Test Report
Class II Permissive Change

Report Number: 30693481
Project Numbers: 3069348
Report Date: December 27, 2004

Testing performed on the

Wireless mobile data device
Model Number: MultiConnect 1xRTT
FCC ID: RZ3MDC0V01

to

FCC Parts 22H, 24E and 15B
for
Mentor Engineering Inc.

A2LA Certificate Number: 1755-01

Test Performed by:	**Test Authorized by:**
Intertek Testing Services NA, Inc 1365 Adams Court Menlo Park, CA 94025	Mentor Engineering Inc. Suite 230, 2891 Sunridge Way NE Calgary Alberta, T1Y 7K7, Canada

Prepared by: _____ **Date:** 12/27/04
Bruce Gordon, Test Engineer

Reviewed by: _____ **Date:** 12/27/04
David Chernomordik, EMC Technical Manager

VERIFICATION OF COMPLIANCE
Report No. 30693481

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Equipment Under Test:	Wireless mobile data device
Trade Name:	Mentor Engineering
Model No.:	MultiConnect 1xRTT
Serial No.:	Not Labled
FCC ID:	RZ3MDC0V01
IC ID:	2234A-MDC0V01
Applicant:	Mentor Engineering, Inc.
Contact:	Mr. Jonade Khan
Address:	Suite 230, 2891 Sunridge Way NE Calgary Alberta, T1Y 7K7
Country	Canada
Tel. number:	403-777-3760 ext 226
Fax number:	403-777-3769
Manufacturer:	Mentor Engineering, Inc.
Contact:	Mr. Jonade Khan
Address:	Suite 230, 2891 Sunridge Way NE Calgary Alberta, T1Y 7K7
Country	Canada
Tel. number:	403-777-3760 ext 226
Fax number:	403-777-3769
Applicable Regulation:	FCC Part 22H, FCC Part 24E, FCC Part 15B
Test Site Location:	ITS - Site 1 1365 Adams Drive Menlo Park, CA 94025
Date of Test:	December 13 - 23 , 2004

We attest to the accuracy of this report:

Bruce Gordon
Test Engineer

David Chernomordik
EMC Technical Manager

TABLE OF CONTENTS

1.0 Introduction

1.1 Product Description

The Equipment under Test (EUT) is wireless mobile data device designed for installation in a vehicle. It is intended for use with a Computer Aided Dispatch system. The device contains an internal RF data modem, which operates in 800 MHz and 1900 MHz bands.

The EUT has the ability to interface to multiple inputs and outputs from the vehicle and peripheral devices.

For more information about the built-in radio modem, please refer to the product details.

Use of Product	In vehicle
Whether quantity (>1) production is planned	Yes
Cellular Phone standard	CDMA
Rated RF Output Power	23.5 dBm (Cell band) 23.5 dBm (PCS band)
Frequency Ranges	824.7 - 848.31 MHz, CDMA channels: 1013 - 777 1851.25 - 1908.75 MHz, CDMA channels: 25 - 1175
Antenna (e) & Gain	Max 3 dBi
Detachable antenna?	yes
External input	Data
Operating temperature	-30^0C to $+60^0$C

EUT receive date: December 10, 2004
EUT receive condition: The prototype version of the EUT was received in good condition with no apparent damage. As declared by the Applicant it is identical to the production units.
Test start date: December 13, 2004
Test completion date: December 23, 2004

1.2 Justification

The Mentor's model MultiConnect 1xRTT has a built-in dual band CDMA modem which is in all hardware and software aspects identical (unmodified) to the previously certified device FCC ID: RZ3MDC0V01 used in the model MDC 1xRTT. Therefore, the following test results from test report 30693501 issued on 12/27/04 are applicable to the model MultiConnect 1xRTT.

FCC Rule	Description of Test
2.1046	RF Power Output
22.913(a), 24.232(b)	ERP, EIRP
2.1049	Occupied Bandwidth, Emission Designator
2.1051, 22.917(a), 24.238(a)	Out of Band Emissions at Antenna Terminals
2.1055	Frequency Stability vs. Temperature and Voltage
2.1091	RF Exposure evaluation

Therefore, the only tests to be performed are the following:

Part 22/24 Spurious Radiation

Part 15 Radiated Emissions

1.3 Summary of Test Results

FCC Rule	Description of Test	Result	Page
2.1053, 22.917(a), 24.238(a)	Part 22/24 Spurious Radiation	Complies	7
15.109	Part 15 Radiated Emissions	Complies	12

2.0 Part 22/24 Spurious Radiation

FCC 2.1053, 22.917(a), 24.238(a)

2.1 Requirement

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency outside the frequency band by at least (43 + 10 log P) dB.

Note: That corresponds to the level of -13 dBm for any out-of-band and spurious emissions.

