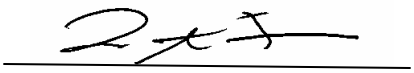
Axonn LLC
FCC Part 15, Certification Application
CM1 Frequency Hopping Transceiver

UST Project: 07-0057
Issue Date: April 5, 2007

3505 Francis Circle Alpharetta, GA 30004
PH: 770-740-0717 Fax: 770-740-1508
www.ustech-lab.com

I certify that I am authorized to sign for the manufacturer and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

UNITED STATES TECHNOLOGIES, INC. (AGENT RESPONSIBLE FOR TEST):

By: 

Name: Louis A. Feudi

Title: VP / Operations & Engineering

Date: April 5, 2007

Axonn LLC
19349 N. 12th Street
Covington, LA 70433

By: _____

Name: _____

Title: _____

Date: _____

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MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Axonn LLC**

MODEL: **CM1**

FCC ID: **L2V-CM1**

DATE: **April 5, 2007**

This report concerns (check one): Original grant X
Class II change_____

Equipment type: **Low Power 2.4 GHz Frequency Hopping Transceiver**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until:_____
date

N.A. agrees to notify the Commission by N.A.
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

United States Technologies, Inc.
3505 Francis Circle
Alpharetta, GA 30004

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Fax Number: (770) 740-1508

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SECTION 1

GENERAL INFORMATION

GENERAL INFORMATION

1.1 Product Description

The Equipment Under Test (EUT) is an Axonn LLC, Model CM1 Frequency Hopping Transceiver. The EUT is a 2.4 GHz Frequency Hopping Transceiver configuration module which is intended for use as an interface to wireless sensor networks. The unit is being submitted as a low power device.

1.2 Related Submittal(s)/Grant(s)

The EUT will be used to send/receive data. The Frequency Hopping Transceiver presented in this report will be used with other like Frequency Hopping Transceivers:

The EUT is subject to the following authorizations:

a) Certification as a low power Frequency Hopping Transceiver under 15.249
b) DOC as a digital device

The information contained in this report is presented for the certification & DOC authorization(s) for the EUT.

SECTION 2

TESTS AND MEASUREMENTS

TEST AND MEASUREMENTS

2.1 Configuration of Tested System

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Block diagrams of the tested systems are shown in Figures 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2a -g.

The sample used for testing was received by U.S. Technologies on March 23, 2007 in good condition.

2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

2.3 Test Equipment

Table 2 describes test equipment used to evaluate this product.

2.4 Modifications

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 15, Class B Limits for the transmitter portion of the EUT or the Class B Digital Device Requirements.

FIGURE 1
TEST CONFIGURATION

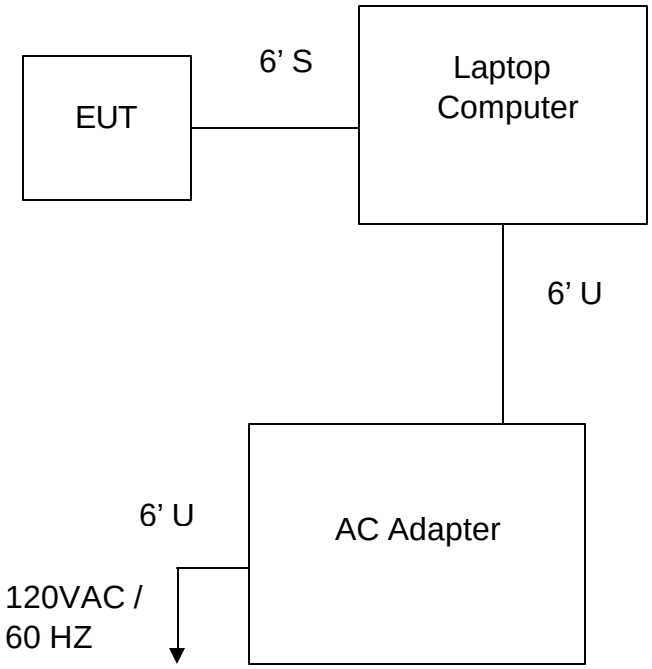

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TABLE 1

Test Date: March 23-27, 2007
UST Project: 07-0057
Customer: Axonn LLC
Model: CM1

EUT and Peripherals

PERIPHERAL MANU.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Axonn LLC (EUT)	CM1	None	None	6' S USB Cable
Laptop Computer Compaq Corp	Armada 7400	7908BXL20326	None	None
AC Adapter Compaq Corp	341809-101	00015059	None	6' U dc output 6' U 120VAC / 60 Hz

