MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587-3201 ● PHONE (510) 489-6300 ● FAX (510) 489-6372

November 10, 2003

BeamReach Networks
755 North Mathilda Avenue
Sunnyvale, CA 94086

Reference: BRN-5000 with WCSA and WCSB

Dear Mr. Tony Tokuno,

Enclosed is the EMC Test Report for the BeamReach Networks, BRN-5000 with WCSA and WCSB tested to the requirements of the FCC Rules and Regulations, Part 27 Subpart C, of Title 47 of the CFR, for a Miscellaneous Wireless Communications Services.

Thank you for using the testing services of MET Laboratories. If you have any questions regarding these results or if MET can be of further assistance to you, please feel free to contact me. We appreciate your business and look forward to working with you again soon.

Kindest Regards,
MET LABORATORIES, INC.

Cheryl Anicete
Documentation Department

Enclosures: (\BeamReach Networks\EMCS13860-FCC27.rpt)

Electro-Magnetic Compatibility
Test Report

for the

BeamReach Networks
BRN-5000 with WCSA and WCSB

Tested Under

FCC Part 27, Subpart C
Title 47 of the CFR
for Miscellaneous Wireless Communications Services

MET REPORT: **EMCS13860-FCC27**

November 10, 2003

PREPARED FOR:

BeamReach Networks
755 North Mathilda Avenue
Sunnyvale, CA 94086

PREPARED BY:

MET Laboratories, Inc.
33439 Western Avenue
Union City, California 94587

Electro-Magnetic Compatibility
Test Report

for the

BeamReach Networks
BRN-5000 with WCSA and WCSB

Tested Under

FCC Part 27, Subpart C
Title 47 of the CFR
for Miscellaneous Wireless Communications Services

MET REPORT: **EMCS13860-FCC27**

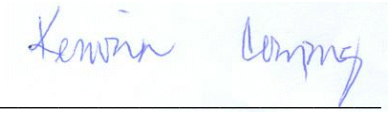
PREPARED FOR:

BeamReach Networks
755 North Mathilda Avenue
Sunnyvale, CA 94086

Alvin Ilarina, Manager
Electromagnetic Compatibility Testing

Cheryl Anicete
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 27, Subpart C, of the FCC Rules under normal use and maintenance.



Kerwinn Corpuz
Project Engineer

REPORT STATUS SHEET

Revision	Report/Revision Date	Reason for Revision
∅	November 10, 2003	Initial Issue.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PHOTOGRAPHS

LIST OF FIGURES

LIST OF TERMS AND ABBREVIATIONS

AC	**A**lternating **C**urrent
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBm	**d**ecibels **B**elow 1 **m**illiwatt
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µ**H**	**microh**enry
µ**F**	**microf**arad
µ**s**	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane
W	**W**atts

Summary of Test Results

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 27, Subpart C. All tests were conducted using measurement procedure ANSI C63.4: 2001.

Type of Submission/ Rule Part:	Certification / Part 27 Subpart C
EUT:	BRN-5000 Base Station
FCC ID:	QONBRN5000
Equipment Code:	TNB
Emissions Designator:	7M50D7D
RF Power Output:	Output Power at antenna port: Block A: 37 dBm (5 Watts); Block B: 36 dBm (4 Watts) EIRP: Block A: 251.2 Watts; Block B: 199.5 Watts
Frequency Range (MHz):	Block A: 2305 - 2310 and 2350 - 2355 Block B: 2310 - 2315 and 2355 - 2360
Frequency Stability:	stay within the authorized bands of operation

Table 1. Summary of Test Results

Name of Test	FCC Rule Part/Section	Results
RF Power Output	2.1046; 27.50(a)(1)	Complies
Modulation Characteristics	2.1047(a)	N/A - EUT is non-analog voice.
Occupied Bandwidth	2.1049	Complies
Spurious Emissions at Antenna Terminals	2.1051; 27.53(a)(1) and (3)	Complies
Radiated Spurious Emissions	2.1051; 27.53(a)(1) and (3)	Complies
Frequency Stability over Temperature Variations	2.1055 (a)(1); 27.54	Complies
Frequency Stability over Battery Power	2.1055 (d)(2)	Complies - Refer to Appendix A for test results.

Table 2. Summary of Test Results

I. Executive Summary

I. Executive Summary

A. Purpose of Test

An EMC evaluation to determine compliance of the BRN-5000 with WCSA and WCSB (referred to as EUT hereafter) with the requirements of Part 27, Subpart C, was conducted. (All references are to the most current version of Title 47 of the Code of Federal Regulations in effect). In accordance with §2.1033, the following data is presented in support of the Certification of the EUT. BeamReach Networks, should retain a copy of this document, and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued.

B. Executive Summary

The EUT, as supplied to MET Laboratories, complied with the requirements stated in this test report.

References	Description
Purchase Order #1983	BeamReach Networks Purchase Order for the BRN-5000 with WCSA and WCSB Testing
ANSI-C63.4: 2001	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
TIA/EIA-603-A-2001	Land Mobile HM or PM Communications Equipment Measurement and Performance Standards
FCC 47CFR, Chapter 1, Part 2	Title 47 Code of Federal Regulations Part 2 - Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
FCC 47CFR, Chapter 1, Part 15	Title 47 Code of Federal Regulations Part 15 - Digital Devices
FCC 47CFR, Chapter 1, Part 27	Title 47 Code of Federal Regulations Part 27 - Miscellaneous Wireless Communications Services

Table 3. References

II. General

II. General

A. Test Site

All testing was conducted at MET Laboratories, Inc., 4855 Patrick Henry Drive, Building 6, Santa Clara, California 95054. Radiated Emissions measurements were performed inside a 10 meter semi-anechoic chamber. In accordance with §2.948(a)(2), a complete site description is filed with the Commission's Laboratory in Columbia, Maryland. MET Laboratories has been accredited by the National Voluntary Laboratory Accreditation Program (Lab Code: 100273-0).

B. Description of Test Sample

The EUT is a broadband wireless access system. It provides high spectral efficiency and capacity in non line-of-sight propagation environments.

The model BRN-5000 aggregates the airlinks from all its associated remote units, modulates/demodulates the to and from the RF signal, and interfaces with the router and/or Subscriber Management System.

Located in a central office or other similar locale.

C. Emission Designator Description

The WCS bandwidth is calculated as follows. When the base station is configured to use WCS A band, at any given instant in time, it will use the bandwidth from 2305.625 MHz to 2309.375 MHz in the lower A band and 2350.625 to 2354.375 MHz in the upper A band. This is a total of 7.5 MHz of bandwidth used in normal operation. The bandwidth used by the base station when configured to use WCS B band is 2310.625 to 2314.375 MHz and 2355.625 to 2359.375 MHz. Another way to calculate this is that we use a total of 1200 carriers in the lower band and 1200 carriers in the upper band. Carrier spacing is 3.125 kHz for a total bandwidth of 2400 * 3.125 kHz = 7.5 MHz.

The D7D designator was determined as follows. The digital modulation report describes all of this in more detail with the exception of the pre-established transmit sequence.

For type of modulation, the D represents emission in which the main carrier is amplitude and angle modulated either simultaneously of in a pre-established sequence. Our base transmit pre-established sequence is sync burst, initialization burst, sync burst, training burst and data burst. The sync burst uses BPSK modulation. The initialization burst uses 4QAM. The training burst uses 4QAM. The data burst can be 8PSK, 16QAM or 32QAM. Note that the bursts are not pulses but modulated carriers with cyclic prefixes in between so the phase is continuous between bursts. Phase discontinuities only occur during the TDD channel turn-around between transmit and receive.

For nature of signal modulating the carrier, the 7 represents 2 or more channels containing quantized or digital information. All carriers are modulated. All 2400 carriers contain digital information with no analog modulation used on any carrier. All carriers are time division duplexed between a transmit time and a receive time, with the base transmitting during transmit time and the CPE transmitting during the receive time.

For type of information transmitted, the D represents data transmission, telemetry, telecommand. The information transmitted by the base is not telegraphy, FAX, telephony, television. The information transmitted is data, which has been reformatted from IP packets into frames of data used in our airlink transmissions.

II. General

D. General Test Setup

The EUT was tested in the configuration shown on the following pages:

E. Mode of Operation

The EUT was configured in accordance with the manufacturer's instructions and was operated as follows for all testing contained in this report unless stated otherwise:

Refer to Chapter 6 of the Base Station Installation Manual for Mode of Operation.

Base Configuration

The Base was configured for 8 antenna, 2 subband pair, redundant WCS operation, which is the highest total output power of the configurations.

Other Configurations are:

8 antenna, 1 subband pair redundant
6 antenna, 2 subband pair redundant
6 antenna, 1 subband pair redundant

All previously mentioned configurations but with non-redundant hardware for a total 8 different configurations.

Backhaul interfaces include ATM over OC-3, ATM over DS3 and IP over 100BaseT.

Power amps used were 10 watt versions.

