

3.0 System Test Configuration

3.1 Justification

Data was taken with the EUT configured for low, mid, and high XMIT frequencies.

The EUT has six identical transmit ports and six identical receive ports. Only one transmit and one receive port can be active at a time. Port 6 and Port 1 exhibited the highest emission levels and were used for antenna measurements.

Since the only change was the antennas, only out of band radiated emissions testing was performed to validate the Class II Permissive Change. The EUT characteristics had previously been evaluated for peak readings and it was determined that peak emissions were less than 20dB greater than average, therefore; only average data was acquired.

Radiated emissions were measured with all the antenna ports connected to a coaxial cable and antenna.

3.2 EUT Exercise Software

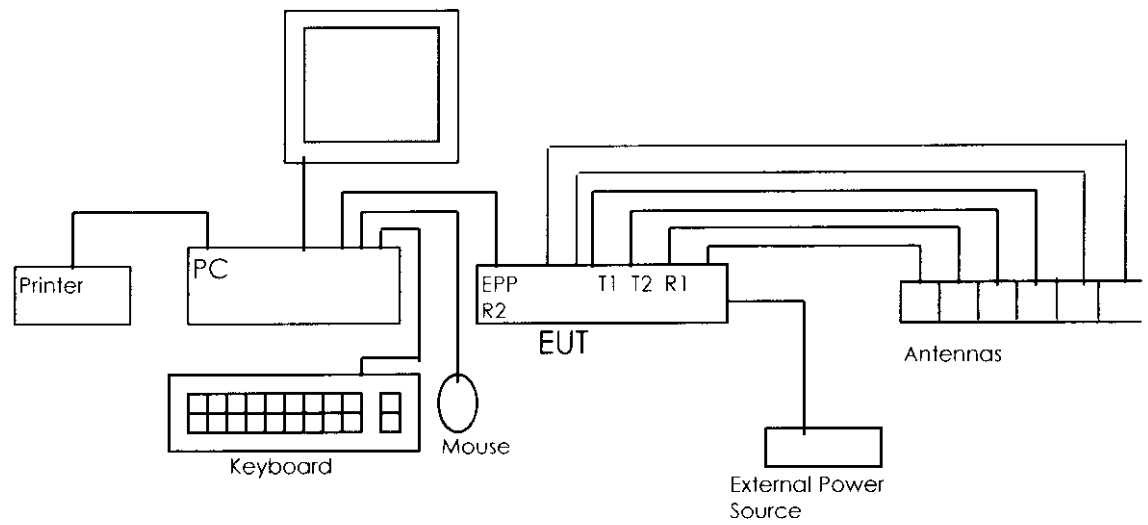
A **Windows™** based program called *Microstamp Standard Assist V3.45 (3.4600)* was run off the hard-disk in the PC. It allows the EUT to be configured for hopping or no hopping (C/W) transmit modes. A typical frequency application is simulated by a routine called "Dots Animation".

3.3 Special Accessories

A power/serial test cable was used.

3.4 Equipment Modifications

None.

Figure 3.1: Configuration of Tested System

6.0 Radiated Emissions Data

6.1 The following data lists the two most significant emission frequencies, total (corrected) levels, and specification margins for each set of antennas tested. Correction factors, antenna height, table azimuth, etc., are contained in the data sheets immediately following. Explanation of the correction factors is given in paragraph 6.2 of this report. Complete graphs and data sheets may be referenced on the following pages. Minimum margins are listed below:

Antennas America M2:45HPSPLHC Antennas

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization	XMIT Band
7440.000	AV	49.7	54.0	4.3	Vertical	T1
7440.000	AV	49.6	54.0	4.4	Horizontal	T6

Judgment: Passed, minimum margin of 4.3 dB.

Antennas America M2:45HPSRHC Antennas

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization	XMIT Band
7200.00	AV	51.1	54.0	2.9	Horizontal	T1
7440.00	AV	51.1	54.0	2.9	Vertical	T6

Judgment: Passed, minimum margin of 2.9 dB.

Tecom Circular Polarization Antennas

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization	XMIT Band
7200.00	AV	45.4	54.0	8.6	Vertical	T1
7200.00	AV	44.4	54.0	9.6	Vertical	T6

* Positive (+) Margins = measured levels less than specification limit.

* Negative (-) Margins = measured levels greater than specification limit.

Judgment: Passed, minimum margin of 8.6 dB.

6.0 Radiated Emissions Data con't

MA/COMM ANPC-175G-P-O-SF Antennas

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization	XMIT Band
7440.00	AV	44.1	54.0	9.9	Vertical	T1
7440.00	AV	44.2	54.0	9.8	Vertical	T6

Judgment: Passed, minimum margin of 9.8 dB.

MA/COMM ANPC-176G-P-O-SF Antennas

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization	XMIT Band
7200.00	AV	44.2	54.0	9.8	Vertical	T1
7200.00	AV	44.0	54.0	10.0	Vertical	T6

Judgment: Passed, minimum margin of 9.8 dB.

MA/COMM ANPC-118 Antennas

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization	XMIT Band
7200.00	AV	47.5	54.0	6.5	Vertical	T1
7200.00	AV	46.9	54.0	7.1	Vertical	T6

Judgment: Passed, minimum margin of 6.5 dB.

Test Personnel:

Tester Signature



Typed/Printed Name: Dan Haas

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Antennas America M2:45HPSPLHC Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4800.000 T1	27.9	AV	35.4	HHRN	35.0	3.0	31.3	54.0	0.0	1.0	-22.7
4880.000 T1	27.1	AV	35.6	HHRN	35.0	3.0	30.7	54.0	0.0	1.0	-23.3
4960.000 T1	27.7	AV	35.8	HHRN	35.0	3.0	31.5	54.0	0.0	1.0	-22.5
4800.000 T1	27.5	AV	35.4	VHRN	35.0	3.0	30.9	54.0	0.0	1.0	-23.1
4880.000 T1	26.7	AV	35.6	VHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4960.000 T1	27.3	AV	35.8	VHRN	35.0	3.0	31.1	54.0	0.0	1.0	-22.9
4800.000 T6	26.9	AV	35.4	HHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4880.000 T6	26.2	AV	35.6	HHRN	35.0	3.0	29.8	54.0	0.0	1.0	-24.2
4960.000 T6	26.1	AV	35.8	HHRN	35.0	3.0	29.9	54.0	0.0	1.0	-24.1
4800.000 T6	27.1	AV	35.4	VHRN	35.0	3.0	30.5	54.0	0.0	1.0	-23.5
4880.000 T6	26.4	AV	35.6	VHRN	35.0	3.0	30.0	54.0	0.0	1.0	-24.0
4960.000 T6	26.4	AV	35.8	VHRN	35.0	3.0	30.2	54.0	0.0	1.0	-23.8