TABLE 2
TEST INSTRUMENTS

EQUIPMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8558B	HEWLETT-PACKARD	2332A10055	3/28/07
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	7/3/06
SIGNAL GENERATOR	8648B	HEWLETT-PACKARD	3642U01679	10/13/06
RF PREAMP	8447D	HEWLETT-PACKARD	2944A06291	5/24/06
BICONICAL ANTENNA	3110B	EMCO	9307-1431	10/11/06
LOG PERIODIC	3146	EMCO	3110-3236	9/15/05 2 Yr.
HORN ANTENNA	SAS-571	A. H. SYSTEMS	605	04/1/05 2 Yr.
PREAMP	8449B	HEWLETT PACKARD	3008A00480	8/10/06
CALCULATION PROGRAM	N/A	N/A	Ver. 6.0	N/A

2.5 Antenna Description (Paragraph 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Axonn LLC Corporation will sell the Configuration Module, Model CM1 with the following antenna integrally mounted on the pwb.

MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB	TYPE OF CONNECTOR
Johanson	Patch	2450ATA100	3 dBi	Integral to PCB

2.6 Fundamental, Peak, and Average Radiated Spurious Emissions in the Frequency Range 30 -25000 MHz (FCC Section 15.249)

The EUT was placed into a continuous transmit mode of operation. A preliminary scan was performed on the EUT to determine frequencies that were caused by the transmitter portion of the product. Significant emissions that fell within restricted bands were then measured on an OATS site. Radiated measurements below 1 GHz were tested with a RBW = 120 kHz. Radiated measurements above 1 GHz were measured using a RBW = VBW = 1 MHz. The results of peak radiated fundamental frequencies and spurious emissions falling within restricted bands are given in Table 3a –3d and Figure 3a – 3d.

Average values were calculated using the following duty cycle correction.

Worst Case Transmit Duty Cycle for CM1

The duty cycle de-rating factor used in the calculation of average radiated limits (per 15.249) is described below. This factor was calculated by first determining the worst case scenario for system operation
The worst case operating scenario is as follows:

Maximum transmit time/on equals 538 us (0.538 ms) over a 1.5 sec period. FCC regulations allow a maximum period of 100 ms.

The transmission duty cycle correction factor is then calculated as:

$$20 * \log_{10} (0.583\text{ms}/100\text{ ms}) = -44.7\ \textbf{dB}$$

This value was subtracted from the peak data listed in Section 2.8 and compared to the average limits in tables 3e and 3f.