II. General

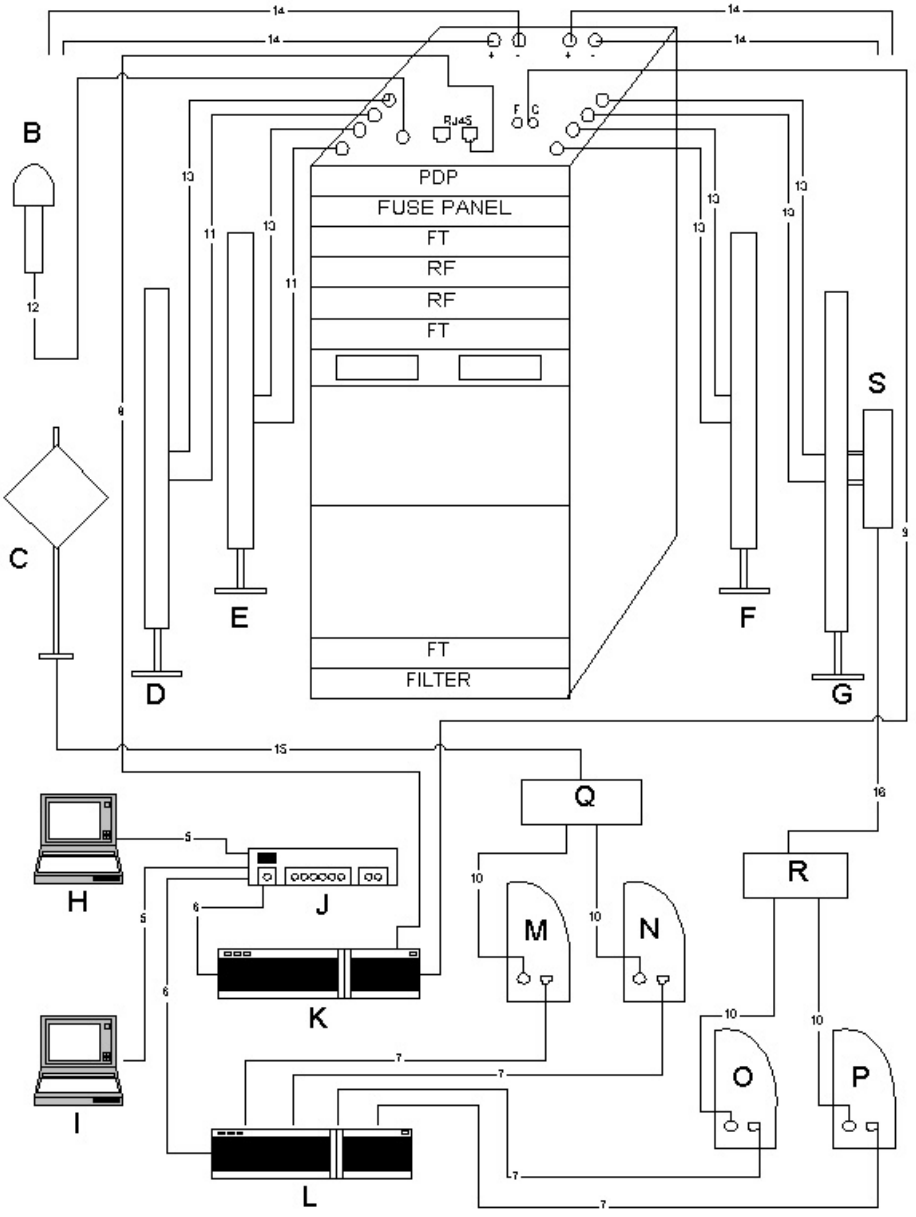


Figure 1. Test Configuration

II. General

EUT Configuration

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
A1	PDP		None Listed	None Listed	None Listed	None Listed
A2	Fuse Panel		None Listed	None Listed	None Listed	None Listed
A3	PM1	Power Modules	WCS-10Watts	1101318-03	611130000108	01
A3	PM2	Power Modules	WCS-10Watts	1101318-03	611130000106	01
A3	PM3	Power Modules	WCS-10Watts	1101318-03	611130000107	01
A3	PM4	Power Modules	WCS-10Watts	1101318-03	611130000109	01
A4	CF1	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A4	CF2	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A4	CF3	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A4	CF4	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A5	PRBD		None Listed	1101630	03	02
A6	CF1	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A6	CF2	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A6	CF3	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A6	CF4	COMNAV	12DBPCVC-5607.5/2352.5/C6/K-0	None Listed	None Listed	None Listed
A7	PM1	Power Modules	WCS-10Watts	1101318-03	611130000102	01
A7	PM2	Power Modules	WCS-10Watts	1101318-03	611130000104	01
A7	PM3	Power Modules	WCS-10Watts	1101318-03	611130000103	01
A7	PM4	Power Modules	WCS-10Watts	1101318-03	611130000105	01
A8	GPS-P		None Listed	None Listed	12105352	None Listed
A8	GPS-R		None Listed	None Listed	None Listed	None Listed
A9	1	LO	None Listed	1101618-01	108	X3
A9	2	LO	None Listed	1101618-01	001	X8
A9	3 - 5	Blank				
A9	6	PRBT	None Listed	1102633-01	191620000302	X8
A9	7	PRBT	None Listed	1102633-01	191620000015	X6
A9	8 - 12	Blank				
A9	13	RFSW	None Listed	1101615-01	201620000312	01
A9	14	Blank				
A9	15	RFSW	None Listed	1101615-01	201620000308	01
A9	16	Blank				
A9	17	RFSW	None Listed	1101615-01	201620000311	01
A9	18	Blank				
A9	19	RFSW	None Listed	1101615-01	201620000239	01
A9	20 - 21	Blank				
A10	1	XCVR	None Listed	1101622-01	171620000252	X4
A10	2	XCVR	None Listed	1101622-01	171620000253	X4
A10	3 - 4	Blank				
A10	5	XCVR	None Listed	1101622-01	170620000251	X4
A10	6	MTM	None Listed	1101400-01	010	X6

II. General

EUT Configuration (cont.)

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
A10	7	MTM	None Listed	1101400-01	009	X6
A10	8 - 9	Blank				
A10	10	MTM	None Listed	1101400-01	003	X6
A10	11	MBP	None Listed	1101410-01	007	X7
A10	12	MBP	None Listed	1101410-01	134	X4
A10	13 - 18	Blank				
A10	19	MBP	None Listed	1101410-01	109	X4
A10	20	NIC	None Listed	1101420-01	121230000176	01
A10	21	NIC	None Listed	1101420-01	121230000177	01
A11	Fan Tray		None Listed	FA3-S17640-001	0010-0129	01

Support Equipment

Ref. ID	Description	Manufacturer	Model Number
B	GPS Antenna	Trimble	41555-00
C	RX Antenna	None listed	None listed
D	TX Antenna	Phazar	WCS Panel
E	TX Antenna	Phazar	WCS Panel
F	TX Antenna	Phazar	WCS Panel
G	TX Antenna	Phazar	WCS Panel
H	Laptop	Sony Corp.	PCG-9B2L
I	Laptop	Sony Corp.	PCG-9532
J	Network Hub	Netgear Corp.	FS105
K	Traffic Generator	Spirent	SmartBits 200
L	Traffic Generator	Spirent	SmartBits 200
M	CPE	BeamReach Networks	BRU-150 WCS A/B Band
N	CPE	BeamReach Networks	BRU-150 WCS A/B Band
O	CPE	BeamReach Networks	BRU-150 WCS A/B Band
P	CPE	BeamReach Networks	BRU-150 WCS A/B Band
Q	SMA Hub	Mini-Circuits	ZN2PD2-50
R	SMA Hub	Mini-Circuits	ZC16PD-2185
S	IDU Antenna	Andrew	QD-2327

II. General

Ports and Cabling Information

Ref. ID	Port Name	Port Location (Ref. ID + Slot)	Connector Type	Cable Type	Qty.	Length (m)	Shielded (?)	Cable Termination (Ref. ID + Slot + Port ID)
1	J3	A3 & A7, PM1-4	SMA	Coaxial	8	0.2	Ye	A5, J3
2	J2	A3 & A7, PM 1-4	SMA	Coaxial	8	0.2	Yes	A4 & A6, J2
3	J1	A4 & A6, CF 1-4	SMA	Coaxial	8	0.2	Yes	A5, J1
4	J4	A4 & A6, CF 1-4	SMA	Coaxial	8	0.2	Yes	A5, J4
5	1, 2	J	RJ45	CAT5, 24 AWG, UTP	2	1.0	No	H, I
6	3	J	RJ45	CAT5, 24 AWG, UTP	2	1.0	No	K, L
7	Ethernet	L	RJ45	CAT5, 24 AWG, UTP	4	1.0	No	M, N, O, P
8	Ethernet	K	RJ45	CAT5, 24 AWG, UTP	1	10.0	No	A (top)
9	TX, RX	K	LC	Single Mode Fiber Optic	1	10.0	No	A (top)
10	1, 2, 16	Q, R	SMA	Coaxial	4	1.0	Yes	M, N, O, P
11	S	Q, R	SMA/N- Type	Coaxial	2	5.0	Yes	A (top)
12	GPS ANT P	A (top)	BNC	Coaxial	1	25.0	Yes	B
13	2, 3, 4, 6, 8	A (top)	N Type	Coaxial	5	5.0	Yes	D, E, F, G
14	-48 Vdc, RTN	A (top)	Lug	4 AWG	4	5.0	No	DC Power supply
15	S	Q	SMA/N-Type	Coaxial	1	10.0	Yes	C
16	S	R	SMA/N-Type	Coaxial	1	10.0	Yes	S

II. General

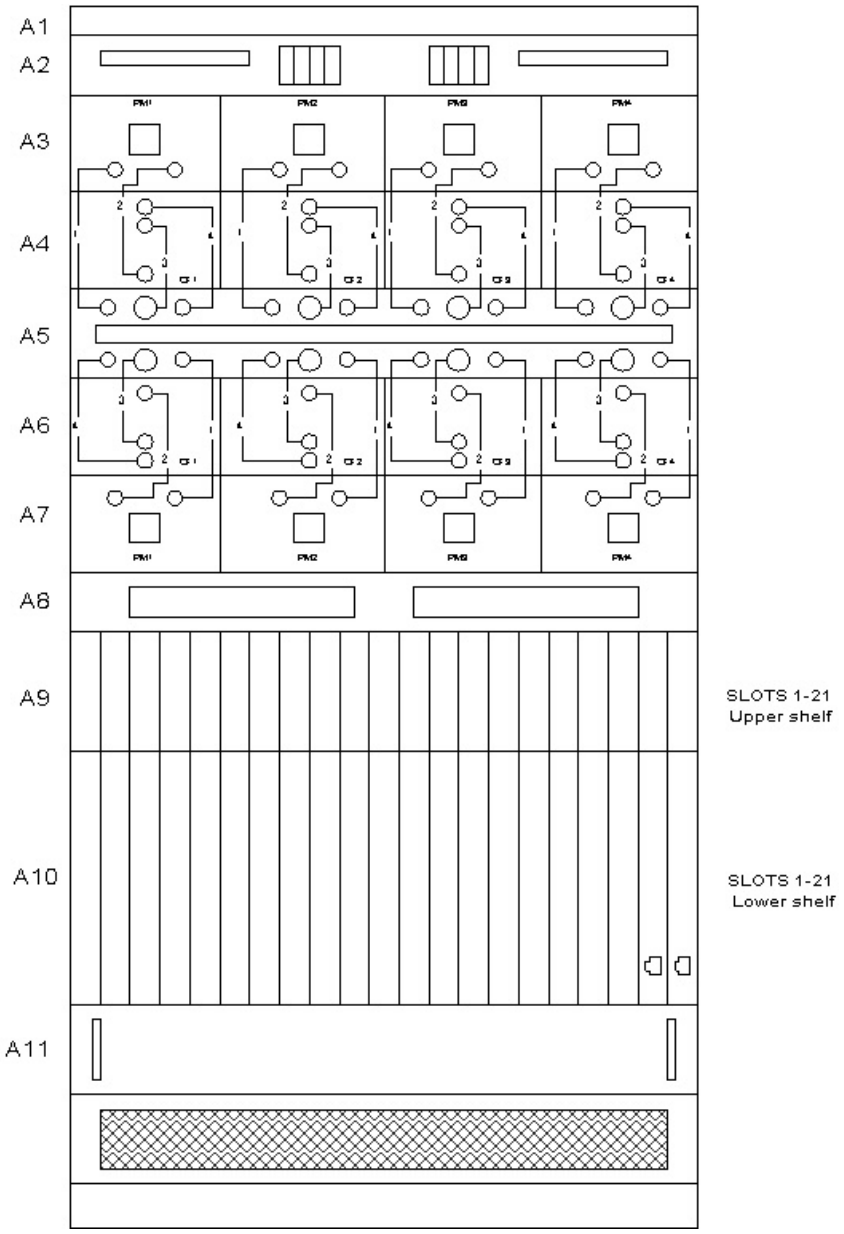


Figure 2. Port Identification

II. General

F. Modification

The following list of modifications were applied to comply with FCC Part 15 and Part 27:

1. Added an aluminum shroud over the bottom rear portion of the main rack. This shroud covers the rear of the fan tray assembly, the 9U backplane assembly and the 4U backplane assembly, with cabling either routed out through the shroud or terminated with connections on the shroud.

