

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, Texas Tech University, Lubbock, TX, USA
 MSEE, University of Texas at Arlington, Arlington, TX, USA

2 years of Design and Development experience in the field of two-way radio communication.
6 years of Design and Development experience in the field of Cellular/PCS communication.

NAME: Michael Graham

SIGNATURE: _____

DATE: March 20, 2003

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: Michael Pieper

SIGNATURE: _____

DATE: March 20, 2003

POSITION: Engineering Manager

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NAME: Michael Pieper

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DATE: March 20, 2003

POSITION: Engineering Manager

SUBMITTED MEASURED DATA -- INDEXEXHIBIT DESCRIPTION

11A RF Output-Data

11B Adjacent Channel Coupled Power (ACCP) Requirements

11B-1 ACCP Results \leq 400 kHz for QPSK and C4FM Modulation at 763, 764 & 776 MHz.

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11C-1 Conducted Spurious Harmonic Emissions, Power Output at 55 Watts

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11D Radiated Spurious Emissions: Setup, Specifications, Index

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11F-1 Part 90 Operation, Setup, Specifications, and Results

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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.

Measured RF output	<u>55</u>	Watts
Normal DC Voltage	<u>28.0</u>	Volts
Normal DC Current	<u>13.5</u>	Amperes
DC Input power for final RF amplifying device(s)	<u>385</u>	Watts
Primary Supply Voltage	<u>48</u>	Volts DC

Minimum Measured RF output	<u>2.5</u>	Watts
Normal DC Voltage	<u>28.0</u>	Volts
Normal DC Current	<u>3.1</u>	Amperes
DC Input power for final RF amplifying device(s)	<u>88</u>	Watts
Primary Supply Voltage	<u>48</u>	Volts DC

ACCP Requirements

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

Modulation Type: C4FM - 9600 bps Random Data
 Emission Designator: 8K10F1E

Channelization: 12.5 kHz

SPECIFICATION REQUIREMENT:

§ 90.543 Emission limits: For operation in the 764-776 MHz Band
§ 27.53 Emission limits: For operation in the 762-764 MHz Band

For base transmitters designed to operate with a 12.5 kHz channel bandwidth, the ACCP shall be in accordance to the following table.

12.5 KHz Base Transmitter ACCP Requirements for 90.543(b) and 27.53(d)

Offset from Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACCP (dBc)
9.375	6.25	-40
15.625	6.25	-60
21.875	6.25	-60
37.5	25	-60
62.5	25	-65
87.5	25	-65
150	100	-65
250	100	-65
>400 to receive band	30(s)	-80 (continues at -6dB/Octave)
In the receive band	30(s)	-100

Measurement Procedure, per 90.543(b) and 27.53(d):

Setting the Reference Level, per 90.543(b)(1) and 27.53(d)(2)(i): Using a spectrum analyzer capable of ACCP measurements set the measurement bandwidth to the channel size, (12.5 kHz). Set the frequency offset of the measurement to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth. Record this power level as the reference power level.

Measuring the power Level at frequency offset <600 kHz, per 90.543(b)(2) and 27.53(d)(2)(ii): Using a spectrum analyzer capable of ACCP measurements set the measurement bandwidth as shown in the table. Measure the ACCP in dBm. These measurements should be made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power level. The absolute ACCP values must be less than the values given in the table for each condition.

Measuring the power Level at frequency offset >600 kHz, per 90.543(b)(3) and 27.53(d)(2)(iii): Set the spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and sample mode detection. Sweep ± 6 MHz

from the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the power. The response at frequencies >600 kHz must be less than the values listed in the table.

Measurement results, per 90.543(b) and 27.53(d):

For measurements \leq 400 kHz offset from center frequency the ACCP results are shown in Tabular format. For measurements $>$ 400 kHz offset from center frequency the ACCP results are shown in Graphical format.

The ACCP test results for $>$ 400 kHz offsets are shown for QPSK modulation only, as this represents the worse case of the two supported modulation techniques.

ACCP Data:

<u>EXHIBIT</u>	<u>DESCRIPTION</u>
11B-1	ACCP Results \leq 400 kHz for QPSK and C4FM Modulation
11B-2	ACCP Results $>$ 400 kHz at 762 MHz
11B-3	ACCP Results $>$ 400 kHz at 764 MHz
11B-4	ACCP Results $>$ 400 kHz at 776 MHz

ACCP Test Results for offset frequencies \leq 400 kHz

ACCP Test Results: QPSK Modulation, Pout = 55 Watts

Offset from Center Freq (kHz)	FCC Requirements			Measurement Results					
				763 MHz*		764 MHz		776 MHz	
	Measurement BW (kHz)	Maximum ACP (dBc)		Max ACP at low side offset freq (dBc)	Max ACP at high side offset freq (dBc)	Max ACP at low side offset freq (dBc)	Max ACP at high side offset freq (dBc)	Max ACP at low side offset freq (dBc)	Max ACP at high side offset freq (dBc)
+/- 9.375	6.25	-40		-41.90	-42.10	-42.10	-42.00	-42.00	-42.10
+/- 15.625	6.25	-60		-74.60	-74.60	-74.80	-74.70	-74.50	-74.60
+/- 21.875	6.25	-60		-77.40	-75.60	-76.70	-76.20	-77.00	-76.90
+/- 37.5	25	-60		-72.20	-71.60	-71.40	-71.70	-71.70	-71.50
+/- 62.5	25	-65		-72.60	-72.10	-72.40	-72.20	-72.40	-72.50
+/- 87.5	25	-65		-72.60	-72.60	-73.20	-73.20	-73.40	-73.30
+/- 150	100	-65		-69.30	-69.50	-68.90	-69.20	-69.00	-69.00
+/- 250	100	-65		-73.20	-73.00	-72.70	-72.50	-72.70	-72.40
+/- 350**	100	-65		-76.40	-76.40	-76.00	-75.90	-76.10	-75.80

* 763 MHz specification is covered by 27.53(d).

** proposed changes to 90.543 & 27.53 ACP table. Current specification has no requirements from 300 to 400 kHz

ACCP Test Results: C4FM Modulation, Pout = 55 Watts

Offset from Center Freq (kHz)	FCC Requirements			Measurement Results					
				763 MHz*		764 MHz		776 MHz	
	Measurement BW (kHz)	Maximum ACP (dBc)		Max ACP at low side offset freq (dBc)	Max ACP at high side offset freq (dBc)	Max ACP at low side offset freq (dBc)	Max ACP at high side offset freq (dBc)	Max ACP at low side offset freq (dBc)	Max ACP at high side offset freq (dBc)
+/- 9.375 *	6.25	-40		-43.80	-42.60	-42.90	-42.50	-43.50	-43.50
+/- 15.625	6.25	-60		-74.70	-74.30	-74.70	-74.40	-74.90	-74.60
+/- 21.875	6.25	-60		-77.40	-76.70	-77.20	-77.00	-77.10	-77.20
+/- 37.5	25	-60		-72.20	-71.90	-72.00	-71.90	-71.80	-71.90
+/- 62.5	25	-65		-72.70	-72.80	-72.90	-72.70	-72.60	-72.90
+/- 87.5	25	-65		-73.40	-73.40	-73.70	-73.40	-73.30	-73.40
+/- 150	100	-65		-69.10	-69.20	-69.20	-69.30	-69.10	-69.30
+/- 250	100	-65		-72.70	-72.80	-72.90	-72.90	-73.00	-73.00
+/- 350**	100	-65		-76.00	-76.10	-76.10	-76.10	-76.20	-76.00

* 763 MHz specification is covered by 27.53(d).

** proposed changes to 90.543 & 27.53 ACP table. Current specification has no requirements from 300 to 400 kHz

APPLICANT: MOTOROLA INC.

