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Technical Report No. 07-012ad

Addendum to the Technical Report 07-012:
 “EMI Evaluation of the XM Satellite Radio, Inc.
 Xpress EZ to FCC Class B
 Conducted and Radiated Emission Requirements
 And Intentional Radiator Requirements”


Date Performed: 1/25/2007 – 1/30/2007

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Date of Test Report: 12 February 2007

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1. INTRODUCTION

The shipping version of the XM Satellite Radio, Inc. **Xpress EZ** evaluated for compliance to the FCC Class B requirements in the Technical Report 07-012. This addendum documents test results obtained for alternate configurations or accessories for the device (*italic font*). Note that throughout the measurements it was verified that the unit could not operate outside of the frequency band 88 MHz to 108 MHz. Also, the audio level of the device was set to maximum. The results apply only to the specific items of equipment, configurations and procedures supplied to the Florida Atlantic University EMI Research Lab by XM Satellite Radio, Inc., as reported in this document.

2. OBJECTIVE

This evaluation was performed to verify the conformance of alternate configurations of the XM Satellite Radio, Inc Xpress EZ receiver to U.S. Federal Communications Commission (FCC) Code of Federal Regulations (CFR), Title 47 - Telecommunication, Part 15 - Radio Frequency Devices,

- Subpart B - Unintentional Radiators, Section 15.107(a) Conducted limits, and Section 15.109(a) Radiated Class B Emission limits.
- Subpart C – Paragraph 15.239 (a) (b) (c) – Operation in the band 88 MHz to 108 MHz

Mode of Operation

- During FCC Part 15 Subpart B, Paragraph 15.107(a) conducted emissions tests, the EUT was configured to receive an XM Satellite Radio signal, with the EUT in the **Bullwinkle** home cradle with the XM *PHIHONG* Home AC adapter.
- During FCC Part 15 Subpart B, Paragraph 15.109(a), the EUT was configured to receive an XM Satellite Radio signal, with the EUT in an **Xpress EZ** home cradle, using only an XM Satellite Radio home antenna and a *PHIHONG* power supply.
- During FCC Part 15 Subpart C, Paragraph 15.239 (b)(c) radiated emissions tests, the EUT was configured to transmit a continuous FM signal with normal modulation at 96.9 MHz using the XM Satellite Radio's FM Coupler attached to a standard FM aerial antenna attached to a large ground plane. Three configurations were attempted:
 - The device in an **Xpress EZ** car cradle with a *Low-Noise cigarette lighter adapter (CLA)*, using only an XM Satellite Radio car antenna.
 - The device with an alternate display (*display version B, EDT*) in an **Xpress EZ** car cradle with a dual ferrite CLA, using only an XM Satellite Radio car antenna.
 - The device with a *new EEPROM* in an **Xpress EZ** car cradle with a dual ferrite CLA, using only an XM Satellite Radio car antenna.

3. CONCLUSION

The alternate configurations of the XM Satellite Radio, Inc. **Xpress EZ** receiver met the FCC Class B conducted and radiated emission requirements, as well as the intentional radiation limits, as described in the following pages.

4. TEST PROCEDURES AND RESULTS

4.1 GENERAL TEST PROCEDURES

The measurement techniques identified in the measurement procedure of ANSI C63.4-2003 *"American National Standard of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"* were followed as close as practical during this evaluation. Complete details and specific procedures used are discussed in the respective test result sections.

4.2 CONDUCTED EMISSIONS – Section 15.107(a)

4.2.1 Home Cradle with PHIHONG Power Supply

The XM Satellite Radio, Inc **Xpress EZ** receiver was evaluated in the **Xpress EZ** home cradle for a PHIHONG (Model No.: PSM08A-052) wall adapter power supply. The test setup is defined and depicted in the technical report 07-012 section 4.2.

Figure 1 shows the conducted emissions on both the phase and neutral lines measured in the receiver peak detection mode. It can be seen that on both the phase and neutral lines, the emissions did not exceed the limits. Hence, the system is in compliance.

4.2.2 4.2.2 – Home Cradle with PHIHONG Power Supply Data

The EUT was tested for the peak-detected emissions on phase and neutral lines while the press EZ unit was receiving a live XM broadcast.

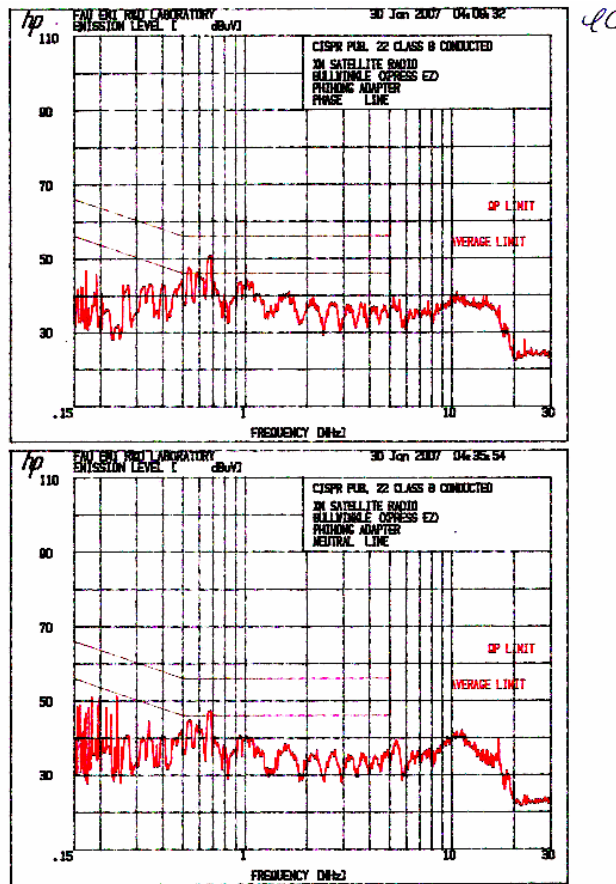


FIGURE 1: Phase and Neutral Conducted Emissions 150 kHz-30 MHz

From the above Figure, the peak emissions that exceeded or were within 5 dB of the limit are reported in Table 1.

