|                |                                |                       |         |
|----------------|--------------------------------|-----------------------|---------|
| Horizontal:    | 12 kHz per Division            | Resolution Bandwidth: | 30 kHz  |
| Vertical:      | 10 dB per Division             | Video Bandwidth:      | 30 kHz  |
| Sweep Time:    | 75 Seconds (<2000 Hz / Second) | Span:                 | 120 kHz |
| Detector Mode: | Positive Peak                  |                       |         |

**Emission Measurement Analyzer Settings:**

|                |                                |                       |         |
|----------------|--------------------------------|-----------------------|---------|
| Horizontal:    | 12 kHz per Division            | Resolution Bandwidth: | 100 Hz  |
| Vertical:      | 10 dB per Division             | Video Bandwidth:      | 1 kHz   |
| Sweep Time:    | 75 Seconds (<2000 Hz / Second) | Span:                 | 120 kHz |
| Detector Mode: | Positive Peak                  |                       |         |

**Test Procedure:**

- 1) Adjust the spectrum analyzer per the values specified in the Reference Calibration Analyzer Settings.
- 2) Modulate the transmitter with the appropriate signaling pattern, (psuedorandom data) and key the transmitter. Use the analyzer controls to set this signal to the full-scale reference line. Allow the analyzer to sweep.
- 3) Adjust the analyzer per the Emission Measurement Analyzer Settings.
- 4) Allow the analyzer to sweep, and record the resultant emission levels.
- 5) Plot the resulting analyzer trace and the emission mask limit, add text and labeling as appropriate.

# OCCUPIED BANDWIDTH -- 12.5 kHz CHANNELS

REF 22.1 dBm

ATTEN 40 dB

10 dB/  
POS PK

LOG PAGE: 885796 DATE: 6/15/00

NAME: Ferdie DeLeon

SIGNATURE: \_\_\_\_\_

RES BW 30 kHz  
RES BW 100 Hz  
D-Mask

CENTER 860.0125 MHz  
RES BW 100 Hz

VID BW 1 kHz

SPAN 120 kHz  
SWP 75 sec

**CONDUCTED SPURIOUS EMISSIONS****SPECIFICATION REQUIREMENT:****Reference: Part 90.210 (Emission Mask D)**

On any frequency displacement of more than 12.5 kHz removed from the center of the authorized bandwidth, the power of any emission shall be attenuated below the transmitter power (P) by at least 50 plus  $10 \log_{10}$ (Mean output power in Watts) decibels or 70 decibels, whichever is the lesser attenuation.

For this transmitter, when operating at the full power setting of 100 Watts, this specification limit is 70.0 dBC.

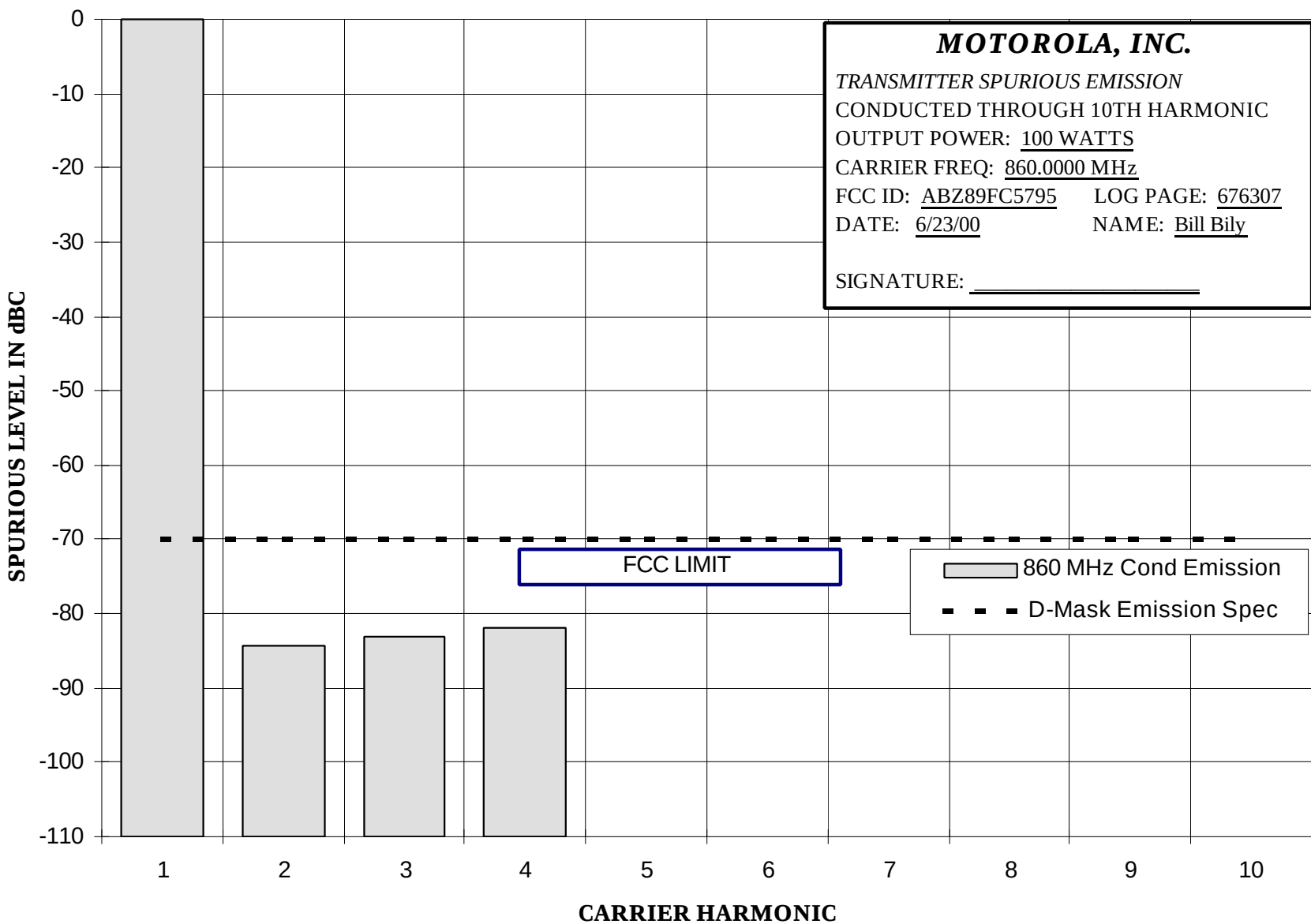
For this transmitter, when operating at the lowest power setting of 5 Watts, this specification limit is 57.0 dBC.