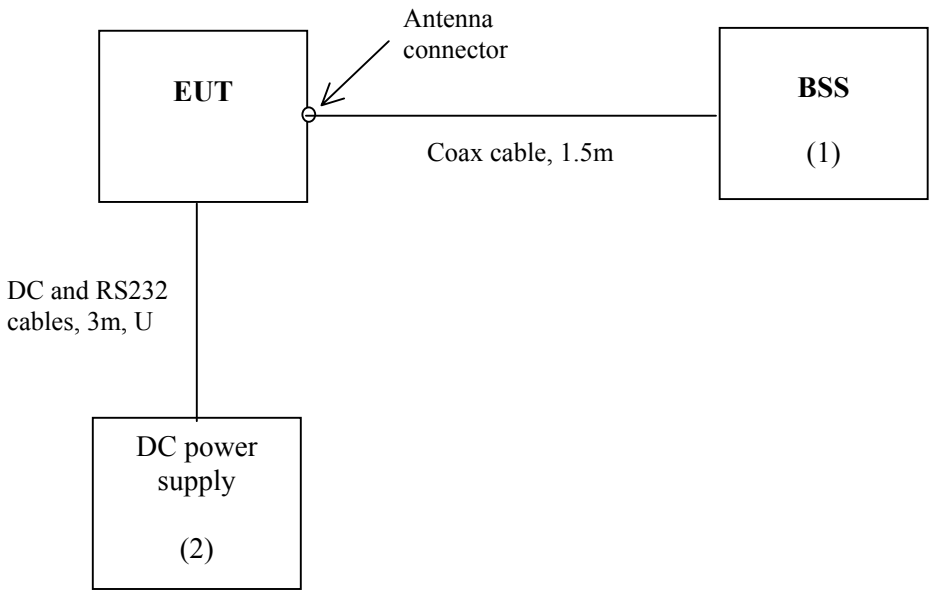
2.2 Test Configuration

2.2.1 Support Equipment

Item #	Description	Model No.	S/N
1	Wireless communications test set (Base Station Simulator)	Agilent 8960 Series 10	GB43133135
2	DC Power Supply	GPR-6030	PC303RP1

2.2.2 Block diagram of Test Setup

Block diagram of test setup for spurious radiated emission test of the transmitter



2.3 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The antenna height is varied from 1 to 4 meters.

The frequency range up to 10th harmonic of each of the three fundamental frequency (low, middle, and high channels) for each band (cellular and PCS) was investigated. The tests were performed with the EUT placed on three orthogonal axes. The worst case of emissions was reported.

For spurious emissions attenuation, the substitution method was used. The EUT was substituted by a reference antenna (half-wave dipole - below 1 GHz, or Horn antenna - above 1GHz), connected to a signal generator. The signal generator output level ($\mathbf{V_g}$ in dBm) was adjusted to obtain the same reading as from EUT. The ERP/EIRP at the spurious emissions frequency was calculated as follows.

$ERP_{(dBm)} = \mathbf{V_g} + \mathbf{G}_{(dBd)}$; $EIRP_{(dBm)} = \mathbf{V_g} + \mathbf{G}_{(dBi)}$

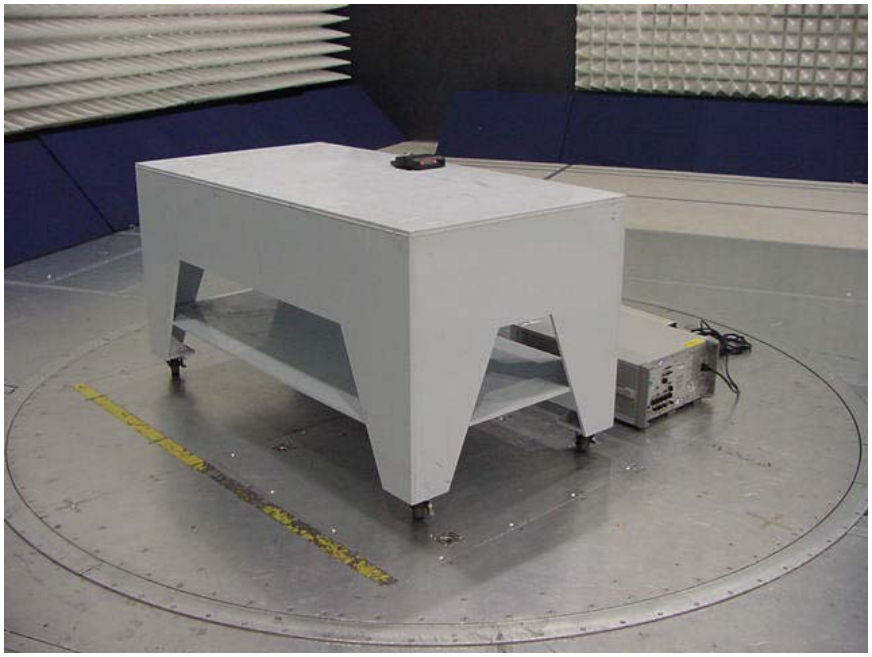
The spurious emissions attenuation is the difference between ERP/EIRP at the fundamental frequency and at the spurious emission frequency.