Line Tested	Frequency (kHz)	Peak Value (dBμV)	Average Value (dBμV)	QP Value (dBμV)	Avg. Limit (dBμV)	Margin to Avg. Limit (dB)
Phase	246.62	47.2			54.18	6.98
Neutral	246.62	51.9			54.18	2.28
Phase	538	47.7	32.89		46	13.11*
Neutral	538	44.5			46	1.5
Phase	677.7	50.8	35.14		46	10.86*
Neutral	677.7	48	39.2		46	6.8*

Table 1: Conducted Emission Peak Measurement

* These values refer to the data reported in the Average Value column

4.3 RADIATED EMISSIONS

4.3.1 Home Cradle with PHIHONG Power Supply

In the home cradle setup, the EUT was placed in the **Xpress EZ** home cradle, with an XM home antenna and *PHIHONG* 5V AC power adapter (Model No.: PSM08A-052). External speakers were connected to the audio output connector on the home cradle with the unit receiving a live XM broadcast signal. The general test setup is described and depicted in the Technical Report 07-012 sections 4.3.1 and 4.3.2. The results apply only to the specific items of equipment, configurations and procedures supplied to the Florida Atlantic University EMI Research Lab by XM Satellite Radio, Inc., as reported in this document.

It can be seen on the figures below that the emissions did not exceed the limit. Hence the system is in compliance.