2. Added absorber material to the rear of the shroud. Material is ETS-Lindgren PN FL-1125CL. This is a flat laminate absorber made from three layers of carbon impregnated foam with a thickness of 2.9 cm.

3. Added 5 ferrite beads on cables ANT1 - ANT8, A109PRBT1 and A109PRBT2 at exit from shroud. Ferrites are FairRite Pns 2643802702 (1 each), 2643167851 (1 each), 0443167251 (1 each) and 0443164151 (2 each).

4. Added shield to the Fast Ethernet and DS-3 cables between 9U backplane and the top of the rack.

5. Modified the LO primary and redundant modules to enable or disable the LO outputs when not being used.

6. Routing of coax cabling on the LO Module was modified, with 6 cables now routed on the topside of the board connected between the right angle edge connector and right angle PCB mounted connectors

G. Disposition of Test Sample

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to BeamReach Networks upon completion of testing.

III. Electromagnetic Compatibility RF Power Output Requirements

III. Electromagnetic Compatibility RF Power Output Requirements

A. RF Power Output

Technical Specifications: §2.1046 and §27.50(a)(1)

Test equipment: Test equipment for RF Power Output is listed in Section VIII of this report.

Photograph:

Photograph 1. RF Power Output Test Setup Photo

III. Electromagnetic Compatibility RF Power Output Requirements

Measurement Procedures: As required by 47 CFR 2.1046, *RF power output measurements* were made at the RF output terminals using a Directional Coupler and a Power Meter connected with a Sensor.

Set a 32.1 dB Reference level Offset to Power Meter. The EUT was set to transmit within the operating frequency range. The EUT was set to maximum output power. Documented the Power Meter reading of the RF output Power in tabular format. Repeated measurements with Block B operating frequency range.

Results: Equipment complies with 47CFR 2.1046 and 27.50(a)(1). The BRN-5000 Base Station does not exceed 2000 Watts peak (EIRP) at the carrier frequency.

All RF Power output measurements were direct connection to RF output Terminal of EUT.

The following page show measurements of RF Power output which is recorded below:

WCS Block A: 2305-2310 and 2350-2355 MHz

WCS Block B: 2310-2315 and 2355-2360 MHz

Photograph 2. Maximum Power Output

Frequency Range (MHz)	Measured Output Power (dBm)	50% Duty Cycle (dB)	Antenna Gain (dBi)	Total Output Power (dBm/Watts)
2305-2310 and 2350-2355	34	3	17	54 / 251.2
2310-2315 and 2355-2360	33	3	17	53 / 199.5

Test Engineer: Kerwinn Corpuz

Test Date: 07/21/03

IV. Electromagnetic Compatibility Modulation Characteristics Requirements

IV. Electromagnetic Compatibility Modulation Characteristics Requirements

A. Modulation Characteristics

Technical Specifications: §2.1047

Test equipment: Test equipment for Modulation Characteristics is listed in Section VIII of this report.

Measurement Procedures: As required by 47 CFR 2.1047, *Modulation Characteristics measurements* were made at the RF output terminals.

Results: EUT is not required for this test.
The EUT contains no analog voice.

V. Electromagnetic Compatibility Occupied Bandwidth Requirements

V. Electromagnetic Compatibility Occupied Bandwidth Requirements

A. Occupied Bandwidth

Technical Specifications: §2.1049

Test equipment: Test equipment for Occupied Bandwidth is listed in Section VIII of this report.

Photograph:

Photograph 3. Occupied Bandwidth Test Setup Photo

V. Electromagnetic Compatibility Occupied Bandwidth Requirements

Measurement Procedures:

As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made at the RF output terminals using a Directional Coupler and a Spectrum Analyzer.

Set a 22.1 dB Reference level Offset and RBW = VBW = 100 kHz to Spectrum Analyzer. The EUT was set to transmit in the operating frequency range with maximum power. Activated the 99% Occupied Bandwidth of the Spectrum Analyzer function. Plotted the Occupied Bandwidth Emission graph. Repeated measurements with paired channel and Block B.

Results:

Equipment complies with Section 2.1049. The following pages show measurements of 99% Occupied Bandwidth plots which are recorded below:

WCS Block A	
Plot #	**Comment**
1	Lower pair Channel: 99% Occupied Bandwidth at center frequency of 2307.5 MHz
2	Higher pair Channel: 99% Occupied Bandwidth at center frequency of 2352.5 MHz
WCS Block B	
Plot #	**Comment**
3	Lower pair Channel: 99% Occupied Bandwidth at center frequency of 2312.5 MHz
4	Higher pair Channel: 99% Occupied Bandwidth at center frequency of 2357.5 MHz

V. Electromagnetic Compatibility Occupied Bandwidth Requirements

Plot #1: Block A Lower pair Channel 99% Occupied BW

Plot #2: Block A Higher pair Channel 99% Occupied BW

V. Electromagnetic Compatibility Occupied Bandwidth Requirements

Plot #3: Block B Lower pair Channel 99% Occupied BW

Plot #4: Block B Higher pair Channel 99% Occupied BW

Test Engineer: Kerwinn Corpuz

Test Date: 07/21/03

VI. Electromagnetic Compatibility Emissions Requirements

VI. Electromagnetic Compatibility Emissions Requirements

A. Spurious Emissions at Antenna Terminals

Technical Specifications: §2.1051 and §27.53(a)(1) and (3)

Test equipment: Test equipment for Spurious Emissions at Antenna Terminals is listed in Section VIII of this report.

Photograph:

Photograph 4. Spurious Emissions at Antenna Terminals Test Setup Photo

VI. Electromagnetic Compatibility Emissions Requirements

Measurement Procedures: As required by 47 CFR 2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Directional Coupler, Power Splitter and a Spectrum Analyzer.

Set the Reference Level Offset of 17.6 dB with frequency range of 30M - 1 GHz and 22.1 dB with frequency range of 1 - 24 GHz. A Power Splitter was use during the sweeping of 30M - 1 GHz and Directional Coupler with the frequency of 1 - 24 GHz. Spectrum Analyzer was set to RBW = VBW = 100 kHz. The EUT was set to transmit in the operating frequency range. Sweep the frequency range from 30 MHz to the 10th harmonic of the fundamental. The Display Line was set as the limit line depending on the frequency range to be investigated. Plotted the Spurious Emissions graph. Repeated measurements for both WCS Block A and WCS Block B. All measurements were made with average detector.

Measured maximum Output Power of the EUT at antenna port: 5 Watts or 37 dBm

Emission Limit between the frequency of 2320 - 2345 MHz: 80 + 10 log (P) dB
Po - (80 + 10log 5) = 37dBm - (87 dB) = -50 dBm

Emission Limit below the frequency of 2300 MHz and above the frequency of 2370 MHz: 70 + 10 log (P) dB
Po - (70 + 10log 5) = 37dBm - (77 dB) = -40 dBm

Emission Limit between the frequency of 2300 - 2320 MHz and 2345 - 2370 MHz: 43 + 10 log (P) dB
Po - (43 + 10log 5) = 37 dBm - (50 dB) = -13 dBm

Results: Equipment complies with Section 2.1051 and 27.53(a)(1) and (3). The following pages show measurements of Spurious Emission plots which are recorded below:

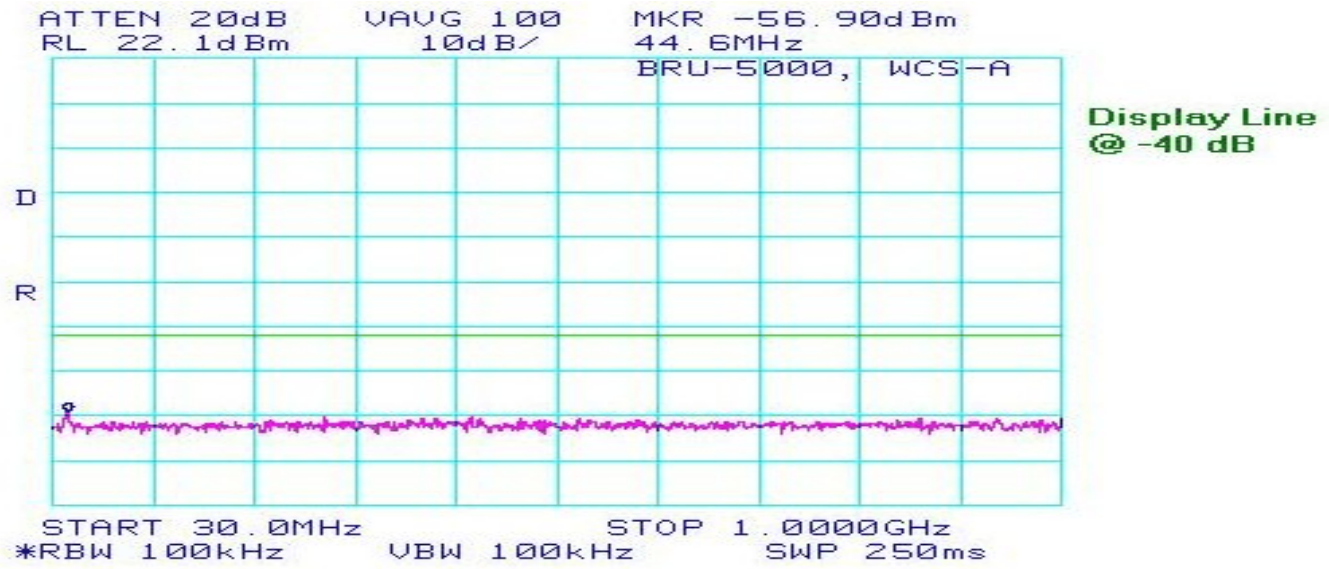
WCS Block A	
Plot #	**Comment**
5	Spurious Emissions between 30 M - 1 GHz with Display Line at -40 dBm
6	Spurious Emissions between 1 - 2.3 GHz with Display Line at -40 dBm
7	Spurious Emissions between 2.3 - 2.32 GHz with Display Line at -13 dBm
8	Spurious Emissions between 2.32 - 2.345 GHz with Display Line at -50 dBm
9	Spurious Emissions between 2.345 - 2.37 GHz with Display Line at -13 dBm
10	Spurious Emissions between 2.37 - 24 GHz with Display Line at -40 dBm

