Axonn L.L.C.
FCC Part 15, Certification Application
AXC550 Transmitter

UST Project: 01-0647
January 10, 2002

MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Axonn L.L.C.**

MODEL: **AXC550 Transmitter**

FCC ID: **L2VAXC550**

DATE: **January 10, 2002**

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

Equipment type: ___**Direct Sequence Spread Spectrum (Modular)**___

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

Phone Number: (770) 740-0717
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 the Axonn L.L.C.'s, Model AXC550 Transmitter. The EUT utilizes direct sequence spread spectrum technology for communication on the following channels: 905.58, 908.58, 911.58, 914.58, 917.58, 920.58, 923.58, and 926.58 MHz at approximately +21 dBm into the antenna. The transmitter modulation incorporates BPSSK modulation for generating a direct-sequence, spread spectrum carrier. The data modulation for the device utilizes either OOK or BPSK data modulation techniques as selectable by the user application.

This application is being submitted in order to approve the EUT as a stand-alone module. Please refer to the following letter from Axonn L.L.C.

AXONN L.L.C. 2021 Lakeshore Drive · Suite 500 · New Orleans, Louisiana 70122 · (504) 282-8119 · FAX (504) 384 2427

November 12, 2001

Federal Communications Commission
Equipment Authorization Division
7435 Oakland Mills Road
Columbia, MD 21046

Dear Sir or Madam:

This letter requests that the attached filing (FCC ID L2VAXC550) be submitted for modular approval. In reference to FCC Public Notice DA 00-1407, the following is stated:

1. All components except the antennas are enclosed by the metal shielding and ground plane.
2. All data inputs are buffered.
3. The device has its own power supply regulation.
4. The device is a complete transmitter module, with its own reference oscillator and permanently attached antenna. All connectors are for power supply and data inputs.
5. The device was submitted as a stand-alone unit for testing. The conducted emissions requirements do not apply as this will be a battery-powered unit.

Best Regards,

David Alley

David Alley
Axonn LLC

1.2 Related Submittal(s)/Grant(s)

The EUT will be used with part of a system to send/receive data. The transmitter presented in this report will be used with similar transceivers or previously approved receivers.

The EUT is subject to the following authorizations:

a) Certification as a transmitter

The information contained in this report is presented for the certification authorization 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 (1992). 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. Interconnecting cables were manipulated as necessary to maximize emissions. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

The sample used for testing was received by U.S. Technologies on November 11, 2001 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

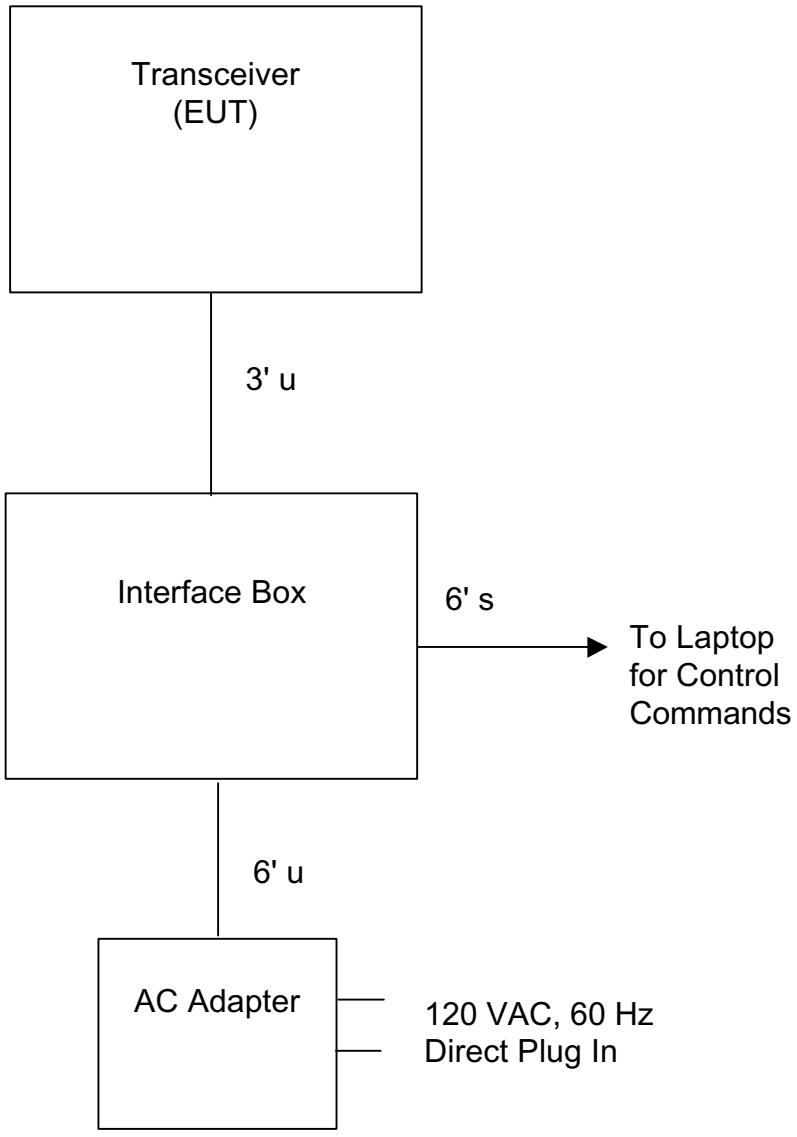
Table 2 describes test equipment used to evaluate this product.

2.4 Modifications

No modifications were made by US Tech, to bring the EUT into compliance with FCC Part 15 limits for the transmitter portion of the EUT.

FIGURE 1

TEST CONFIGURATION



Test Date: November 13- December 19, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

FIGURE 2a

Photograph(s) for Spurious Emissions (Front)

Test Date: November 13- December 19, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

FIGURE 2b

Photograph(s) for Spurious Emissions (Back)

Test Date: November 13- December 19, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

FIGURE 2c

Photograph(s) for Digital Device/Receiver Emissions (Front)

Photograph not available

Test Date: November 13- December 19, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

FIGURE 2d

Photograph(s) for Digital Device/Receiver Emissions (Back)

Photograph not available

Test Date: November 13- December 19, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

FIGURE 2e

Photograph(s) for Conducted Emissions

Transmitter

Test Date: November 13- December 19, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

FIGURE 2f

Photograph(s) for Conducted Emissions

Receiver

TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Modular TX Board Axonn L.L.C.	AXC550	None	L2VAXC550 (pending)	3’u
Interface Box Axonn L.L.C.	None	None	None	6’s
AC Adapter	106104	0033	None	6' u

TABLE 2
TEST INSTRUMENTS

TYPE	MANUFACTURER	MODEL	SN.
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
BILOG	CHASE	CBL6112A	2238
LISN	SOLAR ELE.	8028	910494
LISN	SOLAR ELE.	8028	910495
MULTIMETER	FLUKE	85	53710469
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394

2.6 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.

The Axonn L.L.C. Model AXC550 Transmitter incorporates an internal (integrated) antenna only. The EUT contains 1 transmit antenna and 2 receive antennas. The manufacture has performed testing on the antenna and considers it to have a 0 dBd gain (2.1 dBi). A future model may incorporate a connector and external antennas, however the manufacturer will apply for a permissive change on this version in the future.

2.7 Peak Power Within the Band 902 - 928 MHz per FCC Section 15.247(b)

Peak power within the band 902 - 928 MHz has been measured with a spectrum analyzer. Since the EUT incorporated an integrated antenna, this measurement was made on a OAT's site. The measurement was made with a spectrum analyzer using a peak detector with the VBW ≥ RBW ≥ 6 dB bandwidth and the EIRP from the EUT was calculated. Field strength of the peak fundamental emissions is shown in Table 3 and Figure 3.

The EUT did not incorporate any antennas of directional gain greater than 6 dBi, therefore the output power has not been reduced as required by 15.247(b)(3).

TABLE 3
PEAK POWER OUTPUT

Test Date: November 13, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

Frequency (MHz)	Receiver Reading (dBm) @3m	Correction Factor (dB)	Corrected Reading (V/m) @3m	Measured Power (Watt)	FCC Limit (Watt)
905.58	-20.8	30.4	0.676083	0.085	1.0
914.58	-20.2	30.5	0.732824	0.099	1.0
926.58	-24.0	30.7	0.484172	0.043	1.0

Transmitters peak power calculated using:

$$P\ (W) = \frac{(E*d)^2}{30*G}$$

where d = 3 meters, E = corrected measured field strength in V/m, and G = numeric gain of transmitting antenna (1.62 for 2.1 dBi).

SAMPLE CALCULATIONS:

CORRECTED READING @ 3m (V/m) = Antilog ((-20.8 + 30.4 + 107)/20)* 10^{-6} = 0.676083
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature:  **Name: Austin Thompson**