EQUIPMENT TYPE: ABZ89FC5805

ACCP Plot for offset frequencies > 400 kHz at 762 MHz

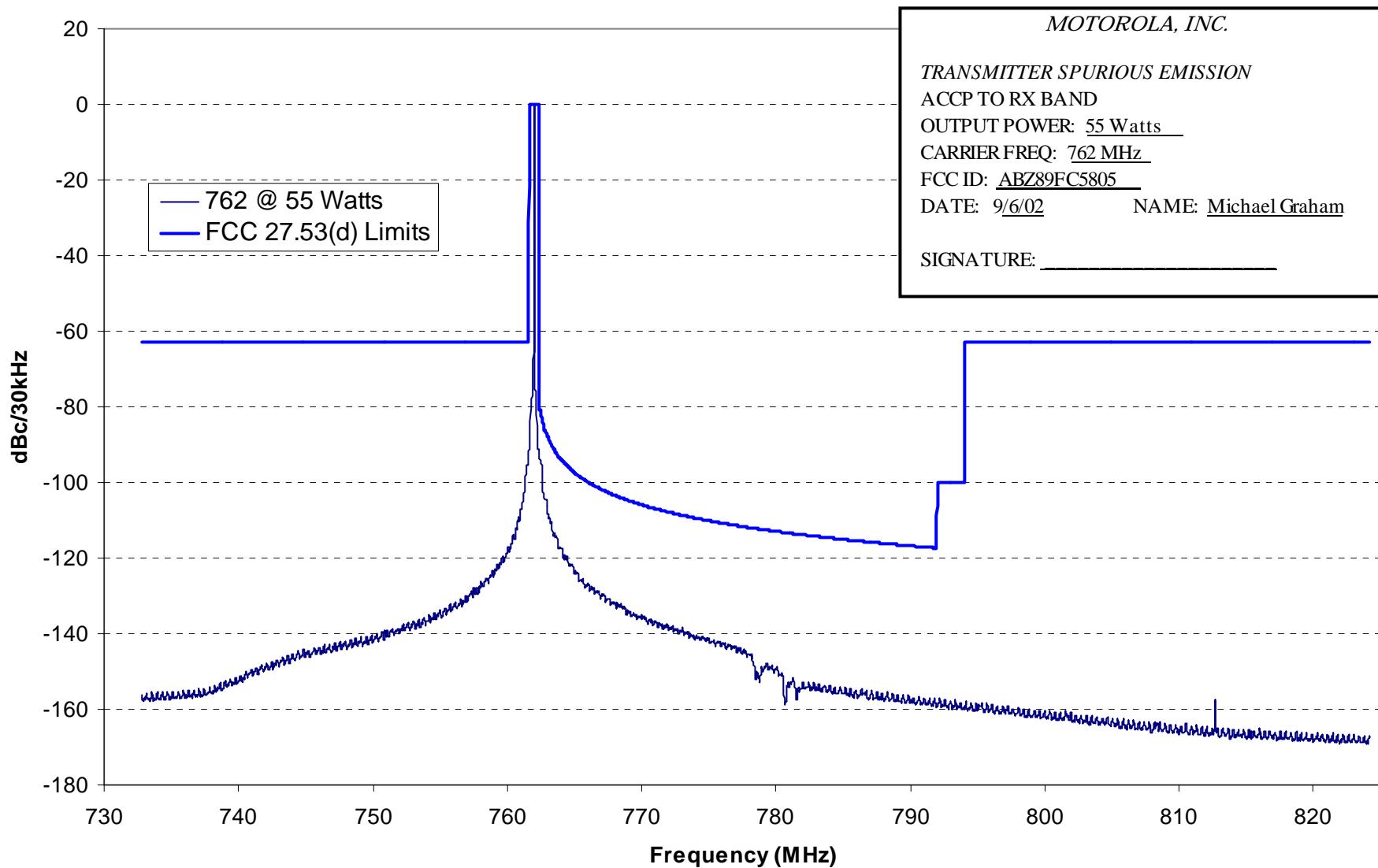


EXHIBIT 11B-2

APPLICANT: MOTOROLA INC.

EQUIPMENT TYPE: ABZ89FC5805

ACCP Plot for offset frequencies > 400 kHz at 764 MHz

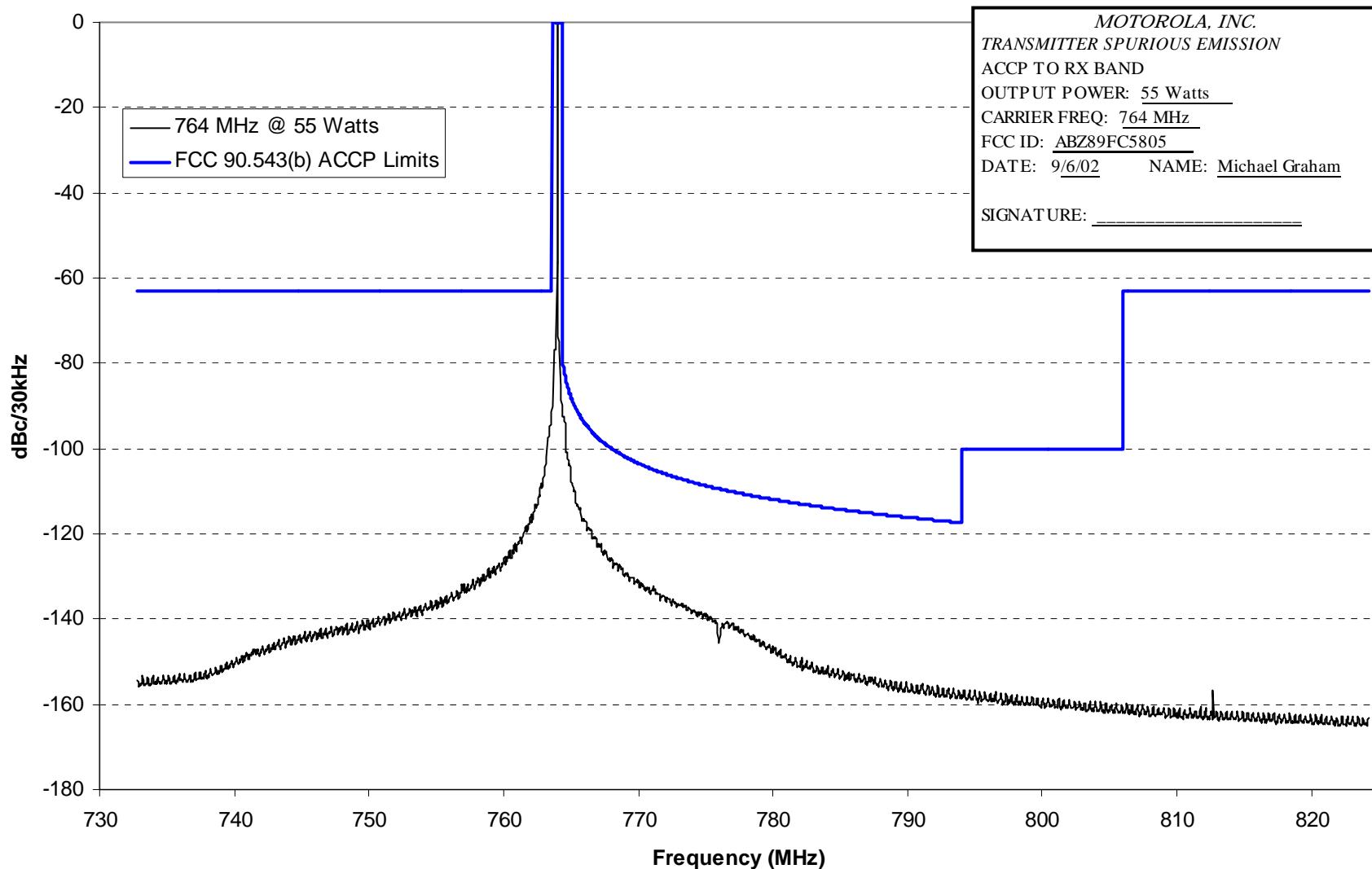


EXHIBIT 11B-3

APPLICANT: MOTOROLA INC.

EQUIPMENT TYPE: ABZ89FC5805

ACCP Plot for offset frequencies > 400 kHz at 776 MHz

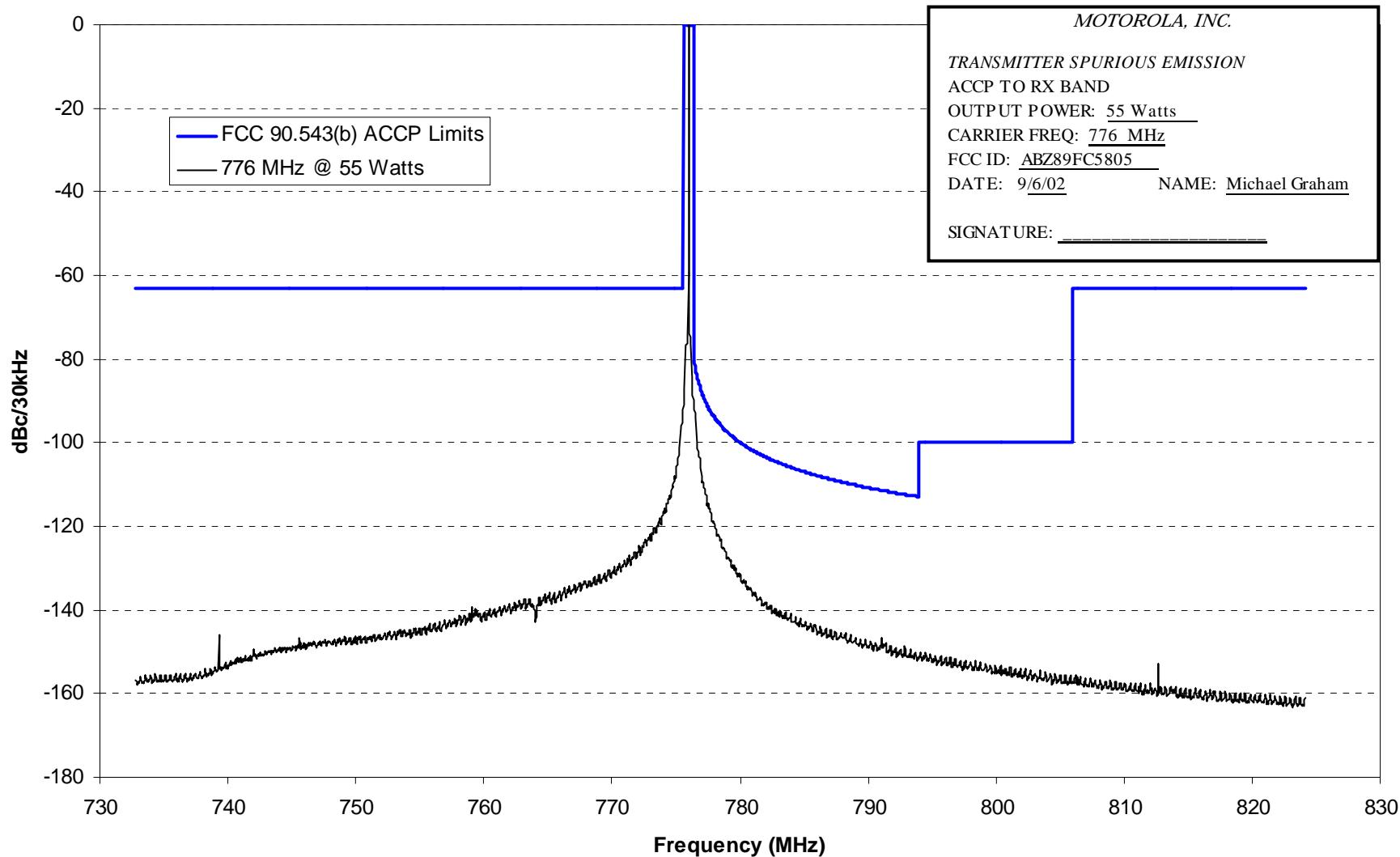


EXHIBIT 11B-4

CONDUCTED SPURIOUS EMISSIONS**SPECIFICATION REQUIREMENT:****Reference: Part 90.543(c) and Part 27.53(d)(3)**

On any frequency displacement outside of the frequency ranges covered in the ACCP tables, the power of any emission must be reduced below the unmodulated carrier power (P) by at least $43+10\log(P)$.

