FCC Certification Test Report

FCC Certification Test Report for Minerva Co. FCC ID: RP2-TX3

January 16, 2004

Revision 1 issued February 17, 2004

Prepared for:

Minerva Co.
P.O. Box 1536
Dahlgren, VA 22448

Prepared By:

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7560 Lindbergh Drive
Gaithersburg, Maryland 20879

FCC Certification Test Program

FCC Certification Test Report
for the
Minerva Co.
TX-3 Wireless Accelerometer
RP2-TX3

January 16, 2004

WLL JOB# 7905

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Wireless/Telco Services Manager & Chief EMC Engineer

Abstract

This report has been prepared on behalf of Minerva Co. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Intentional Radiator under Part 15.249 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Minerva Co. TX-3 Wireless Accelerometer.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The Minerva Co. TX-3 Wireless Accelerometer complies with the limits for a Intentional Radiator device under Part 15.249 of the FCC Rules and Regulations.

Revision History	Revision 1 issued February 17, 2004 to address comments from AmericanTCB

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1 Introduction

1.1 Compliance Statement

The Minerva Co. TX-3 Wireless Accelerometer complies with the limits for a Intentional Radiator device under Part 15.249 of the FCC Rules and Regulations.

This test report reflects the testing performed for the certification of the TX-3 Host. Separate testing was performed for the digital and receiver portion under the DoC process.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 2001 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	Minerva Co. P.O. Box 1536 Dahlgren, VA 22448
WLL Quotation Number:	61228

1.4 Test Dates

Testing was performed on December 22, 2003.

1.5 Test and Support Personnel

Washington Laboratories, LTD	Greg Snyder
Client Representative	Doug Dougherty

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
cm	centimeter
CW	Continuous Wave
dB	decibel
dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
k	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
m	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

The Minerva Co. TX-3 Wireless Accelerometer is a hybrid transmitter specifically designed for short-range wireless data communication applications. The device makes acceleration measurements, formats the data into packets, and transmits the data to a receiver.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Minerva Co.
FCC ID Number	RP2-TX3
EUT Name:	Wireless Accelerometer
Model:	TX-3
FCC Rule Parts:	§15.249
Frequency Range:	916.5 MHz
Modulation:	OOK
Occupied Bandwidth:	550kHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	1
Antenna Type	1/4 λ whip
Interface Cables:	None
Power Source & Voltage:	6 Vdc from battery

2.2 Test Configuration

The TX-3 was tested in a stand-alone configuration.

2.3 Testing Algorithm

The TX-3 was configured to send a continuous stream of data packets. Worst case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Equipment	Serial Number	Calibration Due
Sunol JB1 Biconilog Antenna	A090501	10/21/04
ARA Double Ridge Horn Antenna: DRG-118/A	1236	12/29/03
Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 1)	2928A04750	7/02/04
Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 1)	3303A01786	7/08/04
Hewlett-Packard RF Preselector: HP 85685A (Site 1)	3146A01296	7/02/04
Hewlett-Packard Spectrum Analyzer: HP 8593A	3009A00739	6/25/04
Hewlett-Packard Pre-Amplifier: HP 8449B	3008A00729	2/11/04
Solar Electronics LISN 8012-50-R-24-BNC	8379493	6/30/04

4 Test Results

4.1 Duty Cycle Correction

Measurements may be adjusted where pulsed RF is utilized to find the average level associated with a quantity. This calculation is applied to limits for pulsed licensed and unlicensed devices.

On time = $N_1L_1 + N_2L_2 + \ldots + N_{N-1}L_{N-1} + N_NL_N$, where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.

- For Licensed Transmitters basic formula can be stated as 20log[Duty Cycle]
- For Unlicensed Intentional Radiators under 47CFR Part 15, all duty cycle measurements compared to a 100 millisecond period
- i.e. duty cycle = on time/100 milliseconds or period, whichever is less
- Restating the basic formula:
    - Duty cycle = $(N_1L_1 + N_2L_2 + \ldots + N_{N-1}L_{N-1} + N_NL_N)/100$ or T, whichever is less

Where T is the period of the pulse train.

The following Figures show the plots of the modulated carrier. The spectrum analyzer was set to Zero Span and the video triggered to collect the worst case pulse train of the modulation. Calculations of the duty cycle correction factor were obtained from time data provided by the plots.

