Exhibit B General Information

B.1.0 (2.201) Emission, Modulation & Transmission Characteristics

The emissions designator is determined as follows:

The bandwidth of the spread spectrum is: 80 MHZ

First Symbol - Type of Modulation: Combination of angle, pulse & amplitude (W)

Second Symbol - Nature of Signal(s) Modulating the Carrier: Single channel digital (1)

Third Symbol - Type of Information to be Transmitted: Data (D)

Therefore the emission designator is as follows

80M0W1D

B.1.1 (2.202) Bandwidth

Bandwidth criteria is contained in C.8.6 of this application. Bandwidth measurements were made in accordance with ANSI C63.4(1992).

B.2.0 (2.907) Certification

The WaveAccess waveLyNX BR132 has been tested to the applicable requirements of Part 15 of the FCC rules and requires certification for un-licenced operation.

B.2.1 (2.909) Responsible Party

WaveAccess Ltd.
P.O. Box 2473
10 Hayezira Street
Ra'anana, Israel 43663
Phone: 011-972-9-748-2606
Fax: 011-972-9-748-3218

B.2.2 (2.925) Identification

a)(1) The FCC identifier is indicated on the FORM 731.

a)(2) Labeling information is contained in D.3.0 of this application.

The NetWeaver CU132 is both a spread spectrum transmitter and a Class A computer peripheral.

B.2.3 (2.926) FCC Identifier

The FCC identifier is indicated on the FORM 731.

It is, FCC ID: NCACU132V100NWUS

B.3.0 (2.947 & 2.1041) Measurement Procedure

Test Equipment List:

Some of the following measurement equipment were used during compliance testing:

EQUIPMENT LIST TABLE 1					
Abbr	Equipment	Manufacturer	Model	Serial	Cal Due
ANT1	BROADBAND ANTENNA	COMPLIANCE DESIGN	B1000	1649, 1650, 1651	25Apr98
ANT2	BROADBAND ANTENNA	COMPLIANCE DESIGN	B1000	1831, 1850, 1852	11Jun98
ANT3	BROADBAND ANTENNA	COMPLIANCE DESIGN	B1000	668, 523, 533	15Apr98
ANT4	BROADBAND ANTENNA	COMPLIANCE DESIGN	B1000	3317, 3245, 3352	03Jul98
ANT5	BROADBAND ANTENNA	COMPLIANCE DESIGN	B1000	1670, 1671, 1672	29May98
CLMP1	ABSORBING CLAMP	FISCHER CUSTOM	F-201	122	30Apr98
CLMP2	ABSORBING CLAMP	FISCHER CUSTOM	F-201	297	16Jan99
DIP1	TUNED DIPOLE SET	COMPLIANCE DESIGN	A100	402	30-Jan-99
DIP2	TUNED DIPOLE SET	COMPLIANCE DESIGN	A100	506	24Jun98
DIP3	TUNED DIPOLE SET	COMPLIANCE DESIGN	A100	3947	23Jan99
HORN1	HORN ANTENNA	EMCO	3115	4632	03Jul98
HORN2	HORN ANTENNA	EMCO	3115	4675	02Sep98
HORN3	HORN ANTENNA	EMCO	3116	2090	11Feb99
HP1	SPECTRUM ANALYZER	HEWLETT PACKARD	8591	3308A01445	12May98
HP2	SPECTRUM ANALYZER	HEWLETT PACKARD	8591	3346A02319	25Jun98
HP3	SPECTRUM ANALYZER	HEWLETT PACKARD	8593A	3009A00659	30Apr98
LISN1	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	871083	15Jan99
LISN10	LISN	SOLAR ELECTRONICS	9252-50-R-24-BNC	941712	24May98
LISN11	LISN	SOLAR ELECTRONICS	9252-50-R-24-BNC	941713	23May98
LISN12	LISN	SOLAR ELECTRONICS	9252-50-R-24-BNC	941714	25Aug98
LISN13	LISN	SOLAR ELECTRONICS	9252-50-R-24-BNC	955107	15Jan99
LISN14	LISN	SOLAR ELECTRONICS	6338-5-TS-50-N	871131	27Jan99
LISN15	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	865575	1/10/98
LISN2	LISN	SOLAR ELECTRONICS	6338-5-TS-50-N	871132	27Jan99
LISN3	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	8379114	14Jan99
LISN4	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	837929	15Jan99
LISN5	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	934610	05Jun98
LISN6	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	934611	23May98
LISN7	LISN	SOLAR ELECTRONICS	8012-50-R-24-BNC	934612	05Jun98
LISN8	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	871047	08Jul98
LISN8	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	871055	08Jul98

EQUIPMENT LIST TABLE 2					
Abbr	Equipment	Manufacturer	Model	Serial	Cal Due
LISN8	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	883147	08Jul98
LISN8	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	883151	08Jul98
LISN9	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	953947	14Jan99
LISN9	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	953948	14Jan99
LISN9	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	953949	14Jan99
LISN9	LISN	SOLAR ELECTRONICS	8028-50-TS-24-BNC	953950	14Jan99
LOG1	BICONOLOG ANTENNA	EMCO	3142	1116	1/13/99
LOG2	BICONOLOG ANTENNA	EMCO	3142	1223	12/6/98
LOOP1	LOOP ANTENNA	EMPIRE DEVICES	LG105	61	17Jan99
LOOP2	LOOP ANTENNA	EMPIRE DEVICES	LP105	905	17Jan99
LOOP3	LOOP ANTENNA	EMCO	6509	9612-1403	05Jun98
PRB1	LINE PROBE	SOLAR ELECTRONICS	8614-1	932725	24May98
PRB2	LINE PROBE	SOLAR ELECTRONICS	8614-1	932731	08Jul98
PRB3	LINE PROBE	SOLAR ELECTRONICS	9533-1	955905	24May98
PRE1	PREAMPLIFIER	COMPLIANCE DESIGN	P950	1648	02Apr98
PRE2	PREAMPLIFIER	COMPLIANCE DESIGN	P950	5107	02Apr98
PRE3	PREAMPLIFIER	COMPLIANCE DESIGN	P950	1828	02Apr98
PRE4	PREAMPLIFIER	COMPLIANCE DESIGN	P950	1844	02Apr98
PRE5	PREAMPLIFIER	COMPLIANCE DESIGN	P950	PROTO1	02Apr98
PRE6	PREAMPLIFIER	HEWLETT PACKARD	8447D	1937A03354	10Apr98
PRE7	PREAMPLIFIER	HEWLETT PACKARD	8447D	2944A08718	16Apr98
PRE8	PREAMPLIFIER	MITEQ	NSP4000-NF	507145	9/25/98
REC1	RECEIVER	HEWLETT PACKARD	8542	3520A00125	06Nov98
REC1	RF FILTER	HEWLETT PACKARD	85420	3427A00126	06Nov98
REC2	RECEIVER	HEWLETT PACKARD	85422	3625A00188	04Jan99
REC2	RF FILTER	HEWLETT PACKARD	8542	3427A00177	04Jan99
REC3	RECEIVER	HEWLETT PACKARD	8546A	3325A00160	09May98
REC3	RECEIVER	HEWLETT PACKARD	8546A	3330A00158	09May98
SCOPE1	OSCILLOSCOPE	TEKTRONIX	TDS380	B011379	07Oct98
SIG1	SIGNAL GENERATOR	HEWLETT PACKARD	8648B	3537A01040	10Apr99
TEK1	SPECTRUM ANALYZER	TEKTRONIX	2784	B010153	25Apr98

AC Wireline Conducted Measurement Method

Measurement Procedure

The transmitter shall be operated at its maximum power output. For a transceiver, the receiver portion can be tested at the same time as the transmitter.

The conducted emissions shall be measured with a 50 ohm/50 microhenry (μH) line impedance stabilization network (LISN).

A ground plane or screen is required for power line conducted measurements. This ground plane is to consist of a conducting floor and at least one vertical earth-grounded conducting surface. Each surface shall be at least 2.0 x 2.0 metres.

The EUT shall be placed 40 centimetres from the vertical grounded surface, and shall be kept at least 80 centimetres from any other earth-grounded conducting surface. The EUT shall be placed at a distance of 80 centimetres from the LISN and connected thereto by the AC power cord. Power cords with leads in excess of the 80 centimetres separating the EUT from the LISN shall be folded back and forth so as to form a bundle not exceeding 30 centimetres in length located at the LISN. The electrical bond between the LISN enclosure and the ground plane is ensured prior to the test.

Radiation Measurement Method

Measuring Distance

The following is a description of a "3-metre test site". Measurements using a calibrated site of greater dimensions are permitted, with the field strength extrapolated to the specified distance of the technical standard using an inverse linear distance extrapolation, i.e. 20 dB/decade.

Open Field Test Site

Intertek Testing Services emissions test sites at 593 Massachusetts Avenue, Boxborough Massachusetts are registered with the FCC (Last updated as of January 16, 1997), Site Filing Number 31040/SIT 1300F2 and under the NAVLAP program (NAVLAP LabCode: 100270-0).

Equipment Test Platform

The EUT is oriented in the manner in which it is designed to operate and placed on a nonconducting turntable 1.0 metre above ground. The table is capable of being rotated through 360 degrees in azimuth. The power supply and other external cables are fed through a hole in the centre of the table and extended downwards.

All available accessories are connected to the EUT by interconnection cables supplied by the manufacturer. Excess cables are folded back and forth to form a bundle 30 to 40 cm in length and placed on the test platform. It is also draped over the edge of the platform provided that it is kept at least 40 cm above the ground plane.

Measurement Method

Extend the EUT antenna fully and operate the EUT in its normal mode of operation. The EUT's radiated spectrum shall be measured using a tuned dipole (or other standard antenna herein known as the measurement antenna) in the vertical plane of polarization.

