



TUV RHEINLAND ADDENDUM TO FC02-002B

FOR THE

WHERENET LOCATION SENSOR, LAP-4200

FCC PART 15 SUBPART C SECTIONS 15.247, 15.207 & 15.209

AND

FCC PART 15 SUBPART B SECTION 15.109 CLASS B

COMPLIANCE

DATE OF ISSUE: MARCH 27, 2002

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Date of test: November 26 - January 22, 2002

Report No.: FC02-002C

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A2LA (USA); DATech (Germany); BSMI (Taiwan); Nemko (Norway); and GOST (Russia).

CKC Laboratories, Inc has received test site Registration Acceptance from the following agencies:

FCC (USA); VCCI (Japan); and Industry Canada.

CKC Laboratories, Inc. has received Letters of Acceptance through an MRA for the following agencies:

ACA/NATA (Australia); SABS (South Africa); SWEDAC (Sweden); Radio Communications Agency (RA); HOKLAS (Hong Kong); Bakom (Swiss); BIPT (Belgium); Denmark Telestyrelsen; RvA (Netherlands); SEE (Luxembourg) SITTEL (Bolivia); and UKAS (UK).

ADMINISTRATIVE INFORMATION

DATE OF TEST:	November 26 - January 22, 2002
DATE OF RECEIPT:	November 26, 2001
PURPOSE OF TEST:	To demonstrate the compliance of the WhereNet Location Sensor, LAP-4200, with the requirements for FCC Part 15 Subpart C Sections 15.247, 15.207, 15.209 and FCC Part 15 Subpart B Section 15.109 Class B devices. Addendum A revised tables 1, 2, 5, added table 7 and corrected the manufacturer name. Addendum B revised the data in tables 1 and 2, as well as the corresponding data in Appendix C. Addendum C removed all references to testing of the WLAN transmitter.
TEST METHOD:	ANSI C63.4 (1992) and ITU-R 55/1
MANUFACTURER:	WhereNet 2858 De La Cruz Blvd Santa Clara, CA 95050
REPRESENTATIVE:	Ken Chesley
TEST LOCATION:	CKC Laboratories, Inc. 480 Los Viboras Road, Hollister, CA 95023 1653 Los Viboras Road, Hollister, CA 95023 5473A Clouds Rest, Mariposa, CA 95338

SUMMARY OF RESULTS

The TUV Rheinland WhereNet Location Sensor, LAP-4200 was tested in accordance with the following standards and specifications:

United States

- FCC Part 15 Subpart B Section 15.109 Class B
- FCC Part 15 Subpart C Section 15.247/15.209
- ANSI C63.4 (1992) method

Canada

RSS-210 using:

- FCC Part 15 Subpart B Section 15.109 Class B
- FCC Part 15 Subpart C Section 15.247/15.209
- ANSI C63.4 (1992) and ITU-R 55/1 methods

Industry of Canada File No. IC 3171-B

Industry of Canada File No. IC 3170-C

The results in this report apply only to the items tested, as identified herein.

MODIFICATIONS REQUIRED FOR COMPLIANCE

No modifications were necessary for compliance.

APPROVALS

QUALITY ASSURANCE:



Dennis Ward, Quality Manager



Christine Nicklas, EMC/Lab Manager

TEST PERSONNEL:



Art Rice, Test Engineer



Chuck Kendall, EMC/Lab Manager



Randy Clark, EMC Engineer

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

WhereNet manufactures a Real Time Location System (RTLS) used to track assets throughout a facility. The Location Sensor (models LAP-4200 and LOS-4100) receives the signals transmitted by the WhereTags, which are attached to the tracked assets. The decoded tag information is then time stamped and routed to a PC for additional processing. The locate algorithm running on the PC calculates the tag position based on the time stamps of multiple Location Sensors throughout the site, and reports that tag position to the database, where it is displayed by the Resource Manager software. There are two separate Location Sensor models:

- LOS-4100 (802.3 Wired Ethernet)
- LAP-4200 (with 802.11b Wireless LAN Access Point, also known as a Locating Access Point)

The difference between the two models is that the LAP-4200 contains an Access Point, while the LOS-4100 does not. These units are identical in appearance; the only way to distinguish them is by the model number on the housing. Note that both units have a wired Ethernet port; the LAP-4200 has a can function as either a client bridge or an access point. Both units also include a low power transmitter which is used to distribute configuration data and timing signals to other Location Sensor units. This transmitter, which has the same transmitter characteristics as a WhereTag, is referred to as the embedded tag circuitry.

Note: Only the production model LAP-4200, which represents the worst case unit, was tested by CKC Laboratories. Inside the LAP-4200 is a previously approved transmitter, FCC ID: H9PLA4131M.

EQUIPMENT UNDER TEST

Antenna Flat Panel

Manuf: WhereNet
Model: AK-120
Serial: None
FCC ID: DoC

WhereNet Location Sensor

Manuf: WhereNet
Model: LAP4-200
Serial: M00460110000
FCC ID: NSQLAP-4200-A

Switching Power Adapter

Manuf: Globtek, Inc.
Model: GT-2-1097-5024
Serial: 013A230260
FCC ID: DoC

Antenna All Weather Omni

Manuf: WhereNet
Model: AK-210-10
Serial: none
FCC ID: DoC

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

AC Adapter for PC

Manuf: Delta
Model: ADP-50GB
Serial: M2819010414
FCC ID: DoC

Ethernet Hub

Manuf: Bay Networks
Model: DS108
Serial: DS18F9B09756
FCC ID: DoC

AC Adapter for Hub

Manuf: Bay Networks
Model: PWR-002-004
Serial: NA
FCC ID: DoC

AC Adapter for WLAN

Manuf: Transceiver Symbol Tech
Model: 50-25000-021
Serial: 002131099
FCC ID: DoC

Switching Power Adapter

Manuf: Globtek, Inc.
Model: GT-2-1097-5024
Serial: 013A230260
FCC ID: DoC

WLAN Transceiver

Manuf: Symbol Technologies
Model: A66233-01
Serial: 00034715C4FF
FCC ID: DoC

Laptop PC

Manuf: Hitachi
Model: 7560
Serial: TE0136700153
FCC ID: DoC

15.33 FREQUENCY RANGE TESTED

15.109 Radiated: 1-12.8 GHz
15.207 Conducted: 450 kHz – 30 MHz
15.209/15.247 Radiated: 9kHz – 26.5 GHz

EUT OPERATING FREQUENCY

The EUT was operating at 2462 MHz.

TEMPERATURE AND HUMIDITY DURING TESTING

The temperature during testing was within +15°C and + 35°C.
The relative humidity was between 20% and 75%.

REPORT OF MEASUREMENTS

The following tables report the six highest worst case levels recorded during the tests performed on the WhereNet Location Sensor, LAP-4200. All readings taken are peak readings unless otherwise noted. The data sheets from which these tables were compiled are contained in Appendix B.

Table 1: 15.247(b)(1) Peak Power Emission: OATS Testing									
FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB					
2462.058	118.8	28.6	-32.5	8.2		123.1	143.0	-19.9	V-1
2462.245	125.6	28.6	-32.5	8.2		129.9	143.0	-13.1	H-1
2462.023	130.5	28.6	-32.5	8.2		134.8	143.0	-8.2	V-2
2462.050	128.3	28.6	-32.5	8.2		132.6	143.0	-10.4	H-2

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart C Section 15.247(b)(1)
Test Distance: 3 Meters

NOTES:
H = Horizontal Polarization
V = Vertical Polarization
1 = Configuration 1
2 = Configuration 2

COMMENTS: Table results are comprised of the readings from data taken in the following configurations:

Configuration 1 = Laptop PC attached to the WhereNet Location Sensor (LAP-4200). LAP is transmitting in the Tag Mode with an 840 command for output power. All units are on the 80 cm high wooden turntable. All readings have been corrected to a RBW of 28.6MHz. All readings have been converted to voltage delivered to the antenna terminal using $(E_d)^2/30G$ and the field strength readings at 3 meters.

Configuration 2 = Laptop PC attached to the WhereNet Location Sensor (LAP-4200). LAP is transmitting in the Tag Mode with an 840 command for output power. All units are on the 80 cm high wooden turntable. All Weather Omni Antennas are attached. All readings have been corrected to 28.6MHz RBW. All readings have been corrected to voltage delivered to the antenna using $(E_d)^2/30G$ and the field strength measured at 3 meters.

Table 2: 15.247(b)(1) Peak Power Emission: Antenna Terminal Testing

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB					
2462.245	128.2	0.0				128.2	137.0	-8.8	N

Test Method: ANSI C63.4 (1992)

Spec Limit: FCC Part 15 Subpart C Section 15.247(b)(1)

Test Distance: No Distance

NOTES:

N = No Polarization

COMMENTS: Table results are comprised of the readings from data taken in the following configurations:

Laptop PC attached to the WhereNet Location Sensor (LAP-4200). LAP is transmitting in the Tag Mode with power set to 840. Frequency Tested: Fundamental

RBW = 2MHz

VBW = 3MHz

(BW set to highest settings)

2 MHz BW Correction: $10\log(28.6/2) = 11.55$

The readings on the data sheet are already corrected (+11.55dB) for bandwidth. The readings reflect all of the power contained in the 6 dB bandwidth.

Table 3: 15.247(c)/15.209 Highest Radiated Emission Levels: 9kHz-30MHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB					
0.010	44.6	18.3		0.0		62.9	127.6	-64.7	N
0.069	12.3	10.2		0.1		22.6	110.8	-88.2	N
0.142	23.6	9.6		0.1		33.3	104.5	-71.2	N
0.153	49.1	9.7		0.1		58.9	103.9	-45.0	N
5.004	27.2	9.5		0.3		37.0	69.5	-32.5	N
19.780	34.0	8.6		0.6		43.2	69.5	-26.3	N

Test Method: ANSI C63.4 (1992)

Spec Limit: FCC Part 15 Subpart C Sections 15.247(c)/15.209

Test Distance: 3 Meters

NOTES: N = No Polarization

COMMENTS: The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test of the continuous mode TAG transmitters. Note 2) Scan and maximize spurious signals 9 kHz-30 MHz. Note 3) Long timing cable was looped back, routed down through hole in metal turntable, to simulate a typical installation. **Note: All readings are ambient readings.**

Table 4: 15.247(c)/15.209 Highest Radiated Emission Levels: 30-1000MHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB					
549.412	47.0	19.8	-28.2	5.7		44.3	46.0	-1.7	H-2
549.467	43.9	21.9	-27.8	3.1		41.1	46.0	-4.9	H-3
650.003	43.6	21.3	-28.3	6.4		43.0	46.0	-3.0	V-2
671.557	44.2	21.7	-27.7	3.4		41.6	46.0	-4.4	HQ-3
500.033	45.6	17.6	-28.2	5.3		40.3	46.0	-5.7	V-2
750.071	46.7	21.5	-27.6	3.6		44.2	46.0	-1.8	VQ-3

Test Method: ANSI C63.4 (1992)

Spec Limit: FCC Part 15 Subpart C Sections 15.274(c)/15.209

Test Distance: 3 Meters

NOTES:

H = Horizontal Polarization

V = Vertical Polarization

Q = Quasi Peak Reading

2 = Configuration 2

3 = Configuration 3

COMMENTS: The following three configurations were tested in the 30-1000 MHz range:

Configuration 1 = The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test in the continuous TAG transmit mode. Note 2) Scan and maximize spurious signals 30-1000 MHz. Note 3) Transmit specification outside restricted band was set at -20 dBc (72.0 dB μ V) for the TAG transmitter, which is the worst case limit for the transmitters. **Note:** None of the readings from this configuration are part of the highest readings listed above.

Configuration 2 = The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. This is a test for spurious emissions with the Tag receiver.
(continued on next page)

Configuration 3 = The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test of the TAG receivers. Note 2) Scan and maximize spurious signals 30-1000 MHz. Note 3) Long timing cable was looped back, routed down through hole in metal turntable, to simulate a typical installation.

Table 5: 15.247(c)/15.209 Highest Radiated Emission Levels: 1-26.5GHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS			CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTE S
		Ant dB	Amp dB	Cable dB				
2483.736	42.7	27.8	-34.2	7.9	44.2	54.0	-9.8	H
2349.104	39.7	27.8	-34.2	8.4	41.7	54.0	-12.3	V
1047.919	43.0	27.5	-36.6	4.9	38.8	54.0	-15.2	V
1750.019	37.8	27.0	-34.5	8.2	38.5	54.0	-15.5	V
1149.658	43.8	27.1	-36.1	5.2	40.0	54.0	-14.0	V
1047.918	41.0	27.5	-36.6	4.9	36.8	54.0	-17.2	H

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart C Sections 15.247(c)/15.209
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
A = Average Reading

COMMENTS: The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test in the WLAN transmit mode, LAN is disconnected. Note 2) Maximized spurious signals 1-26.5 GHz.

Table 6: 15.207 Highest Conducted Emission Levels:

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V	SPEC LIMIT dB μ V	MARGIN dB	NOTES
		Lisn dB	Cable dB						
4.220000	38.5	0.1	0.1			38.7	48.0	-9.3	B
4.22000	38.5	-0.1	0.1			38.5	48.0	-9.5	W
4.595375	38.4	0.1	0.1			38.6	48.0	-9.4	B
4.793300	38.7	0.1	0.1			38.9	48.0	-9.1	B
5.107250	38.4	0.1	0.1			38.6	48.0	-9.4	B
16.408500	38.5	0.0	0.1			38.6	48.0	-9.4	B

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart C Section 15.207

NOTES: B = Black Lead
W = White Lead

COMMENTS: The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. This is a test while the Tag receiver is operating. The EUT and AC adapter are connected to 120 V, 60 Hz.