For this transmitter, when operating at the full power setting of 55 Watts, this specification limit is 60.4 dBc.

For this transmitter, when operating at the lowest power setting of 2.5 Watts, this specification limit is 47 dBc.

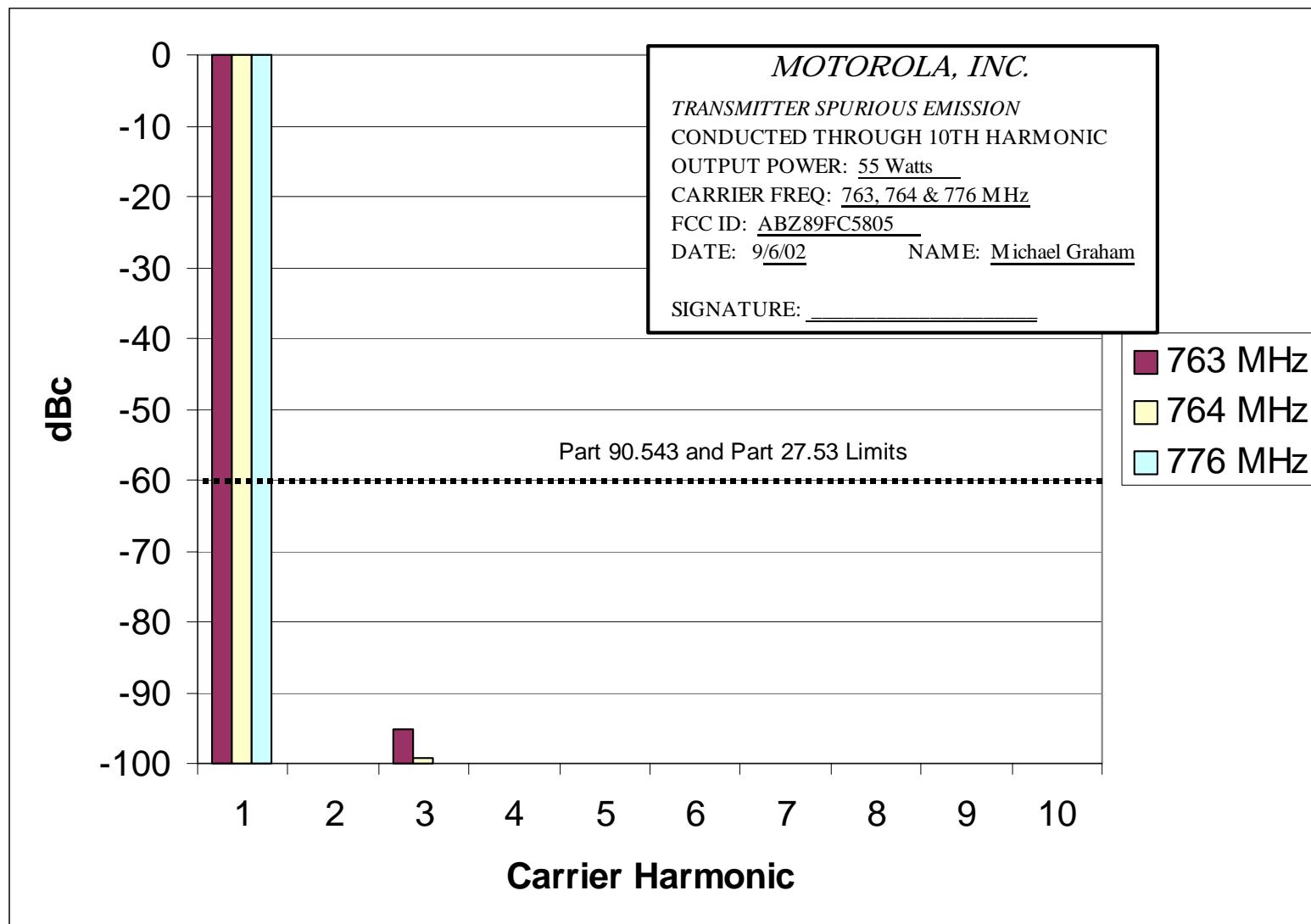
Modulation: Psuedorandom data

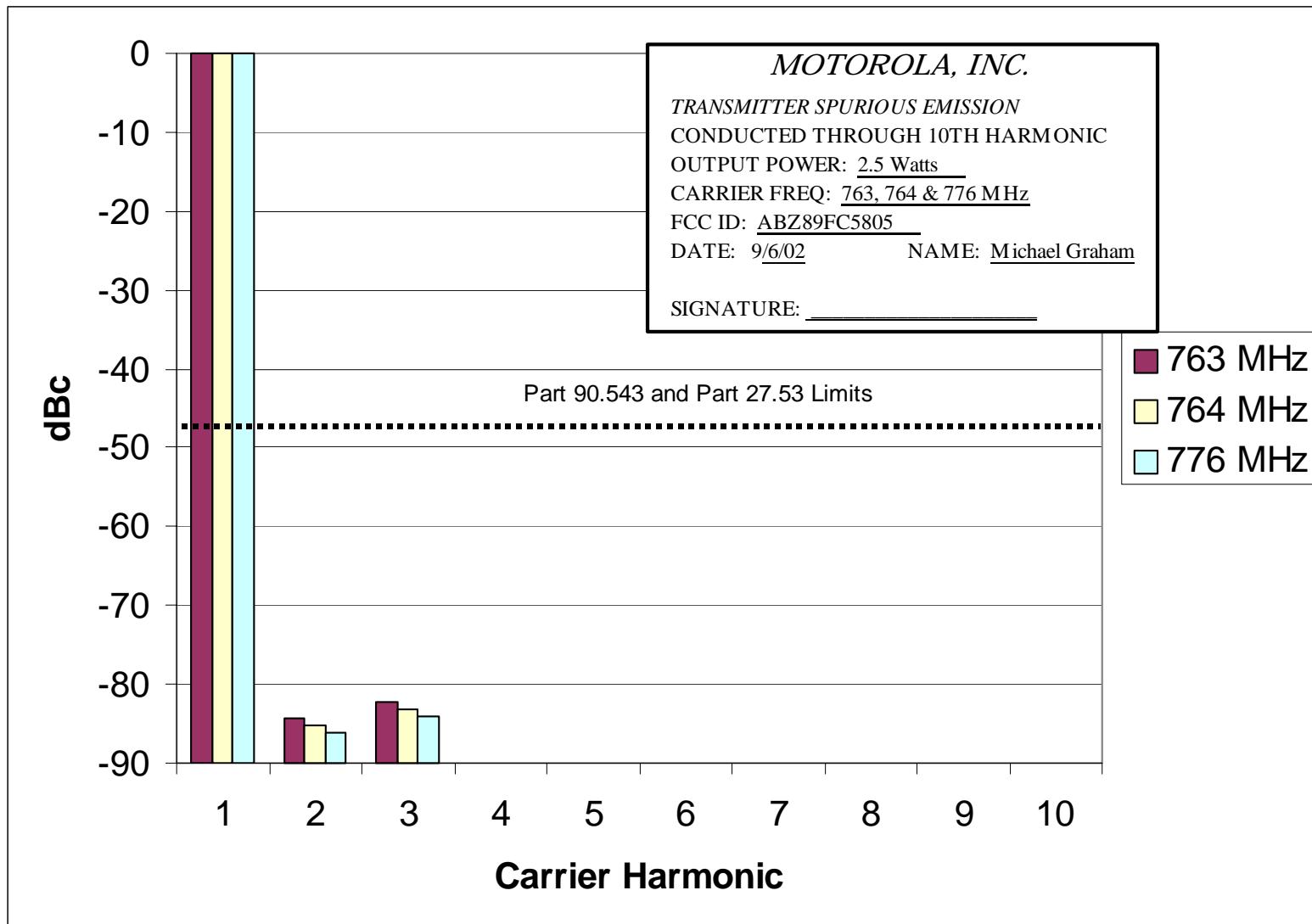
Carrier Frequency: Three carrier frequencies were measured, 763 MHz, 764 MHz and 776 MHz. These frequencies represent the center of the 762-764 MHz band covered by 27.53 and the band edges covered by 90.543.