The tuned dipole shall be located horizontally 3 metres from the EUT and it shall be mounted on a non-conducting mast that permits the antenna height to be varied between 1.0 and 4.0 metres. The lower element of the vertical dipole shall be kept at least 25 centimetres above the ground plane for any measurement.

The received signal shall be coupled to a spectrum analyzer. The EUT shall be rotated through a total of 360 degrees in azimuth and the height of the measurement antenna varied between 1.0 and 4.0 metres to find the maximum field strength. Record the frequency and the field strength.

The above test is to be repeated with the measurement antenna in the horizontal polarization. In lieu of separate measurements using the measurement antenna first in the vertical and then in the horizontal polarizations, as described above, it is permissible that the measurement antenna polarization be rotated to maximize each field strength reading.

For hand-held or body-worn devices, the device shall be tested in three orthogonal planes: lying on its side, back, and on its end.

The EUT shall be de-activated and the residual field strength due to the ambient RF noise measured. To ensure that the EUT field strength measurement is not significantly influenced by ambient RF noise, the latter level shall be at least 6 dB below that of the EUT signal.

B.4.0 (2.1033) Application for Certification

B.4.1 (2.1033) Form 731

The FORM 731 is contained in Exhibit A of this application.

B.4.2 (2.1033) Technical Report

B.4.2.1 Name and Address of Manufacturer/Applicant

See B.2.1 of this application for the Manufacturer.

B.4.2.2 FCC Identifier

See Form 731 in Exhibit A of this application.

B.4.2.3 Installation and Operating Instructions

See D.8.0 of this application for the instruction manual.

B.4.2.4 Brief Description of circuit functions and operation

The NetWeaver is a Point-to-Multipoint (P-t-M) wireless access system capable of supporting hundreds of remote sites (single workstation or complete network at each remote). NetWeaver employs Frequency Hopping (FH) Spread-Spectrum technology at data rates of 3.2 and 1.6 Mbps. The FH radio provides good immunity against interference and enables operation of collocated systems, thereby increasing overall data throughput. NetWeaver has been optimized for IP traffic and provides high speed networking at distances of several miles.

B.4.2.5 Block Diagram

See D.5.0 for a block diagram of the device.

B.4.2.6 Radiated and Conducted Emissions

Exhibit C of the application contain the results of radiated and conducted emissions testing, specifically:

FCC Section	Application Section	Description
15.107	C.1.0	Unintentional radiator conducted emissions
15.109	C.2.0	Unintentional radiatro radiated emissions
15.205	C.6.0	Restricted Bands of operation
15.207	C.7.0	Intentional radiator conducted emissions
15.209	C.7.0	Radiated emissions: General Requirement
15.247(c)	C.8.13 C.8.14	Conducted Spurious Emissions Restricted Bands Radiated Emissions

B.4.2.7 Photographs

See D.1.0 for detailed photographs of the device.

B.4.2.8 Peripherals and support equipment

Printer: Hewlett Packard DeskJet 600C
M/N: C4547A
S/N: SG62B1H0CX
FCC ID: B94C2184X

Monitor: NANAO
M/N: MA-1760
S/N: A7585023-USM
FCC ID: GCJMA-1760

B.4.2.8 Peripherals and support equipment (con't)

Mouse:	Microsoft P/N: 58267 S/N: 00865704 FCC ID: C3KSMP1
Keyboard:	SIIG M/N: KB1927 Wintouch S/N: SIIGJ22C60003464 FCC ID: FK2SIIGSKB104W
Laptop:	Texas Instrument (remotely located) M/N: NSK82WW/T1 S/N: K82653040031A FCC ID: Not Labeled
Power Supply:	WaveAccess M/N: WA10-06220-0-1 S/N: 0273 FCC ID: Not Applicable
	Linksys 5-Port Workgroup Hub (remotely located) M/N: EW5HUB S/N: Not Labeled FCC ID: KFYPH5
	Delta Electronics (remotely locatd) M/N: ADP-36HB S/N: A5614019957 FCC ID: Not Applicable
Ethernet Bridge:	WaveAccess (remotely located) M/N: NetWeaver CU132 S/N: Not Labeled FCC ID: Not Labeled

B.4.2.8 Peripherals and support equipment (con't)

Cables:

(1) Parallel Cable (2.5m, shielded, metal hood)
(1) 10BaseT Cable [EXT1] (14m, unshielded, plastic hood)
(1) 10BaseT Cable [EXT2] (8m, unshielded, plastic hood)
(1) 10BaseT Cable (1m, unshielded, plastic hood)
(2) AC Power Cords (2m, shielded, metal hood)
(1) Serial Cable (3m, unshielded, plastic hood)
(1) Video Cable (2m, shielded, metal hood)

B.4.2.9 FHSS Receiver Characteristics

The receiver operates in the same frequency band as the transmitter and utilizes the same pseudorandom hopping characteristics.

B.4.3 (2.1033(c)) Application FEE and 731 Form

The NetWeaver CU132 is one device that falls under two parts of the FCC rules, FCC Part 15, Subpart B Class A and FCC Part 15, Subpart C 15.247. One application, one certification, FCC identifier and application fee is required.

B.5.0 (2.1045(a)) Information and Identification Label

See Sections B.2.2, B.2.3 & D.3.0 of this application for applicable labelling requirements and instructions.

B.5.1 (15.15) General Technical Information

b) User Controls - The device does not have any external controls accessible to the user that can be adjusted and operated in violation of the limits of this Standard. The manual instructs the installer how to set up the transmitter based on the antenna used in operation.

B.5.2 (15.19) Labelling Requirements

The complete labeling and label location drawings are included in Exhibit D.3.

B.5.3 (15.21) Information to User

Cautions to the user are contained in the instruction manual on Page ii.

B.5.4 (15.27) Special Accessories

Accessories and peripheral equipment that are normally required to be connected to the device in actual use are connected with representative cable lengths for the tests, if applicable.

B.6.0 (15.31) Measurement Standards

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application, Exhibit C.1.1.

B.6.1 (15.33) Frequency Range of Radiated Emissions

For Subpart B Operation: The highest frequency is 80 MHz	Emissions were investigated to 1000 MHz
For Subpart C Operation: The highest frequency is 2,480 MHz	Emissions were investegated to the 10th Harmonic

B.6.2 (15.35) Measurement Detector and Bandwidth

When performing measurements the following table was used to determine the appropriate detector and resolution banddwidth

Frequency Range (MHz)	Detector*	RBW (KHz)
0.450 to 30	Quasi-Peak	9
30 to 1000	Quasi-Peak	120
1000 +	Average	1000**

* When measurements are specified with an average detector and the emission has a known duty cycle, a peak reading is recorded and an average factor is subtracted from the measurement.
** Lower resolution bandwidth may be used to compensate for high noise floor readings. When this is done, the presence of pulse desensitization was verified.

B.7.0 (15.101 & 15.201) Equipment Authorization of Unintentional Radiators

Under 15.101 of the FCC rules the device is a Class A computer peripheral subject to verification.

Under 15.201 of the FCC rules the device is a spread spectrum frequency hopping transmitter, subject to certification.

B.8.0 (15.105) Information to the User

An instruction manual is provided in Exhibit D.8.

Exhibit C Results of Compliance Tests

C.0.0 System Test Configuration

C.0.1 Justification

The transmitter was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (1992).

During testing, the peripheral locations were not varied with respect to the main unit.

The arrangement of the cables dangling from the rear of the table was varied to the extent possible to produce the maximum emissions.

For maximizing emissions, the system was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data.

C.0.2 EUT Exercising Software

The unit was configured to transmit continuously on three different frequencies; high, medium and low. Radiated emissions testing was performed with hop stopped and while hopping. During emissions testing of the unintentional radiator, the device was installed a a computer peripheral within the guidelines of ANSI C63.4(1992).

C.0.3 General Equipment Information

RECEIVER

FREQUENCY RANGE	2400-2483.5 MHz
NO. OF CHANNELS	78
TUNABLE BANDS	N/A
DESIGNATED RECEPTION MODE AND BANDWIDTH:	Spread Spectrum Frequency Hopping 79 MHz
INTERMEDIATE FREQUENCY(IES)	N/A
INPUT IMPEDANCE	N/A
OUTPUT IMPEDANCE	50 ohms
AUDIO POWER OUTPUT Manufacturers rating	N/A
CRYSTAL FREQUENCY(IES)	Same as Transmitter

TRANSMITTER

FREQUENCY RANGE	2400-2483.5 MHz
NO. OF CHANNELS	78
BANDWIDTH	79 MHz
TYPE OF EMISSION	Spread Spectrum Frequency Hopping
OUTPUT IMPEDANCE	50 ohms
CRYSTAL FREQUENCY(IES)	0.8, 3.6864, 6.4, 10.0, 20, 26.666, 32 & 80 MHz
POWER OUTPUT: Manufacturers rating	0.063 watts

C.1.0 (15.107) Conducted Limits

PERFORMED BY: Kouma Sinn DATE: February 23, 1998

The following page(s) are tables and graphs containing the results of line-conducted emissions testing. To summarize:

Table #	Frequency (MHz)	Worst-case Margin (dB)	Next Highest Margin (dB)	Pass/ Fail
2	1.470	-16	-19	Pass

