



FCC Certification Test Report
for
Cattron-Theimeg, Inc.
CN2ETH-15

September 30, 2003

Prepared for:

Cattron-Theimeg, Inc.
58 Shenango Street
Sharpsville, PA 16150

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879



FCC Certification Test Program

FCC Certification Test Report for the Cattron-Theimeg, Inc. T01 Single Paddle Toggle Controller CN2ETH-15

September 30, 2003

WLL JOB# 7479

Prepared by: Brian J. Dettling
Documentation Specialist

Reviewed by: Gregory M. Snyder
Chief EMC Engineer

Abstract

This report has been prepared on behalf of Cattron-Theimeg, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Cattron-Theimeg, Inc. T01 Single Paddle Toggle Controller.

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 Cattron-Theimeg, Inc. T01 Single Paddle Toggle Controller complies with the limits for a Periodic Intentional Radiator device under Part 15.231 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The Cattron-Theimeg, Inc. T01 Single Paddle Toggle Controller complies with the limits for a Periodic Intentional Radiator device under Part 15.231 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated 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: Cattron-Theimeg, Inc.
58 Shenango Street
Sharpsville, PA 16150

Purchase Order Number: 126567

Quotation Number: 60678

1.4 Test Dates

Testing was performed from March 10, 2003 to March 12, 2003.

1.5 Test and Support Personnel

Washington Laboratories, LTD

Ken Gemmell, James Ritter

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 Cattron-Theimeg, Inc. T01 Single Paddle Toggle Controller is a heavy industrial remote controller for operation of heavy equipment designed to duplicate the operating characteristics of the controls most commonly found on the controlled machine. It can be used with all CATTRON-THEIMEG™ AT Series or MP Series receiver/decoder units as well as being used with existing CATTRON-THEIMEG™ PRRC systems as either a replacement or spare controller.

The controller is operated via a “push-to-operate” paddle located on the top of the unit. This paddle is spring loaded so that the transmission ceases operation when it is not depressed.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Cattron-Theimeg, Inc.
FCC ID Number	CN2ETH-15
EUT Name:	Single Paddle Toggle Controller
Model:	T01
FCC Rule Parts:	§15.231
Frequency Range:	447 - 473MHz
Maximum Output Power:	<1mW
Modulation:	Pulsed FSK
Necessary Bandwidth:	104.5 kHz
Keying:	Manual
Type of Information:	Control
Number of Channels:	3
Power Output Level	Fixed
Antenna Type	Integral
Interface Cables:	None
Power Source & Voltage:	12Vdc from battery

2.2 Test Configuration

The T01 was tested in a stand-alone configuration.

2.3 Testing Algorithm

The T01 was operated by being powered on and set for continuous operation. 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

Site 2 List:

Manufacturer	Model/Type	Function	Identification	Cal. Due
HP	8568B	Spectrum Analyzer	2634A02888	7/03/03
HP	85650A	Quasi-Peak Adapter	3303A01786	7/05/03
HP	85685A	RF Preselector	3221A01395	5/17/03
ARA	LPB-2520	BiconiLog Antenna	1044	6/19/03
ARA	DRG-118/A	Double Ridge Horn Antenna	1236	8/29/03
HP	8564E	Spectrum Analyzer	3643A00657	5/19/03
HP	8449B	Pre-Amplifier	3008A00729	2/11/04

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 = $N_1L_1 + N_2L_2 + \dots + N_{N-1}L_{N-1} + N_NL_N$, 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 $20\log[\text{Duty Cycle}]$
- 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:
 - o Duty cycle = $(N_1L_1 + N_2L_2 + \dots + N_{N-1}L_{N-1} + N_NL_N)/100$ 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 pulse train of the modulation. Calculations of the duty cycle correction factor were obtained from time data provided by the plots.

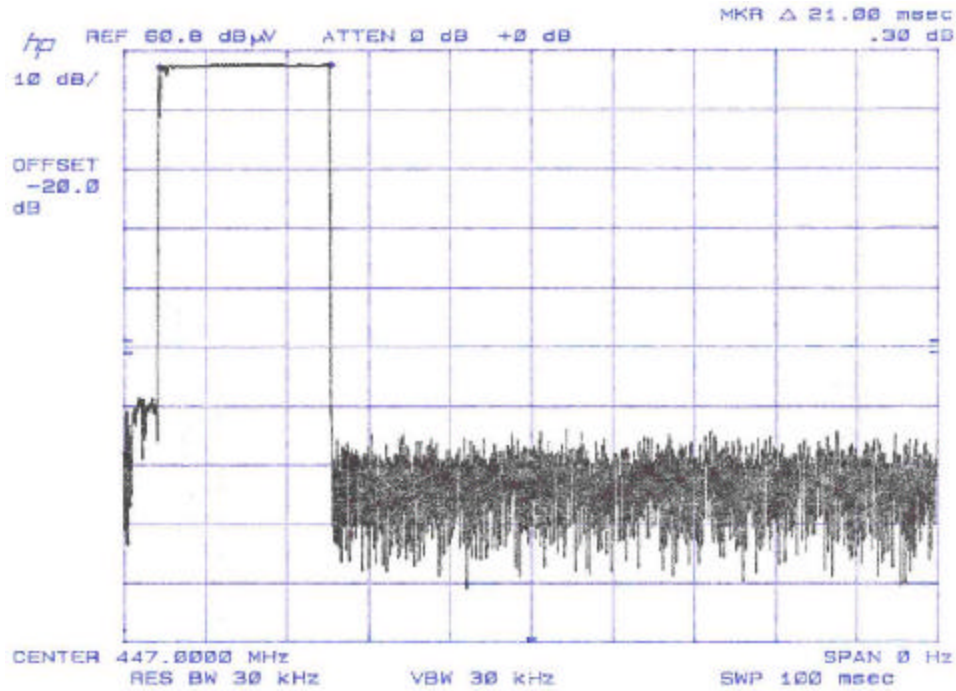


Figure 1. Channel 0 Duty Cycle, Pulse Width (100ms)