Table 7: 15.109 Highest Radiated Emission Levels: 1-12.8GHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS			CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant	Amp	Cable				
1289.471	45.5	26.6	-35.5	5.6	42.2	54.0	-11.8	H
1000.003	46.2	27.7	-36.8	4.7	41.8	54.0	-12.2	VA
2188.253	38.7	27.8	-34.2	9.1	41.4	54.0	-12.6	H
1149.660	45.0	27.1	-36.1	5.2	41.2	54.0	-12.8	H
1180.333	44.8	27.0	-36.0	5.3	41.1	54.0	-12.9	H
1231.083	44.2	26.8	-35.8	5.5	40.7	54.0	-13.3	H

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart B Section 15.109
Test Distance: 3 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
A = Average Reading

COMMENTS: The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away.

Note 1) This is a test in the TAG receive mode.

Note 2) Scan and maximized spurious signals 1-12.8 GHz.

MEASUREMENT UNCERTAINTY

Associated with data in this report is a ± 4 dB measurement uncertainty.

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables. The corrected data was then compared to the applicable emission limits to determine compliance.

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available I/O ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. I/O cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected. All excessive interconnecting cable was bundled in 30-40 centimeter lengths.

The radiated and conducted emissions data of the WhereNet Location Sensor, LAP-4200 was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in Table A.

Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

TABLE A: SAMPLE CALCULATIONS		
	Meter reading	(dB μ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB μ V/m)

A typical data sheet will display the following in column format:

#	Freq	Rdng	8447F	Bicon	Chase	Mag L	Corr	Spec	Margin	Polar
	Amp	HP-83	Pream	Horn	Log	LOG28	Inser	Cable	H-B 3	Hol-B
		Black	White	Site	Log S					

means reading number.

Freq is the frequency in MHz of the obtained reading.

Rdng is the reading obtained on the spectrum analyzer in dB μ V.

Pream, amp, 8447F and AP-83 are the preamplifier factor or gain in dB.

Bicon and Chase are the biconical antenna factor in dB.

Log, Log S and LOG28 are the log periodic antenna factor in dB.

Mag L is the magnetic loop antenna factor in dB.

Horn is the horn antenna factor in dB.

Cable, H-B 3, Hol-B, Site and Inser are the cable loss in dB of the coaxial cable on the OATS.

Dist is the distance factor in dB used when testing at a different test distance than the one stated in the spec.

Corr is the corrected reading in dB μ V/m (field strength).

Spec is the specification limit (dB) stated in the FCC regulations.

Margin is the closeness to the specified limit in dB; + is over and - is under the limit.

Polar is the polarity of the antenna with respect to earth.

Black and white are the line impedance stabilization network factor in dB for conducted emissions.

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Table A were used to collect both the radiated and conducted emissions data for the WhereNet Location Sensor, LAP-4200. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. For radiated measurements below 300 MHz, the biconical antenna was used. For frequencies from 300 to 1000 MHz, the log periodic antenna was used. The horn antenna was used for frequencies above 1000 MHz. All antennas were located at a distance of 3 meters from the edge of the EUT. Conducted emissions tests required the use of the FCC type LISNs.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. For conducted emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. A 10 dB external attenuator was also used during conducted tests, with internal offset correction in the analyzer. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

FCC SECTION 15.35: TABLE B: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	450 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	26.5 GHz	1 MHz

These settings were used unless otherwise noted in the test conditions on the individual test data sheets.

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the Tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data for the WhereNet Location Sensor, LAP-4200.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

EUT TESTING

Radiated Emissions

The EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters.

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. The frequency range of 30 MHz to 88 MHz was scanned with the biconical antenna located about 1.5 meter above the ground plane in the vertical configuration. During this scan, the turntable was rotated and all peaks at or near the limit were recorded. The frequency range of 100 to 300 MHz was then scanned in the same manner using the biconical antenna and the peaks recorded. Lastly, a scan of the FM band from 88 to 110 MHz was made, using a reduced resolution bandwidth and frequency span. The biconical antenna was changed to the horizontal polarity and the above steps were repeated. After changing to the log periodic antenna in the horizontal configuration, the frequency range of 300 to 1000 MHz was scanned. The log periodic antenna was changed to the vertical polarity and the frequency range of 300 to 1000 MHz was again scanned. For frequencies exceeding 1000 MHz, the horn antenna was used. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

A thorough scan of all frequencies was made manually using a small frequency span, rotating the turntable as needed. The test engineer maximized the readings with respect to the table rotation and configuration of EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor. Photographs showing the final worst case configuration of the EUT are contained in Appendix A.

Mains Conducted Emissions

During conducted emissions testing, the EUT was located on a wooden table measuring approximately 80 cm high, 1 meter deep, and 1.5 meters in length. One wall of the room where the EUT was located has a minimum 2 meter by 2 meter conductive plane. The EUT was mounted on the wooden table 40 cm away from the conductive plane, and 80 cm from any other conductive surface.

The vertical metal plane used for conducted emissions was grounded to the earth. Power to the EUT was provided through a LISN. The LISN was grounded to the ground plane. All other objects were kept a minimum of 80 cm away from the EUT during the conducted test.

For conducted emissions testing, a 30 to 50 second sweep time was used for automated measurements in the frequency bands of 450 kHz to 1.705 MHz, 1.705 MHz to 3 MHz, and 3 MHz to 30 MHz. All readings within 20 dB of the limit were recorded. At frequencies where the recorded emissions were close to the limit, further investigation was performed manually at a slower sweep rate.

Antenna Conducted Emissions

For measuring the signal strength on the RF output port of the EUT, the spectrum analyzer was connected directly to the EUT. The sweep time of the analyzer was adjusted so that the spectrum analyzer readings were always in a calibrated range. All readings within 20 dB of the limit were recorded.

TRANSMITTER CHARACTERISTICS

15.203 Antenna Requirements)

In order to comply with 15.203, the Location Sensors utilizes non-standard MCX type antenna connectors.

15.205 Restricted Bands

The Fundamental operating frequency lies outside the restricted bands and therefore complies with the requirements of Section 15.205 of the FCC rules.

Any spurious emission coming from the EUT was investigated to determine if any portion lies inside the restricted band. If any portion of a spurious emissions signal was found to be within a restricted band, investigation was performed to ensure compliance with Section 15.209.

15.247(a)(2) Bandwidth Measurements (Direct Sequence)

The fundamental frequency was kept within the permitted band, 2400-2483.5 MHz. The minimum 6dB bandwidth shall be at least 500 kHz. Refer to the occupied bandwidth plots.

15.247(b)(1) Peak Output Power

The RF conducted test was measured using a direct connection between the antenna port of the transmitter and the spectrum analyzer, through suitable attenuation. The resolution bandwidth was adjusted to greater than the 6 dB bandwidth of the emissions.

- ◆ **15.247(b)(1)** The maximum peak output power of frequency hopping systems operating in the 2400-2483.5 band and for all direct sequences shall not exceed 1 watt.

15.247(b)(3)(i) Directional Gain Reduction

There are three possible antennas that may be used with the LAP-4200:

- AK-210 All Weather Omni with a 2 dBi linear gain and 5 dBi CP (circular polarized) gain.
- AK-120 Flat Panel (patch) with a 5 dBi linear gain and 8 dBi CP gain.
- AK-110 Office Omni (indoors only) with a 0 dBi linear gain and 3 dBi CP gain. Note CKC did not test with this antenna.

15.247(d) Peak Power Spectral Density

The peak power spectral density conducted from the EUT to the antenna was not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

15.215 Additional Provisions To The General Radiated Emission Limitations

The fundamental frequency was kept within at least the central 80% of the permitted band.

APPENDIX A

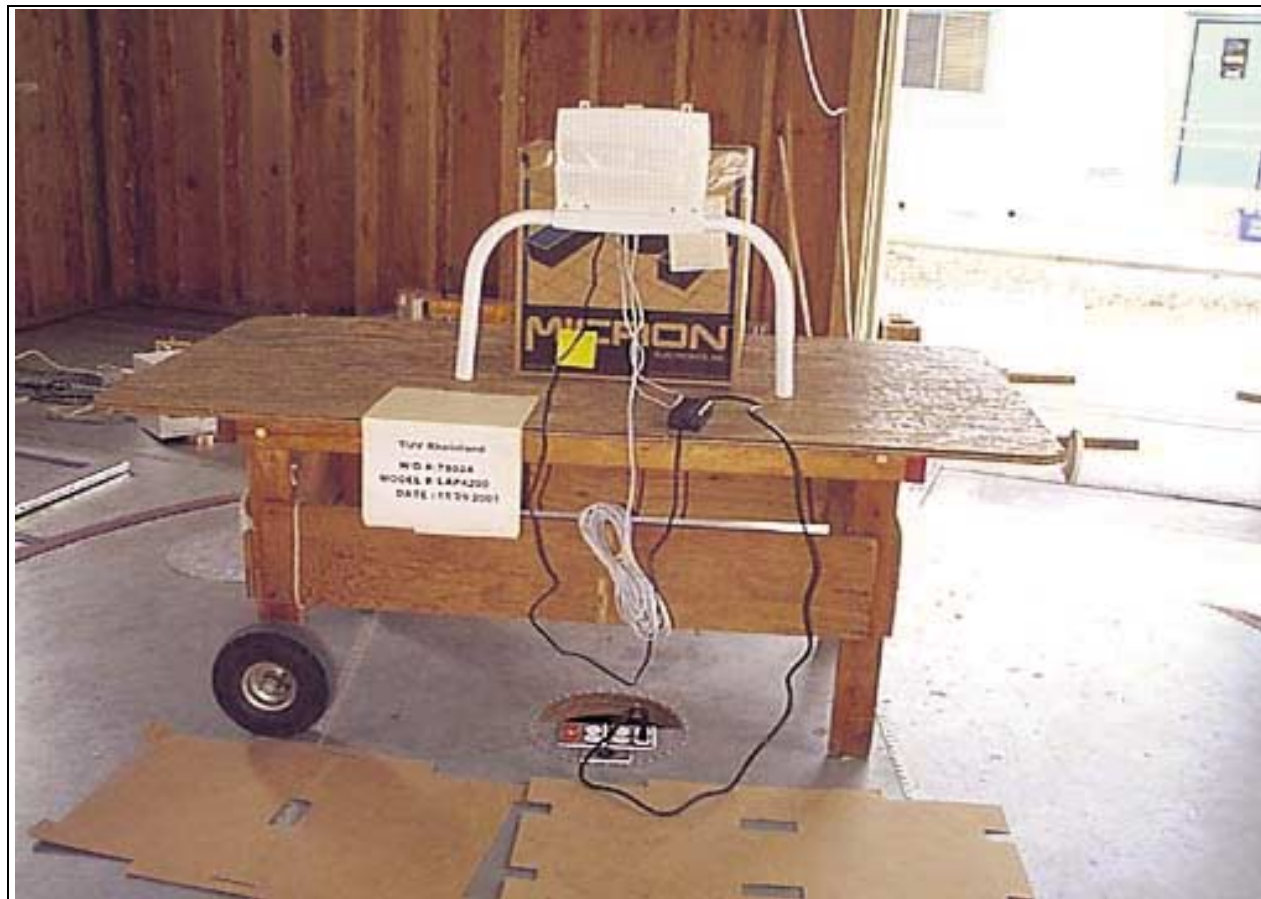
TEST SETUP PHOTOGRAPHS

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Antenna Conducted

PHOTOGRAPH SHOWING RADIATED EMISSIONS



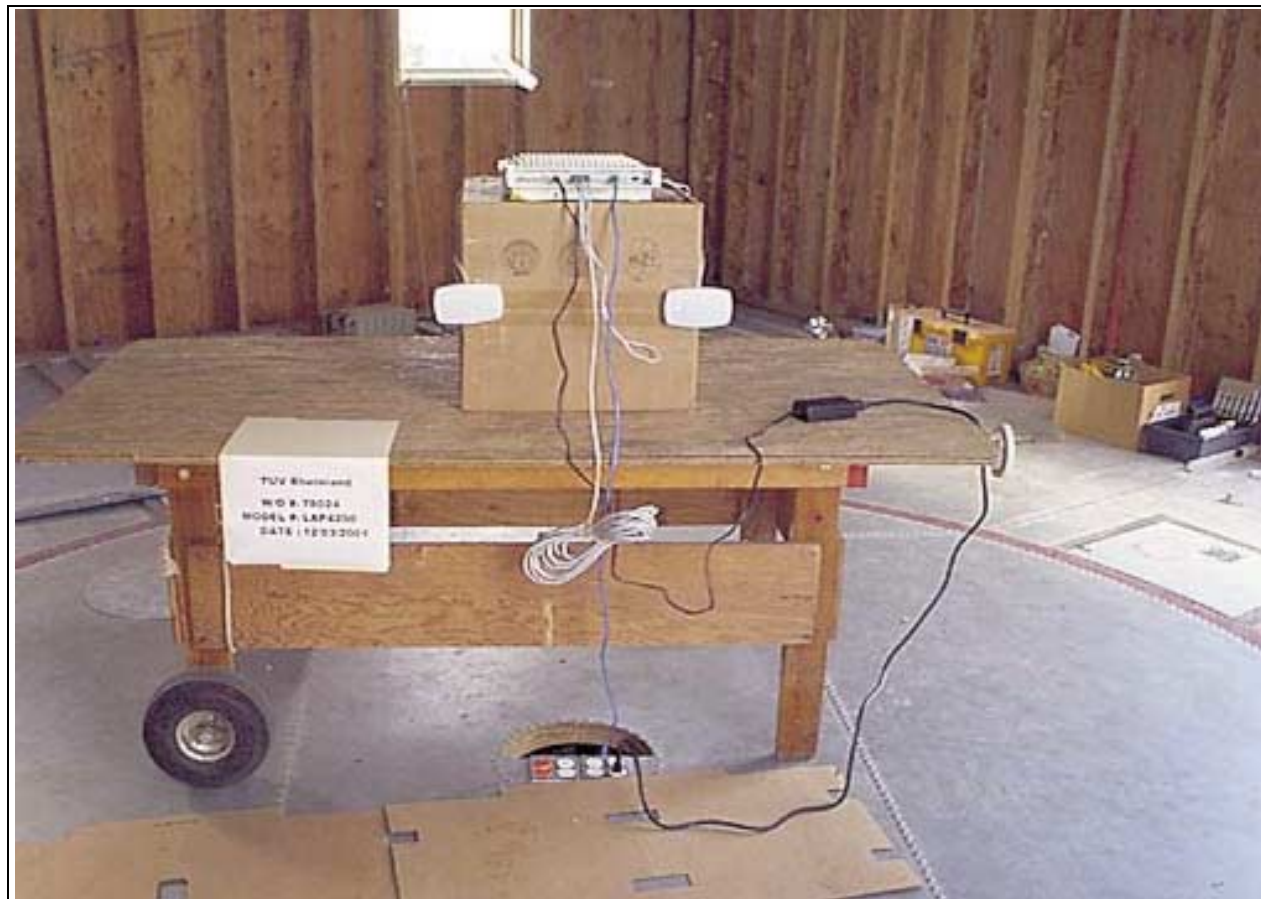
Radiated Emissions - Front View of LAP-4200 with AK-210 Antenna