Intertek Testing Services

Emissions Site 1 Boxborough, MA

Table:2

Company: Wave Access

Model: CU132

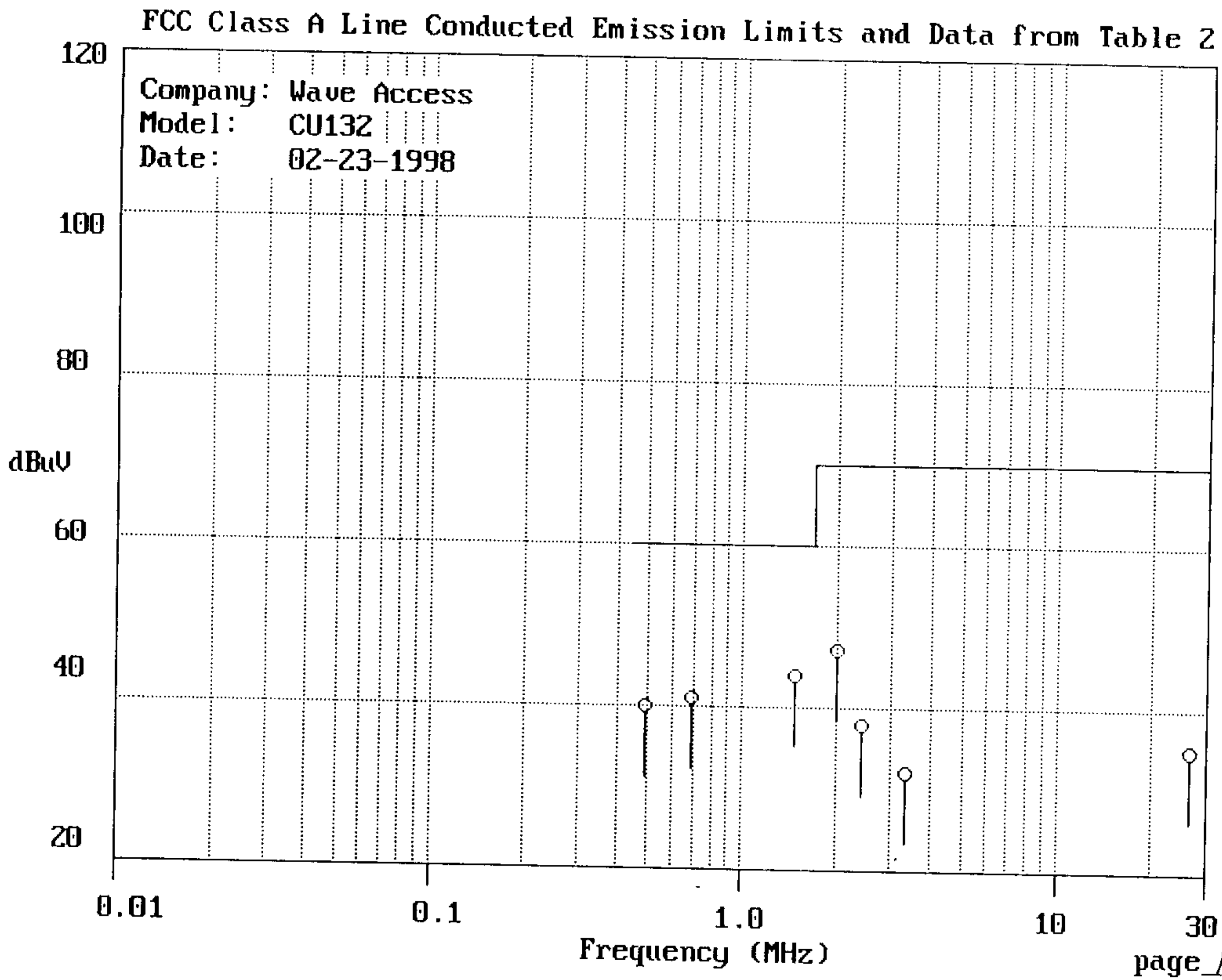
Notes: Line conducted scan

FCC Class A Conducted Emissions

Frequency (MHz)	Reading Side A (dBuV)	Reading Side B (dBuV)	Class A Limit (dBuV)	Margin (dB)
0.492	40	38	60	-20
0.688	41	39	60	-19
1.470	43	44	60	-16
2.000	47	46	70	-23
2.390	38	38	70	-32
3.320	31	32	70	-38
26.67	33	35	70	-35

Test Engineer: Kouma Sinn

Test Date: 02-23-1998


FCC Class A Line Conducted Emission Limits and Data from Table 2
Company: Wave Access
Model: CU132
Date: 02-23-1998
120
100
80
dBuV
60
40
20
0.01
0.1
1.0
10
30
Frequency (MHz)

C.2.0 (15.109) Radiated Emissions Limits

Results of radiated emissions testing is contained in section C.7.0 of this application.

C.3.0 (15.111) Antenna Power Conduction Limits for Receivers

The receiver operates above 960 MHz and is therefore exempt from the requirement.

C.4.0 (15.203) Antenna Requirement Not used, see Amendment.

The DP02 antennas are attached directly to the box using non-standard connectors (reversed polarized SMA) and consequently are the only antennas that don't require professional installation. All the other antennas, which require professional installation, must use the 2 foot RG-58 (with reverse polarized SMA), plus the 20 foot (or longer) RG-8 cables to connect to the bridge box.

C.5.0 (15.204) External Amplifier and Antenna Modification

The installer/user is warned against the use of external amplifiers and antenna modifications in FCC Warning page ii and Section 2.3.1, pages 12 and 13 of the user manual.

C.6.0 (15.205) Conducted Limits

See section C.1.0 of this application for conducted measurement results. The device is a single unit and the conducted emissions measurements need only be measured once.

C.7.0 (15.207 & 15.209) Radiated Emissions Limits and Restricted Bands of Operation

PERFORMED BY: Kouma Sinn
DATE: February 23, 1998

Table #	Modulation	Antenna	Transmit Frequency (MHz)	Measured Frequency (MHz)	Net Reading (µV/m)	Limit (µV/m)	Margin (dB)	Pass/ Fail
1A	QPSK	Standard	Hopping	480.0	447	630	-3	Pass
1	QPSK	Sector (ST 16) CU132	2402	19216.0	282	500	-5	Pass
2	QPSK		2440	19520.0	251	500	-6	Pass
3	QPSK		2480	19840.0	282	500	-5	Pass
4	QPSK	Planar (PN20)	2402	19216.0	282	500	-5	Pass
5	QPSK		2440	19520.0	251	500	-6	Pass
6	QPSK		2480	19840.0	282	500	-5	Pass
10	QPSK	Omni (OM10) CU132	2402	19216.0	282	500	-5	Pass
11	QPSK		2440	19520.0	251	500	-6	Pass
12	QPSK		2480	19840.0	282	500	-5	Pass
13	QPSK	Parabolic Grid (PS19)	2402	19216.0	282	500	-5	Pass
14	QPSK		2440	19520.0	251	500	-6	Pass
15	QPSK		2480	19840.0	251	500	-5	Pass

Intertek Testing Services

Emissions Site 1 Boxborough, MA

Table:1 - A

Company: Wave Access

Model: CU132

Notes: Radiated scan at 3 meters

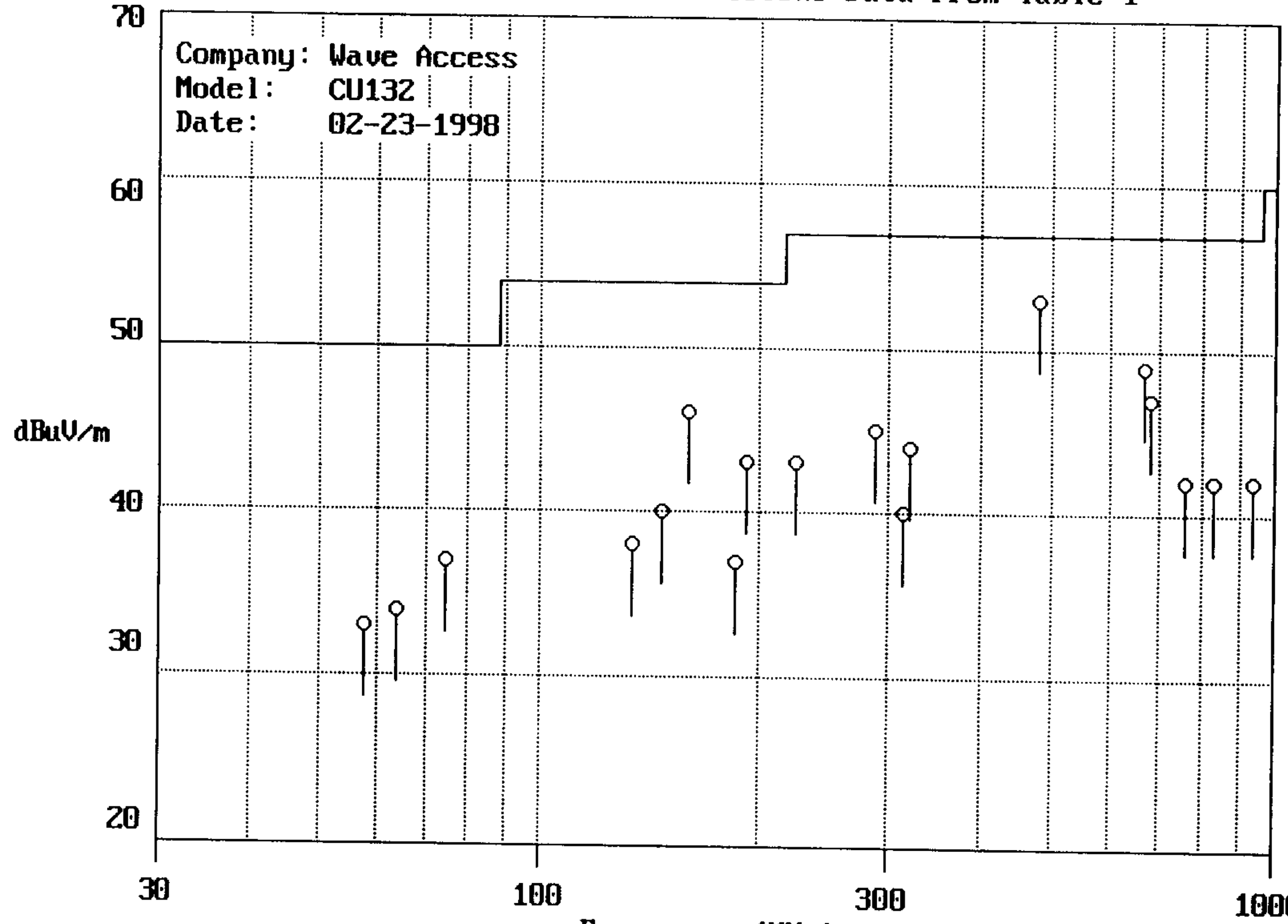
FCC Class A Radiated Emissions

Antenna Polarity	Frequency (MHz)	Reading (dBuV)	Antenna Factor (dB)	Net at 3 meter (dBuV/m)	Class A Limit (dBuV/m)	Margin (dB)
V	57.61	23.0	10	33	50	-17
V	64.00	25.0	9	34	50	-16
H	74.67	30.0	7	37	50	-13
H	134.4	25.0	13	38	54	-16
V	147.2	27.0	13	40	54	-14
V	160.0	30.0	16	46	54	-8
H	185.6	21.0	16	37	54	-17
H	192.0	27.0	16	43	54	-11
H	224.0	24.0	19	43	56	-13
H	288.0	23.0	22	45	56	-11
H	313.6	17.0	23	40	56	-16
H	320.0	21.0	23	44	56	-12
H	480.0	27.0	26	53	56	-3
H	666.7	19.0	30	49	56	-7
H	680.0	17.0	30	47	56	-9
V	760.0	12.0	30	42	56	-14
V	826.7	9.0	33	42	56	-14
V	933.3	6.0	36	42	56	-14