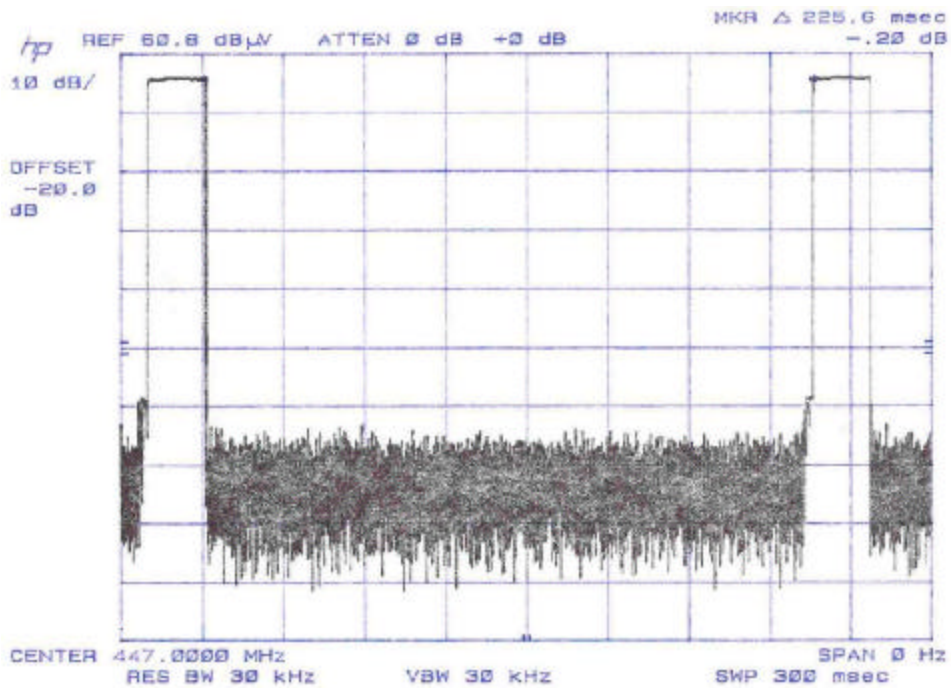


Figure 2. Channel 0 Duty Cycle Plot, Pulse Repetition (300ms)

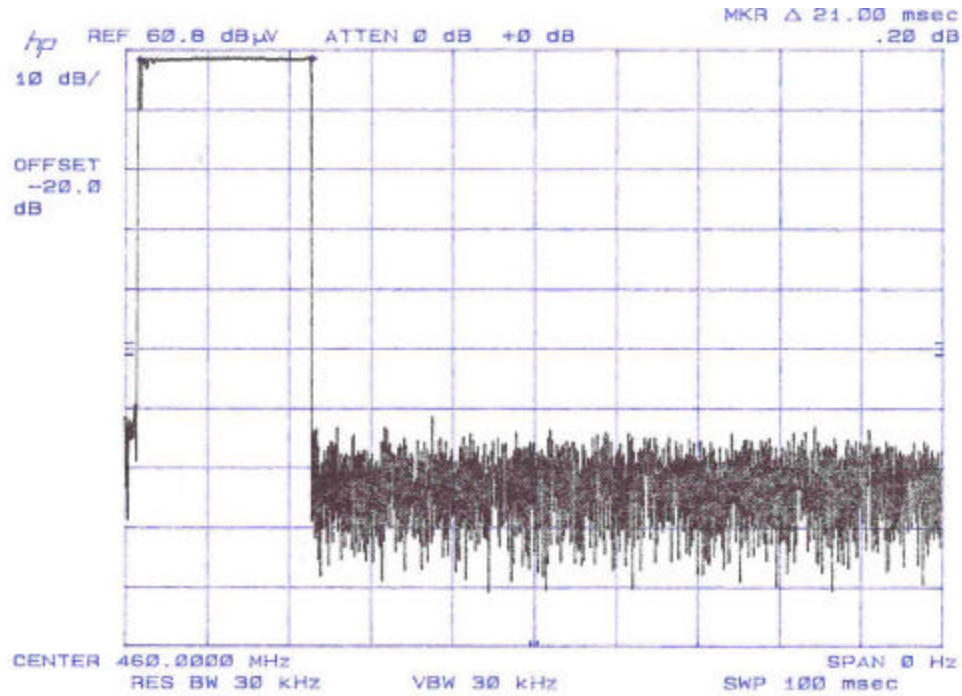


Figure 3. Channel 1 Duty Cycle Plot, Pulse Width (100ms)

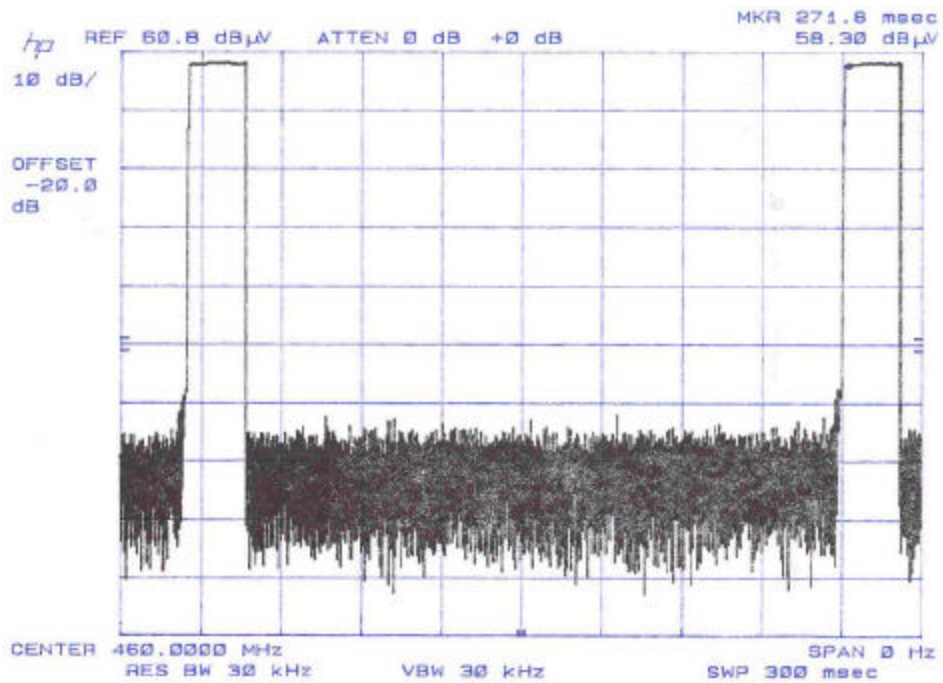


Figure 4. Channel 1 Duty Cycle Plot, Pulse Repetition (300ms)