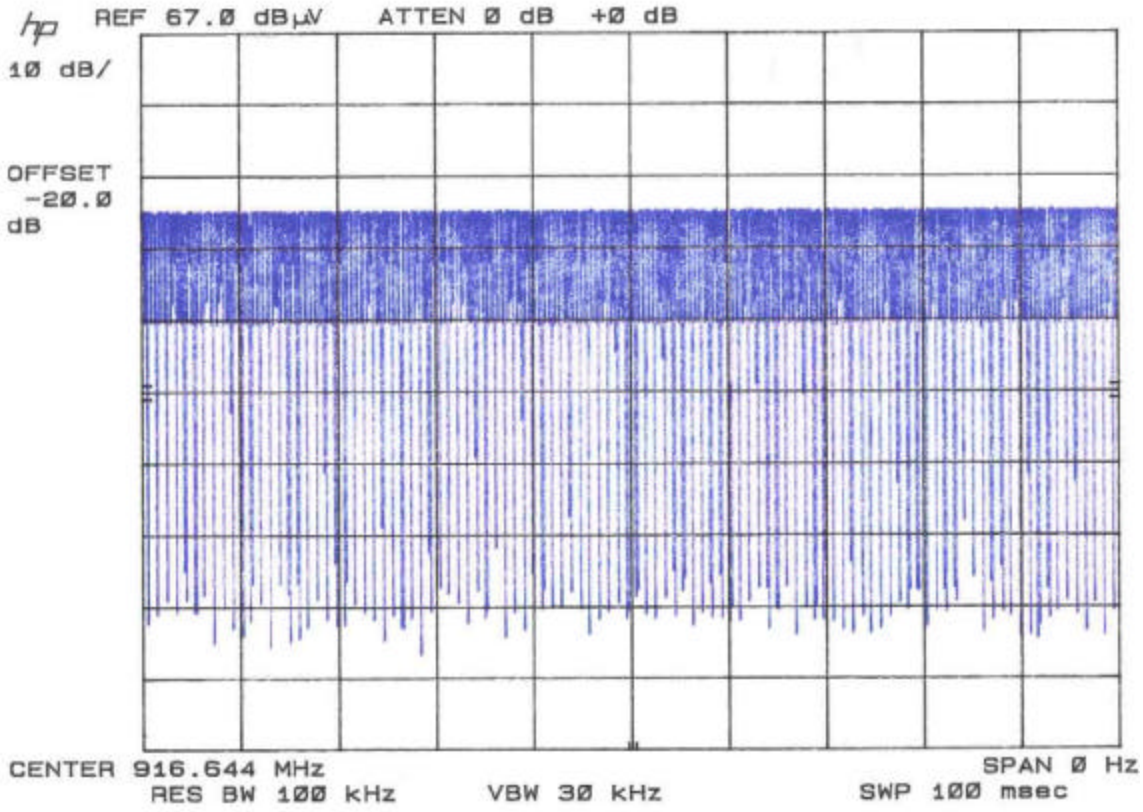

Figure 1. Duty Cycle Plot – Worst Case 100ms and Pulse Train

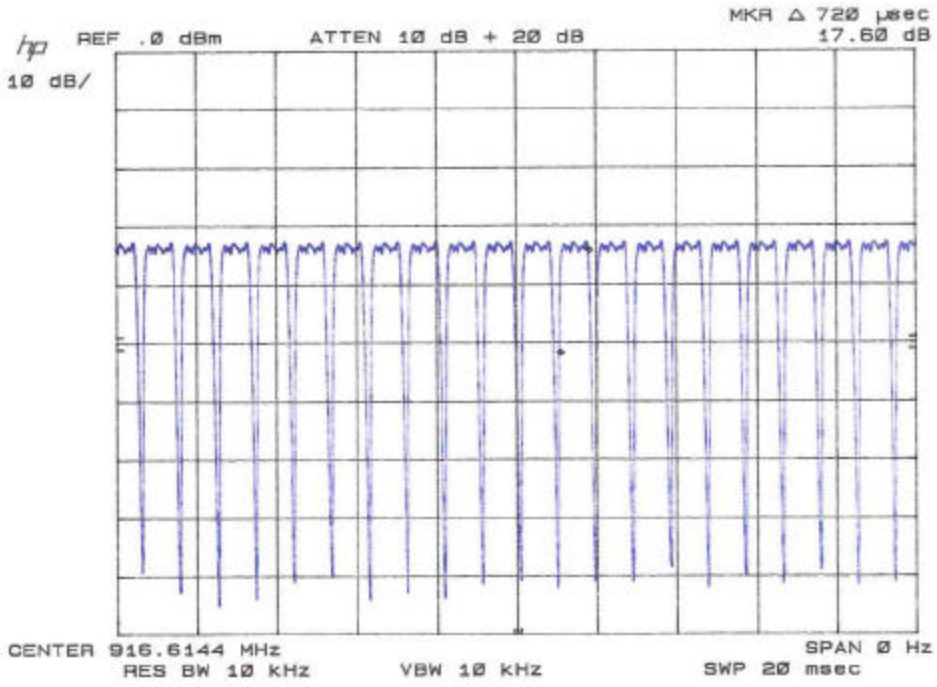

Figure 2. Duty Cycle Plot – On Time Pulse Width

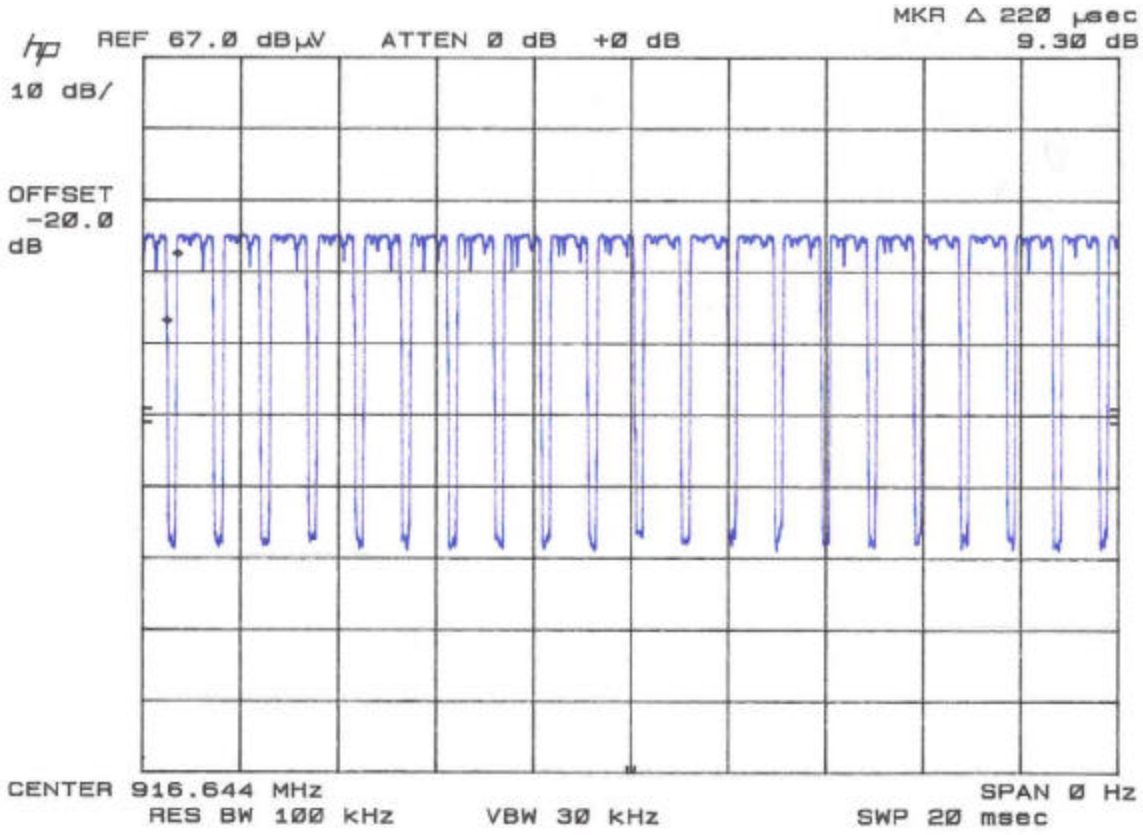

Figure 3. Duty Cycle Plot – Off Time Pulse Width (20ms view)

From the data in Figure 1 and Figure 3, the following calculations are made.

On Time per 100ms (worst case):

21 per 20ms = 105 per 100ms = 75.6ms on time / 100ms

Duty cycle calculation:

75.6ms/100ms = 75.6% on time = -2.43dB duty cycle correction

4.2 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

At full modulation, the occupied bandwidth was measured as shown:

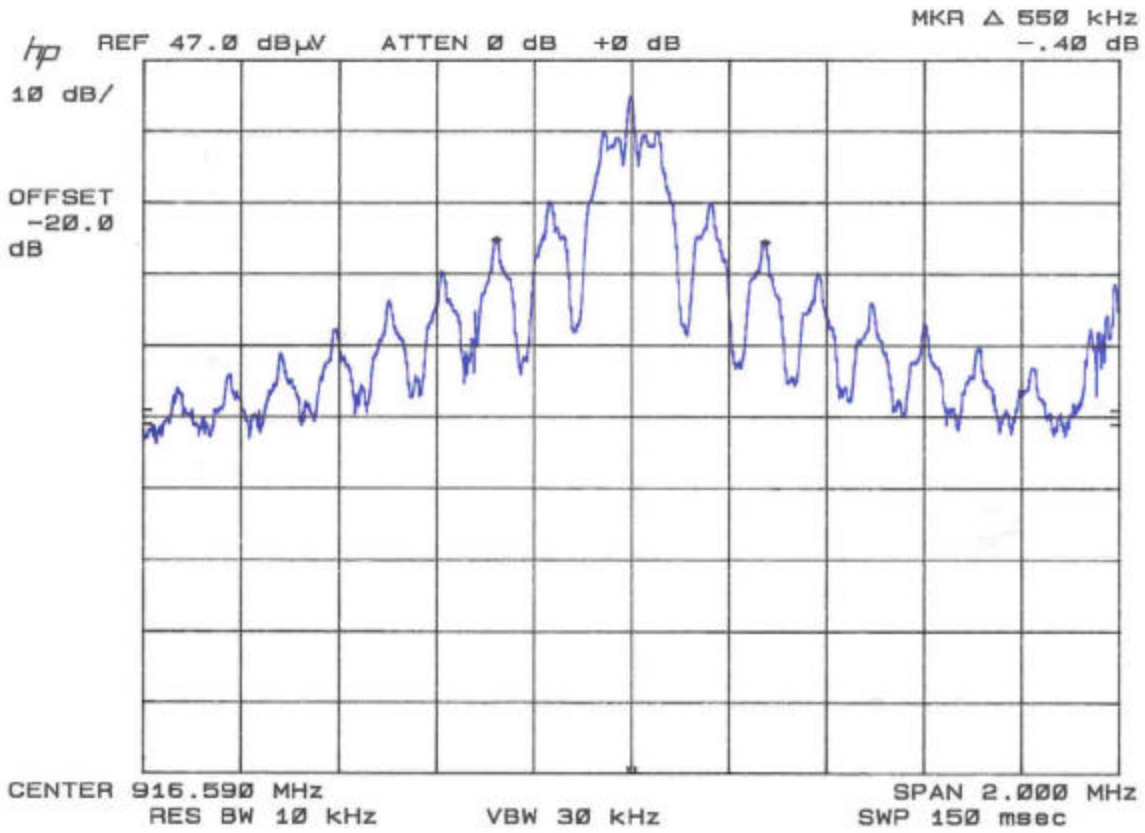

Figure 4. Occupied Bandwidth, Channel 1

Table 3 provides a summary of the Occupied Bandwidth Results.

Table 3. Occupied Bandwidth Results

Frequency	Bandwidth
Channel 1 916.5MHz	550kHz

4.3 Radiated Emissions: (FCC Part §2.1053)

The EUT must comply with the radiated emission limits of 15.249(a). The limits are as shown in the following table.

Table 4. Radiated Emissions Limits

Fundamental Frequency	Field Strength of Fundamental (µV/m)	Field Strength of Harmonics (µV/m)
902 – 928 MHz	50,000	500
2400 – 2483.5 MHz	50,000	500
5725 – 5875 MHz	50,000	500
24.00 – 24.25 GHz	250,000	2500

4.3.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2001. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	100kHz	>100kHz
>1000 MHz	1 MHz	1MHz (peak)

Emissions were measured to the 10th harmonic of the transmit frequency. Worst case emission levels are reported. Measurements below 1 GHz were performed using a quasi-peak measurement detector.

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level):	V dBµV
Antenna Factor (Ant Corr):	AFdB/m
Cable Loss Correction (Cable Corr):	CCdB
Duty Cycle Correction (Average)	DCCdB (measurements above 1 GHz only)
Amplifier Gain:	GdB
Electric Field (Corr Level):	EdBµV/m = VdBµV + AFdB/m + CCdB + DCCdB - GdB

Table 5. Radiated Emissions Test Data, Fundamental Frequency

CLIENT:	Minerva	DATE:	12/22/200
TESTER:	Greg Snyder	JOB #:	7905
EUT Information:		**Test Requirements:**	
EUT:	TX3	TEST STANDARD:	FCC Part 15.249
CONFIGURATION:	Continuous Transmit	DISTANCE:	3m
CLOCKS:	916.5MHz (Tx Freq)	CLASS:	B
S/N:	Proto 1		
Test Equipment/Limit:			
ANTENNA:	A_00007	LIMIT:	LFCC_3m_Class_B
CABLE:	CSITE2_3m	AMPLIFIER (dB)	None

Quasi-peak measurements

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Flat (X)										
916.50	H	90.0	1.0	63.7	22.2	4.5	90.3	32887.5	50000.0	-3.6
916.50	V	0.0	1.0	54.0	22.2	4.5	80.6	10765.4	50000.0	-13.3
Upright (Y)										
916.50	V	45.0	1.0	61.0	22.2	4.5	87.6	24100.8	50000.0	-6.3
916.50	H	315.0	1.0	50.2	22.2	4.5	76.8	6950.7	50000.0	-17.1
Side (Z)										
916.50	H	135.0	1.0	63.7	22.2	4.5	90.3	32887.5	50000.0	-3.6
916.50	V	90.0	1.0	54.0	22.2	4.5	80.6	10765.4	50000.0	-13.3