Test Engineer: Kouma Sinn

Test Date: 02-23-1998

3 meter FCC Class A Radiated Emissions Data from Table 1



Intertek Testing Services

Boxborough, MA

TABLE: 1
Date of Test: 02-23-1998

COMPANY: Wave Access
MODEL: CU132

NOTES: H/S scan with ST16 antenna at 2402 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4804.000	25	20	34	0	0	0	39	89	500	-15
12010.000	25	20	41	0	0	0	46	200	500	-8
19216.000	22	20	47	0	0	0	49	282	500	-5

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

Intertek Testing Services

Boxborough, MA

COMPANY: Wave Access
MODEL: CU132

TABLE: 2
Date of Test: 02-23-1998

NOTES: H/S scan with ST16 antenna at 2440 MHz in QPSK

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4880.000	25	20	34	0	0	0	39	89	500	-15
7320.000	22	20	39	0	0	0	41	112	500	-13
12200.000	24	20	41	0	0	0	45	178	500	-9
19520.000	22	20	46	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 3
Date of Test: 02-23-1998

NOTES: H/S scan with ST16 antenna at 2480 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4960.000	20	20	34	0	0	0	34	50	500	-20
7440.000	20	20	40	0	0	0	40	100	500	-14
12400.000	22	20	41	0	0	0	43	141	500	-11
19840.000	23	20	46	0	0	0	49	282	500	-5
22320.000	20	20	48	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 4
Date of Test: 02-23-1998

NOTES: H/S scan with PN20 antenna at 2402 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4804.000	25	20	34	0	0	0	39	89	500	-15
12010.000	25	20	41	0	0	0	46	200	500	-8
19216.000	22	20	47	0	0	0	49	282	500	-5

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 5
Date of Test: 02-23-1998

NOTES: H/S scan with PN20 antenna at 2440 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4880.000	25	20	34	0	0	0	39	89	500	-15
7320.000	22	20	39	0	0	0	41	112	500	-13
12200.000	24	20	41	0	0	0	45	178	500	-9
19520.000	22	20	46	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 6
Date of Test: 02-23-1998

NOTES: H/S scan with PN20 antenna at 2480 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4960.000	20	20	34	0	0	0	34	50	500	-20
7440.000	20	20	40	0	0	0	40	100	500	-14
12400.000	22	20	41	0	0	0	43	141	500	-11
19840.000	23	20	46	0	0	0	49	282	500	-5
22320.000	20	20	48	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 10
Date of Test: 02-23-1998

NOTES: H/S scan with OMNI antenna at 2402 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4804.000	25	20	34	0	0	0	39	89	500	-15
12010.000	25	20	41	0	0	0	46	200	500	-8
19216.000	22	20	47	0	0	0	49	282	500	-5

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 11
Date of Test: 02-23-1998

NOTES: H/S scan with OMNI antenna at 2440 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4880.000	25	20	34	0	0	0	39	89	500	-15
7320.000	22	20	39	0	0	0	41	112	500	-13
12200.000	24	20	41	0	0	0	45	178	500	-9
19520.000	22	20	46	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 12
Date of Test: 02-23-1998

NOTES: H/S scan with OMNI antenna at 2480 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4960.000	20	20	34	0	0	0	34	50	500	-20
7440.000	20	20	40	0	0	0	40	100	500	-14
12400.000	22	20	41	0	0	0	43	141	500	-11
19840.000	23	20	46	0	0	0	49	282	500	-5
22320.000	20	20	48	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 13
Date of Test: 02-23-1998

NOTES: H/S scan with PS19 antenna at 2402 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4804.000	25	20	34	0	0	0	39	89	500	-15
12010.000	25	20	41	0	0	0	46	200	500	-8
19216.000	22	20	47	0	0	0	49	282	500	-5

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

COMPANY: Wave Access
MODEL: CU132

TABLE: 14
Date of Test: 02-23-1998

NOTES: H/S scan with PS19 antenna at 2440 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4880.000	25	20	34	0	0	0	39	89	500	-15
7320.000	22	20	39	0	0	0	41	112	500	-13
12200.000	24	20	41	0	0	0	45	178	500	-9
19520.000	22	20	46	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

Boxborough, MA

COMPANY: Wave Access
MODEL: CU132

TABLE: 15
Date of Test: 02-23-1998

NOTES: H/S scan with PS19 antenna at 2480 MHz in QPSK mode

Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
4960.000	20	20	34	0	0	0	34	50	500	-20
7440.000	20	20	40	0	0	0	40	100	500	-14
12400.000	22	20	41	0	0	0	43	141	500	-11
19840.000	23	20	46	0	0	0	49	282	500	-5
22320.000	20	20	48	0	0	0	48	251	500	-6

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

C.8.0 (15.247) Operation within the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

C.8.1 15.247 (a) Frequency Hopping Spread Spectrum

The transmitter is a spread spectrum frequency hopping transmitter that occupies the 2400 to 2483.5 MHz band.

C.8.2 (15.247 (a)(1)) Channel Separation

Channel Separation is 1 MHz as measured in plot number [1].

C.8.3 (15.247 (a)(1)) Pseudorandom Operation

See **Exhibit D.9.0 Additional information from WaveAccess** for a description of how the hopping works.

C.8.4 (15.247 (a)(1)) Channel usage

See **Exhibit D.9.0 Additional information from WaveAccess** for a description of how the hopping works.

C.8.5 (15.247 (a)(1)) Receiver Characteristics

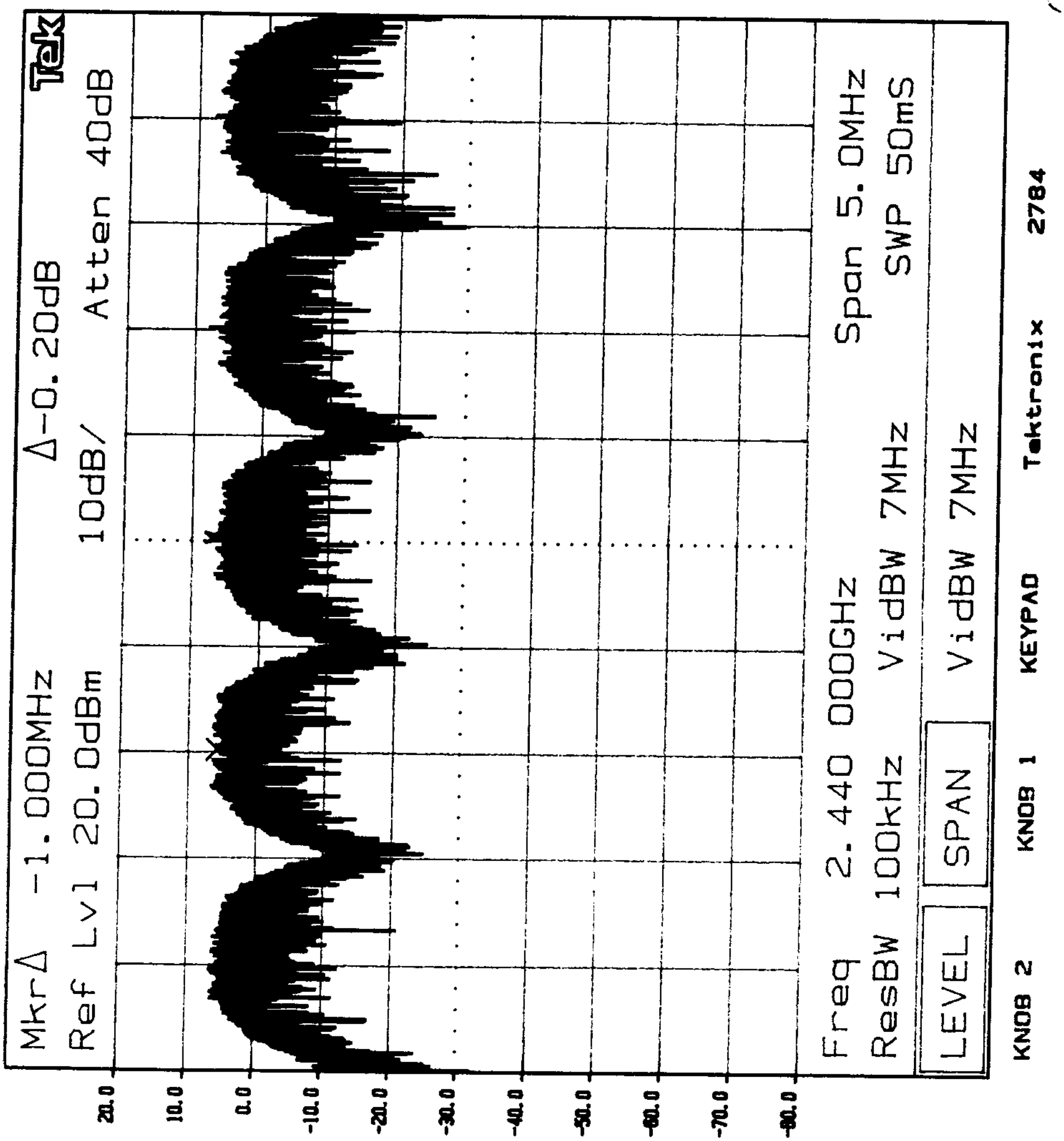
The receiver operates in Spread Spectrum frequency hopping fashion of the transmitter.