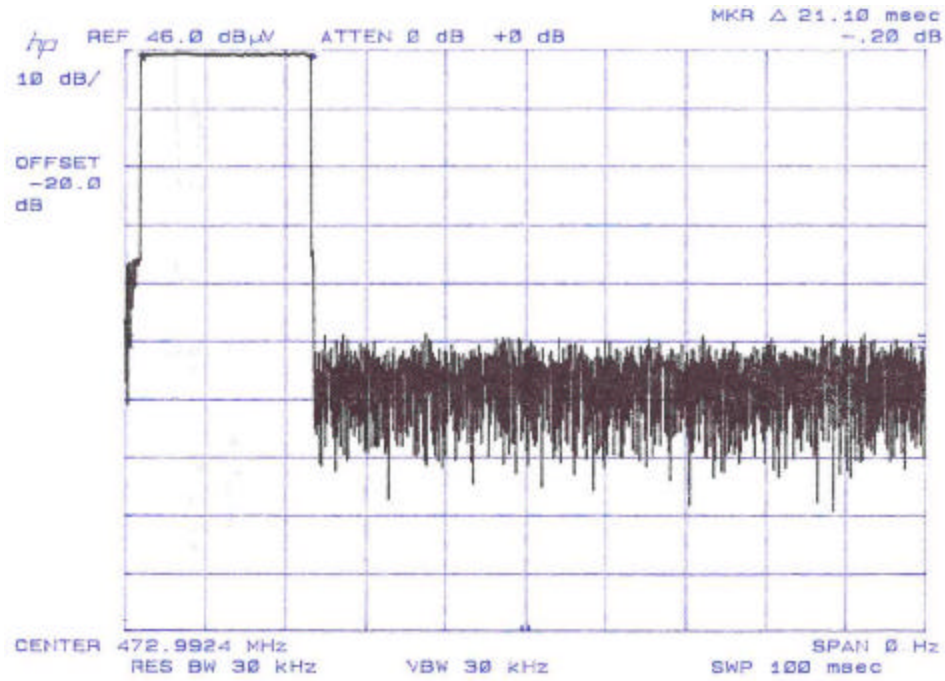


Figure 5. Channel 2 Duty Cycle Plot, Pulse Width (100ms)

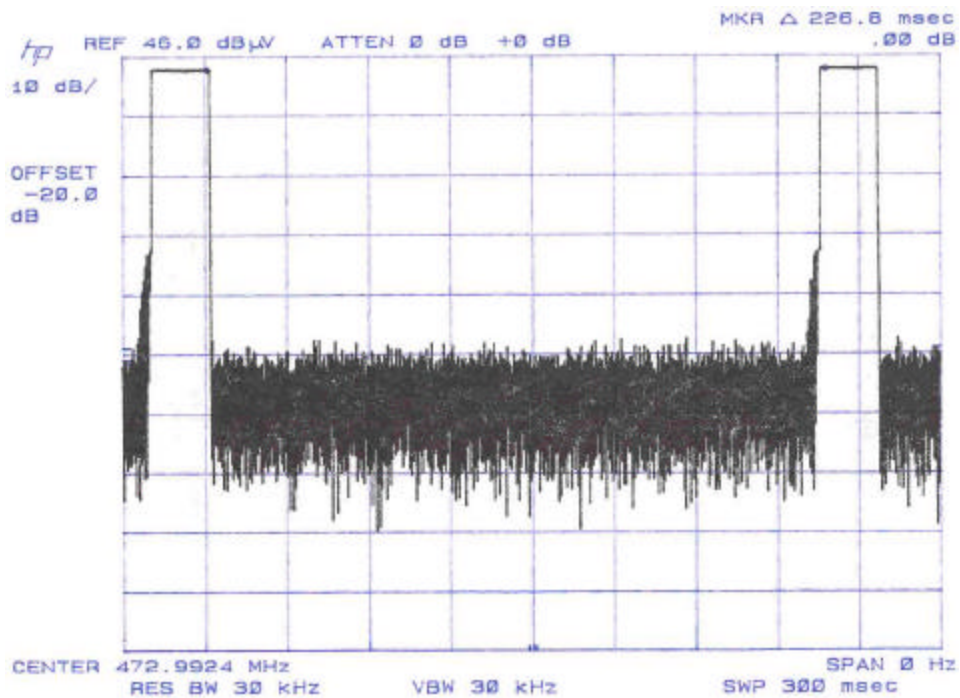


Figure 6. Channel 2 Duty Cycle Plot, Pulse Repetition (300ms)

From the data in Figure 1 and Figure 2, the following calculations are made.

On Time Per Code Group: 21.1 mS

Code Group Repetition Rate: 226.8 mS

Worst case on time per 100 mS: 21.1 mS (measured)

Per manufacturer, the worst case transmit time could be 28.625mS. Also, the device will cease transmissions within 5 seconds after the release of the push-to-operate switch.

The data are summarized in the following table.

Table 3. Duty Cycle Correction

Measurement Time	Total ON Time (worst case)	Duty Cycle (%)	Duty Cycle (dB)
100 mS	28.625 mS	28.625	-10.9

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.

FCC Part 15.231 states that the 20 dB bandwidth of the modulated carrier shall be as follows:

Frequency Range (MHz)	Occupied Bandwidth Limit
70-900 MHz	0.25%
> 900 MHz	0.5%

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

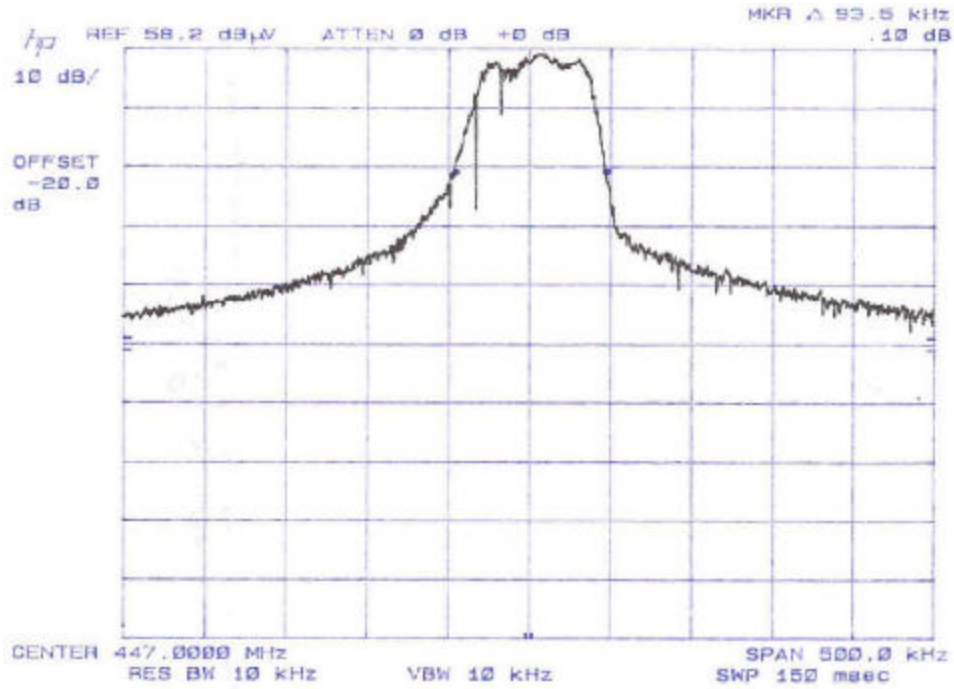


Figure 7. Occupied Bandwidth, Channel 0

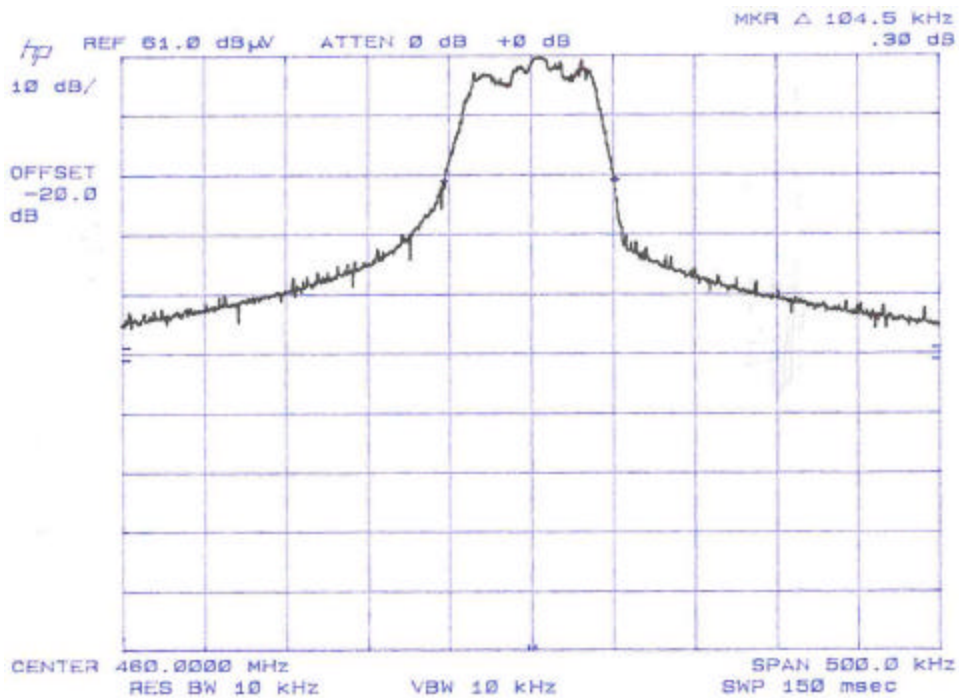


Figure 8. Occupied Bandwidth, Channel 1

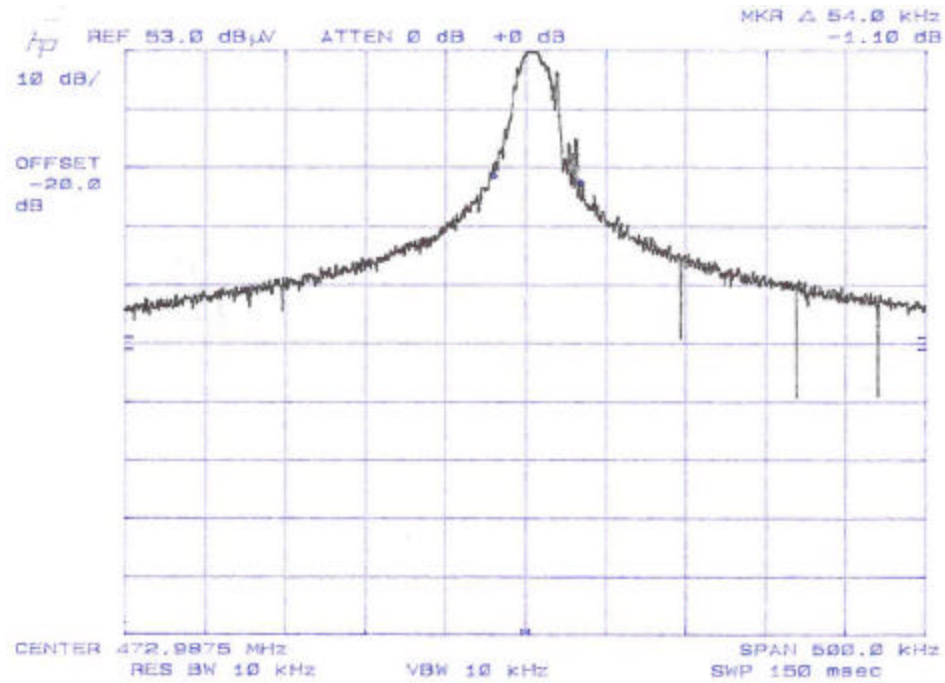


Figure 9. Occupied Bandwidth, Channel 2

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel 447 MHz	93.5 kHz	1.118 MHz	Pass
Mid Channel 460 MHz	104.5 kHz	1.150 MHz	Pass
High Channel 473 MHz	54 kHz	1.182 MHz	Pass

4.3 Radiated Spurious Emissions: (FCC Part §2.1053)

The EUT must comply with requirements for radiated spurious emissions. The limits are as shown in the following table.

Table 5. Radiated Spurious Emissions Limits

Frequency/Channel	Emission	Fundamental	Harmonic Level (E-Field)
Ch 0, 447 MHz	Fundamental	11542 $\mu\text{V/m}$	
	Harmonics		1154 $\mu\text{V/m}$
	Restricted Bands		500 $\mu\text{V/m}$
Ch 1, 460 MHz	Fundamental	12083 $\mu\text{V/m}$	
	Harmonics		1208 $\mu\text{V/m}$
	Restricted Bands		500 $\mu\text{V/m}$
Ch 2, 473 MHz	Fundamental	12500 $\mu\text{V/m}$	
	Harmonics		1250 $\mu\text{V/m}$
	Restricted Bands		500 $\mu\text{V/m}$

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.