Table 6. Radiated Emissions Data, Harmonics

Average Data:

CLIENT: Minerva
TESTER: Greg Snyder
EUT Information:
EUT: TX3
CONFIGURATION: Continuous Transmit
CLOCKS: 916.5MHz (Tx Freq)
S/N: Proto 1
Test Equipment/Limit:
ANTENNA: A_00425
CABLE: CSITE2_HF

DATE: 12/22/2003
JOB #: 7905
Test Requirements:
TEST STANDARD: FCC Part 15.249
DISTANCE: 3m
CLASS: B
LIMIT: LFCC_3m_Class_B
AMPLIFIER (dB) A_00312

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Duty Cycle (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Flat (X)												
1833.00	H	180.0	1.0	50.0	28.7	3.1	34.1	2.4	45.3	184.9	500	-8.6
2749.50	H	225.0	1.0	52.8	30.4	2.9	34.4	2.4	49.1	286.4	500	-4.8
3663.70	H	0.0	1.0	34.2	31.0	2.8	34.6	0.0	33.4	47.0	500.0	-20.5 **a**
4582.75	H	0.0	1.0	33.2	32.7	3.8	34.5	0.0	35.2	57.5	500.0	-18.8 **a**
5499.30	H	0.0	1.0	32.5	34.5	4.2	34.4	0.0	36.8	69.0	500.0	-17.2 **a**
6415.80	H	0.0	1.0	32.7	36.2	4.2	34.6	0.0	38.4	83.5	500.0	-15.5 **a**
7332.40	H	0.0	1.0	33.3	37.7	4.6	34.8	0.0	40.8	109.8	500.0	-13.2 **a**
8248.95	H	0.0	1.0	33.2	38.5	4.9	34.1	0.0	42.4	131.9	500.0	-11.6 **a**
9165.00	H	0.0	1.0	33.8	39.2	5.0	33.0	0.0	44.9	176.2	500.0	-9.1 **a**
1833.00	V	180.0	1.0	49.7	28.7	3.1	34.1	2.4	45.0	178.6	500	-8.9
2749.50	V	225.0	1.0	50.7	30.4	2.9	34.4	2.4	47.0	224.9	500	-6.9
3663.70	V	0.0	1.0	34.2	31.0	2.8	34.6	0.0	33.4	47.0	500.0	-20.5 **a**
4582.75	V	0.0	1.0	33.2	32.7	3.8	34.5	0.0	35.2	57.5	500.0	-18.8 **a**
5499.30	V	0.0	1.0	32.5	34.5	4.2	34.4	0.0	36.8	69.0	500.0	-17.2 **a**
6415.80	V	0.0	1.0	32.7	36.2	4.2	34.6	0.0	38.4	83.5	500.0	-15.5 **a**
7332.40	V	0.0	1.0	33.3	37.7	4.6	34.8	0.0	40.8	109.8	500.0	-13.2 **a**
8248.95	V	0.0	1.0	33.2	38.5	4.9	34.1	0.0	42.4	131.9	500.0	-11.6 **a**
9165.00	V	0.0	1.0	33.8	39.2	5.0	33.0	0.0	44.9	176.2	500.0	-9.1 **a**
Upright (Z)												
1833.00	V	180.0	1.0	48.5	28.7	3.1	34.1	2.4	43.7	153.8	500	-10.2
2749.50	V	180.0	1.0	51.8	30.4	2.9	34.4	2.4	48.0	252.3	500	-5.9
3663.70	V	0.0	1.0	34.2	31.0	2.8	34.6	0.0	33.4	47.0	500.0	-20.5 **a**
4582.75	V	0.0	1.0	33.2	32.7	3.8	34.5	0.0	35.2	57.5	500.0	-18.8 **a**
5499.30	V	0.0	1.0	32.5	34.5	4.2	34.4	0.0	36.8	69.0	500.0	-17.2 **a**
6415.80	V	0.0	1.0	32.7	36.2	4.2	34.6	0.0	38.4	83.5	500.0	-15.5 **a**
7332.40	V	0.0	1.0	33.3	37.7	4.6	34.8	0.0	40.8	109.8	500.0	-13.2 **a**
8248.95	V	0.0	1.0	33.2	38.5	4.9	34.1	0.0	42.4	131.9	500.0	-11.6 **a**
9165.00	V	0.0	1.0	33.8	39.2	5.0	33.0	0.0	44.9	176.2	500.0	-9.1 **a**
1833.00	H	180.0	1.0	50.5	28.7	3.1	34.1	2.4	46.1	202.5	500	-7.8