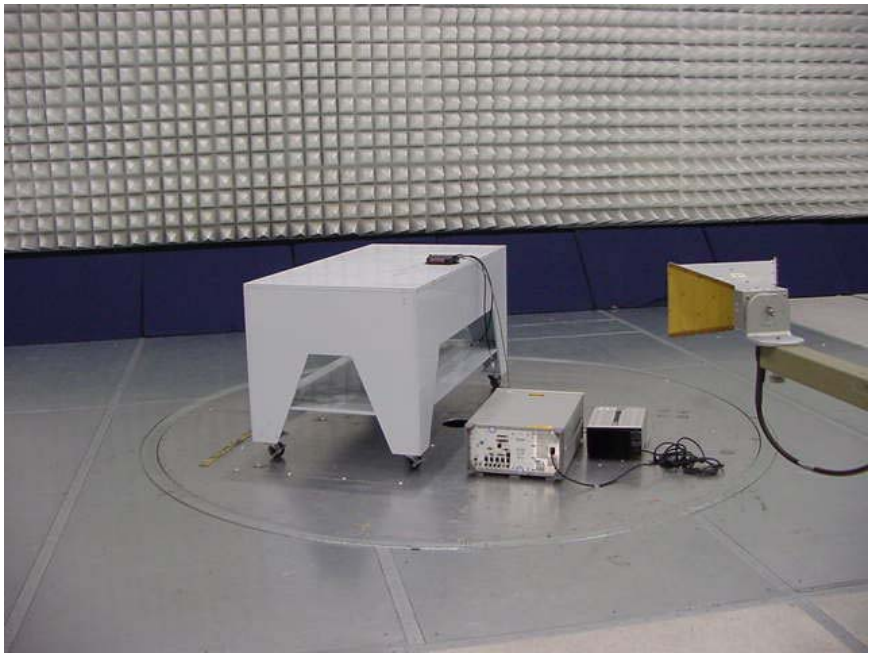
2.4 Test Equipment

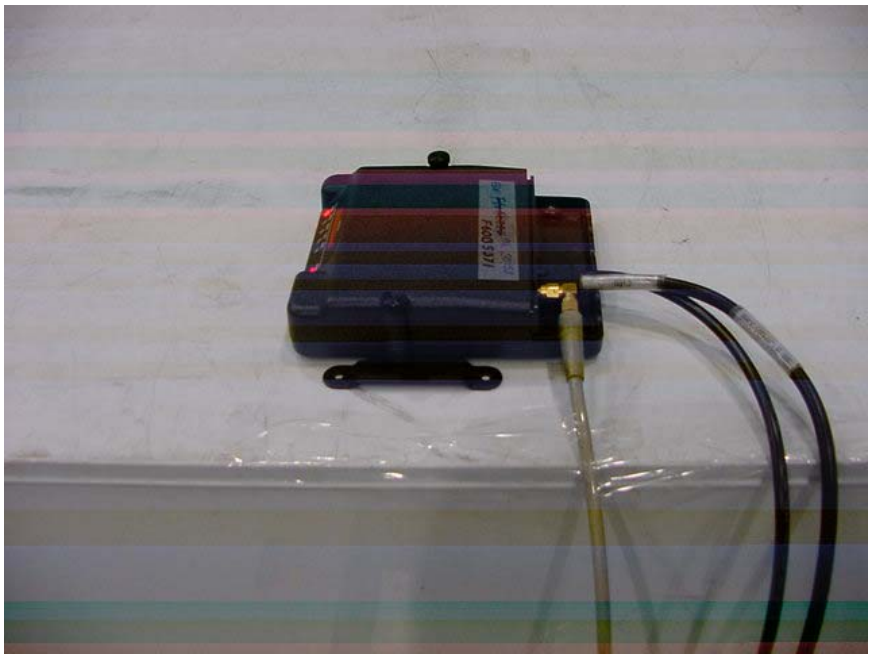
EMCO 3115 Horn Antennas
Rohde & Schwarz FSP40 Spectrum Analyzer
Low Pass Filter
Preamplifiers