Table 6. Radiated Emissions Testing Administrative Information

CLIENT:	Cattron-Theimeg	DATE:	3/11/03
TESTER:	Ken Gemmell/James Ritter	JOB #:	7479
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	TO1	TEST STD:	FCC Part 15.231
CONFIGURATION:	Constant Transmit	DISTANCE:	3m
CLOCKS:	447-470	CLASS:	B
S/N:	62135011		
<u>Low Frequency Test Equipment/Limit:</u>		<u>High Frequency Test Equipment/Limit:</u>	
ANTENNA:	A_00007	ANTENNA:	A_00004
CABLE:	CSITE2_3m	CABLE:	CSITE2_HF
LIMIT:	LFCC_3m_Class_B		
Low Frequency (30 MHz to 1 GHz)		High Frequency Amp (1GHz to 18 GHz)	
AMPLIFIER (dB)	0		

Table 7: Radiated Emission Test Data, Channel 0

Frequency	Polarity	Azimuth	Ant. Hght	SA Level (QP)	Ant. Corr.	Cable Corr.	Duty Cycle Corr	Amp Gain	Corr. Level	Corr. Level	Limit	Margin
(MHz)	H/V	Degree	(m)	dBuV	dB/m	dB	dB	dB	dBuV/m	uV/m	uV/m	dB
Channel 0 Back												
447.00	V	135.0	1.0	63.6	15.5	4.9	-10.9	0.0	73.1	4522.3	11541.7	-8.1
894.00	V	180.0	1.0	17.7	21.2	7.5	-10.9	0.0	35.5	59.7	1154.2	-25.7
1341.00	V	180.0	1.0	43.0	26.5	2.1	-10.9	34.2	26.4	21.0	500.0	-27.5
1788.00	V	180.0	1.0	45.6	28.2	3.1	-10.9	34.1	31.9	39.4	1154.2	-29.3
2235.00	V	0.0	1.0	43.7	29.4	3.2	-10.9	34.2	31.3	36.5	500.0	-22.7
2682.00	V	0.0	1.0	44.0	30.2	2.9	-10.9	34.4	31.8	39.1	500.0	-22.1
3129.00	V	0.0	1.0	46.8	30.8	2.8	-10.9	34.6	35.0	56.0	1154.2	-26.3
3576.00	V	0.0	1.0	43.3	31.3	2.8	-10.9	34.6	31.9	39.5	1154.2	-29.3
4023.00	V	0.0	1.0	41.2	31.7	2.8	-10.9	34.6	30.2	32.5	500.0	-23.7
4470.00	V	0.0	1.0	40.7	32.3	3.6	-10.9	34.6	31.2	36.3	1154.2	-30.1
447.00	H	180.0	1.0	68.1	15.5	4.9	-10.9	0.0	77.6	7592.1	11541.7	-3.6
894.00	H	180.0	1.0	21.4	21.2	7.5	-10.9	0.0	39.2	91.4	1154.2	-22.0
1341.00	H	180.0	1.0	46.8	26.5	2.1	-10.9	34.2	30.2	32.5	500.0	-23.7
1788.00	H	0.0	1.0	45.2	28.2	3.1	-10.9	34.1	31.5	37.5	1154.2	-29.8
2235.00	H	0.0	1.0	43.5	29.4	3.2	-10.9	34.2	31.1	35.8	500.0	-22.9
2682.00	H	0.0	1.0	44.2	30.2	2.9	-10.9	34.4	32.0	39.8	500.0	-22.0
3129.00	H	0.0	1.0	43.5	30.8	2.8	-10.9	34.6	31.6	38.2	1154.2	-29.6
3576.00	H	0.0	1.0	42.2	31.3	2.8	-10.9	34.6	30.8	34.6	1154.2	-30.5
4023.00	H	0.0	1.0	43.2	31.7	2.8	-10.9	34.6	32.2	40.9	500.0	-21.7
4470.00	H	0.0	1.0	40.2	32.3	3.6	-10.9	34.6	30.7	34.3	1154.2	-30.6
Channel 0 Side												
447.00	V	180.0	1.0	67.5	15.5	4.9	-10.9	0.0	77.0	7085.3	11541.7	-4.2

