Radioframe Networks, Inc.

DH2

January 15, 2003

Report No. RAFN0023

Report Prepared By:



1-888-EMI-CERT

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Certificate of Test

Issue Date: July 01, 2003 Radioframe Networks, Inc. Model : DH2

Emissions

Description	Pass	Fail
FCC 15.247, Power Spectral Density	\boxtimes	
FCC 15.247, Spurious RF Conducted Emissions	\boxtimes	
FCC 15.247, Band Edge Compliance	\boxtimes	
FCC 15.247, Peak Output Power	\boxtimes	
FCC 15.247, Occupied Bandwidth	\boxtimes	
FCC 15.247, Spurious Radiated Emissions	\boxtimes	
FCC 15.207, AC Power Line Conducted Emissions	\boxtimes	

The equipment was tested in the configuration and mode(s) of operation provided by the client. The specific tests and test levels were specified by the client. Any additional tests, or product configurations that should be tested are the responsibility of the client. Product compliance is the responsibility of the client.

Modifications made to the product

• No EMI suppression devices were added or modified. The EUT was tested as delivered.

Deviations to the test standard

• No deviations were made to the test standard

Approved By:

1.1/-

Greg Kiemel, Director of Engineering

This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.



Revision Number	Description	Date	Page Number
00	None		



FCC: The Open Area Test Sites, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files.

TCB: Northwest EMC has been accredited by ANSI to ISO/IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

A2LA: Accreditation has been granted to Northwest EMC, Inc. to perform the Electromagnetic Compatibility (EMC) tests described in the Scope of Accreditation. Assessment performed to ISO/IEC 17025. Certificate Number: 1936-01, Certificate Number: 1936-02, Certificate Number 1936-03

Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body. (A2LA)

TÜV Product Service: Included in TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements. Certificate No. USA0302C

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.











NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).	(N) NEMKO
Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.	2
Industry Canada: Accredited by Industry Canada for performance of radiated measurements. Our open area test sites comply with RSP 100, Issue 7, section 3.3.	*
VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. <i>(Registration Nos Evergreen: C-1071 and R-1025, Trails End: C-694 and R-677, Sultan: C-905, R-871 and R-1172, North Sioux City C-1246, R-1185 and R-1217)</i>	VCI
BSMI: Northwest EMC has been designated by NIST and validated by C- Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.	BSMI
CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S EU Mutual Recognition Agreement	CE
GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification	F

Northwest

Scope of Accreditations

Revision 06/24/03

	FCC	NIST	TUV PS	TUV Rheinland	Nemko	Technology International	Industry Canada	BSMI	vcci	GOST	NATA
IEC 1000-4-2			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-4-3			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-4-4			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-4-5			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-4-6			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-4-8			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-4-11			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-3-2			\checkmark	\checkmark	\checkmark	\checkmark					
IEC 1000-3-3			\checkmark	\checkmark	\checkmark	\checkmark					
AS/NZS 3548											\checkmark
CNS 13438								\checkmark			
ISO/IEC Guide 25			\checkmark	\checkmark	\checkmark	 		\checkmark			
ISO/IEC17025			\checkmark	\checkmark	\checkmark	\checkmark					
Radiated Emissions			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
Conducted Emissions			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
OATS Sites	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
Hillsboro 5-Meter Chamber (EV01)	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
TCB for Licensed Transmitters	\checkmark										
TCB for un-Licensed Transmitters	\checkmark										
Cab for R&TTE		\checkmark									
CAB for EMC		\checkmark									



Scope of Accreditations (A2LA)

Revision 06/24/03

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

NORTHWEST EMC Evergreen Facility 22975 NW Evergreen Pkwy #400 Hillsboro, OR 97124 David Tolman Phone: 503 844 4066

ELECTRICAL (EMC)

Valid until: July 31, 2004

Certificate Number: 1936-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following <u>Electromagnetic Compatibility (EMC) tests</u>:

EMC Standards

Title

Radiated & Conducted Emissions

CFR 47, FCC Part 15 using ANSI C63.4	American National Standard for methods of measurement of radio-noise emissions for low-voltage electrical and electronic equipment in the range of 9 kHz to 40GHz.
CISPR 22	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
CNS 13438	Limits and methods of measurement of radio interference characteristics of information technology equipment.
EN 55022	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
Canada ICES-003	Digital apparatus
AS/NZS 3548	Australian/New Zealand Standard Limits and methods of measurement of radio disturbance characteristics of information technology equipment
Canada ICES-001	Industrial, scientific and medical radio frequency generators
CNS 13803	Industrial, Scientific and Medical Instrument

Northwest EMC	Scope of Accreditations (A2LA)	Revision 06/24/03
AS/NZS 2064	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	
EN 61000-6-3	Electromagnetic capability – Generic emission standard. Part 1: Residential, commercial and light industry. (I.S.)	
EN 61000-6-4	Electromagnetic compatibility – Generic emission standard. Part 2: Industrial environment	
VCCI V-3/99.05	Technical Requirements	
VCCI V-4/99.05	Instruction for Test Conditions for Requirement under Test	
CISPR 11	Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	
EN 55011	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.	
EN 55103-1	Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1: Emission	
EN 61000-3-2	Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limits for harmonic current emissions	
EN 61000-3-3	Electromagnetic compatibility (EMC). Part 3: Limits Section 2: Limitation of voltage fluctuations and flicker in low-voltage supply systems.	
GR-1089 Section 3 (excluding analog voice band)	Bellcore electromagnetic compatibility and electrical safety – Generic criteria for network telecommunications equipment.	
Immunity		
EN 61000-4-2 AS/NZS 61000-4-2	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test – Basic EMC Publication	
EN 61000-4-3 AS/NZS 61000-4-3	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 3: Radiated, radio-frequency, electromagnetic field immunity test	
EN 61000-4-4 AS/NZS 61000-4-4	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 4: Electrical fast transient/burst immunity test – Basic EMC publication	

Scope of Accreditations (A2LA)

EN 61000-4-5 AS/NZS 61000-4-5	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques. Section 5: Surge immunity test.
EN 61000-4-6 AS/NZS 61000-4-6	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 6: Immunity to conducted disturbances, induce by radio-frequency fields.
EN 61000-4-8	Electromagnetic compatibility (EMC). Part 4: Testing and measurement techniques. Section 8: Power frequency magnetic field immunity test.
EN 61000-4-11	Electromagnetic Compatibility (EMC) Part 4: Testing and measurement techniques. Section 11: Voltage dips, short interruptions and voltage. Variations immunity tests.
EN 61000-6-1	Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 1: Immunity for residential, commercial and light-industrial environments
EN 61000-6-2	Electromagnetic Compatibility (EMC)- Part 6: Generic standards- Section 2: Immunity for industrial environments
IEEE/ANSI C62.41	IEEE recommended practice on surge voltages in low- voltage AC power circuits
Product Standards	
GR-1089 Section 3 (excluding voice band)	Bellcore electromagnetic compatibility and electrical safety – Generic criteria for network telecommunications equipment.
EN 61326	Electrical equipment for measurement, control and laboratory use – EMC requirements
EN 60601-1-2	Medical electrical equipment Part 1: general requirements for safety Section 2: Collateral standard: Electromagnetic compatibility – requirements and tests
EN 50130-4	Alarm Systems. Part 4: Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems.
EN 55103-2	Electromagnetic Compatibility – Product family standard for audio, video, audio-visual and entertainment lighting control professional use. Part 2: Immunity
EN 55024	Immunity Requirements for Information Technology Equipment – ITE Immunity

Other Standards

ETS 300 220	Electromagnetic compatibility and Radio spectrum matters (ERM); Short range devices; Technical characteristics and test methods for radio equipment to be used in the 25 MHZ to 1000 MHZ frequency range with power levels ranging up to 500 mW; Part 1: Parameters intended for regulatory purposes; Part 2: Supplementary parameters not intended for regulatory Purposes
ETS 300 224	Electro Magnetic Compatability and Radio Spectrum Matters; Paging Services; Technical characteristics and test methods for on site paging service devices.
ETS 300 328	Radio Equipment and Systems (RES); Wideband transmission systems; Technical characteristics and test conditions for data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques
ETS 300 489-1	Electro Magnetic Compatability and Radio Spectrum Matters; Common Technical Requirements
ETS 300 489-2	Specific conditions for radio paging equipment
ETS 300 489-3	Specific conditions for Short Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz
Canadian RSS-102	Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields
Canadian RSS-119	Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz
Canadian RSS-123	Low Power Licensed Radiocommunication Devices
Canadian RSS-139	Licensed Radiocommunications Devices in the Band 2400- 2483.5 MHz
Canadian RSS-210	Industry Canada – Low power license-exempt radio communication devices
SAE J1113-41	Radiated and conducted emissions.
SAE J1113-21	Radiated immunity absorber lined chamber (200 MHz – 1 GHz)
SAE J1113-23	Radiated immunity stripline method (only 10 kHz – 200 MHz @ 80 V/m)

Northwest **EMC**

Scope of Accreditations (A2LA)

SAE J1113-4 (only substitution method)	Conducted immunity Bulk Current Injection
SAE J1113-13	ESD
FCC 47 Parts 22 (Cellular), 24, 25, 26 & 27	TCB Scope B1 (Excluding SAR testing)
FCC 47 Parts 22 (Non-Cellular), 73,74,90,95 & 97	TCB Scope B2 (Excluding SAR testing)
FCC 47 Parts 80 & 87	TCB Scope B3 (Excluding SAR testing)
FCC 47 Parts 21, 74, 101	TCB Scope B4 (Excluding SAR testing)
Onsite Testing	
EN61000-6-2	Generic Immunity Standard for Industrial Applications
EN61000-6-4	Generic Emissions Standard for Industrial Applications



What is measurement uncertainty?