Table 3a. PEAK FUNDAMENTAL EMISSIONS

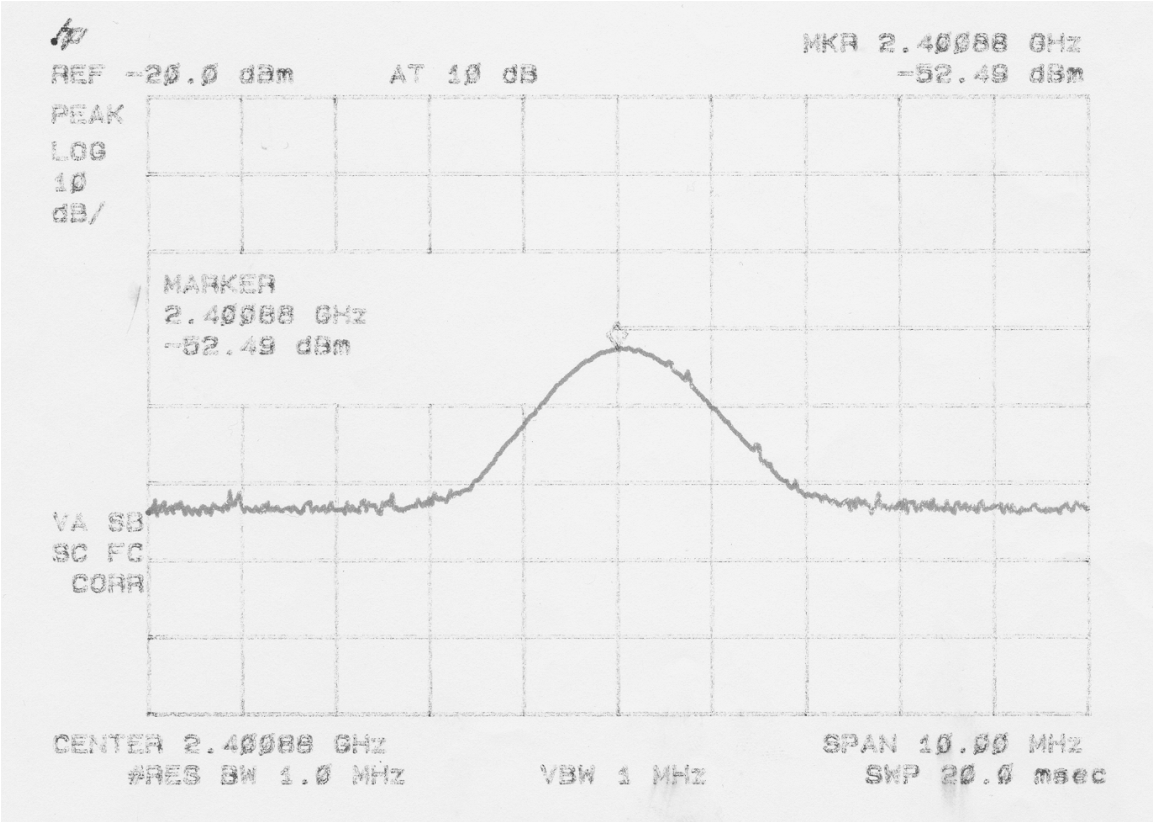
Radiated Emissions									
						Client:	Axonn		
	Project:	07-0057		**Class:**		**Model:**	CM1		
Frequency	**Test Data**	**AF**	**Test Data**	**AF+CA -AMP**	**Results**	**Limits**	**Distance /**	**Margin**	**PK = n**
(MHz)	**(dBm)**	**Table**	**(dBuV)**	**(dB)**	**(uV/m)**	**(uV/m)**	**Polarity**	**(dB)**	**/ QP**
2400.88	-52.5	1HN3mV	54.5	31.9	20945.7	500000.0	3m./VERT	**27.6**	**PK**
2439.89	-48.5	1HN3mV	58.5	32.0	33298.3	500000.0	3m./VERT	**23.5**	**PK**
2480.01	-50.6	1HN3mV	56.4	32.0	26536.6	500000.0	3m./VERT	**25.5**	**PK**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-52.5 + 31.9 + 107)/20) = 20945.7
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: _____ **Name: Louis A. Feudi**