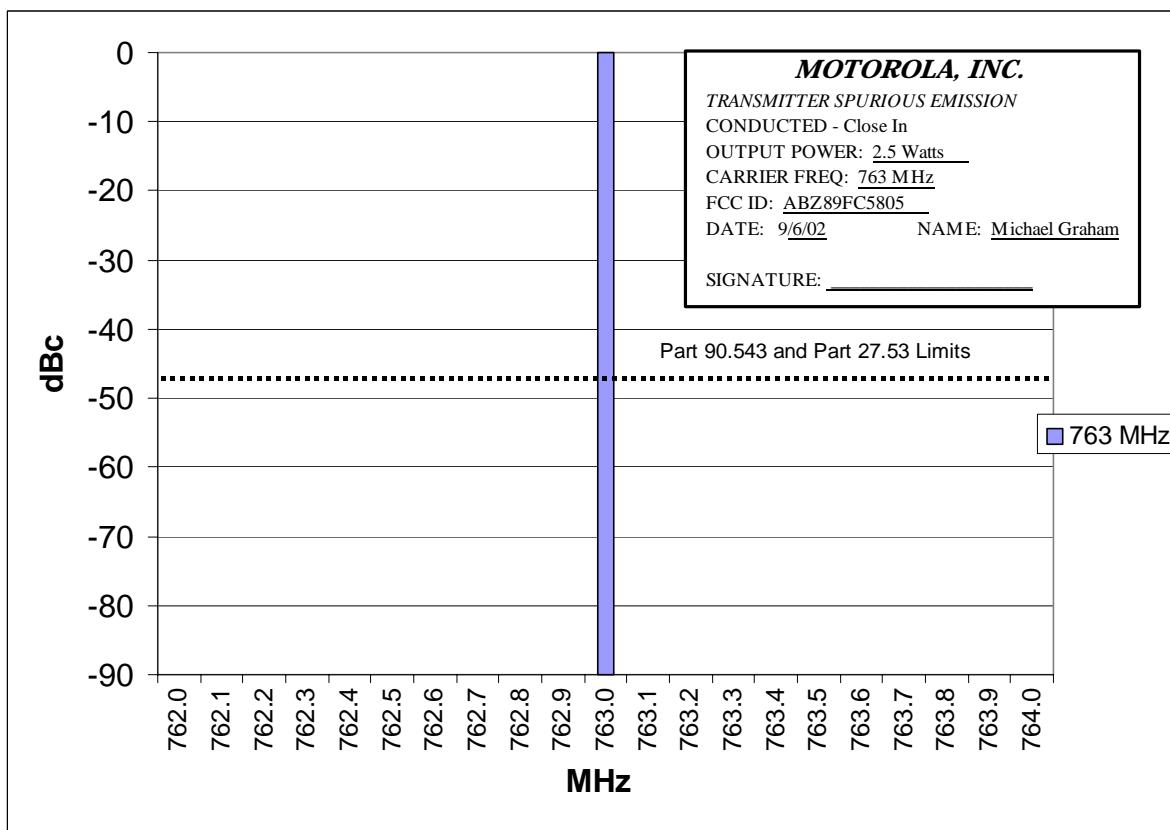
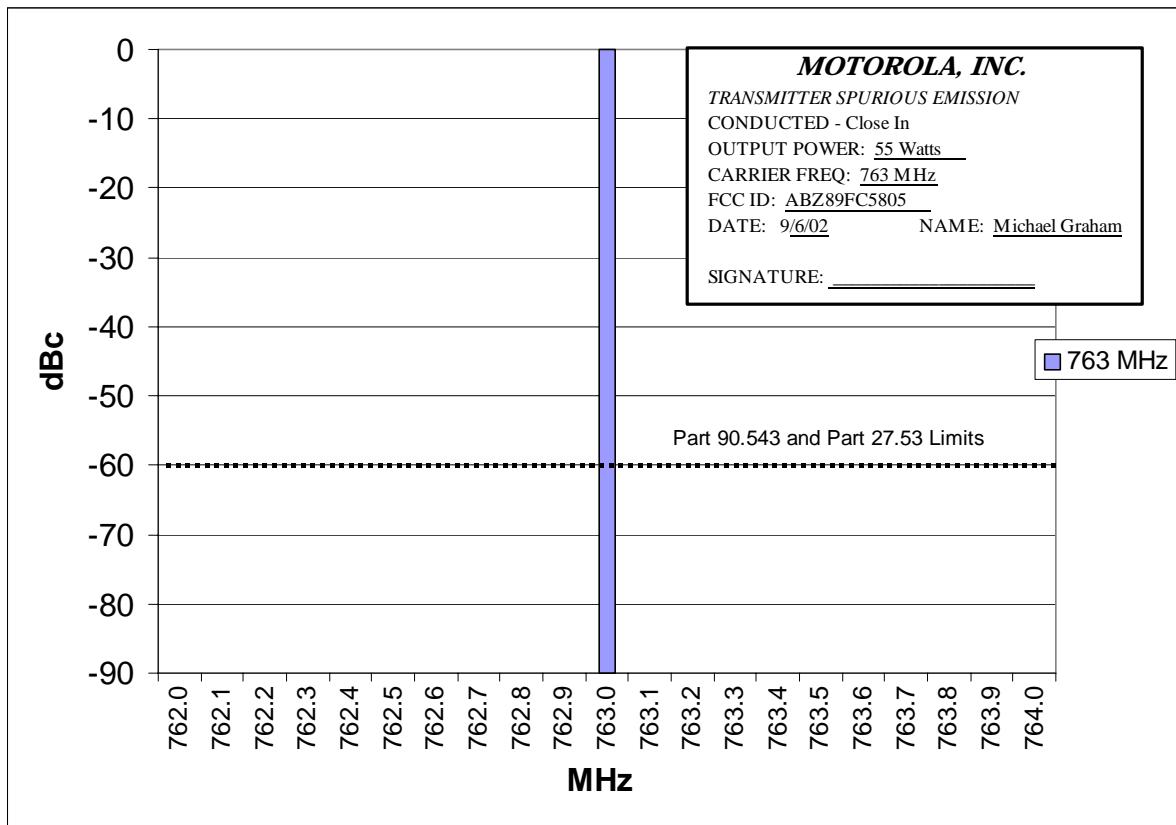
The spurious emissions test results are shown for QPSK modulation only, this represents the worse case of the two supported modulation techniques.