C.8.6 (15.247 (a)(1)(ii)) Number of Hopping Frequencies

Their are 78 hopping frequencies.

QPSK PLOT #1

105.13 K



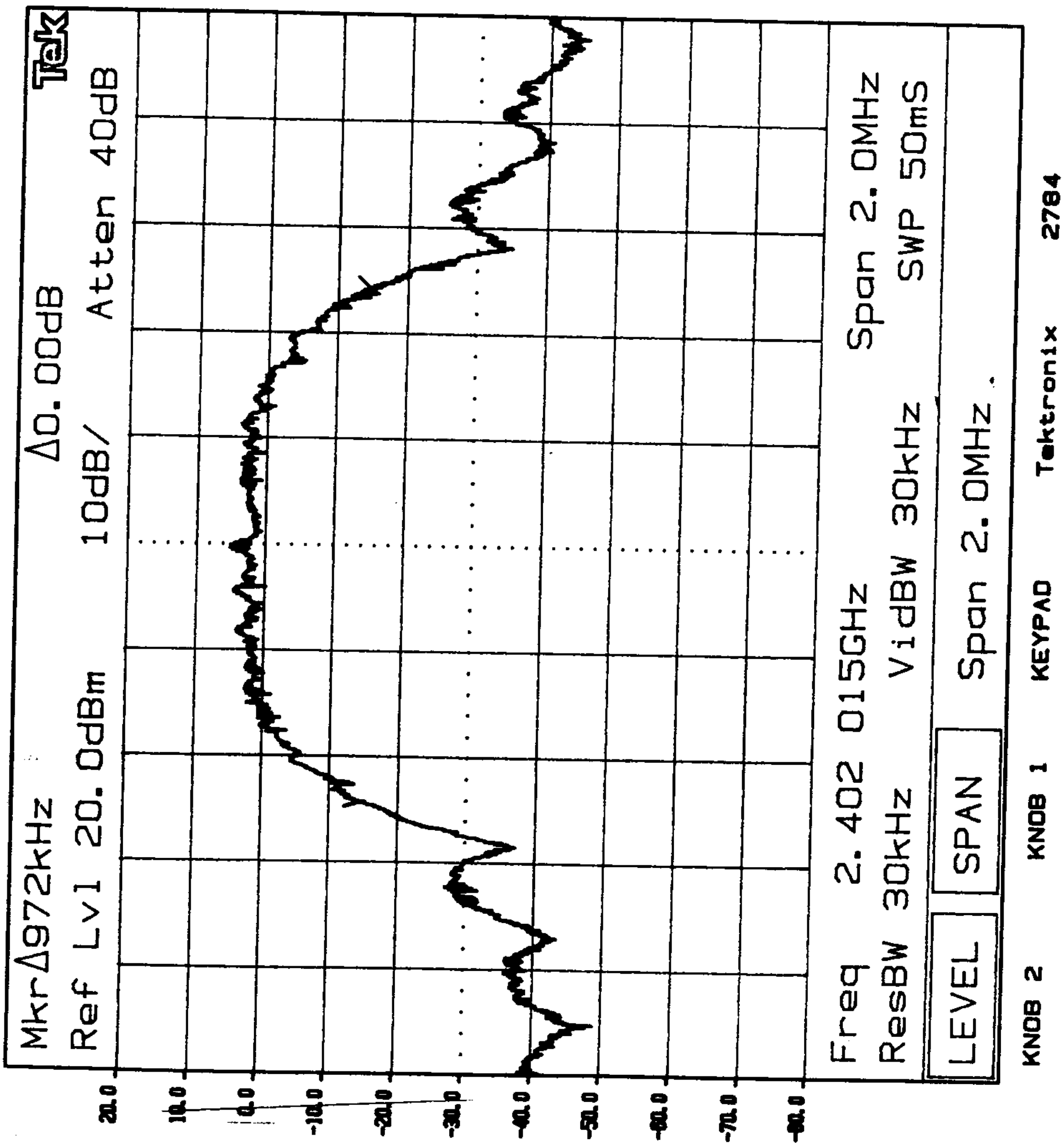
C.8.7 (15.247 (a)(1)(ii)) Bandwidth (20 dBc)

The plots on the following page shows the fundamental emission when modulated. Bandwidth is measured 20 dB below the peak carrier. Resolution bandwidth is chosen to be much less than the bandwidth limit but not below 10 KHz.

Plot #	Transmit Frequency (MHz)	Measured Bandwidth (KHz)	Bandwidth Limit (KHz)	Pass/Fail	Resolution Bandwidth (KHz)
2	2402.0	972	1000	Pass	30
3	2440.0	968	1000	Pass	30
4	2480.0	962	1000	Pass	30
5	Hopping	78 MHz	N/A	N/A	100

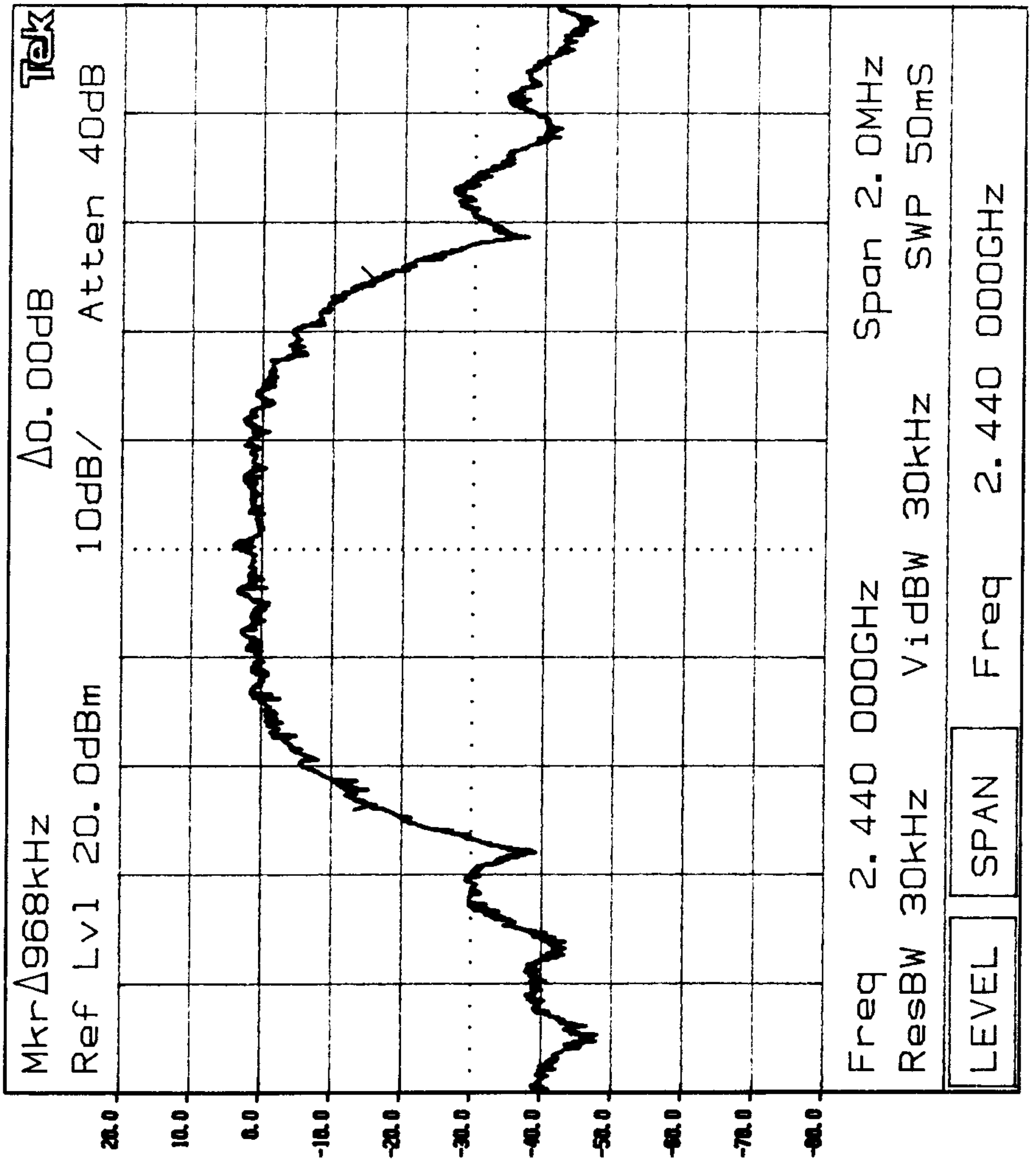
Measurements were made with both types of modulation (QPSK and 16QAM), however QPSK gave worst-case bandwidths and they are what is reported here.