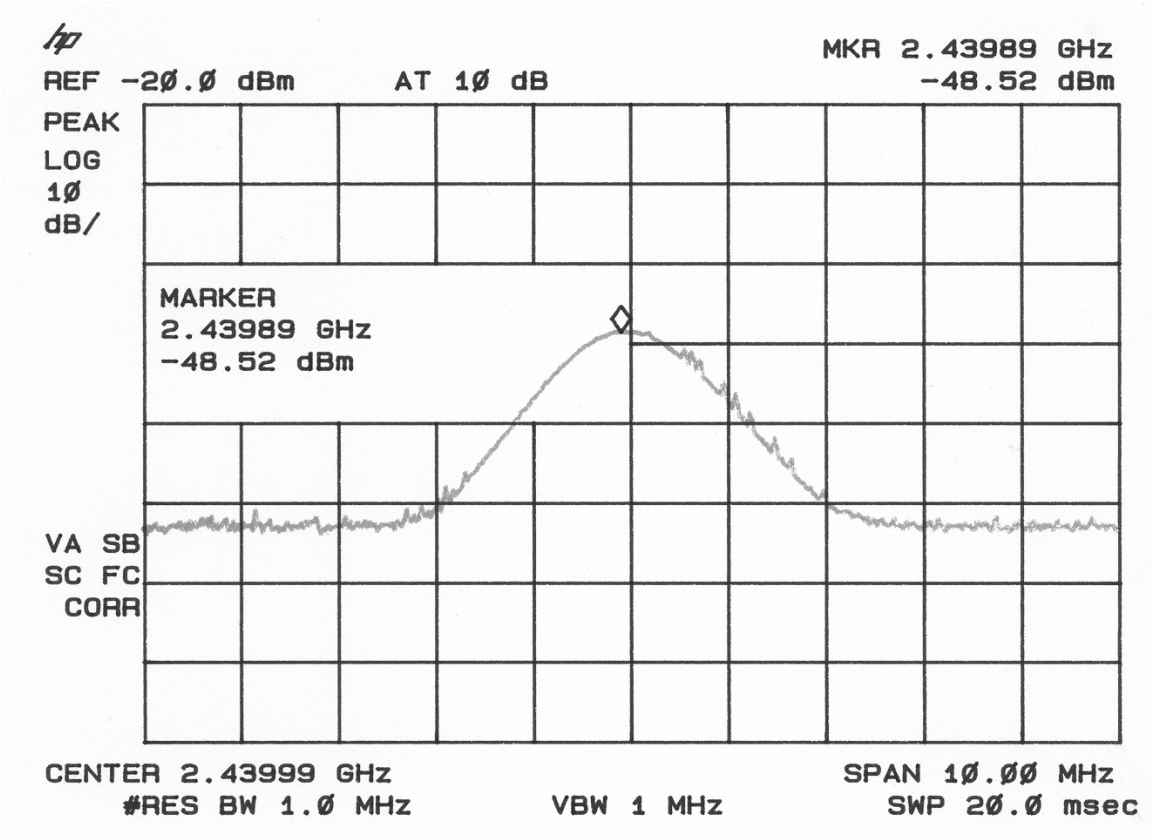
FCC ID: L2V-CM1

Figure 3a - 1
Peak Radiated Emission 15.247(c) Fundamental Low



FCC ID: L2V-CM1

Figure 3a - 2
Peak Radiated Emission 15.247(c) Fundamental Mid



FCC ID: L2V-CM1

Figure 3a - 3
Peak Radiated Emission 15.247(c) Fundamental High

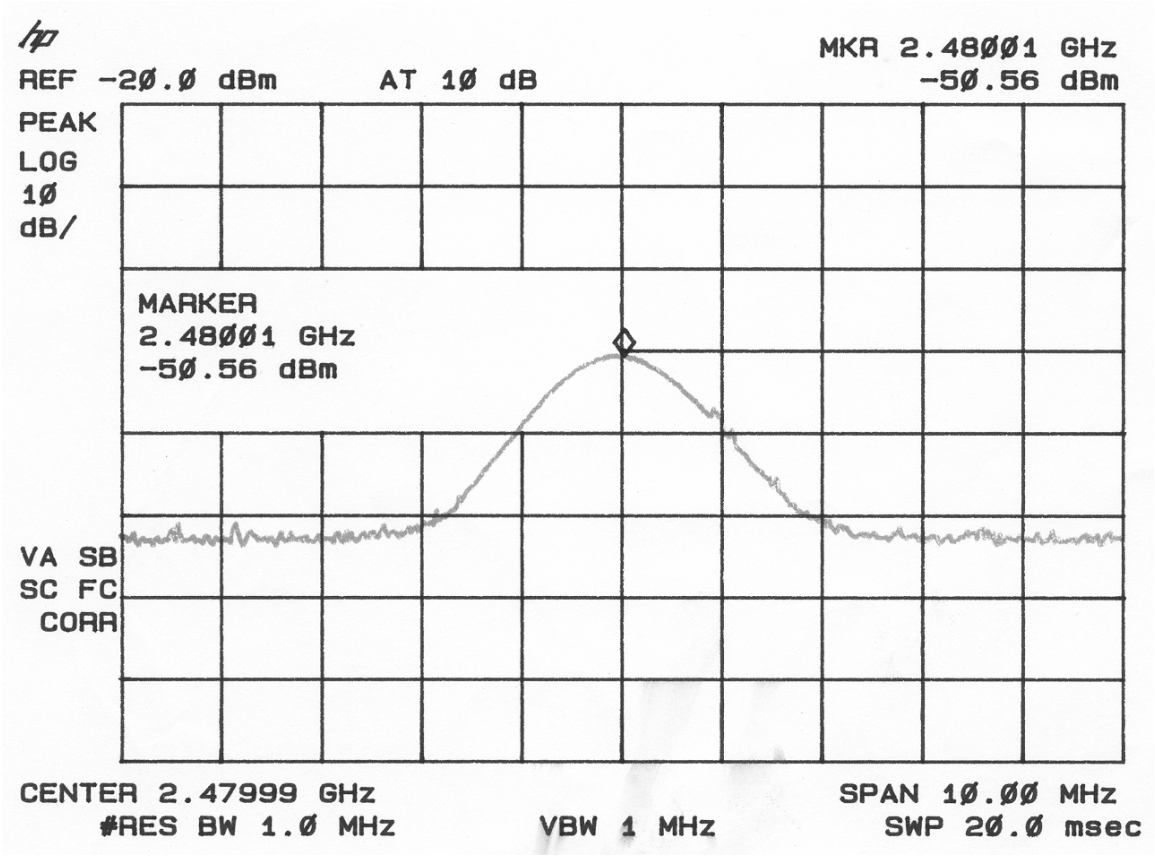


Table 3b. PEAK RADIATED SPURIOUS EMISSIONS (Low)

Radiated Emissions									
						Client:	Axonn		
L.F.	**Project:**	07-0057		**Class:**		**Model:**	CM1		