Figure 3a
Peak Power per FCC Section 15.247(b) - low

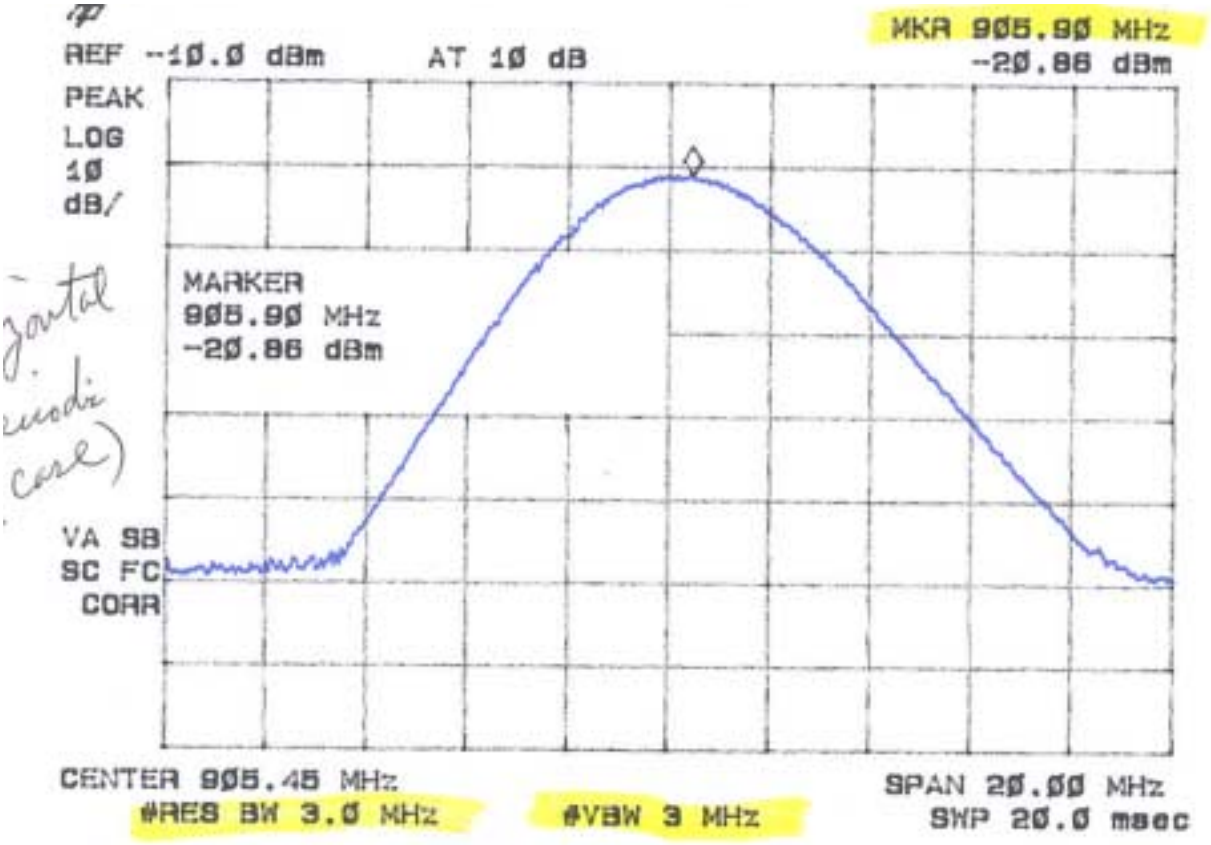


Figure 3b
Peak Power per FCC Section 15.247(b) - mid

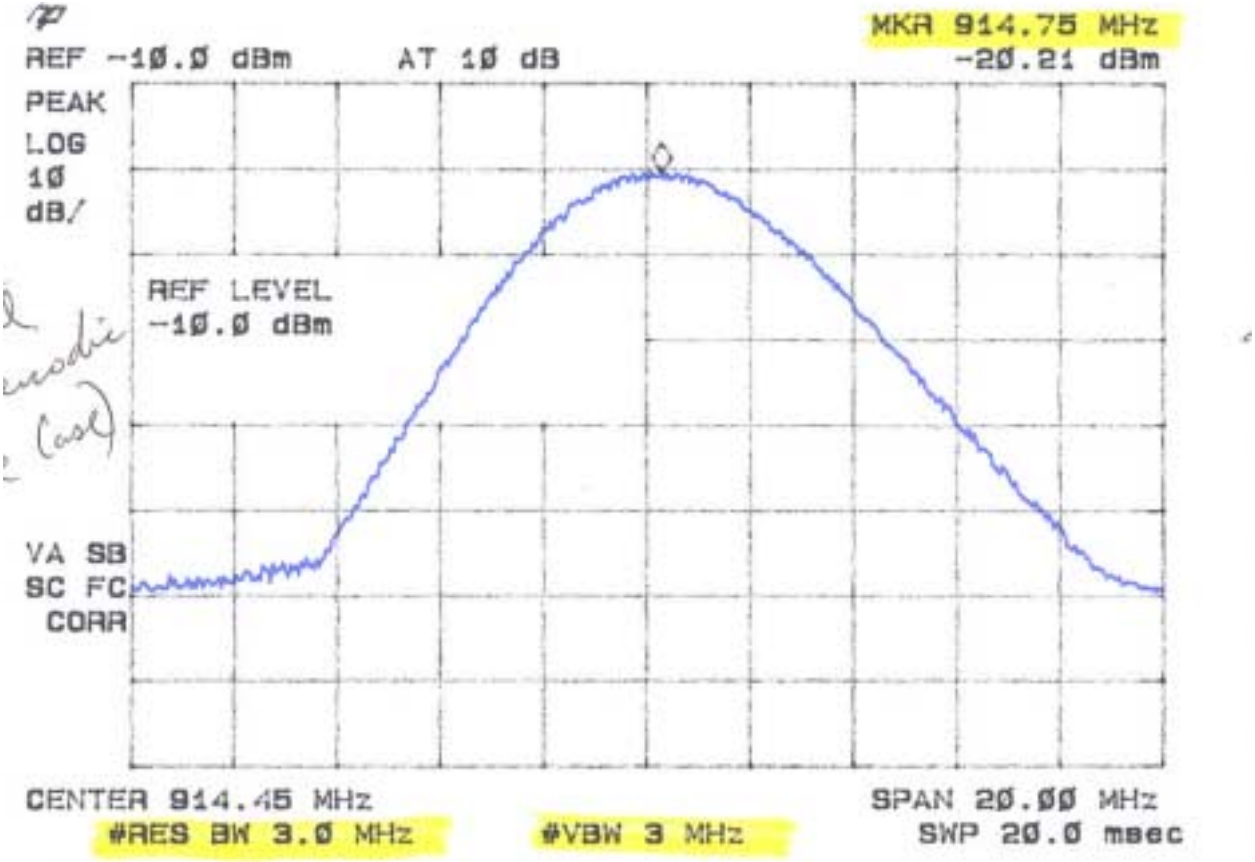
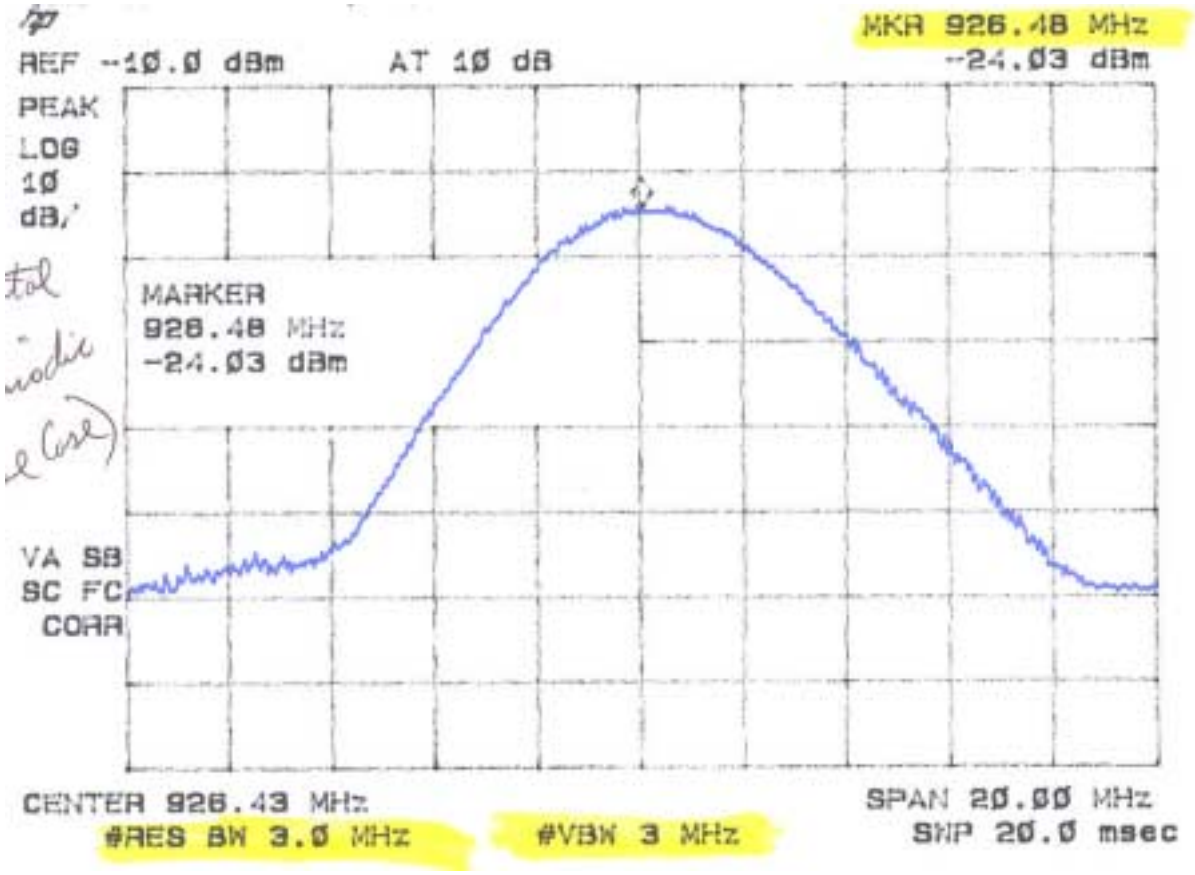


Figure 3c
Peak Power per FCC Section 15.247(b) - high



2.8 Antenna Conducted Spurious Emission in the Frequency Range 30 - 10000 MHz (FCC Section 15.247(c))

Since the EUT has an integrated antenna only, Antenna Conducted Spurious Emissions have been deemed not necessary.

2.9 Peak Radiated Spurious Emission in the Frequency Range 30 -10000 MHz (FCC Section 15.247(c))

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 OAT's 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 spurious emissions falling within restricted bands are given in Table 4a through Table 4c and Figure 5a-5f.