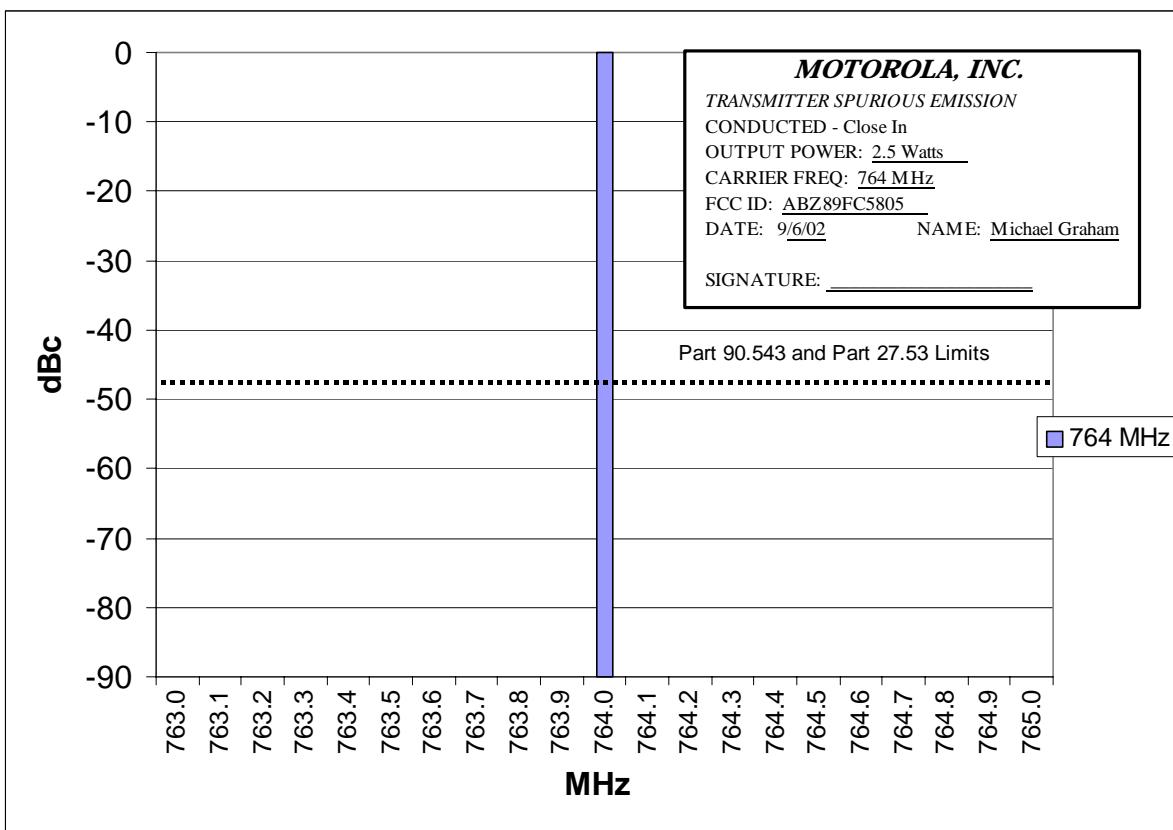
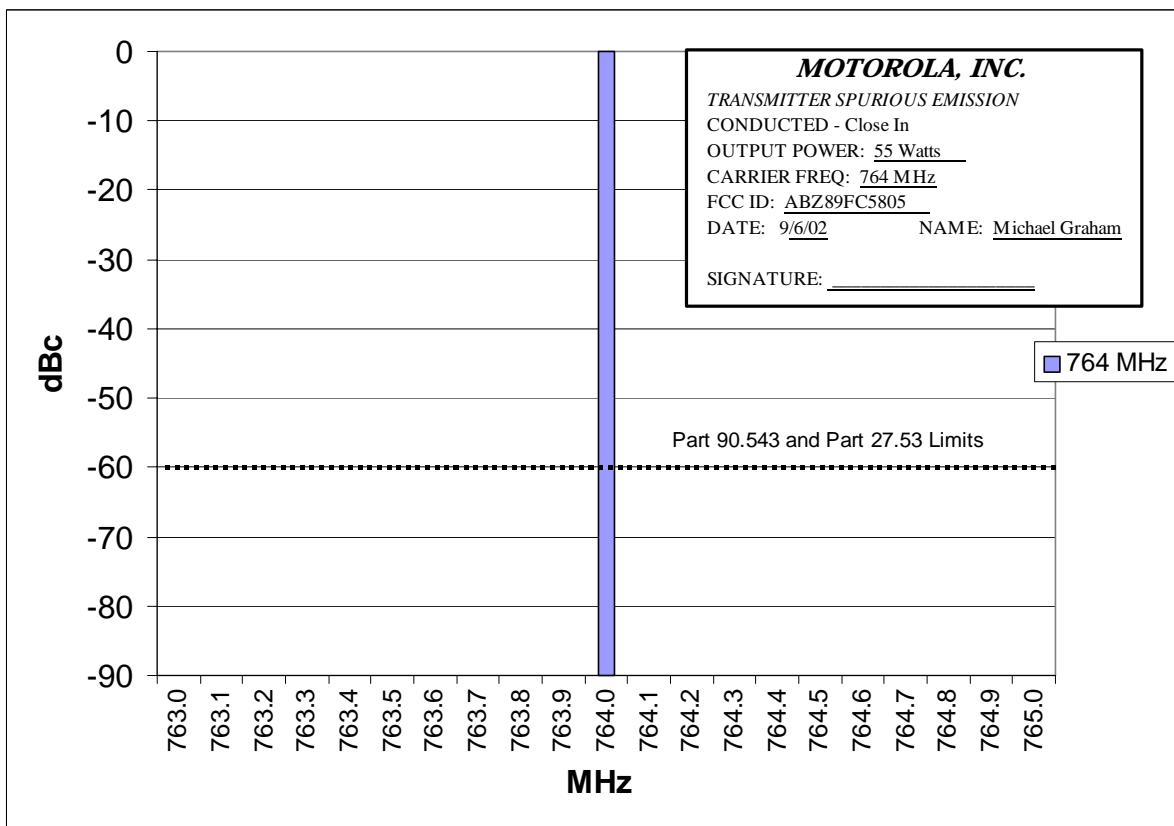
SPURIOUS EMISSION PLOTS:**EXHIBIT DESCRIPTION**

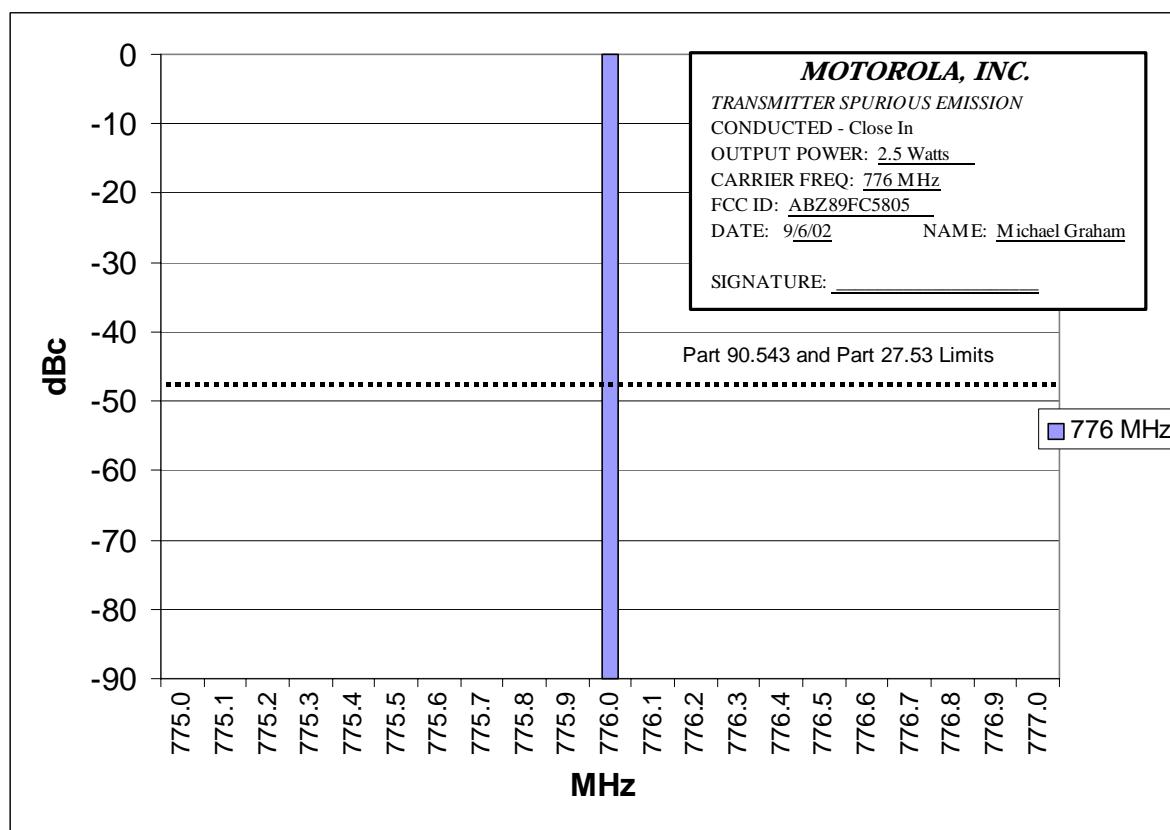
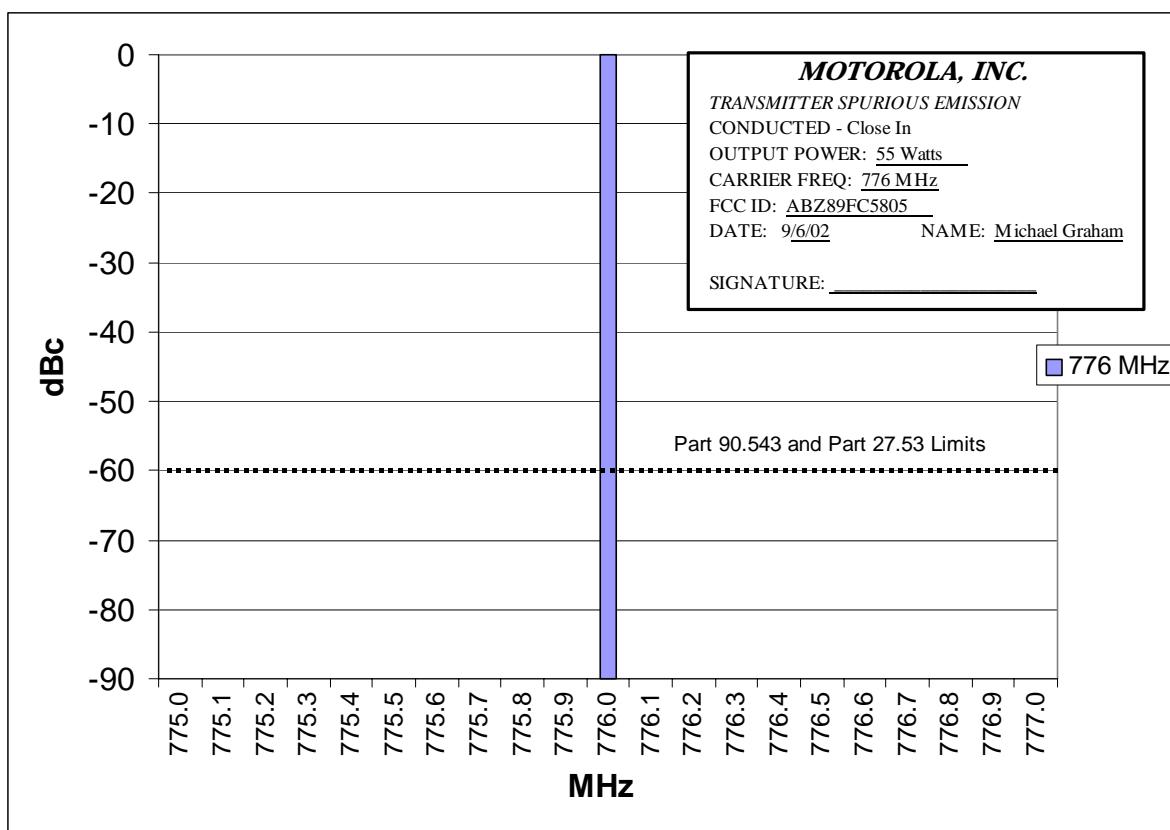
11C-1	Conducted Spurious Harmonic Emissions, Power Output at 55 Watts
11C-2	Conducted Spurious Harmonic Emissions, Power Output at 2.5 Watts
11C-3	Conducted Spurious Close-In Emissions, 763 MHz at Power Output of 55 Watts and 2.5 Watts
11C-4	Conducted Spurious Close-In Emissions, 764 MHz at Power Output of 55 Watts and 2.5 Watts
11C-5	Conducted Spurious Close-In Emissions, 776 MHz at Power Output of 55 Watts and 2.5 Watts











RADIATED SPURIOUS EMISSIONS**SPECIFICATION REQUIREMENT:****Reference: Part 90.543(c) and Part 27.53(d)(3)**

On any frequency displacement outside of the frequency ranges covered in the ACCP tables, the power of any emission must be reduced below the unmodulated carrier power (P) by at least $43+10^*\log(P)$.