Frequency	**Test Data**	**AF**	**Test Data**	**AF+CA-AMP**	**Results**	**Limits**	**Distance /**	**Margin**	**PK = n**
(MHz)	**(dBm)**	**Table**	**(dBuV)**	**(dB)**	**(uV/m)**	**(uV/m)**	**Polarity**	**(dB)**	**/ QP**
4801.90	-48.0	1HN3mV	59.0	5.2	1630.1	5000.0	3m./VERT	**9.7**	PK
7203	-63.3 *	1HN3mV	43.7	9.6	462.2	5000.0	3m./VERT	**20.7**	PK

Data corrected by 0.1 dB for loss of high pass filter, except to fundamental

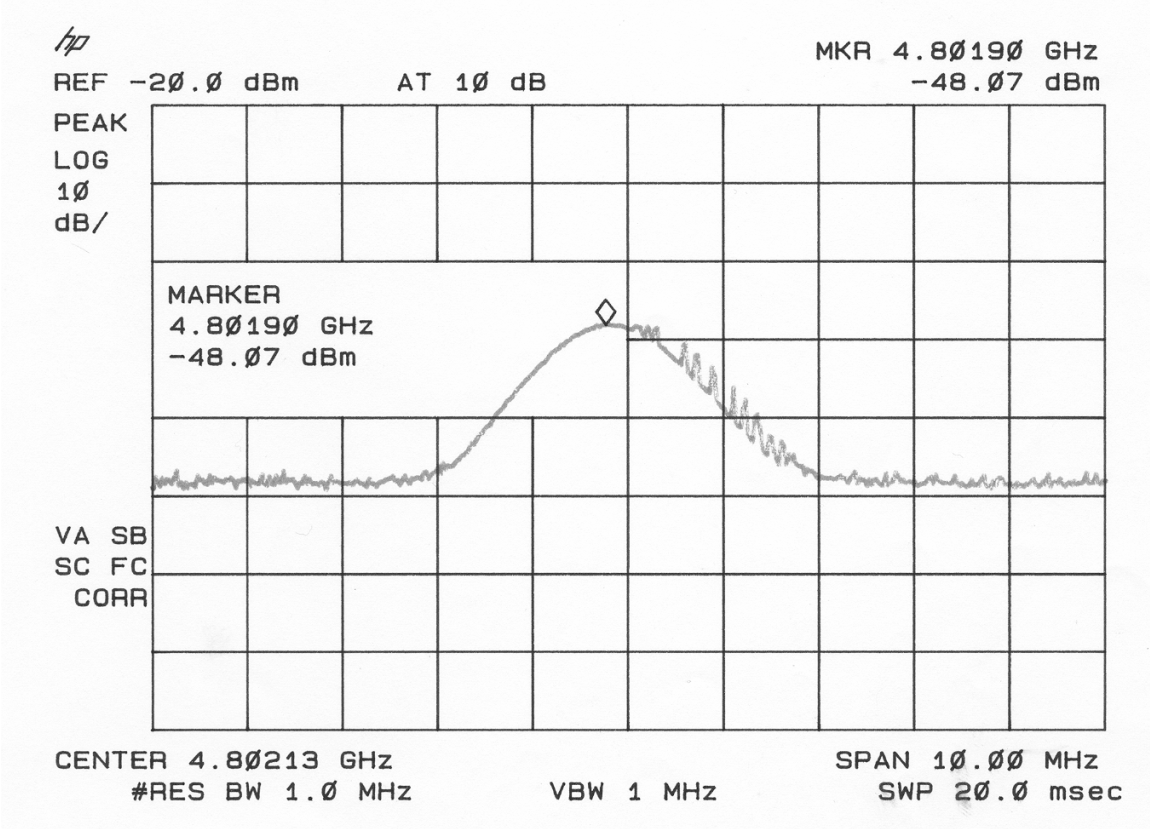
* Conversion from 1 meter to 3 meters = -9.54 dB