4.3.2.2 Home Cradle with PHIHONG Power Supply Data

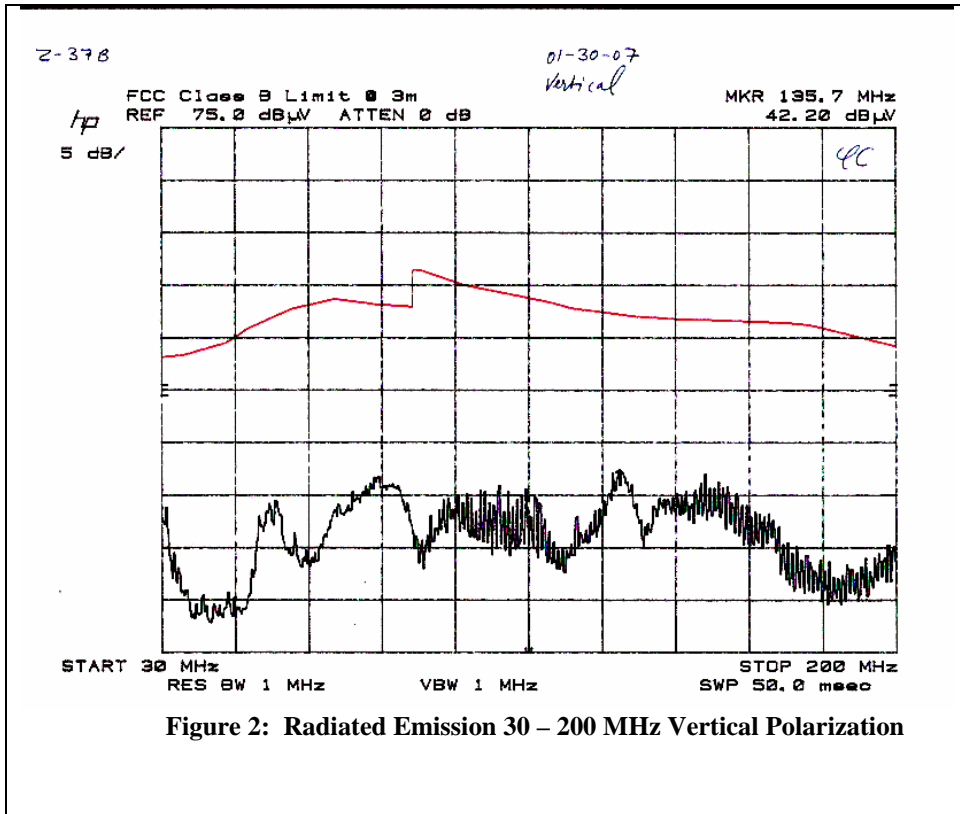


Figure 2: Radiated Emission 30 – 200 MHz Vertical Polarization

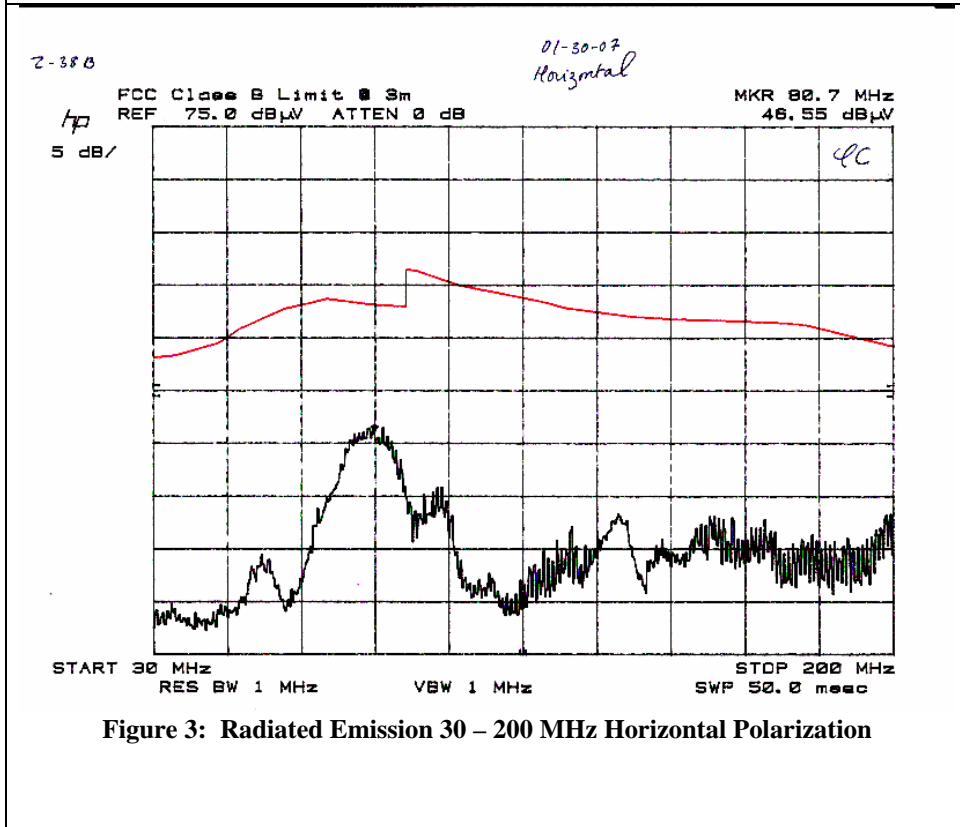


Figure 3: Radiated Emission 30 – 200 MHz Horizontal Polarization

Z-398

01-30-07
Vertical

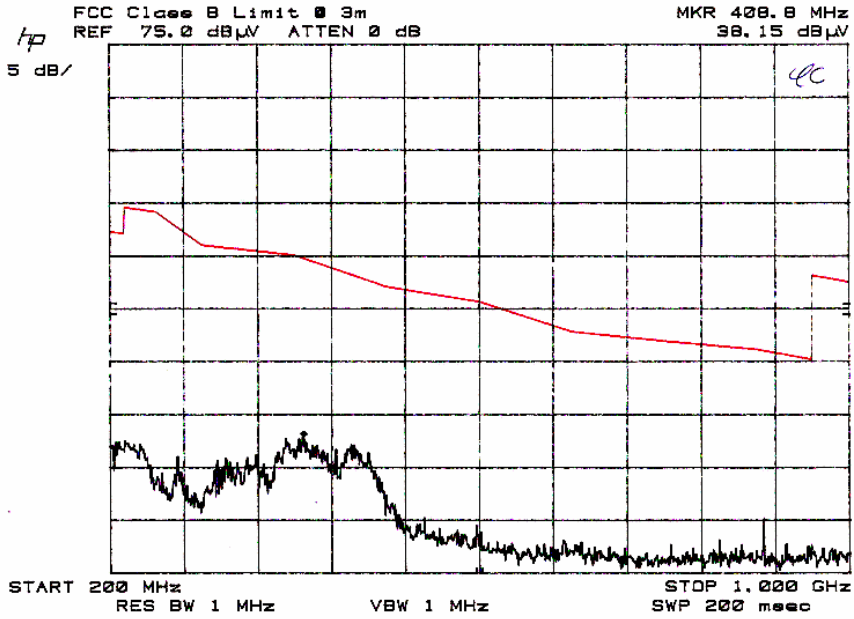


Figure 4: Radiated Emission 200MHz – 1 GHz Vertical Polarization

Z-408

01-30-07
Horizontal

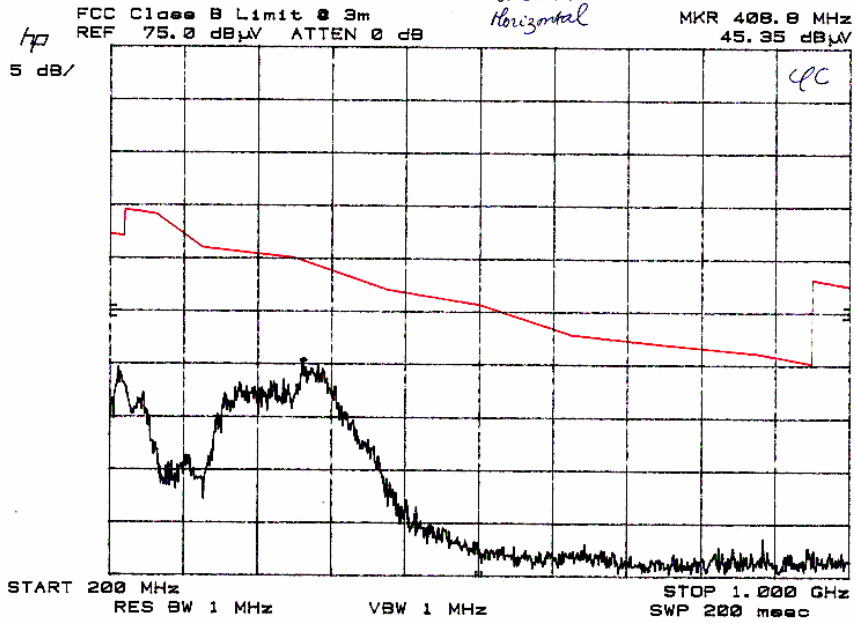


Figure 5: Radiated Emission 200 – 1000 MHz Vertical Polarization

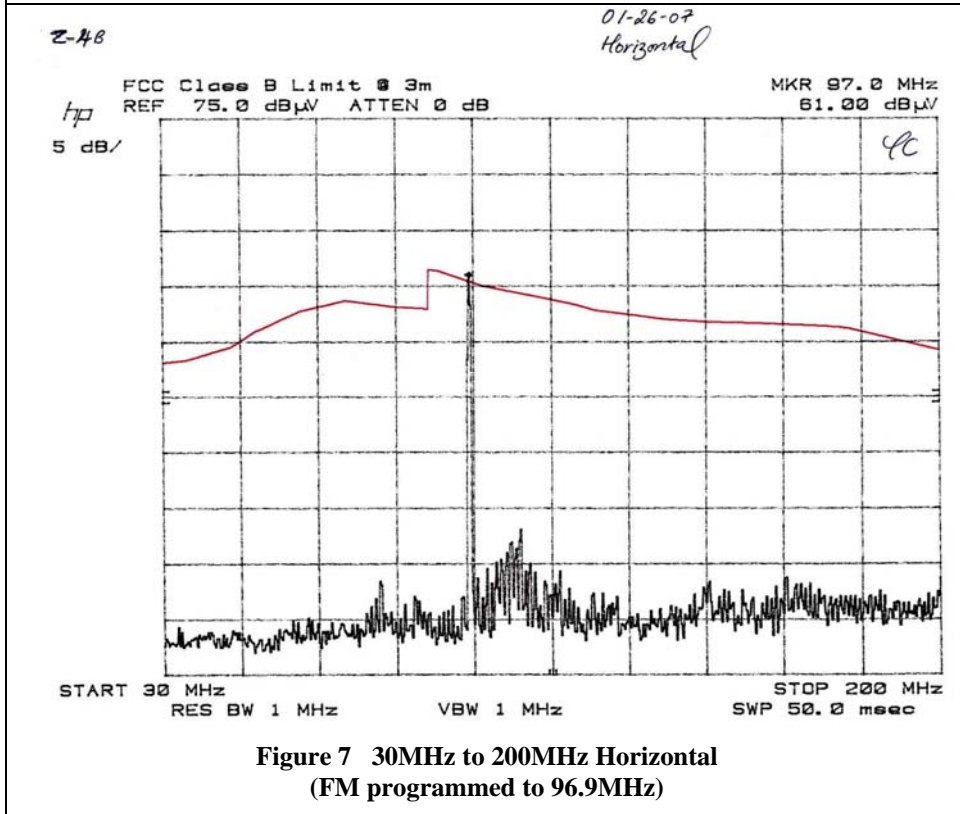
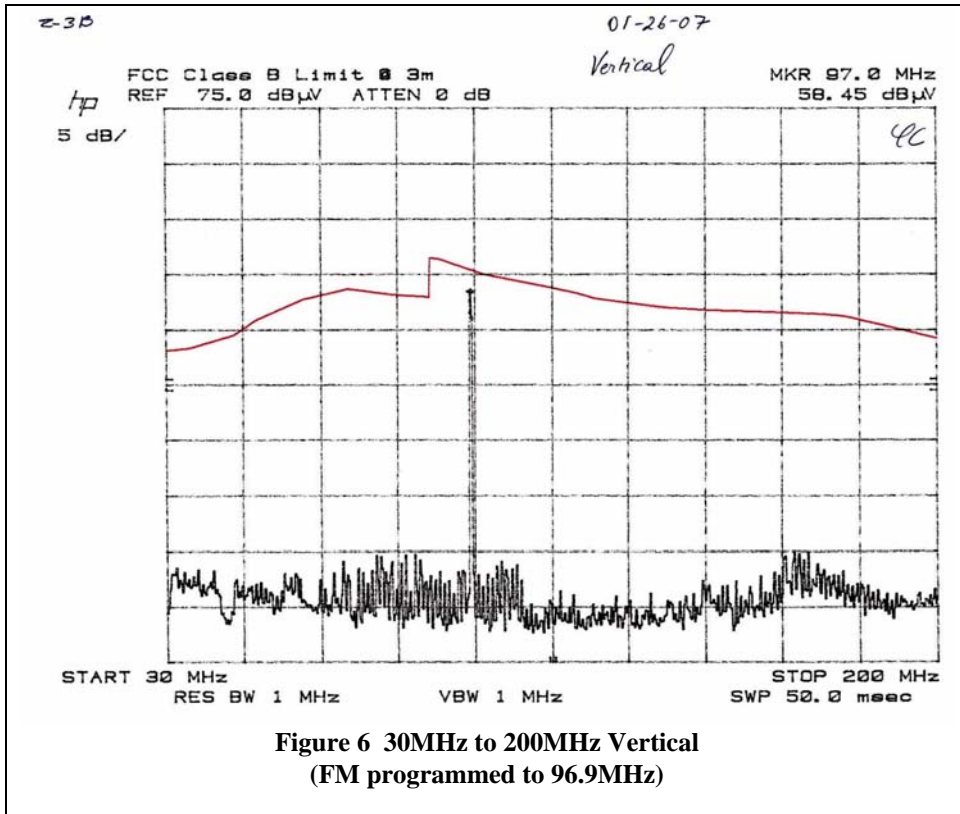
4.3.2 INTENTIONAL RADIATOR – Section 15.239 Operation in the Band 88 MHz to 108 MHz