PHOTOGRAPH SHOWING RADIATED EMISSIONS



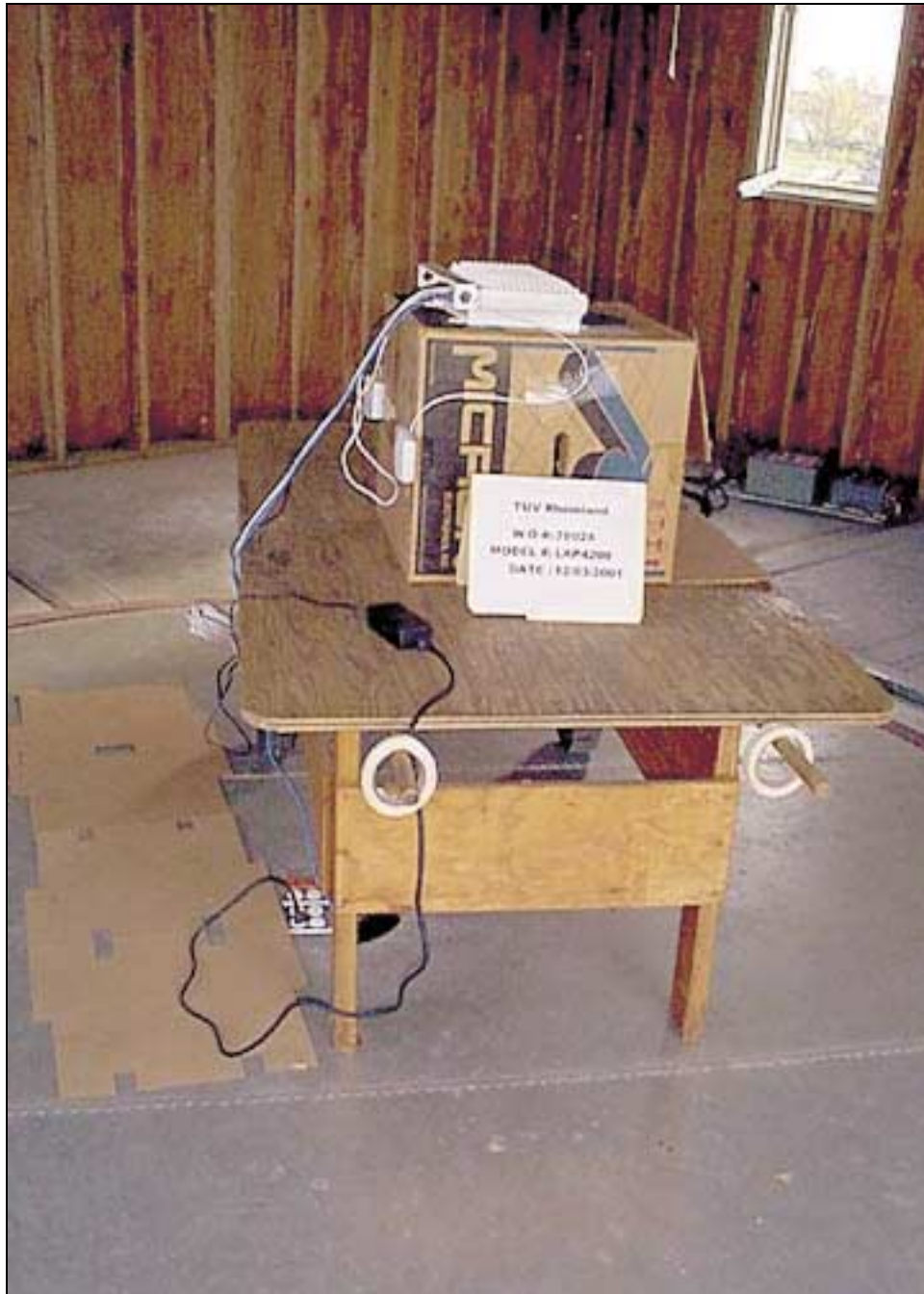
Radiated Emissions - Side View LAP-4200 with AK-210 Antenna

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View of LAP-4200 with AK120 Antenna

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Side View of LOS-4100 with AK-120 Antenna

PHOTOGRAPH SHOWING MAINS CONDUCTED EMISSIONS



Mains Conducted Emissions - Front View

PHOTOGRAPH SHOWING MAINS CONDUCTED EMISSIONS



Mains Conducted Emissions - Side View

APPENDIX B

TEST EQUIPMENT LIST

15.247(a)(2) Bandwidth and 15.247(d) Spectral Density Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8596E S.A.	3346A00225	05/24/2001	05/24/2002	783

15.247(b)(1) Peak Power Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Spectrum Analyzer (HP-8596E)	3346A00209	07/06/2001	07/06/2002	784
8449B PreAmp	3008A00301	10/19/2001	10/19/2002	2010
Horn Antenna	9307-4085	02/28/2001	02/28/2002	656
Cable #2 (2')	FSJ1-50A	04/16/2001	04/16/2002	0
Cable #4 (50')	FSJ1-50A	04/16/2001	04/16/2002	0
Cable #7 (25')	FSJ1-50A	04/16/2001	04/16/2002	0
HP 8596E S.A.	3346A00225	05/24/2001	05/24/2002	783
Spectrum Analyzer	3623A00539	12/12/2001	12/12/2002	1406

15.247(c)/15.209 Radiated Emission 9kHz-30MHz Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
S.A.	2049A01408	06/14/2001	06/14/2002	313
S.A. Display	2112A02174	06/14/2001	06/14/2002	313
QP Adapter	2430A00541	06/14/2001	06/14/2002	313
Hol-B 3M Rad. cable .01-1000MHz	rad_cab_3M_01_hol-b.01-1000MHz	09/13/2001	09/13/2002	0
Mag loop, Emco 6502	2078	08/17/2001	08/17/2002	432

15.247(c)/15.209 Radiated Emission 30-1000MHz Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
S.A.	2049A01408	06/14/2001	06/14/2002	313
S.A. Display	2112A02174	06/14/2001	06/14/2002	313
QP Adapter	2430A00541	06/14/2001	06/14/2002	313
Hol-B 3M Rad. cable .01-1000MHz	rad_cab_3M_01_hol-b.01-1000MHz	09/13/2001	09/13/2002	0
Log Periodic, AH Systems SAS 200/510	288	05/16/2001	05/16/2002	566
Bilog, Chase CBL6111C	2630	10/10/2001	10/10/2002	0
Preamp, HP 8447F opt H64	2944A03850	04/09/2001	04/09/2002	501
Quasi Peak Adapter	2043A00231	04/10/2001	04/10/2002	90
Spectrum Analyzer	2601A02378	04/10/2001	04/10/2002	1377
Spectrum Analyzer Display	2542A10641	04/10/2001	04/10/2002	0
Bicon, A.H. SAS-200/540	416	10/30/2001	10/30/2002	509
HP 8447D Preamp	2727A06124	01/09/2001	01/09/2002	480
Cable, Rad., Site C	radcable01hc	01/15/2001	01/15/2002	0

15.247(c)/15.209 Radiated Emission 1-26GHz Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8564E Spec. An.	01984	12/12/2001	12/12/2002	1406
Horn Ant., Emco 3115	9307-5655	07/09/2001	07/09/2002	2157
Preamp, HP83017A	3123A0464	05/14/2001	05/14/2002	1271
H-B 3meter Rad. cable 1-13.5GHz	Hol-B 3-m rad cable- 01-1GHz-13.5GHz	10/03/2001	10/03/2002	0

15.207 Conducted Emissions Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
Quasi Peak Adapter	2043A00231	04/10/2001	04/10/2002	90
Spectrum Analyzer	2601A02378	04/10/2001	04/10/2002	1377
Spectrum Analyzer Display	2542A10641	04/10/2001	04/10/2002	0
LISN, Emco 3816/NM	9408-1007	07/20/2001	07/20/2002	494

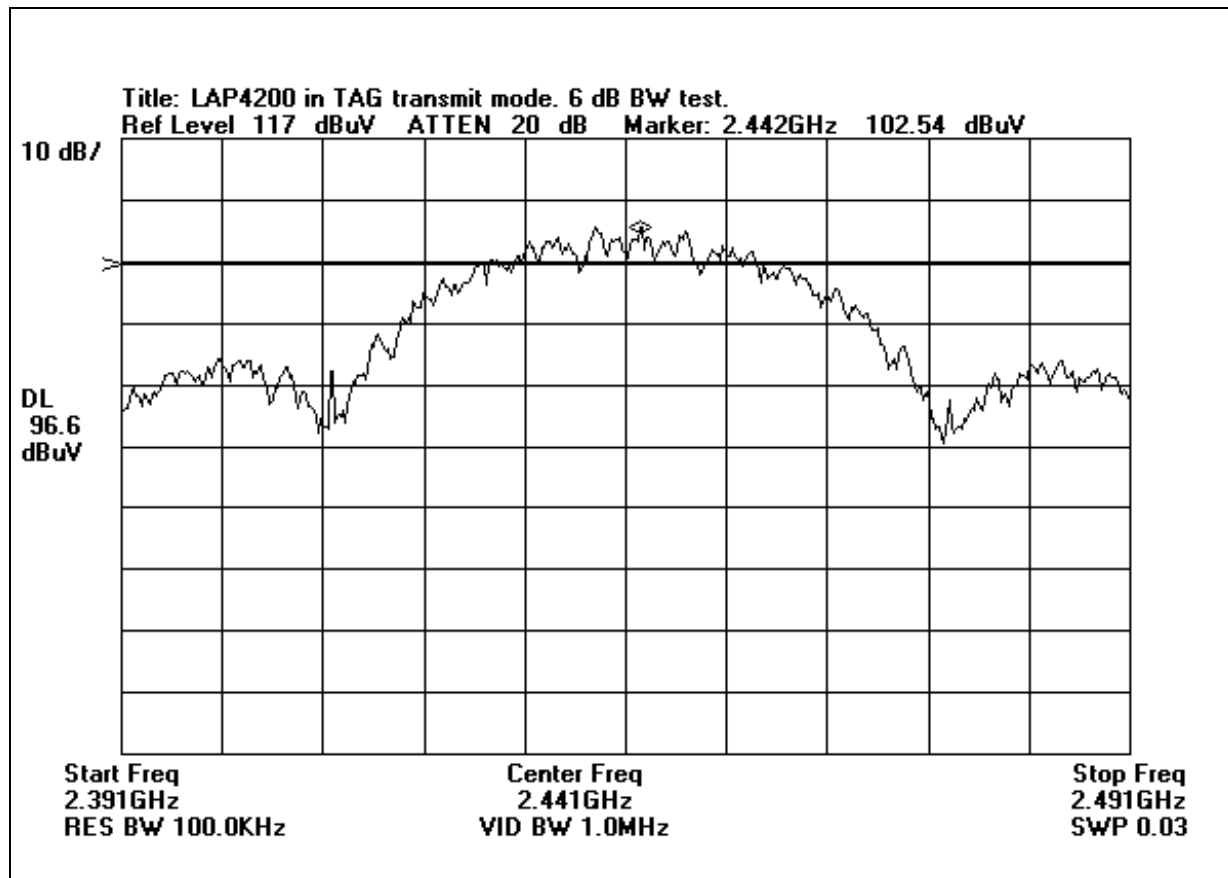
15.109 Radiated Emissions Test Equipment:

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8564E Spec. An.	01984	12/12/2000	12/12/2001	1406
Preamp, HP83017A	3123A0464	05/14/2001	05/14/2002	1271
Horn Ant., Emco 3115	9307-5655	07/09/2001	07/09/2002	2157
H-B 3meter Rad. cable 1-13.5GHz	Hol-B 3-m rad cable- 01-1GHz-13.5GHz	10/03/2001	10/03/2002	0