QPSK PLOT #2



pg. 70

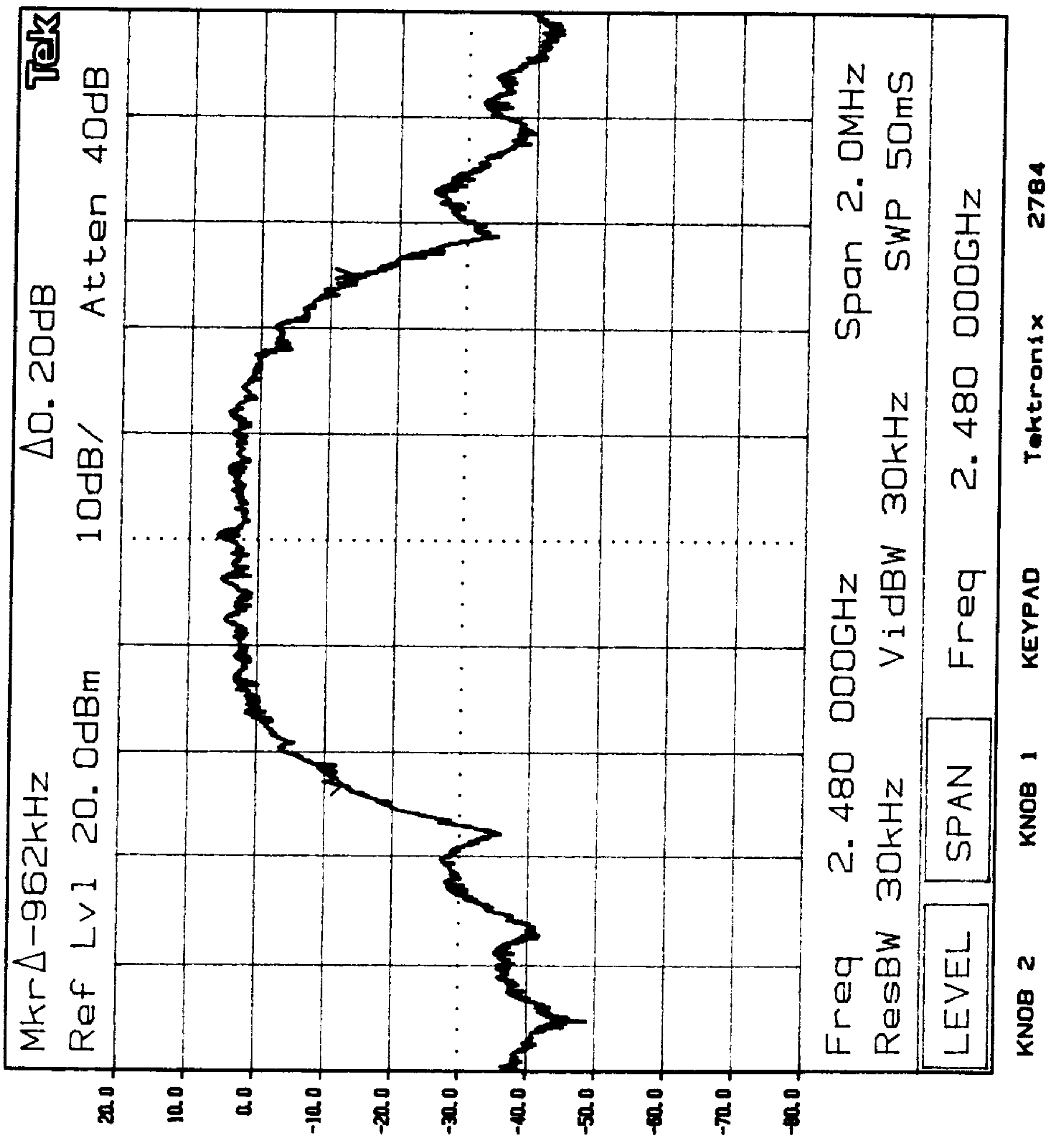
QPSK PLOT #3



Tek
Mkr Δ968kHz
Δ0.00dB
Ref Lvl 20.0dBm
10dB/
Atten 40dB
Freq 2.440 000GHz
Span 2.0MHz
ResBW 30kHz
VidBW 30kHz
SWP 50mS
LEVEL
SPAN
Freq 2.440 000GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0

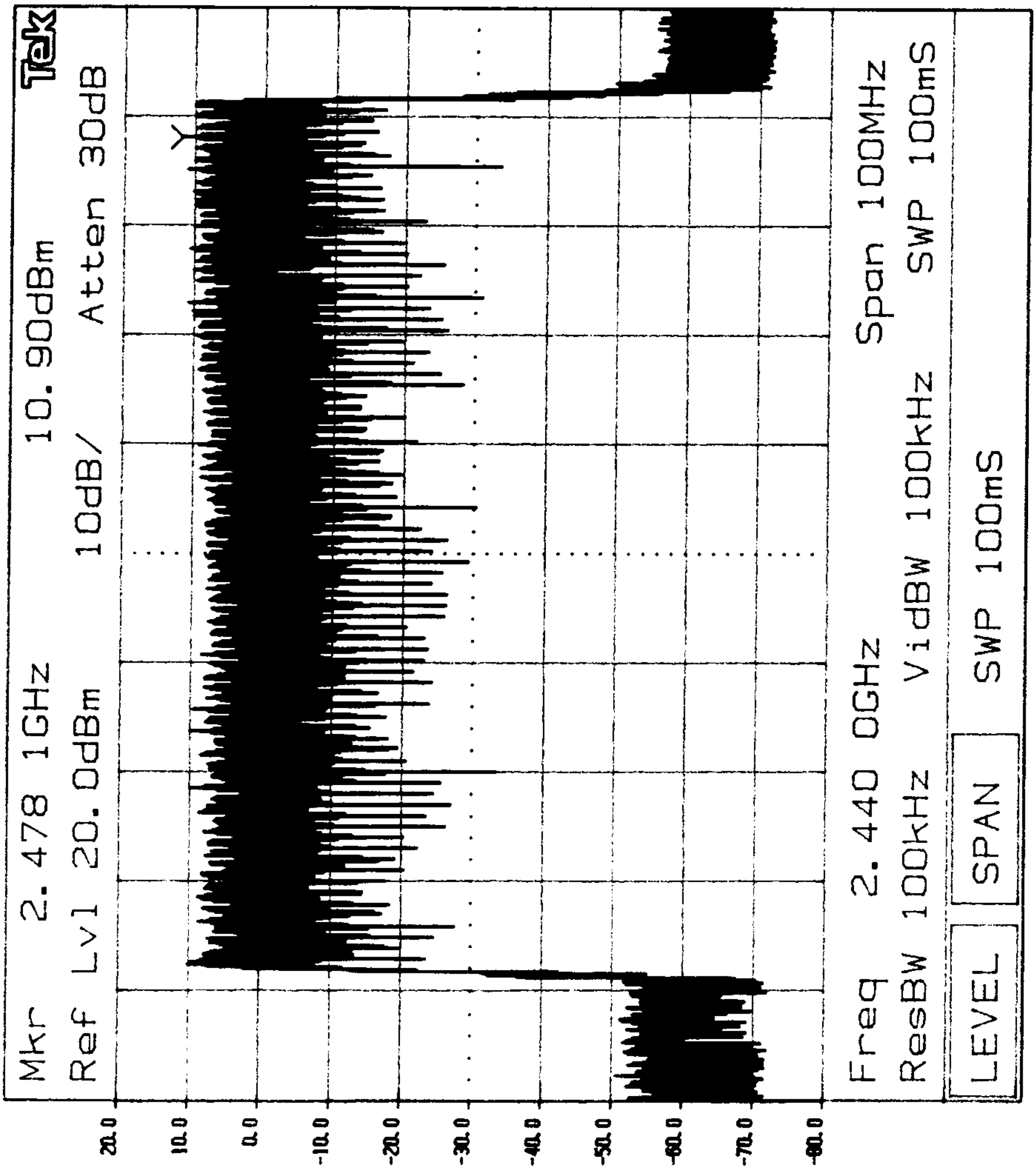
QPSK

PLOT #4



Tek
MkrΔ-962kHz
ΔO. 20dB
Ref Lvl 20. 0dBm
10dB/
Atten 40dB
Freq 2. 480 000GHz
Span 2. 0MHz
ResBW 30kHz
VidBW 30kHz
SWP 50mS
LEVEL
SPAN
Freq 2. 480 000GHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784
20.0
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0

QPSK PLOT #5



pg. 13A

C.8.8 (15.247 (a)(1)(ii)) Average Time of Occupancy

Time of Occupancy on a single channel	Time period before cycle starts again	Time of Occupancy on a single channel Limt	Time period before cycle starts again (limit)	Pass/ Fail
0.3797 seconds	30 seconds	0.4 seconds	30 seconds	Pass

C.8.9 (15.247 (b)(1)) Output Power

Output Power

The manufacturer's a output power is 0.063 watts and the limit is 1.0 watt.

Output Power Measurements

Transmit Frequency (MHz)	Measured Output Power (dBm)	Output Power (watts)	Limit for Out of Band Emissions (dBm)
2402.0	16	0.0398	-4
2440.0	16	0.0398	-4
2480.0	17	0.0501	-3

C.8.10 (15.247 (b)(3)(i)) Fixed Point-to-Point Operation

The NetWeaver CU132 is designed to work with several high gain, professionally installed and point-to-point transmitters. When the antennas are installed the parameters are chosen for that antenna in the software and the output power will be adjusted accordingly.

Reduction is based on the antenna gain being greater than 6 dB over isotropic.

Antenna Name	P-to-P ? (Yes/No	Gain over Isotropic (dBi)	Total Gain (dB)	Limit EIRP (dB)	Pass/Fail
Parabolic Grid (PS19)	Yes	19	37	36	Pass*
Omni (OM10)	No	10	28	36	Pass
Planar (PN20)	No	20	38	36	Pass*
Sector (ST16)	No	16	34	36	Pass

*The reduction in output power assumes that the output power is 1 watt (30 dBm). If the sum of the output power gain plus the AG/3 is greater than 30 dBm, a reduction is applied. For the Parabolic Grid antenna, the need to reduce the output power is determined as follows

Antenna Gain = 20 dBi
Maximum allowed = 6 dBi

Reduction is determined by (20 dBi - 6 dBi) / 3 = 5 dB.
The output power must be (30 dBm - 6 dB) = 24 dB. The maximum output power is 18 dBm. (18dBm + 5 dB = 23) so no reduction is necessary.