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-48.0 + 5.2 + 107)/20) = 1630.1
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: _____ **Name: Louis A. Feudi**

FCC ID: L2V-CM1

Figure 3b - 1
Peak Radiated Spurious Emission 15.247(c) Low



FCC ID: L2V-CM1

Figure 3b - 2
Peak Radiated Spurious Emission 15.247(c) Low

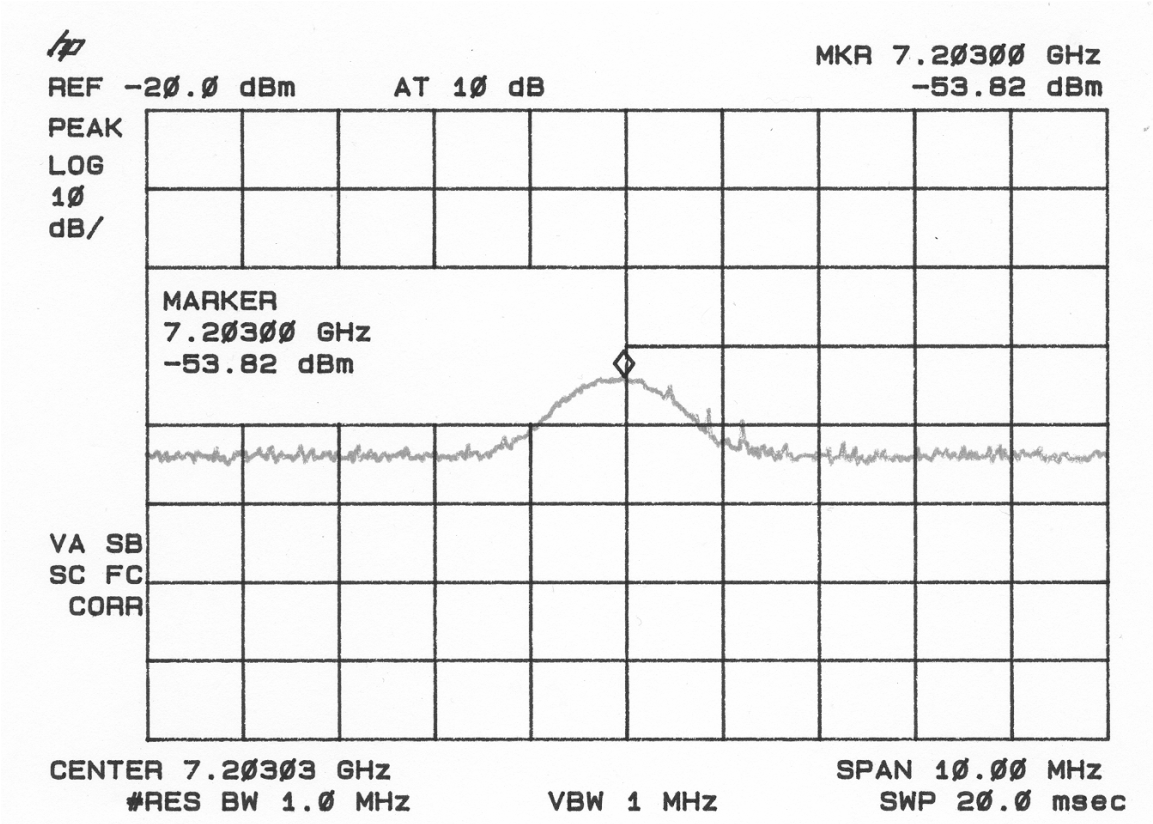


Table 3c. PEAK RADIATED SPURIOUS EMISSIONS (Mid)