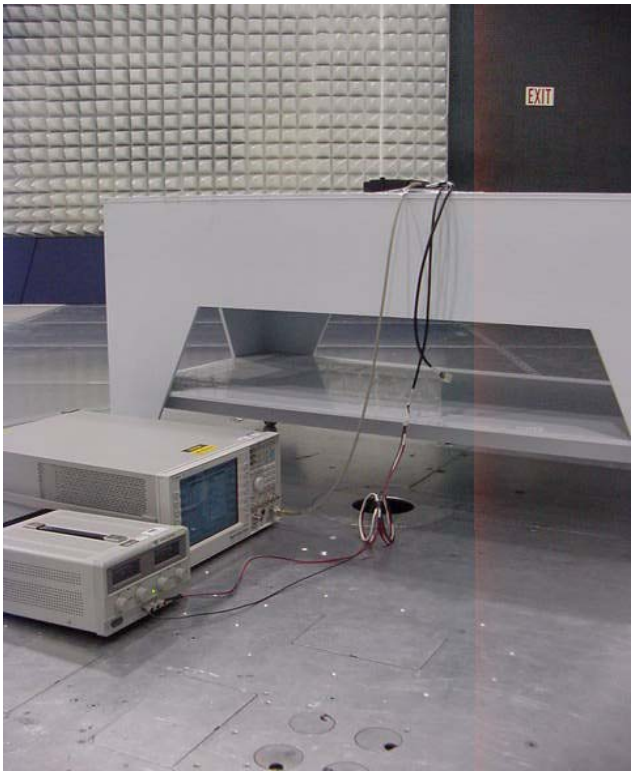
2.5 Configuration Photographs

FCC Part 22/24 Radiated Emission Test Setup Photographs








EXIT

2.6 Test Results

Frequency	Antenna Polariz.	SA Reading (EUT)	Signal Generator Output required to have the same SA Reading as from EUT	ERP*	ERP Limit	ERP Margin
MHz		**dB(µV)**	**V_gdBm**	**dBm**	**dBm**	**dB**
Channel 824.2 MHz						
1648.4	V	54.3	-57.3	-50.9	-13.0	-37.9
2472.6	V	53.1	-76.9	-69.4	-13.0	-56.4
3296.8	V	43.0	-83.0	-75.3	-13.0	-62.3
Channel 836.4 MHz						
1672.8	V	55.0	-55.5	-49.1	-13.0	-36.1
2509.2	V	52.5	-76.5	-69.0	-13.0	-56.0
3345.6	V	42.2	-82.8	-75.1	-13.0	-62.1
Channel 848.8 MHz						
1697.6	V	56.5	-53.5	-47.1	-13.0	-34.1
2546.4	V	54.0	-74.0	-66.5	-13.0	-53.5
3395.2	V	42.1	-82.4	-74.7	-13.0	-61.7

* ERP is calculated as: $ERP_{(dBm)} = V_{g(dBm)} + G_{(dBd)}$

Frequency	Antenna Polariz.	SA Reading (EUT)	Signal Generator Output required to have the same SA Reading as from EUT	EIRP*	EIRP Limit	EIRP Margin
MHz		**dB(µV)**	**V_gdBm**	**dBm**	**dBm**	**dB**
Channel 1850.2 MHz						
3700.4	V	28.0	-59.7	-49.9	-13.0	-36.9
5550.6	V	62.3	-38.0	-27.0	-13.0	-14.0
7400.8	V	53.0	-44.0	-32.6	-13.0	-19.6
Channel 1880 MHz						
3760.0	V	29.1	-57.1	-47.3	-13.0	-34.3
5640.0	V	61.5	-38.6	-27.5	-13.0	-14.5
7520.0	V	51.6	-44.9	-33.5	-13.0	-20.5
Channel 1909.8 MHz						
3819.6	V	31.9	-53.0	-43.2	-13.0	-30.2
5729.4	V	62.1	-37.4	-26.2	-13.0	-13.2
7639.2	V	50.7	-45.3	-33.9	-13.0	-20.9

* EIRP is calculated as: $EIRP_{(dBm)} = V_{g(dBm)} + G_{(dBi)}$

All other emissions not reported are more than 20 dB below the limit.