For this transmitter, when operating at the full power setting of 55 Watts, this specification limit is 60.4 dBc.

For this transmitter, when operating at the lowest power setting of 2.5 Watts, this specification limit is 47 dBc.

Modulation: Pseudorandom data

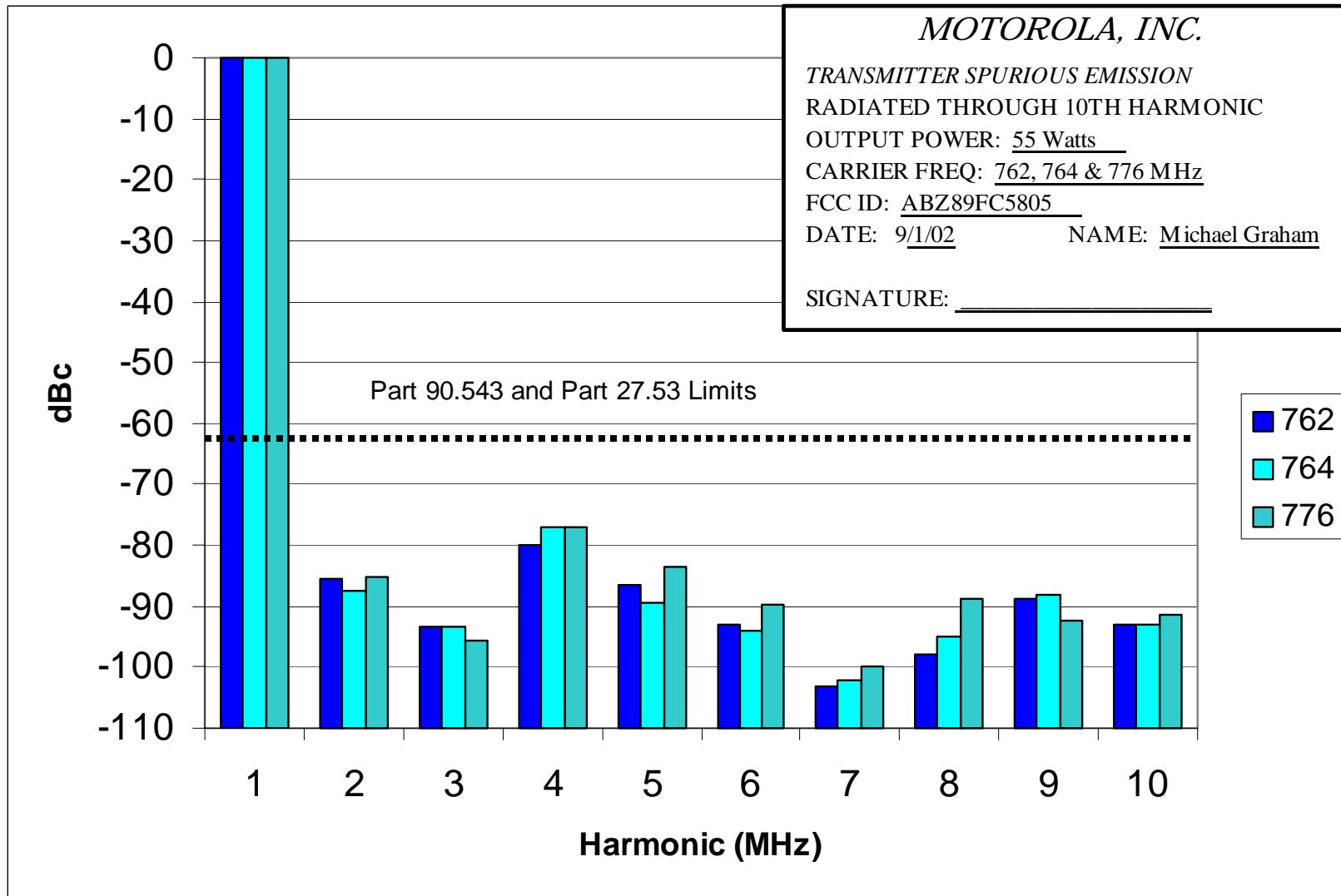
Carrier Frequency: Three carrier frequencies were measured, 762 MHz, 764 MHz and 776 MHz. These frequencies represent the edge of the 762-764 MHz band covered by 27.53 and the band edges covered by 90.543.

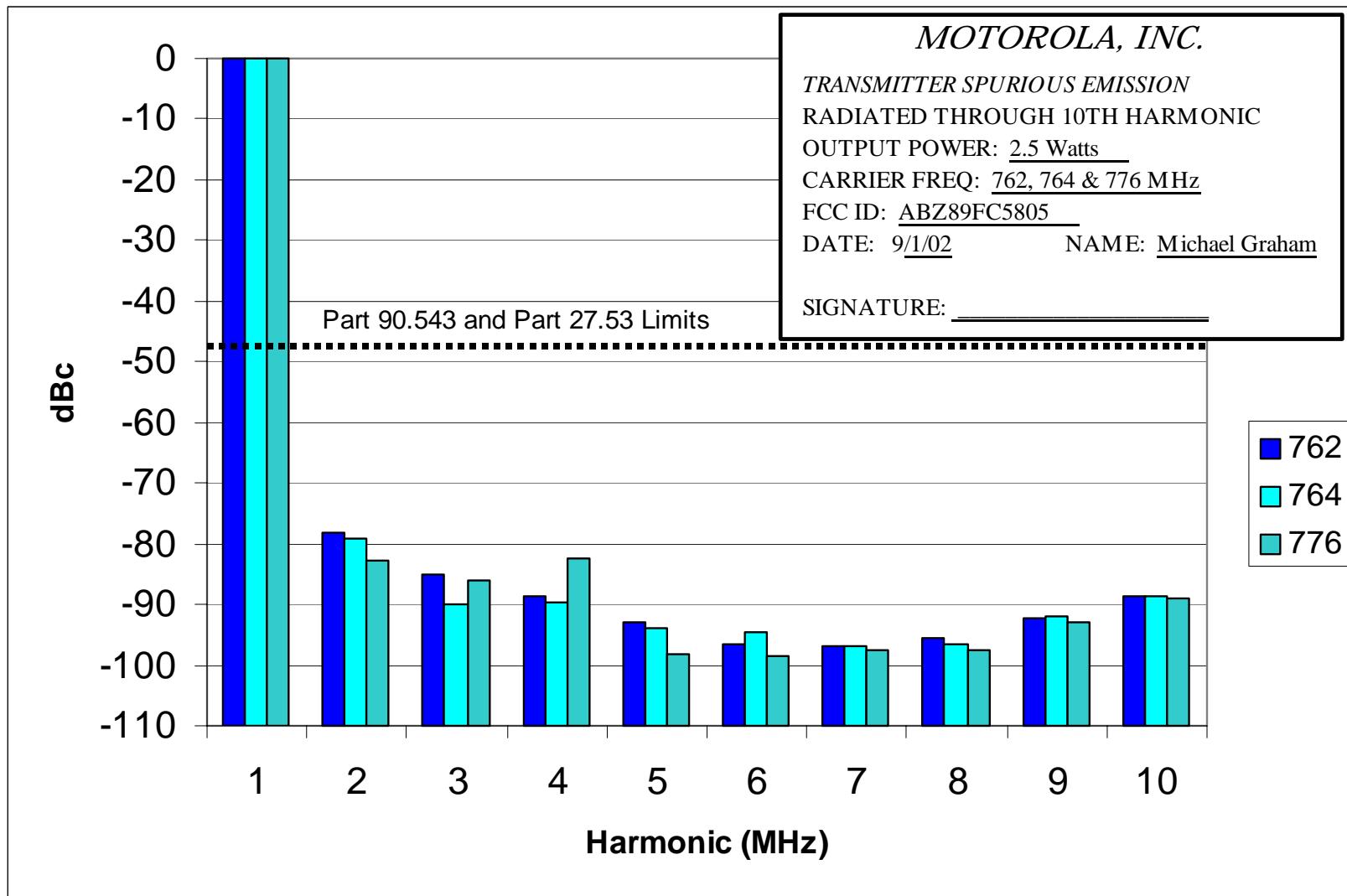
The radiated spurious emissions test results are shown for QPSK modulation only as this represents the worse case of the two supported modulation techniques.