Radiated Emissions									
						Client:	Axonn		
L.F.	**Project:**	07-0057		**Class:**	**B**	**Model:**	CM1		
Frequency	**Test Data**	**AF**	**Test Data**	**AF+CA-AMP**	**Results**	**Limits**	**Distance /**	**Margin**	**PK = n**
(MHz)	**(dBm)**	**Table**	**(dBuV)**	**(dB)**	**(uV/m)**	**(uV/m)**	**Polarity**	**(dB)**	**/ QP**
4879.96	-51.8	1hn3mh	55.2	5.7	1104.1	5000.0	3m./HORZ	**13.1**	PK
7319.93	-63.5 *	1hn3mh	43.5	10.2	483.9	5000.0	3m./HORZ	**20.3**	PK
9759.77	-69.8 *	1hn3mh	37.2	13.5	343.3	5000.0	3m./HORZ	**23.3**	PK

Data corrected by 0.1 dB for loss of high pass filter, except to fundamental

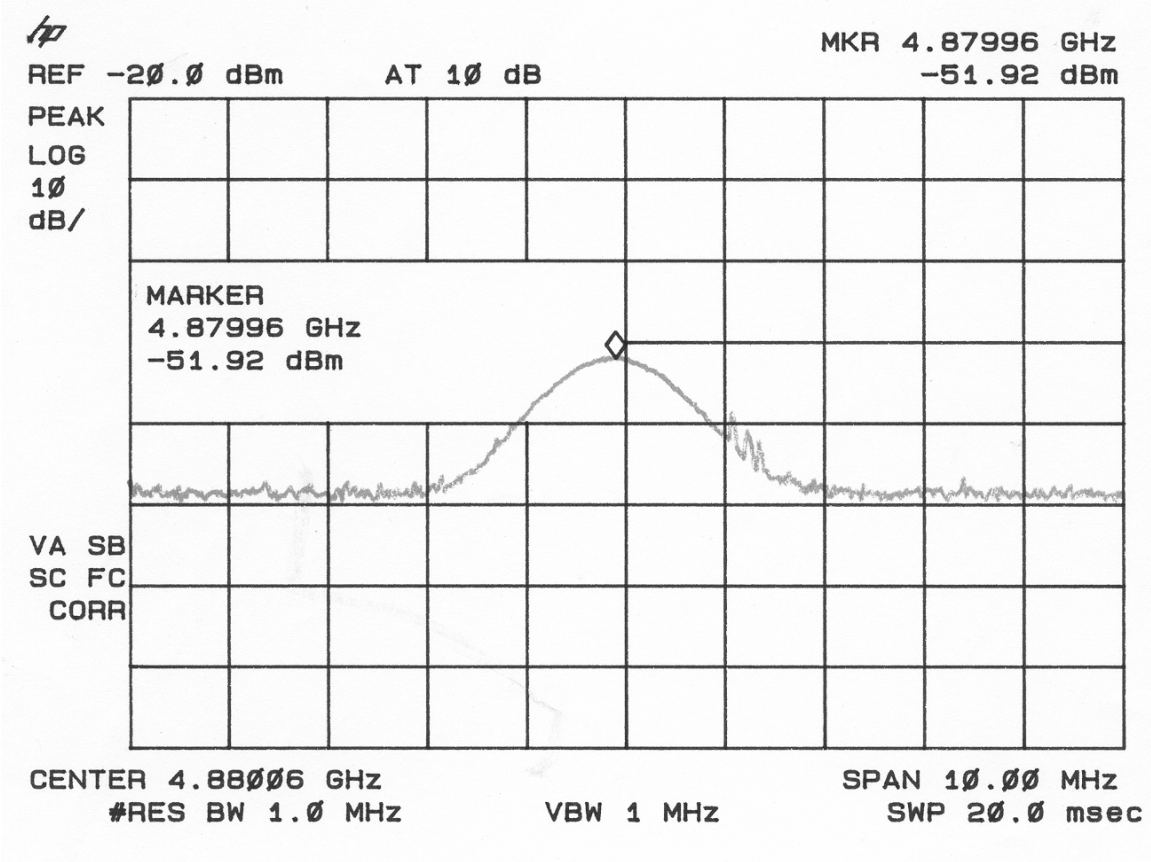
* Conversion from 1 meter to 3 meters = -9.54 dB