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

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 Job Number: MICN0038
 Test Date: 08-02-1998
 Tested By: Daniel Haas. TE04
 Test Distance: 3 meters.
 Comments: Antennas America M2:45HPSPLHC Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
7200.000 T1	39.5	AV	38.3	HHRN	32.8	4.6	49.6	54.0	0.0	1.0	-4.4
7320.000 T1	34.4	AV	38.6	HHRN	33.0	4.6	44.6	54.0	0.0	1.0	-9.4
7440.000 T1	38.8	AV	38.9	HHRN	33.2	4.7	49.2	54.0	0.0	1.0	-4.8
7200.000 T1	37.9	AV	38.3	VHRN	32.8	4.6	48.0	54.0	0.0	1.0	-6.0
7320.000 T1	32.9	AV	38.6	VHRN	33.0	4.6	43.1	54.0	0.0	1.0	-10.9
7440.000 T1	39.3	AV	38.9	VHRN	33.2	4.7	49.7	54.0	0.0	1.0	-4.3
7200.000 T6	38.9	AV	38.3	HHRN	32.8	4.6	49.0	54.0	0.0	1.0	-5.0
7320.000 T6	35.0	AV	38.6	HHRN	33.0	4.6	45.2	54.0	0.0	1.0	-8.8
7440.000 T6	39.2	AV	38.9	HHRN	33.2	4.7	49.6	54.0	0.0	1.0	-4.4
7200.000 T6	35.1	AV	38.3	VHRN	32.8	4.6	45.2	54.0	0.0	1.0	-8.8
7320.000 T6	32.7	AV	38.6	VHRN	33.0	4.6	42.9	54.0	0.0	1.0	-11.1
7440.000 T6	35.9	AV	38.9	VHRN	33.2	4.7	46.3	54.0	0.0	1.0	-7.7

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

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Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Antennas America M2:45HPSPLHC Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
9600.000 T1	30.3	AV	40.7	HHRN	34.8	5.8	42.0	54.0	0.0	1.0	-12.0
9760.000 T1	31.6	AV	40.8	HHRN	34.7	5.9	43.6	54.0	0.0	1.0	-10.4
9920.000 T1	31.5	AV	40.9	HHRN	34.5	6.0	43.9	54.0	0.0	1.0	-10.1
9600.000 T1	31.6	AV	40.7	VHRN	34.8	5.8	43.3	54.0	0.0	1.0	-10.7
9760.000 T1	31.3	AV	40.8	VHRN	34.7	5.9	43.3	54.0	0.0	1.0	-10.7
9920.000 T1	31.6	AV	40.9	VHRN	34.5	6.0	44.0	54.0	0.0	1.0	-10.0
9600.000 T6	32.3	AV	40.7	HHRN	34.8	5.8	44.0	54.0	0.0	1.0	-10.0
9760.000 T6	31.9	AV	40.8	HHRN	34.7	5.9	43.9	54.0	0.0	1.0	-10.1
9920.000 T6	31.5	AV	40.9	HHRN	34.5	6.0	43.9	54.0	0.0	1.0	-10.1
9600.000 T6	32.0	AV	40.7	VHRN	34.8	5.8	43.7	54.0	0.0	1.0	-10.3
9760.000 T6	31.8	AV	40.8	VHRN	34.7	5.9	43.8	54.0	0.0	1.0	-10.2
9920.000 T6	32.0	AV	40.9	VHRN	34.5	6.0	44.4	54.0	0.0	1.0	-9.6


 Signature

Temperature 77F 40% Humidity

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Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Antennas America M2:45HPSPRHCT Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4800.000 T1	27.5	AV	35.4	HHRN	35.0	3.0	30.9	54.0	0.0	1.0	-23.1
4880.000 T1	27.2	AV	35.6	HHRN	35.0	3.0	30.8	54.0	0.0	1.0	-23.2
4960.000 T1	29.3	AV	35.8	HHRN	35.0	3.0	33.1	54.0	0.0	1.0	-20.9
4800.000 T1	27.4	AV	35.4	VHRN	35.0	3.0	30.8	54.0	0.0	1.0	-23.2
4880.000 T1	27.1	AV	35.6	VHRN	35.0	3.0	30.7	54.0	0.0	1.0	-23.3
4960.000 T1	28.7	AV	35.8	VHRN	35.0	3.0	32.5	54.0	0.0	1.0	-21.5
4800.000 T6	27.4	AV	35.4	HHRN	35.0	3.0	30.8	54.0	0.0	1.0	-23.2
4880.000 T6	26.9	AV	35.6	HHRN	35.0	3.0	30.5	54.0	0.0	1.0	-23.5
4960.000 T6	27.6	AV	35.8	HHRN	35.0	3.0	31.4	54.0	0.0	1.0	-22.6
4800.000 T6	27.1	AV	35.4	VHRN	35.0	3.0	30.5	54.0	0.0	1.0	-23.5
4880.000 T6	27.0	AV	35.6	VHRN	35.0	3.0	30.6	54.0	0.0	1.0	-23.4
4960.000 T6	27.1	AV	35.8	VHRN	35.0	3.0	30.9	54.0	0.0	1.0	-23.1