APPENDIX C

MEASUREMENT DATA SHEETS

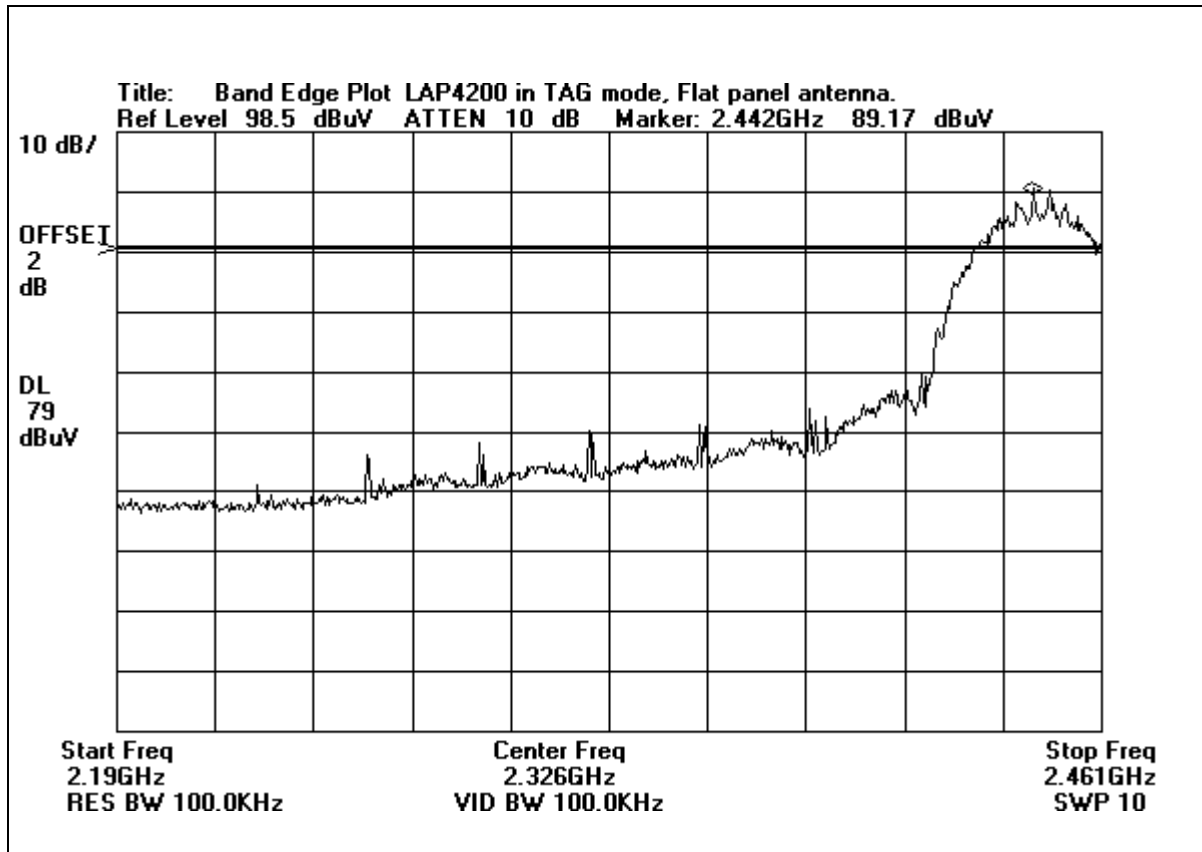
FCC Part 15.247(a)(2) Bandwidth Plot – Direct Sequence



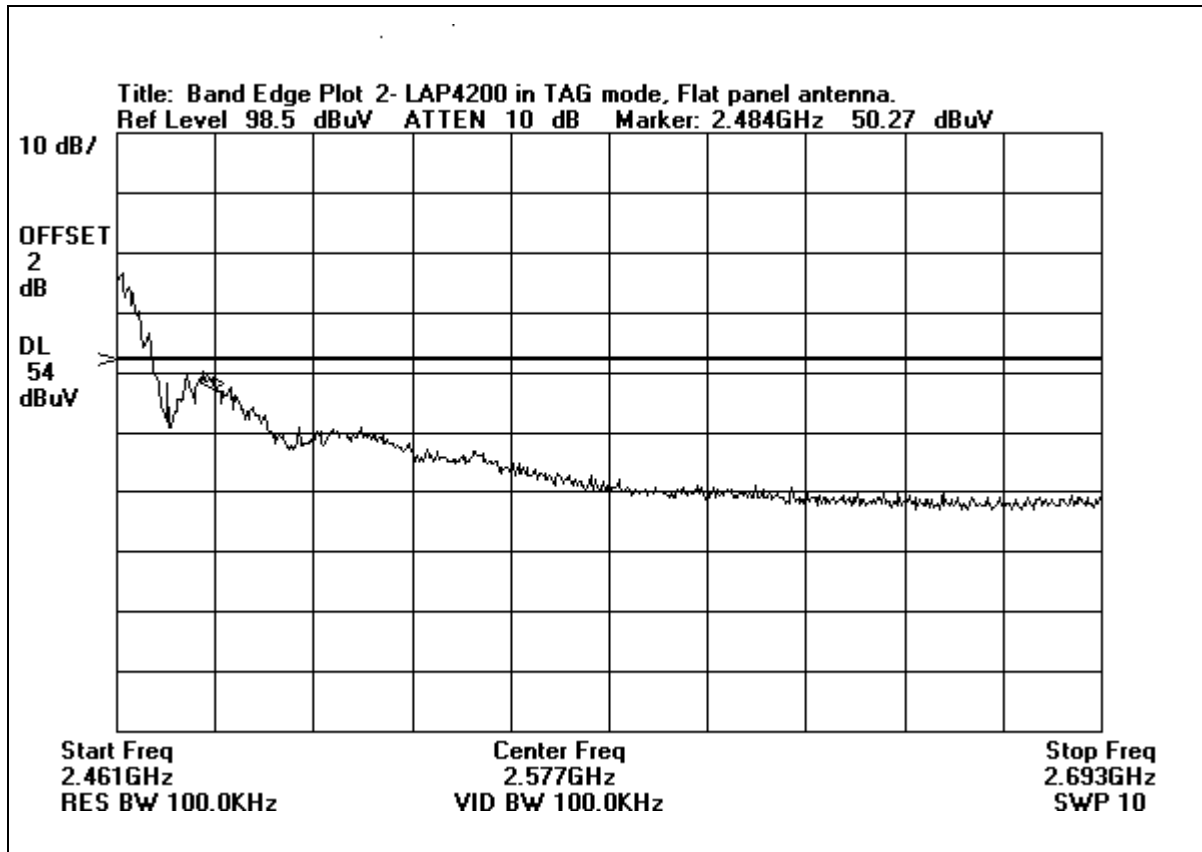
Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 10 feet away. Note 1) This is a test in the Tag transmit mode, LAN is connected. The EUT is on the bench next to the S.A. connected through an 18 inch long cable. Note 2) Connected directly to the right antenna port. The 6 dB bandwidth was measured at 28.6 MHz.