RADIATED SPURIOUS EMISSION PLOTS:**EXHIBIT DESCRIPTION**

11D-1 Radiated Spurious Emissions, Power Output at 55 Watts

11D-2 Radiated Spurious Emissions, Power Output at 2.5 Watts





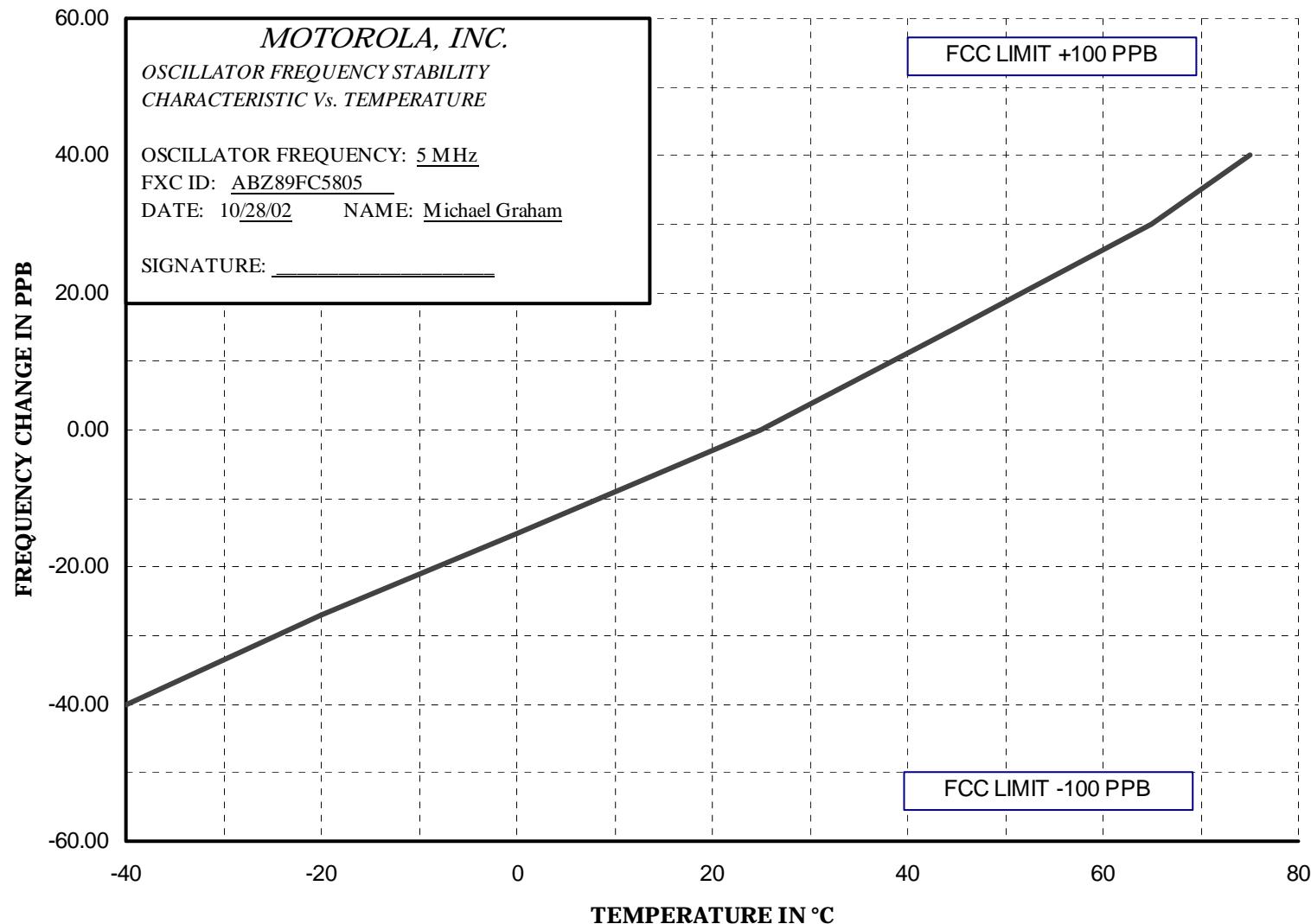
OSCILLATOR FREQUENCY STABILITY**SPECIFICATION REQUIREMENT:****Reference: Part 90.541 and Part 27.54**

Fixed and Base stations, operating at 762-776 MHz, must have a frequency stability of better than 100 PPB.

Manufacturer's data for the Private Site Controller (PSC 9600) site frequency standard was used in generation of the following frequency stability exhibits.

FREQUENCY STABILITY PLOTS:

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



APPLICANT: MOTOROLA INC.

EQUIPMENT TYPE: ABZ89FC5805

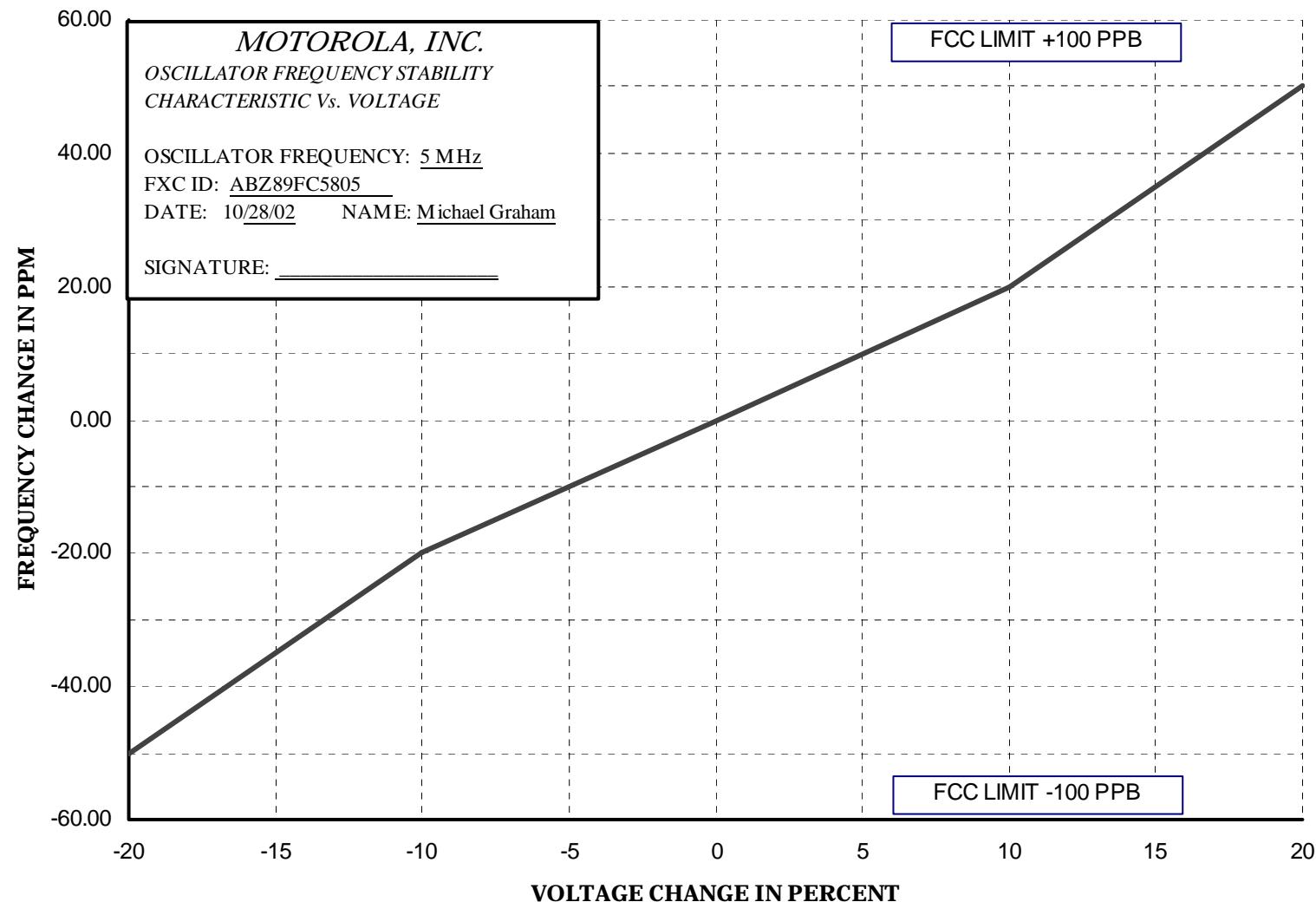


EXHIBIT 11E-2

Protection of the 1559-1610 MHz Band

SPECIFICATION REQUIREMENT:

Reference: Part 90.543(e) and Part 27.53(e)

See exhibits for setup and specification requirements.

Protection of the 1559-1610 MHz Band Exhibits:

<u>EXHIBIT</u>	<u>DESCRIPTION</u>
11F-1	Part 90 Operation, Setup, Specification, and Results
11F-2	Part 27 Operation, Setup, Specification, and Results

Protection of the 1559-1610 MHz Band**SPECIFICATION REQUIREMENT:****Reference: Part 90.543(e)**

For operation in the 764-776 MHz and 794-806 MHz bands all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80dBW for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

The data was measured at the Fort Worth OATS test site using the base radio and transmit combiner to drive a representative dipole antenna with 55 watts average power, measured at the output of the combiner network. The radiated emissions in the 1559-1610 MHz band were recorded.

For this test the transmitter was configured for 55 Watts output power at 776 MHz. The receiver channel is locked to 806 MHz.