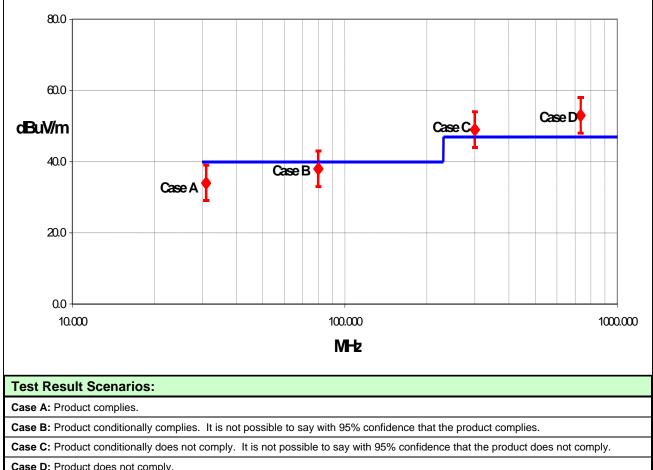
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and measurement uncertainty, then test results can be interpreted from the diagram below.



Case D: Product does not comply.



Radiated Emissions ≤ 1 GHz		Value (dB)				
	Probability Biconical		Log Pe	eriodic	D	ipole	
	Distribution	ion Antenna		Antenna		Antenna	
Test Distance		3m	10m	3m	10m	3m	10m
Combined standard	normal	+ 1.86	+ 1.82	+ 2.23	+ 1.29	+ 1.31	+ 1.25
uncertainty <i>u_c(y)</i>		- 1.88	- 1.87	- 1.41	- 1.26	- 1.27	- 1.25
Expanded uncertainty U	normal (k=2)	+ 3.72	+ 3.64	+ 4.46	+ 2.59	+ 2.61	+ 2.49
(level of confidence \approx 95%)		- 3.77	- 3.73	-2.81	- 2.52	- 2.55	- 2.49

Radiated Emissions > 1 GHz	Value (dB)		
	Probability	Without High	With High
	Distribution	Pass Filter	Pass Filter
Combined standard uncertainty <i>u_c(y)</i>	normal	+ 1.29 - 1.25	+ 1.38 - 1.35
Expanded uncertainty U	normal (k=2)	+ 2.57	+ 2.76
(level of confidence $\approx 95\%$)		- 2.51	2.70

Conducted Emissions		
	Probability	Value
	Distribution	(+/- dB)
Combined standard uncertainty <i>uc(y)</i>	normal	1.48
Expanded uncertainty <i>U</i> (level of confidence ≈ 95 %)	normal (k = 2)	2.97

Radiated Immunity							
	Probability	Value					
	Distribution	(+/- dB)					
Combined standard uncertainty <i>uc(y)</i>	normal	1.05					
Expanded uncertainty U (level of confidence ≈ 95 %)	normal (k = 2)	2.11					

Conducted Immunity							
	Probability	Value					
	Distribution	(+/- dB)					
Combined standard uncertainty <i>uc(y</i>)	normal	1.05					
Expanded uncertainty U (level of confidence ≈ 95 %)	normal (k = 2)	2.10					

Legend

 $u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: **k**. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then k=3 (CL of 99.7%) can be used. Please note that with a coverage factor of one, uc(y) yields a confidence level of only 68%.



Facilities











California

Orange County Facility 41 Tesla Ave. Irvine, CA 92618 (888) 364-2378 FAX (503) 844-3826

Oregon

Evergreen Facility 22975 NW Evergreen Pkwy., Suite 400 Hillsboro, OR 97124 (503) 844-4066 FAX (503) 844-3826

Oregon

Trails End Facility 30475 NE Trails End Lane Newberg, OR 97132 (503) 844-4066 FAX (503) 537-0735

South Dakota

North Sioux City Facility

745 N. Derby Lane P.O. Box 217 North Sioux City, SD 57049 (605) 232-5267 FAX (605) 232-3873

Washington

Sultan Facility

14128 339th Ave. SE Sultan, WA 98294 (888) 364-2378 FAX (360) 793-2536

Party Requesting the Test

Company Name:	Radioframe Networks, Inc.
Address:	1120 112 th Ave. NE, Suite 600
City, State, Zip:	Bellevue, WA 98004
Test Requested By:	Steven Peters
Model:	DH2
First Date of Test:	December 19, 2002
Last Date of Test:	January 15, 2003
Receipt Date of Samples:	December 19, 2002
Equipment Design Stage:	Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	Information not available at time of test
I/O Ports:	Radio blade interface to back plane of RFU unit. No external I/O.

Functional Description of the EUT (Equipment Under Test):

802.11(b) radio blade

Client Justification for EUT Selection:

Representative of production unit

Client Justification for Test Selection

To demonstrate compliance of radio to FCC 15.247 requirements



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High
<u> </u>

Operating Modes Investigated: Typical

Data Rates Investigated: Maximum

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: -48VDC

Software\Firmware Applied During Test							
Exercise software	EtherPeek	Version	4.02				
Description							
The system was tested us device during the testing.		duction software to exercise as used to transfer data pac					

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	32596-0004
Chassis Unit	Radio Frame Networks	1230500-00	None
PC	Dell	Inspiron 4100	N/A

Cables



Occupied Bandwidth

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
Data/Power	No	3m	No	Chassis Unit	Test Fixture	
Ethernet	No	3.0	No	PC	Chassis Unit	
PA - Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown						

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	03/08/2001	24 mo

Test Description

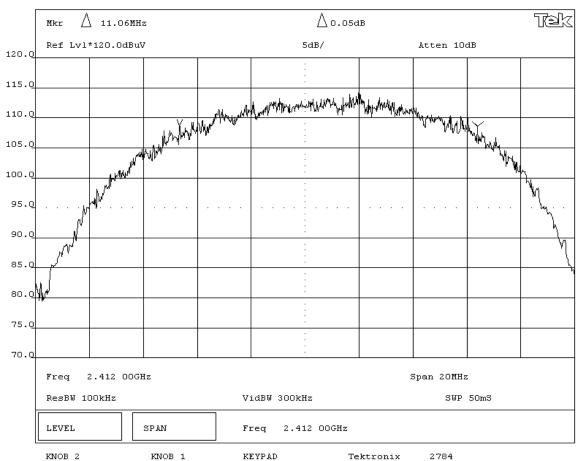
Requirement: Per 47 CFR 15.247(a)(2), the 6 dB bandwidth of a system using digital modulation techniques must be at least 500kHz. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The occupied bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation.

Completed by:

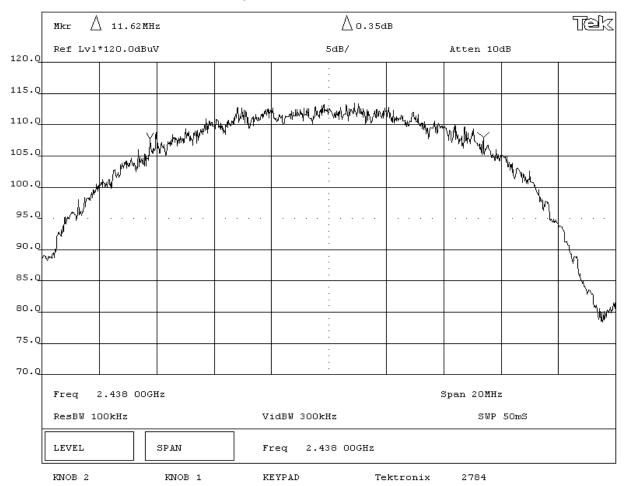
Porting to Reling

NORTHWEST EMC		EMISSIONS I	DATA SHEET		Transmitters Rev df11/13/02
EUT:	DH2			Work Order:	
Serial Number:	none			Date:	12/19/02
Customer:	Radio Frame Networks			Temperature:	21 °C
Attendees:	Dean Busch, Kevin Boyd			Humidity:	34%
Customer Ref. No.:	None			Bar. Pressure:	30.02
Tested by:	Rod Peloquin		Power: 120 V, 60 Hz	Job Site:	EV06
TEST SPECIFICATION	IS				
Specification:	47 CFR 15.247(a)(2)	Year: Most Current	Method: FCC97-114, ANSI C63	4 Year:	1992
SAMPLE CALCULATI	ONS				
COMMENTS					
EUT OPERATING MOI	DES				
Maximum output pow	er at maximum data rate				
DEVIATIONS FROM T	EST STANDARD				
None					
REQUIREMENTS					
The minumum 6dB ba	ndwidth is 500KHz				
RESULTS			BANDWIDTH		
Pass			11.06MHz		
SIGNATURE					
Tested By:	Portog la Relay	, רע			
DESCRIPTION OF TES	ST				
		Occupied Bandwid	dth - Low Channel		



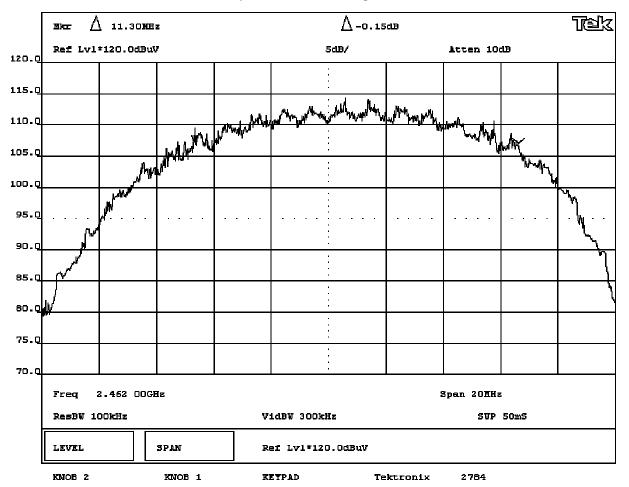
EMC		IONS DAT	A SHI	EET		Transmitter Rev df11/13/0
EUT:	DH2				Work Order:	RAFN0023
Serial Number:	none				Date:	12/19/02
Customer:	Radio Frame Networks				Temperature:	21 °C
Attendees:	Dean Busch, Kevin Boyd				Humidity:	34%
Customer Ref. No.:	None				Bar. Pressure:	30.02
Tested by:	Rod Peloquin		Power:	120 V, 60 Hz	Job Site:	EV06
TEST SPECIFICATIONS	3					
Specification:	47 CFR 15.247(a)(2) Year: Most Cu	irrent	Method:	FCC97-114, ANSI C63.4	Year:	1992
COMMENTS						
DEVIATIONS FROM TE	r at maximum data rate					
Maximum output powe DEVIATIONS FROM TE None	r at maximum data rate					
Maximum output powe DEVIATIONS FROM TE None REQUIREMENTS	r at maximum data rate ST STANDARD					
Maximum output powe DEVIATIONS FROM TE None REQUIREMENTS The minumum 6dB bar	r at maximum data rate ST STANDARD					
Maximum output powe DEVIATIONS FROM TE None REQUIREMENTS The minumum 6dB bar RESULTS	r at maximum data rate ST STANDARD	BANDWIE				
Maximum output powe DEVIATIONS FROM TE None REQUIREMENTS The minumum 6dB bar	r at maximum data rate ST STANDARD	BANDWIE 11.62MH				