Test Result:	Complies by 13.2 dB

3.0 Part 15 Radiated Emissions from digital part and receiver

FCC 15.109

3.1 Radiated Emission Limits

The following radiated emission limits apply to Class A unintentional radiators:

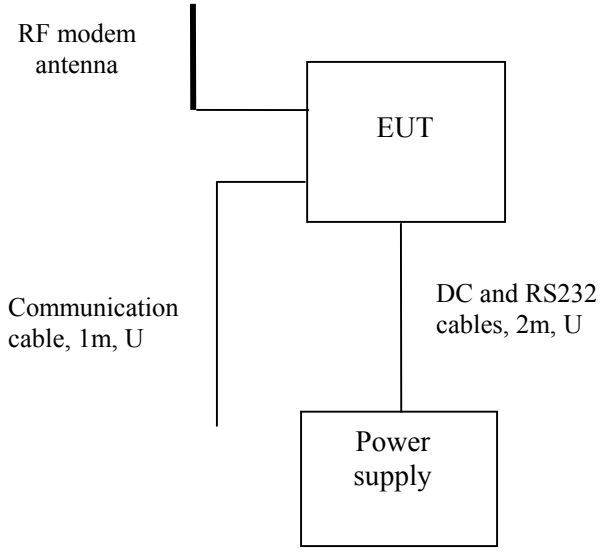
Radiated Emissions Limits, FCC Section 15.109(b)

Frequency MHz	Class A at 10m µV/m	Class A at 10m dB(µV/m)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt, dB (µV), and microvolts (µV). To convert between them, use the following formulas: 20 LOG_{10} (µV) = dB (µV), dB (m) = dB (µV)-107.

3.2 Block diagram of Test Setup

Block diagram of test setup for radiated emission test of the digital part and receiver



3.3 Test Procedure

For emission testing, the EUT was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

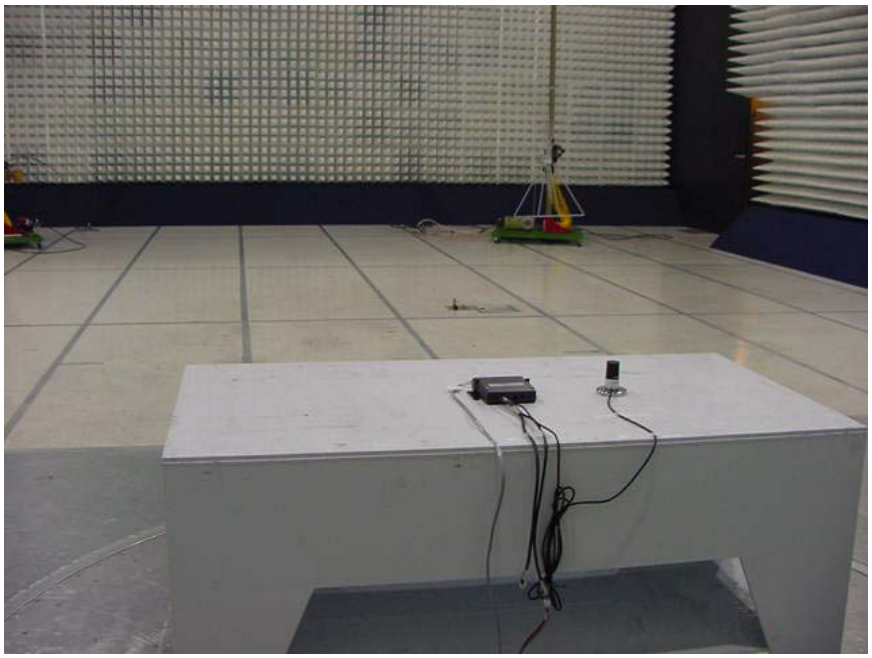
For radiated emission measurements, the EUT is placed on a wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible).

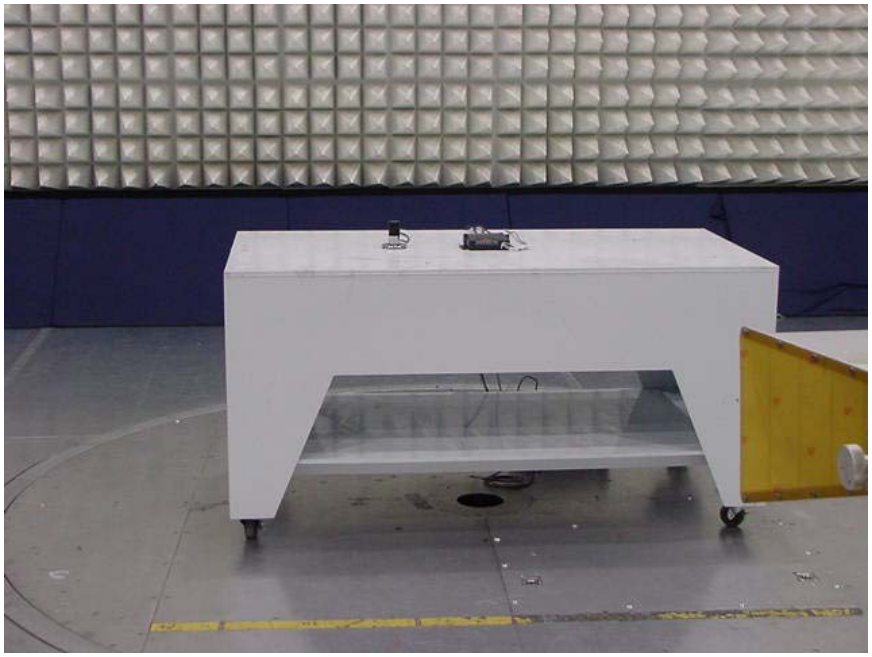
The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