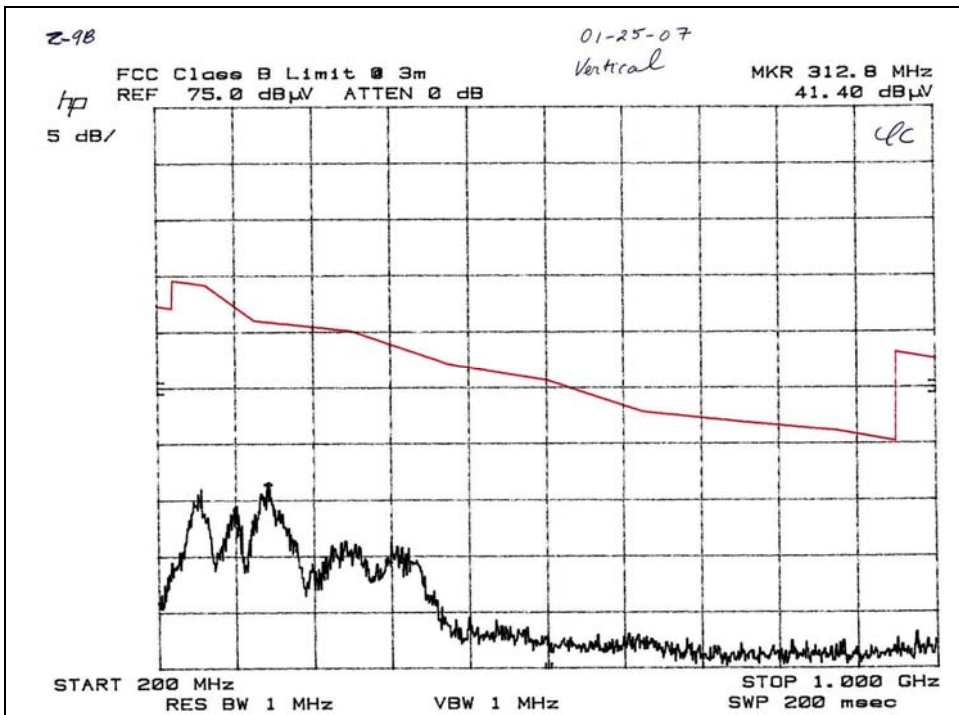
4.4.1 Test Setup – Using FM Aerial antenna

The XM Radio Inc, **Xpress EZ** was placed into an **Xpress EZ** car cradle with an XM FM Coupler attached to the RF jack of the car cradle. An XM car antenna is attached to the FM Coupler's RF jack. A 5V cigarette lighter adapter (CLA) power supply is connected to the radio, and powered by a car battery which is placed on the floor. For these measurements the EUT was programmed to operate at 96.9 MHz. The test setup and measurement procedure are further described in the Technical Report 07-012 sections 4.4.1. The data reported is pertinent to the configurations reported below:

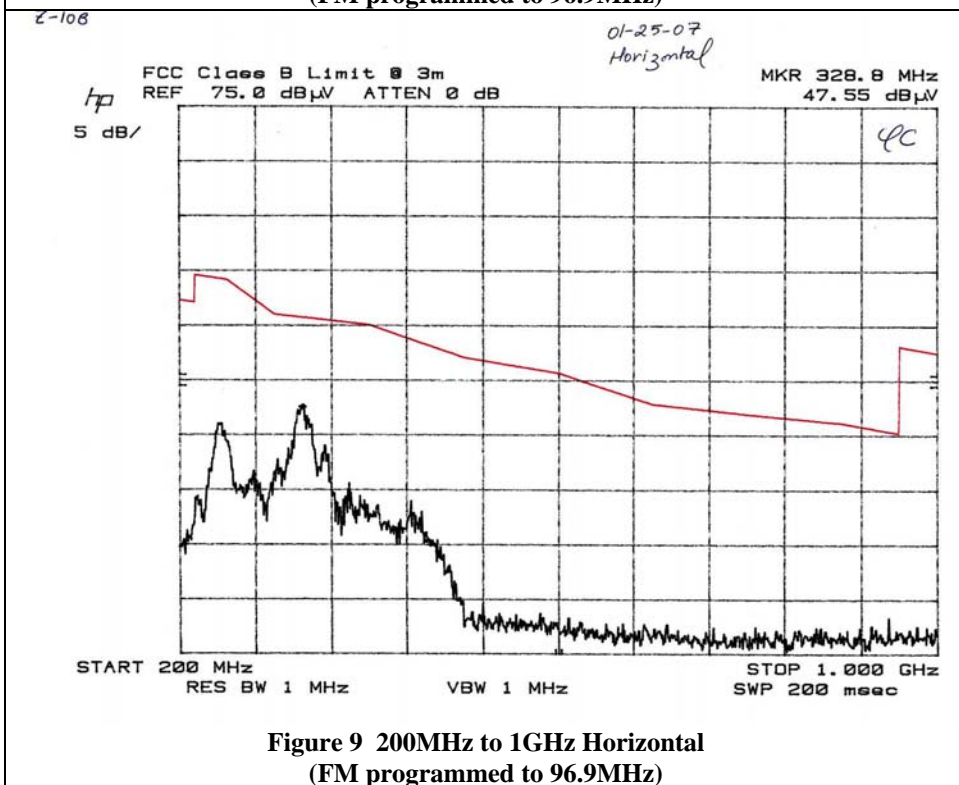
- The device in an **Xpress EZ** car cradle with a *Low-Noise cigarette lighter adapter (CLA)*, using only an XM Satellite Radio car antenna.
- The device with an alternate display (*display version B, EDT*) in an **Xpress EZ** car cradle with a dual ferrite CLA, using only an XM Satellite Radio car antenna.
- The device with a *new EEPROM* in an **Xpress EZ** car cradle with a dual ferrite CLA, using only an XM Satellite Radio car antenna.

4.3.2.1 Car Cradle with Low-Noise CLA Data



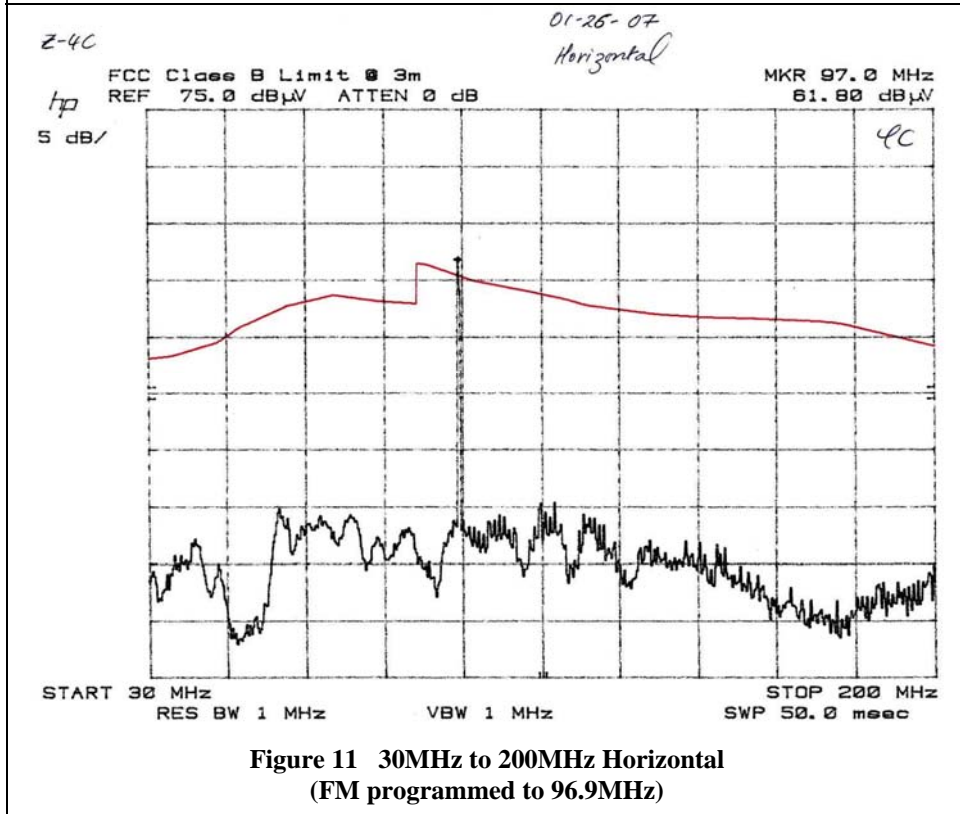
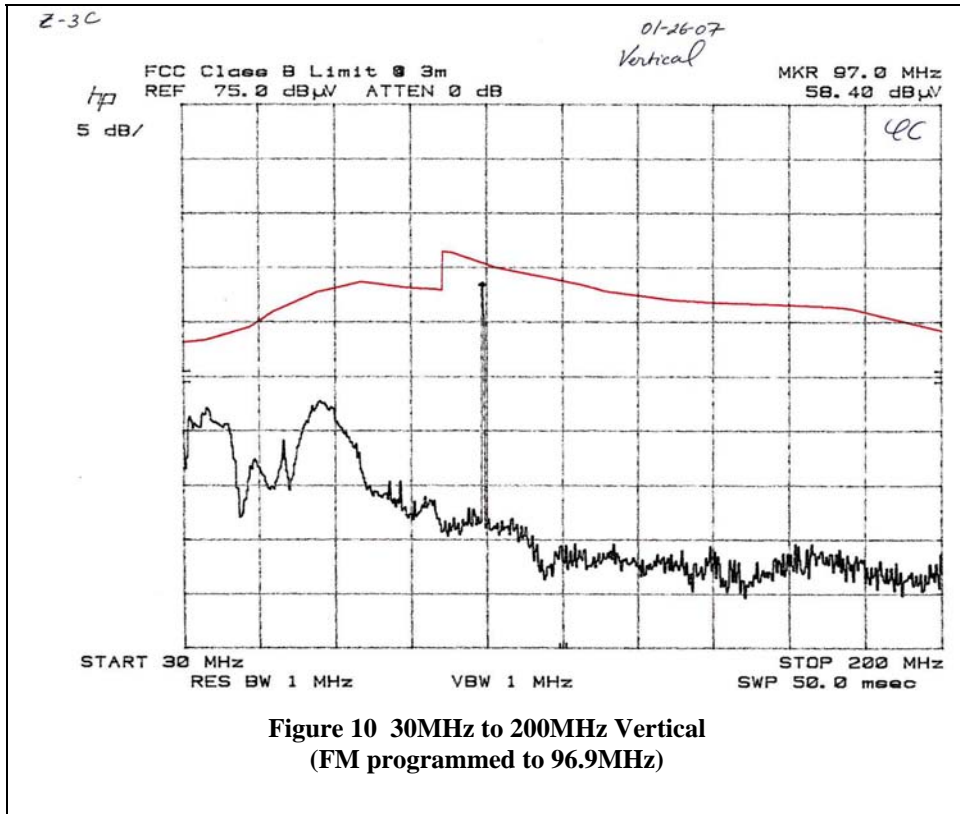