Figure 5a
Peak Radiated Spurious Emission 15.247(c) - Low

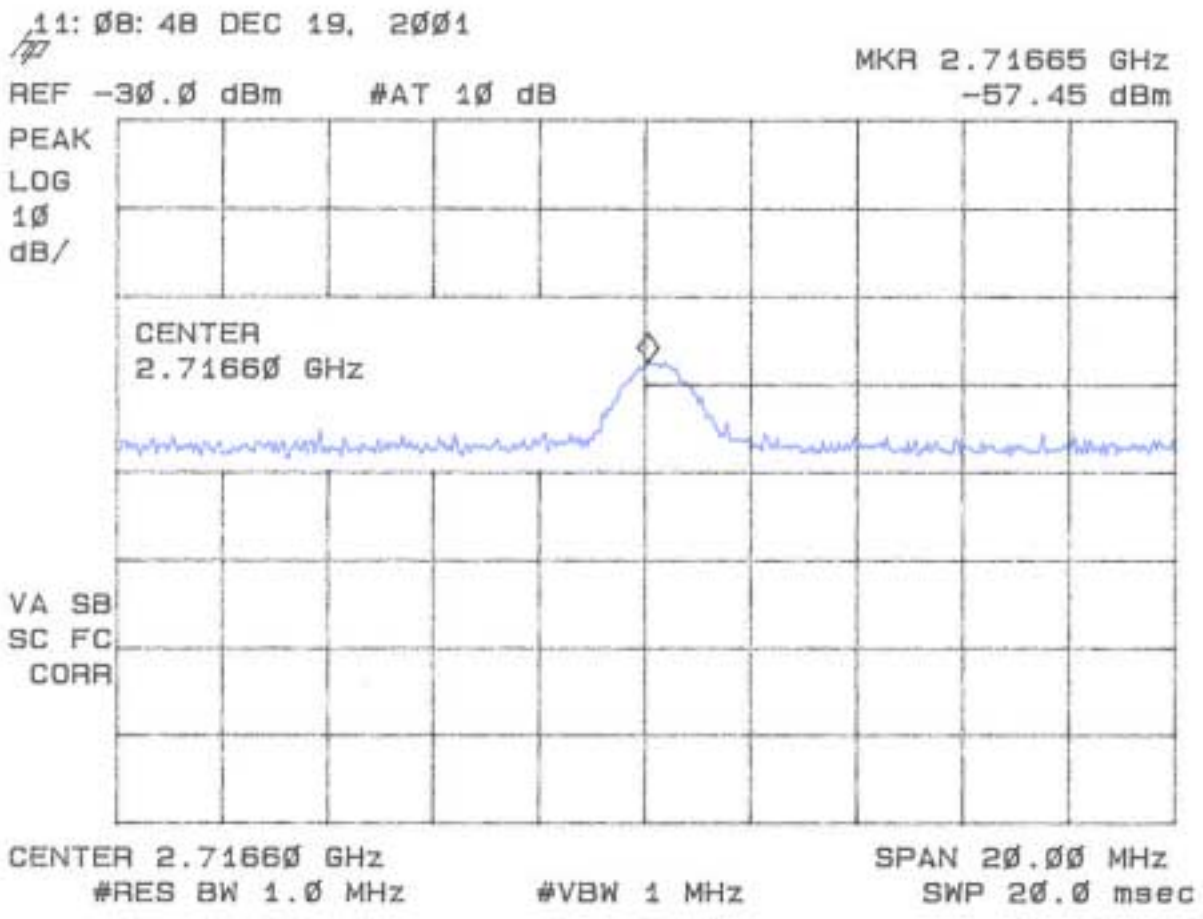


Figure 5b
Peak Radiated Spurious Emission 15.247(c) - Low

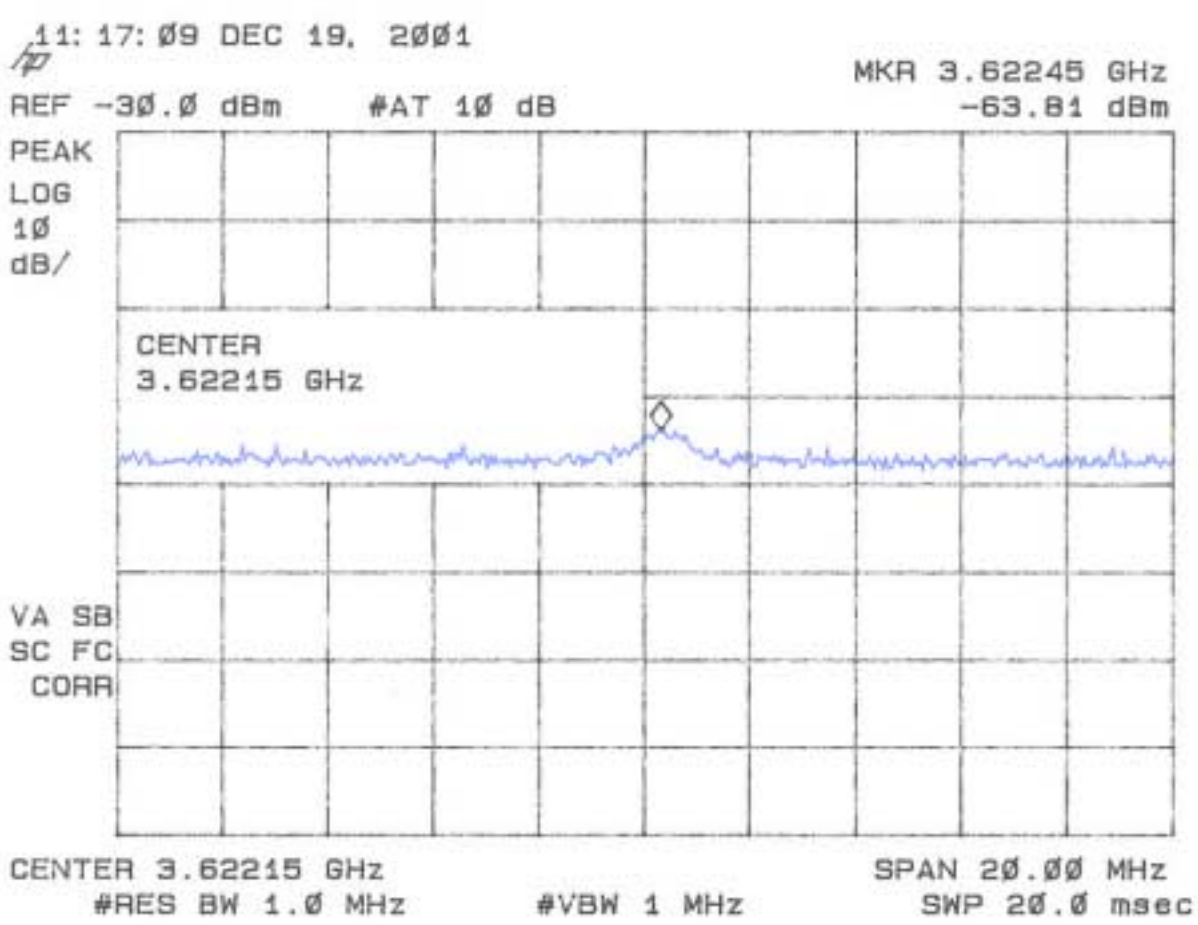


Figure 5c
Peak Radiated Spurious Emission 15.247(c) - Mid

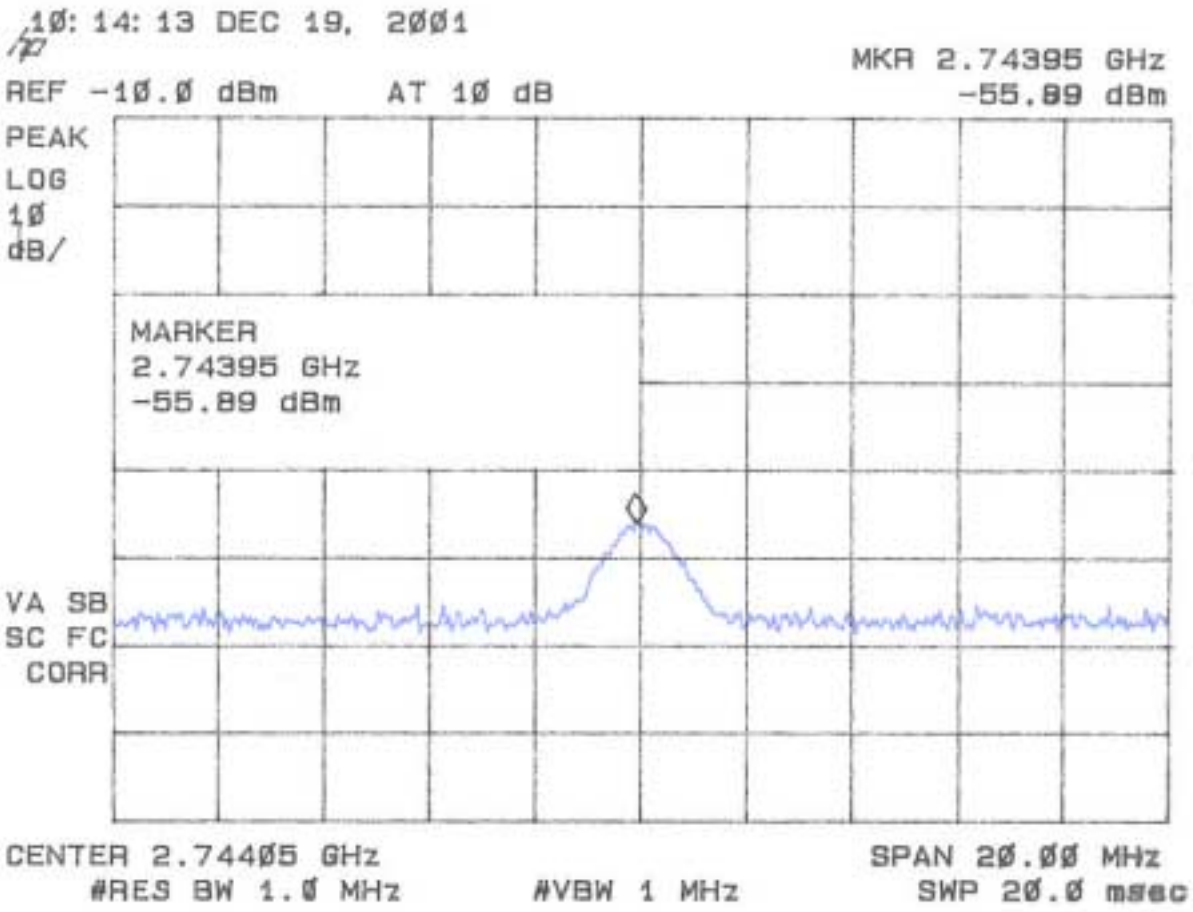


Figure 5d
Peak Radiated Spurious Emission 15.247(c) - Mid

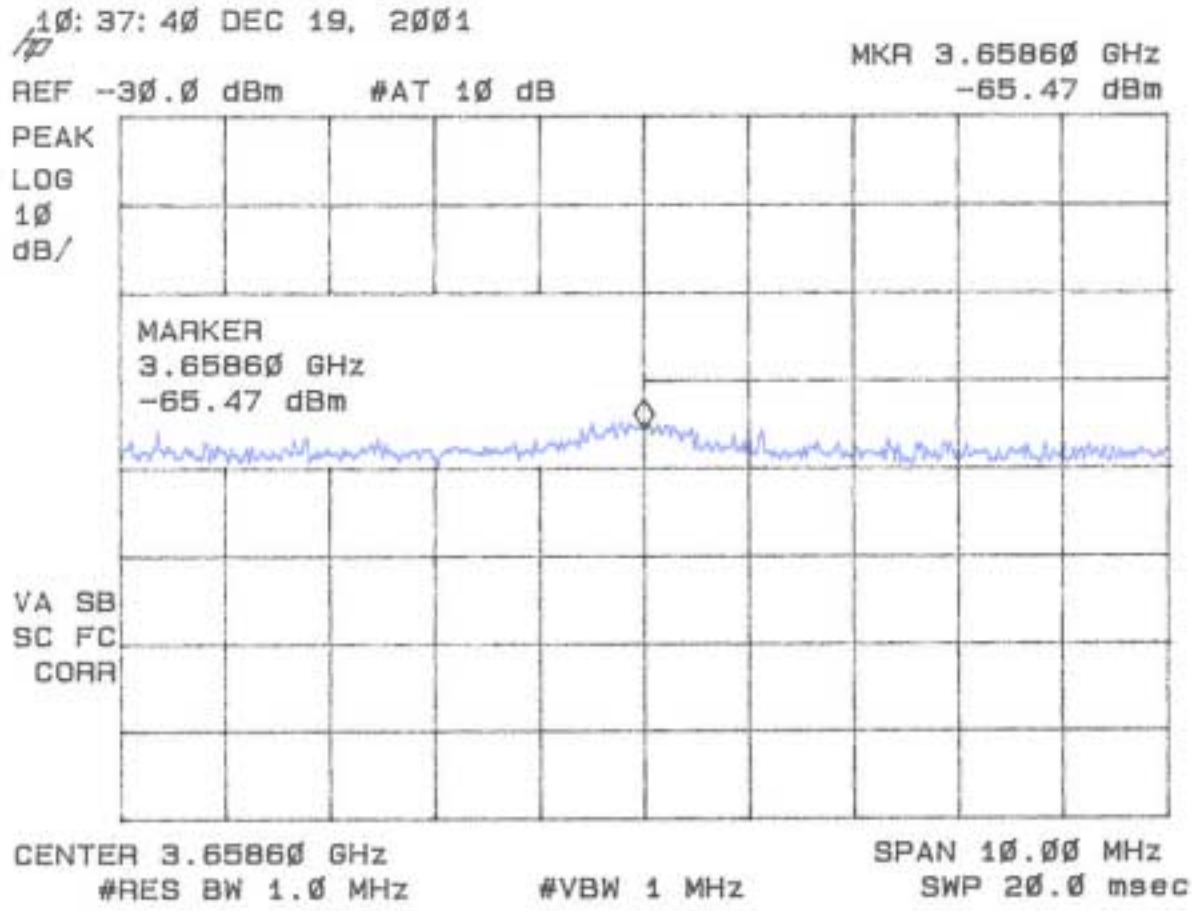


Figure 5e
Peak Radiated Spurious Emission 15.247(c) - High

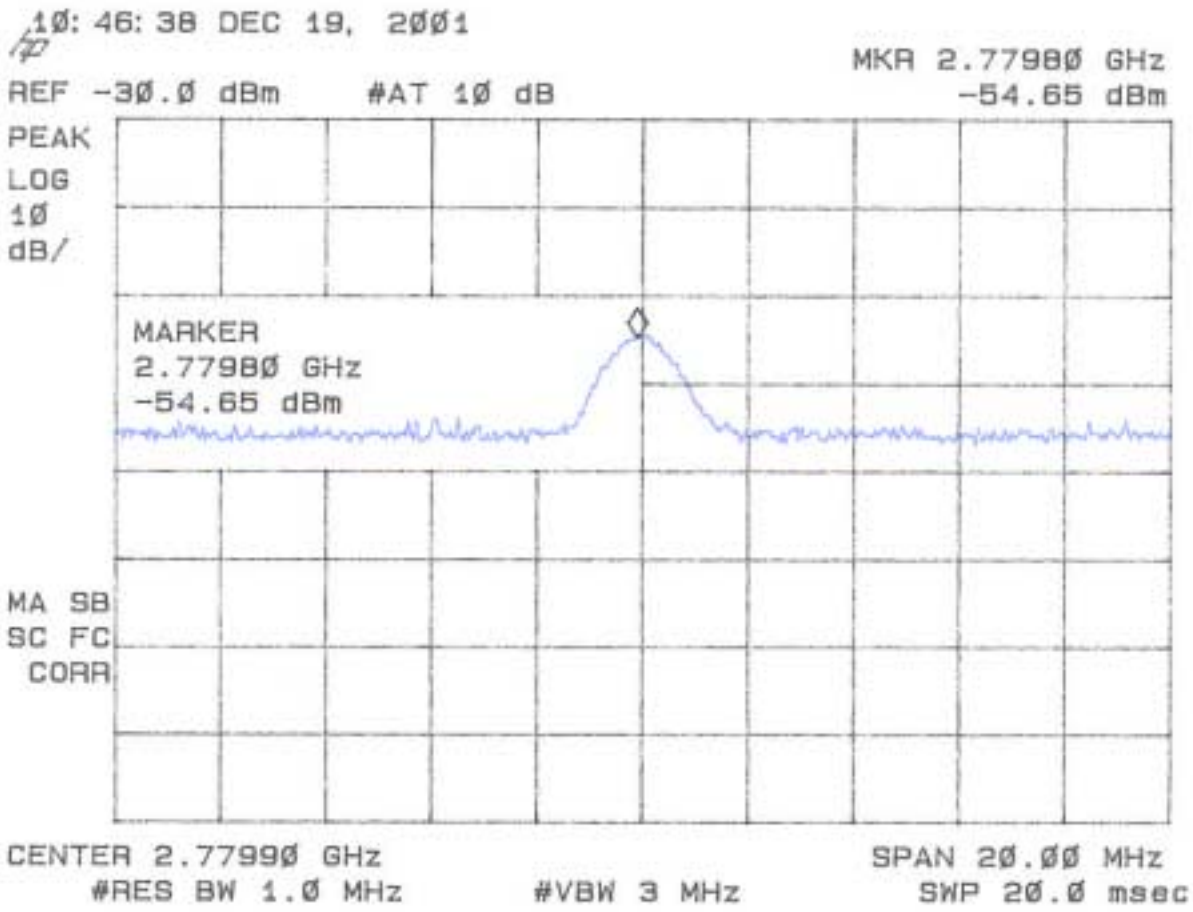


Figure 5f
Peak Radiated Spurious Emission 15.247(c) - High

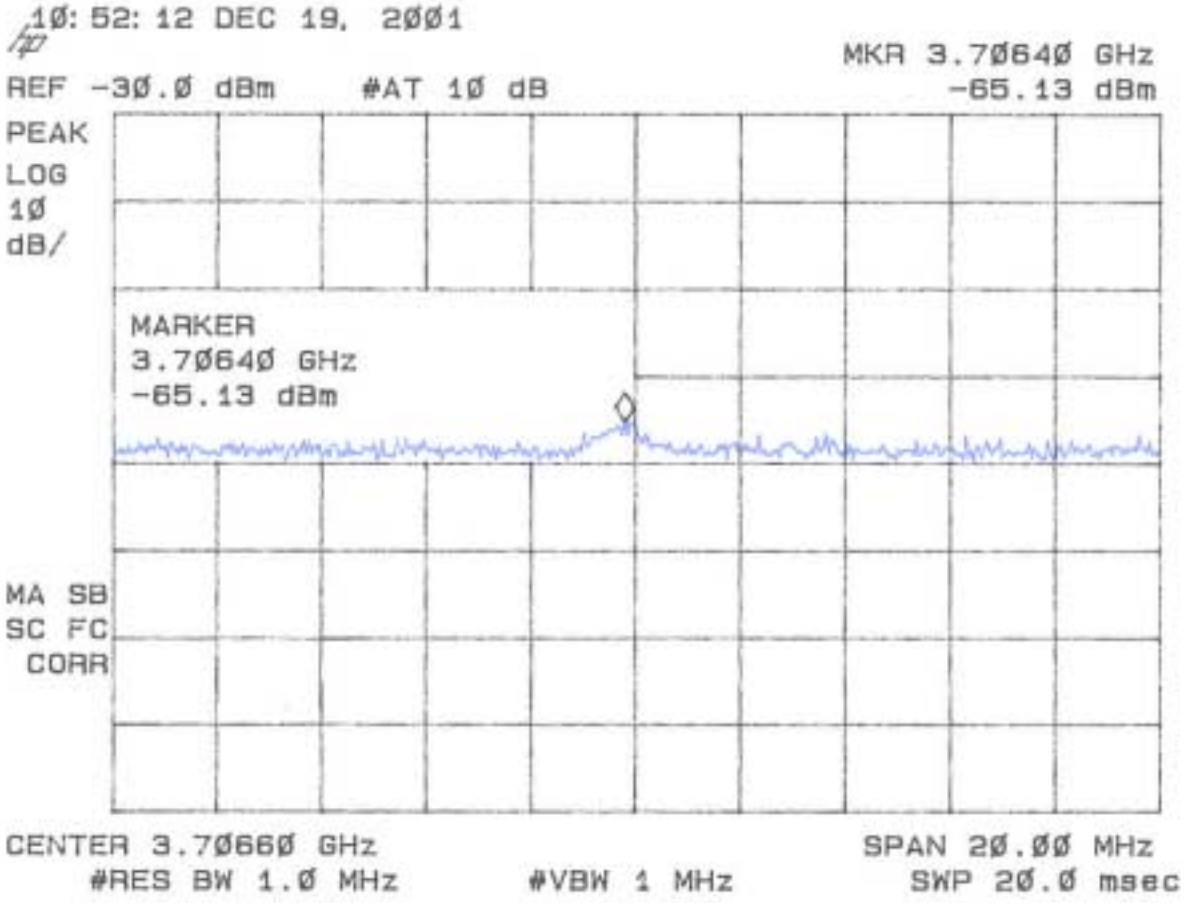


TABLE 4a. PEAK RADIATED SPURIOUS EMISSIONS

Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Peak Measurements > 1GHz (Low)

FREQ. (GHz)	TEST DATA* (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
2.71665	-56.5	34.8	30.9	4.7	369.5	5000.0
3.62245	-62.8	34.2	33.1	5.3	262.8	5000.0

*** = Data above 2 GHz adjusted by + 1 dB for high pass filter**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-56.5 - 34.8 + 30.9 + 4.7 + 107)/20) = 369.5
CONVERSION FROM dBm TO dBuV = 107 dB

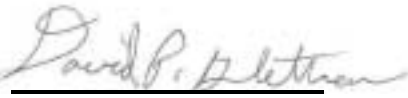
Tester Signature:  **Name: David Blethen**

TABLE 4b. PEAK RADIATED SPURIOUS EMISSIONS

Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Peak Measurements > 1GHz (Mid)