Modulation: Pseudorandom data

Carrier Frequency: A carrier frequency of 776 MHz was measured. This frequency represents the band edge of the 764-776 MHz band whose second harmonic, VCO and receiver spurs are closest to the 1559-1610 MHz band.

The test results are shown for QPSK modulation only, as this represents the worse case of the two supported modulation techniques.

The Worst-Case spur measured in the GNSS band was recorded as -92.54 dBW/MHz at 1578 MHz.

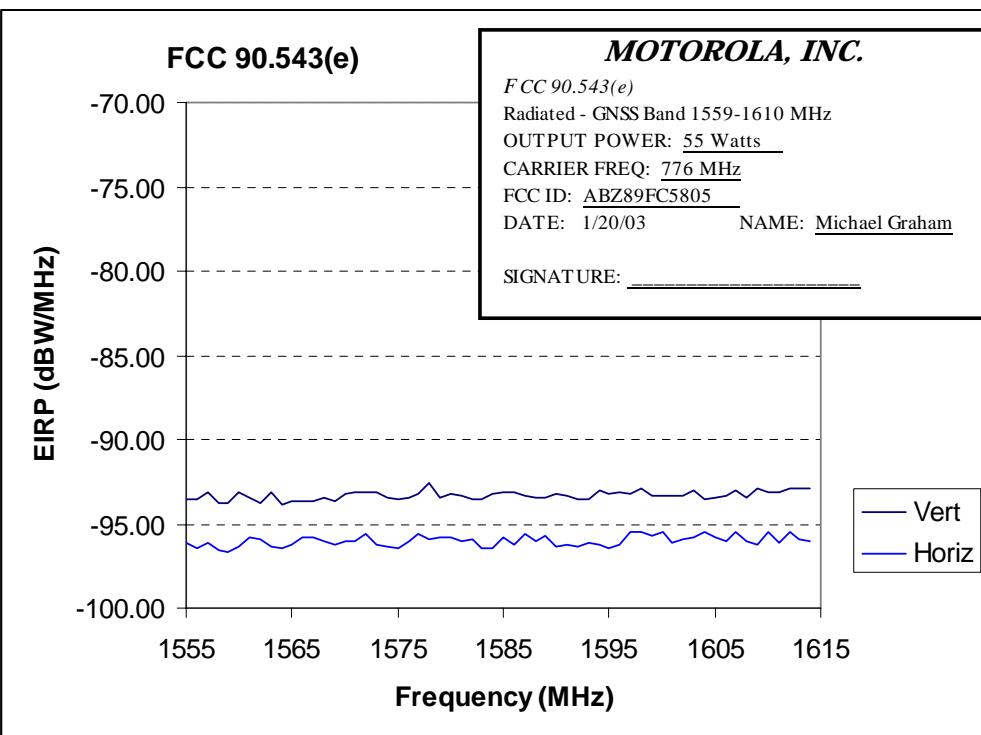
90.543(e) Conformance Data:

EXHIBIT DESCRIPTION

11F-1 Protection of the 1559-1610 MHz band, Power Output at 55 Watts at 776 MHz

Title:	GNSS band testing, FCC 90.543(e)	
Specification	< -70 dBW/MHz for wideband signals	
	< -80 dBW for discrete signals less than 700 Hz bandwidth	
Date:	20-January, 2003	
Product:	STR3000 700 MHz	
Temp/Humidity:	27C/42%	
TX Frequency:	776 MHz	
Channel Spacing	12.5 kHz	
EIRP Maximum (dBW/MHz)		
Frequency (MHz)	Vertical Polarization	Horizontal Polarization
1578	-92.54	-95.94

Plot for EIRP limits in the GNSS band



Protection of the 1559-1610 MHz Band**SPECIFICATION REQUIREMENT:****Reference: Part 27.53(e)**

For operation in the 746-764 MHz and 776-794 MHz bands all emissions including harmonics in the band 1559-1610 MHz shall be limited to $-70\text{dBW}/\text{MHz}$ equivalent isotropically radiated power (EIRP) for wideband signals, and -80dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

The data was measured at the Fort Worth OATS test site using the base radio and transmit combiner to drive a representative dipole antenna with 55 watts average power, measured at the output of the combiner network. The radiated emissions in the 1559-1610 MHz band were recorded.

For this test the transmitter was configured for 55 Watts output power at 763 MHz. The receiver channel is locked to 793 MHz.

Modulation: Pseudorandom data

Carrier Frequency: A carrier frequency of 763 MHz was measured. This frequency represents the center of the 762-764 MHz guard band. band whose second harmonic, VCO and receiver spurs are closest to the 1559-1610 MHz band.

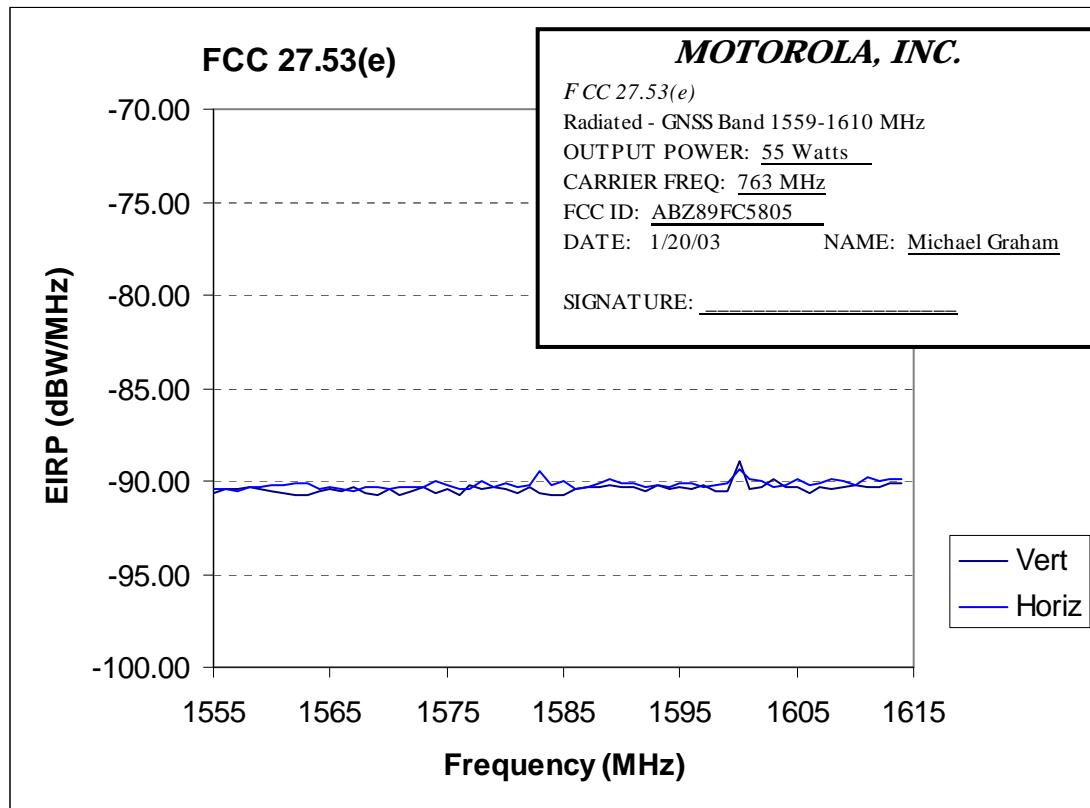
The test results are shown for QPSK modulation only, as this represents the worse case of the two supported modulation techniques.

EXHIBIT DESCRIPTION

11F-2 Protection of the 1559-1610 MHz band, Power Output at 55 Watts at 763 MHz

Title:	GNSS band testing, FCC 90.543(e)	
Specification	< -70 dBW/MHz for wideband signals	
	< -80 dBW for discrete signals less than 700 Hz bandwidth	
Date:	07-February, 2003	
Product:	STR3000 700 MHz	
Temp/Humidity:	10C/40%	
TX Frequency:	763 MHz	
Channel Spacing	12.5 kHz	
EIRP Maximum (dBW/MHz)		
Frequency (MHz)	Vertical Polarization	Horizontal Polarization
1600	-88.92	-89.32

Plot for EIRP limits in the GNSS band



TEST EQUIPMENT LIST

<u>MODEL</u>	<u>MANUFACTURER</u>	<u>DESCRIPTION</u>	<u>Eqmt ID No.</u>	<u>Last Cal</u>	<u>Next Cal</u>
E4419B	Hewlett Packard	RF Power Meter	120423	12/05/01	12/05/02
E9301A	Hewlett Packard	RF Power Sensor	120422	12/09/01	01/03/03
8563A	Hewlett Packard	Spectrum Analyzer	210419	05/23/02	05/39/04
8644B	Hewlett Packard	Signal Generator	212042	07/01/02	07/09/05
8593EM	Hewlett Packard	EMC Analyzer	112019	03/06/02	03/06/03
85460A	Hewlett Packard	EMI Analyzer, Filter	117028	11/28/01	11/28/02
85462A	Hewlett Packard	EMI Analyzer, Rcvr	117027	11/28/01	11/28/02
83006A	Hewlett Packard	RF Amps, Wideband	112251	09/05/01	09/05/02
(Various)	Weinschel, Kathrein, Bird	RF Loads	Various	no calibration required	
3020A, etc.	Narda	Directional Coupler	Various	no calibration required	