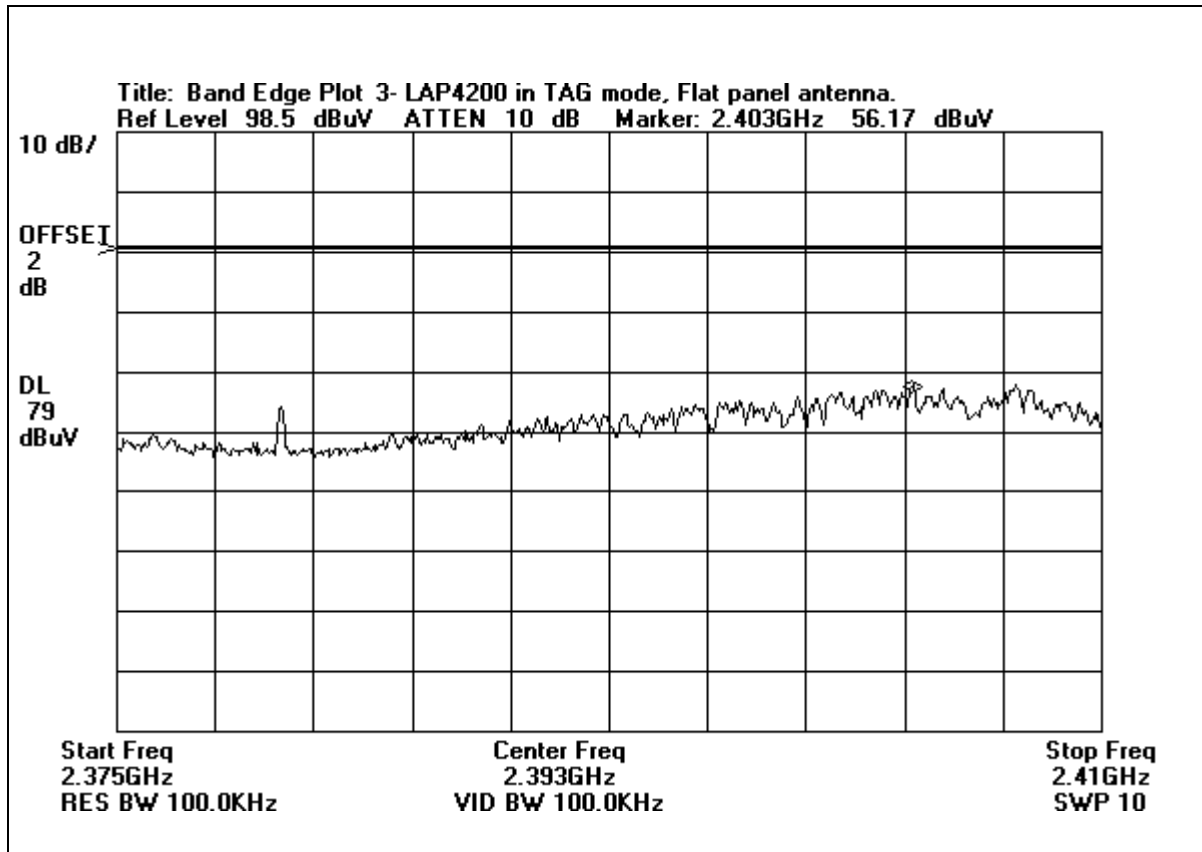
Bandedge Plot – TAG with Patch Antenna



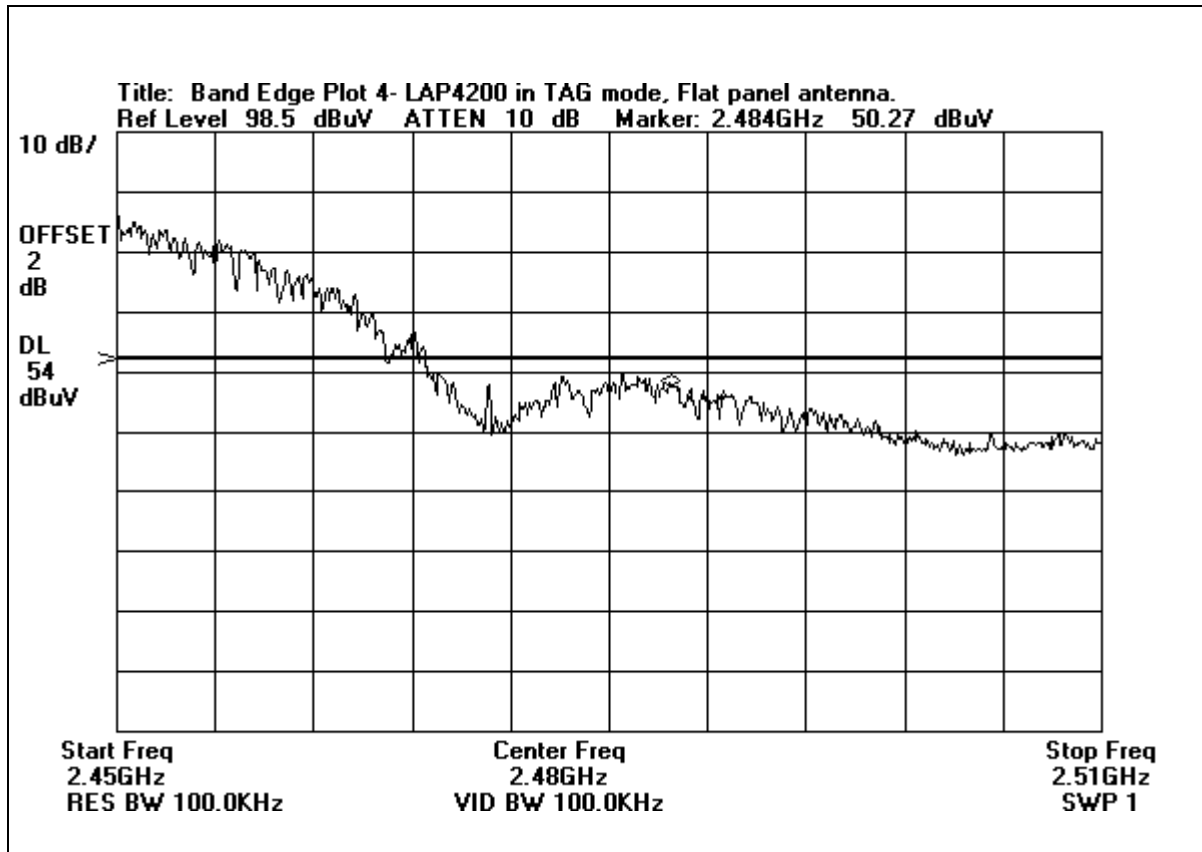
Bandedge Plot – TAG with Patch Antenna



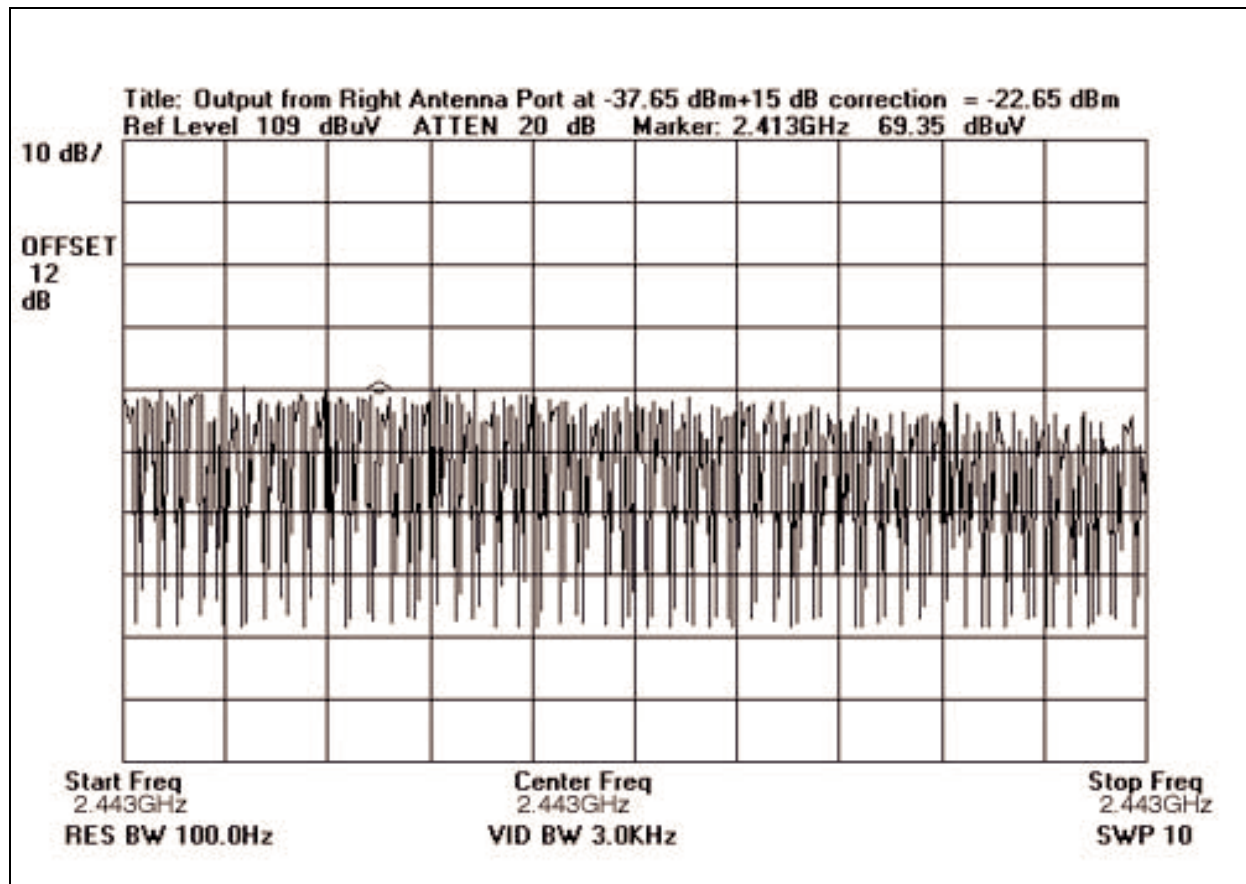
Bandedge Plot – TAG with Patch Antenna



Bandedge Plot – TAG with Patch Antenna



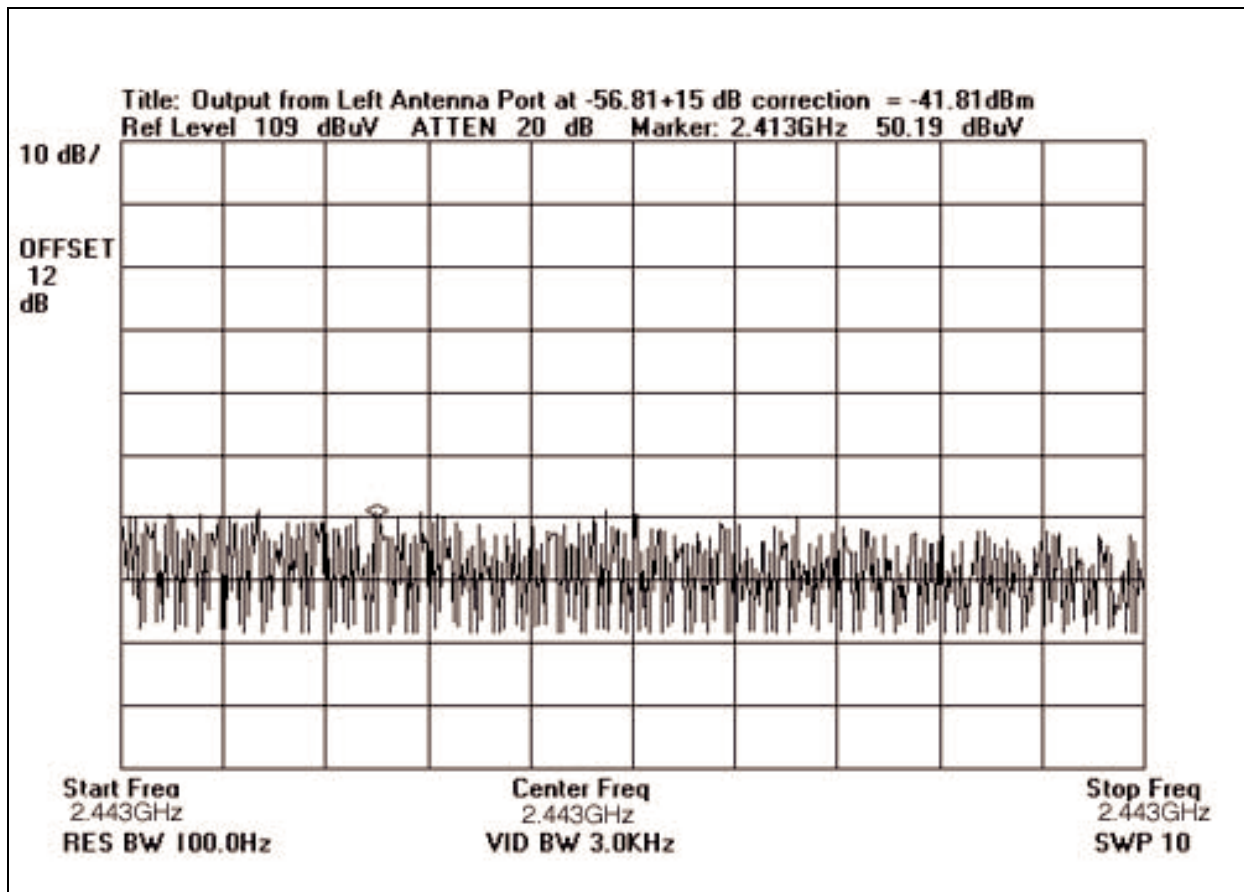
FCC Part 15.247(d) Peak Power Spectral Density



Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. Note 1) This is a test in the WLAN Access mode, LAN is not connected. The EUT is on the bench next to the S.A. connected through an 18 inch long cable. Note 2) Connected directly to the left antenna port. Note 3) Max hold was used to capture the signal. RBW=3 kHz, span=10 MHz.

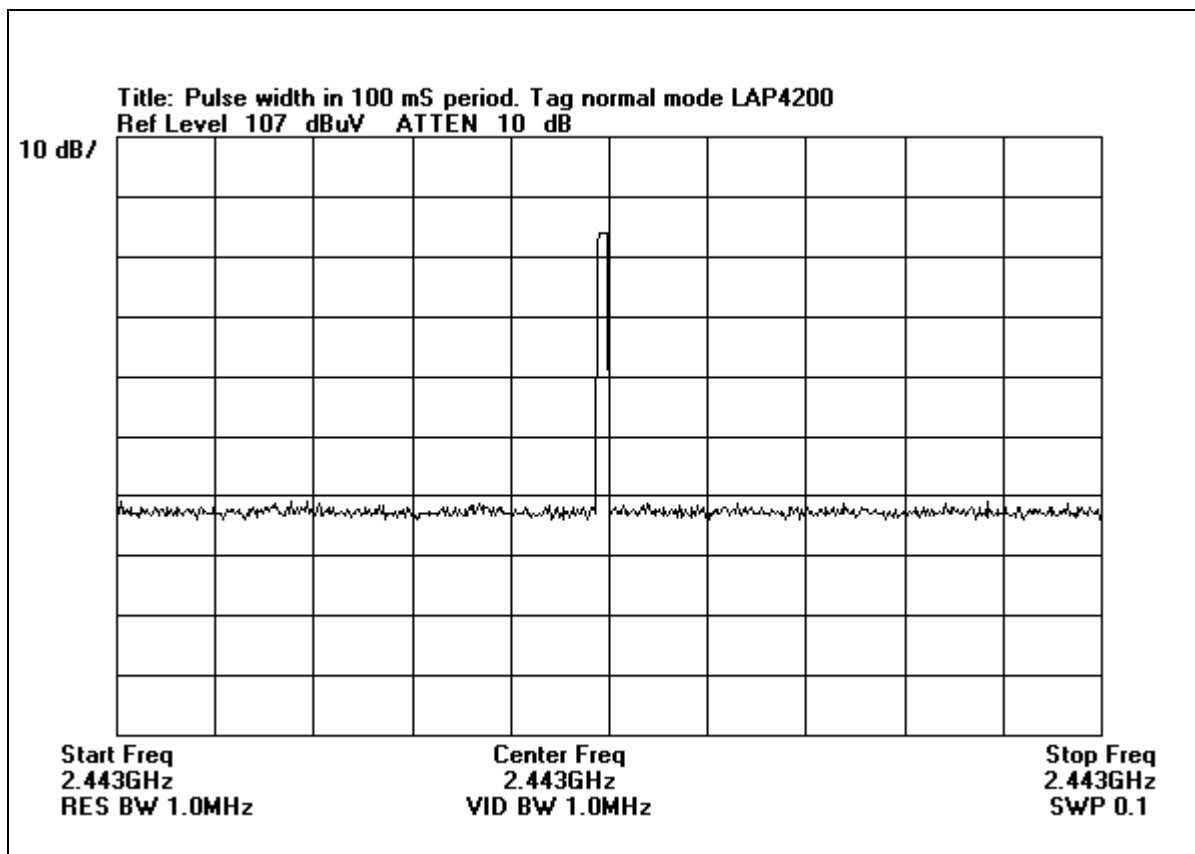
FCC Part 15.247(d) Peak Power Spectral Density



Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. Note 1) This is a test in the WLAN Access mode, LAN is not connected. The EUT is on the bench next to the S.A. connected through an 18 inch long cable. Note 2) Connected directly to the left antenna port. Note 3) Max hold was used to capture the signal. RBW=3 kHz, span=10 MHz.

Pulse Width



Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest • Mariposa, CA 95338 • 800-500-4362

Customer: **TUV Rheinland**
 Specification: **15.247(b)(1)**
 Work Order #: **78024**
 Test Type: **Maximized Emissions**
 Equipment: **Location Sensor**
 Manufacturer: WhereNet
 Model: LP-4200
 S/N: M00460110000

Date: 01/04/2002
 Time: 18:29:24
 Sequence#: 1
 Tested By: Chuck Kendall

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Location Sensor*	WhereNet	LP-4200	M00460110000
Antenna Flat Panel	WhereNet	AK-120	None

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
AC Adapter for Hub	Bay Networks	PWR-002-004	none
AC Adapter for WLAN	Transceiver Symbol Tech	50-25000-021	002131099
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260

Test Conditions / Notes:

Laptop PC attached to the WhereNet Location Sensor (LAP-4200). LAP is transmitting in the Tag Mode with an 840 command for output power. All units are on the 80 cm high wooden turntable. All readings have been corrected to a RBW of 28.6MHz. All readings have been converted to voltage delivered to the antenna terminal using $(E_d)^2/30G$ and the field strength readings at 3 meters.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Amp Cable dB	Horn dB	Cable dB	Cable dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	2462.245M	125.6	-32.5 +2.7	+28.6	+0.3	+5.2	+0.0	129.9	143.0	-13.1	Horiz
2	2462.058M	118.8	-32.5 +2.7	+28.6	+0.3	+5.2	+0.0	123.1	143.0	-19.9	Vert

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest • Mariposa, CA 95338 • 800-500-4362

Customer: **TUV Rheinland**
 Specification: **15.247(b)(1)**
 Work Order #: **78024**
 Test Type: **Maximized Emissions**
 Equipment: **Location Sensor**
 Manufacturer: WhereNet
 Model: LP-4200
 S/N: M00460110000

Date: 01/04/2002
 Time: 18:45:30
 Sequence#: 2
 Tested By: Chuck Kendall

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Location Sensor*	WhereNet	LP-4200	M00460110000
Antenna All Weather Omni	WhereNet	AK-120-10	None

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
AC Adapter for Hub	Bay Networks	PWR-002-004	none
AC Adapter for WLAN	Transceiver Symbol Tech	50-25000-021	002131099
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260

Test Conditions / Notes:

Laptop PC attached to the WhereNet Location Sensor (LAP-4200). LAP is transmitting in the Tag Mode with an 840 command for output power. All units are on the 80 cm high wooden turntable. All Weather Omni Antennas are attached. All readings have been corrected to 28.6MHz RBW All readings have been corrected to voltage delivered to the antenna using $(Ed)^{2/30G}$ and the field strength measured at 3 meters.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Amp Cable dB	Horn dB	Cable dB	Cable dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	2462.023M	130.5	-32.5 +2.7	+28.6	+0.3	+5.2	+0.0	134.8	143.0	-8.2	Vert
2	2462.050M	128.3	-32.5 +2.7	+28.6	+0.3	+5.2	+0.0	132.6	143.0	-10.4	Horiz

Test Location: CKC Laboratories, Inc. • 5473A Clouds Rest • Mariposa, CA 95338 • (209) 966-5240

Customer: **TUV WhereNet**
 Specification: **15.247(b)(1)**
 Work Order #: **78024**
 Test Type: **Maximized Emissions**
 Equipment: **Location Sensor**
 Manufacturer: WhereNet
 Model: LP-4200
 S/N: M00460110000

Date: 01/22/2002
 Time: 17:41:35
 Sequence#: 3
 Tested By: Randy Clark

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Location Sensor*	WhereNet	LP-4200	M00460110000
Antenna All Weather Omni	WhereNet	AK-120-10	None

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
AC Adapter for Hub	Bay Networks	PWR-002-004	none
AC Adapter for WLAN	Transceiver Symbol Tech	50-25000-021	002131099
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260

Test Conditions / Notes:

Laptop PC attached to the WhereNet Location Sensor (LAP-4200). LAP is transmitting in the Tag Mode with power set to 840.
 Frequency Tested: Fundamental
 RBW = 2MHz
 VBW = 3MHz
 (BW set to highest settings)
 2 MHz BW Correction: $10\log(28.6/2) = 11.55$
 The readings on the data sheet are already corrected (+11.55dB) for bandwidth. The readings reflect all of the power contained in the 6 dB bandwidth.