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) dBuV	Ant. Corr. dB/m	Cable Corr. dB	Duty Cycle Corr dB	Amp Gain dB	Corr. Level dBuV/m	Corr. Level uV/m	Limit uV/m	Margin dB
894.00	V	135.0	1.0	21.0	21.2	7.5	-10.9	0.0	38.8	87.3	1154.2	-22.4
1341.00	V	180.0	1.0	45.5	26.5	2.1	-10.9	34.2	28.9	28.0	500.0	-25.0
1788.00	V	180.0	1.0	43.5	28.2	3.1	-10.9	34.1	29.8	30.9	1154.2	-31.4
2235.00	V	0.0	1.0	44.5	29.4	3.2	-10.9	34.2	32.1	40.2	500.0	-21.9
2682.00	V	180.0	1.0	45.2	30.2	2.9	-10.9	34.4	33.0	44.7	500.0	-21.0
3129.00	V	0.0	1.0	43.8	30.8	2.8	-10.9	34.6	32.0	39.7	1154.2	-29.3
3576.00	V	0.0	1.0	41.7	31.3	2.8	-10.9	34.6	30.3	32.6	1154.2	-31.0
4023.00	V	0.0	1.0	42.2	31.7	2.8	-10.9	34.6	31.2	36.5	500.0	-22.7
4470.00	V	0.0	1.0	40.3	32.3	3.6	-10.9	34.6	30.9	34.9	1154.2	-30.4
447.00	H	180.0	1.0	67.9	15.5	4.9	-10.9	0.0	77.4	7419.3	11541.7	-3.8
894.00	H	180.0	1.0	22.6	21.2	7.5	-10.9	0.0	40.4	105.0	1154.2	-20.8
1341.00	H	180.0	1.0	50.1	26.5	2.1	-10.9	34.2	33.5	47.5	500.0	-20.4
1788.00	H	180.0	1.0	48.1	28.2	3.1	-10.9	34.1	34.4	52.4	1154.2	-26.9
2235.00	H	0.0	1.0	44.8	29.4	3.2	-10.9	34.2	32.4	41.6	500.0	-21.6
2682.00	H	0.0	1.0	46.3	30.2	2.9	-10.9	34.4	34.1	50.7	500.0	-19.9
3129.00	H	0.0	1.0	45.2	30.8	2.8	-10.9	34.6	33.3	46.4	1154.2	-27.9
3576.00	H	0.0	1.0	42.1	31.3	2.8	-10.9	34.6	30.7	34.2	1154.2	-30.6
4023.00	H	0.0	1.0	43.9	31.7	2.8	-10.9	34.6	32.9	44.4	500.0	-21.0
4470.00	H	0.0	1.0	41.8	32.3	3.6	-10.9	34.6	32.3	41.2	1154.2	-29.0
Channel 0 Upright												
447.00	V	180.0	1.0	64.5	15.5	4.9	-10.9	0.0	74.0	5016.0	11541.7	-7.2
894.00	V	135.0	1.0	17.5	21.2	7.5	-10.9	0.0	35.3	58.3	1154.2	-25.9
1341.00	V	190.0	1.0	49.2	26.5	2.3	-10.9	34.2	32.8	43.7	500.0	-21.2
1788.00	V	20.0	1.0	49.5	28.2	2.4	-10.9	34.1	35.2	57.2	1154.2	-26.1
2235.00	V	0.0	1.0	51.8	29.4	2.8	-10.9	34.2	39.0	88.7	500.0	-15.0
2682.00	V	90.0	1.0	52.7	30.2	3.1	-10.9	34.4	40.7	108.4	500.0	-13.3
3129.00	V	0.0	1.0	51.5	30.8	3.4	-10.9	34.6	40.3	103.6	1154.2	-20.9
3576.00	V	250.0	1.0	46.2	31.3	3.7	-10.9	34.6	35.7	60.8	1154.2	-25.6
4023.00	V	10.0	1.0	47.5	31.7	3.8	-10.9	34.6	37.6	75.7	500.0	-16.4
4470.00	V	0.0	1.0	46.8	32.3	4.0	-10.9	34.6	37.7	76.6	1154.2	-23.6
447.00	H	135.0	1.0	66.2	15.5	4.9	-10.9	0.0	75.7	6100.4	11541.7	-5.5
894.00	H	180.0	1.0	20.5	21.2	7.5	-10.9	0.0	38.3	82.4	1154.2	-22.9
1341.00	H	170.0	1.0	50.7	26.5	2.3	-10.9	34.2	34.3	52.0	500.0	-19.7
1788.00	H	290.0	1.0	56.3	28.2	2.4	-10.9	34.1	42.0	125.6	1154.2	-19.3
2235.00	H	80.0	1.0	52.8	29.4	2.8	-10.9	34.2	40.0	99.5	500.0	-14.0
2682.00	H	160.0	1.0	51.7	30.2	3.1	-10.9	34.4	39.7	96.6	500.0	-14.3
3129.00	H	170.0	1.0	51.3	30.8	3.4	-10.9	34.6	40.1	101.6	1154.2	-21.1
3576.00	H	350.0	1.0	49.0	31.3	3.7	-10.9	34.6	38.5	84.3	1154.2	-22.7
4023.00	H	290.0	1.0	50.7	31.7	3.8	-10.9	34.6	40.8	109.1	500.0	-13.2
4470.00	H	45.0	1.0	46.2	32.3	4.0	-10.9	34.6	37.1	71.3	1154.2	-24.2

Table 8: Radiated Emission Test Data, Channel 1

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Corr.	Duty Cycle Corr (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
Channel 1 Back												
460.00	V	180.0	1.0	65.9	16.5	4.9	-10.9	0.0	76.4	6626.4	12083.3	-5.2
920.00	V	135.0	1.0	21.7	22.4	7.8	-10.9	0.0	41.0	111.6	1208.3	-20.7
1380.00	V	0.0	1.0	47.3	26.7	2.3	-10.9	34.2	31.2	36.2	500.0	-22.8
1840.00	V	90.0	1.0	58.7	28.4	2.4	-10.9	34.0	44.5	168.6	1208.3	-17.1
2300.00	V	280.0	1.0	58.2	29.5	2.8	-10.9	34.2	45.4	187.1	1208.3	-16.2
2760.00	V	170.0	1.0	53.7	30.3	3.2	-10.9	34.4	41.8	123.6	500.0	-12.1
3220.00	V	180.0	1.0	53.3	30.9	3.5	-10.9	34.6	42.3	130.2	1208.3	-19.4
3680.00	V	0.0	1.0	48.3	31.4	3.7	-10.9	34.6	38.0	79.3	500.0	-16.0
4140.00	V	90.0	1.0	44.9	31.9	3.9	-10.9	34.6	35.2	57.5	500.0	-18.8
4600.00	V	0.0	1.0	45.0	32.5	4.0	-10.9	34.5	36.1	63.6	500.0	-17.9
460.00	H	180.0	1.0	67.5	16.5	4.9	-10.9	0.0	78.0	7966.6	12083.3	-3.6
920.00	H	180.0	1.0	24.0	22.4	7.8	-10.9	0.0	43.3	145.5	1208.3	-18.4
1380.00	H	180.0	1.0	47.0	26.7	2.3	-10.9	34.2	30.8	34.9	500.0	-23.1
1840.00	H	270.0	1.0	56.7	28.4	2.4	-10.9	34.0	42.5	133.9	1208.3	-19.1
2300.00	H	260.0	1.0	55.7	29.5	2.8	-10.9	34.2	42.9	140.3	1208.3	-18.7
2760.00	H	80.0	1.0	52.7	30.3	3.2	-10.9	34.4	40.8	110.2	500.0	-13.1
3220.00	H	100.0	1.0	48.7	30.9	3.5	-10.9	34.6	37.6	76.1	1208.3	-24.0
3680.00	H	270.0	1.0	47.5	31.4	3.7	-10.9	34.6	37.2	72.1	500.0	-16.8
4140.00	H	190.0	1.0	46.0	31.9	3.9	-10.9	34.6	36.3	65.3	500.0	-17.7
4600.00	H	10.0	1.0	45.5	32.5	4.0	-10.9	34.5	36.6	67.4	500.0	-17.4
Channel 1 Side												
460.00	V	180.0	1.0	67.2	16.5	4.9	-10.9	0.0	77.7	7696.2	12083.3	-3.9
920.00	V	180.0	1.0	21.5	22.4	7.8	-10.9	0.0	40.8	109.1	1208.3	-20.9
1380.00	V	90.0	1.0	47.7	26.7	2.3	-10.9	34.2	31.5	37.6	500.0	-22.5
1840.00	V	190.0	1.0	58.7	28.4	2.4	-10.9	34.0	44.5	168.6	1208.3	-17.1
2300.00	V	270.0	1.0	58.0	29.5	2.8	-10.9	34.2	45.3	183.4	1208.3	-16.4
2760.00	V	90.0	1.0	53.3	30.3	3.2	-10.9	34.4	41.5	118.9	500.0	-12.5
3220.00	V	0.0	1.0	50.5	30.9	3.5	-10.9	34.6	39.5	94.0	1208.3	-22.2
3680.00	V	270.0	1.0	48.7	31.4	3.7	-10.9	34.6	38.3	82.5	500.0	-15.7
4140.00	V	285.0	1.0	46.2	31.9	3.9	-10.9	34.6	36.5	66.6	500.0	-17.5
4600.00	V	245.0	1.0	44.6	32.5	4.0	-10.9	34.5	35.7	60.9	500.0	-18.3
460.00	H	180.0	1.0	68.0	16.5	4.9	-10.9	0.0	78.5	8438.7	12083.3	-3.1
920.00	H	180.0	1.0	22.6	22.4	7.8	-10.9	0.0	41.9	123.8	1208.3	-19.8
1380.00	H	0.0	1.0	46.5	26.7	2.3	-10.9	34.2	30.3	32.9	500.0	-23.6
1840.00	H	90.0	1.0	56.5	28.4	2.4	-10.9	34.0	42.4	131.3	1208.3	-19.3
2300.00	H	350.0	1.0	53.8	29.5	2.8	-10.9	34.2	41.1	113.5	1208.3	-20.5
2760.00	H	170.0	1.0	54.3	30.3	3.2	-10.9	34.4	42.5	133.4	500.0	-11.5
3220.00	H	0.0	1.0	50.8	30.9	3.5	-10.9	34.6	39.8	97.6	1208.3	-21.9
3680.00	H	90.0	1.0	48.0	31.4	3.7	-10.9	34.6	37.7	76.4	500.0	-16.3
4140.00	H	190.0	1.0	44.8	31.9	3.9	-10.9	34.6	35.1	57.1	500.0	-18.9
4600.00	H	90.0	1.0	45.2	32.5	4.0	-10.9	34.5	36.2	64.9	500.0	-17.7