VI. Electromagnetic Compatibility Emissions Requirements

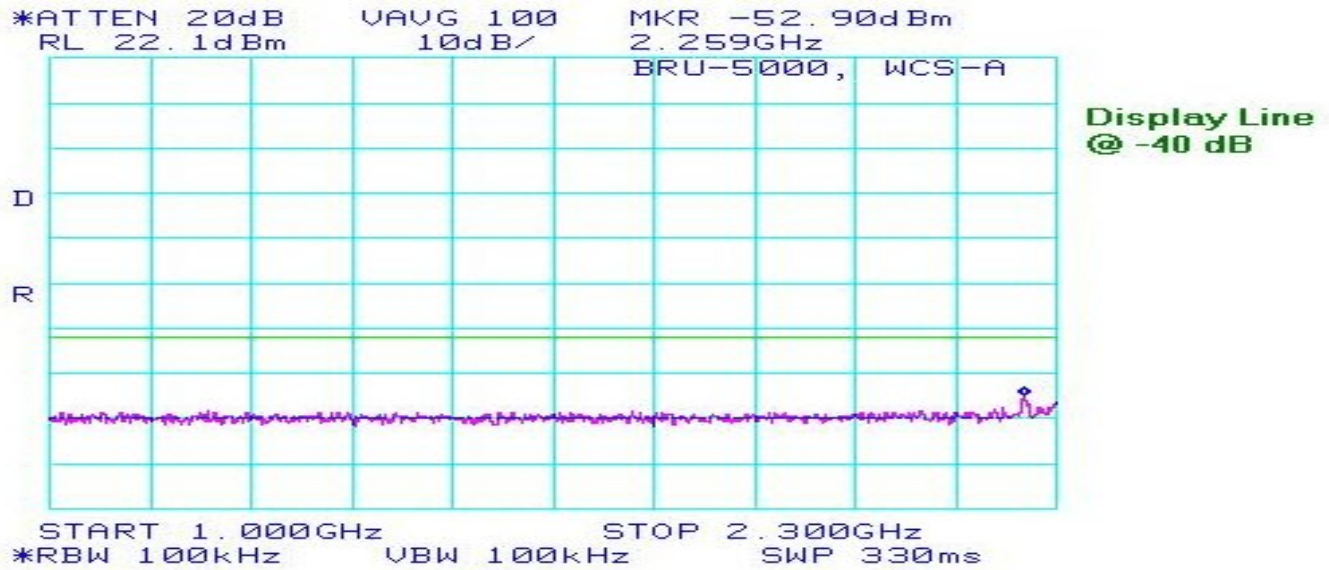
WCS Block B	
Plot #	**Comment**
11	Spurious Emissions between 30 M - 1 GHz with Display Line at -40 dBm
12	Spurious Emissions between 1 - 2.3 GHz with Display Line at -40 dBm
13	Spurious Emissions between 2.3 - 2.32 GHz with Display Line at -13 dBm
14	Spurious Emissions between 2.32 - 2.345 GHz with Display Line at -50 dBm
15	Spurious Emissions between 2.345 - 2.37 GHz with Display Line at -13 dBm
16	Spurious Emissions between 2.37 - 24 GHz with Display Line at -40 dBm

The following plots are included to illustrate compliance with the required rule parts.

VI. Electromagnetic Compatibility Emissions Requirements



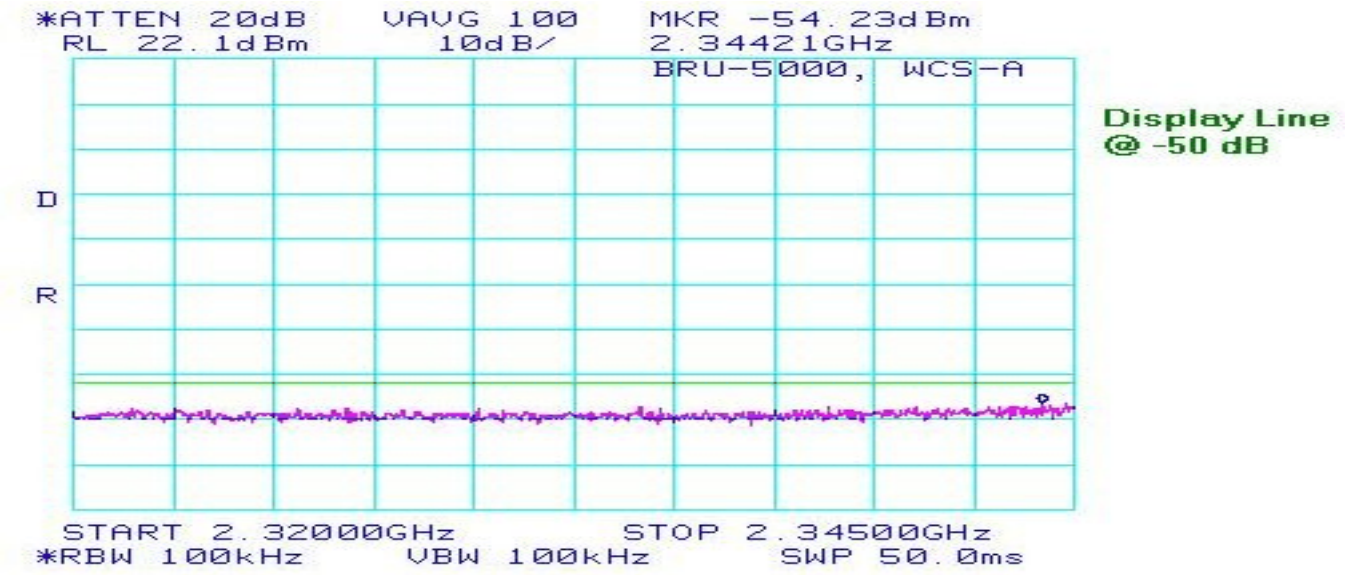
Plot #5: WCSA Spurious Emission 30 MHz - 1 GHz



Plot #6: WCSA Spurious Emission 1 - 2.3 GHz

VI. Electromagnetic Compatibility Emissions Requirements

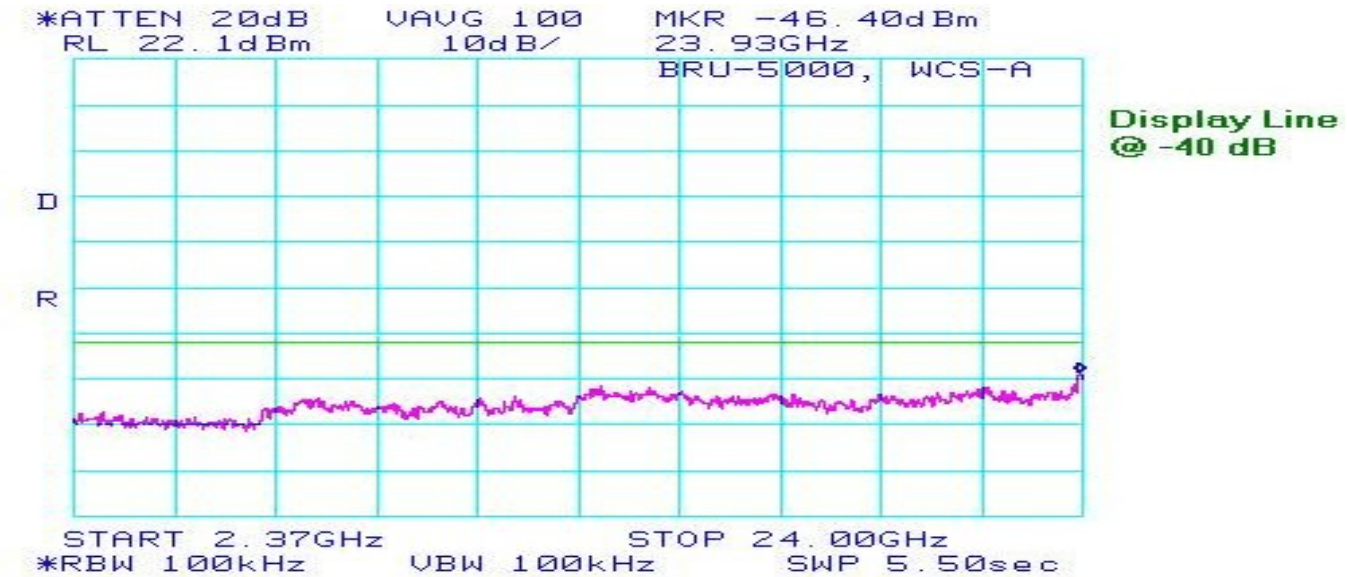
Plot #7: WCSA Spurious Emission 2.3 - 2.32 GHz



Plot #8: WCSA Spurious Emission 2.32 - 2.345 GHz

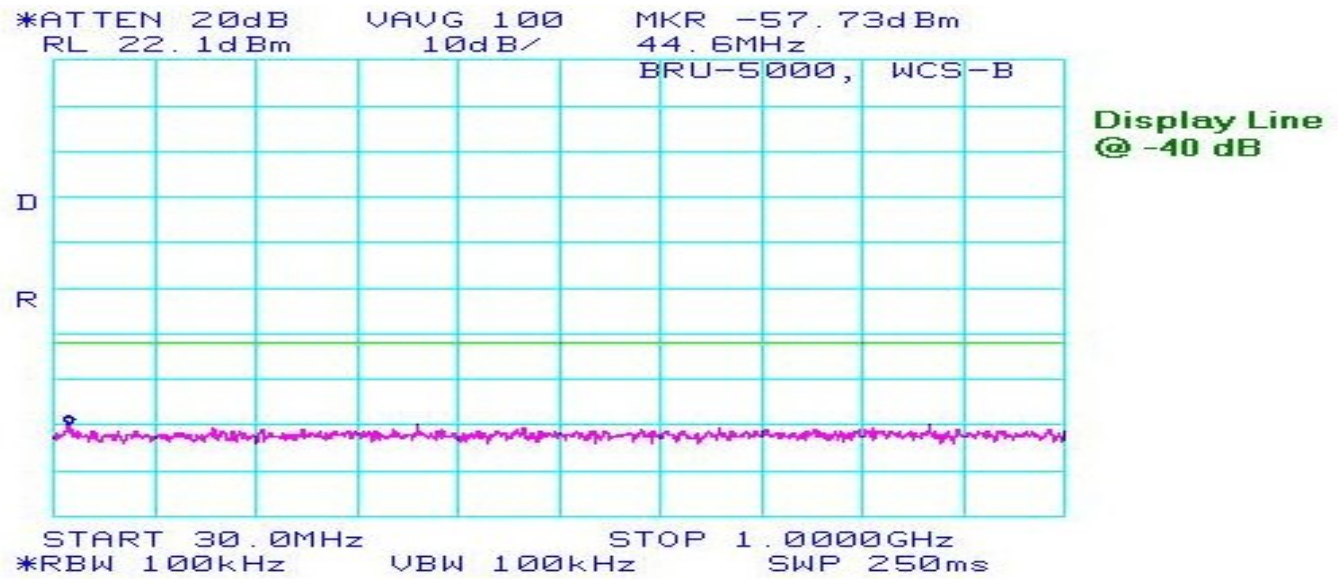
VI. Electromagnetic Compatibility Emissions Requirements