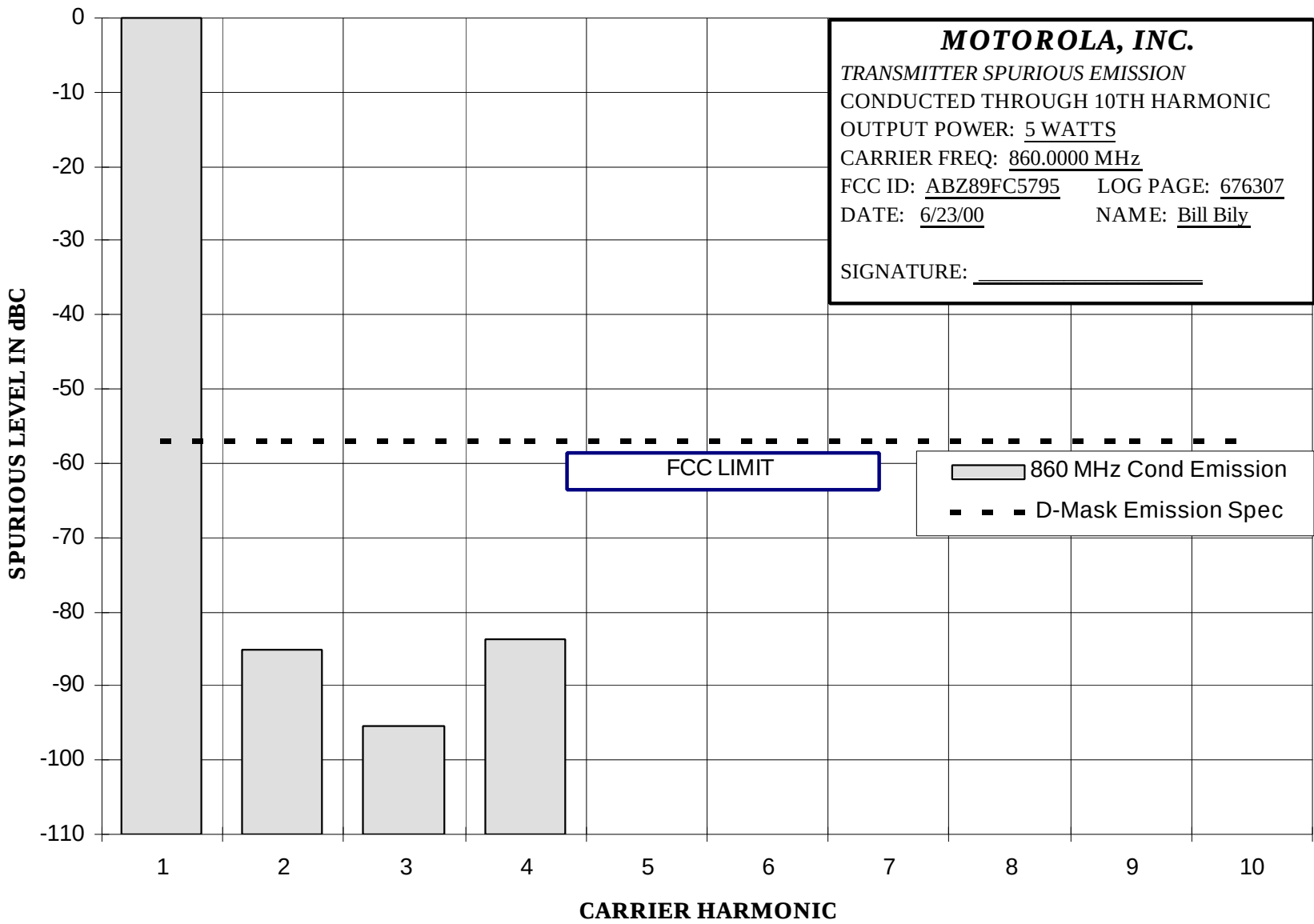
Modulation: Psuedorandom data

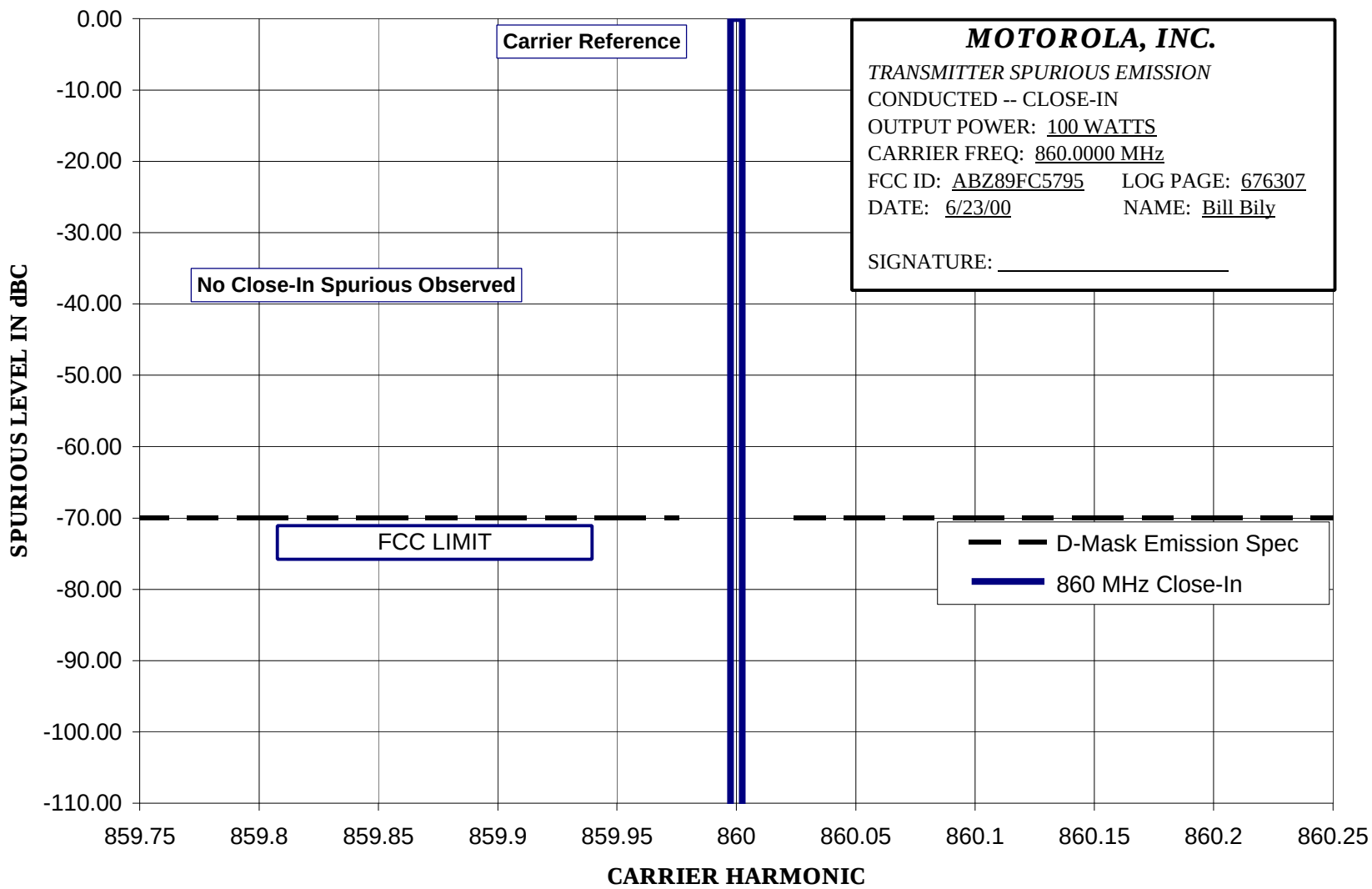
Carrier Frequency: One carrier frequency, at 860.0000 MHz, was measured. This frequency is near the center of the operating band 851-870 MHz.

