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

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

NAME: **Ken Weiss**

SIGNATURE: _____

DATE: **November 19, 2001**

POSITION: **Lead Electrical Engineer**

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

NAME: **Steve Noskowicz**

SIGNATURE: _____

DATE: **November 19, 2001**

POSITION: **Engineering Manager**

SUBMITTED MEASURED DATA -- INDEX

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 modules, or twelve parallel power transistors.

Measured RF output	**70**	Watts, Average
DC Voltage	**28.5**	Volts
DC Current	**14.7**	Amperes
Input power for final RF amplifying device(s)	**420**	Watts
Primary Supply Voltage	**48**	Volts DC
Minimum Measured RF output	**5**	Watts, Average
Normal DC Voltage	**28.5**	Volts
Normal DC Current	**2.5**	Amperes
Input power for final RF amplifying device(s)	**70**	Watts
Primary Supply Voltage	**48**	Volts DC

OCCUPIED BANDWIDTH

Modulation Type: Quad-QAM – 64 kbps Random Data Per Channel – Single Carrier
Emission Designator: 17K7D7W
Channelization: 25 kHz per channel
Power Setting: 70-Watts Average

SPECIFICATION REQUIREMENT:
§ 90.691 Emission Mask Requirements for EA-Based Systems:
(a) Out of band emission requirements apply only to the 'outer' channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P), in Watts, by at least *116*log$_{10}$(F/6.1) dB or 50 plus 10 log$_{10}$(P) dB or 80 dB, whichever is the lesser attenuation,* where F is the frequency removed from the center of the outer channel in the block, in kiloHertz, and where F is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block by greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P), in Watts, by at least *43 plus 10 log$_{10}$(P) dB or 80 dB, whichever is the lesser attenuation,* where F is the frequency removed from the center of the outer channel in the block, in kiloHertz, and where F is greater than 37.5 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

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 17.7 kHz per carrier is based upon a 99% power measurement of the transmitter spectrum, per 2.202 (a).

Measurement Procedure and Instrument Settings:
Reference Calibration Analyzer Settings:

Horizontal:	12.5 kHz per Division	Resolution Bandwidth:	300 kHz
Vertical:	10 dB per Division	Video Bandwidth:	300 kHz
Sweep Time:	75 Seconds (<2000 Hz / Second)	Span:	125 kHz
Detector Mode:	Positive Peak		

Emission Measurement Analyzer Settings:

Horizontal:	12.5 kHz per Division	Resolution Bandwidth:	300 Hz
Vertical:	10 dB per Division	Video Bandwidth:	3 kHz
Sweep Time:	75 Seconds (<2000 Hz / Second)	Span:	125 kHz
Detector Mode:	Positive Peak		

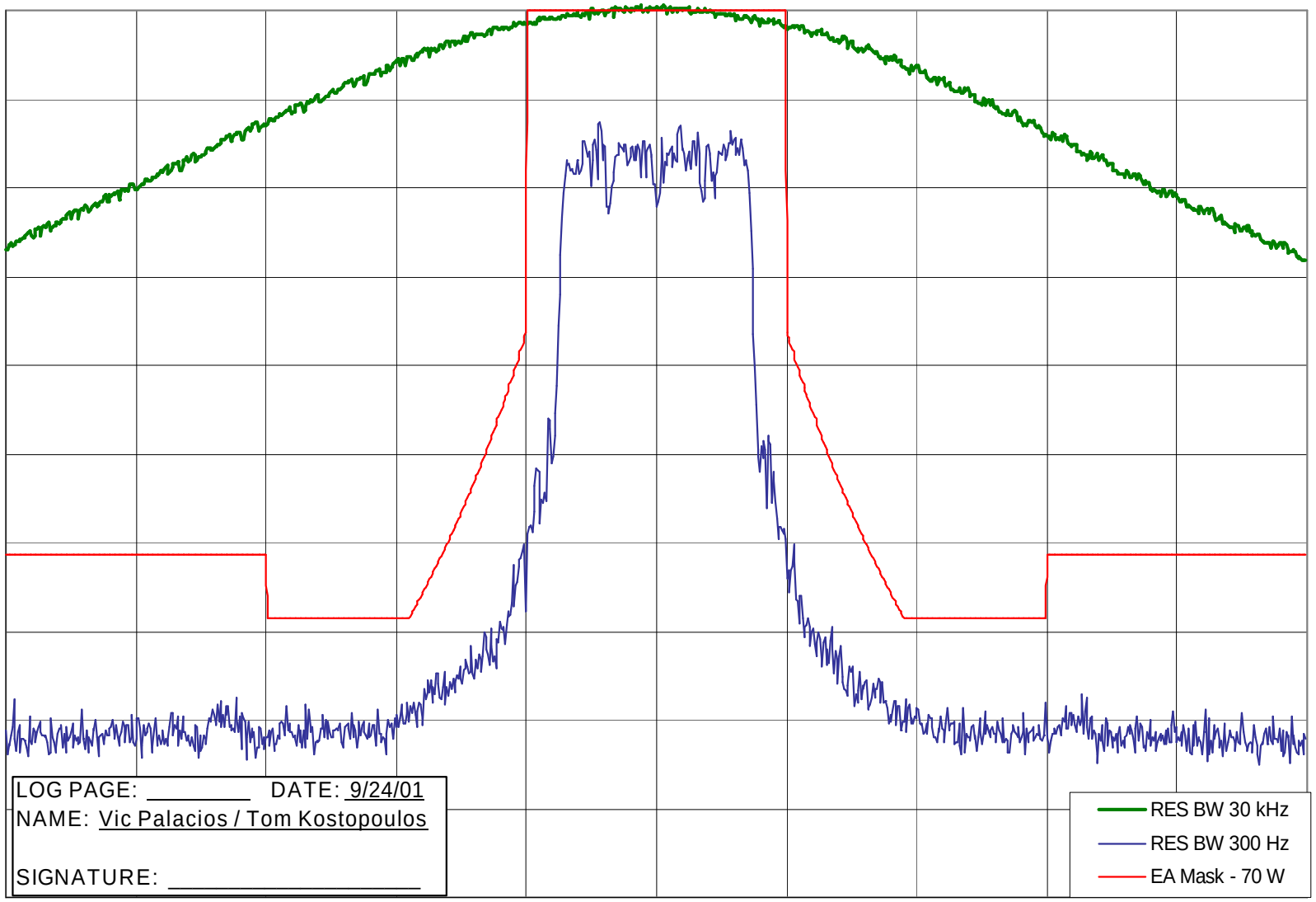
Test Procedure:
1) Adjust the spectrum analyzer per the values specified in the Reference Calibration Analyzer Settings.
2) Modulate the transmitter with the appropriate signaling pattern, (psuedorandom data) and key the transmitter at the full carrier power rating. Use the analyzer controls to set this signal to the full-scale reference line. Allow the analyzer to sweep fully and store the sweep.
3) 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.