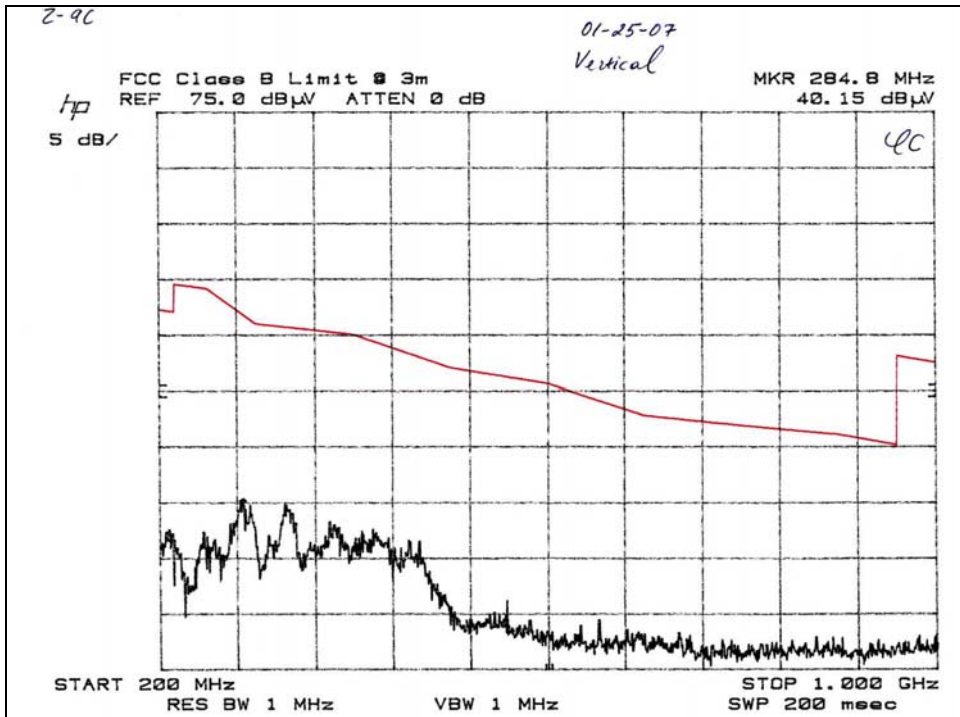
**Figure 8 200MHz to 1GHz Vertical
 (FM programmed to 96.9MHz)**



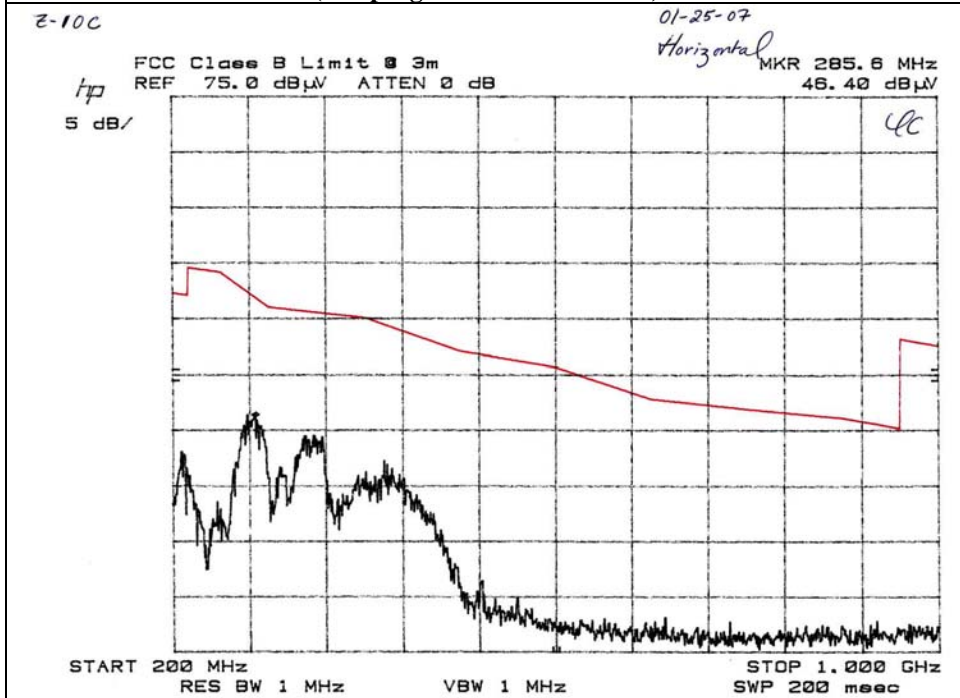
**Figure 9 200MHz to 1GHz Horizontal
 (FM programmed to 96.9MHz)**