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-51.8 + 5.7 + 107)/20) = 1104.1
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: _____ **Name: Louis A. Feudi**

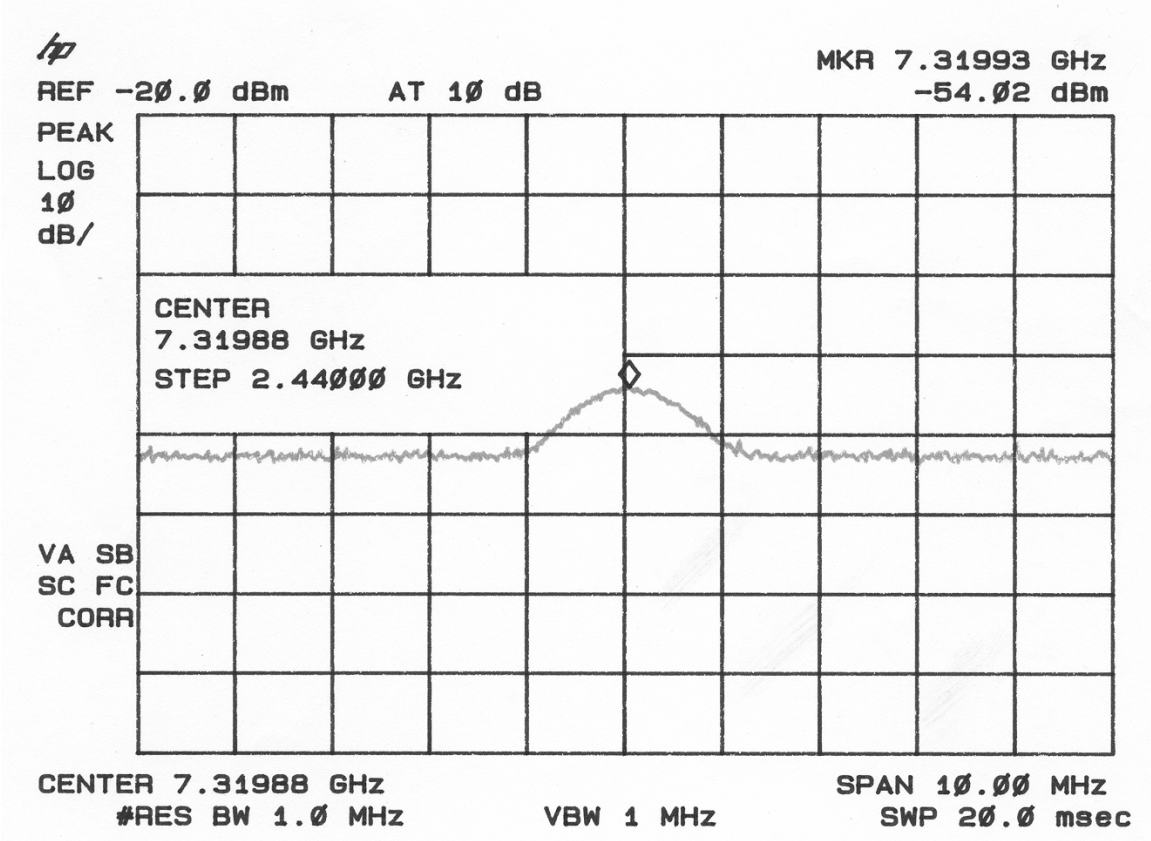
FCC ID: L2V-CM1

Figure 3c - 1
Peak Radiated Spurious Emission 15.247(c) Mid



FCC ID: L2V-CM1

Figure 3c - 2
Peak Radiated Spurious Emission 15.247(c) Mid



FCC ID: L2V-CM1

igure 3c - 3
Peak Radiated Spurious Emission 15.247(c) Mid