Occupied Bandwidth - Mid Channel



NORTHWEST EMC	EMISSIO	NS DATA SH	EET		Transmitter: Rev df11/13/0
EUT:	DH2			Work Order	RAFN0023
Serial Number:	none			Date	12/19/02
Customer:	Radio Frame Networks			Temperature	21 °C
Attendees:	Dean Busch, Kevin Boyd			Humidity	34%
Customer Ref. No.:	None			Bar. Pressure	30.02
Tested by:	Rod Peloquin	Power	: 120 V, 60 Hz	Job Site:	EV06
TEST SPECIFICATION	S				
Specification:	47 CFR 15.247(a)(2) Year: Most Current	Method	: FCC97-114, ANSI C63.	4 Year	1992
EUT OPERATING MOD Maximum output powe DEVIATIONS FROM TE None	er at maximum data rate				
REQUIREMENTS					
The minumum 6dB bar	ndwidth is 500KHz				
RESULTS		BANDWIDTH			
Pass		11.3MHz			
SIGNATURE					
Tested By:	Rochy Le Felergy				

Occupied Bandwidth - High Channel





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

Operating Modes Investigated: Typical

Data Rates Investigated: Maximum

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: -48VDC

Software\Firmware Applied During Test							
Exercise software	EtherPeek	Version	4.02				
Description							
		oduction software to exercise as used to transfer data pac					

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	32596-0004
Chassis Unit	Radio Frame Networks	1230500-00	None
PC	Dell	Inspiron 4100	N/A



Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Data/Power	No	3m	No	Chassis Unit	Test Fixture
Ethernet	No	3.0	No	PC	Chassis Unit

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett Packard	8593E	AAP	10/23/2002	12 mo

Test Description

Requirement: Per 47 CFR 15.247(b)(1), the maximum peak output power must not exceed 1 Watt. The measurement is made using either a peak power meter, or a spectrum analyzer.

If a spectrum analyzer is used, the resolution bandwidth must be set to greater than the 6 dB bandwidth of the modulated carrier, and the video bandwidth set to greater than or equal to the resolution bandwidth. If the largest resolution bandwidth is less than the 6 dB bandwidth of the modulated carrier, the analyzer band power function can be used with these settings:

- Set RBW = VBW = Max
- Set Channel Bandwidth = Bandwidth of modulated carrier plus the resolution bandwidth
- Set Frequency Span just large enough to capture emission
- User peak detector only set to max hold

(This alternate method was presented by Joe Dichoso of the FCC's OET Division at an FCC Workshop for TCBs, Feb 14, 2002)

Configuration: The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was transmitting at its maximum data rate and maximum output power.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.

Completed by: Porty to Relenge

			FN	IISSIO	NS DAT	A SHE	FT				
NORTHWEST										Trans	smitters
EMC				Ou	tput Pow	/er					df11/15/02
	EUT: DH2								Work Order:	RAFN0023 12/19/02	
	nber: none omer: Radio Fran	ne Networks							Temperature:		
	dees: Dean Busc								Humidity:		
Customer Ref									Bar. Pressure:		
	d by: Rod Peloqu	uin				Power: 1	20 V, 60 Hz		Job Site:	EV06	
TEST SPECIFICA	TIONS ation: 47 CFR 15.	247(1-)(4)	Vee	Mart Cumment		Mathada	CC 07 444 ANG	002.4	Veer	4000	
SAMPLE CALCU		247(D)(1)	fea	r: Most Current		Wethod: F	CC 97-114, ANSI	663.4	fear	1992	
COMMENTS											
EUT OPERATING		un dete sete									
Maximum output DEVIATIONS FRO											
None	JWITEST STAND	AND									
REQUIREMENTS											
Maximum peak c	onducted output	power does not e	exceed 1 Watt								
RESULTS					AMPLIT						
Pass SIGNATURE					76m	W					
Test		in he Ro	len	_							
				Lo	ow Channe	əl					
12:55:29 //// REF 200.0	9 DEC 19, 3 mW	2002	#AT 20) dB				MKR 2.	.41193 GHz 40.832	mW	
SMPL	CHANNEL P	OWER				,					
LOG 10	Pwr: 7	5.033 mW		۱ م	m	> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	sh.s		25.C0 kHz		
dB/	5.	431 nW/Hz		www.wh			1	~~~~~.			
			when	ų.				C\$91₽∞ 	25.00 kHz		
OFFST 21.5			www.					CBM	14.UN MHZ		
dB									```	<u>_</u>	
	hwww	w								huw	~~^
MA SB SC FC											
CORR											
• • • •											

CENTER 2.41200 GHz

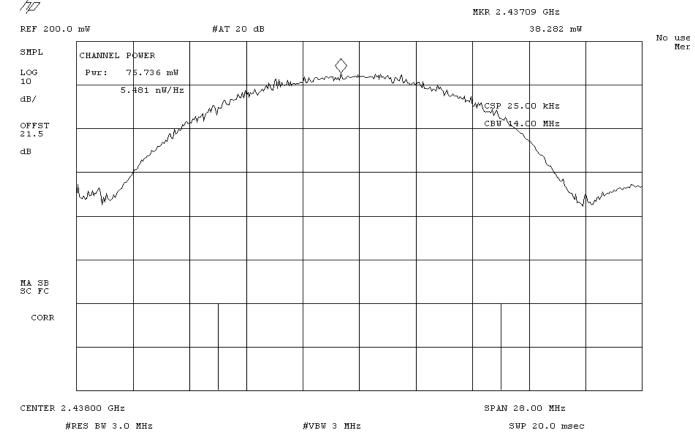
#RES BW 3.0 MHz

SWP 20.0 msec

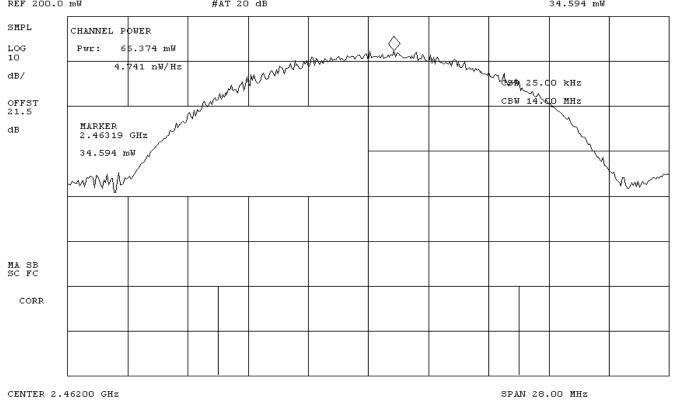
SPAN 28.00 MHz

No

IORTHWEST EMISSIONS DATA SHEET Transmitte							
EMC		Output	Power		Rev df11/15/02		
EUT:	DH2			Work Order	RAFN0023		
Serial Number:	none			Date	12/19/02		
Customer:	Radio Frame Networks	adio Frame Networks					
Attendees:	Dean Busch, Kevin Boyd			Humidity	34%		
Customer Ref. No.:	None			Bar. Pressure:	30.02		
	Rod Peloquin		Power: 120 V, 60 Hz	Job Site	EV06		
TEST SPECIFICATION	S						
	47 CFR 15.247(b)(1)	Year: Most Current	Method: FCC 97-114, ANSI C63	.4 Year	1992		
SAMPLE CALCULATION	ONS						
COMMENTS							
EUT OPERATING MOI							
	er at maximum data rate						
DEVIATIONS FROM T	EST STANDARD						
None							
REQUIREMENTS							
Maximum peak condu	cted output power does not excee	ed 1 Watt					
RESULTS			AMPLITUDE				
Pass			76.7mW				
SIGNATURE Tested By:	Porto la Relegy	<u>ح</u>					
DESCRIPTION OF TES	эт <u></u>						
		Mid Cł	nannel				
13:08:06 DH	C 19, 2002						



NORTHWEST		EMISSIONS [DATA SHEET		Transmitter
					Tansmillers
EMC		Output	Power		Rev df11/15/0
EUT	DH2			Work Order:	RAFN0023
Serial Number:				Date:	12/19/02
Customer	Radio Frame Networks			Temperature	: 21 °C
Attendees	Dean Busch, Kevin Boyd			Humidity:	34%
Customer Ref. No.:				Bar. Pressure:	: 30.02
Tested by:	Rod Peloquin		Power: 120 V, 60 Hz	Job Site:	EV06
TEST SPECIFICATION	IS				
Specification:	47 CFR 15.247(b)(1)	Year: Most Current	Method: FCC 97-114, ANSI C63.4	Year	: 1992
DEVIATIONS FROM T None REQUIREMENTS	er at maximum data rate EST STANDARD				
	cted output power does not excee				
RESULTS			AMPLITUDE		
Pass SIGNATURE			66.37mW		
Tested By: DESCRIPTION OF TES		High Cl	hannel		
/	EC 19, 2002				
ΠP			MKR	2.46319 GHz	
REF 200.0 mW		#AT 20 dB		34.594	mbl



#RES BW 3.0 MHz

#VBW 3 MHz

SWP 20.0 msec

No



Band Edge Compliance of RF Conducted Emissions

Revision 11/14/02

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:	
Low	
High	

Operating Modes Investigated: Typical

Data Rates Investigated: Maximum

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: -48VDC

Software\Firmware Applied During Test						
Exercise software	EtherPeek	Version	4.02			
Description						
			o exercise the functions of the r data packets at the maximum			

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	32596-0004
Chassis Unit	Radio Frame Networks	1230500-00	None
PC	Dell	Inspiron 4100	N/A



Band Edge Compliance of RF Conducted Emissions

Revision 11/14/02

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Data/Power	No	3m	No	Chassis Unit	Test Fixture
Ethernet	No	3.0	No	PC	Chassis Unit

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	03/08/2001	24 mo

Test Description

Requirement: Per 47 CFR 15.247(c), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100 kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 5 MHz below the band edge to 5 MHz above the band edge.