FREQ. (GHz)	TEST DATA* (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
2.74395	-54.9	34.8	30.9	4.8	449.4	5000.0
3.65860	-64.5	34.2	33.2	5.3	219.0	5000.0

*** = Data above 2 GHz adjusted by + 1 dB for high pass filter**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-54.9 - 34.8 + 30.9 + 4.8 + 107)/20) = 449.4
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: David B. Blethen **Name: David Blethen**

TABLE 4c. PEAK RADIATED SPURIOUS EMISSIONS

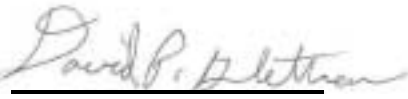
Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Peak Measurements > 1GHz (High)

FREQ. (GHz)	TEST DATA* (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
2.77980	-53.7	34.8	31.0	4.9	523.9	5000.0
3.70640	-64.1	34.1	33.3	5.3	233.4	5000.0

*** = Data above 2 GHz adjusted by + 1 dB for high pass filter**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-53.7 - 34.8 + 31.0 + 4.9 + 107)/20) = 523.9
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature:  **Name: David Blethen**

2.10 Average Spurious Emission in the Frequency Range 30 - 10000 MHz (FCC Section 15.247(c))

The results of average radiated spurious emissions falling within restricted bands are given in Table 5a through Table 5c and Figure 6a through Figure 6f.

Duty Cycle Correction During 100 msec:

Duty cycle correction has not been applied to the measurement data.