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

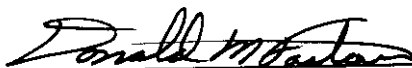
Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas, TE04
Test Distance: 3 meters.
Comments: Antennas America M2:45HPSPRHCT Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
7200.000 T1	41.0	AV	38.3	HHRN	32.8	4.6	51.1	54.0	0.0	1.0	-2.9
7320.000 T1	36.1	AV	38.6	HHRN	33.0	4.6	46.3	54.0	0.0	1.0	-7.7
7440.000 T1	39.5	AV	38.9	HHRN	33.2	4.7	49.9	54.0	0.0	1.0	-4.1
7200.000 T1	40.3	AV	38.3	VHRN	32.8	4.6	50.4	54.0	0.0	1.0	-3.6
7320.000 T1	38.7	AV	38.6	VHRN	33.0	4.6	48.9	54.0	0.0	1.0	-5.1
7440.000 T1	38.0	AV	38.9	VHRN	33.2	4.7	48.4	54.0	0.0	1.0	-5.6
7200.000 T6	39.5	AV	38.3	HHRN	32.8	4.6	49.6	54.0	0.0	1.0	-4.4
7320.000 T6	36.5	AV	38.6	HHRN	33.0	4.6	46.7	54.0	0.0	1.0	-7.3
7440.000 T6	39.4	AV	38.9	HHRN	33.2	4.7	49.8	54.0	0.0	1.0	-4.2
7200.000 T6	40.5	AV	38.3	VHRN	32.8	4.6	50.6	54.0	0.0	1.0	-3.4
7320.000 T6	37.6	AV	38.6	VHRN	33.0	4.6	47.8	54.0	0.0	1.0	-6.2
7440.000 T6	40.7	AV	38.9	VHRN	33.2	4.7	51.1	54.0	0.0	1.0	-2.9

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Antennas America M2:45HPSRHCT Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
9600.000 T1	31.2	AV	40.7	HHRN	34.8	5.8	42.9	54.0	0.0	1.0	-11.1
9760.000 T1	30.5	AV	40.8	HHRN	34.7	5.9	42.5	54.0	0.0	1.0	-11.5
9920.000 T1	31.2	AV	40.9	HHRN	34.5	6.0	43.6	54.0	0.0	1.0	-10.4
9600.000 T1	30.7	AV	40.7	VHRN	34.8	5.8	42.4	54.0	0.0	1.0	-11.6
9760.000 T1	31.3	AV	40.8	VHRN	34.7	5.9	43.3	54.0	0.0	1.0	-10.7
9920.000 T1	31.2	AV	40.9	VHRN	34.5	6.0	43.6	54.0	0.0	1.0	-10.4
9600.000 T6	31.0	AV	40.7	HHRN	34.8	5.8	42.7	54.0	0.0	1.0	-11.3
9760.000 T6	31.4	AV	40.8	HHRN	34.7	5.9	43.4	54.0	0.0	1.0	-10.6
9920.000 T6	31.4	AV	40.9	HHRN	34.5	6.0	43.8	54.0	0.0	1.0	-10.2
9600.000 T6	31.2	AV	40.7	VHRN	34.8	5.8	42.9	54.0	0.0	1.0	-11.1
9760.000 T6	31.3	AV	40.8	VHRN	34.7	5.9	43.3	54.0	0.0	1.0	-10.7
9920.000 T6	31.2	AV	40.9	VHRN	34.5	6.0	43.6	54.0	0.0	1.0	-10.4

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
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Equipment Tested: Interogater Antennas
 Serial Number:
 Manufacturer: Micron Communications
 Job Number: MICN0038
 Test Date: 08-02-1998
 Tested By: Daniel Haas. TE04
 Test Distance: 3 meters.
 Comments: Tecom Circular Polarization Antennas, 3' Cables, Maximum Power Setting
 Type 505097BL and 50597BR, Serial No. P002 and P019

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4800.000 T1	26.9	AV	35.4	HHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4880.000 T1	26.9	AV	35.6	HHRN	35.0	3.0	30.5	54.0	0.0	1.0	-23.5
4960.000 T1	27.2	AV	35.8	HHRN	35.0	3.0	31.0	54.0	0.0	1.0	-23.0
4800.000 T1	26.9	AV	35.4	VHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4880.000 T1	27.4	AV	35.6	VHRN	35.0	3.0	31.0	54.0	0.0	1.0	-23.0
4960.000 T1	27.3	AV	35.8	VHRN	35.0	3.0	31.1	54.0	0.0	1.0	-22.9
4800.000 T6	26.9	AV	35.4	VHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4880.000 T6	26.8	AV	35.6	VHRN	35.0	3.0	30.4	54.0	0.0	1.0	-23.6
4960.000 T6	26.7	AV	35.8	VHRN	35.0	3.0	30.5	54.0	0.0	1.0	-23.5
4800.000 T6	26.9	AV	35.4	HHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4800.000 T6	26.7	AV	35.4	HHRN	35.0	3.0	30.1	54.0	0.0	1.0	-23.9
4880.000 T6	27.0	AV	35.6	HHRN	35.0	3.0	30.6	54.0	0.0	1.0	-23.4

 for Dan Haas
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Temperature 77F 40% Humidity

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Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Tecom Circular Polarization Antennas, 3' Cables, Maximum Power Setting
Type 505097BL and 50597BR, Serial No. P002 and P019

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
7200.000 T1	33.5	AV	38.3	HHRN	32.8	4.6	43.6	54.0	0.0	1.0	-10.4
7320.000 T1	32.2	AV	38.6	HHRN	33.0	4.6	42.4	54.0	0.0	1.0	-11.6
7440.000 T1	31.8	AV	38.9	HHRN	33.2	4.7	42.2	54.0	0.0	1.0	-11.8
7200.000 T1	35.3	AV	38.3	VHRN	32.8	4.6	45.4	54.0	0.0	1.0	-8.6
7320.000 T1	33.8	AV	38.6	VHRN	33.0	4.6	44.0	54.0	0.0	1.0	-10.0
7440.000 T1	32.1	AV	38.9	VHRN	33.2	4.7	42.5	54.0	0.0	1.0	-11.5
7200.000 T6	32.7	AV	38.3	HHRN	32.8	4.6	42.8	54.0	0.0	1.0	-11.2
7320.000 T6	32.1	AV	38.6	HHRN	33.0	4.6	42.3	54.0	0.0	1.0	-11.7
7440.000 T6	31.6	AV	38.9	HHRN	33.2	4.7	42.0	54.0	0.0	1.0	-12.0
7200.000 T6	34.3	AV	38.3	VHRN	32.8	4.6	44.4	54.0	0.0	1.0	-9.6
7320.000 T6	33.5	AV	38.6	VHRN	33.0	4.6	43.7	54.0	0.0	1.0	-10.3
7440.000 T6	31.5	AV	38.9	VHRN	33.2	4.7	41.9	54.0	0.0	1.0	-12.1

 for Dan Haas
Signature

Temperature 77F 40% Humidity

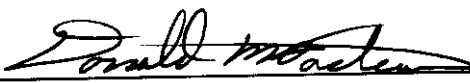
Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Tecom Circular Polarization Antennas, 3' Cables, Maximum Power Setting
Type 505097BL and 50597BR, Serial No. P002 and P019