Completed by:

Porting to Relings

IC						E	MIS	SSI	ON	S D	ΑΤΑ	۱S	HE	ΞT						Trans Rev o
	EUT:	DH2															V	Vork Ord	er: RAFNO	
Serial Nu																		Da	te: 12/19/0	2
			rame Ne														Те	•	re: 21 °C	
Atter stomer Re			isch, Ke	evin Boy	d												De		ty: 34%	
	ed by:		oquin									Po	wer: 120	V. 60	-17		ва		re: 30.02 te: EV06	
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Specific			15.247(c	:)			Year: M	ost Cur	rent			Met	hod: FC	C 97-11	4, ANSI	C63.4		Ye	ar: 1992	
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IENTS																				
PERATIN	g Mode	S																		
num outpu	-			ata rate																
	s																			
num level o LTS		purious	emissi	on at the	e edge of	the aut	horized	band is	20dB do		n the fun IPLITUD		tal							
											-28.7dB									
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	LEV	EL			SPAN		Ţ	F	req	2.40	0 00G	Hz								

Serial Numb Custom Attende Istomer Ref. N Tested I SPECIFICATI Specificatio 'LE CALCULA MENTS DPERATING M num output pc ATIONS FROM JIREMENTS num level of a JITS ATURE Tested RIPTION OF T	mer: Radio Fri lees: Dean Bu No.: None i by: Rod Pele TIONS tion: 47 CFR - ATIONS MODES power at maxi M TEST STAN any spurious	15.247(c) imum data rate NDARD emission at the	e edge of the au Relegy	>			n from the fundar AMPLITUDE -43dB	Method:	120 V, 60 F	IZ IZ	D. Temperati Humid Bar. Press Job S	lity: 34%
Custom Attende istomer Ref. N Tested SPECIFICATH Specificati Speci	mer: Radio Fri lees: Dean BL No.: None i by: Rod Peli IONS tion: 47 CFR 1 ATIONS MODES power at maxi M TEST STAN any spurious	isch, Kevin Boy oquin 15.247(c) imum data rate NDARD emission at the	e edge of the au Relegy	uthorized			n from the fundar AMPLITUDE	Method:			Temperati Humid Bar. Press Job S	ure: 21 °C lity: 34% ure: 30.02 lite: EV06
Attende Istomer Ref. N Tested I SPECIFICATI Specification ILE CALCULA MENTS OPERATING M hum output po ATIONS FROM IIREMENTS NUM level of a LTS ATURE Tested RIPTION OF 1 2 D - 0	Ides: Dean Bu No.: None 1 by: Rod Pelo TIONS MODES power at maximum M TEST STAN any spurious	isch, Kevin Boy oquin 15.247(c) imum data rate NDARD emission at the	e edge of the au Relegy	uthorized			n from the fundar AMPLITUDE	Method:			Humid Bar. Press Job S	lity: 34% ure: 30.02 ite: EV06
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Tested I SPECIFICATI Specification Specification LE CALCULA MENTS OPERATING M num output po ATIONS FROM IREMENTS INTURE Tested RIPTION OF T	ATIONS ATIONS MODES power at maxim any spurious d By: TEST	15.247(c) imum data rate NDARD emission at the	Reley	uthorized			n from the fundar AMPLITUDE	Method:			Job S	ite: EV06
SPECIFICATI Specification PLE CALCULA MENTS DPERATING M num output po ATIONS FROM JIREMENTS NUM Level of a LITS ATURE Tested RIPTION OF T	TIONS tion: 47 CFR t ATIONS MODES power at maxi M TEST STAM any spurious d By: TEST	15.247(c) imum data rate NDARD emission at the	Reley	uthorized			n from the fundar AMPLITUDE	Method:				
Specification PLE CALCULA MENTS DPERATING M num output po ATIONS FROM UIREMENTS num level of a LTS ATURE Tested	MODES POWER AT TRAIN MODES POWER AT TRAIN ANY SPURIOUS d By: TEST	imum data rate NDARD emission at the	Reley	uthorized			n from the fundar AMPLITUDE		FCC 97-11	4, ANSI C63.4	Y.	ear: 1992
PLE CALCULA MENTS OPERATING M num output po ATIONS FROM UREMENTS Num level of a LTS ATURE Tested RIPTION OF 1	ATIONS MODES power at maxi M TEST STAH any spurious d By: TEST	imum data rate NDARD emission at the	Reley	uthorized			n from the fundar AMPLITUDE					
DPERATING M num output pc ATIONS FROM JIREMENTS num level of a JILTS ATURE Tested	power at maxi M TEST STAN any spurious d By: TEST	NDARD	Reley	>	band is	20dB dow	AMPLITUDE	nental				
DPERATING M num output pc ATIONS FROM VIREMENTS num level of a ILTS ATURE Tested RIPTION OF 1	power at maxi M TEST STAN any spurious d By: TEST	NDARD	Reley	>	band is	20dB dow	AMPLITUDE	nental				
num output po ITIONS FROM IREMENTS num level of a LTS Tested RIPTION OF T	power at maxi M TEST STAN any spurious d By: TEST	NDARD	Reley	>	band is	20dB dow	AMPLITUDE	nental				
IREMENTS num level of a LTS ATURE RIPTION OF T	any spurious d By: TEST A	emission at the	Reley	>	band is	20dB dow	AMPLITUDE	nental				
num level of a LTS ATURE Tested RIPTION OF 1	d By:		Reley	>	band is	20dB dow	AMPLITUDE	nental				
LTS ATURE Tested RIPTION OF T	d By:		Reley	>			AMPLITUDE					
Tested	TEST	chay be					-43dB					
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I II	LEVEL		SPAN		Fz	eq 2	.483 50GHz					
		I I										



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

Operating Modes Investigated: Typical

Data Rates Investigated: Maximum

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: -48VDC

Frequency Range In	vestigated		
Start Frequency	30 MHz	Stop Frequency	25 GHz

Software\Firmware Applied During Test								
Exercise software	EtherPeek	Version	4.02					
Description								
The system was tested using standard operating production software to exercise the functions of the								
device during the testing. The EtherPeek software was used to transfer data packets at the maximum								
data rate.								

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	32596-0004
Chassis Unit	Radio Frame Networks	1230500-00	None
PC	Dell	Inspiron 4100	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Data/Power	No	3m	No	Chassis Unit	Test Fixture
Ethernet	No	3.0	No	PC	Chassis Unit

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	03/08/2001	24 mo

Test Description

Requirement: Per 47 CFR 15.247(c), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100 kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

Completed by:

Rochy to Relenge

NORTHWEST		EMISSIONS D	OATA SHEET		Transmitters Rev df11/13/02
	EUT: DH2			V	/ork Order: RAFN0023
	umber: none				Date: 12/19/02
	tomer: Radio Frame Networks ndees: Dean Busch, Kevin Boyd			Te	mperature: 21 °C Humidity: 34%
Customer Re				Ba	. Pressure: 30.02
	ted by: Rod Peloquin		Power: 120 V, 60		Job Site: EV06
TEST SPECIFIC	CATIONS				
Specific SAMPLE CALC	cation: 47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-11	14, ANSI C63.4	Year: 1992
COMMENTS					
EUT OPERATIN					
	ut power at maximum data rate ROM TEST STANDARD				
None	ROM LOT STANDARD				
REQUIREMENT	rs				
	of any spurious emission outside of	f the authorized band is 20 dB down fr	om the fundamental		
RESULTS Pass					
Pass SIGNATURE					
	0.0	0			
	Rocky In Pres	leman			
	0	03			
Tes	sted By:				
DESCRIPTION	OF TEST				
		nducted Spurious Emis	ssions - Low Chan	nel 0MHz-3G	Hz
r					-
	Mkr 🛆 -372MHz				Tek
10.0	Ref Lvl*10.0dBm		10dB/	Atten 10dB	
10.0					
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	OMHz t	to 3.000GHz			

OMHz	to	3.000GHz	
ResBW 100kHz		VidBW 300kHz	SWP 1.7S
LEVEL	SPAN	Stop 3.000GHz	

EMC	EIVIIS	SIONS D	ATA SHEET		Transmitters Rev df11/13/02
EUT:				Work Order:	
Serial Number:	none			Date:	12/19/02
Customer:	Radio Frame Networks			Temperature:	21 °C
	Dean Busch, Kevin Boyd			Humidity:	34%
Customer Ref. No.:	None			Bar. Pressure:	30.02
Tested by:	Rod Peloquin		Power: 120 V, 60 Hz	Job Site:	EV06
TEST SPECIFICATION	IS				
	(<i>)</i>	ost Current	Method: FCC 97-114, ANSI C63	4 Year:	1992
SAMPLE CALCULATI	ONS				
COMMENTS					
None					
EUT OPERATING MO	DE8				
modulation, low chan					
DEVIATIONS FROM T					
None	EGTOTANDARD				
REQUIREMENTS					
	spurious emission outside of the authorized b	and is 20 dB down fro	om the fundamental		
RESULTS					
Pass					
SIGNATURE					
Tested By:	Rochy Le Relings				

Antenna Conducted Spurious Emissions - Low Channel 3GHz-6.5GHz

	Mkr 4	.833GHz	*-51	0.70dBm						Tek
10.0	Ref Lvl	*10.OdBm				10dB/		Atten 100	iB	
0.0						:				
-10.0										
-20.0						• • •				
-30.0						: : :				
-40.0										
-50.0										
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-70.0										
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-90.0						:				
	2.990	DGHz	to	6.5	OOGHz	:				
	ResBW 10	OOkHz		V:	idBW	300kHz		SWP	2.05	
	LEVEL		SPAN	St	crt	2.990GHz				