Plot #9: WCSA Spurious Emission 2.345 - 2.37 GHz

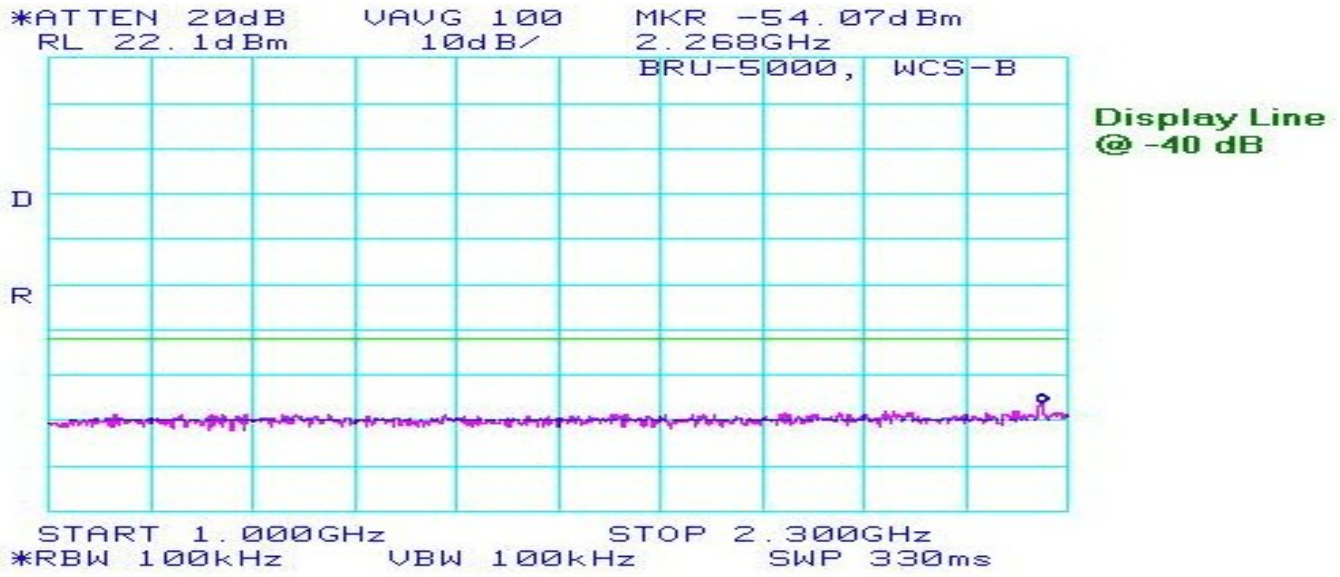


Plot #10: WCSA Spurious Emission 2.37 - 24 GHz

VI. Electromagnetic Compatibility Emissions Requirements



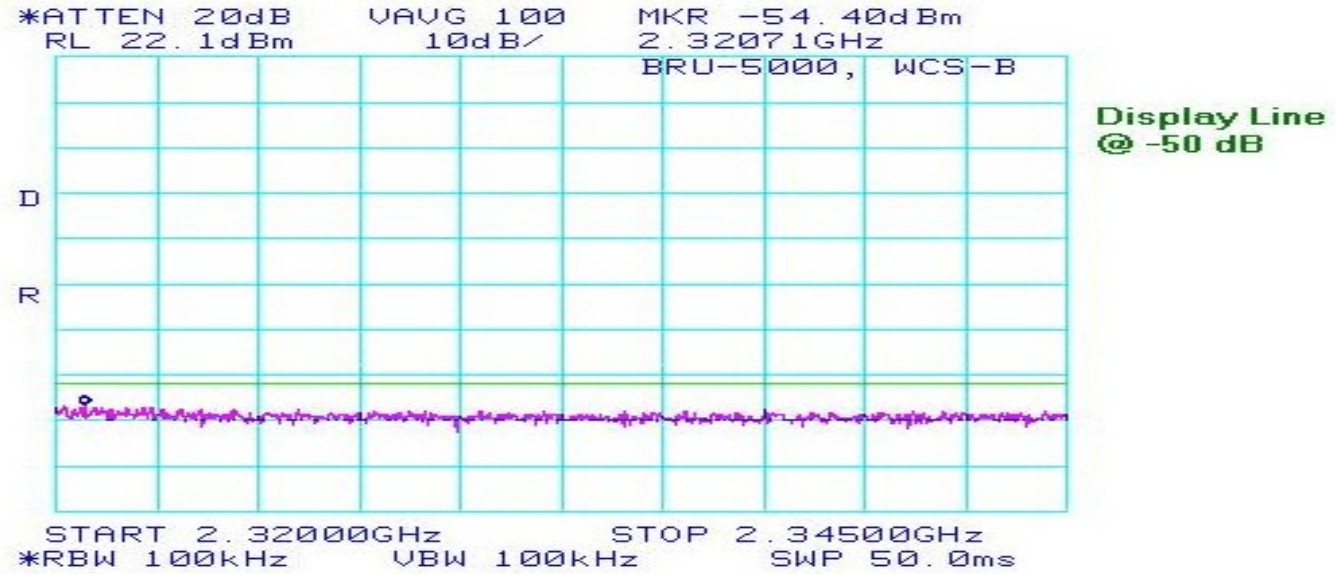
Plot #11: WCSB Spurious Emission 30 MHz - 1 GHz



Plot #12: WCSB Spurious Emission 1 - 2.3 GHz

VI. Electromagnetic Compatibility Emissions Requirements

Plot #13: WCSB Spurious Emission 2.3 - 2.32 GHz



Plot #14: WCSB Spurious Emission 2.32 - 2.345 GHz

VI. Electromagnetic Compatibility Emissions Requirements

Plot #15: WCSB Spurious Emission 2.345 - 2.37 GHz

Plot #16: WCSB Spurious Emission 2.37 - 24 GHz

Test Engineer: Kerwinn Corpuz

Test Date: 07/21/03

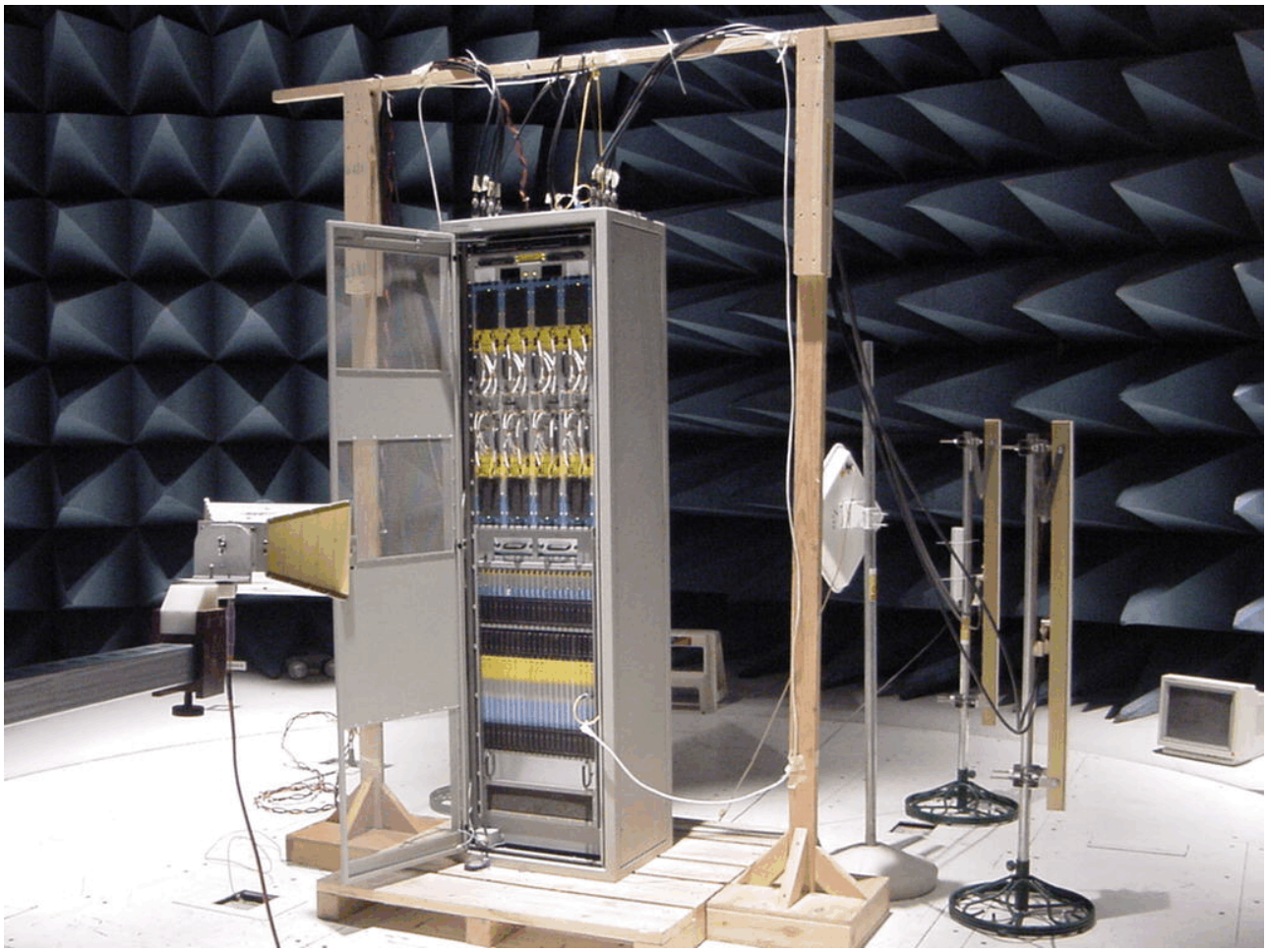
VI. Electromagnetic Compatibility Emissions Requirements

B. Radiated Emissions (Substitution Method)

Technical Specifications: §2.1053 and §27.53(a)(3)

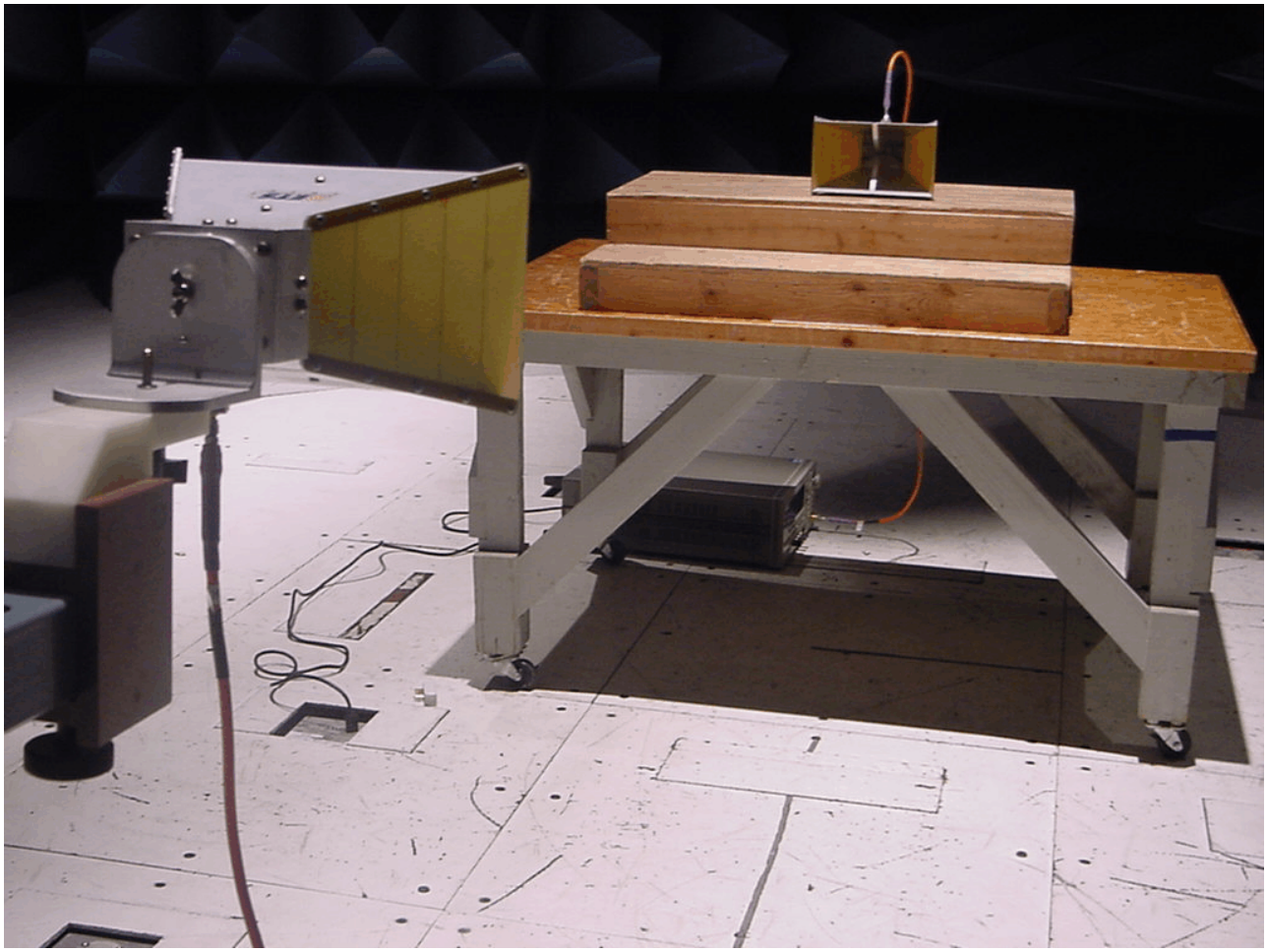
Test equipment: Test equipment for Radiated Emissions (Substitution Method) is listed in Section VIII this report.