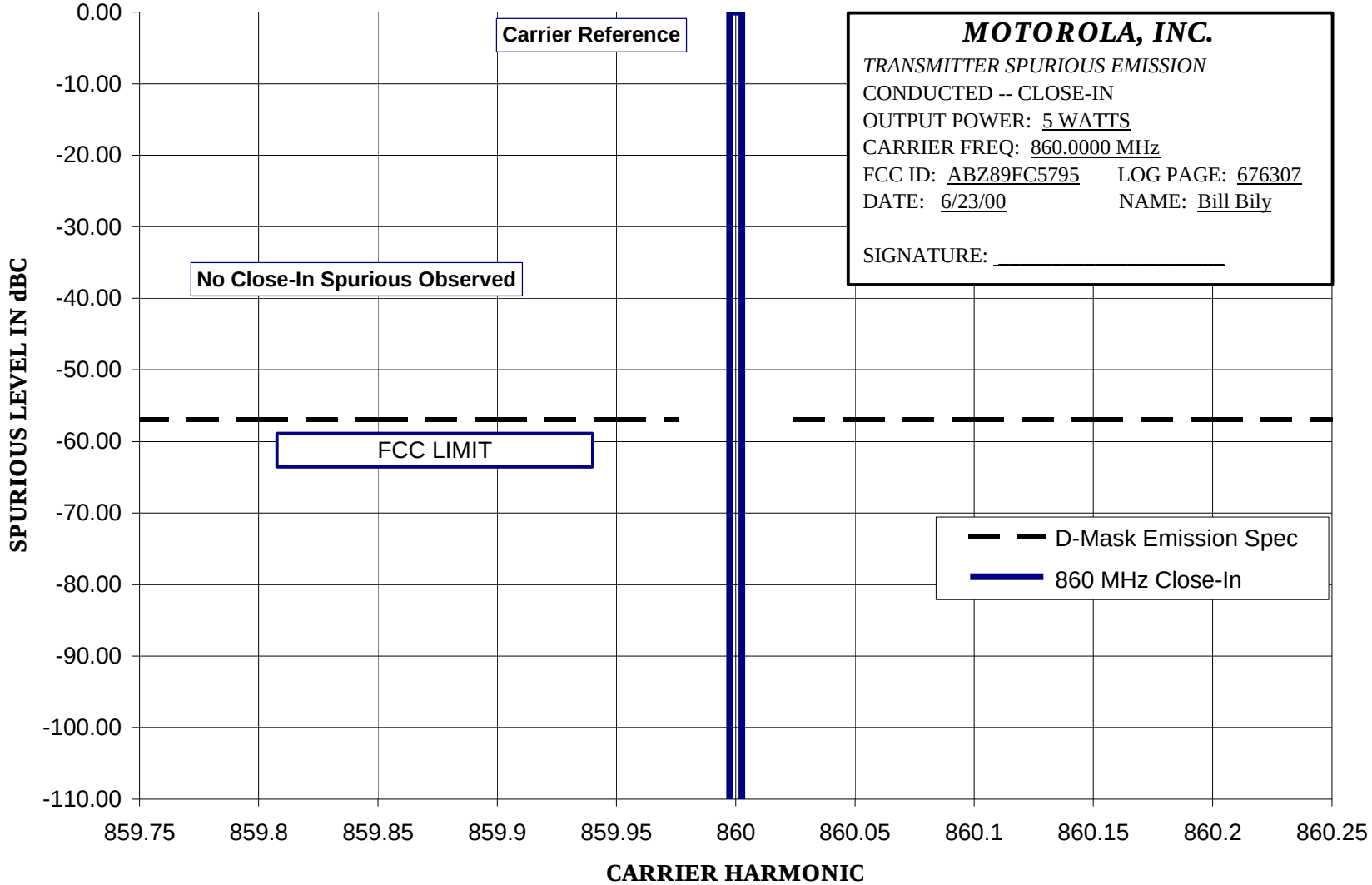
**SPURIOUS EMISSION PLOTS:**

| <b><u>EXHIBIT</u></b> | <b><u>DESCRIPTION</u></b>                                        |
|-----------------------|------------------------------------------------------------------|
| 11C-1                 | Conducted Spurious Harmonic Emissions, Power Output at 100 Watts |
| 11C-2                 | Conducted Spurious Harmonic Emissions, Power Output at 5 Watts   |
| 11C-3                 | Conducted Spurious Close-In Emissions, Power Output at 100 Watts |
| 11C-4                 | Conducted Spurious Close-In Emissions, Power Output at 5 Watts   |









**RADIATED SPURIOUS EMISSIONS**

**SPECIFICATION REQUIREMENT:**

**Reference: Part 90.210 (Emission Mask D)**

On any frequency displacement of more than 12.5 kHz removed from the center of the authorized bandwidth, the power of any emission shall be attenuated below the transmitter power (P) by at least 50 plus  $10 \log_{10}$ (Mean output power in Watts) decibels or 70 decibels, whichever is the lesser attenuation.