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
9600.000 T1	30.2	AV	40.7	HHRN	34.8	5.8	41.9	54.0	0.0	1.0	-12.1
9760.000 T1	30.3	AV	40.8	HHRN	34.7	5.9	42.3	54.0	0.0	1.0	-11.7
9920.000 T1	30.5	AV	40.9	HHRN	34.5	6.0	42.9	54.0	0.0	1.0	-11.1
9600.000 T1	30.2	AV	40.7	VHRN	34.8	5.8	41.9	54.0	0.0	1.0	-12.1
9760.000 T1	30.2	AV	40.8	VHRN	34.7	5.9	42.2	54.0	0.0	1.0	-11.8
9920.000 T1	30.7	AV	40.9	VHRN	34.5	6.0	43.1	54.0	0.0	1.0	-10.9
9600.000 T6	30.1	AV	40.7	HHRN	34.8	5.8	41.8	54.0	0.0	1.0	-12.2
9760.000 T6	29.7	AV	40.8	HHRN	34.7	5.9	41.7	54.0	0.0	1.0	-12.3
9920.000 T6	30.5	AV	40.9	HHRN	34.5	6.0	42.9	54.0	0.0	1.0	-11.1
9600.000 T6	30.1	AV	40.7	VHRN	34.8	5.8	41.8	54.0	0.0	1.0	-12.2
9760.000 T6	30.6	AV	40.8	VHRN	34.7	5.9	42.6	54.0	0.0	1.0	-11.4
9920.000 T6	30.1	AV	40.9	VHRN	34.5	6.0	42.5	54.0	0.0	1.0	-11.5

 for Dan Haas
Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
 Serial Number:
 Manufacturer: Micron Communications
 Job Number: MICN0038
 Test Date: 08-02-1998
 Tested By: Daniel Haas. TE04
 Test Distance: 3 meters.
 Comments: MA/COMM ANPC-175G-P-O-SF Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4800.000 T1	27.6	AV	35.4	HHRN	35.0	3.0	31.0	54.0	0.0	1.0	-23.0
4880.000 T1	28.5	AV	35.6	HHRN	35.0	3.0	32.1	54.0	0.0	1.0	-21.9
4960.000 T1	29.5	AV	35.8	HHRN	35.0	3.0	33.3	54.0	0.0	1.0	-20.7
4960.000 T1	26.6	AV	35.8	VHRN	35.0	3.0	30.4	54.0	0.0	1.0	-23.6
4880.000 T1	26.8	AV	35.6	VHRN	35.0	3.0	30.4	54.0	0.0	1.0	-23.6
4800.000 T1	26.9	AV	35.4	VHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4800.000 T6	27.7	AV	35.4	HHRN	35.0	3.0	31.1	54.0	0.0	1.0	-22.9
4880.000 T6	27.1	AV	35.6	HHRN	35.0	3.0	30.7	54.0	0.0	1.0	-23.3
4960.000 T6	27.7	AV	35.8	HHRN	35.0	3.0	31.5	54.0	0.0	1.0	-22.5
4800.000 T6	26.9	AV	35.4	VHRN	35.0	3.0	30.3	54.0	0.0	1.0	-23.7
4880.000 T6	26.8	AV	35.6	VHRN	35.0	3.0	30.4	54.0	0.0	1.0	-23.6
4960.000 T6	27.1	AV	35.8	VHRN	35.0	3.0	30.9	54.0	0.0	1.0	-23.1

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

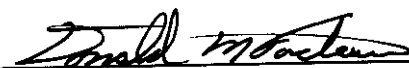
Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: MA/COMM ANPC-175G-P-O-SF Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
7200.000 T1	33.6	AV	38.3	HHRN	32.8	4.6	43.7	54.0	0.0	1.0	-10.3
7320.000 T1	32.7	AV	38.6	HHRN	33.0	4.6	42.9	54.0	0.0	1.0	-11.1
7440.000 T1	32.2	AV	38.9	HHRN	33.2	4.7	42.6	54.0	0.0	1.0	-11.4
7200.000 T1	31.6	AV	38.3	VHRN	32.8	4.6	41.7	54.0	0.0	1.0	-12.3
7320.000 T1	32.9	AV	38.6	VHRN	33.0	4.6	43.1	54.0	0.0	1.0	-10.9
7440.000 T1	33.7	AV	38.9	VHRN	33.2	4.7	44.1	54.0	0.0	1.0	-9.9
7200.000 T6	32.5	AV	38.3	HHRN	32.8	4.6	42.6	54.0	0.0	1.0	-11.4
7320.000 T6	32.3	AV	38.6	HHRN	33.0	4.6	42.5	54.0	0.0	1.0	-11.5
7440.000 T6	32.0	AV	38.9	HHRN	33.2	4.7	42.4	54.0	0.0	1.0	-11.6
7200.000 T6	33.0	AV	38.3	VHRN	32.8	4.6	43.1	54.0	0.0	1.0	-10.9
7320.000 T6	32.4	AV	38.6	VHRN	33.0	4.6	42.6	54.0	0.0	1.0	-11.4
7440.000 T6	33.8	AV	38.9	VHRN	33.2	4.7	44.2	54.0	0.0	1.0	-9.8