Measurement Data: Reading listed by margin. Test Distance: None

#	Freq MHz	Rdng dB μ V	dB	dB	dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	2462.245M	128.2					+0.0	128.2	137.0	-8.8	None

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Road, Site B • Hollister, CA 95023 • (831) 637-8176

Customer: **TUV Rheinland**
 Specification: **FCC15.247(c)(2.4 GHz) & 15.209**
 Work Order #: **78024**
 Test Type: **Maximized Emissions**
 Equipment: **WhereNet Location Sensor**
 Manufacturer: WhereNet
 Model: LAP4200
 S/N: M00460110000

Date: 12/04/2001
 Time: 17:11:11
 Sequence#: 35
 Tested By: Art Rice

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna Flat Panel	WhereNet	AK-120	none
Antenna Flat Panel	WhereNet	AK-120	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test of the continuous mode TAG transmitters. Note 2) Scan and maximize spurious signals 9 kHz-30 MHz. Note 3) Long timing cable was looped back, routed down through hole in metal turntable, to simulate a typical installation.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	Mag L dB	Hol-B		Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
				dB	dB					
1	19.780M	34.0			+0.6	+0.0	43.2	69.5	-26.3	None
			+8.6							Ambient level
2	5.004M	27.2			+0.3	+0.0	37.0	69.5	-32.5	None
			+9.5							Ambient level
3	153.060k	49.1			+0.1	+0.0	58.9	103.9	-45.0	None
			+9.7							Ambient level
4	10.000k	44.6			+0.0	+0.0	62.9	127.6	-64.7	None
			+18.3							Ambient level
5	142.050k	23.6			+0.1	+0.0	33.3	104.5	-71.2	None
			+9.6							Ambient level
6	69.440k	12.3			+0.1	+0.0	22.6	110.8	-88.2	None
			+10.2							Ambient level

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Road, Site B • Hollister, CA 95023 • (831) 637-8176

Customer: **TUV Rheinland**
 Specification: **FCC15.247(c)(2.4 GHz) & 15.209**
 Work Order #: **78024** Date: 12/04/2001
 Test Type: **Maximized Emissions** Time: 16:10:28
 Equipment: **WhereNet Location Sensor** Sequence#: 32
 Manufacturer: WhereNet Tested By: Art Rice
 Model: LAP4200
 S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna Flat Panel	WhereNet	AK-120	none
Antenna Flat Panel	WhereNet	AK-120	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test in the continuous TAG transmit mode. Note 2) Scan and maximize spurious signals 30-1000 MHz. Note 3) Transmit specification outside restricted band was set at -20 dBc (72.0 dBuV) for the TAG transmitter, which is the worst case limit for the transmitters.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	8447F dB	Chase dB	Hol-B dB	LOG28 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	133.676M	43.4	-26.5	+11.4	+1.5	+0.0	+0.0	29.8	43.5	-13.7	Vert
2	150.041M	37.6	-26.4	+11.1	+1.5	+0.0	+0.0	23.8	43.5	-19.7	Vert
3	150.041M	37.5	-26.4	+11.1	+1.5	+0.0	+0.0	23.7	43.5	-19.8	Horiz

4	549.468M QP	49.9	-27.8	+0.0	+3.1	+21.9	+0.0	47.1	72.0	-24.9	Horiz
									This signal is not in a restricted band. The -20 dBc limit applies.		
^	549.467M	50.0	-27.8	+0.0	+3.1	+21.9	+0.0	47.2	72.0	-24.8	Horiz
									This signal is not in a restricted band. The -20 dBc limit applies.		
6	427.381M QP	52.1	-27.1	+0.0	+2.7	+18.3	+0.0	46.0	72.0	-26.0	Horiz
									This signal is not in a restricted band. The -20 dBc limit applies.		
^	427.380M	51.9	-27.1	+0.0	+2.7	+18.3	+0.0	45.8	72.0	-26.2	Horiz
									This signal is not in a restricted band. The -20 dBc limit applies.		
8	750.071M QP	46.7	-27.6	+0.0	+3.6	+21.5	+0.0	44.2	72.0	-27.8	Vert
^	750.079M	48.0	-27.6	+0.0	+3.6	+21.5	+0.0	45.5	72.0	-26.5	Vert
10	549.462M	45.3	-27.8	+0.0	+3.1	+21.9	+0.0	42.5	72.0	-29.5	Vert
11	671.557M QP	44.2	-27.7	+0.0	+3.4	+21.7	+0.0	41.6	72.0	-30.4	Horiz
^	671.552M	44.8	-27.7	+0.0	+3.4	+21.7	+0.0	42.2	72.0	-29.8	Horiz
13	450.065M	46.3	-27.2	+0.0	+2.9	+18.1	+0.0	40.1	72.0	-31.9	Vert
14	650.070M	42.5	-27.9	+0.0	+3.3	+22.0	+0.0	39.9	72.0	-32.1	Vert
15	702.051M	42.9	-27.8	+0.0	+3.5	+21.3	+0.0	39.9	72.0	-32.1	Horiz
16	915.731M QP	39.8	-27.3	+0.0	+3.9	+23.4	+0.0	39.8	72.0	-32.2	Vert
^	915.722M	41.0	-27.3	+0.0	+3.9	+23.4	+0.0	41.0	72.0	-31.0	Vert
18	450.074M QP	45.4	-27.2	+0.0	+2.9	+18.1	+0.0	39.2	72.0	-32.8	Horiz
^	450.074M	47.5	-27.2	+0.0	+2.9	+18.1	+0.0	41.3	72.0	-30.7	Horiz
20	488.415M	45.6	-27.6	+0.0	+2.8	+17.9	+0.0	38.7	72.0	-33.3	Vert
21	732.589M	39.9	-27.7	+0.0	+3.5	+21.4	+0.0	37.1	72.0	-34.9	Horiz

22	671.510M	39.1	-27.7	+0.0	+3.4	+21.7	+0.0	36.5	72.0	-35.5	Vert
23	732.598M	38.8	-27.7	+0.0	+3.5	+21.4	+0.0	36.0	72.0	-36.0	Vert
24	803.815M	37.0	-27.7	+0.0	+3.7	+22.3	+0.0	35.3	72.0	-36.7	Horiz
25	750.073M	37.6	-27.6	+0.0	+3.6	+21.5	+0.0	35.1	72.0	-36.9	Horiz
26	742.771M	37.0	-27.7	+0.0	+3.5	+21.5	+0.0	34.3	72.0	-37.7	Horiz
27	691.905M	36.7	-27.8	+0.0	+3.5	+21.4	+0.0	33.8	72.0	-38.2	Horiz
28	803.804M	35.4	-27.7	+0.0	+3.7	+22.3	+0.0	33.7	72.0	-38.3	Vert
29	650.034M	35.2	-27.9	+0.0	+3.3	+22.0	+0.0	32.6	72.0	-39.4	Horiz
30	488.369M	39.5	-27.6	+0.0	+2.8	+17.9	+0.0	32.6	72.0	-39.4	Horiz
31	709.819M	35.4	-27.8	+0.0	+3.5	+21.3	+0.0	32.4	72.0	-39.6	Horiz
32	427.381M	37.9	-27.1	+0.0	+2.7	+18.3	+0.0	31.8	72.0	-40.2	Vert
33	742.773M	34.4	-27.7	+0.0	+3.5	+21.5	+0.0	31.7	72.0	-40.3	Vert
34	640.986M	34.4	-27.9	+0.0	+3.4	+21.7	+0.0	31.6	72.0	-40.4	Horiz
35	610.466M	34.1	-27.8	+0.0	+3.3	+20.7	+0.0	30.3	72.0	-41.7	Horiz
36	437.550M	36.5	-27.2	+0.0	+2.8	+18.2	+0.0	30.3	72.0	-41.7	Horiz
37	500.057M	35.9	-27.6	+0.0	+3.0	+17.8	+0.0	29.1	72.0	-42.9	Vert
38	64.816M	50.7	-26.8	+6.1	+1.0	+0.0	+0.0	24.9	72.0	-47.1	Vert
39	61.849M	48.4	-26.8	+5.9	+0.9	+0.0	+0.0	22.5	72.0	-49.5	Vert
40	225.066M	46.3	-26.1	+10.9	+2.0	+0.0	+0.0	22.2	72.0	-49.8	Vert
41	213.724M	44.9	-26.2	+10.0	+1.9	+0.0	+0.0	20.6	72.0	-51.4	Horiz
42	225.076M	44.5	-26.1	+10.9	+2.0	+0.0	+0.0	20.4	72.0	-51.6	Horiz
43	225.076M	44.5	-26.1	+10.9	+2.0	+0.0	+0.0	20.4	72.0	-51.6	Horiz
44	175.029M	43.6	-26.4	+9.2	+1.7	+0.0	+0.0	18.9	72.0	-53.1	Vert
45	250.079M	42.4	-26.0	+12.6	+2.2	+0.0	+0.0	18.6	72.0	-53.4	Vert

46	213.726M	42.5	-26.2	+10.0	+1.9	+0.0	+0.0	18.2	72.0	-53.8	Vert
47	91.571M	43.4	-26.8	+8.9	+1.2	+0.0	+0.0	17.8	72.0	-54.2	Vert
48	175.022M	41.6	-26.4	+9.2	+1.7	+0.0	+0.0	16.9	72.0	-55.1	Horiz
49	30.665M	40.0	-26.8	+17.8	+0.6	+0.0	+0.0	13.8	72.0	-58.2	Vert

Test Location: CKC Laboratories, Inc. • 1653 Los Viboras Rd., Site C • Hollister, Ca 95023 • (831) 637-0485

Customer: **TUV Rheinland**

Specification: **FCC 15.209**

Work Order #: **78024**

Date: 11/26/2001

Test Type: **Maximized Emissions**

Time: 17:18:16

Equipment: **WhereNet Location Sensor**

Sequence#: 2

Manufacturer: WhereNet

Tested By: Art Rice

Model: LAP4200

S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna All Weather Omni	WhereNet	AK-210-10	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none
WLAN Transceiver	Symbol Technologies	A66233-01	00034715C4FF
AC Adapter for WLAN Transceiver	Symbol Technologies	50-25000-021	002131099

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. This is a test for spurious emissions while the Tag receiver is operating.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	pream dB	Bicon dB	Log s dB	Site dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	549.412M	47.0	-28.2	+0.0	+19.8	+5.7	+0.0	44.3	46.0	-1.7	Horiz
^	549.394M	48.2	-28.2	+0.0	+19.8	+5.7	+0.0	45.5	46.0	-0.5	Horiz
3	650.003M	43.6	-28.3	+0.0	+21.3	+6.4	+0.0	43.0	46.0	-3.0	Vert
^	650.023M	44.2	-28.3	+0.0	+21.3	+6.4	+0.0	43.6	46.0	-2.4	Vert
5	500.033M	45.6	-28.2	+0.0	+17.6	+5.3	+0.0	40.3	46.0	-5.7	Vert
6	749.995M	39.6	-27.7	+0.0	+21.1	+6.7	+0.0	39.7	46.0	-6.3	Vert

7	915.656M	34.3	-27.2	+0.0	+23.5	+7.6	+0.0	38.2	46.0	-7.8	Vert
8	732.536M	38.2	-27.8	+0.0	+20.9	+6.6	+0.0	37.9	46.0	-8.1	Vert
9	124.996M	48.6	-27.5	+11.6	+0.0	+2.4	+0.0	35.1	43.5	-8.4	Vert
10	427.000M	41.3	-27.7	+0.0	+17.1	+4.9	+0.0	35.6	46.0	-10.4	Horiz
11	649.990M	35.6	-28.3	+0.0	+21.3	+6.4	+0.0	35.0	46.0	-11.0	Horiz
12	125.042M	42.2	-27.5	+11.6	+0.0	+2.4	+0.0	28.7	43.5	-14.8	Horiz
13	225.033M	35.4	-26.9	+15.5	+0.0	+3.4	+0.0	27.4	46.0	-18.6	Horiz

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Road, Site B • Hollister, CA 95023 • (831) 637-8176