NORTHWEST EMC		EMISSIONS	DATA SHEET		Transmitters Rev df11/13/02		
EUT:					der: RAFN0023		
Serial Number:					Date: 12/19/02		
	Radio Frame Networks				ture: 21 °C		
	Dean Busch, Kevin Boyd				dity: 34%		
Customer Ref. No.:	None			Bar. Press	ure: 30.02		
	Rod Peloquin		Power: 120 V, 60 Hz	Job S	Site: EV06		
TEST SPECIFICATION							
	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4 Y	'ear: 1992		
SAMPLE CALCULATI	ONS						
COMMENTS							
None							
EUT OPERATING MO							
modulation, low chan							
DEVIATIONS FROM T	EST STANDARD						
None							
REQUIREMENTS							
	y spurious emission outside of the	authorized band is 20 dB down	from the fundamental				
RESULTS	RESULTS						
Pass							
SIGNATURE							
Rochy te Relenge							

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 6.5GHz-15GHz

										Tek
10.0		*10.OdBm				10dB/		Atten 100	1B	
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-30.0						:				
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	ResBW 10	DOkHz		V:	idBW	300kHz		SWP	4.85	
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NORTHWEST EMC		EMISSIONS	DATA SHEET			Transmitters Re df11/13/02	
EUT:	DH2			W	ork Order: R		
Serial Number:						12/19/02	
	Radio Frame Networks				mperature: 2		
	Dean Busch, Kevin Boyd				Humidity: 3		
Customer Ref. No.:	None			Bar.	Pressure: 3	0.02	
Tested by:	Rod Peloquin		Power: 120 V, 60 Hz		Job Site: E	EV06	
TEST SPECIFICATION							
	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4	Year: 1	992	
SAMPLE CALCULATI	IONS						
COMMENTS							
None							
EUT OPERATING MOI	DES						
modulation, low chan	inel						
DEVIATIONS FROM T	EST STANDARD						
None							
REQUIREMENTS							
Maximum level of any	spurious emission outside of the	e authorized band is 20 dB down	from the fundamental				
RESULTS							
Pass	Pass						
SIGNATURE							
Pochy la Relings							

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 15GHz-25GHz

											Tek
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-70.0											
-80.0											
-90.Q	14.990	287	to	25	L	,					
	ResBW 10					300kHz			SWP	5.75	
	LEVEL		SPAN	St	top	25.00GHz					

NORTHWEST		EMISSIONS [DATA SHEET		Transmitters Rev df11/13/02
	EUT: DH2			Work Order	: RAFN0023
	mber: none				: 12/19/02
	omer: Radio Frame Networks			Temperature	
	dees: Dean Busch, Kevin Boyd			Humidity	
Customer Re			Demon 400 1/ 00	Bar. Pressure:	
Test TEST SPECIFIC	ed by: Rod Peloquin		Power: 120 V, 60	Hz Job Site	
	ation: 47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-1	14. ANSI C63.4 Year	: 1992
SAMPLE CALC		real. Most ourrent	Method. 1 00 37-1		. 1352
COMMENTS					
EUT OPERATIN					
	ut power at maximum data rate				
DEVIATIONS FI	ROM TEST STANDARD				
None REQUIREMENT	·s				
	of any spurious emission outside of the	e authorized band is 20 dB down f	rom the fundamental		
RESULTS					
Pass					
SIGNATURE					
Tec	Rocky to Rely	, 75			
DESCRIPTION					
DESCRIPTION		unted Spurious Emi	colone Mid Chan	nol OMH+ 20H+	
	Antenna Cond	ucted Spurious Emi			
	мжr 🛆 -93мнz		∆-47.30dB		Tek
10.0	Ref Lvl*10.0dBm		10dB/	Atten 10dB	
				v	
0.0					
-10.0			· .		
			:		
-20.0					
-30.0					
-30.0					
			· · · · · · · · · · · · · · · · · · ·		
-40.0			•	.	
-50.0			:		1
-30.0			· / /		
			:	mound and Markeline was	
-60.Q	porter to a second so the seco	moto to prove a second and the second to the second	ware a proper state the second and the second states and the secon	Werman Wight War	when any and and a second second
	·				
70 0					
-70.0					
-80.Q					
Т			:]
			:		
-90.04					———
	OMHz to	3.000GHz			

OMHz	to	3.000GHz	
ResBW 100kHz		VidBW 300kHz	SWP 1.7S
LEVEL	SPAN	Stop 3.000GHz	

NORTHWEST EMC		EMISSIONS	DATA SHEET			Transmitters Rev df11/13/02
EUT:	DH2			Wor	rk Order: F	RAFN0023
Serial Number:	none				Date: 1	12/19/02
	Radio Frame Networks				perature: 2	
Attendees:	Dean Busch, Kevin Boyd	н	lumidity: 3	34%		
Customer Ref. No.:	None	Bar. P	ressure: 3	30.02		
Tested by:	Rod Peloquin		Power: 120 V, 60 Hz		Job Site: E	EV06
TEST SPECIFICATION						
Specification:	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C6	3.4	Year: 1	992
SAMPLE CALCULATI	ONS					
COMMENTS None EUT OPERATING MOI	DES					
modulation, mid chan	inel					
DEVIATIONS FROM T	EST STANDARD					
None						
REQUIREMENTS						
	spurious emission outside of the	e authorized band is 20 dB down	from the fundamental			
RESULTS						
Pass						
SIGNATURE						
Tested By:	Rocky la Rely					

Antenna Conducted Spurious Emissions - Mid Channel 3GHz-6.5GHz

	Mkr 4	.885GHz	*-5	0.80dBm							Tek
10.0	Ref Lvl	*10.OdBm				10dB	7		Atten 100	1B	
						:					
0.0						:					
-10.0											
-20.0											
-30.0						•					
-40.0											
-50.0						;	Ý				
-60.0	water which a state of the stat	a for a factor of the factor o	and the second second	helan and a farmer and a far a fa		Here de Harrison anna	hmmmh	mannaliphing	4aculturally polyany and	perterlation of the second	and the second
-70.0											
-80.0						•					
-90.0											
-30.0	2.99	DGHz	to	6.5	OOGHz						
	ResBW 1					300kHz			SWP	2.05	
	LEVEL		SPAN	St	trt	2.990GH	z				

NORTHWEST EMC		EMISSIONS	DATA SHEET		Transmitters Rev df11/13/02					
EUT:				Work Order:						
Serial Number:					: 12/19/02					
	Radio Frame Networks			Temperature:						
	Dean Busch, Kevin Boyd			Humidity:	. 34%					
Customer Ref. No.:			Power: 120 V, 60 Hz	Bar. Pressure:						
	Rod Peloquin	Job Site:	EV06							
TEST SPECIFICATION										
	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4 Year:	1992					
SAMPLE CALCULATI	ONS									
COMMENTS										
None										
EUT OPERATING MOI										
modulation, mid chan										
DEVIATIONS FROM T	EST STANDARD									
None										
REQUIREMENTS										
	spurious emission outside of the spurious emission outside spurious emission outside spurious emission outside spurious emission spurious emissi	e authorized band is 20 dB down	from the fundamental							
RESULTS										
Pass										
SIGNATURE										
Tested By:	Rocky ter Relings									

Antenna Conducted Spurious Emissions - Mid Channel 6.5GHz-15GHz

											Tek
10.0	Ref Lvl [†]	*10.OdBm				10dB	/		Atten 100	ЗB	
0.0						· ·					
-10.0											
-20.0											
-30.0						•					
-40.0						- - -					
						· · · · ·					
-50.0											
-60.0	hand ward you have	der territorie and the state	Marthagen again a she	nyuhwerronananahaha	Walter	White Harry	www.whee	hole and the second	the second states and the se	workstow www.	~whitef it the attention of the states of th
-70.0											
-80.0						•					
-90.0											
-90.0	6.499	AGHZ	to	15.0	OOGHz						
	ResBW 10					300kHz			SWP	4.85	
	LEVEL		SPAN	St	trt	6.499GH	z				

NORTHWEST EMC		EMISSIONS	DATA SHEET			Transmitters Rev df11/13/02				
EUT:				Wo		RAFN0023				
Serial Number:						12/19/02				
	Radio Frame Networks				nperature:					
	Dean Busch, Kevin Boyd				Humidity:					
Customer Ref. No.:			Pressure:							
	Rod Peloquin		Power: 120 V, 60 Hz		Job Site:	EV06				
TEST SPECIFICATION										
	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4	Year:	1992				
SAMPLE CALCULATI	ONS									
COMMENTS										
None EUT OPERATING MOI	250			_	_					
modulation, mid chan										
DEVIATIONS FROM T										
None	EST STANDARD									
REQUIREMENTS										
	y spurious emission outside of the	e authorized band is 20 dB down	from the fundamental							
RESULTS										
Pass										
SIGNATURE										
Tested By: _	Rocky la Roleng									

Antenna Conducted Spurious Emissions - Mid Channel 15GHz-25GHz

											Tek
10.0	Ref Lvl'	*10.OdBm				10dB/			Atten 100	ЗB	
0.0											
-10.0						 : :	+				
-20.Q						· ·					
-30.Q						:	_				
-40.Q						· · · · · · · · · · · · · · · · · · ·					
-50.Q							r	Hundrethiller	mothershippy	mannahar	"oghthi _{asalue} Addin
-60.Q	www.hanardon.	for which the for the se	maninananan	www.www.alther.actury	anter and the second	where the second we	wanter Mart				
-70.0						- - - -					
-80.Q						:					
-90.Q											
	14.990 ResBW 10		to		OOGHz idBW	: 300kHz			SWP	5.75	
	LEVEL		SPAN	St	trt	14.99GHz					