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
 Serial Number:
 Manufacturer: Micron Communications
 Job Number: MICN0038
 Test Date: 08-02-1998
 Tested By: Daniel Haas. TE04
 Test Distance: 3 meters.
 Comments: MA/COMM ANPC-175G-P-O-SF Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
9600.000 T1	30.9	AV	40.7	HHRN	34.8	5.8	42.6	54.0	0.0	1.0	-11.4
9760.000 T1	30.9	AV	40.8	HHRN	34.7	5.9	42.9	54.0	0.0	1.0	-11.1
9920.000 T1	30.9	AV	40.9	HHRN	34.5	6.0	43.3	54.0	0.0	1.0	-10.7
9600.000 T1	30.7	AV	40.7	VHRN	34.8	5.8	42.4	54.0	0.0	1.0	-11.6
9760.000 T1	30.5	AV	40.8	VHRN	34.7	5.9	42.5	54.0	0.0	1.0	-11.5
9920.000 T1	30.9	AV	40.9	VHRN	34.5	6.0	43.3	54.0	0.0	1.0	-10.7
9600.000 T6	30.3	AV	40.7	HHRN	34.8	5.8	42.0	54.0	0.0	1.0	-12.0
9760.000 T6	30.5	AV	40.8	HHRN	34.7	5.9	42.5	54.0	0.0	1.0	-11.5
9920.000 T6	30.5	AV	40.9	HHRN	34.5	6.0	42.9	54.0	0.0	1.0	-11.1
9600.000 T6	30.3	AV	40.7	VHRN	34.8	5.8	42.0	54.0	0.0	1.0	-12.0
9760.000 T6	30.1	AV	40.8	VHRN	34.7	5.9	42.1	54.0	0.0	1.0	-11.9
9920.000 T6	30.4	AV	40.9	VHRN	34.5	6.0	42.8	54.0	0.0	1.0	-11.2


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas, TE04
Test Distance: 3 meters.
Comments: MA/COMM ANPC-176G-P-O-SF Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4800.000 T1	28.3	AV	35.4	HHRN	35.0	3.0	31.7	54.0	0.0	1.0	-22.3
4880.000 T1	28.0	AV	35.6	HHRN	35.0	3.0	31.6	54.0	0.0	1.0	-22.4
4960.000 T1	28.2	AV	35.8	HHRN	35.0	3.0	32.0	54.0	0.0	1.0	-22.0
4800.000 T1	26.8	AV	35.4	VHRN	35.0	3.0	30.2	54.0	0.0	1.0	-23.8
4880.000 T1	27.1	AV	35.6	VHRN	35.0	3.0	30.7	54.0	0.0	1.0	-23.3
4960.000 T1	26.8	AV	35.8	VHRN	35.0	3.0	30.6	54.0	0.0	1.0	-23.4
4800.000 T6	28.0	AV	35.4	HHRN	35.0	3.0	31.4	54.0	0.0	1.0	-22.6
4880.000 T6	28.0	AV	35.6	HHRN	35.0	3.0	31.6	54.0	0.0	1.0	-22.4
4960.000 T6	27.4	AV	35.8	HHRN	35.0	3.0	31.2	54.0	0.0	1.0	-22.8
4800.000 T6	26.8	AV	35.4	VHRN	35.0	3.0	30.2	54.0	0.0	1.0	-23.8
4880.000 T6	26.8	AV	35.6	VHRN	35.0	3.0	30.4	54.0	0.0	1.0	-23.6
4960.000 T6	26.6	AV	35.8	VHRN	35.0	3.0	30.4	54.0	0.0	1.0	-23.6

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: MA/COMM ANPC-176G-P-O-SF Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
7200.000 T1	33.3	AV	38.3	HHRN	32.8	4.6	43.4	54.0	0.0	1.0	-10.6
7320.000 T1	32.4	AV	38.6	HHRN	33.0	4.6	42.6	54.0	0.0	1.0	-11.4
7440.000 T1	31.5	AV	38.9	HHRN	33.2	4.7	41.9	54.0	0.0	1.0	-12.1
7200.000 T1	34.1	AV	38.3	VHRN	32.8	4.6	44.2	54.0	0.0	1.0	-9.8
7320.000 T1	33.7	AV	38.6	VHRN	33.0	4.6	43.9	54.0	0.0	1.0	-10.1
7440.000 T1	33.4	AV	38.9	VHRN	33.2	4.7	43.8	54.0	0.0	1.0	-10.2
7200.000 T6	33.0	AV	38.3	HHRN	32.8	4.6	43.1	54.0	0.0	1.0	-10.9
7320.000 T6	32.3	AV	38.6	HHRN	33.0	4.6	42.5	54.0	0.0	1.0	-11.5
7440.000 T6	31.7	AV	38.9	HHRN	33.2	4.7	42.1	54.0	0.0	1.0	-11.9
7200.000 T6	33.9	AV	38.3	VHRN	32.8	4.6	44.0	54.0	0.0	1.0	-10.0
7320.000 T6	33.5	AV	38.6	VHRN	33.0	4.6	43.7	54.0	0.0	1.0	-10.3
7440.000 T6	32.9	AV	38.9	VHRN	33.2	4.7	43.3	54.0	0.0	1.0	-10.7


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Time Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 08-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: MA/COMM ANPC-176G-P-O-SF Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
9600.000 T1	30.4	AV	40.7	HHRN	34.8	5.8	42.1	54.0	0.0	1.0	-11.9
9760.000 T1	30.0	AV	40.8	HHRN	34.7	5.9	42.0	54.0	0.0	1.0	-12.0
9920.000 T1	30.6	AV	40.9	HHRN	34.5	6.0	43.0	54.0	0.0	1.0	-11.0
9600.000 T1	30.3	AV	40.7	VHRN	34.8	5.8	42.0	54.0	0.0	1.0	-12.0
9760.000 T1	30.5	AV	40.8	VHRN	34.7	5.9	42.5	54.0	0.0	0.0	-11.5
9920.000 T1	30.7	AV	40.9	VHRN	34.5	6.0	43.1	54.0	0.0	0.0	-10.9
9600.000 T6	30.3	AV	40.7	HHRN	34.8	5.8	42.0	54.0	0.0	1.0	-12.0
9760.000 T6	29.9	AV	40.8	HHRN	34.7	5.9	41.9	54.0	0.0	1.0	-12.1
9920.000 T6	30.2	AV	40.9	HHRN	34.5	6.0	42.6	54.0	0.0	1.0	-11.4
9600.000 T6	30.3	AV	40.7	VHRN	34.8	5.8	42.0	54.0	0.0	1.0	-12.0
9760.000 T6	30.2	AV	40.8	VHRN	34.7	5.9	42.2	54.0	0.0	1.0	-11.8
9920.000 T6	30.4	AV	40.9	VHRN	34.5	6.0	42.8	54.0	0.0	1.0	-11.2