Figure 6a
Average Radiated Spurious Emission 15.247(c) - Low

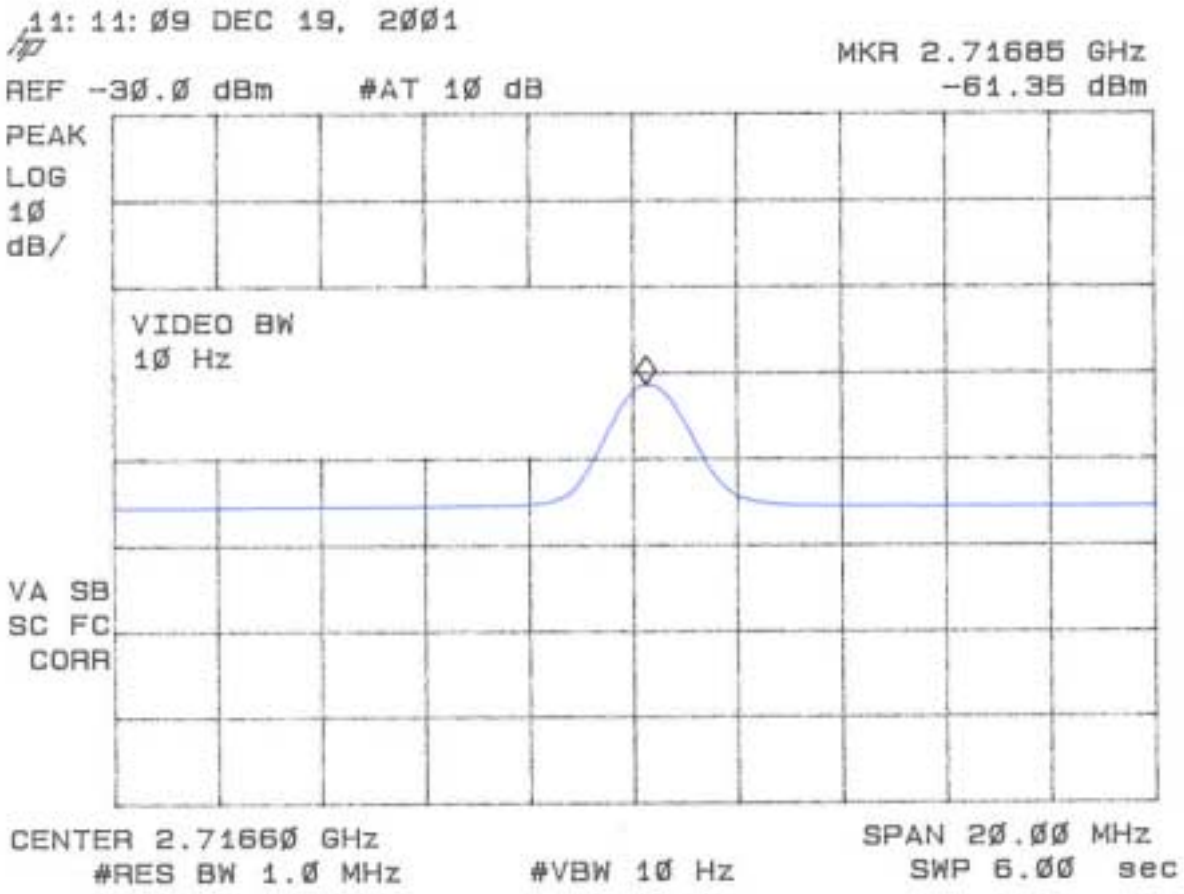


Figure 6b
Average Radiated Spurious Emission 15.247(c) - Low

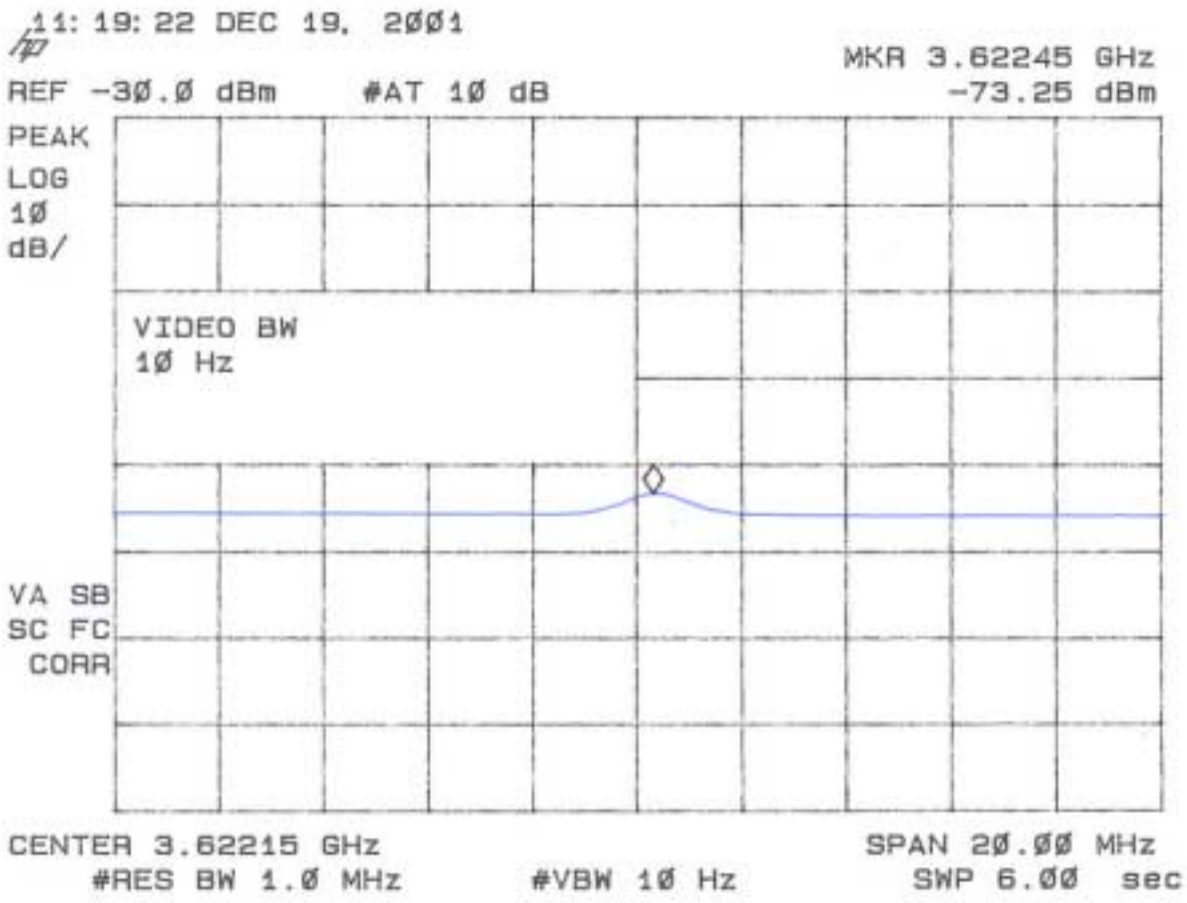


Figure 6c
Average Radiated Spurious Emission 15.247(c) - Mid

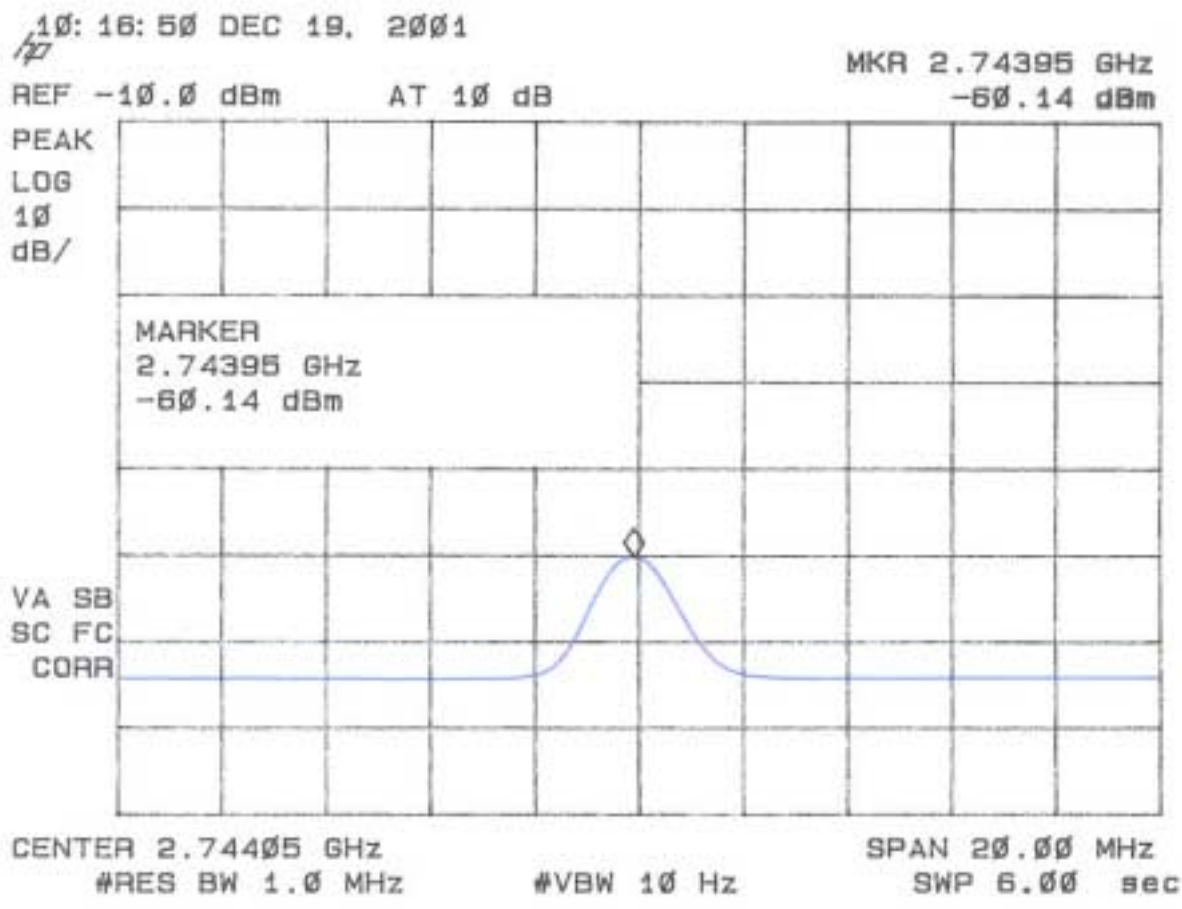


Figure 6d
Average Radiated Spurious Emission 15.247(c) - Mid

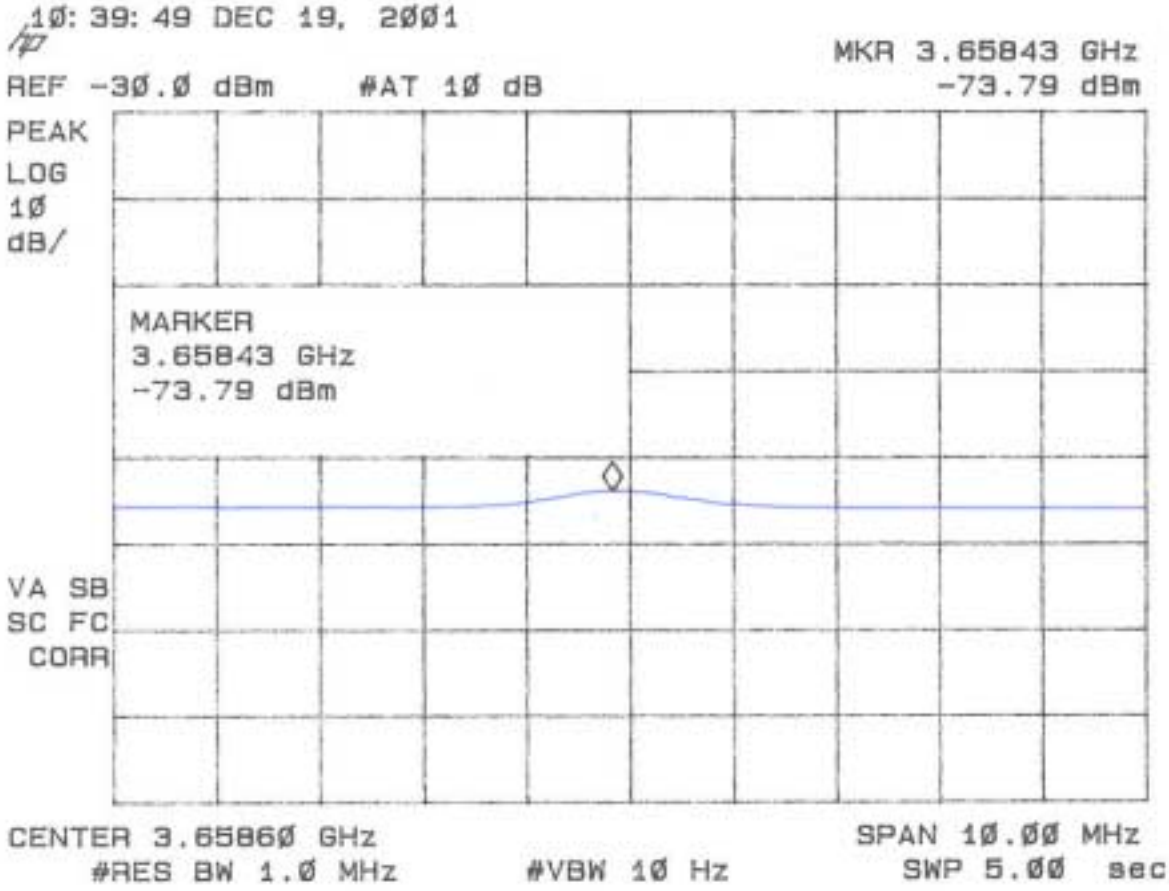


Figure 6e
Average Radiated Spurious Emission 15.247(c) - High

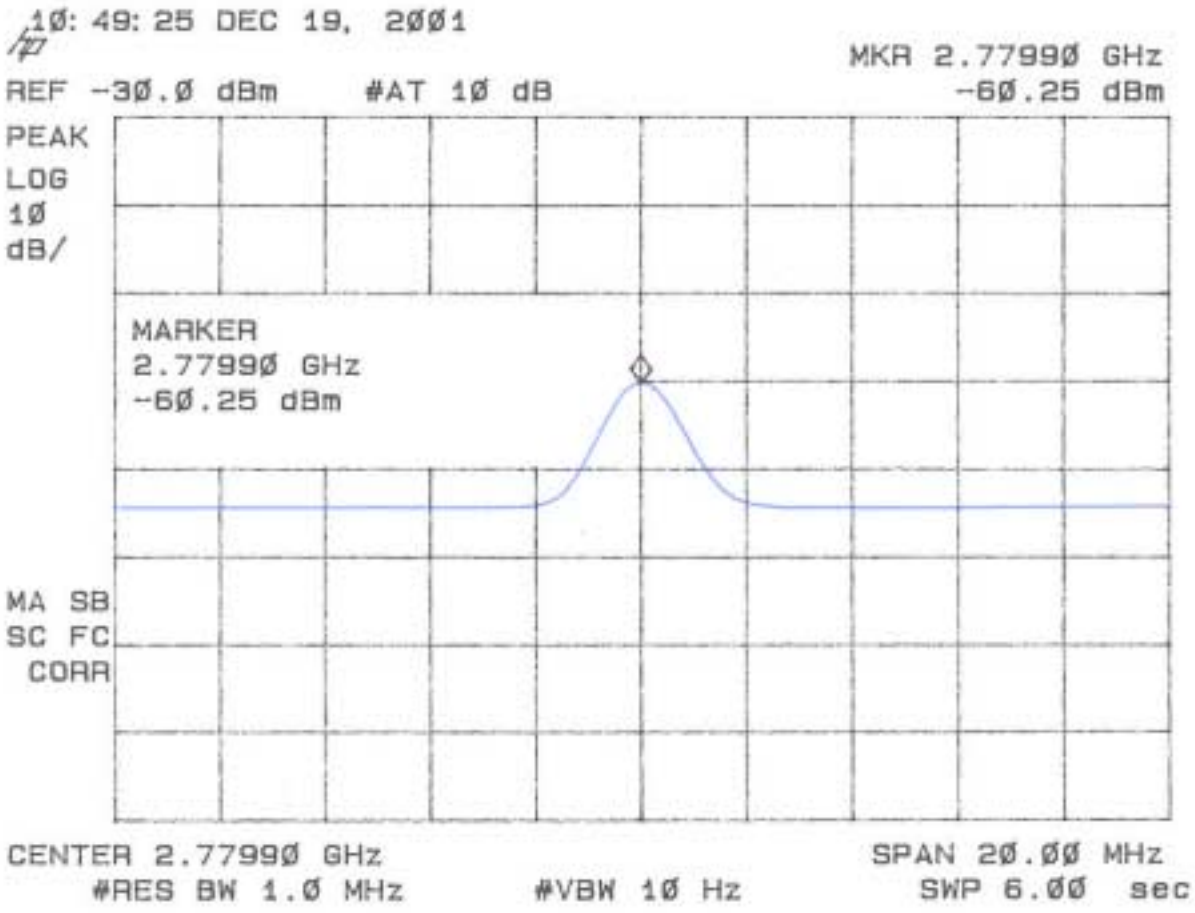


Figure 6f
Average Radiated Spurious Emission 15.247(c) - High

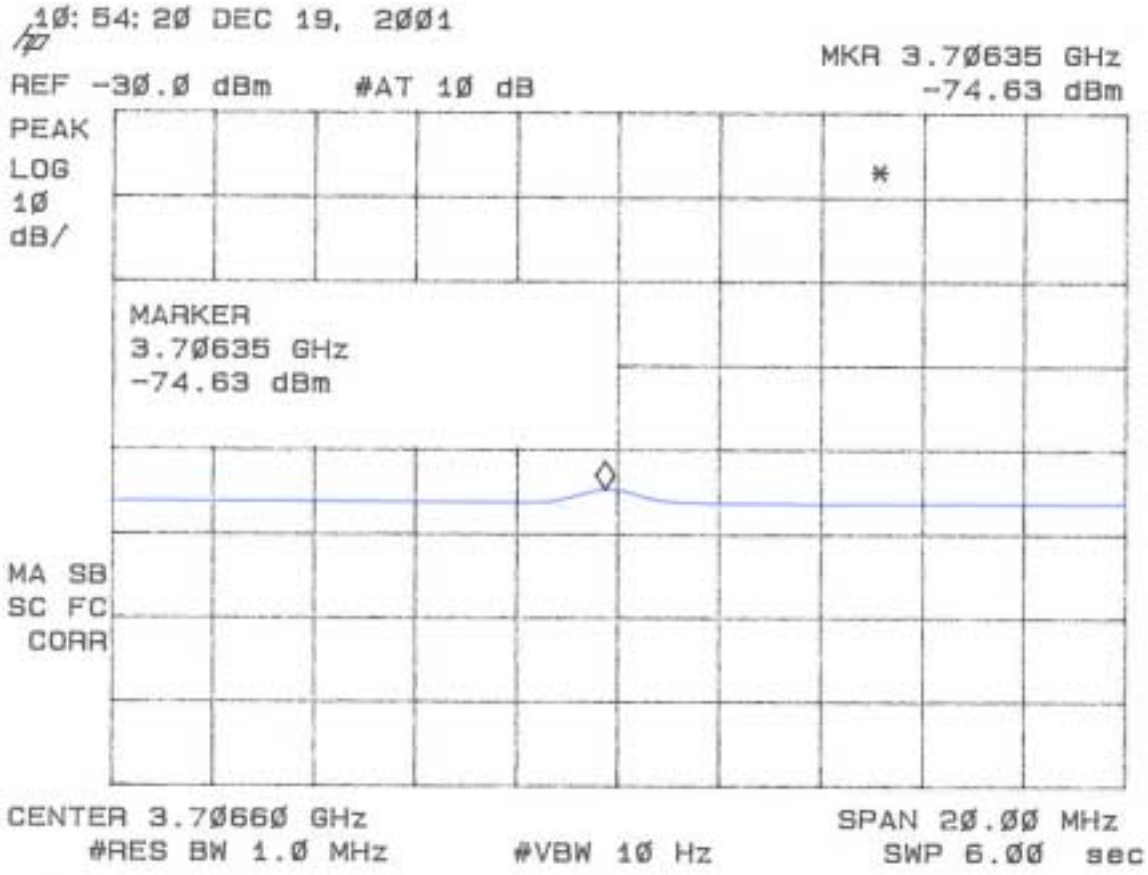


TABLE 5a. AVERAGE RADIATED SPURIOUS EMISSIONS

Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Average Measurements > 1GHz (Low)

FREQ. (GHz)	TEST DATA* (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
2.71685	-60.4	34.8	30.9	4.7	235.8	500.0
3.62245	-72.3	34.2	33.1	5.3	88.0	500.0

*** = Data above 2 GHz adjusted by + 1 dB for high pass filter**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-60.4 - 34.8 + 30.9 + 4.7 + 107)/20) = 235.8
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: David B. Blethen **Name: David Blethen**

TABLE 5b. AVERAGE RADIATED SPURIOUS EMISSIONS

Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Average Measurements > 1GHz (Mid)