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Corr.	Duty Cycle Corr (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
Channel 1 Upright												
460.00	V	180.0	1.0	63.4	16.5	4.9	-10.9	0.0	73.9	4969.1	12083.3	-7.7
920.00	V	180.0	1.0	19.8	22.4	7.8	-10.9	0.0	39.1	89.7	1208.3	-22.6
1380.00	V	190.0	1.0	49.5	26.7	2.3	-10.9	34.2	33.3	46.5	500.0	-20.6
1840.00	V	90.0	1.0	53.8	28.4	2.4	-10.9	34.0	39.7	96.6	1208.3	-21.9
2300.00	V	90.0	1.0	53.5	29.5	2.8	-10.9	34.2	40.8	109.3	1208.3	-20.9
2760.00	V	270.0	1.0	51.8	30.3	3.2	-10.9	34.4	40.0	100.0	500.0	-14.0
3220.00	V	180.0	1.0	50.3	30.9	3.5	-10.9	34.6	39.3	92.1	1208.3	-22.4
3680.00	V	0.0	1.0	48.8	31.4	3.7	-10.9	34.6	38.5	84.0	500.0	-15.5
4140.00	V	180.0	1.0	46.3	31.9	3.9	-10.9	34.6	36.6	67.8	500.0	-17.4
4600.00	V	170.0	1.0	43.5	32.5	4.0	-10.9	34.5	34.6	53.5	500.0	-19.4
460.00	H	180.0	1.0	66.3	16.5	4.9	-10.9	0.0	76.8	6938.6	12083.3	-4.8
920.00	H	180.0	1.0	23.7	22.4	7.8	-10.9	0.0	43.0	140.5	1208.3	-18.7
1380.00	H	180.0	1.0	48.9	26.7	2.3	-10.9	34.2	32.7	43.4	500.0	-21.2
1840.00	H	0.0	1.0	57.8	28.4	2.4	-10.9	34.0	43.7	153.1	1208.3	-17.9
2300.00	H	170.0	1.0	58.7	29.5	2.8	-10.9	34.2	45.9	198.2	1208.3	-15.7
2760.00	H	145.0	1.0	55.3	30.3	3.2	-10.9	34.4	43.5	149.7	500.0	-10.5
3220.00	H	165.0	1.0	51.5	30.9	3.5	-10.9	34.6	40.5	105.4	1208.3	-21.2
3680.00	H	270.0	1.0	44.8	31.4	3.7	-10.9	34.6	34.5	53.0	500.0	-19.5
4140.00	H	180.0	1.0	42.7	31.9	3.9	-10.9	34.6	33.0	44.6	500.0	-21.0
4600.00	H	180.0	1.0	43.1	32.5	4.0	-10.9	34.5	34.2	51.1	500.0	-19.8