Customer: **TUV Rheinland**

Specification: **FCC 15.209**

Work Order #: **78024**

Date: 12/04/2001

Test Type: **Maximized Emissions**

Time: 16:10:28

Equipment: **WhereNet Location Sensor**

Sequence#: 34

Manufacturer: WhereNet

Tested By: Art Rice

Model: LAP4200

S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna Flat Panel	WhereNet	AK-120	none
Antenna Flat Panel	WhereNet	AK-120	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test of the TAG receiver. Note 2) Scan and maximize spurious signals 30-1000 MHz. Note 3) Long timing cable was looped back, routed down through hole in metal turntable, to simulate a typical installation.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	8447F dB	Chase dB	Hol-B dB	LOG28 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	750.071M	46.7	-27.6	+0.0	+3.6	+21.5	+0.0	44.2	46.0	-1.8	Vert
QP											
^	750.079M	48.0	-27.6	+0.0	+3.6	+21.5	+0.0	45.5	46.0	-0.5	Vert
3	671.557M	44.2	-27.7	+0.0	+3.4	+21.7	+0.0	41.6	46.0	-4.4	Horiz
QP											
^	671.552M	44.8	-27.7	+0.0	+3.4	+21.7	+0.0	42.2	46.0	-3.8	Horiz
5	549.467M	43.9	-27.8	+0.0	+3.1	+21.9	+0.0	41.1	46.0	-4.9	Horiz
6	450.065M	46.3	-27.2	+0.0	+2.9	+18.1	+0.0	40.1	46.0	-5.9	Vert

7	650.070M	42.5	-27.9	+0.0	+3.3	+22.0	+0.0	39.9	46.0	-6.1	Vert
8	702.051M	42.9	-27.8	+0.0	+3.5	+21.3	+0.0	39.9	46.0	-6.1	Horiz
9	915.731M QP	39.8	-27.3	+0.0	+3.9	+23.4	+0.0	39.8	46.0	-6.2	Vert
^	915.722M	41.0	-27.3	+0.0	+3.9	+23.4	+0.0	41.0	46.0	-5.0	Vert
11	549.462M	42.4	-27.8	+0.0	+3.1	+21.9	+0.0	39.6	46.0	-6.4	Vert
12	450.074M QP	45.4	-27.2	+0.0	+2.9	+18.1	+0.0	39.2	46.0	-6.8	Horiz
^	450.074M	47.5	-27.2	+0.0	+2.9	+18.1	+0.0	41.3	46.0	-4.7	Horiz
14	488.415M	45.6	-27.6	+0.0	+2.8	+17.9	+0.0	38.7	46.0	-7.3	Vert
15	30.665M	40.0	-26.8	+17.8	+0.6	+0.0	+0.0	31.6	40.0	-8.4	Vert
16	732.589M	39.9	-27.7	+0.0	+3.5	+21.4	+0.0	37.1	46.0	-8.9	Horiz
17	64.816M	50.7	-26.8	+6.1	+1.0	+0.0	+0.0	31.0	40.0	-9.0	Vert
18	671.510M	39.1	-27.7	+0.0	+3.4	+21.7	+0.0	36.5	46.0	-9.5	Vert
19	427.380M	42.3	-27.1	+0.0	+2.7	+18.3	+0.0	36.2	46.0	-9.8	Horiz
20	732.598M	38.8	-27.7	+0.0	+3.5	+21.4	+0.0	36.0	46.0	-10.0	Vert
21	803.815M	37.0	-27.7	+0.0	+3.7	+22.3	+0.0	35.3	46.0	-10.7	Horiz
22	750.073M	37.6	-27.6	+0.0	+3.6	+21.5	+0.0	35.1	46.0	-10.9	Horiz
23	61.849M	48.4	-26.8	+5.9	+0.9	+0.0	+0.0	28.4	40.0	-11.6	Vert
24	742.771M	37.0	-27.7	+0.0	+3.5	+21.5	+0.0	34.3	46.0	-11.7	Horiz
25	691.905M	36.7	-27.8	+0.0	+3.5	+21.4	+0.0	33.8	46.0	-12.2	Horiz
26	803.804M	35.4	-27.7	+0.0	+3.7	+22.3	+0.0	33.7	46.0	-12.3	Vert
27	213.724M	44.9	-26.2	+10.0	+1.9	+0.0	+0.0	30.6	43.5	-12.9	Horiz
28	225.066M	46.3	-26.1	+10.9	+2.0	+0.0	+0.0	33.1	46.0	-12.9	Vert
29	650.034M	35.2	-27.9	+0.0	+3.3	+22.0	+0.0	32.6	46.0	-13.4	Horiz
30	488.369M	39.5	-27.6	+0.0	+2.8	+17.9	+0.0	32.6	46.0	-13.4	Horiz

31	709.819M	35.4	-27.8	+0.0	+3.5	+21.3	+0.0	32.4	46.0	-13.6	Horiz
32	133.676M	43.4	-26.5	+11.4	+1.5	+0.0	+0.0	29.8	43.5	-13.7	Vert
33	427.381M	37.9	-27.1	+0.0	+2.7	+18.3	+0.0	31.8	46.0	-14.2	Vert
34	742.773M	34.4	-27.7	+0.0	+3.5	+21.5	+0.0	31.7	46.0	-14.3	Vert
35	640.986M	34.4	-27.9	+0.0	+3.4	+21.7	+0.0	31.6	46.0	-14.4	Horiz
36	225.076M	44.5	-26.1	+10.9	+2.0	+0.0	+0.0	31.3	46.0	-14.7	Horiz
37	225.076M	44.5	-26.1	+10.9	+2.0	+0.0	+0.0	31.3	46.0	-14.7	Horiz
38	250.079M	42.4	-26.0	+12.6	+2.2	+0.0	+0.0	31.2	46.0	-14.8	Vert
39	213.726M	42.5	-26.2	+10.0	+1.9	+0.0	+0.0	28.2	43.5	-15.3	Vert
40	175.029M	43.6	-26.4	+9.2	+1.7	+0.0	+0.0	28.1	43.5	-15.4	Vert
41	610.466M	34.1	-27.8	+0.0	+3.3	+20.7	+0.0	30.3	46.0	-15.7	Horiz
42	437.550M	36.5	-27.2	+0.0	+2.8	+18.2	+0.0	30.3	46.0	-15.7	Horiz
43	91.571M	43.4	-26.8	+8.9	+1.2	+0.0	+0.0	26.7	43.5	-16.8	Vert
44	500.057M	35.9	-27.6	+0.0	+3.0	+17.8	+0.0	29.1	46.0	-16.9	Vert
45	175.022M	41.6	-26.4	+9.2	+1.7	+0.0	+0.0	26.1	43.5	-17.4	Horiz
46	150.041M	37.6	-26.4	+11.1	+1.5	+0.0	+0.0	23.8	43.5	-19.7	Vert
47	150.041M	37.5	-26.4	+11.1	+1.5	+0.0	+0.0	23.7	43.5	-19.8	Horiz

Test Location: CKC Laboratories, Inc. • 480 Los Viboras Road, Site B • Hollister, CA 95023 • (831) 637-8176

Customer: **TUV Rheinland**
 Specification: **FCC15.247(2.4 GHz) & 15.209**
 Work Order #: **78024** Date: 12/03/2001
 Test Type: **Maximized Emissions** Time: 15:27:02
 Equipment: **WhereNet Location Sensor** Sequence#: 30
 Manufacturer: WhereNet Tested By: Art Rice
 Model: LAP4200
 S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna Flat Panel	WhereNet	AK-120	none
Antenna Flat Panel	WhereNet	AK-120	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test in the TAG transmit mode, LAN is connected. Note 2) Maximized spurious signals 1-26.5 GHz.

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	HP-83 dB	Horn dB	H-B 3 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	7394.434M	24.0	-33.1	+40.6	+14.5	+0.0	46.0	54.0	-8.0	Vert
								3rd harmonic, noise floor		
2	7385.104M Ave	23.3	-33.1	+40.5	+14.5	+0.0	45.2	54.0	-8.8	Horiz
								3rd harmonic, noise floor		
3	2483.736M	42.7	-34.2	+27.8	+7.9	+0.0	44.2	54.0	-9.8	Horiz
4	4933.040M	32.3	-33.7	+31.7	+11.9	+0.0	42.2	54.0	-11.8	Horiz
								2nd harmonic		
5	2349.104M	39.7	-34.2	+27.8	+8.4	+0.0	41.7	54.0	-12.3	Vert
6	1149.658M	43.8	-36.1	+27.1	+5.2	+0.0	40.0	54.0	-14.0	Vert

7	2463.887M	120.9	-34.2	+27.8	+7.9	+0.0	122.4	137.0 Transmit fundamental at RBW=1 MHz. Corrected to 10.5 MHz	-14.6	Horiz
8	1047.919M	43.0	-36.6	+27.5	+4.9	+0.0	38.8	54.0	-15.2	Vert
9	1750.019M	37.8	-34.5	+27.0	+8.2	+0.0	38.5	54.0	-15.5	Vert
10	1047.918M	41.0	-36.6	+27.5	+4.9	+0.0	36.8	54.0	-17.2	Horiz
11	1058.093M	40.2	-36.5	+27.5	+4.9	+0.0	36.1	54.0	-17.9	Vert
12	2463.867M	113.7	-34.2	+27.8	+7.9	+0.0	115.2	137.0 Transmit fundamental at RBW=1 MHz. Corrected to 10.5MHz	-21.8	Vert
13	4930.255M	21.2	-33.7	+31.7	+11.9	+0.0	31.1	54.0 3rd harmonic, noise floor	-22.9	Vert

Test Location: CKC Laboratories, Inc. • 1653 Los Viboras Rd., Site C • Hollister, Ca 95023 • (831) 637-0485

Customer: **TUV Rheinland**

Specification: **FCC 15.207**

Work Order #: **78024**

Date: 11/26/2001

Test Type: **Conducted Emissions**

Time: 5:47:47 PM

Equipment: **WhereNet Location Sensor**

Sequence#: 4

Manufacturer: WhereNet

Tested By: Art Rice

Model: LAP4200

S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna All Weather Omni	WhereNet	AK-210-10	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none
WLAN Transceiver	Symbol Technologies	A66233-01	00034715C4FF
AC Adapter for WLAN Transceiver	Symbol Technologies	50-25000-021	002131099

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. This is a test while the Tag receiver is operating. The EUT and AC adapter are connected to 120 V, 60 Hz.

Measurement Data:

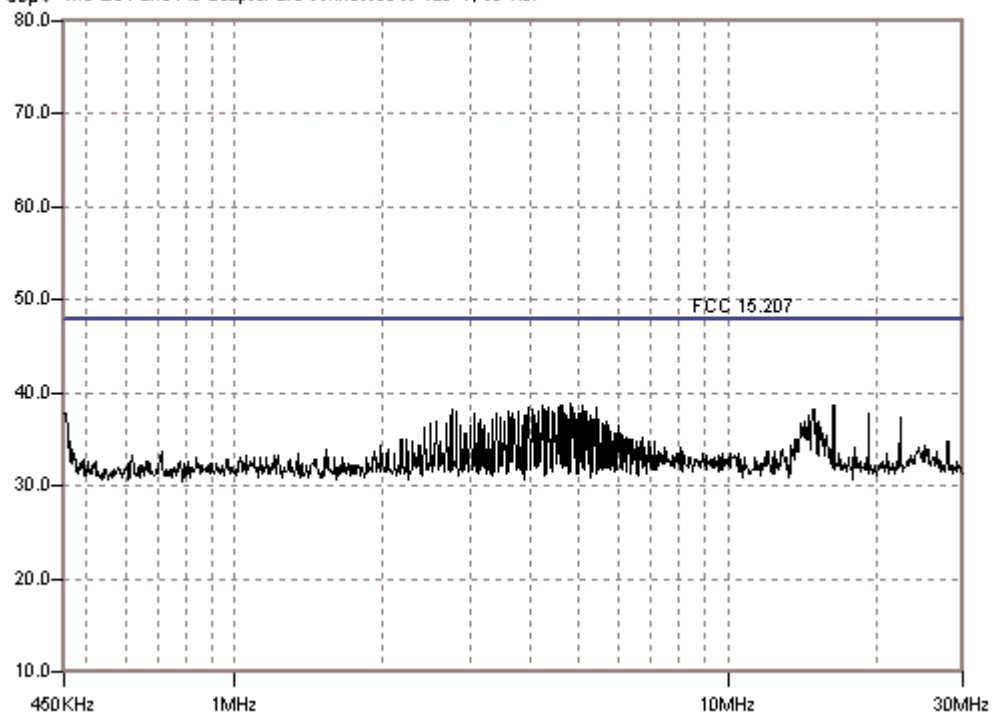
Reading listed by margin.