C.8.11 (15.247 (b)(3)(iii)) Point-to-Point Installation Instructions

The instruction manual contains installation instruction for Fixed point-to-point installation. See Exhibit D.8.0 pages: 11 through 12 contain antenna installation instructions.

C.8.12 (15.247 (b)(4)) Public Exposure to RF (1.1307)

The instruction manual contained in Exhibit D.8.0 in Section 2.3.1, page(s) 11 contain warnings about RF exposure.

C.8.13 (15.247 (c)) Conducted Spurious Emissions
Restricted bands - Radiated Emissions

PERFORMED BY: Kouma Sinn

DATE: June 16, 1997*

Table #	Transmit Frequency (MHz)	Measured Frequency (MHz)	Net Reading (dBm)	Limit (dBm)	Margin (dB)	Pass/ Fail
16	2402	4804	-55	-5	-50	Pass
17	2440	4880	-56	-6	-50	Pass
18	2480	4960	-50	-5	-45	Pass

***Testing on the BR132**

Measurements were made with the device operating in both QPSK and 16QAM modulation modes. The data for the worst case modes are indicated above and are following, however no emissions were detected within 20 dB of the limit.

C.8.14 (15.247 (g)) Hopping for Long / Short Periods

See **Exhibit D.9.0 Additional information from WaveAccess** for a description of how the hopping works.

C.8.15 (15.247 (h)) Hopping Intelligence

The transmitter does not employ intelligence to effect the hop sequence.

Table 16

Company: Wave Access

Type of Test: Conducted Antenna Emissions

Notes: QPSK Mode, 2402 MHz Fundamental Frequency

Model: Wavelynx

Frequency (GHz)	Reading (dBm)	Cable Loss (dB)	Net Reading (dBm)	Limit (dBm)	Margin (dB)
2.402	15	0	15	N/A	N/A
4.804	-55	0	-55	-5	-50
7.206	-69	0	-69	-5	-64
9.608	-69	1	-68	-5	-63
12.010	-68	1	-67	-5	-62
14.412	-69	1	-68	-5	-63
16.814	-68	1	-67	-5	-62
19.216	-67	1	-66	-5	-61
21.618	-62	1	-61	-5	-56
24.020	-61	2	-59	-5	-54

Test Engineer: Kouma Sinn

Date of Test: June 16, 1997

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Table 17

Company: Wave Access

Type of Test: Conducted Antenna Emissions

Notes: 16QAM Mode, 2440 MHz Fundamental Frequency

Model: Wavelynx

Frequency (GHz)	Reading (dBm)	Cable Loss (dB)	Net Reading (dBm)	Limit (dBm)	Margin (dB)
2.440	14	0	14	N/A	N/A
4.880	-56	0	-56	-6	-50
7.320	-70	0	-70	-6	-64
9.760	-69	1	-68	-6	-62
12.200	-68	1	-67	-6	-61
14.640	-68	1	-67	-6	-61
17.080	-67	1	-66	-6	-60
19.250	-66	1	-65	-6	-59
21.960	-63	1	-62	-6	-56
24.400	-61	2	-59	-6	-53

Test Engineer: Kouma Sinn

Date of Test: June 16, 1997

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Company: Wave Access

Table 18

Type of Test: Conducted Antenna Emissions

Notes: QPSK Mode, 2480 MHz Fundamental Frequency

Model: Wavelynx

Frequency (GHz)	Reading (dBm)	Cable Loss (dB)	Net Reading (dBm)	Limit (dBm)	Margin (dB)
2.480	15	0	15	N/A	N/A
4.960	-50	0	-50	-5	-45
7.440	-78	0	-78	-5	-73
9.920	-79	1	-78	-5	-73
12.400	-80	1	-79	-5	-74
14.880	-77	1	-76	-5	-61
17.360	-76	1	-75	-5	-70
19.840	-76	1	-75	-5	-70
22.320	-75	1	-74	-5	-69
24.800	-73	2	-71	-5	-66

Test Engineer: Kouma Sinn

Date of Test: June 16, 1997

pg 13

Exhibit D Additional Materials

D.2.0 Photographs of the Device

D.4.0 Advertising Literature

Not Applicable

D.9.0 Additional Information for WaveAccess

February 19, 1998

WaveAccess
NetWeaver™ CU132's Part 15.247 Parameters

Radio Parameters:

$B_{20dB} \leq 1$ MHz
Number of hopping channel carrier frequencies = 79
Hopping channel carrier frequencies separation = 1 MHz
Lowest carrier frequency = 2402 MHz
Highest carrier frequency = 2480 MHz
Average time of occupancy on any frequency within a 30 second period = 0.3797 second
Hopping frequency = 48.828 Hz
Receiver bandwidth = 1 MHz
Maximum peak output power of transmitter = 18 dBm
Average output power of transmitter = ≈12 dBm (QPSK)

Cables: All antenna cable assemblies consist of a 2 foot RG-58 cable with a loss equal to 0.7dB, converting from the non-standard radio connector to an N-type connector, and the antenna cable. The antenna cable minmum length is such that the total assembly loss is at least 2.0dB at 2.44GHz. This is determined by cable type. For example, Times' LMR-400 which has attenuation of 6.7dB/100ft, requires cable lengths no shorter than 20 feet.

Antennas: The set of antennas used by *NetWeaver* CU132 is specified in the table below. This set consists of three different antenna types. Tested antennas are in bold. The maximum EIRP values assume transmit power of 18 dBm and a minimum combined cable loss of 2.0dB.

Antenna Type	WaveAccess' Name	Gain [dBi]	Horizontal Beamwidth [°]	Vertical Beamwidth [°]	Mximum EIRP [dBm]
Sector	**ST16**	16	90	7	32
	ST12	12.5	90	10	28.5
Omni-directional	**OM10**	10	360	8	26
	OM09	9	360	14	25
	OM08	8	360	15	24
	OM05	5	360	38	20.0
Planar	**PN20**	20	22.5	10.5	36
	PN17	17	22	22	33
	PN15	15	34	34	31
Parabolic	**PS19**	19	18	20	35

RF Connectors: The radio unit has a non-standard RF connector. The transition cable adapts that connector to a female N-type connector. Antenna cables have male N-type and female N-type connectors. Antennas have male N-type connectors. Note: professional installation is required.

Hopping Patterns:

There are 78 hopping sequences according to the following formula:

$$\text{Hopping Sequence}_{k,m}[i] = 2402 + (b[i] + k + 3 \cdot m) \bmod 79 \ \ [\text{MHz}]$$

where k=0,1 or 2, m=0,1,2,....,25, i=0,1,2,....,78
and

i	b[i]	i	b[i]	i	b[i]	i	b[i]	i	b[i]	i	b[i]	i	b[i]	i	b[i]
0	0	10	76	20	18	30	34	40	14	50	20	60	48	70	55
1	23	11	29	21	11	31	66	41	57	51	73	61	15	71	35
2	62	12	59	22	36	32	7	42	41	52	64	62	5	72	53
3	8	13	22	23	72	33	68	43	74	53	39	63	17	73	24
4	43	14	52	24	54	34	75	44	32	54	13	64	6	74	44
5	16	15	63	25	69	35	4	45	70	55	33	65	67	75	51
6	71	16	26	26	21	36	60	46	9	56	65	66	49	76	38
7	47	17	77	27	3	37	27	47	58	57	50	67	40	77	30
8	19	18	31	28	37	38	12	48	78	58	56	68	1	78	46
9	61	19	2	29	10	39	25	49	45	59	42	69	28	-	-

Example A: for k=0, m=0, we obtain the following hopping sequence, expressed in MHz:
2402, 2425, 2464, 2410, 2445, 2418, 2473, 2449, 2421, 2463, 2478, 2431, 2461, 2424, 2454, 2465, 2428, 2400, 2433, 2404, 2420, 2413, 2438, 2474, 2456, 2471, 2423, 2405, 2439, 2412, 2436, 2468, 2409, 2470, 2477, 2406, 2462, 2429, 2414, 2427, 2416, 2459, 2443, 2476, 2434, 2472, 2411, 2460, 2401, 2447, 2422, 2475, 2466, 2441, 2415, 2435, 2467, 2452, 2458, 2444, 2450, 2417, 2407, 2419, 2408, 2469, 2451, 2442, 2403, 2430, 2457, 2437, 2455, 2426, 2446, 2453, 2440, 2432 and 2448.

Example B: for k=1, m=3, we obtain the following hopping sequence, expressed in MHz:
2412, 2435, 2474, 2420, 2455, 2428, 2404, 2459, 2431, 2473, 2409, 2441, 2471, 2434, 2464, 2475, 2438, 2410, 2443, 2414, 2430, 2423, 2448, 2405, 2466, 2402, 2433, 2415, 2449, 2422, 2446, 2478, 2419, 2401, 2408, 2416, 2472, 2439, 2424, 2437, 2426, 2469, 2453, 2407, 2444, 2403, 2421, 2470, 2411, 2457, 2432, 2406, 2476, 2451, 2425, 2445, 2477, 2462, 2468, 2454, 2460, 2427, 2417, 2429, 2418, 2479, 2461, 2452, 2413, 2440, 2467, 2447, 2465, 2436, 2456, 2463, 2450, 2442 and 2458.

The system changes its carrier frequency at fixed intervals (every 20 msec) under the direction of the coded sequence specified above. The near term distribution of the frequencies appears random, the long term distribution appears evenly distributed over the hop set (2402 to 2480 MHz), and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

NetWeaver CU132 selects its hopping pattern randomly or enforced by the user. In any case there is no coordination between two links, thus any two links will collide (i.e. use the same channel simultaneously) in a random manner.