APPLICANT: MOTOROLA, INC.

EQUIPMENT TYPE: ABZ89FC5763-A

Occupied Bandwidth -- EBRC / LNODCT - 70 Watts

REF 7.6 dBm ATTEN 20 dB



CENTER 860.0125 MHz
RES BW 300 Hz

VID BW 10 kHz

SPAN 125 kHz
SWP 75 sec

EXHIBIT 11B (Sheet 2 of 2)

CONDUCTED SPURIOUS EMISSIONS

SPECIFICATION REQUIREMENT:

Reference: Part 90.691 (Emission Mask EA)

On any frequency displacement of greater than 37.5 kHz removed from the authorized frequency block, the power of any emission shall be attenuated below the transmitter power (P), in Watts, by at least 43 plus 10 $\log_{10}$(P) dB or 80 dB, whichever is the lesser attenuation.

Modulation:	Psuedorandom data
Carrier Frequency:	A carrier at 860.0125 MHz was measured. This frequency is near the center of the operating band 851-870 MHz.

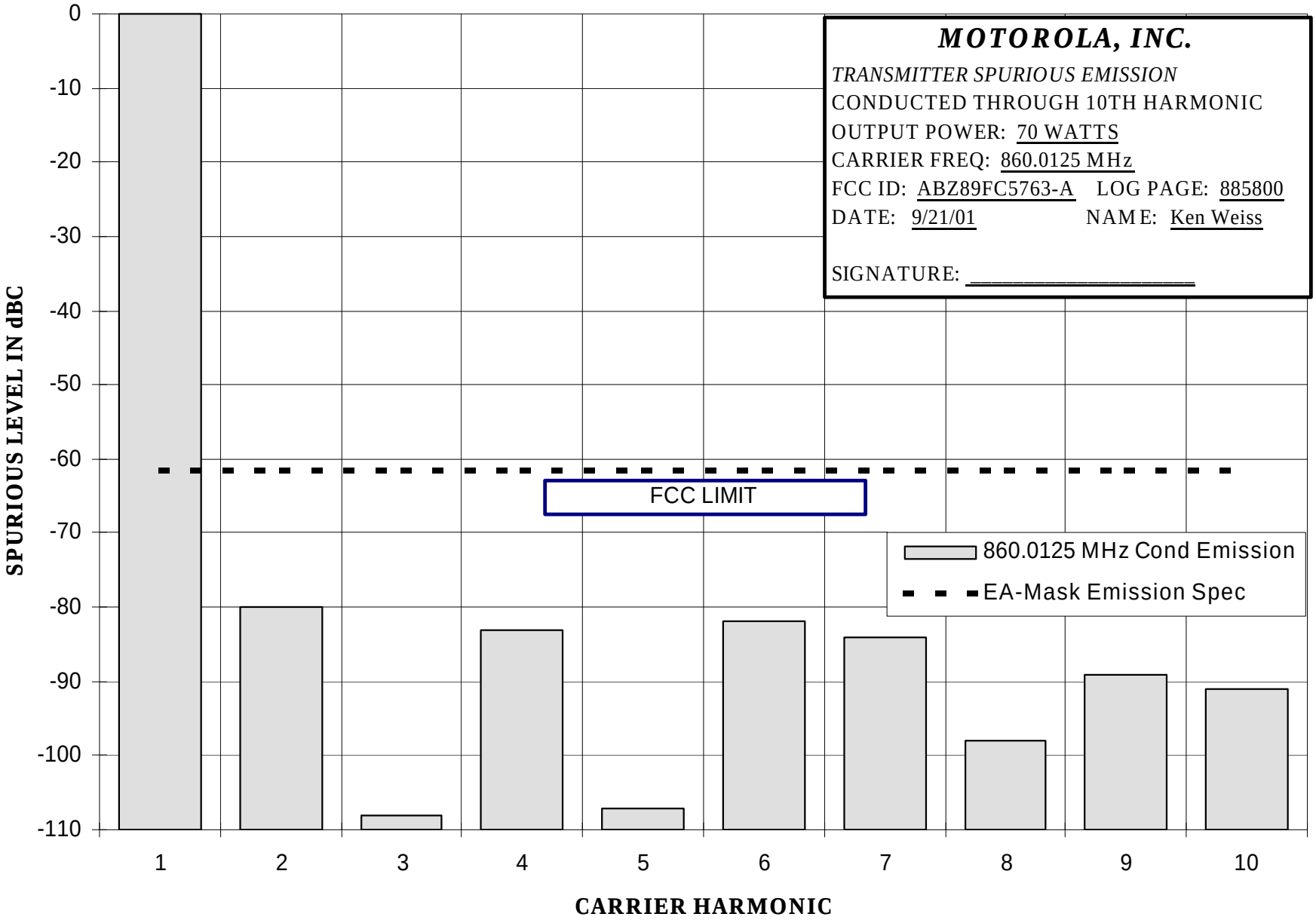
SPURIOUS EMISSION PLOTS:

EXHIBIT	DESCRIPTION
11C-1	Conducted Spurious Emissions, Harmonics, Power Output at 70 Watts The specification limit is –61.5 dBC
11C-2	Conducted Spurious Emissions, Harmonics, Power Output at 5 Watts The specification limit is -50.0 dBC
11C-3	Conducted Spurious Emissions, Close-In, Power Output at 70 Watts The specification limit is –61.5 dBC

APPLICANT: MOTOROLA, INC.

EQUIPMENT TYPE: ABZ89FC5763-A

EXHIBIT 11C-1



APPLICANT: MOTOROLA, INC.

EQUIPMENT TYPE: ABZ89FC5763-A

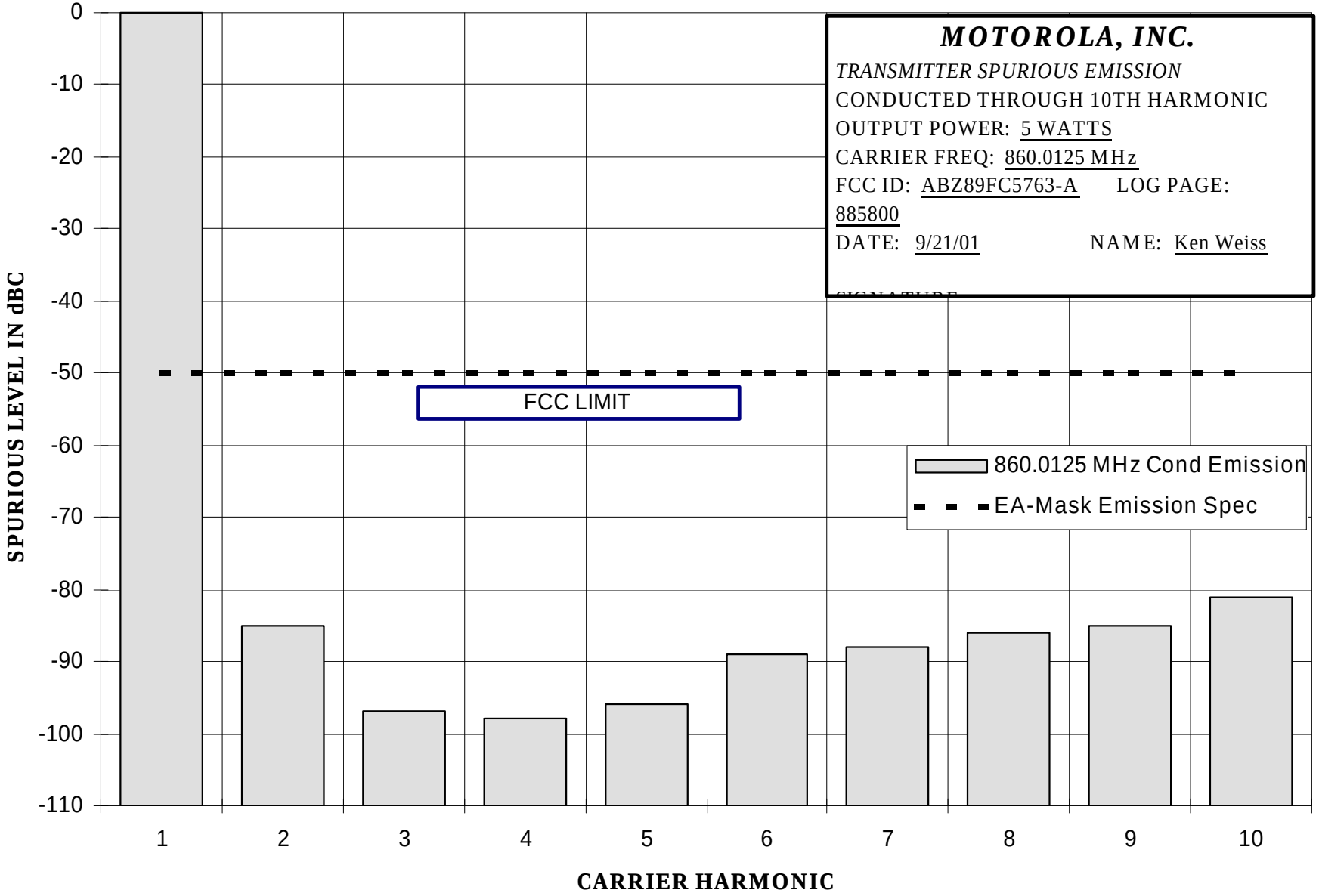


EXHIBIT 11C-2

APPLICANT: MOTOROLA, INC.

EQUIPMENT TYPE: ABZ89FC5763-A

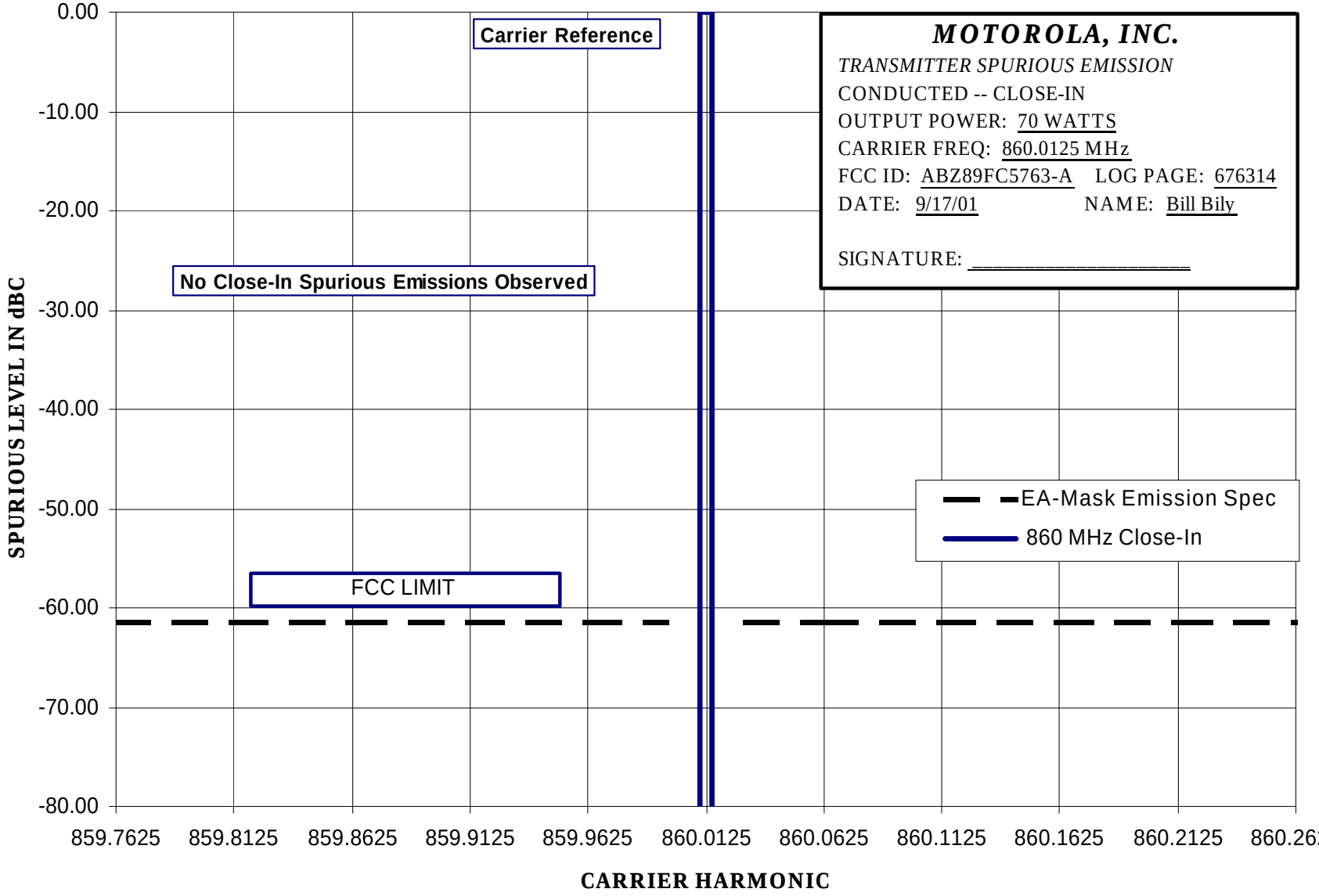


EXHIBIT 11C-3

RADIATED SPURIOUS EMISSIONS

SPECIFICATION REQUIREMENT:

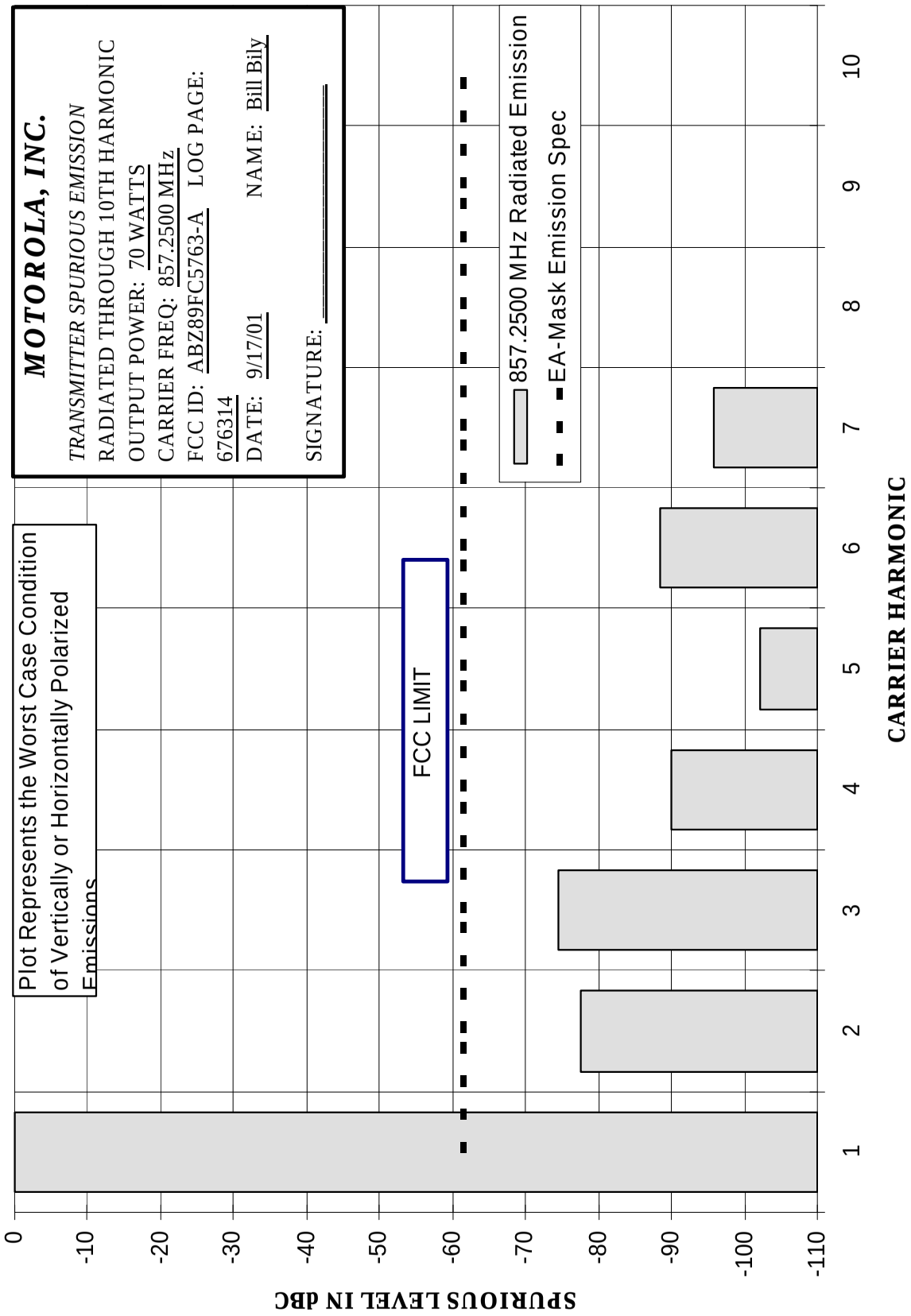
Reference: Part 90.691 (Emission Mask EA)