NORTHWEST				E	MISSI	ON	IS DATA S	SHEET			Ti	ransmitters Rev df11/13/02
	EUT: DH2									Work Orde	r: RAFN0023	- dri 1/10/02
	mber: none									Date	e: 12/19/02	
	tomer: Radio									Temperatur		
Atter Customer Re	ndees: Dean		evin Bo	yd						Humidit Bar. Pressure		
	ed by: Rod						Po	ower: 120 V, 60	Hz		e: EV06	
TEST SPECIFIC								120 9,00		000 010		
Specific	cation: 47 Cl	FR 15.247(c)		Year: Most Cu	urrent	Met	thod: FCC 97-11	4, ANSI C63.4	Yea	r: 1992	
SAMPLE CALC	ULATIONS											
None												
EUT OPERATIN												
modulation, hig DEVIATIONS FI			•									
None	KOW TEST S	JANDARL										
REQUIREMENT	rs											
Maximum level		ious emiss	sion ou	tside of the auth	orized band is	s 20 dB	down from the fundame	ental				
RESULTS												
Pass												
SIGNATURE				_								
Tes	sted By:	Rock	36	. Reley	<u></u>							
DESCRIPTION	OF TEST											
		Ante	nna	Conduct	ed Spuri	ous	Emissions - H	ligh Char	nel 0MHz	z-3GHz		
[Икх <u>А-372 ИН</u> 2 <u>А-50.70 ав</u>									Tek		
10.0	Ref Lv	Ref Lv1*10.0dBm				-	10 dB/		Atten 100	3B		
0.0										Υ		
-10.0							:					
-20.0												
							:					
-30.0							:					
-40.Q			• •			.	· · · · · · · · · · · ·	· · · · · 、				
-50.0						-				₩ .		
-60.0	مريد ويوريونيونيونيونيونيونيونيونيونيونيونيونيوني	and an particular	yan aha	- Marina Marina	<u>nadadiladak</u>	<u>vliminah</u>	un an	the way way and a	and had well "	"Windoway	water when	
-70.0						\vdash	:					
-80.Q												
-90.0												
	OM	Iz		to	3.()00GE	Iz					
	ResBU	100kHz				'idBT	300kHz		SOP	1.75		
	LEVEL			SPAN	ľ	k r	2.100GHz					

EUT: DH2 Work Order: [RAFN0023] Serial Number: none Date: 12/19/02 Customer: Radio Frame Networks Temperature: 21 °C Attendees: Dean Busch, Kevin Boyd Humidity: 34% Customer Ref. No: None Bar. Pressure: 30.02 Tested by: Rod Peloquin Power: 120 V, 60 Hz Job Site: EV06 TEST SPECIFICATIONS Secification: 47 CFR 15.247(c) Year: Most Current Method: FCC 97-114, ANSI C63.4 Year: 1992 SAMPLE CALCULATIONS EUT OPERATING MODES EUT OPERATING MODES EUT OPERATING MODES EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None None EUT OPERATING solution outside of the authorized band is 20 dB down from the fundamental REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE SIGNATURE	NORTHWEST EMC		EMISSIONS [DATA SHEET		Transmitters Rev df11/13/02
Customer: Radio Frame Networks Temperature: 21 °C Attendees: Dean Busch, Kevin Boyd Humidity: 34% Customer Ref. No:: None Bar. Pressure: 30.02 Tested by: Rod Peloquin Power: 120 V, 60 Hz Job Site: EV06 TEST SPECIFICATIONS Specification: 47 CFR 15.247(c) Year:: Most Current Method: FCC 97-114, ANSI C63.4 Year: 1992 SAMPLE CALCULATIONS EVO EVO FCC 97-114, ANSI C63.4 Year: 1992 COMMENTS None EUT OPERATING MODES EUT OPERATING MODES EUT OPERATING MODES EUT OPERATING MODES EVI PEVAINTONS FROM TEST STANDARD REQUIREMENTS REQUIREMENTS REQUIREMENTS REQUIREMENTS Pass SIGNATURE Pass SIGNATURE SIGNATURE EVI PEVAINCE EVI Pass SIGNATURE EVIC PERATING MODES EVIC PERATURE EVIC	EUT:	DH2			Work Order:	RAFN0023
Attendees: Dean Busch, Kevin Boyd Humidity: 34% Customer Ref. No.: None Bar. Pressure: 30.02 Tested by: Rod Peloquin Power: 120 V, 60 Hz Job Site: EV06 TEST SPECIFICATIONS Specification: 47 CFR 15.247(c) Year: Most Current Method: FCC 97-114, ANSI C63.4 Year: 1992 SAMPLE CALCULATIONS COMMENTS None EUT OPERATING MODES EUT OPERATING MODES EUT OPERATING MODES Second and the secon	Serial Number:	none			Date:	12/19/02
Customer Ref. No.: None Bar. Pressure: 30.02 Tested by: Rod Peloquin Power: 120 V, 60 Hz Job Site: EV06 TEST SPECIFICATIONS Sample Contract of the contract of	Customer:	Radio Frame Networks			Temperature:	21 °C
Tested by: Rod Peloquin Power: 120 V, 60 Hz Job Site: EV06 TEST SPECIFICATIONS Specification: 47 CFR 15.247(c) Year: Most Current Method: FCC 97-114, ANSI C63.4 Year: 1992 SAMPLE CALCULATIONS COMMENTS None EUT OPERATING MODES EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE Add Reference	Attendees:	Dean Busch, Kevin Boyd			Humidity:	34%
TEST SPECIFICATIONS Specification: 47 CFR 15.247(c) Year: Most Current Method: FCC 97-114, ANSI C63.4 Year: 1992 SAMPLE CALCULATIONS COMMENTS Sample CALCULATIONS Second State Sta	Customer Ref. No.:	None			Bar. Pressure:	30.02
Specification: 47 CFR 15.247(c) Year: Most Current Method: FCC 97-114, ANSI C63.4 Year: 1992 SAMPLE CALCULATIONS	Tested by:	Rod Peloquin		Power: 120 V, 60 Hz	Job Site:	EV06
SAMPLE CALCULATIONS COMMENTS None EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE	TEST SPECIFICATION	IS				
COMMENTS None EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE	Specification:	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4 Year:	1992
None EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE	SAMPLE CALCULATI	ONS				
None EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE	COMMENTS					
EUT OPERATING MODES modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE						
modulation, high channel DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE Maxhadabaa		DES				
DEVIATIONS FROM TEST STANDARD None REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE Machage Reference of the authorized band is 20 dB down from the fundamental RESULTS						
REQUIREMENTS Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE Morby the Relense	, ,					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental RESULTS Pass SIGNATURE Mody Relays	None					
RESULTS Pass SIGNATURE Nochy In Releny	REQUIREMENTS					
Pass SIGNATURE Nochy Le Releny	Maximum level of any	spurious emission outside of th	e authorized band is 20 dB down f	rom the fundamental		
SIGNATURE Rochy la Relenge	RESULTS					
Rochy Le Relenge	Pass					-
	SIGNATURE					
DESCRIPTION OF TEST						

Antenna Conducted Spurious Emissions - High Channel 3GHz-6.5GHz

	Mkr 4.	935GHz	*-5	0.90dBm							Tek
10.0	Ref Lvl*	10.0dBm				10	dB/		Atten	10dB	
0.0						•					
-10.0											
-20.0											
-30. <u>0</u>											
-40.0											
-50. <u>0</u>				. Ա.ա			Maralland	a constanting to sea before the	meters and a state	thelenvertekidentiinee	Munner
-60.0	i, hayter and a group of the	hter and the state of the state	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	⋪ ₩₩ ₽₽₩₽	******		· ··· pictere	and the second to be			
-70.0						:			_		
-80.0											
-90.0											
	2.990	GHz	to	6.5	OOGH	z					
	ResBW 10	OkHz		V:	idBW	300kHz			នា	IP 2.0S	
	LEVEL		SPAN	M}	٢r	4.935G	Hz				

NORTHWEST		EMISSIONS		Transmitters Rev df11/13/02						
EUT:	DH2			Work Order:	RAFN0023					
Serial Number:	none			Date:	12/19/02					
Customer:	Radio Frame Networks			Temperature:	21 °C					
Attendees:	Dean Busch, Kevin Boyd			Humidity:	. 34%					
Customer Ref. No.:	None			Bar. Pressure:	30.02					
Tested by:	Rod Peloquin	Power: 120 V, 60 Hz	Job Site:	EV06						
TEST SPECIFICATION										
	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C63	.4 Year:	1992					
SAMPLE CALCULATION	ONS									
COMMENTS										
None										
EUT OPERATING MOI										
modulation, high char										
DEVIATIONS FROM T	EST STANDARD									
None										
REQUIREMENTS										
	y spurious emission outside of the	authorized band is 20 dB down	from the fundamental							
RESULTS										
Pass										
SIGNATURE	SIGNATURE									
Rochy Le Roley										

Antenna Conducted Spurious Emissions - High Channel 6.5GHz-15GHz

										Tek
10.0	Ref Lvl*10).OdBm				10 dB/		Atten 100	10	
0.0						• •				
-10.0						:				
-20.0										
-30.Q										
-40.Q		• • • •				••••••				
-50.Q										
-60.Q	mar and the second second	ulation of the second	where the second second	in the second second second	a.	and the second	with my many and	PRANIE LANGER	manipular	hyper after a factor
-70.Q						<u>.</u>				
-80.Q										
-90.0										
	6.499GI	Ez	to	15.0	OOGHz	1				
	Res80 100)	cHz		V:	idBU	300kHz		SUP	4.8S	
	LEVEL		SPAN	51	trt	6.499GHz				

NORTHWEST EMC		EMISSIONS	DATA SHEET	Transmitters Re df11/13/0:					
EUT:	DH2			Work Orde	er: RAFN0023				
Serial Number:	none			Dat	e: 12/19/02				
Customer:	Radio Frame Networks			Temperatur	e: 21 °C				
Attendees:	Dean Busch, Kevin Boyd			Humidit	y: 34%				
Customer Ref. No.:	None			Bar. Pressure	e: 30.02				
Tested by:	Rod Peloquin	Job Sit	e: EV06						
TEST SPECIFICATION	NS								
Specification:	47 CFR 15.247(c)	Year: Most Current	Method: FCC 97-114, ANSI C6	.3.4 Yea	ır: 1992				
SAMPLE CALCULATI	ONS								
COMMENTS									
None									
EUT OPERATING MO	DES								
modulation, high char	nnel								
DEVIATIONS FROM T	EST STANDARD								
None									
REQUIREMENTS									
Maximum level of any	y spurious emission outside of the	authorized band is 20 dB down	from the fundamental						
RESULTS									
Pass									
SIGNATURE									
Rocky Le Reley									