For this transmitter, when operating at the full power setting of 100 Watts, this specification limit is 70.0 dBC.

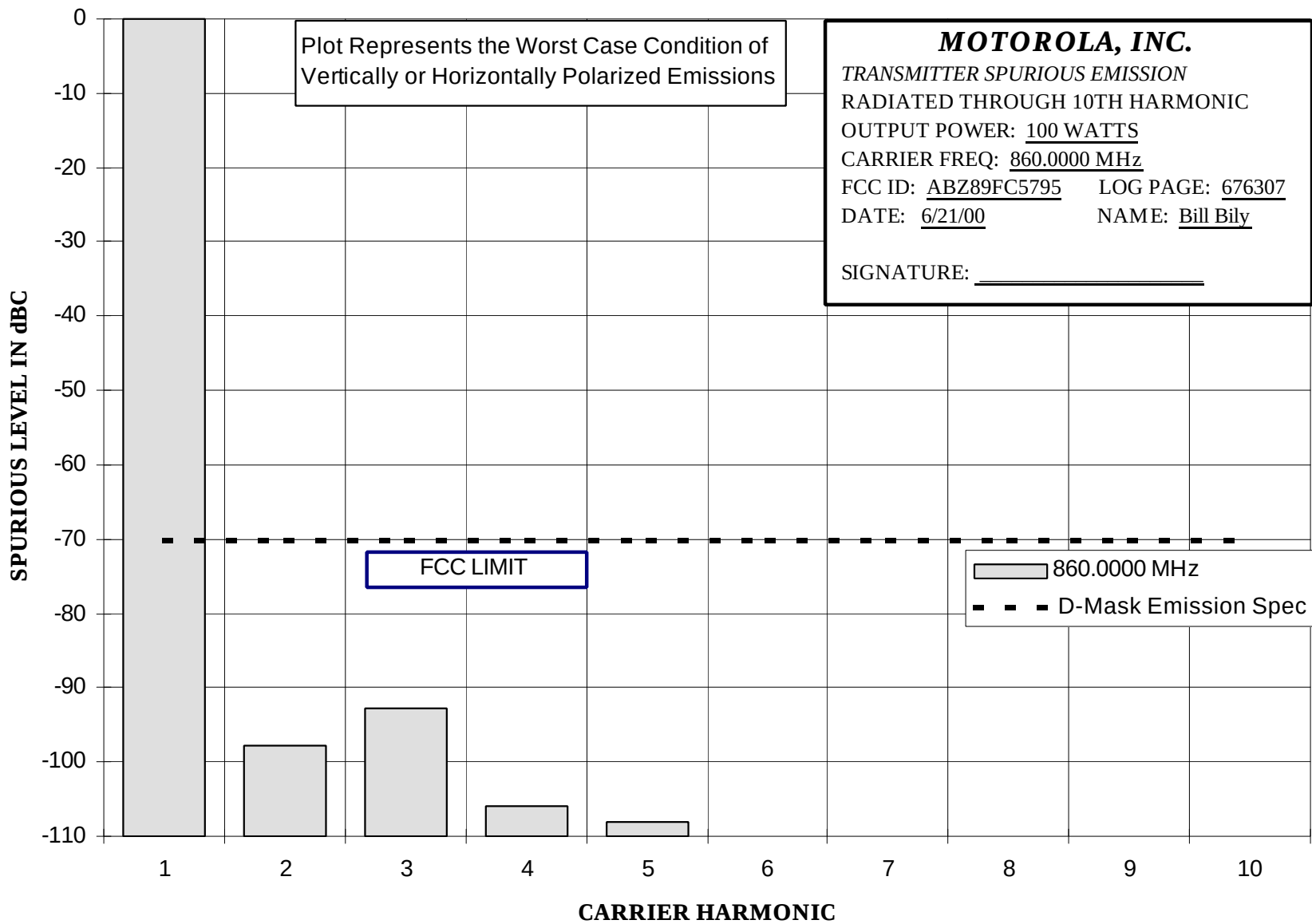
For this transmitter, when operating at the lowest power setting of 5 Watts, this specification limit is 57.0 dBC.