Each transmission starts upon the packet's time of arrival (if channel is free). This could be at any time and at any frequency or frequencies. The transmission frequency changes every 20 msec regardless of when the packet arrives or how long it is, therefore each frequency is used equally, statistically in manner. In other words, the time of arrival, and thereby time of transmission, is random and uncoordinated with the hopping channel which by itself is uniformly distributed between 2402 MHz to 2480 MHz. In particular, if the transmitter is presented with a continuous data stream it would distribute its transmissions evenly over the 79 carrier frequencies s.

Receiver/Transmitter Matching:

The receivers synchronize with the transmitter when they are powered on and stay synchronized until they are powered down. From this point the receiver hops together with the transmitter as well as all with the other device in the point-to-point link, using the same hopping sequence and channels.

The receiver mixes down the RF frequencies to a constant IF frequency of 350 MHz. Here the receiver bandwidth is set at a constant 1 MHz by a SAW filter (see block diagram and schematic attached). Repeated and multiple packets are synchronized to the transmitter RF frequency and mixed down to the receiver SAW filter.

Dwell Time:

The dwell time is 20.48 msec. The full hopping cycle is 1.618 sec (79 times the dwell time). Plots showing these two parameters are provided.

Plots 1 to 3 show the transmitted signal at the low, middle and high channels (2402, 2440 and 2480 MHz), respectively, when the system operates at a single frequency (special mode) and transmits a packet at each hop. The dwell time of about 20.5 msec manifests itself through the time between transmissions.

Plots 4 to 6 show the transmitted signal at the low, middle and high channels (2402, 2440 and 2480 MHz), respectively, when the system operates normally (with hopping) and transmits a packet at each hop. The hopping cycle of about 1.62 sec manifests itself through the time between visits of the particular channel.

February 20, 1997

WaveAccess
NetWeaver™ CU132's Parameters (Canada)

Radio Parameters:

$B_{20dB} \leq 1$ MHz
Number of hopping channel carrier frequencies = 29
Hopping channel carrier frequencies separation = 1 MHz
Lowest carrier frequency = 2452 MHz
Highest carrier frequency = 2480 MHz
Average time of occupancy on any frequency within a 30 second period = 1.03448 second
Hopping frequency = 48.828 Hz
Receiver bandwidth = 1 MHz
Maximum peak output power of transmitter = 18 dBm
Maximum peak EIRP : See table below.
Average output power of transmitter = ≈4dB below peak output power (QPSK)

Cables: All antenna cable assemblies consist of a 2 foot RG-58 cable with a loss equal to 0.7dB, converting from the non-standard radio connector to an N-type connector, and the antenna cable. The antenna cable minmum length is such that the total assembly loss is at least 2.0dB at 2.44GHz. This is determined by cable type. For example, Times' LMR-400 which has attenuation of 6.7dB/100ft, requires cable lengths no shorter than 20 feet.

Antennas: The set of antennas used by *NetWeaver* CU132 is specified in the table below. This set consists of three different antenna types. Tested antennas are in bold. The maximum EIRP values assume transmit power of 18 dBm and a minimum combined cable loss of 2.0dB.

Antenna Type	WaveAccess' Name	Gain [dBi]	Horizontal Beamwidth [°]	Vertical Beamwidth [°]	Mximum EIRP [dBm]
Sector	**ST16**	16	90	7	32
	ST12	12.5	90	10	28.5
Omni-directional	**OM10**	10	360	8	26
	OM09	9	360	14	25
	OM08	8	360	15	24
	OM05	5	360	38	20.0
Planar	**PN20**	20	22.5	10.5	36
	PN17	17	22	22	33
	PN15	15	34	34	31
Parabolic	**PS19**	19	18	20	35

RF Connectors: The radio unit has a non-standard RF connector. The transition cable adapts that connector to a female N-type connector. Antenna cables have male N-type and female N-type connectors. Antennas have male N-type connectors. Note: professional installation is required.

Hopping Patterns:

There are 27 hopping sequences according to the following formula:

$$\mathbf{f(i) = [b(i) + o] \bmod 29 + 54}$$

$$\text{Hopping Sequence}_{k,m}[i] = 2452 + (b[i] + k + 3 \cdot m) \bmod 29 \ \ [\text{MHz}]$$

where k=0,1 or 2, m=0,1,2,....,8, i=0,1,2,....,29
and

i	b(i)	i	b(i)	i	b(i)	i	b(i)
0	**0**	8	**28**	16	**20**	24	**13**
1	**18**	9	**21**	17	**9**	25	**25**
2	**27**	10	**11**	18	**8**	26	**4**
3	**23**	11	**3**	19	**17**	27	**22**
4	**1**	12	**10**	20	**16**	28	**6**
5	**12**	13	**7**	21	**15**		
6	**19**	14	**5**	22	**14**		
7	**26**	15	**2**	23	**24**		

The system changes its carrier frequency at fixed intervals (every 20 msec) under the direction of the coded sequence specified above. The near term distribution of the frequencies appears random, the long term distribution appears evenly distributed over the hop set (2452 to 2480 MHz), and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

NetWeaver CU132 selects its hopping pattern randomly or enforced by the user. In any case there is no coordination between two links, thus any two links will collide (i.e. use the same channel simultaneously) in a random manner.

WaveAccess

FCC TEST

ITS CHECKLIST

***NetWeaver* CU132 Wireless Bridge**

2/19/98

Model number /name: *NetWeaver* CU132

Simplified Operating Instructions:

Connect the antenna to the unit using a 20 foot LMR-400 and 2 foot RG-58 cables (provided).
Connect the wall mounted power adapter to rear panel.
Turn on the unit.
Connect a 10BaseT cable from the local wired network to the unit.

For a more detailed operating instructions see the enclosed *NetWeaver* BR132 User's Guide.

Unique Cabling:

- Antenna cable through a transition cable to reversed polarity SMA connector on the front panel ("Main"). Note: the other RF connector, "Aux", is not in use.
- 10BaseT to the RJ45 connector on the rear panel ("ETHERNET").
- Power supply adapter cord to plug input on the rear panel ("DC IN").
- RS-232C (DB-9, female-female) to DB-9 connector ("TEST"). Used to connect a monitor (PC).
- Two 10BaseT cables to the two RJ45 connectors, "EXT1" and "EXT2", on the (right side of) rear panel. These connections, carrying RS485 communications, are parts of a bus connectiong all co-located CU-132 units. Used to coordinate transmit times between multiple co-located CU-132 units (while not avoiding the independent and colliding frequency hopping patterns).

List of Clock Frequencies:

0.8, 3.6864, 6.4, 10, 20, 26.666, 32, 80 MHz.
All timings are derived from the 3.6864, 32 and 80 MHz oscillators.

Schematics:

Bridge PHY Revision-.
Jaguar WaveAccess AP V1.3
Sync Balcony V2.0

Product Description:

The *NetWeaver* CU132 wireless bridge is the central unit of a point-to-multipoint wireless network which transfers data to and from remote units (**identical** to *waveLyNX* BR132, FCC ID= NCABR132V100LXUS, with product names of

NetWeaver SDR132 and MDR132) at distances of up to 10 miles. The link between the CU132 unit and each of the SDR132 and MDR132 units in the network is point-to-point, in the sense that the SDR132/MDR132 communicates only with the central unit (CU132). All units in the nwetwork employ a frequency hopping spread spectrum radio covering 79 channels of 1 MHz each.

Data rates of 3.2 and 1.6 Mbps (using 16QAM and QPSK modulation techniques, respectively) are supported and switched automatically as dictated by channel conditions.

Several types of antennas can be used with the CU132 unit: sector antennas with gains of up to 16dBi, omni antennas with gains of up to 10dBi and pannel antennas (for narrow sector applications) with gains up to 20dBi. The SDR132/MDR132 units employ the same antennas (and cables) as approved for *waveLyNX* BR132 (i.e. parabolic reflector with gains of up to 24dBi, Yagi with a gain of 14dBi, omni antennas with gains of up to 12dBi, and Patch/Planar with gains of up to 9dBi).

For a radio parameters list see the enclosed "*NetWeaver™* CU132's Radio Parameters".

For a detailed description see the enclosed *NetWeaver* CU132 User's Guide.

Support Equipment:

10BaseT wired network (connected to the EUT) and its components:

Data-Grade Network Cable, UTP, 24 Gauge, 4 Pair, 100 ohm (Belkin # A7J304-250)

5 Port Workgroup Hub (Linksys model no: EW5HUB)

Laptop computer (Canon Innova Book 350CD, SN Toshiba MK1924FCV)

PCMCIA Ethernet 10Mbps LAN Adapter (Megahertz model no. XJ10BT, SN 6530162385).

A monitor to set up the EUT and RS-232C (DB-9, female/female) cable connecting the monitor to EUT.

A *NetWeaver* SDR132 (identical to *waveLyNX* BR132 wireless bridge) and 10BaseT wired network (connected to SDR132) and its components:

Data-Grade Network Cable, UTP, 24 Gauge, 4 Pair, 100 ohm (Belkin # A7J304-250), Crossed

Laptop computer (Texas Instruments Extensa 510)

PCMCIA Ethernet 10Mbps LAN Adapter (Megahertz model no. XJ10BT, SN 6530162385)

Intended Operating Environment: an office environment where a 10BaseT Local Area Network is installed.

Software Exercise Program:

- For normal operation:
  DOS script which copies a file back and forth (infinite loop) between the two PCs via the wireless bridge. The PCs are connected to the two 10BaseT networks on each side of the bridge.
- Special FCC testing software:
  Controls the mode of operation between receive only and receive/transmit, regular hopping and a single frequency operation, and 16QAM and QPSK (3.2 Mbps and

1.6 Mbps data rates, respectively) operations. In all transmit cases a synthetic packet is used without a need for having a destination. Mode switching is done by SNMP commands sent from a Linux SNMP manager (installed on a PC).