Photograph:



Photograph 5. Radiated Emissions Test Setup Photo (1 - 24 GHz)

VI. Electromagnetic Compatibility Emissions Requirements



Photograph 6. Radiated Emissions Test Setup Photo (Substitution Method)

VI. Electromagnetic Compatibility Emissions Requirements

Measurement Procedures:

As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). The distance between the EUT and the test antenna is 3 meter. The EUT RF port was connected to its original antenna. Then set to transmit in the operating frequency range with maximum power output. Maximized each frequency emission that are detected by rotating the turntable to 360°and varying the test antenna from 1 to 4 meter height. Activate Spectrum Analyzer to average detector mode. Record reading in a tabular format. These steps were repeated with vertical and horizontal polarization, and the paired channel.

Once all emissions are collected and recorded, replaced the EUT with a substitution antenna connected to a 1.5 meter 2.92mm(K) cable and a signal generator. All test setup on the receiving side should be the same as it was when measuring the emissions of the EUT. Repeat all steps above except that the emissions will be compared with the signal generator's amplitude. Record reading in a tabular format.

The Radiated Spurious Emissions *Limit* is obtained by the following:

Measured maximum Output Power of the EUT at antenna port: 5 Watts or 37 dBm

Emission Limit below the frequency of 2300 MHz and above the frequency of 2370 MHz: 70 + 10 log (P) dB
Po - (70 + 10log 5) = 37dBm - (77 dB) = -40 dBm

Results:

Equipment complies with Section 2.1053 and 27.53(a)(3). The following pages show measurements of emissions data sheet which are recorded below:

VI. Electromagnetic Compatibility Emissions Requirements

Subject: Radiated Emissions (Substitution Method) Test Results

Specification: FCC Part 27 Subpart C, §2.1053 and §27.53(a)(3)

Frequency	Polarization	Spectrum Analyzer	Signal Generator	Cable Loss	Tx Ant. Gain	EIRP	Limit	Margin
(MHz)	V/H or SNF	(dBuV/m) AVG	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4615	SNF	-	-	-	-	-	-	-
6922.5	V	41	-63.4	1.94	10.51	-54.83	-40	-14.83
6922.5	H	35.5	-64	1.94	10.74	-55.2	-40	-15.2
9230	V	36	-61.5	2.69	11.07	-53.12	-40	-13.12
9230	H	36	-61.4	2.69	11.06	-53.03	-40	-13.03
11537.5	SNF	-	-	-	-	-	-	-
13845	SNF	-	-	-	-	-	-	-
16152.5	SNF	-	-	-	-	-	-	-
18460	SNF	-	-	-	-	-	-	-
20767.5	SNF	-	-	-	-	-	-	-
23075	SNF	-	-	-	-	-	-	-
Below are LO frequencies in MHz								
1957.5	V	47.3	-61	0.32	7.92	-53.4	-40	-13.4
1957.5	H	52.7	-51	0.32	7.92	-43.4	-40	-3.4
3915	V	45.8	-57	1.07	9.45	-48.62	-40	-8.62
3915	H	45	-58.5	1.07	9.45	-50.12	-40	-10.12

Table 4. WCS-A Low Pair Test Results

Note: V = vertical, H = horizontal and SNF = spectrum noise floor

Test Engineer: Kerwinn Corpuz

Test Date: 07/07/03

VI. Electromagnetic Compatibility Emissions Requirements

Subject: Radiated Emissions (Substitution Method) Test Results

Specification: FCC Part 27 Subpart C, §2.1053 and §27.53(a)(3)

Frequency	Polarization	Spectrum Analyzer	Signal Generator	Cable Loss	Tx Ant. Gain	EIRP	Limit	Margin
(MHz)	V/H or SNF	(dBuV/m) AVG	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4705	SNF	-	-	-	-	-	-	-
7057.5	V	41	-60.5	2.16	11.16	-51.5	-40	-11.5
7057.5	H	39	-61	2.16	11.06	-52.1	-40	-12.1
9410	V	35.5	-61.7	2.76	11.36	-53.1	-40	-13.1
9410	H	35.3	-61.2	2.76	11.42	-52.54	-40	-12.54
11762.5	SNF	-	-	-	-	-	-	-
14115	SNF	-	-	-	-	-	-	-
16467.5	SNF	-	-	-	-	-	-	-
18820	SNF	-	-	-	-	-	-	-
21172.5	SNF	-	-	-	-	-	-	-
23525	SNF	-	-	-	-	-	-	-
Below are LO frequencies in MHz								
2002.5	V	42	-67	0.33	8.01	-59.32	-40	-19.32
2002.5	H	54.3	-52.4	0.33	8.01	-44.72	-40	-4.72
4005	V	46	-57	1.1	9.41	-48.69	-40	-8.69
4005	H	52	-51.6	1.1	9.41	-43.29	-40	-3.29

Table 5. WCS-A High Pair Test Results

Note: V = vertical, H = horizontal and SNF = spectrum noise floor

Test Engineer: Kerwinn Corpuz

Test Date: 07/07/03

VI. Electromagnetic Compatibility Emissions Requirements

Subject: Radiated Emissions (Substitution Method) Test Results

Specification: FCC Part 27 Subpart C, §2.1053 and §27.53(a)(3)

Frequency	Polarization	Spectrum Analyzer	Signal Generator	Cable Loss	Tx Ant. Gain	EIRP	Limit	Margin
(MHz)	V/H or SNF	(dBuV/m) AVG	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4625	SNF	-	-	-	-	-	-	-
6937.5	V	41	-63	1.94	10.51	-54.43	-40	-14.43
6937.5	H	35.5	-64	1.94	10.74	-55.2	-40	-15.2
9250	V	36	-61.2	2.69	11.07	-52.82	-40	-12.82
9250	H	36	-61.2	2.69	11.06	-52.83	-40	-12.83
11562.5	SNF	-	-	-	-	-	-	-
13875	SNF	-	-	-	-	-	-	-
16187.5	SNF	-	-	-	-	-	-	-
18500	SNF	-	-	-	-	-	-	-
20812.5	SNF	-	-	-	-	-	-	-
23125	SNF	-	-	-	-	-	-	-
Below are LO frequencies in MHz								
1957.5	V	47.3	-61	0.32	7.92	-53.4	-40	-13.4
1957.5	H	52.7	-51	0.32	7.92	-43.4	-40	-3.4
3915	V	45.8	-57	1.07	9.45	-48.62	-40	-8.62
3915	H	45	-58.5	1.07	9.45	-50.12	-40	-10.12

Table 6. WCS-B Low Pair Test Results

Note: V = vertical, H = horizontal and SNF = spectrum noise floor

Test Engineer: Kerwinn Corpuz

Test Date: 07/07/03

VI. Electromagnetic Compatibility Emissions Requirements

Subject: Radiated Emissions (Substitution Method) Test Results

Specification: FCC Part 27 Subpart C, §2.1053 and §27.53(a)(3)

Frequency	Polarization	Spectrum Analyzer	Signal Generator	Cable Loss	Tx Ant. Gain	EIRP	Limit	Margin
(MHz)	V/H or SNF	(dBuV/m) AVG	(dBm)	(dB)	(dBi)	(dBm)	(dBm)	(dB)
4715	SNF	-	-	-	-	-	-	-
7072.5	V	44	-58	2.16	11.16	-49	-40	-9
7072.5	H	41	-62.5	2.16	11.06	-53.6	-40	-13.6
9430	V	35.5	-61.4	2.76	11.36	-52.8	-40	-12.8
9430	H	37	-59	2.76	11.42	-50.34	-40	-10.34
11787.5	SNF	-	-	-	-	-	-	-
14145	SNF	-	-	-	-	-	-	-
16502.5	SNF	-	-	-	-	-	-	-
18860	SNF	-	-	-	-	-	-	-
21217.5	SNF	-	-	-	-	-	-	-
23575	SNF	-	-	-	-	-	-	-
Below are LO frequencies in MHz								
2002.5	V	42	-67	0.33	8.01	-59.32	-40	-19.32
2002.5	H	54.3	-52.4	0.33	8.01	-44.72	-40	-4.72
4005	V	46	-57	1.1	9.41	-48.69	-40	-8.69
4005	H	52	-51.6	1.1	9.41	-43.29	-40	-3.29

Table 7. WCS-B High Pair Test Results

Note: V = vertical, H = horizontal and SNF = spectrum noise floor

Test Engineer: Kerwinn Corpuz

Test Date: 07/07/03

VII. Electromagnetic Compatibility Frequency Stability Requirements

VII. Electromagnetic Compatibility Frequency Stability Requirements

A. Frequency Stability

Refer to Appendix A (Customer Supplied Documentation) for compliance of FCC Rule Part/Section 2.1055 (d)(2).