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Duty Cycle (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
2749.50	H	270.0	1.0	51.3	30.4	2.9	34.4	2.4	47.9	249.2	500	-6.0
3663.70	H	0.0	1.0	34.2	31.0	2.8	34.6	0.0	33.4	47.0	500.0	-20.5 **a**
4582.75	H	0.0	1.0	33.2	32.7	3.8	34.5	0.0	35.2	57.5	500.0	-18.8 **a**
5499.30	H	0.0	1.0	32.5	34.5	4.2	34.4	0.0	36.8	69.0	500.0	-17.2 **a**
6415.80	H	0.0	1.0	32.7	36.2	4.2	34.6	0.0	38.4	83.5	500.0	-15.5 **a**
7332.40	H	0.0	1.0	33.3	37.7	4.6	34.8	0.0	40.8	109.8	500.0	-13.2 **a**
8248.95	H	0.0	1.0	33.2	38.5	4.9	34.1	0.0	42.4	131.9	500.0	-11.6 **a**
9165.00	H	0.0	1.0	33.8	39.2	5.0	33.0	0.0	44.9	176.2	500.0	-9.1 **a**
Side (Z)												
1833.00	H	180.0	1.0	46.7	28.7	3.1	34.1	2.4	42.1	126.9	500	-11.9
2749.50	H	270.0	1.0	51.8	30.4	2.9	34.4	2.4	48.2	256.2	500	-5.8
3663.70	H	0.0	1.0	34.2	31.0	2.8	34.6	0.0	33.4	47.0	500.0	-20.5 **a**
4582.75	H	0.0	1.0	33.2	32.7	3.8	34.5	0.0	35.2	57.5	500.0	-18.8 **a**
5499.30	H	0.0	1.0	32.5	34.5	4.2	34.4	0.0	36.8	69.0	500.0	-17.2 **a**
6415.80	H	0.0	1.0	32.7	36.2	4.2	34.6	0.0	38.4	83.5	500.0	-15.5 **a**
7332.40	H	0.0	1.0	33.3	37.7	4.6	34.8	0.0	40.8	109.8	500.0	-13.2 **a**
8248.95	H	0.0	1.0	33.2	38.5	4.9	34.1	0.0	42.4	131.9	500.0	-11.6 **a**
9165.00	H	0.0	1.0	33.8	39.2	5.0	33.0	0.0	44.9	176.2	500.0	-9.1 **a**
1833.00	V	180.0	1.0	50.0	28.7	3.1	34.1	2.4	45.4	185.6	500	-8.6
2749.50	V	90.0	1.0	53.8	30.4	2.9	34.4	2.4	50.2	322.5	500	-3.8
3663.70	V	0.0	1.0	34.2	31.0	2.8	34.6	0.0	33.4	47.0	500.0	-20.5 **a**
4582.75	V	0.0	1.0	33.2	32.7	3.8	34.5	0.0	35.2	57.5	500.0	-18.8 **a**
5499.30	V	0.0	1.0	32.5	34.5	4.2	34.4	0.0	36.8	69.0	500.0	-17.2 **a**
6415.80	V	0.0	1.0	32.7	36.2	4.2	34.6	0.0	38.4	83.5	500.0	-15.5 **a**
7332.40	V	0.0	1.0	33.3	37.7	4.6	34.8	0.0	40.8	109.8	500.0	-13.2 **a**
8248.95	V	0.0	1.0	33.2	38.5	4.9	34.1	0.0	42.4	131.9	500.0	-11.6 **a**
9165.00	V	0.0	1.0	33.8	39.2	5.0	33.0	0.0	44.9	176.2	500.0	-9.1 **a**

a = ambient

Peak Data, Channel 1:

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Flat (X)											
1833.00	H	180.0	1.0	50.0	28.7	3.1	34.1	47.5	236.3	5000.0	-26.5
2749.50	H	225.0	1.0	52.8	30.4	2.9	34.4	51.6	381.7	5000.0	-22.3
3663.70	H	0.0	1.0	43.6	31.0	2.8	34.6	42.8	138.6	5000.0	-31.1 **a**
4582.75	H	0.0	1.0	43.8	32.7	3.8	34.5	45.8	195.0	5000.0	-28.2 **a**
5499.30	H	0.0	1.0	42.5	34.5	4.2	34.4	46.8	218.2	5000.0	-27.2 **a**
6415.80	H	0.0	1.0	43.8	36.2	4.2	34.6	49.5	299.9	5000.0	-24.4 **a**
7332.40	H	0.0	1.0	45.2	37.7	4.6	34.8	52.7	432.0	5000.0	-21.3 **a**
8248.95	H	0.0	1.0	45.2	38.5	4.9	34.1	54.4	525.1	5000.0	-19.6 **a**
9165.00	H	0.0	1.0	44.8	39.2	5.0	33.0	55.9	625.1	5000.0	-18.1 **a**
1833.00	V	180.0	1.0	49.7	28.7	3.1	34.1	47.5	236.3	5000.0	-26.5
2749.50	V	225.0	1.0	50.7	30.4	2.9	34.4	49.5	299.7	5000.0	-24.4
3663.70	V	0.0	1.0	43.6	31.0	2.8	34.6	42.8	138.6	5000.0	-31.1 **a**
4582.75	V	0.0	1.0	43.8	32.7	3.8	34.5	45.8	195.0	5000.0	-28.2 **a**
5499.30	V	0.0	1.0	42.5	34.5	4.2	34.4	46.8	218.2	5000.0	-27.2 **a**
6415.80	V	0.0	1.0	43.8	36.2	4.2	34.6	49.5	299.9	5000.0	-24.4 **a**
7332.40	V	0.0	1.0	45.2	37.7	4.6	34.8	52.7	432.0	5000.0	-21.3 **a**
8248.95	V	0.0	1.0	45.2	38.5	4.9	34.1	54.4	525.1	5000.0	-19.6 **a**
9165.00	V	0.0	1.0	44.8	39.2	5.0	33.0	55.9	625.1	5000.0	-18.1 **a**
Upright (Z)											
1833.00	V	180.0	1.0	48.5	28.7	3.1	34.1	46.3	205.8	5000.0	-27.7
2749.50	V	180.0	1.0	51.8	30.4	2.9	34.4	50.6	340.2	5000.0	-23.3
3663.70	V	0.0	1.0	43.6	31.0	2.8	34.6	42.8	138.6	5000.0	-31.1 **a**
4582.75	V	0.0	1.0	43.8	32.7	3.8	34.5	45.8	195.0	5000.0	-28.2 **a**
5499.30	V	0.0	1.0	42.5	34.5	4.2	34.4	46.8	218.2	5000.0	-27.2 **a**
6415.80	V	0.0	1.0	43.8	36.2	4.2	34.6	49.5	299.9	5000.0	-24.4 **a**
7332.40	V	0.0	1.0	45.2	37.7	4.6	34.8	52.7	432.0	5000.0	-21.3 **a**
8248.95	V	0.0	1.0	45.2	38.5	4.9	34.1	54.4	525.1	5000.0	-19.6 **a**
9165.00	V	0.0	1.0	44.8	39.2	5.0	33.0	55.9	625.1	5000.0	-18.1 **a**
1833.00	H	180.0	1.0	50.5	28.7	3.1	34.1	48.3	259.1	5000.0	-25.7
2749.50	H	270.0	1.0	51.3	30.4	2.9	34.4	50.1	321.1	5000.0	-23.8
3663.70	H	0.0	1.0	43.6	31.0	2.8	34.6	42.8	138.6	5000.0	-31.1 **a**
4582.75	H	0.0	1.0	43.8	32.7	3.8	34.5	45.8	195.0	5000.0	-28.2 **a**
5499.30	H	0.0	1.0	42.5	34.5	4.2	34.4	46.8	218.2	5000.0	-27.2 **a**
6415.80	H	0.0	1.0	43.8	36.2	4.2	34.6	49.5	299.9	5000.0	-24.4 **a**
7332.40	H	0.0	1.0	45.2	37.7	4.6	34.8	52.7	432.0	5000.0	-21.3 **a**
8248.95	H	0.0	1.0	45.2	38.5	4.9	34.1	54.4	525.1	5000.0	-19.6 **a**
9165.00	H	0.0	1.0	44.8	39.2	5.0	33.0	55.9	625.1	5000.0	-18.1 **a**