Antenna Conducted Spurious Emissions - High Channel 15GHz-25GHz

											Tek
10.0	Ref Lvl*10	D.OdBm				10 dB/		Åtte	en 10a	10	
						:					
0.0						· :					
-10.0						:					
-20.0											
						:					
-30.Q											
-40.Q						•••••••••••••••••••••••••••••••••••••••					
-50.0								man	the work	+	Water Strategy and the second
-60.0	Martin Mary Mary Mary	happerton have by day	gry have my	1944 Million Mar	مېرييمېر.	ant the second	for the design				
						:					
-70.Q						· :					
-80.Q											
-90.0											
	14.99GH:	z	to	25.	OOGHz	5					
	ResBT 100kHz		V:	VidBT 300kHz			STP	5.75			
	LEVEL		3PAN	51	trt	14.99GHz					



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High
-

Operating Modes Investigated: Typical

Data Rates Investigated: Maximum

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: -48VDC from Chassis Unit

Software\Firmware Applied During Test							
Exercise software	EtherPeek	Version	4.02				
Description							
		duction software to exercise as used to transfer data pac					

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	32596-0004
Chassis Unit	Radio Frame Networks	1230500-00	None
PC	Dell	Inspiron 4100	N/A



Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Data/Power	No	3m	No	Chassis Unit	Test Fixture
Ethernet	No	3.0	No	PC	Chassis Unit

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	03/08/2001	24 mo

Test Description

Requirement: Per 47 CFR 15.247(d), the peak power spectral density conducted from the antenna port of a direct sequence transmitter must not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

Configuration: The peak power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. Per the procedure outlined in FCC 97-114, the spectrum analyzer was used as follows:

The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be $1.5 \times 10^6 \div 3 \times 10^3 =$ 500 seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

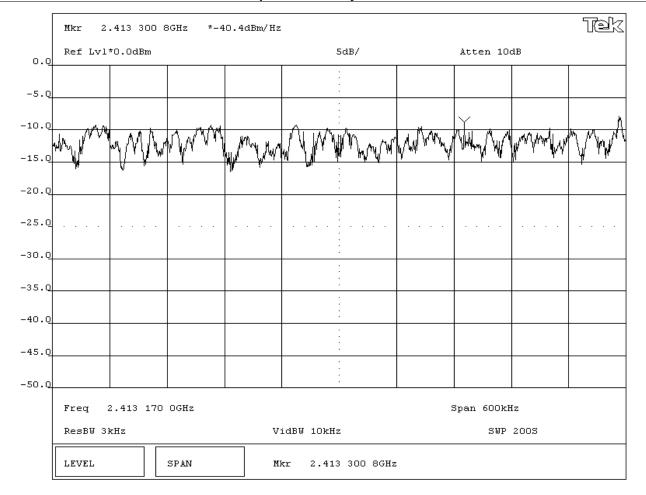
"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.7 dB for correction to 3 kHz."

Completed by:

Porting to Reling

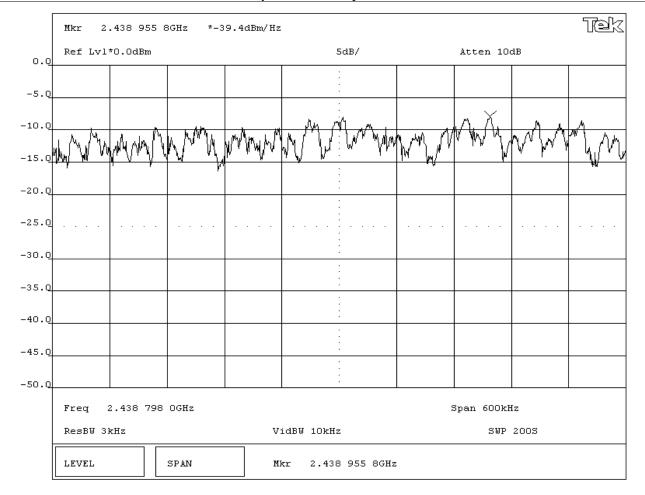
NORTHWEST	EMISSIONS	DATA SHEET			Transmitters _{Rev}			
					df11/13/02			
EUT: DH2 Serial Number: none			Wo	ork Order: R Date: 12				
Customer: Radio Frame Networks			.					
Attendees: Dean Busch, Kevin Boyd				perature: 2 Humidity: 3				
Customer Ref. No.: None				Pressure: 3				
Tested by: Rod Peloquin		Power: 120 V, 60 Hz		Job Site: E				
TEST SPECIFICATIONS		Power. 120 V, 60 Hz		Job Sile.	000			
Specification: 47 CFR 15.247(d)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4	Year: 1	002			
SAMPLE CALCULATIONS	real. Most ourrent		5.4	rear. r	552			
Meter reading on spectrum analyzer is internally com	pensated for cable loss and extern	al attenuation.						
Power Spectral Density per 3kHz bandwidth = Power	•							
Bandwidth Correction Factor = 10*log(3 kHz / 1 Hz) =								
COMMENTS								
EUT OPERATING MODES								
Maximum output power at maximum data rate								
DEVIATIONS FROM TEST STANDARD								
None								
REQUIREMENTS								
Maximum peak power spectral density conducted fro	m a DSSS transmitter does not exc	eed 8 dBm in any 3 kHz band						
RESULTS		AMPLITUDE						
Pass -5.7dBm / 3KHz								
SIGNATURE								
Rochy te Pelings								
DESCRIPTION OF TEST								
Power Spectral Density - Low Channel								

Power Spectral Density - Low Channel



NORTHWEST	EMISSIONS	DATA SHEET			Transmitters _{Rev}			
					df11/13/02			
EUT: DH2 Work Order: RAFN0023 Serial Number: none Date: 12/19/02								
Serial Number: none Customer: Radio Frame Networks			Ter					
Attendees: Dean Busch, Kevin Boyd			Ter	nperature: 2 Humidity: 3				
Customer Ref. No.: None			Der	Pressure: 3				
Tested by: Rod Peloguin		Power: 120 V, 60 Hz	Dar.	Job Site: E				
TEST SPECIFICATIONS		Power. 120 V, 60 Hz		Job Sile.	2006			
Specification: 47 CFR 15.247(d)	Year: Most Current	Method: FCC 97-114, ANSI C6	3.4	Year: 1	992			
SAMPLE CALCULATIONS	real most ourient		0.4	rear. r	002			
Meter reading on spectrum analyzer is internally con	pensated for cable loss and extern	al attenuation.						
Power Spectral Density per 3kHz bandwidth = Power	•							
Bandwidth Correction Factor = 10*log(3 kHz / 1 Hz) =								
COMMENTS								
None								
EUT OPERATING MODES								
modulated								
DEVIATIONS FROM TEST STANDARD								
None								
REQUIREMENTS								
Maximum peak power spectral density conducted from	m a DSSS transmitter does not exc	ceed 8 dBm in any 3 kHz band						
RESULTS		AMPLITUDE						
Pass -4.7dBm / 3KHz								
SIGNATURE								
Porty to Relenge								
DESCRIPTION OF TEST								
Power Spectral Density - Mid Channel								

Power Spectral Density - Mid Channel



NORTHWEST EMC	EMISSIONS I	DATA SHEET		Transmitters Rev df11/13/02				
EUT: DH2			Work Order:					
Serial Number: none			Date:	12/19/02				
Customer: Radio Frame Networks			Temperature:	21 °C				
Attendees: Dean Busch, Kevin Boyd			Humidity:	34%				
Customer Ref. No.: None			Bar. Pressure:	30.02				
Tested by: Rod Peloquin		Power: 120 V, 60 Hz	Job Site:	EV06				
TEST SPECIFICATIONS								
Specification: 47 CFR 15.247(d)	Year: Most Current	Method: FCC 97-114, ANSI C63	3.4 Year:	1992				
SAMPLE CALCULATIONS								
Meter reading on spectrum analyzer is internally comp								
Power Spectral Density per 3kHz bandwidth = Power S		th + Bandwidth Correction Factor.						
Bandwidth Correction Factor = 10*log(3 kHz / 1 Hz) = 3	4.7 dB							
COMMENTS								
None								
EUT OPERATING MODES								
modulated								
DEVIATIONS FROM TEST STANDARD								
None								
REQUIREMENTS								
Maximum peak power spectral density conducted from		•						
RESULTS		AMPLITUDE						
Pass -5.8dBm / 3KHz								
SIGNATURE Rochy to Release Tested By:								
DESCRIPTION OF TEST								
	Power Spectral Density - High Channel							

	Mkr 2.462 793 8GHz *-40.5dBm/Hz									
0.0	Ref Lvl*0.0dBm				5dB/ Atten 10dB			ЗВ		
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-20.0		, 	P '		M	<u> </u>		·W	n or d	γι γγ
-25.0										
-30.0						:				
-35.0										
-40.0										
-45.0						· ·				
-50.0										
	Freq 2.462 909 OGHz Span 600kHz									
	ResBW 31	kHz		v	idBW 10)kHz		SWP	2005	
	LEVEL		SPAN	M	cr 2	.462 793 8GHz	:			



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:				
Low				
Mid				
High				
Operating Modes Investigated:				

Typical

Antennas Investigated: LINX ANT-2.4-RCT-SS

Data Rates Investigated:

5.5Mbps (Maximum)

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: 120 VAC, 60 Hz.

Frequency Range Investigated						
Start Frequency	30 MHz	Stop Frequency	26 GHz			

Software\Firmware Applied During Test									
Exercise software	EtherPeek	Version	4.02						
Description									
		duction software to exercise as used to transfer data pac							

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.



EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	02102500005R
Chassis Unit	Radio Frame Networks	1230500-00	FCC Engineering unit

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
Data/Power	No	1.5m	No	Chassis Unit	Test Fixture	
PA - Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown						

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	01/07/2003	12 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	12/03/2001	14 mo
Antenna, Biconilog	EMCO	3141	AXE	12/31/2001	36 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24- 10P	APJ	01/06/2003	12 mo
Antenna, Horn	EMCO	3115	AHC	08/12/2002	12 mo
Antenna, Horn	EMCO	3160-09	AHG	01/15/2000	39 mo
Pre-Amplifier	Miteq	JSD4-18002600-26- 8P	APU	01/17/2000	39 mo
High Pass Filter	RLC Electronics	F-100-4000-5-R	HFF	05/01/2002	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	03/08/2001	24 mo



Test Description

Requirement: The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

Configuration: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.4:1992). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Bandwidths Used for Measurements

Average Data (kHz)	Quasi-Peak Data (kHz)	Peak Data (kHz)	Frequency Range (MHz)
0.2	0.2	1.0	0.01 – 0.15
9.0	9.0	10.0	0.15 - 30.0
120.0	120.0	100.0	30.0 - 1000
1000.0	N/A	1000.0	Above 1000
vid	N/A		

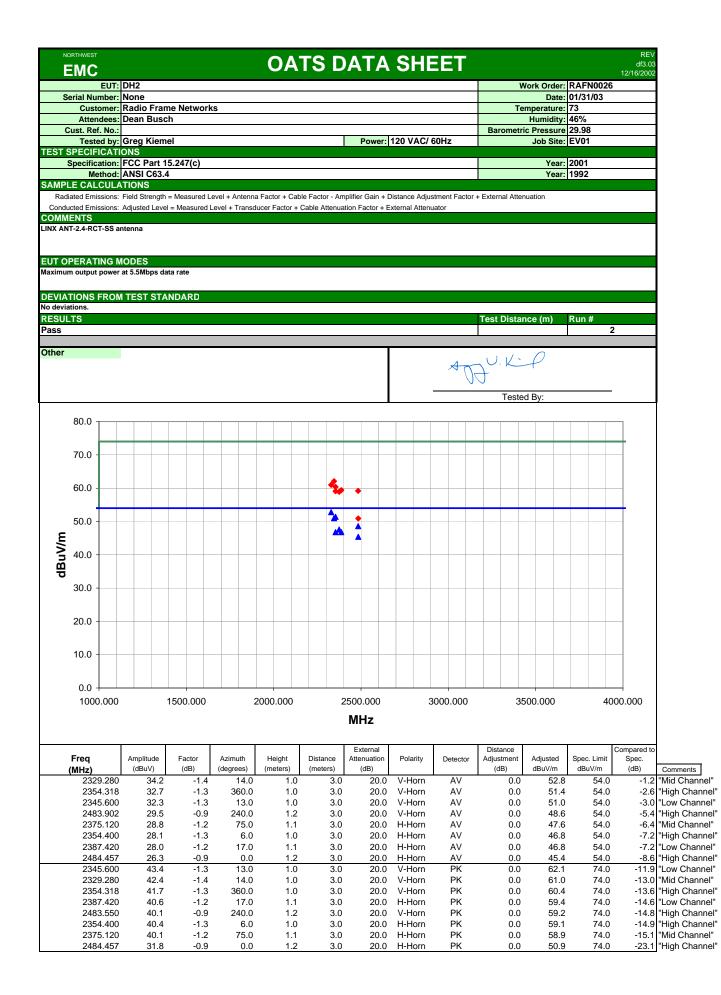
Measurements were made using the bandwidths and detectors specified. No video filter was used.

Completed by:

Porting to Reling

EUT: DH2 Work Order: RAFN0225 Serial Number: Non Tompetature: 3 Customer: Radio Frame Networks Tompetature: 3 Stresset: Right Rod Peloguin Power: power from E-met Jo Stel: EVIT Stresset: Right Rod Peloguin Vear: 2001 Vear: 2001 Methods: JANS (CS: 4 Name Tompetature: Vear: 2001 Moderation: JANS (CS: 4 Name Tompetature: Vear: 2001 Moderation: JANS (CS: 4 Name Tompetature: Vear: 30 Moderation: JANS (CS: 4 Name Tompetature: Vear: 30 Via (S): Stresse: Stress	NORTH					OA	TS D	ΑΤΑ	SH	EET				RE df3. 10/23/20
Serial Number: Date: DiffS03 Custome: Ratio Frame Networks Temperature: 3.4 Custome: None Barometric Pressure 3.0.4 Humility: 34% Tested by: Rod Predoptin Power! power from E-net Job Site: EV01 Specification: FCC Part 15.247(c) V year: 1992 Vyear: 1992 MARLE CALCULATIONS Markade Emission: Anterna Factor + Cable Factor - Ampiler Gain + Distance Adjustment Factor + External Atternation Conduced Emission: Vyear: 1992 Markade Emission: Anterna Factor + Cable Attenuation Pactor + External Atternation Conduced Emission: Conduced Emission: Attenuation VI OPERATING MODES Statute of the Statute of the Statute of the Attenuation Pactor + Cable Attenuation Pactor + External Attenuation Pactor + External Attenuation Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: Statute: <t< th=""><th></th><th></th><th>DH2</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>Nork Order</th><th>RAFN002</th><th></th></t<>			DH2									Nork Order	RAFN002	
Attendess: Deam Busch Humidity: 54% Casts: Ref. No. Barometric Present 30.34 Barometric Present 30.34 Job Site: EV01 Start Ref. No. Year: 2001 Year: 2001 Year: 2001 Method: ANSI C63.4 Year: 2001 Year: 2001 Year: 2001 More CALCULATIONS Year: 2001 Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 More Calculation: FGC Part 15.247(c) Year: 2001 Year: 2001 Start 10	Seria													
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Tested by: Rod Pologuin Power: power from E-net Job Site; EV01 Star SPECIE/CATIONS Year; 2001 Wate; 2001 Method: INSI C63:4 Year; 2001 Method: Federations: Year; 2001 AMPLE CALCULATIONS Year; 2002 Year; 1992 Addated Emission: Feddated Emission: Addated Emission: Xear; 1992 Conducted Emission: Addated Emission: Addated Emission: Xear; 1992 With Channel, LINX ANT-24-RDT-35 antenna Statum dough power at 5.5Mlops data rate Statum				h							_			
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Method: Aver: 1992 MADUE CALCUATIONS Readward Level + Antenna Factor + Cable Factor - Amplifier Can + Datanca Adjustment Factor + External Attenuator Conclusted Ensitions: Substance Cable Measured Level + Transducer Factor + Cable Attenuator Factor + External Attenuator OMINETS Substance Cable Measured Level + Transducer Factor + Cable Attenuator Factor + External Attenuator OMINETS Substance Cable Measured Level + Transducer Factor + Cable Attenuator Factor + External Attenuator OMINETS Substance Cable Measured Level + Transducer Factor + Cable Attenuator Substance Cable FROM TEST STANDARD Substance Cable Measured Level + Measured Level + Measured Level + Transducer Factor + External Attenuator Substance Substance Cable From TEST STANDARD Substance Cable Measured Level + Measured Level + Transducer Factor + External Attenuator Substance Substance Cable From TEST STANDARD Substance Cable Measured Level + Measured + Test + Measured				5.247(c)								Year:	2001	
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2387.000 28.1 -1.2 66.0 1.3 3.0 20.0 H-Horn AV 0.0 46.9 54.0														
2385.913 54.8 -1.2 0.0 1.2 3.0 20.0 V-Horn PK 0.0 73.6 74.0 2386.500 43.5 -1.2 66.0 1.3 3.0 20.0 H-Horn PK 0.0 62.3 74.0														

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	2343.0		27.3	-1.3	48.0	1.3	3.0	20.0	H-Horn		0.0	46.0		-8.0
	2384.0		27.2	-1.2	6.0	1.2	3.0	20.0	V-Horn		0.0	46.0		-8.0
	2322.4 2384.0		27.0 26.7	-1.4 -1.2	44.0 309.0	1.3 1.3	3.0 3.0	20.0 20.0	H-Horn H-Horn		0.0 0.0	45.6 45.5		-8.4 -8.5
	2343.0		46.3	-1.2	60.0	1.2	3.0	20.0	V-Horn		0.0	65.0		-9.0
	2384.0	00	44.3	-1.2	6.0	1.2	3.0	20.0	V-Horn	PK	0.0	63.1	74.0	-10.9
	2322.4		43.6	-1.4	63.0	1.2	3.0	20.0	V-Horn		0.0	62.2		-11.8
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Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

Operating Modes Investigated: Typical

Data Rates Investigated: 5.5Mbps

Output Power Setting(s) Investigated: Maximum

Power Input Settings Investigated: 120 VAC, 60 Hz.

Frequency Range In	vestigated		
Start Frequency	150KHz	Stop Frequency	30MHz

Software\Firmware Applied During Test										
Exercise software	EtherPeek	Version	4.02							
Description	Description									
The system was tested us	ing standard operating pro	duction software to exercise	e the functions of the							
device during the testing. The EtherPeek software was used to transfer data packets at the maximum										
data rate.										

Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT	Radio Frame Networks	DH2	None
Test Fixture	Radio Frame Networks	ASY-0525-010010224	02102500005R
Chassis Unit	Radio Frame Networks	1230500-00	FCC Engineerin



Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
Data/Power	No	1.5m	No	Chassis Unit	Test Fixture	
PA - Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown						

PA = Cable is permanently attached to the device. Shielding and/or present

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo
High Pass Filter	TTE	H97-100k-50-720B	HFC	01/02/2003	12 mo
LISN	Solar	9252-50-R-24-BNC	LIP	12/12/2002	12 mo

Test Description

Requirement: Per 47 15.207(d), if the EUT is connected to the AC power line indirectly, obtaining its power from another device that is connected to the AC power line, then it should be tested to demonstrate compliance with the conducted limits of 15.207.

Configuration: The EUT will be powered from a host 'Chassis Unit' that could be connected to the AC power line. Therefore, the measurements were made on the host 'Chassis Unit' used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest, the highest, and a middle channel in the operational band. The EUT was transmitting at its maximum data rate (5.5Mbps). For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.4-1992.

Completed by:

Rochy to Relenge