4.3.2.2 Car Cradle with Alternate Display Data



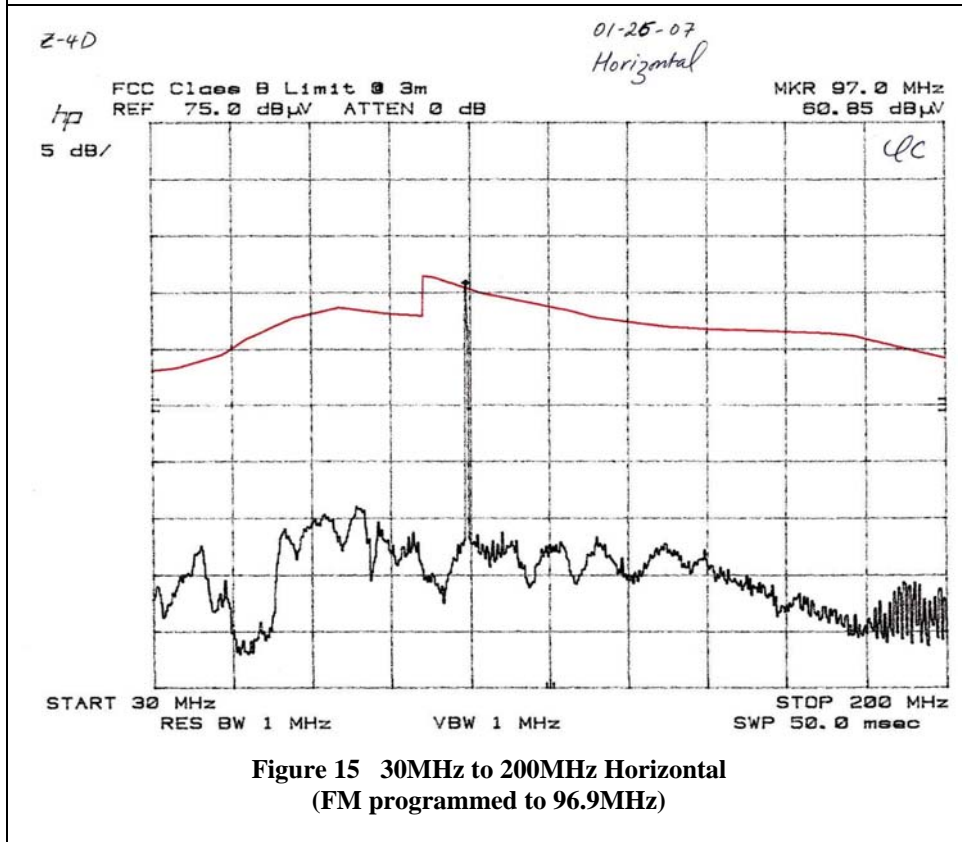
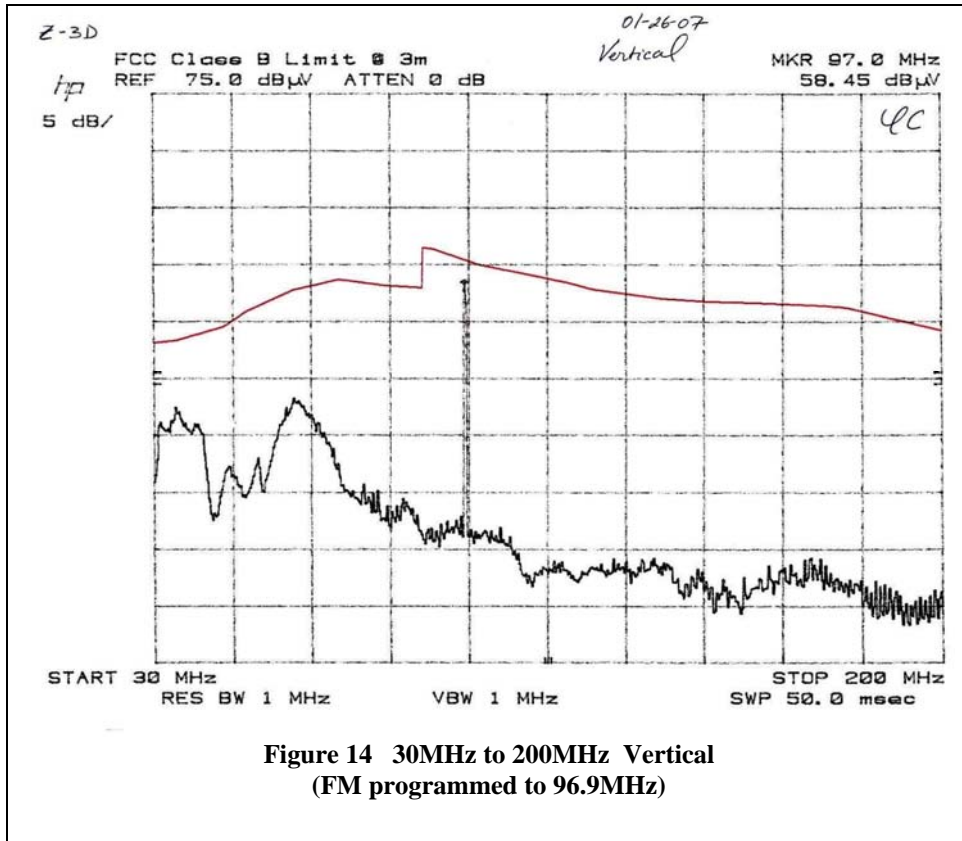