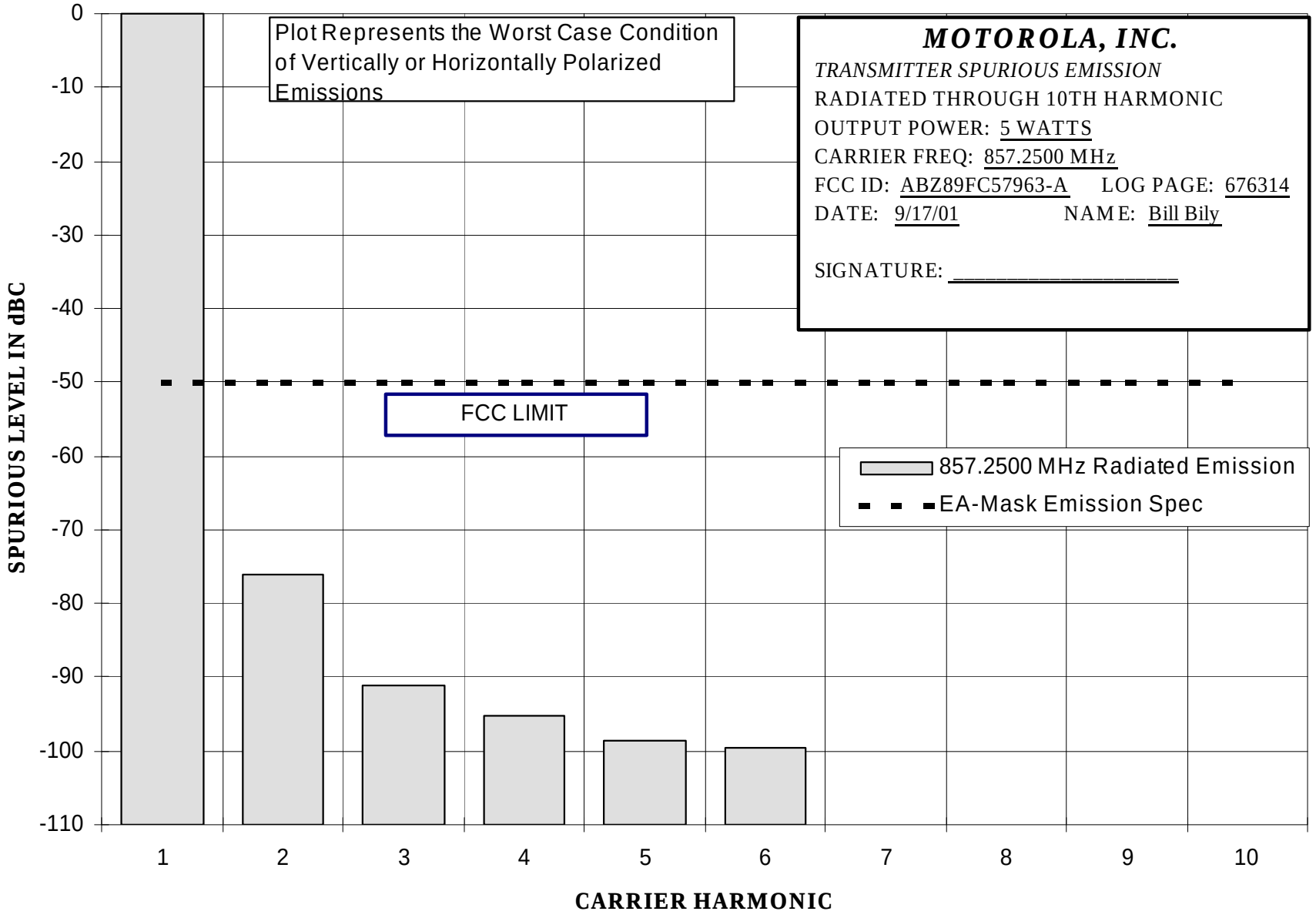
On any frequency displacement of greater than 37.5 kHz removed from the authorized frequency block, the power of any emission shall be attenuated below the transmitter power (P), in Watts, by at least 43 plus 10 $\log_{10}$(P) dB or 80 dB, whichever is the lesser attenuation.

Modulation:	Psuedorandom data
Carrier Frequency:	A carrier centered at 857.25 MHz was measured. This frequency is near the center of the operating band 851-870 MHz.

SPURIOUS EMISSION PLOTS:

EXHIBIT	DESCRIPTION
11D-1	Radiated Spurious Emissions, Power Output at 70 Watts The specification limit is –61.5 dBC
11D-2	Radiated Spurious Emissions, Power Output at 5 Watts The specification limit is -50.0 dBC


MOTOROLA, INC.
TRANSMITTER SPURIOUS EMISSION
RADIATED THROUGH 10TH HARMONIC
OUTPUT POWER: 70 WATTS
CARRIER FREQ: 857.2500 MHz
FCC ID: ABZ89FC5763-A LOG PAGE: 676314
DATE: 9/17/01 NAME: Bill Bily
SIGNATURE:
Plot Represents the Worst Case Condition of Vertically or Horizontally Polarized Emissions
857.2500 MHz Radiated Emission
EA-Mask Emission Spec
FCC LIMIT
SPURIOUS LEVEL IN dBC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
1
2
3
4
5
6
7
8
9
10
CARRIER HARMONIC