FREQ. (GHz)	TEST DATA* (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
2.74395	-59.1	34.8	30.9	4.8	277.1	500.0
3.65843	-72.8	34.2	33.2	5.3	84.2	500.0

*** = Data above 2 GHz adjusted by + 1 dB for high pass filter**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-59.1 - 34.8 + 30.9 + 4.8 + 107)/20) = 277.1
CONVERSION FROM dBm TO dBuV = 107 dB

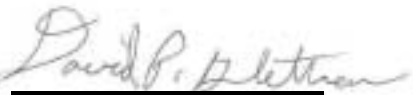
Tester Signature:  **Name: David Blethen**

TABLE 5c. AVERAGE RADIATED SPURIOUS EMISSIONS

Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Average Measurements > 1GHz (High)

FREQ. (GHz)	TEST DATA* (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
2.77990	-59.2	34.8	31.0	4.9	278.2	500.0
3.70635	-73.6	34.1	33.3	5.3	78.2	500.0

*** = Data above 2 GHz adjusted by + 1 dB for high pass filter**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-59.2 - 34.8 + 31.0 + 4.9 + 107)/20) = 278.2
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: David B. Blethen **Name: David Blethen**

2.11 Minimum 6 dB Bandwidth per FCC Section 15.247(a)(2)

The minimum requirement is given in Figure 7a through 7c. If the EUT incorporates different spreading codes or data rates these were each investigated and the one which produced the smallest 6 dB bandwidth was selected for test.