VIII. Test Equipment

VIII. Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

Test Name: RF Power Output					Test Date(s): 7/21/03
MET ID #	EQUIPMENT	MANUFACTURER	MODEL #	LAST CAL	CAL DUE
1S2293	SPECTRUM ANALYZER 9kHz-40GHz	HEWLETT PACKARD	8564E	27-AUG-02	27-AUG-03
1S2276	POWER METER	HEWLETT PACKARD	E4418B	28-AUG-02	28-AUG-03
1S2275	POWER SENSOR	HEWLETT PACKARD	8485A	26-AUG-02	26-AUG-03
1S2034	DIRECTIONAL COUPLER	KRYTAR	101020020	4-MAR-03	4-MAR-04
Test Name: Conducted measurements at RF port					Test Date(s): 7/21/03
MET ID #	EQUIPMENT	MANUFACTURER	MODEL #	LAST CAL	CAL DUE
1S2293	SPECTRUM ANALYZER 9kHz-40GHz	HEWLETT PACKARD	8564E	27-AUG-02	27-AUG-03
1S2276	POWER METER	HEWLETT PACKARD	E4418B	28-AUG-02	28-AUG-03
1S2275	POWER SENSOR	HEWLETT PACKARD	8485A	26-AUG-02	26-AUG-03
1S2034	DIRECTIONAL COUPLER	KRYTAR	101020020	4-MAR-03	4-MAR-04
1S2368	POWER SPLITTER	HEWLETT PACKARD	11667A	SEE NOTE	
–	25W 10dB ATTENUATOR	WEINSCHEL CORP.	33-10-34	SEE NOTE	
Test Name: Radiated Spurious Emissions					Test Date(s): 7/7/03 & 7/8/03
MET ID #	EQUIPMENT	MANUFACTURER	MODEL #	LAST CAL	CAL DUE
1S2293	SPECTRUM ANALYZER 9kHz-40GHz	HEWLETT PACKARD	8564E	27-AUG-02	27-AUG-03
1S2278	SWEPT SIGNAL GENERATOR	AGILENT	83650B	27-AUG-02	27-AUG-03
1S2198	Tx Horn Antenna	EMCO	3115	04-JUN-03	04-JUN-04
1U0007	Rx Horn Antenna	EMCO	3115	06-FEB-03	06-FEB-04
1S2202	Rx Horn Antenna	EMCO	3116	12-MAR-03	12-MAR-04
1S2121	Pre Amplifier	HEWLETT PACKARD	8449B	16-SEP-02	16-SEP-03
--	HPF	MICRO-TRONICS	HPM13145	SEE NOTE	
--	HPF	MICRO-TRONICS	HPM13146	SEE NOTE	
Test Name: Frequency Stability					Test Date(s): 9/4/03
MET ID #	EQUIPMENT	MANUFACTURER	MODEL #	LAST CAL	CAL DUE
The testing was performed by the customer using customer-supplied equipment; no MET equipment was used.					

Table 8. Test Equipment

Note: Functionally test equipment is verified using calibrated instrumentation at the time of testing.

IX. Certification Label & User's Manual Information

IX. Certification Label & User's Manual Information

A. Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

IX. Certification Label & User's Manual Information

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a proviso that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is

IX. Certification Label & User's Manual Information

to be operated.[1] In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, or the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

§ 2.907 Certification.

a. Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart C (of Part 15), which deals with intentional radiators.

IX. Certification Label & User's Manual Information

B. Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(ii Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(ii A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(ii All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

IX. Certification Label & User's Manual Information

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.
– Increase the separation between the equipment and receiver.
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
– Consult the dealer or an experienced radio/TV technician for help.

X. Appendix A (Customer Supplied Documentation)

Figure 1. Frequency Stability Test Set-up – Complete View

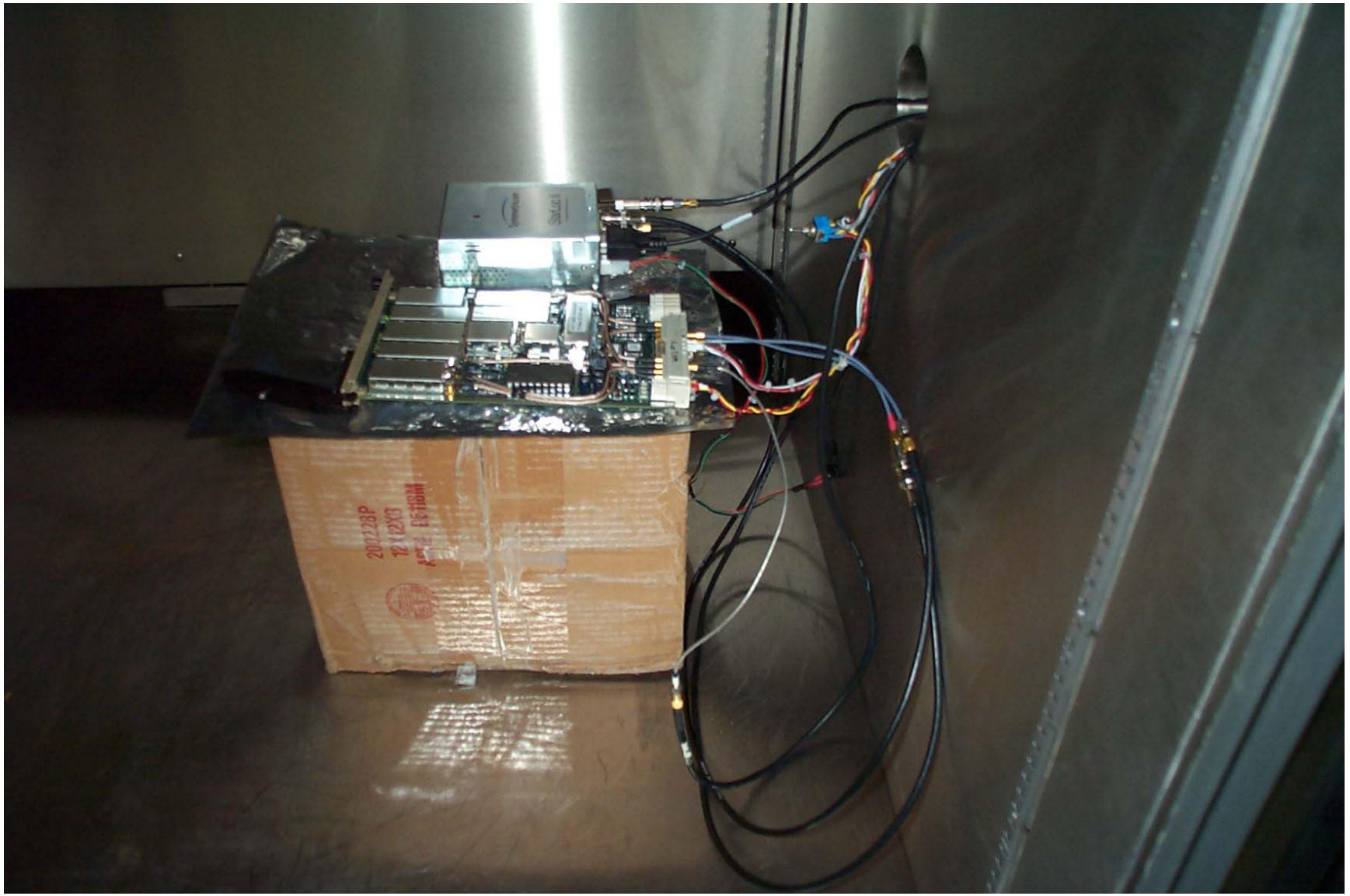


Figure 2. Frequency Stability Test Set-up – close-up of DUT

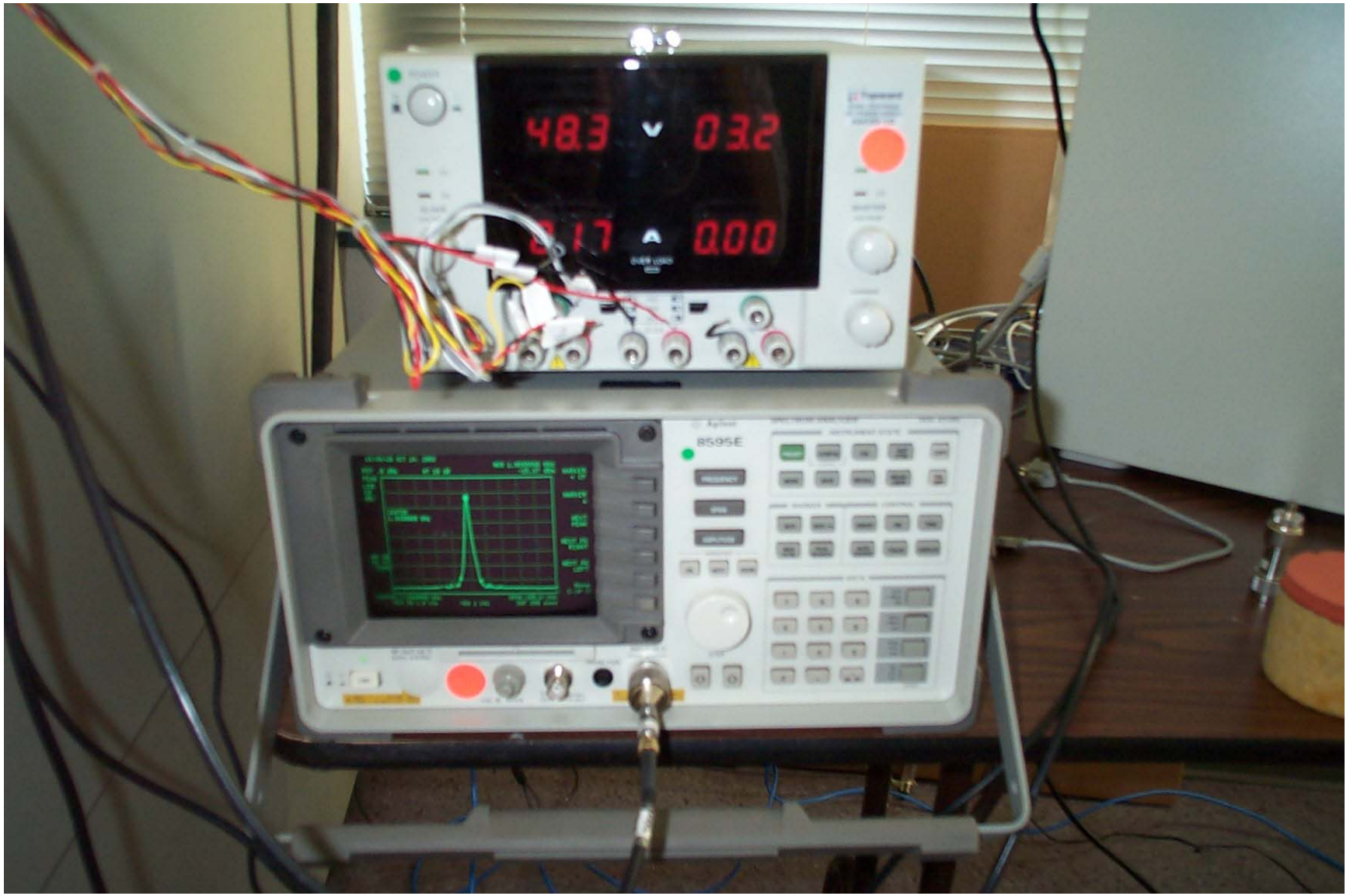


Figure 3. Frequency Stability Test Set-up – close-up of Test Equipment

Figure 4. Frequency Stability Test Set-up – temperature chamber door closed

Beamreach Base Station Frequency Stability Test

Date: 9/4/03 Tested by: Steve Lin

Test Description:

The frequency stability of the Beamreach base station is set by a GPS time/frequency standard. This unit provides a 10MHz output that has been locked to the frequency references onboard the GPS satellites. The local oscillators within the base station are then locked to this very stable reference frequency.