Plot Represents the Worst Case Condition of Vertically or Horizontally Polarized Emissions
MOTOROLA, INC.
TRANSMITTER SPURIOUS EMISSION
RADIATED THROUGH 10TH HARMONIC
OUTPUT POWER: 5 WATTS
CARRIER FREQ: 857.2500 MHz
FCC ID: ABZ89FC57963-A LOG PAGE: 676314
DATE: 9/17/01 NAME: Bill Bily
SIGNATURE: _____
FCC LIMIT
857.2500 MHz Radiated Emission
EA-Mask Emission Spec
SPURIOUS LEVEL IN dBC
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
1
2
3
4
5
6
7
8
9
10
CARRIER HARMONIC

OSCILLATOR FREQUENCY STABILITY

SPECIFICATION REQUIREMENT:

Reference: Part 90.213

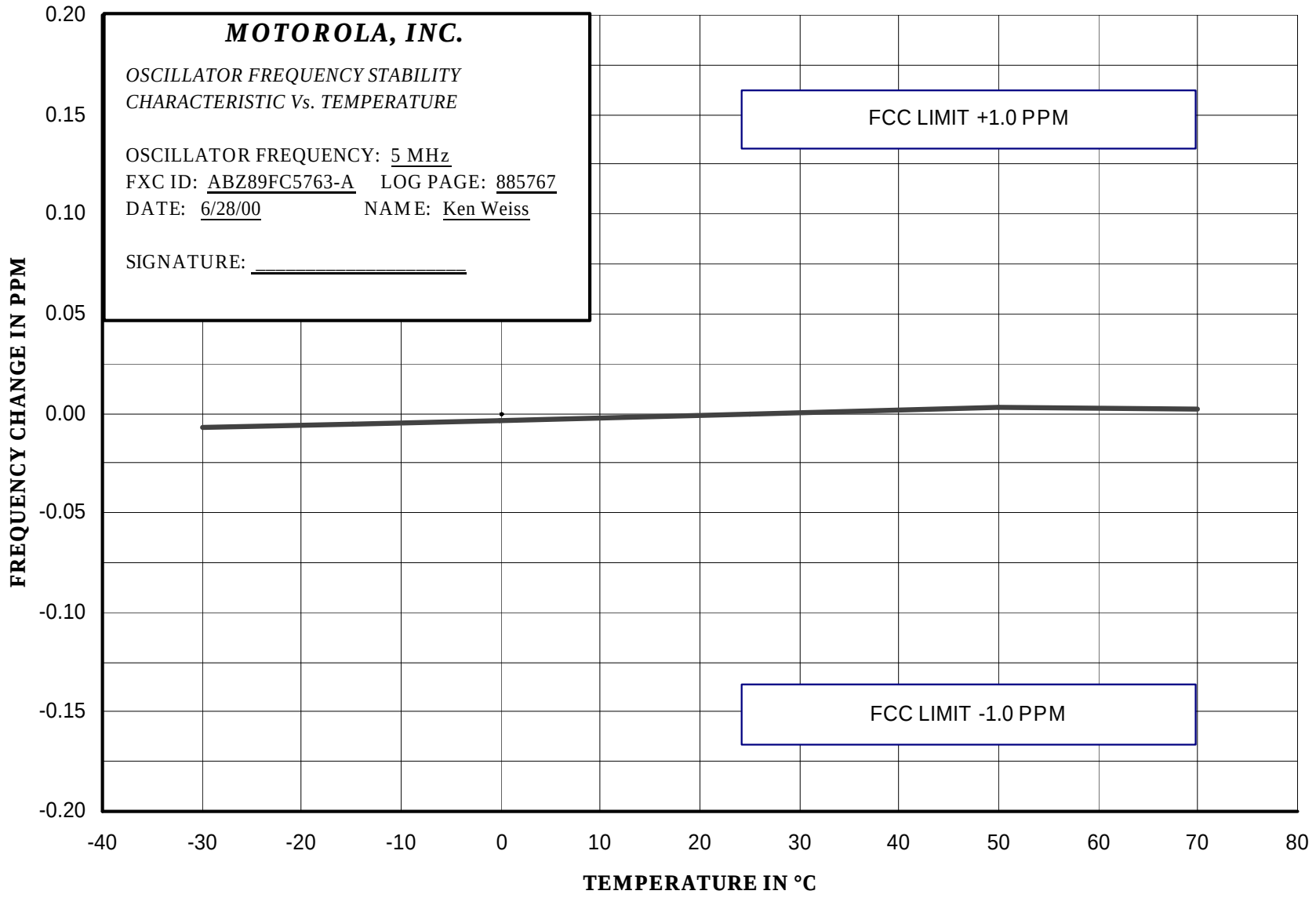
Fixed and Base stations, operating at 851-866 MHz, must have a frequency stability of better than 1.5 PPM.