Figure 7a
6 dB Bandwidth per FCC Section 15.247(a)(2) - low

Figure 7b
6 dB Bandwidth per FCC Section 15.247(a)(2) - mid

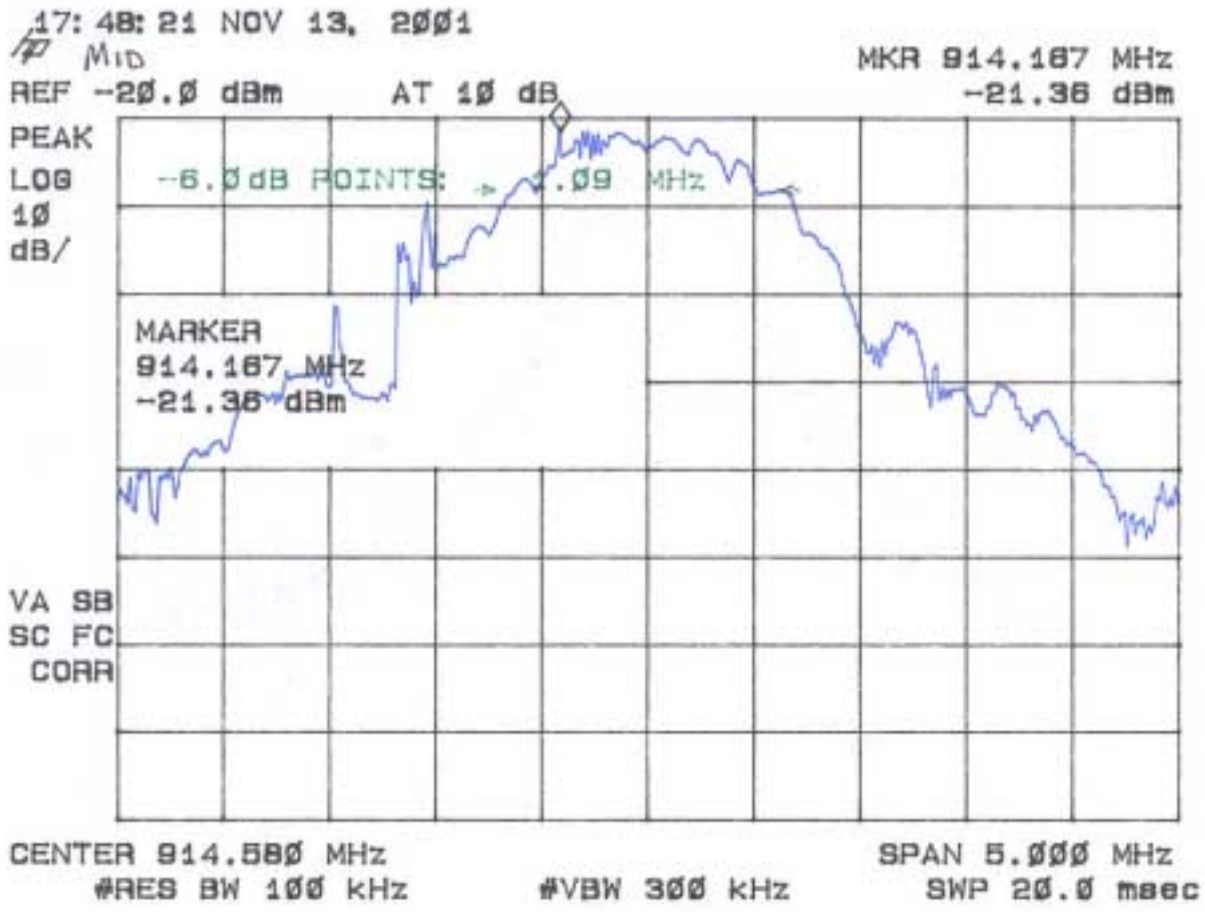
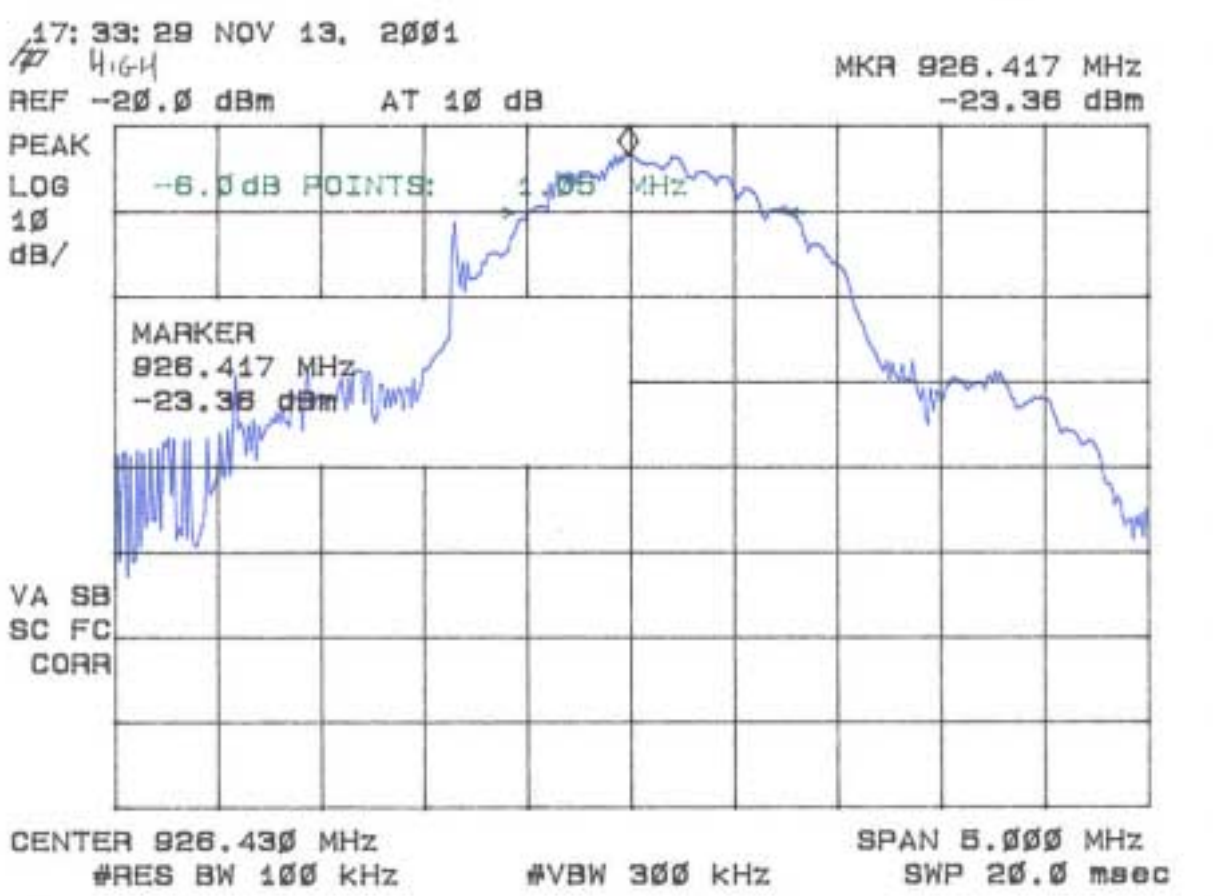


Figure 7c
6 dB Bandwidth per FCC Section 15.247(a)(2) - high



2.12 Power Spectral Density FCC Section 15.247(d)

The transmitter power spectral density averaged over any 1 second interval is given in Table 7 and Figure 8. If the EUT incorporates different spreading codes or data rates these were each investigated and the one which produced the smallest 6 dB bandwidth was selected for test.

Since the EUT incorporated an integrated antenna, this measurement was made on a OAT's by tuning a spectrum analyzer to the highest point of the maximized fundamental emission and zooming in on this portion of the emission utilizing the following spectrum analyzer settings: RBW = 3 kHz, VBW > RBW, span = 300 kHz, sweep = 100 seconds. The maximized point obtained by this method was then used to calculate the power spectral density as shown in Table 6.

TABLE 6
POWER SPECTRAL DENSITY

Test Date: November 13, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Model: AXC550 Transmitter

Frequency (MHz)	Receiver Reading (dBm) @3m	Correction Factor (dB)	Corrected Reading (V/m) @3m	Measured Power (Watt)	FCC Limit (Watt)
905.58	-33.8	30.4	0.151356	0.0042	0.0063
914.58	-33.8	30.5	0.153109	0.0043	0.0063
926.58	-34.6	30.7	0.142889	0.0038	0.0063

NOTE: Limit = Antilog(+8dBm/10) * 10^{-3} = 0.0063 Watts

Transmitters peak power calculated using:

$$P\ (W) = \frac{(E*d)^2}{30*G}$$

where d = 3 meters, E = corrected measured field strength in V/m, and G = numeric gain of transmitting antenna (1.62 for 2.1 dBi).

SAMPLE CALCULATIONS:

CORRECTED READING @ 3m (V/m) = Antilog ((-33.8 + 30.4 + 107)/20)* 10^{-6} = 0.151356
CONVERSION FROM dBm TO dBuV = 107 dB