The frequency vs temperature stability of the Beamreach base station was measured by putting the LO reference and LO generation circuitry in a temperature chamber, running them over the temperature range and measuring the frequency of the LO output. The required components of the base station consisted of the GPS time/frequency standard and the LO module. A spectrum analyzer was used to measure the output frequency of the LO.

Hardware Tested:

LO module S/N 007; and Starloc II GPS module manufactured by Datum Corporation (now Symmetricom).

Test Results:

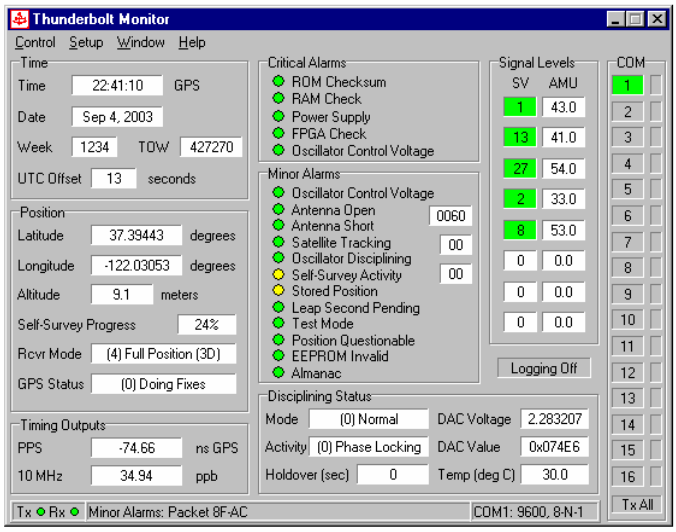
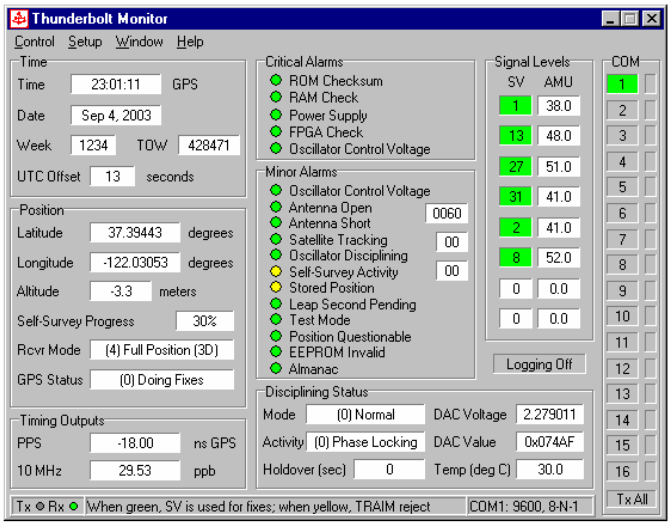
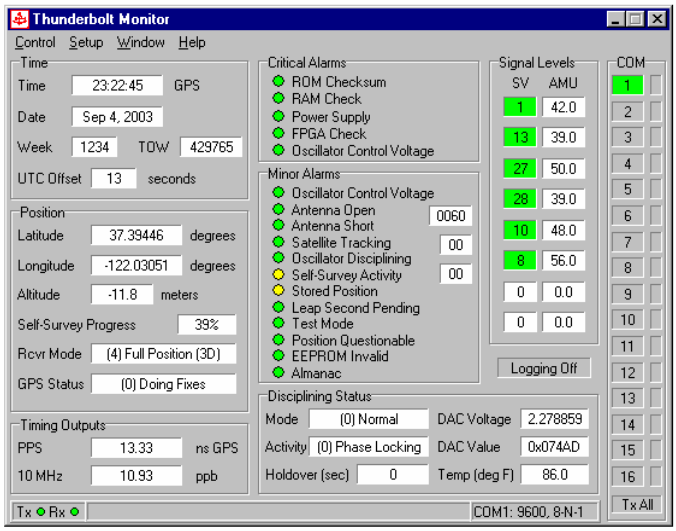
Temperature (deg C)	Measured LO Frequency (Hz)	Frequency Error (Hz)
-20	1,960,000,000	0
-10	1,959,999,994	-6
0	1,959,999,997	-3
10	1,959,999,994	-6
20	1,959,999,997	-3
30	1,959,999,997	-3
40	1,959,999,994	-6
50	1,959,999,994	-6
60	1,959,999,994	-6

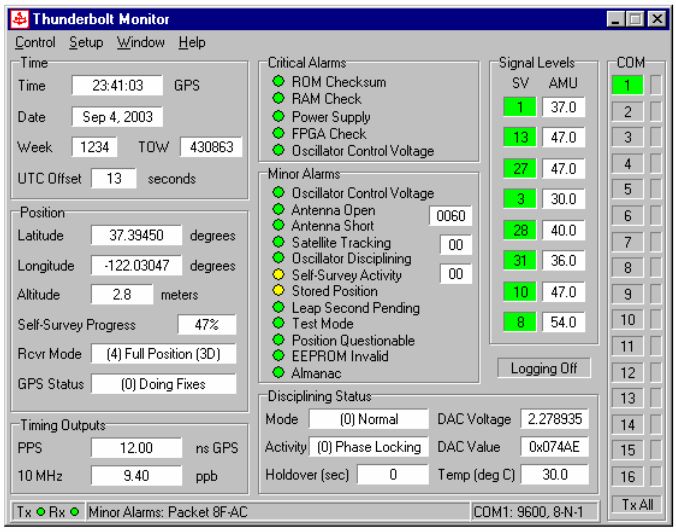
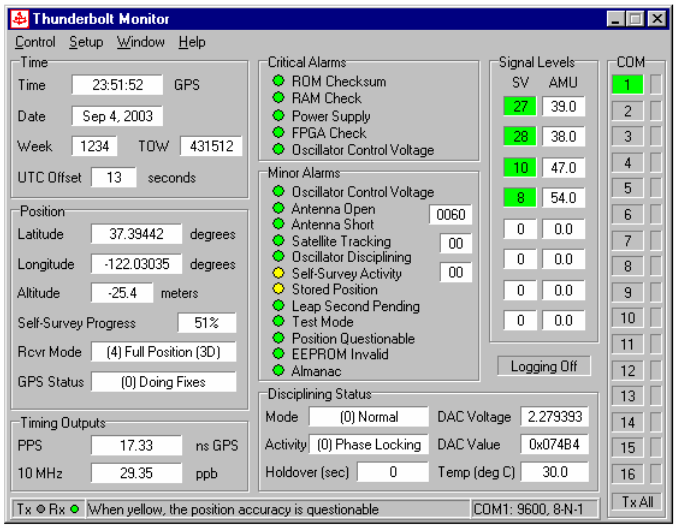
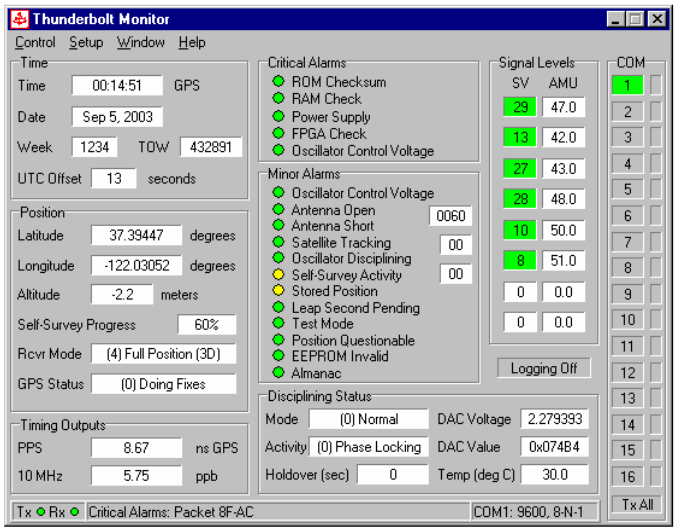
The LO was tuned to a center frequency of 1.96GHz.

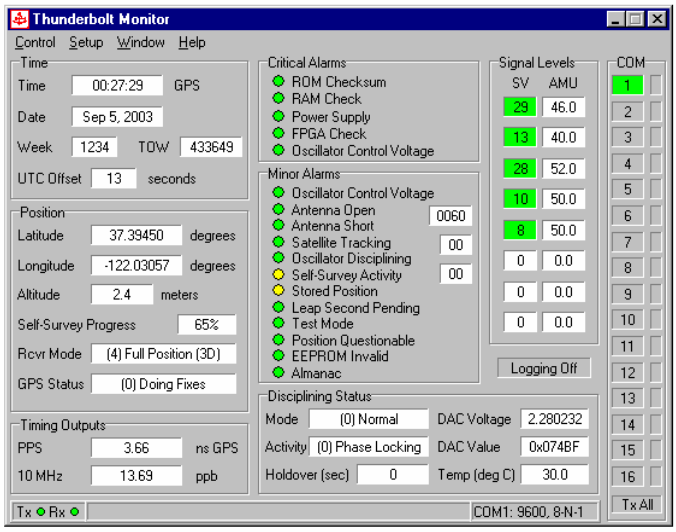
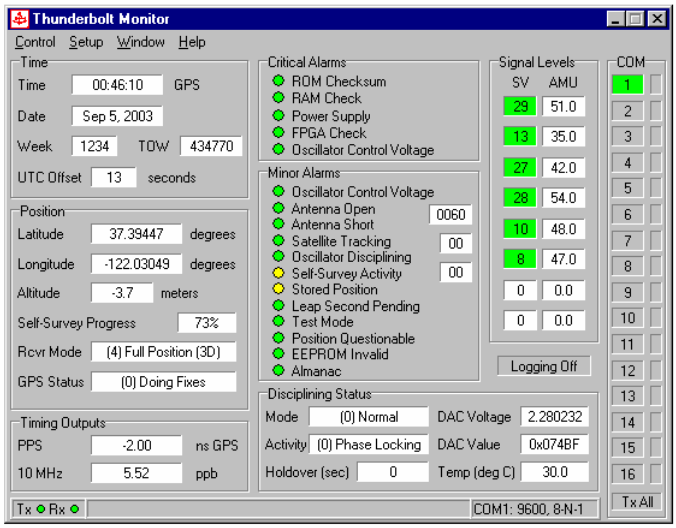
The test data shows that the worst case frequency deviation was 6Hz. FCC part 27.54 states that the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation. The emission bandwidth is 3.75MHz within the 5MHz band resulting in 625kHz guard bands between the emissions and the band edges. The 6Hz frequency deviation over temperature is a very small number compared to the 625kHz guard band, ensuring that the FCC specification is met.

Test Data:

The complete set of test data, including the GPS unit status is given below.

Temp	Measured LO Frequency	GPS Unit Status
-20°C	1,960,000,000 Hz	
-10°C	1,959,999,994 Hz	
0°C	1,959,999,997 Hz	

Temp	Measured LO Frequency	GPS Unit Status
10°C	1,959,999,994 Hz	
20°C	1,959,999,997 Hz	
30°C	1,959,999,997 Hz	

Temp	Measured LO Frequency	GPS Unit Status
40°C	1,959,999,994 Hz	
50°C	1,959,999,994 Hz	
60°C	1,959,999,994 Hz