Test Lead: Black

#	Freq MHz	Rdng dBμV	Insert		Black		Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	4.793M	38.7	+0.1	+0.1			+0.0	38.9	48.0	-9.1	Black
2	4.220M	38.5	+0.1	+0.1			+0.0	38.7	48.0	-9.3	Black
3	5.107M	38.4	+0.1	+0.1			+0.0	38.6	48.0	-9.4	Black
4	4.595M	38.4	+0.1	+0.1			+0.0	38.6	48.0	-9.4	Black
5	16.409M	38.5	+0.1	+0.0			+0.0	38.6	48.0	-9.4	Black

6	4.343M	38.3	+0.1	+0.1	+0.0	38.5	48.0	-9.5	Black
7	5.435M	38.2	+0.1	+0.1	+0.0	38.4	48.0	-9.6	Black
8	4.855M	38.2	+0.1	+0.1	+0.0	38.4	48.0	-9.6	Black
9	4.534M	38.2	+0.1	+0.1	+0.0	38.4	48.0	-9.6	Black
10	3.954M	38.2	+0.1	+0.1	+0.0	38.4	48.0	-9.6	Black
11	14.966M	38.1	+0.1	+0.1	+0.0	38.3	48.0	-9.7	Black
12	4.029M	38.1	+0.1	+0.1	+0.0	38.3	48.0	-9.7	Black
13	4.275M	38.0	+0.1	+0.1	+0.0	38.2	48.0	-9.8	Black
14	2.757M	38.0	+0.1	+0.1	+0.0	38.2	48.0	-9.8	Black
15	4.404M	37.9	+0.1	+0.1	+0.0	38.1	48.0	-9.9	Black
16	2.819M	37.9	+0.1	+0.1	+0.0	38.1	48.0	-9.9	Black
17	5.176M	37.8	+0.1	+0.1	+0.0	38.0	48.0	-10.0	Black
18	4.152M	37.8	+0.1	+0.1	+0.0	38.0	48.0	-10.0	Black
19	3.770M	37.8	+0.1	+0.1	+0.0	38.0	48.0	-10.0	Black
20	3.593M	37.8	+0.1	+0.1	+0.0	38.0	48.0	-10.0	Black
21	19.392M	38.1	+0.0	-0.2	+0.0	37.9	48.0	-10.1	Black
22	4.916M	37.7	+0.1	+0.1	+0.0	37.9	48.0	-10.1	Black
23	4.670M	37.7	+0.1	+0.1	+0.0	37.9	48.0	-10.1	Black
24	3.660M	37.7	+0.1	+0.1	+0.0	37.9	48.0	-10.1	Black
25	3.077M	37.7	+0.1	+0.1	+0.0	37.9	48.0	-10.1	Black
26	5.053M	37.6	+0.1	+0.1	+0.0	37.8	48.0	-10.2	Black
27	4.984M	37.6	+0.1	+0.1	+0.0	37.8	48.0	-10.2	Black
28	4.466M	37.6	+0.1	+0.1	+0.0	37.8	48.0	-10.2	Black
29	455.015k	37.9	+0.0	-0.1	+0.0	37.8	48.0	-10.2	Black
30	3.397M	37.5	+0.1	+0.1	+0.0	37.7	48.0	-10.3	Black

CKC Laboratories, Inc. Date: 11/26/2001 Time: 5:47:47 P W/O#: 78024
 FCC 15.207 Test Lead: Black Sequence#: 4
 dBµV The EUT and AC adapter are connected to 120 V, 60 Hz.



Test Location: CKC Laboratories, Inc. • 1653 Los Viboras Rd., Site C • Hollister, Ca 95023 • (831) 637-0485

Customer: **TUV Rheinland**

Specification: **FCC 15.207**

Work Order #: **78024**

Date: 11/26/2001

Test Type: **Conducted Emissions**

Time: 5:55:18 PM

Equipment: **WhereNet Location Sensor**

Sequence#: 5

Manufacturer: WhereNet

Tested By: Art Rice

Model: LAP4200

S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna All Weather Omni	WhereNet	AK-210-10	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none
WLAN Transceiver	Symbol Technologies	A66233-01	00034715C4FF
AC Adapter for WLAN Transceiver	Symbol Technologies	50-25000-021	002131099

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed up 2 feet, then horizontally 10 feet back away from the EUT. The hub, laptop and WLAN transceiver are located 100 feet away. This is a test while the Tag receiver is operating. The EUT and AC adapter are connected to 120 V, 60 Hz.

Measurement Data:

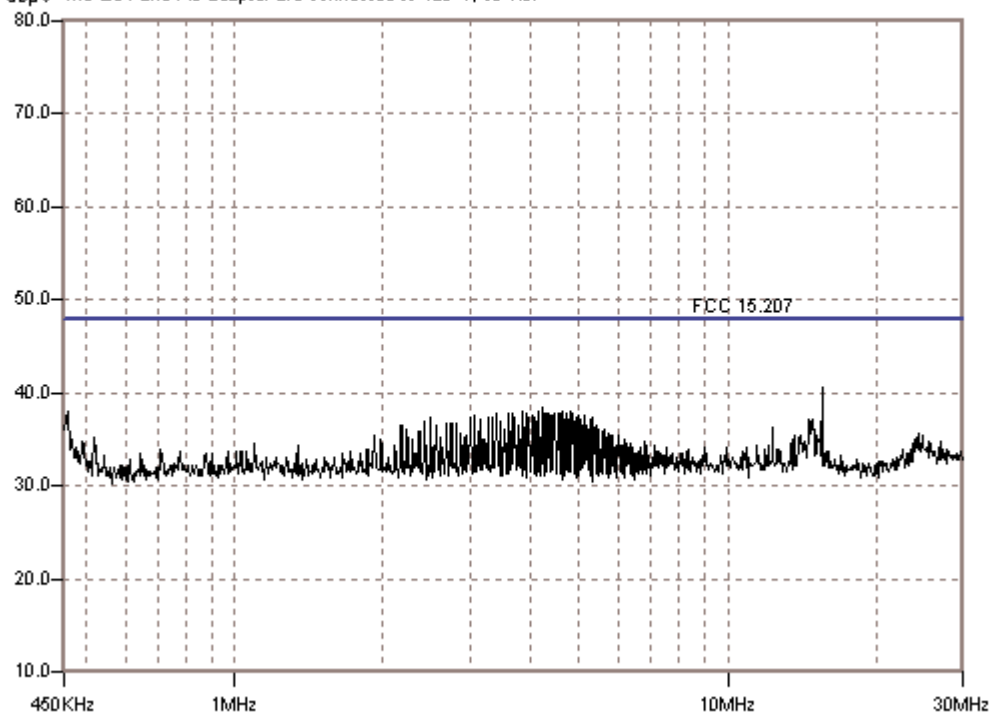
Reading listed by margin.

Test Lead: White

#	Freq MHz	Rdng dBµV			Inser dB	White dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	15.570M	40.4			+0.2	+0.0	+0.0	40.6	48.0	-7.4	White
	Ambient										
2	4.220M	38.5			+0.1	-0.1	+0.0	38.5	48.0	-9.5	White
3	4.793M	38.1			+0.1	-0.1	+0.0	38.1	48.0	-9.9	White
4	460.030k	38.1			+0.1	-0.1	+0.0	38.1	48.0	-9.9	White
5	4.602M	38.0			+0.1	-0.1	+0.0	38.0	48.0	-10.0	White
6	4.152M	38.0			+0.1	-0.1	+0.0	38.0	48.0	-10.0	White
7	3.838M	38.0			+0.1	-0.1	+0.0	38.0	48.0	-10.0	White

8	4.343M	37.9	+0.1	-0.1	+0.0	37.9	48.0	-10.1	White
9	3.892M	37.9	+0.1	-0.1	+0.0	37.9	48.0	-10.1	White
10	3.593M	37.9	+0.1	-0.1	+0.0	37.9	48.0	-10.1	White
11	4.855M	37.8	+0.1	-0.1	+0.0	37.8	48.0	-10.2	White
12	4.281M	37.8	+0.1	-0.1	+0.0	37.8	48.0	-10.2	White
13	3.660M	37.8	+0.1	-0.1	+0.0	37.8	48.0	-10.2	White
14	4.725M	37.7	+0.1	-0.1	+0.0	37.7	48.0	-10.3	White
15	4.534M	37.7	+0.1	-0.1	+0.0	37.7	48.0	-10.3	White
16	4.466M	37.7	+0.1	-0.1	+0.0	37.7	48.0	-10.3	White
17	3.399M	37.7	+0.1	-0.1	+0.0	37.7	48.0	-10.3	White
18	5.121M	37.6	+0.1	-0.1	+0.0	37.6	48.0	-10.4	White
19	4.404M	37.6	+0.1	-0.1	+0.0	37.6	48.0	-10.4	White
20	4.998M	37.5	+0.1	-0.1	+0.0	37.5	48.0	-10.5	White
21	4.029M	37.5	+0.1	-0.1	+0.0	37.5	48.0	-10.5	White
22	3.082M	37.5	+0.1	-0.1	+0.0	37.5	48.0	-10.5	White
23	5.312M	37.4	+0.1	-0.1	+0.0	37.4	48.0	-10.6	White
24	4.930M	37.4	+0.1	-0.1	+0.0	37.4	48.0	-10.6	White
25	4.084M	37.4	+0.1	-0.1	+0.0	37.4	48.0	-10.6	White
26	3.701M	37.4	+0.1	-0.1	+0.0	37.4	48.0	-10.6	White
27	3.015M	37.4	+0.1	-0.1	+0.0	37.4	48.0	-10.6	White
28	2.499M	37.4	+0.1	-0.1	+0.0	37.4	48.0	-10.6	White
29	3.335M	37.3	+0.1	-0.1	+0.0	37.3	48.0	-10.7	White
30	3.273M	37.3	+0.1	-0.1	+0.0	37.3	48.0	-10.7	White

CKC Laboratories, Inc. Date: 11/26/2001 Time: 5:55:18 P W/O#: 78024
FCC 15.207 Test Lead: White Sequence#: 5
dB μ V The EUT and AC adapter are connected to 120 V, 60 Hz.



Test Location: CKC Laboratories, Inc. • 480 Los Viboras Road, Site B • Hollister, CA 95023 • (831) 637-8176

Customer: **TUV Rheinland**

Specification: **FCC B**

Work Order #: **78024**

Date: 12/4/2001

Test Type: **Maximized Emissions**

Time: 10:08:37

Equipment: **WhereNet Location Sensor**

Sequence#: 31

Manufacturer: WhereNet

Tested By: Art Rice

Model: LAP4200

S/N: M00460110000

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
Switching Power Adapter	Globtek, Inc.	GT-2-1097-5024	013A230260
WhereNet Location Sensor*	WhereNet	LAP4200	M00460110000
Antenna Flat Panel	WhereNet	AK-120	none
Antenna Flat Panel	WhereNet	AK-120	none

Support Devices:

Function	Manufacturer	Model #	S/N
Ethernet Hub	Bay Networks	DS108	DS18F9B09756
Laptop PC	Hitachi	7560	TE0136700153
AC Adapter for PC	Delta	ADP-50GB	M2819010414
AC Adapter for Hub	Bay Networks	PWR-002-004	none

Test Conditions / Notes:

The EUT is a WhereNet Location Sensor. It is placed on the test table 0.8 m above the metal turntable. The EUT has timing ports 1 and 2 looped back. An unterminated cable is attached to timing port 3. The AC adapter is placed on the test table. The excess cable length is draped off the table, bundled to 40 cm above ground. The unshielded Ethernet cable is routed down through a hole in the turntable, the underground to 50 feet from the EUT. The hub, laptop and WLAN transceiver are located 50 feet away. Note 1) This is a test in the TAG receive mode. Note 2) Scan and maximized spurious signals 1-12.8 GHz.

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	HP-83 Horn H-B 3				Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
			dB	dB	dB	dB					
1	1289.417M	45.5	-35.5	+26.6	+5.6		+0.0	42.2	54.0	-11.8	Horiz
2	1000.003M Ave	46.2	-36.8	+27.7	+4.7		+0.0	41.8	54.0	-12.2	Vert
3	2188.253M	38.7	-34.2	+27.8	+9.1		+0.0	41.4	54.0	-12.6	Horiz
4	1149.660M	45.0	-36.1	+27.1	+5.2		+0.0	41.2	54.0	-12.8	Horiz
5	1180.333M	44.8	-36.0	+27.0	+5.3		+0.0	41.1	54.0	-12.9	Horiz
6	1231.083M	44.2	-35.8	+26.8	+5.5		+0.0	40.7	54.0	-13.3	Horiz
7	1057.333M	44.7	-36.5	+27.5	+4.9		+0.0	40.6	54.0	-13.4	Vert
8	1241.583M	44.0	-35.7	+26.8	+5.5		+0.0	40.6	54.0	-13.4	Horiz

9	1000.050M Ave	40.5	+0.0	+0.0	+0.0	+0.0	40.5	54.0	-13.5	Horiz
10	1037.736M Ave	44.3	-36.6	+27.5	+4.8	+0.0	40.0	54.0	-14.0	Vert
11	1037.745M	43.8	-36.6	+27.5	+4.8	+0.0	39.5	54.0	-14.5	Horiz
12	1047.921M	42.2	-36.6	+27.5	+4.9	+0.0	38.0	54.0	-16.0	Vert
13	1180.667M	41.3	-36.0	+27.0	+5.3	+0.0	37.6	54.0	-16.4	Vert
14	1068.267M	41.3	-36.5	+27.4	+4.9	+0.0	37.1	54.0	-16.9	Vert
15	1119.476M	40.8	-36.2	+27.2	+5.1	+0.0	36.9	54.0	-17.1	Horiz
16	1099.396M	40.5	-36.3	+27.3	+5.1	+0.0	36.6	54.0	-17.4	Horiz
17	1109.436M	40.0	-36.3	+27.3	+5.1	+0.0	36.1	54.0	-17.9	Horiz
18	1058.088M Ave	39.8	-36.5	+27.5	+4.9	+0.0	35.7	54.0	-18.3	Horiz
19	1140.058M	39.0	-36.2	+27.2	+5.2	+0.0	35.2	54.0	-18.8	Horiz
20	1047.914M Ave	39.0	-36.6	+27.5	+4.9	+0.0	34.8	54.0	-19.2	Horiz
21	1750.017M	33.5	-34.5	+27.0	+8.2	+0.0	34.2	54.0	-19.8	Horiz
22	1028.000M	38.3	-36.7	+27.6	+4.8	+0.0	34.0	54.0	-20.0	Vert
23	1068.267M Ave	38.0	-36.5	+27.4	+4.9	+0.0	33.8	54.0	-20.2	Horiz