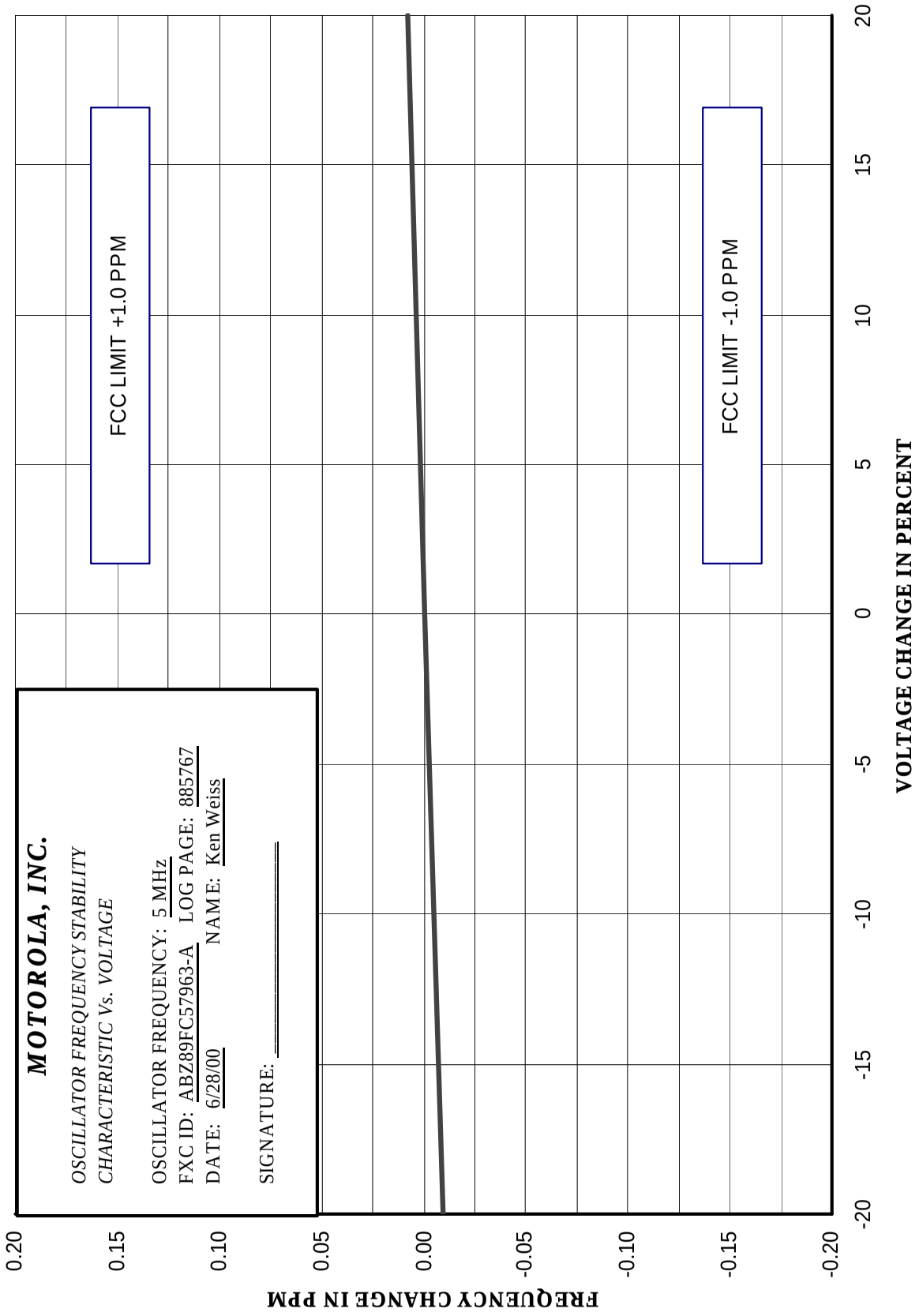
Fixed and Base stations, operating at 866-869 MHz, must have a frequency stability of better than 1.0 PPM.

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

FREQUENCY STABILITY PLOTS:

EXHIBIT	DESCRIPTION
11E-1	Frequency Stability Vs Temperature
11E-2	Frequency Stability Vs Voltage


MOTOROLA, INC.
OSCILLATOR FREQUENCY STABILITY
CHARACTERISTIC Vs. TEMPERATURE
OSCILLATOR FREQUENCY: 5 MHz
FXC ID: ABZ89FC5763-A LOG PAGE: 885767
DATE: 6/28/00 NAME: Ken Weiss
SIGNATURE: _____
FCC LIMIT +1.0 PPM
FCC LIMIT -1.0 PPM
FREQUENCY CHANGE IN PPM
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
TEMPERATURE IN °C


MOTOROLA, INC.
OSCILLATOR FREQUENCY STABILITY
CHARACTERISTIC Vs. VOLTAGE
OSCILLATOR FREQUENCY: 5 MHz
FXC ID: ABZ89FC57963-A LOG PAGE: 885767
DATE: 6/28/00 NAME: Ken Weiss
SIGNATURE:
FCC LIMIT +1.0 PPM
FCC LIMIT -1.0 PPM
FREQUENCY CHANGE IN PPM
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
VOLTAGE CHANGE IN PERCENT
-20
-15
-10
-5
0
5
10
15
20

TEST EQUIPMENT LIST

MODEL	MANUFACTURER	DESCRIPTION	Serial No.	Last Cal	Next Cal
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	06/18/00	06/18/03
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	