Tester Signature: _____ **Name: Tim R. Johnson**

Figure 8a
Power Spectral Density 15.247(d) - low

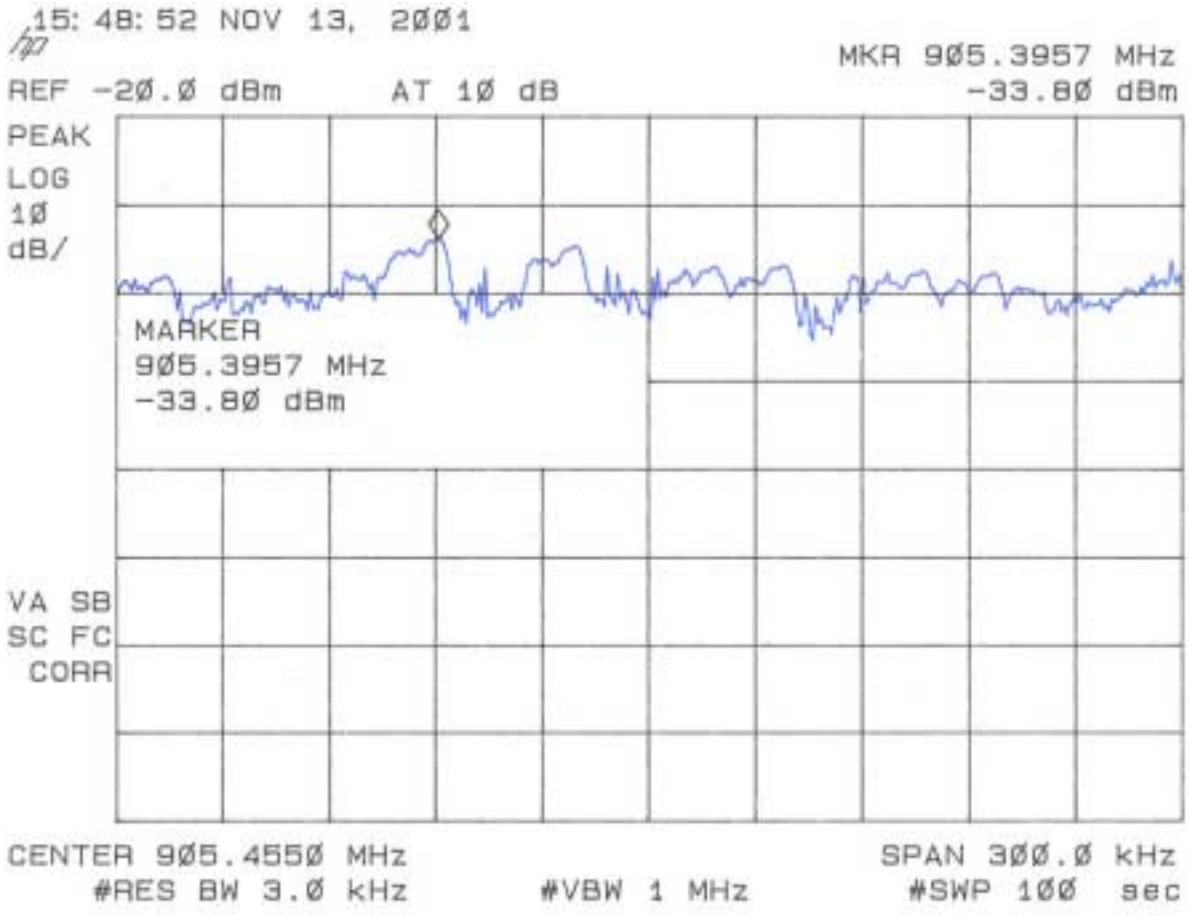


Figure 8b
Power Spectral Density 15.247(d) - mid

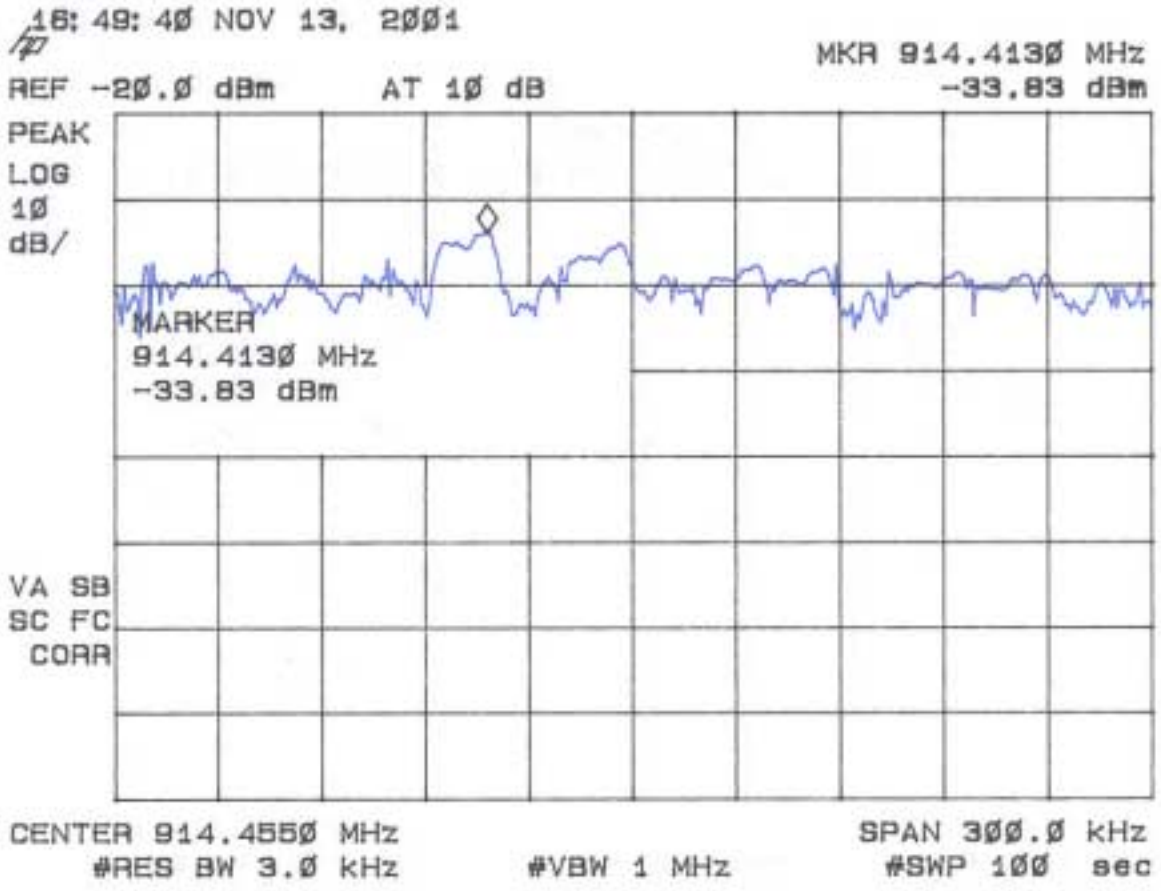
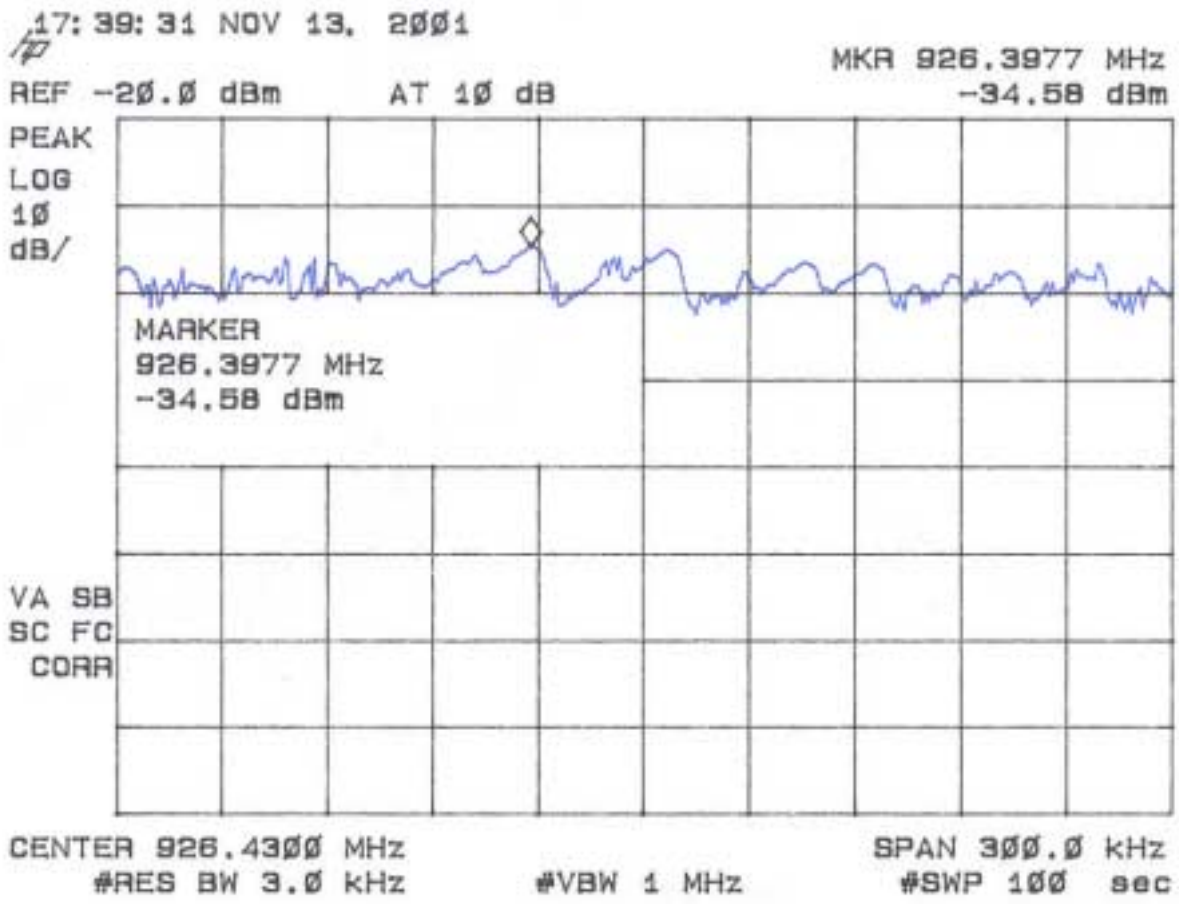


Figure 8c
Power Spectral Density 15.247(d) - high



2.13 Processing Gain

The processing gain is realized in the receiver, which is a separate unit from the EUT presented in this application. Data regarding processing gain for the receiver has been provided on the following page from Axonn L.L.C.

2.14 Power Line Conducted Emissions for Transmitter FCC Section 15.207

The conducted voltage measurements have been carried out in accordance with FCC Section 15.207, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit. The results are given in Table 7.

TABLE 7. CONDUCTED EMISSIONS DATA
CLASS B

Test Date: November 12, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

FREQ. (MHz)	TEST DATA (dBm) PHASE	TEST DATA (dBm) NEUTRAL	LISN LOSS (dB) PHASE	LISN LOSS (dB) NEUTRAL	CABLE FACTOR (dB)	RESULTS (uV) PHASE	RESULTS (uV) NEUTRAL	FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB) PHASE	MARGIN BELOW LIMIT (dB) NEUTRAL
9.86	-88.0	-88.8	0.0	0.0	0.5	9.4	8.6	250.0	28.5	29.3
11.66	-91.7	-91.4	0.0	0.0	0.6	6.2	6.4	250.0	32.1	31.8
12.05	-84.0	-85.5	0.0	0.0	0.6	15.1	12.7	250.0	24.4	25.9
13.56	-88.5	-87.4	0.0	0.0	0.6	9.0	10.2	250.0	28.9	27.8
15.06	-86.4	-85.7	0.0	0.0	0.6	11.5	12.5	250.0	26.8	26.1
15.50	-87.2	-86.0	0.0	0.0	0.7	10.5	12.1	250.0	27.5	26.3

*** - Quasi-Peak**

SAMPLE CALCULATIONS:
RESULTS uV = Antilog ((-88.0 + 0.0 + 0.5 +107)/20) = 9.4
CONVERSION FROM dBm TO dBuV = 107 dB

Tested by
Signature: _____ **Name:** Hernando Orozco

2.15 Radiated Emissions (47 CFR 15.109a)

Radiated emissions were evaluated from 30 to 5000 MHz. Measurements were made with the analyzer's bandwidth set to 120 kHz measurements made less than 1 GHz and 1 MHz are shown in Table 8.

TABLE 8. RADIATED EMISSIONS DATA

CLASS B

Test Date: November 20, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter

Frequency (MHz)	Receiver Reading (dBm) @3m	Correction Factor (dB)	Corrected Reading (uV/m)	FCC Limit (uV/m) @3m
No emissions were detected within 10 dB of the FCC Limit				

Tester Signature: David B. Blethen **Name:** David Blethen

2.16 Power Line Conducted Emissions for Digital Device FCC Section 15.107

The conducted voltage measurements have been carried out in accordance with FCC Section 15.107, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit. The results are given in Table 9.

TABLE 9. CONDUCTED EMISSIONS DATA – DIGITAL DEVICE

Test Date: November 12, 2001
UST Project: 01-0647
Customer: Axonn L.L.C.
Product: AXC550 Transmitter (Receiver)

FREQ. (MHz)	TEST DATA (dBm) PHASE	TEST DATA (dBm) NEUTRAL	LISN LOSS (dB) PHASE	LISN LOSS (dB) NEUTRAL	CABLE FACTOR (dB)	RESULTS (uV) PHASE	RESULTS (uV) NEUTRAL	FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB) PHASE	MARGIN BELOW LIMIT (dB) NEUTRAL
0.45	-78.1	-77.1	0.1	0.1	0.1	28.5	32.0	250.0	18.9	17.9
0.74	-80.1	-78.6	0.1	0.1	0.1	22.6	26.9	250.0	20.9	19.4
1.99	-85.4	-91.1	0.0	0.0	0.2	12.3	6.4	250.0	26.2	31.9
2.30	-85.4	-91.9	0.0	0.0	0.3	12.4	5.9	250.0	26.1	32.6
3.30	-86.2	-91.8	0.0	0.1	0.4	11.4	6.0	250.0	26.8	32.3
4.83	-88.5	-91.6	0.0	0.0	0.4	8.8	6.2	250.0	29.1	32.2

*** - Quasi-Peak**

SAMPLE CALCULATIONS:
RESULTS uV = Antilog ((-78.1 + 0.2 + 0.1 +107)/20) = 28.5
CONVERSION FROM dBm TO dBuV = 107 dB

Tested by
Signature:  **Name: Hernando Orozco**