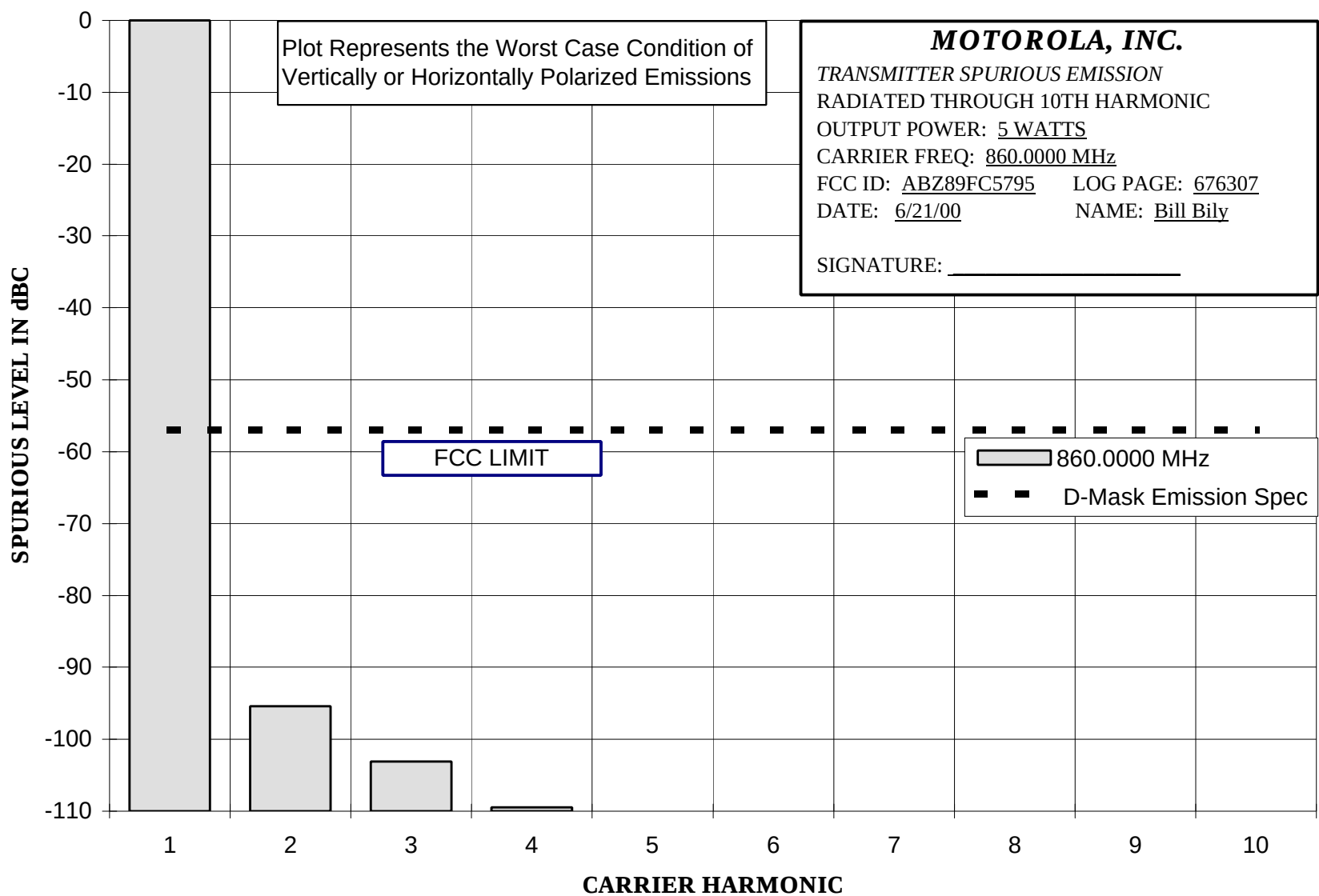
Modulation: Psuedorandom data

Carrier Frequency: One carrier frequency, at 860.0000 MHz, was measured. This frequency is near the center of the operating band 851-870 MHz.

**SPURIOUS EMISSION PLOTS:**

| <b><u>EXHIBIT</u></b> | <b><u>DESCRIPTION</u></b>                              |
|-----------------------|--------------------------------------------------------|
| 11D-1                 | Radiated Spurious Emissions, Power Output at 100 Watts |
| 11D-2                 | Radiated Spurious Emissions, Power Output at 5 Watts   |