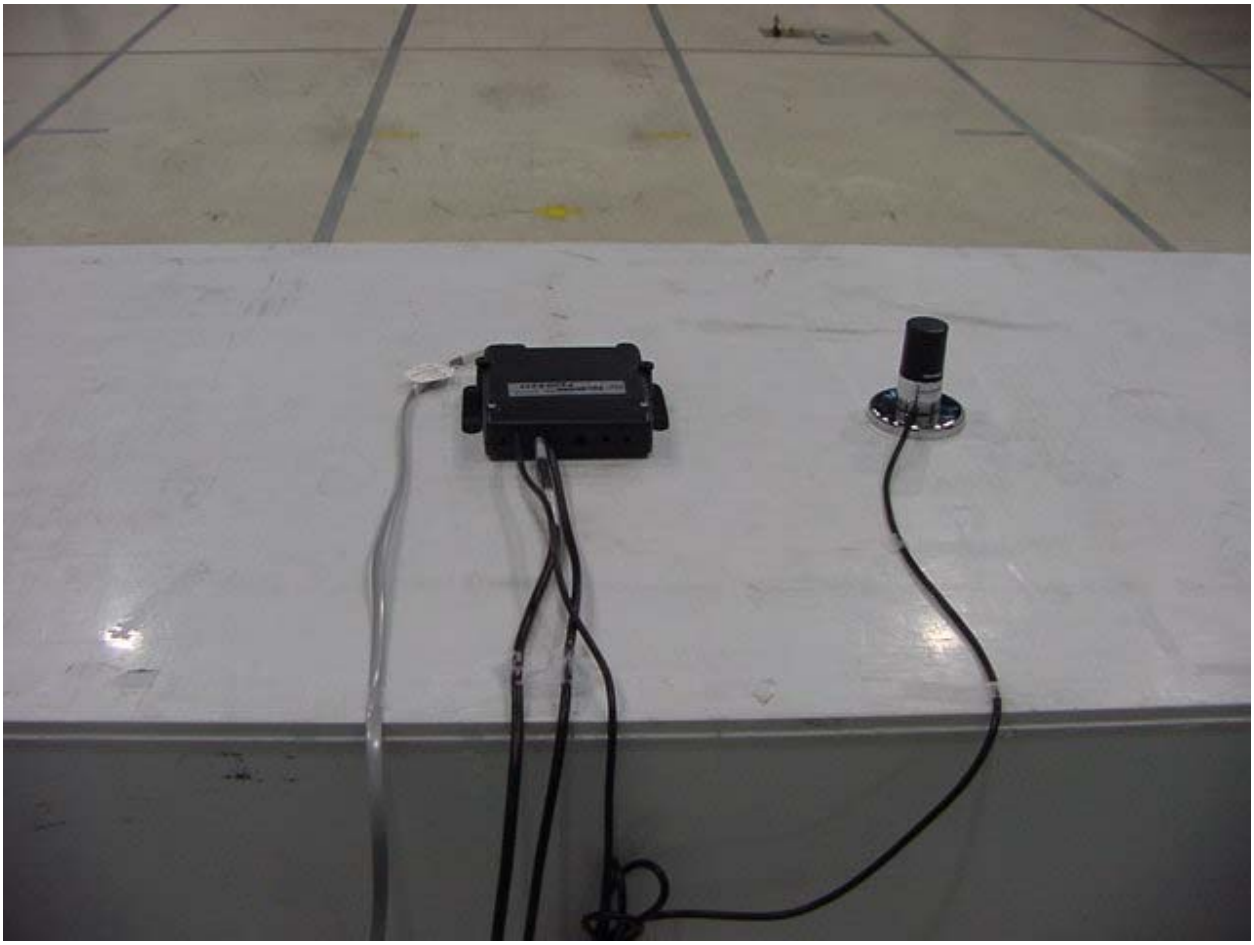
Radiated emissions are taken at 10 m unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent 10-meter reading using inverse scaling with distance.