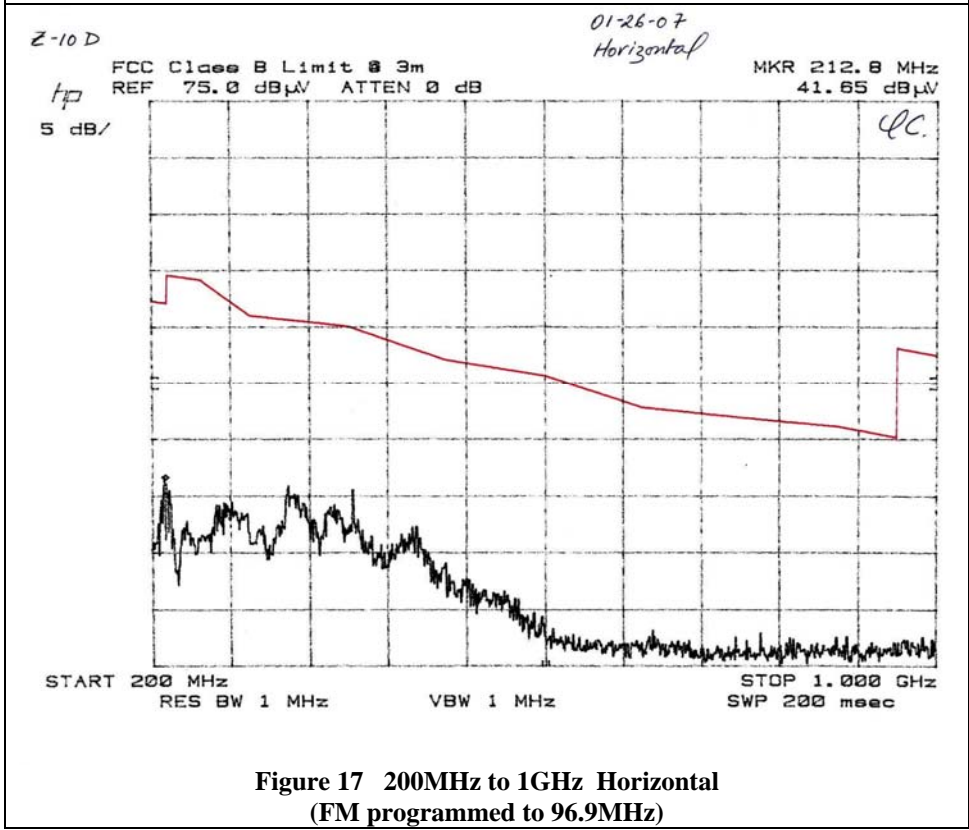
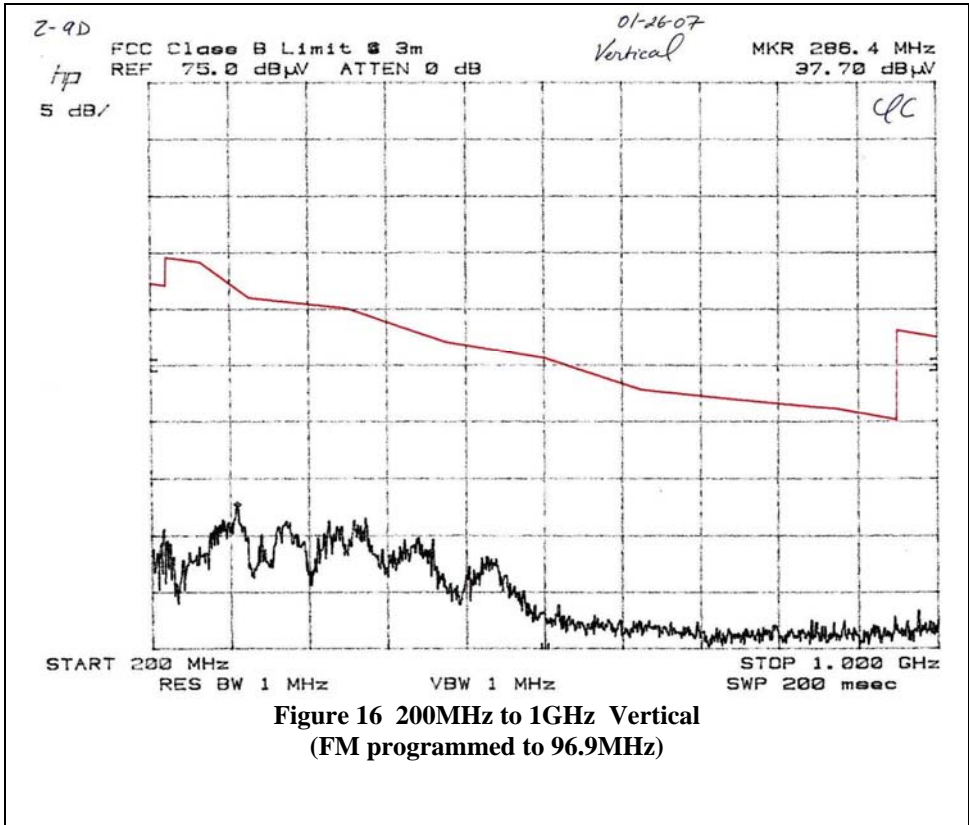
**Figure 12 200MHz to 1GHz Vertical
(FM programmed to 96.9MHz)**



**Figure 13 200MHz to 1GHz Horizontal
(FM programmed to 96.9MHz)**

4.3.2.3 Car Cradle with New EEPROM Data





4.3.2.4 Data Table

The following table shows the emissions that were within 5dB of the limit for all plots that were taken in the 3 meter chamber. Where noted, the QP measurement or intentional radiator limit is used.

		Peak Frequency	Peak Voltage	Correction Factor	Corrected Peak Voltage	FCC Limit	Margin to Limit
Figure	Plot ID	(MHz)	(dBμV)	(dB)	(dBμV/m)	dBμV/m	dB
7	Z-4B	97.0	61.0	16.92	44.08	48 ¹	3.92
11	Z-4C	97.0	61.8	16.92	44.88	48 ¹	3.12
15	Z-4D	97.0	60.85	16.92	43.93	48 ¹	4.07

Table 2: Measurements from FAU 3-m chamber

Note 1: The intentional radiator limit is used for these frequency points.

It can be seen from the previous figures and Table 2 that the emissions did not exceed the limit. Hence, the system is in compliance.

End Report