**OSCILLATOR FREQUENCY STABILITY****SPECIFICATION REQUIREMENT:****Reference: Part 90.213**

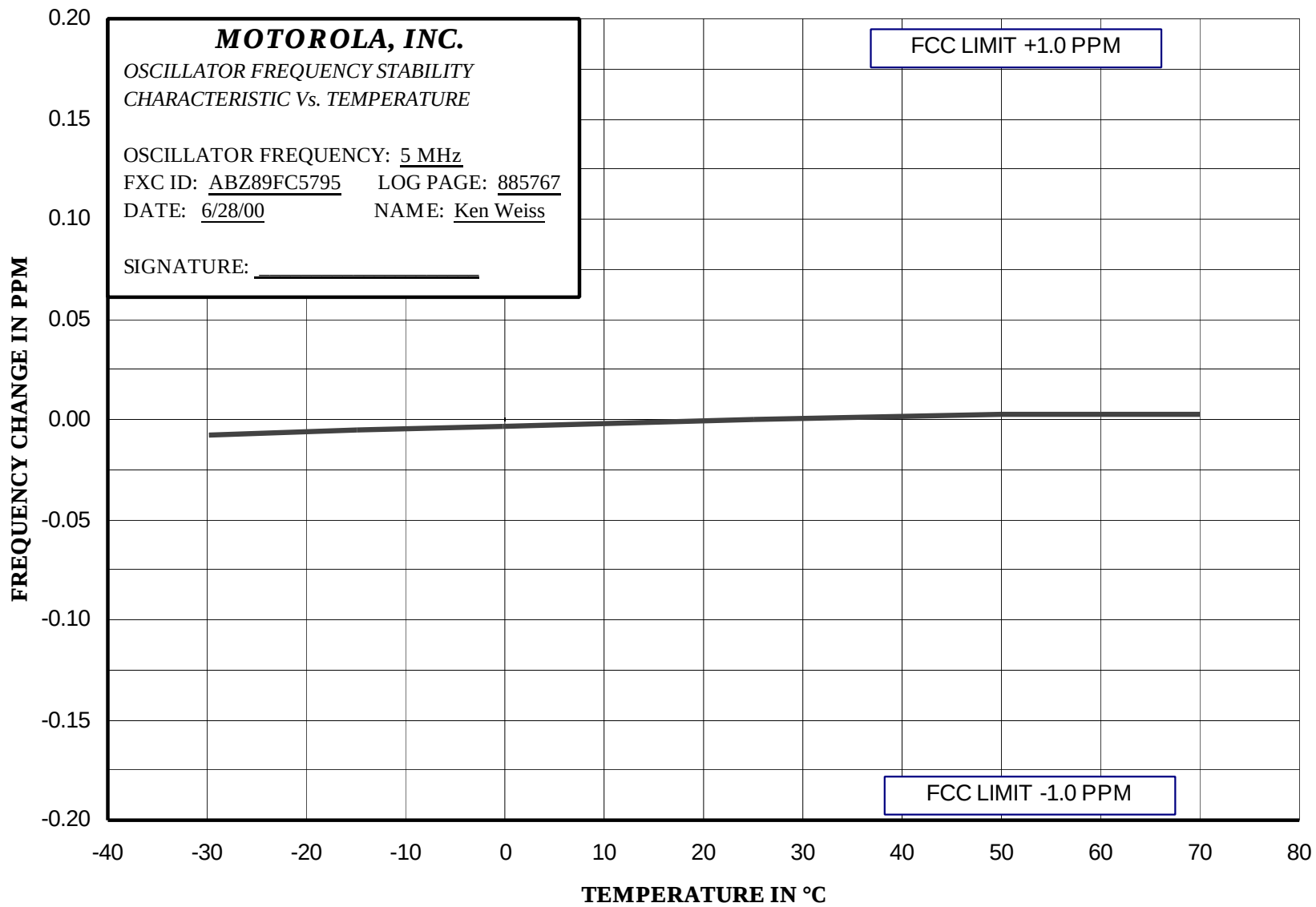
Fixed and Base stations, operating at 851-866 MHz, must have a frequency stability of better than 1.5 PPM.