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Freq. Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 09-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: M/A-COM ANP-C-118 Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4800.000 T1	33.1	AV	35.4	HHRN	35.0	3.0	36.5	54.0	100.0	1.0	-17.5
4800.000 T6	28.1	AV	35.4	VHRN	35.0	3.0	31.5	54.0	90.0	1.0	-22.5
4800.000 T6	28.4	AV	35.4	HHRN	35.0	3.0	31.8	54.0	90.0	1.0	-22.2
4800.000 T1	29.5	AV	35.4	VHRN	35.0	3.0	32.9	54.0	80.0	1.0	-21.1
4880.000 T1	31.5	AV	35.6	VHRN	35.0	3.0	35.1	54.0	80.0	1.1	-18.9
4880.000 T1	31.4	AV	35.6	HHRN	35.0	3.0	35.0	54.0	80.0	1.0	-19.0
4880.000 T6	30.4	AV	35.6	VHRN	35.0	3.0	34.0	54.0	80.0	1.0	-20.0
4880.000 T6	30.8	AV	35.6	HHRN	35.0	3.0	34.4	54.0	90.0	1.0	-19.6
4960.000 T6	32.0	AV	35.8	HHRN	35.0	3.0	35.8	54.0	90.0	1.0	-18.2
4960.000 T1	32.0	AV	35.8	VHRN	35.0	3.0	35.8	54.0	100.0	1.0	-18.2
4960.000 T1	32.8	AV	35.8	HHRN	35.0	3.0	36.6	54.0	80.0	1.0	-17.4
4960.000 T6	33.2	AV	35.8	VHRN	35.0	3.0	37.0	54.0	80.0	1.1	-17.0


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Freq. Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 09-02-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: M/A-COM ANP-C-118 Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
7200.000 T1	36.0	AV	38.3	HHRN	32.8	4.6	46.1	54.0	90.0	1.2	-7.9
7200.000 T6	36.8	AV	38.3	VHRN	32.8	4.6	46.9	54.0	90.0	1.1	-7.1
7200.000 T6	36.2	AV	38.3	HHRN	32.8	4.6	46.3	54.0	110.0	1.2	-7.7
7200.000 T1	37.4	AV	38.3	VHRN	32.8	4.6	47.5	54.0	90.0	1.0	-6.5
7320.000 T1	31.6	AV	38.6	VHRN	33.0	4.6	41.8	54.0	90.0	1.0	-12.2
7320.000 T1	31.7	AV	38.6	HHRN	33.0	4.6	41.9	54.0	110.0	1.0	-12.1
7320.000 T6	34.0	AV	38.6	VHRN	33.0	4.6	44.2	54.0	120.0	1.1	-9.8
7320.000 T6	32.7	AV	38.6	HHRN	33.0	4.6	42.9	54.0	140.0	1.0	-11.1
7440.000 T6	33.1	AV	38.9	HHRN	33.2	4.7	43.5	54.0	90.0	1.2	-10.5
7440.000 T1	34.2	AV	38.9	VHRN	33.2	4.7	44.6	54.0	90.0	1.0	-9.4
7440.000 T1	36.0	AV	38.9	HHRN	33.2	4.7	46.4	54.0	130.0	1.1	-7.6
7440.000 T6	35.8	AV	38.9	VHRN	33.2	4.7	46.2	54.0	130.0	1.1	-7.8


 Signature

Temperature 77F 40% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Freq. Sort

Equipment Tested: Interogater Antennas
Serial Number:
Manufacturer: Micron Communications
Job Number: MICN0038
Test Date: 09-02-1998
Tested By: Daniel Haas, TE04
Test Distance: 3 meters.
Comments: M/A-COM ANP-C-118 Antennas, 3' cables, Maximum Power Setting

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
9600.000 T1	28.4	AV	40.7	HHRN	34.8	5.8	40.1	54.0	90.0	1.0	-13.9
9600.000 T6	28.5	AV	40.7	VHRN	34.8	5.8	40.2	54.0	90.0	1.0	-13.8
9600.000 T6	28.3	AV	40.7	HHRN	34.8	5.8	40.0	54.0	90.0	1.0	-14.0
9600.000 T1	28.2	AV	40.7	VHRN	34.8	5.8	39.9	54.0	110.0	1.0	-14.1
9760.000 T1	28.4	AV	40.8	VHRN	34.7	5.9	40.4	54.0	90.0	1.0	-13.6
9760.000 T1	28.2	AV	40.8	HHRN	34.7	5.9	40.2	54.0	90.0	1.0	-13.8
9760.000 T6	28.2	AV	40.8	VHRN	34.7	5.9	40.2	54.0	90.0	1.0	-13.8
9760.000 T6	28.5	AV	40.8	HHRN	34.7	5.9	40.5	54.0	90.0	1.0	-13.5
9920.000 T6	28.3	AV	40.9	HHRN	34.5	6.0	40.7	54.0	90.0	1.0	-13.3
9920.000 T1	28.3	AV	40.9	VHRN	34.5	6.0	40.7	54.0	90.0	1.0	-13.3
9920.000 T1	29.1	AV	40.9	HHRN	34.5	6.0	41.5	54.0	90.0	1.0	-12.5
9920.000 T6	28.0	AV	40.9	VHRN	34.5	6.0	40.4	54.0	90.0	1.0	-13.6

 for Dan Haas
 Signature

Temperature 77F 40% Humidity

6.1 Field Strength Calculations

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

$$FS = RA + AF + CF - AG$$

where :

- FS = Field Strength
- RA = Measured Level
- AF = Antenna Factor
- CF = Cable Attenuation Factor
- AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/meter.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dBuV/meter}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dBuV/m})/20] = 39.8 \text{ } \mu\text{V/m}$$

6.2 Measurement Bandwidths

Peak Data

150 kHz - 30 MHz	10 kHz
30 MHz - 1000 MHz.....	100 kHz
1000 MHz - 10000 MHz	1000 kHz

Quasi-peak Data

150 kHz - 30 MHz	9 kHz
30 MHz - 1000 MHz.....	120 kHz

Average Data

1000 MHz - 10000 MHz	1000 MHz
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Above 1 GHz, all peak radiated measurements used a video bandwidth set to 1 MHz.
 Above 1 GHz, all average radiated measurements used a video bandwidth set to 10 Hz.