3.4 Configuration Photographs

FCC Part 15 Radiated Emission Test Setup Photographs







3.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV); AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m)
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

3.6 Test Equipment

EMCO 3143 Bilog Antenna
EMCO 3115 Horn Antenna
HP 8546A Spectrum Analyzer
Rohde & Schwarz FSP40 Spectrum Analyzer
Preamplifiers

3.7 Test Results

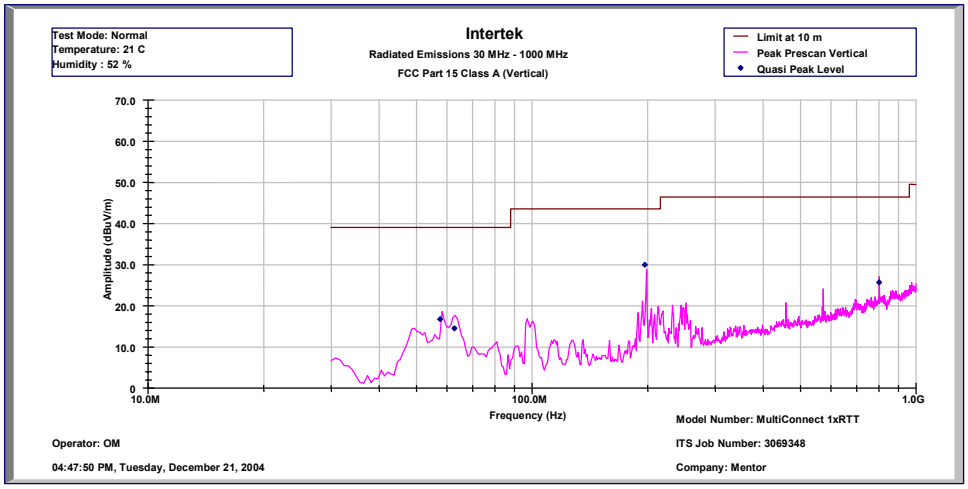
Tested By:	Ollie Moyrong
Test Date:	December 21, 2004

Temperature	**(°C)**	21
Relative Humidity	**(%)**	52

The results on the following page(s) were obtained.

Results:	**Complies** by 13.6 dB

Note: a) A complete scan from 30 MHz to 7.5 GHz was made with antenna oriented horizontally and vertically.
b) The highest emissions are reported
c) Analyzer setting: RBW = 100 kHz, VBW = 100 kHz - below 1 GHz
RBW =1 MHz, VBW = 30 kHz - above 1 GHz
Detector mode: Peak unless otherwise specified in the data page
d) All other emissions not reported are at least 10 dB below the limit



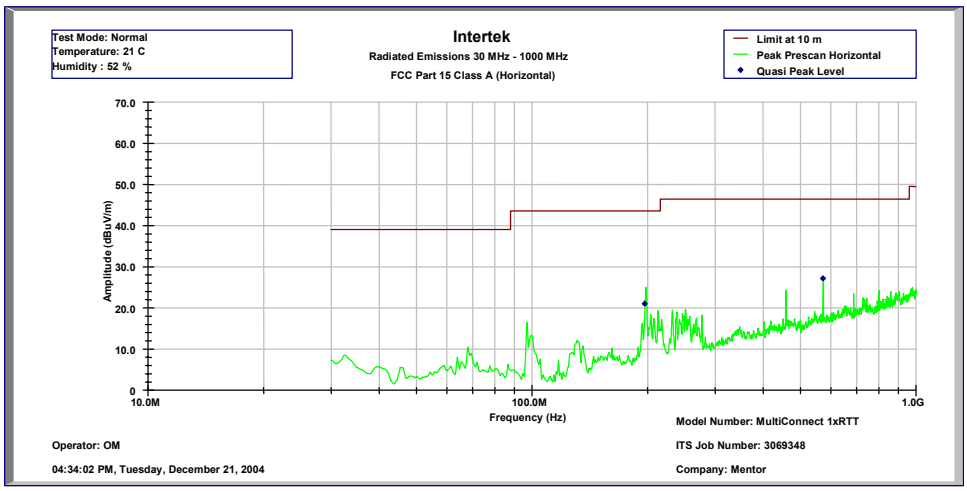
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Vertical)

Operator: OM
Test distance: 10 m
04:47:46 PM, Tuesday, December 21, 2004

Model Number: MultiConnect 1xRTT
ITS Job Number: 3069348
Company: Mentor Engineering

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	CF	AG	AF
MHz	dB(uV/m)	dB(uV/m)	dB	dB	dB	dB	dB(1/m)
57.6	16.7	39.0	-22.3	39.9	4.0	32.4	5.1
62.8	14.5	39.0	-24.5	37.3	4.1	32.3	5.5
196.6	29.9	43.5	-13.6	47.3	5.0	32.3	9.9
801.8	25.7	46.4	-20.7	28.3	7.3	32.4	22.5