Table 9: Radiated Emission Test Data, Channel 2

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Corr.	Duty Cycle Corr (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
Channel 2 Back												
472.99	V	180.0	1.0	66.8	17.7	5.0	-10.9	0.0	78.6	8549.0	12500.0	-3.3
945.98	V	180.0	1.0	23.6	22.9	7.7	-10.9	0.0	43.3	146.0	1250.0	-18.7
1418.96	V	170.0	1.0	45.8	26.8	2.3	-10.9	34.2	29.9	31.1	500.0	-24.1
1891.95	V	180.0	1.0	55.8	28.6	2.5	-10.9	34.0	41.9	124.9	1250.0	-20.0
2364.94	V	180.0	1.0	62.0	29.6	2.9	-10.9	34.2	49.4	295.4	500.0	-4.6
2837.93	V	0.0	1.0	57.0	30.5	3.2	-10.9	34.5	45.3	184.3	500.0	-8.7
3310.91	V	350.0	1.0	52.2	31.0	3.5	-10.9	34.6	41.3	115.8	1250.0	-20.7
3783.90	V	90.0	1.0	50.8	31.5	3.8	-10.9	34.6	40.6	107.3	500.0	-13.4
4256.89	V	190.0	1.0	45.8	32.1	3.9	-10.9	34.6	36.3	65.5	500.0	-17.6
4729.88	V	180.0	1.0	50.5	32.7	4.0	-10.9	34.5	41.8	122.6	500.0	-12.2
473.00	H	180.0	1.0	66.4	17.7	5.0	-10.9	0.0	78.2	8164.3	12500.0	-3.7
946.00	H	180.0	1.0	23.6	22.9	7.7	-10.9	0.0	43.3	146.0	1250.0	-18.7
1418.96	H	0.0	1.0	46.7	26.8	2.3	-10.9	34.2	30.7	34.3	500.0	-23.3
1891.95	H	90.0	1.0	52.4	28.6	2.5	-10.9	34.0	38.5	84.2	1250.0	-23.4
2364.94	H	170.0	1.0	57.3	29.6	2.9	-10.9	34.2	44.7	172.5	500.0	-9.2
2837.93	H	180.0	1.0	53.3	30.5	3.2	-10.9	34.5	41.6	120.8	500.0	-12.3
3310.91	H	190.0	1.0	51.7	31.0	3.5	-10.9	34.6	40.8	109.4	1250.0	-21.2
3783.90	H	190.0	1.0	49.7	31.5	3.8	-10.9	34.6	39.5	93.9	500.0	-14.5
4256.89	H	90.0	1.0	46.7	32.1	3.9	-10.9	34.6	37.2	72.2	500.0	-16.8
4729.88	H	0.0	1.0	48.2	32.7	4.0	-10.9	34.5	39.4	93.8	500.0	-14.5
Channel 2 Side												
472.99	V	180.0	1.0	58.6	17.7	5.0	-10.9	0.0	70.4	3326.0	12500.0	-11.5
945.98	V	135.0	1.0	24.7	22.9	7.7	-10.9	0.0	44.4	165.7	1250.0	-17.6
1418.96	V	180.0	1.0	43.1	26.8	2.3	-10.9	34.2	27.1	22.7	500.0	-26.8
1891.95	V	0.0	1.0	56.5	28.6	2.5	-10.9	34.0	42.6	135.0	1250.0	-19.3
2364.94	V	80.0	1.0	60.5	29.6	2.9	-10.9	34.2	47.9	248.5	500.0	-6.1
2837.93	V	10.0	1.0	57.3	30.5	3.2	-10.9	34.5	45.6	191.4	500.0	-8.3
3310.91	V	10.0	1.0	53.5	31.0	3.5	-10.9	34.6	42.6	135.0	1250.0	-19.3
3783.90	V	180.0	1.0	51.3	31.5	3.8	-10.9	34.6	41.1	113.3	500.0	-12.9
4256.89	V	245.0	1.0	49.2	32.1	3.9	-10.9	34.6	39.7	96.3	500.0	-14.3
4729.88	V	245.0	1.0	46.7	32.7	4.0	-10.9	34.5	37.9	78.9	500.0	-16.0
473.00	H	180.0	1.0	64.5	17.7	5.0	-10.9	0.0	76.3	6560.2	12500.0	-5.6
946.00	H	180.0	1.0	29.9	22.9	7.7	-10.9	0.0	49.6	301.5	1250.0	-12.4
1418.96	H	90.0	1.0	48.2	26.8	2.3	-10.9	34.2	32.2	40.8	500.0	-21.8
1891.95	H	125.0	1.0	54.0	28.6	2.5	-10.9	34.0	40.1	101.2	1250.0	-21.8
2364.94	H	0.0	1.0	55.8	29.6	2.9	-10.9	34.2	43.2	145.2	500.0	-10.7
2837.93	H	0.0	1.0	52.8	30.5	3.2	-10.9	34.5	41.1	114.0	500.0	-12.8
3310.91	H	180.0	1.0	49.7	31.0	3.5	-10.9	34.6	38.8	86.9	1250.0	-23.2

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Corr.	Duty Cycle Corr (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
3783.90	H	100.0	1.0	50.3	31.5	3.8	-10.9	34.6	40.1	101.3	500.0	-13.9
4256.89	H	90.0	1.0	47.8	32.1	3.9	-10.9	34.6	38.3	82.5	500.0	-15.6
4729.88	H	180.0	1.0	48.1	32.7	4.0	-10.9	34.5	39.4	93.0	500.0	-14.6
Channel 2 Upright												
472.99	V	180.0	1.0	65.3	17.7	5.0	-10.9	0.0	77.1	7193.1	12500.0	-4.8
945.98	V	180.0	1.0	22.4	22.9	7.7	-10.9	0.0	42.1	127.2	1250.0	-19.9
1418.96	V	0.0	1.0	45.7	26.8	2.3	-10.9	34.2	29.7	30.6	500.0	-24.3
1891.95	V	90.0	1.0	51.3	28.6	2.5	-10.9	34.0	37.4	74.4	1250.0	-24.5
2364.94	V	165.0	1.0	56.0	29.6	2.9	-10.9	34.2	43.4	148.0	500.0	-10.6
2837.93	V	0.0	1.0	56.2	30.5	3.2	-10.9	34.5	44.5	167.5	500.0	-9.5
3310.91	V	90.0	1.0	53.0	31.0	3.5	-10.9	34.6	42.1	127.5	1250.0	-19.8
3783.90	V	350.0	1.0	49.7	31.5	3.8	-10.9	34.6	39.5	93.9	500.0	-14.5
4256.89	V	0.0	1.0	44.8	32.1	3.9	-10.9	34.6	35.3	58.4	500.0	-18.6
4729.88	V	145.0	1.0	49.5	32.7	4.0	-10.9	34.5	40.8	109.3	500.0	-13.2
473.00	H	180.0	1.0	65.8	17.7	5.0	-10.9	0.0	77.6	7619.3	12500.0	-4.3
946.00	H	180.0	1.0	21.7	22.9	7.7	-10.9	0.0	41.4	117.3	1250.0	-20.6
1418.96	H	90.0	1.0	46.2	26.8	2.3	-10.9	34.2	30.2	32.3	500.0	-23.8
1891.95	H	90.0	1.0	55.0	28.6	2.5	-10.9	34.0	41.1	113.6	1250.0	-20.8
2364.94	H	90.0	1.0	59.2	29.6	2.9	-10.9	34.2	46.6	214.0	500.0	-7.4
2837.93	H	180.0	1.0	54.3	30.5	3.2	-10.9	34.5	42.6	135.5	500.0	-11.3
3310.91	H	170.0	1.0	52.2	31.0	3.5	-10.9	34.6	41.3	115.8	1250.0	-20.7
3783.90	H	45.0	1.0	53.7	31.5	3.8	-10.9	34.6	43.5	148.9	500.0	-10.5
4256.89	H	165.0	1.0	51.0	32.1	3.9	-10.9	34.6	41.5	118.8	500.0	-12.5
4729.88	H	270.0	1.0	51.2	32.7	4.0	-10.9	34.5	42.4	132.5	500.0	-11.5