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Side (Z)											
1833.00	H	180.0	1.0	46.7	28.7	3.1	34.1	44.5	167.3	5000.0	-29.5
2749.50	H	270.0	1.0	51.8	30.4	2.9	34.4	50.6	340.2	5000.0	-23.3
3663.70	H	0.0	1.0	43.6	31.0	2.8	34.6	42.8	138.6	5000.0	-31.1 **a**
4582.75	H	0.0	1.0	43.8	32.7	3.8	34.5	45.8	195.0	5000.0	-28.2 **a**
5499.30	H	0.0	1.0	42.5	34.5	4.2	34.4	46.8	218.2	5000.0	-27.2 **a**
6415.80	H	0.0	1.0	43.8	36.2	4.2	34.6	49.5	299.9	5000.0	-24.4 **a**
7332.40	H	0.0	1.0	45.2	37.7	4.6	34.8	52.7	432.0	5000.0	-21.3 **a**
8248.95	H	0.0	1.0	45.2	38.5	4.9	34.1	54.4	525.1	5000.0	-19.6 **a**
9165.00	H	0.0	1.0	44.8	39.2	5.0	33.0	55.9	625.1	5000.0	-18.1 **a**
1833.00	V	180.0	1.0	50.0	28.7	3.1	34.1	47.8	244.6	5000.0	-26.2
2749.50	V	90.0	1.0	53.8	30.4	2.9	34.4	52.6	428.3	5000.0	-21.3
3663.70	V	0.0	1.0	43.6	31.0	2.8	34.6	42.8	138.6	5000.0	-31.1 **a**
4582.75	V	0.0	1.0	43.8	32.7	3.8	34.5	45.8	195.0	5000.0	-28.2 **a**
5499.30	V	0.0	1.0	42.5	34.5	4.2	34.4	46.8	218.2	5000.0	-27.2 **a**
6415.80	V	0.0	1.0	43.8	36.2	4.2	34.6	49.5	299.9	5000.0	-24.4 **a**
7332.40	V	0.0	1.0	45.2	37.7	4.6	34.8	52.7	432.0	5000.0	-21.3 **a**
8248.95	V	0.0	1.0	45.2	38.5	4.9	34.1	54.4	525.1	5000.0	-19.6 **a**
9165.00	V	0.0	1.0	44.8	39.2	5.0	33.0	55.9	625.1	5000.0	-18.1 **a**

a = ambient

4.4 Band Edge

Since the unit operates at a fixed frequency of 916.59MHz, a single band edge plot was made to show that the entire emission falls within the FCC 902MHz and 928MHz band. The measurement was made on the OATS and no correction factors have been applied to the levels indicated on the plot. Figure 4 is a plot of the emission within the 902 – 928 MHz band.

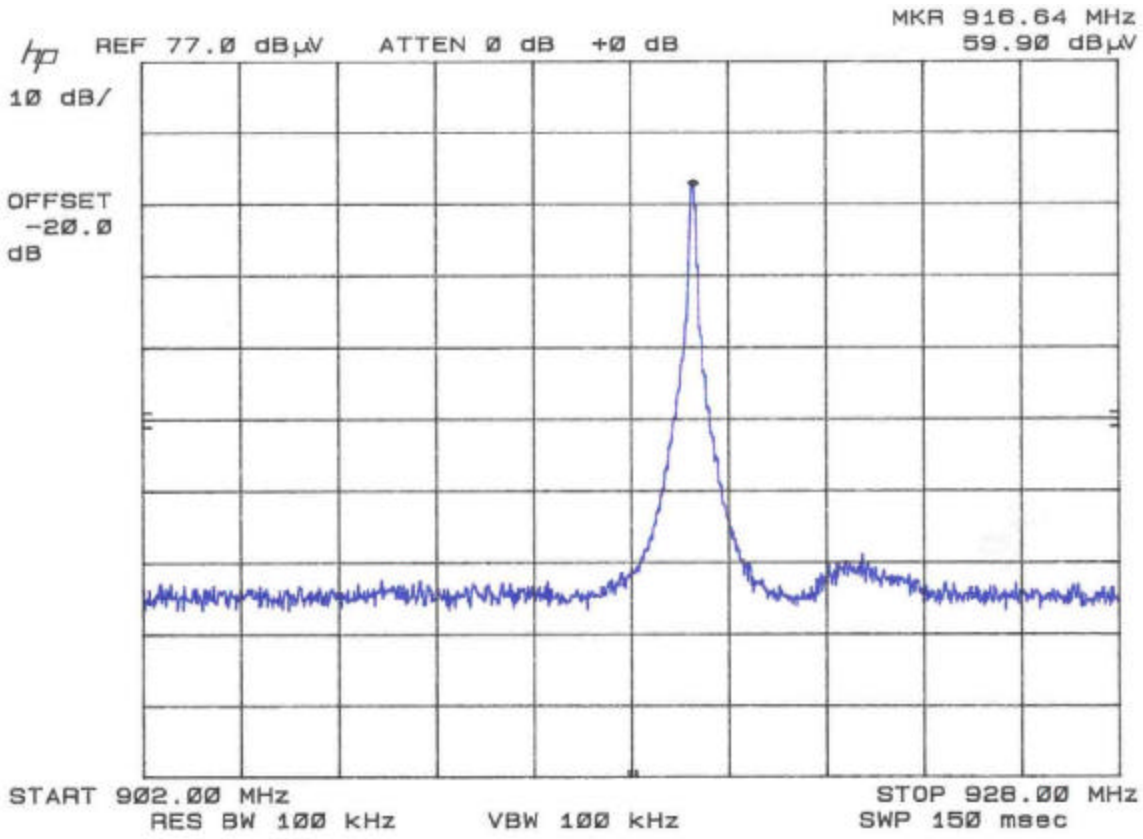

Figure 5. Band Edge Measurement