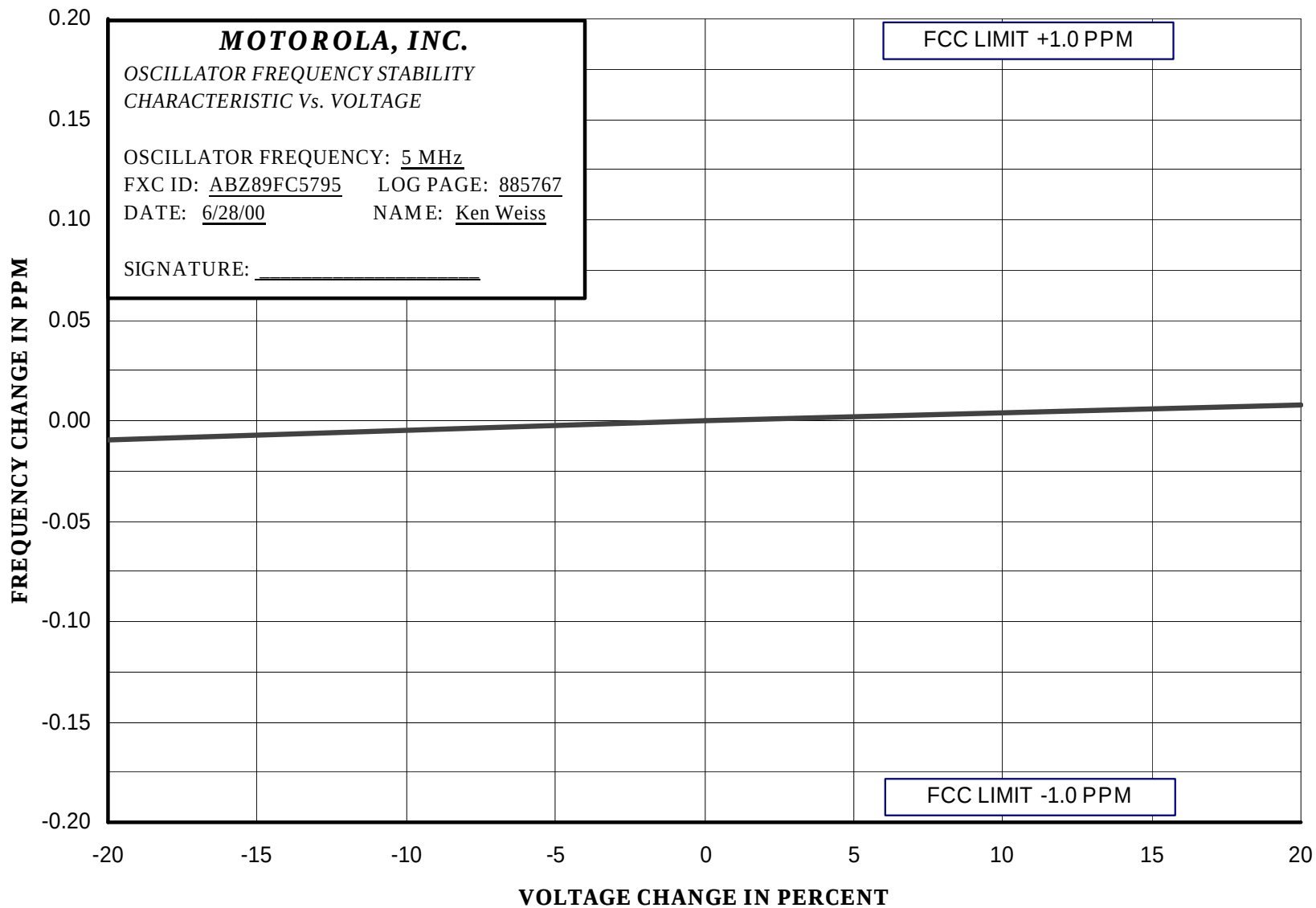
Fixed and Base stations, operating at 866-869 MHz, must have a frequency stability of better than 1.0 PPM.

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

**FREQUENCY STABILITY PLOTS:**

| <b><u>EXHIBIT</u></b> | <b><u>DESCRIPTION</u></b>          |
|-----------------------|------------------------------------|
| 11E-1                 | Frequency Stability Vs Temperature |
| 11E-2                 | Frequency Stability Vs Voltage     |





**TEST EQUIPMENT LIST**

| <b><u>MODEL</u></b> | <b><u>MANUFACTURER</u></b> | <b><u>DESCRIPTION</u></b> | <b><u>Serial No.</u></b> | <b><u>Last Cal</u></b>  | <b><u>Next Cal</u></b> |
|---------------------|----------------------------|---------------------------|--------------------------|-------------------------|------------------------|
| 438A                | Hewlett Packard            | RF Power Meter            | 3513U06093               | 11/05/99                | 11/05/02               |
| 8481A               | Hewlett Packard            | RF Power Sensor           | 2702A78679               | 12/02/98                | 12/02/01               |
| 8568B               | Hewlett Packard            | Spectrum Analyzer         | 2841A04405               | 06/18/97                | 06/18/00               |
| 7475A               | Hewlett Packard            | Plotter                   | 2807F99291               | no calibration required |                        |
| 6071A               | Fluke                      | Signal Generator          | 3005007                  | no calibration required |                        |
| 83712A              | Hewlett Packard            | Signal Generator          | 3429A00455               | no calibration required |                        |
| 85460A              | Hewlett Packard            | EMI Analyzer, Filter      | 3704A00467               | 10/12/99                | 10/12/02               |
| 85462A              | Hewlett Packard            | EMI Analyzer, RF/Display  | 3906A00500               | 10/12/99                | 10/12/02               |
| (Various)           | Weinschel, Kathrein, Bird  | RF Loads                  | Various                  | no calibration required |                        |
| 3020A, etc.         | Narda                      | Directional Coupler       | Various                  | no calibration required |                        |