Test Mode: Receiving
Temperature: 21 C
Humidity : 52 %



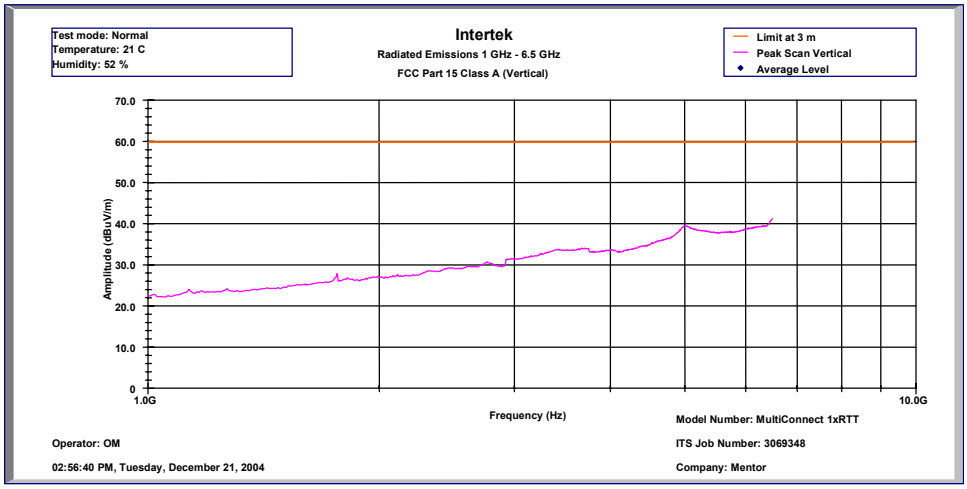
Intertek Testing Services
Radiated Emissions 30 MHz - 1000 MHz
FCC Part 15 Class A (QP-Horizontal)

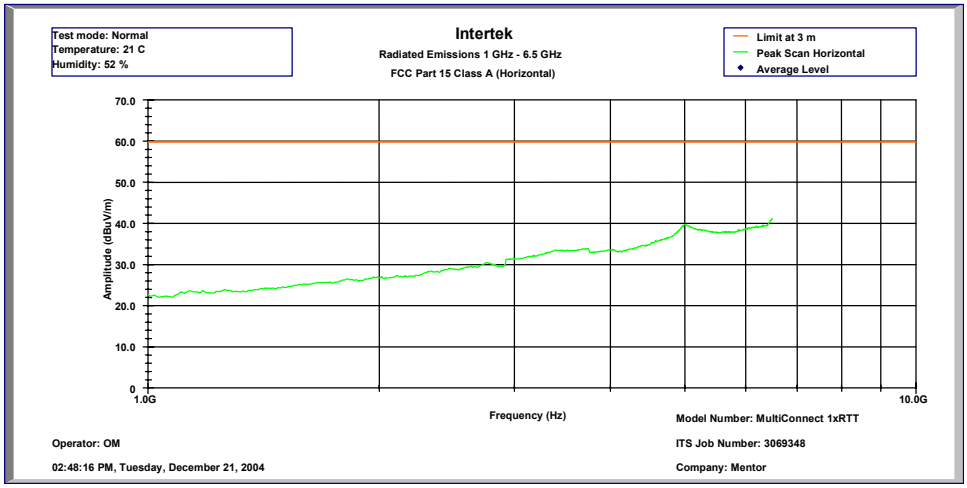
Operator: OM
Test distance: 10 m
04:33:57 PM, Tuesday, December 21, 2004

Model Number: MultiConnect 1xRTT
ITS Job Number: 3069348
Company: Mentor Engineering

Frequency MHz	Quasi Pk FS dB(uV/m)	Limit@10m dB(uV/m)	Margin dB	RA dB(uV)	CF dB	AG dB	AF dB(1/m)
196.6	21.0	43.5	-22.5	38.6	5.0	32.3	9.6
572.7	27.2	46.4	-19.2	34.1	6.7	32.5	18.9

Test Mode: Receiving
Temperature: 21 C
Humidity : 52 %





All emissions above 1 GHz are noise floor

4.0 List of Test Equipment

Measurement equipment used for compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due
BI-Log Antenna	EMCO	3143	9509-1164	12	4/06/05
Double-ridged Horn Antenna	EMCO	3115	9170-3712	12	6/18/05
Double-ridged Horn Antenna	EMCO	3115	8812-3049	12	4/14/05
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	9/10/05
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	9/10/05
Spectrum Analyzer	Rohde & Schwarz	FSP40	036612004	12	2/04/05
Signal Generator	Hewlett Packard	83732A	322A00119	12	3/04/05
Pre-Amplifier	Sonoma Inst.	310	185634	12	3/25/05
Pre-Amplifier	Miteq	AMF-4D-001180-24-10P	799159	12	3/25/05
Wireless communications test set (BSS)	Agilent	8960 series	GB 43133135	12	7/07/05

5.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / 3069348	DC	December 23, 2003	Original document