7.0 Measurement Equipment

Instrument	Model	Serial No.	Freq Range	Last Cal	Cal Due
Spectrum Analyzer	HP 8567A	2718A00358	100 kHz - 1.8 GHz	04/21/98	04/21/99
Log Periodic Ant	EMCO 3146	9212-3486	200 MHz - 1 GHz	01/31/98	01/31/99
Bicon Antenna	Schw. BBA 9106	1300	30 MHz - 200 MHz	01/31/98	01/31/99
Q-peak Adapter	HP 85650A	2043A00214	10 kHz - 1000 MHz	09/01/98	09/01/99
Pre-Amplifier	AR LN1000	15224	100 kHz-1300 MHz	07/20/98	07/20/99
Dipole Antenna	EMCO 3121C	9211-866	28 MHz - 1000 MHz	12/31/97	12/31/98
Spectrum Analyzer	HP 8593E	3414U00634	9 kHz - 2.3 GHz	05/18/98	05/18/99
Horn Antenna	EMCO 3115	4074	100 Hz - 1.5 GHz	10/03/97	10/03/99
Pre-Amplifier	Miteq	456374	1 GHz - 20 GHz	07/08/98	07/08/99
High Pass Filter	MicroLab FXRHD-40N	n/a	4 GHz High Pass Filter	11/20/97	11/20/98

Appendix I: Measurement Procedures

Each frequency was measured in both the horizontal and vertical antenna polarization's.

The EUT position was maximized for each frequency, for both the horizontal and vertical antenna polarization's, using a remotely controlled turntable.

The antenna height was varied from 1 - 4 meters at each frequency, for both the horizontal and vertical positions to maximize the emission level.

The cable and peripheral positions were manipulated to ensure maximum levels at each frequency for both horizontal and vertical antenna polarization's.

Measurements 30 MHz - 1000 MHz are made at an antenna to EUT distance of 3 meters.

Measurements 1000 MHz - 10 GHz are made at an antenna to EUT distance of 3 meters.

Appendix II: Antenna Information

MODEL 4120 POWER OUTPUT LIMITS

The Antennas America and Ma/Comm antennas tested as part of this class II permissive change request have a specified gain over 6 dBi. They are listed as 8 dB and 7 dB respectively. This is 2 dB over the allowed limit of 36 dB EIRP if the full 1 Watt of granted output power is utilized. The model 4120 interrogator, however, is limited to 28 dBm of output through calibration which allows the use of antennas with up to 8 dBi of gain.

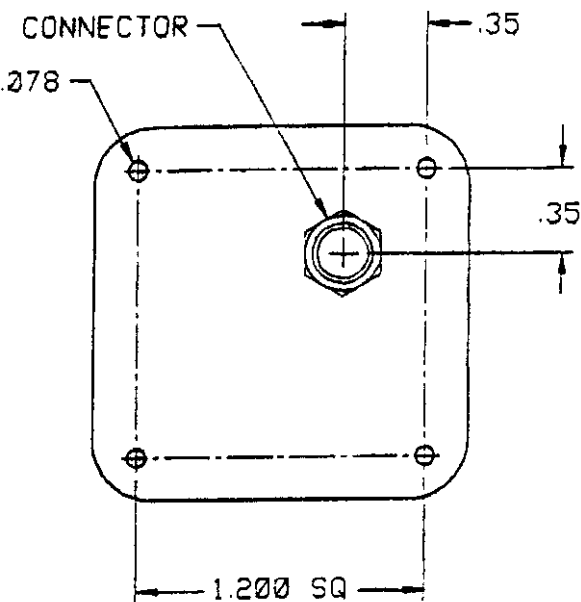
During production testing of the interrogator, it has been noted that few, if any, interrogators will actually deliver 30 dBm of RF power measured at the output ports. This is because of out of band performance. Harmonic generation increases rapidly when the amplifiers begin to run into compression. Typically, fewer than 10% will achieve 29 dBm of output power and still maintain performance within operating limits at room temperature. It is for this reason that the output specification has been placed at 28 dBm, a level which can be achieved by 95% of the units tested.

The output is limited to this level by look up calibration tables which reside in flash memory within each interrogator. When a specific output power is requested, the interrogator interprets this value in terms of the attenuator setting required. Any attempt to set the output above 28 dBm defaults to this value in the look up tables. These tables are unique for every unit and are not interchangeable. They can be considered a part of the hardware since the interrogator will literally not operate without them.

Additionally, if transmission line losses are factored in, there is approximately 1 dB of loss for the 3 feet of cable length with connectors at this frequency. This loss is not accounted for in either the power output or antenna gain figures. If these losses are lumped in with the antennas, the actual antenna gain may be considered that much less than advertised.

For the above stated reasons, operation of the model 4120 interrogator with up to 8 dBi antennas is within the rules as defined by the CFRs.

Joseph Hofstra
Micron test engineer



SPECIFICATIONS

FREQUENCY: _____ 2.4-2.485 GHz
 VSWR: _____ 2.0:1
 GAIN: _____ 3dBic
 BEAMWIDTH: _____ 90° NOM
 POLARIZATION: _____ RHCP

-1	5050978R	SMA-FEMALE
DASH NO	TYPE NO	CONNECTOR

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES: .XX ± .03 .XXX ± .010 ANGLES ± 0.30° MACHINED SURFACE ROUGHNESS 125 ✓ REMOVE BURRS, SHARP EDGES R.005-.015 MACHINED FILLETS R.005-.015 DIMENSIONS ARE AFTER PLATING. MACHINED DIA'S ON COMMON CENTERLINE CONCENTRIC WITHIN .006 TIR. INTERPRET PER ANSI Y14.5M-1982.		CONTRACT NUMBER CONTRACTOR		TECOM INDUSTRIES INC. 8324 TOPANGA CYN BLVD CHATSWORTH, CA 91311 TECOM <i>TECHNICAL EXCELLENCE COMMITTED TO QUALITY</i>	
HOLE TOLERANCES: .040 - .128 ±.003 .138 - .228 ±.004 .234 - .500 ±.006 .515 - .750 ±.008 .765 - 1.000 ±.010 1.031 UP ±.015		DRAWN BY Hiep Van		DATE 10-18-97	
MATL ENGR		CHECKER		MFG ENGR	
APPROVAL <i>mes.</i>		QA		ENGR	
PRGM MGR		ENGR		TITLE PATCH ANTENNA, 2.4-2.485 GHZ	
SCALE 2/1		CAGE CODE 52791		DWG NO 703402	
UNIT WT		SHEET 1 OF 1			

2.4 GHz Patch Antenna for ISM Band

ANP-C-116

V2.01

Features

- Hemispherical/Omnidirectional
- Flat Configuration
- Rugged/Durable
- Low VSWR
- Circular Polarization Minimizes Multipath Effects
- Various Types of Input Connectors Available
- Variety of ISM Applications

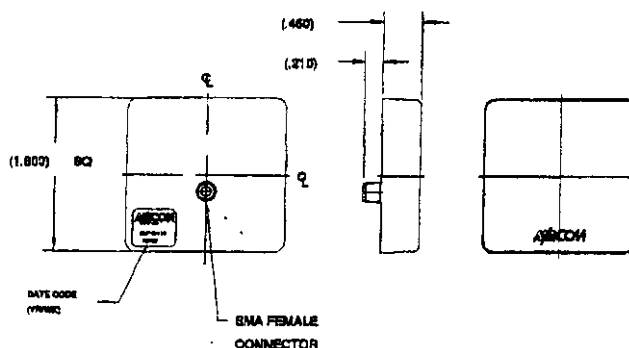
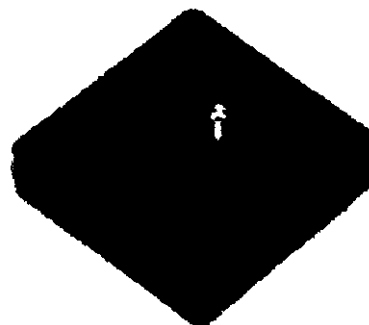
Description

The ANP-C-116 patch antenna is a hemispherical/omnidirectional antenna. It is circularly polarized to maximize immunity to fading in high multipath environments.

This durable antenna has a flat configuration that makes it suitable for surface mount applications. It can be used for a variety of ISM applications such as bar code scanning, auto toll collection, wireless LAN and medical monitoring devices.

Specifications

Frequency Range	2400-2485 MHz
Peak Gain	+4 dBi Min
Polarization	Right Hand Circular
Nominal Impedance	50 Ohms
VSWR	2.0:1 Max
R. F. Power Handling	1 W Avg. Max 3 W Peak Max
Connector Type	SMA Female
Weight	1.5 oz Max



Specifications Subject to Change Without Notice

M/A-COM Inc.

North America: Tel. (800) 366-2266
Fax (800) 618-8883

Asia/Pacific: Tel. +85 2 2111 8086
Fax +85 2 2111 8087

Europe: Tel. +44 (1344) 869-595
Fax +44 (1344) 300-020

Picocell Antennas

ANPC-171G – ANPC-176G Series

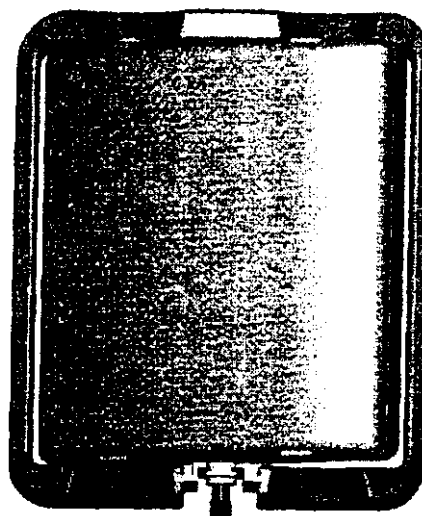
V3.00

Features

- Light Weight, Slim Profile
- Indoor or Outdoor Use
- Weatherproof and Corrosion Resistant
- Built-In Swivel Mount
- Fast and Easy Installation
- Choice of Polarization and Frequency

Description

M/A-COM's picocell antennas provide high performance in an attractive package that discretely blends into indoor and outdoor environments. Our unique pivot mount swivels horizontally, tilts vertically, and locks to enable precise positioning. Our circularly polarized models eliminate the need for spatial diversity antennas and help overcome performance-degrading multipath effects.



Applications

- Extend Cellular/Wireless Coverage Indoors
- Extend PBX/WPBX Within Targeted Zones
- Provide Voice/Data Transfer
- Deploy in Wireless Local Loop, ISM, and WLAN Applications

Part Number	Polarization	Frequency and Band	Approximate Dimensions
ANPC-171G-P-0-SF	Vertical	1710-1880 MHz DCS1800	5.5" x 4.5" x 1.5" (14 x 11.5 x 3.8 cm)
ANPC-172G-P-0-SF	RHCP	—	—
ANPC-173G-P-0-SF	Vertical	1850-1990 MHz PCS, DECT, PHS	5.5" x 4.5" x 1.5" (14 x 11.5 x 3.8 cm)
ANPC-174G-P-0-SF	RHCP	—	—
ANPC-175G-P-0-SF	Vertical	2400-2500 MHz ISM, WLL	5.5" x 4.5" x 1.5" (14 x 11.5 x 3.8 cm)
ANPC-178G-P-0-SF	RHCP	—	—

Specifications

Gain	7 dBi Vertical Polarization 7 dBi Circular Polarization
VSWR	1.5:1
3 dB Beamwidth - Azimuth	70° Nominal
3 dB Beamwidth - Elevation	65° Nominal
Connector	SMA Female (options available with pigtail cable)
Radome Color	Light Gray

Specifications Subject to Change Without Notice

M/A-COM, Inc.North America: Tel. (800) 386-2266
Fax (800) 616-8883Asia/Pacific: Tel. +85 2 2111 8088
Fax +85 2 2111 8087Europe: Tel. +44 (1344) 889 595
Fax +44 (1344) 300 020

Engineering Data

Electrical Specifications (Typical)

M2.45SP RHC/LHC

Frequency	2.45 GHz
Gain	8dBic
Bandwidth – 2:1 VSWR	100 MHz
Horizontal Beamwidth	60°
Vertical Beamwidth	60°
Cross Polarization	>20 dB
Maximum Power Input – Watts	100
Front – to – Back Ratio	>30 dB
Efficiency	85%
Connector	Various
Lightning Protection	Direct Ground

Mechanical Specifications

Width – in. (mm)	5.25 (133.35)
Height – in. (mm)	5.25 (133.35)
Depth – in. (mm)	1.25 (31.75)
Case Material	High Impact UV Stabilized Plastic
Wind/Ice Loading Area	25in ²
Rated Wind Velocity – mph (km/hr)	150 (241.5)
Lateral Thrust @100 mph – lbs. (kg)	5 (11.02)
Torsional Moment @100 mph with Std. Mounting – ft/lbs. (m/kg)	.1 (.2204)