

Underwriters Laboratories Inc.
1285 Walt Whitman Road
Melville, New York 11747-3081
(516) 271-6200

**Report of Measurements
of Electromagnetic Compatibility Testing**

Test Report File No. : **NC3952** Date of issue: March 22, 2000
Applicant : Nortech International
Model / Serial No. : ATR434P/0990416880, FCC ID: OW9ATR434P
Product Type : Transceiver
Power Supply : 12-24Vdc
Manufacturer : Same as Applicant
License holder : Same as Applicant
Address : 32A Wiganthorpe Road
: Pietermaritzburg 3201 South Africa,
Test Result : ☒ **Positive** ☐ **Negative**
Test Project Number : 99ME43512
References(s)

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File Number:NC3952

Issued: March 13 2000

Project Number:99ME43512

Model Number: ATR434P/0990426880,FCC ID:OW9ATR434P

1.0 G E N E R A L - Product Description

The Device Under Test, Model ATR434P Serial Number 0990416880 is a low power intentional Transmitter/Receiver used to identify a vehicle as it enters a toll plaza. This device is base station mounted in the toll plaza. The unit is powered by 12V dc.

1.1 Device Configuration During Test

The Device Under Test is a stand-alone device which was placed on a wooded table and set to transmit continuously. A communications cable was attached to a lap top computer which was placed outside of the test chamber. The computer used is a Toshiba, Model Number PRT800U. This unit has a Declaration of Conformity on file with the FCC.

"The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report."

1.1.1 Deviations from ANSI C63.4 Standard Test Set-up

☒ None

☐ As described below:

1.2 Device Modifications Necessary for Compliance

☐ N/A

☒ As described below:

Resistor R42 changed to 7.5k Ω to comply with Radiated Emissions Criteria.

Environmental conditions in the lab:

	<u>Range</u>
Temperature:	20-25°C
Relative Humidity	30 - 60 %
Atmospheric pressure	680 - 1060 mbar

2.0 EMISSIONS TEST REGULATIONS:

- | | | |
|--|---|----------------------------------|
| ☐ EN 50081-1 /1992 | ☐ Group 1 | ☐ Group 2 |
| ☐ EN 50081-2 /1993 | ☐ Class A | ☐ Class B |
| ☐ EN 55011 / 3.1991 | | |
| ☐ EN 55011/1998 | ☐ Group 1 | ☐ Group 2 |
| | ☐ Class A | ☐ Class B |
| ☐ EN 55013 / 6.1990 | | |
| ☐ EN 55013/1997 | | |
| ☐ EN 55014-1: 1997 | ☐ Household appliances and similar | |
| | ☐ Portable tools | |
| | ☐ Semiconductor devices | |
| ☐ EN 55015 / 1993 | | |
| ☐ EN 55020 / 1995 | | |
| ☐ EN 55022 / 4.1998 | ☐ Class A | ☐ Class B |
| ☐ EN60555-2/1987, EN60555-3/1987 | | |
| ☐ EN60601-1-2: 1993 | | |
| ☐ EN61000-3-2, 1995, EN61000-3-3, 1995 | | |
| ☐ VCCI | ☐ Class 1 | ☐ Class 2 |
| ☐ FCC Part, 15, Subpart B | ☐ Class A | ☐ Class B |
| ☒ FCC Part , 15, Subpart C Paragraph 15.231 | | |
| ☐ FCC Part 18 | | |
| ☐ CISPR 11 (1997) | | |
| ☐ CISPR 14-1(1998) | | |
| ☐ CISPR 22 | | |
| ☐ DENTORI | | |
| ☐ AS3548 | | |
| ☐ Bellcore GR-1089-CORE: Issue 2, 12/1997 with Rev. 1, 2/1999 | | |
| ☐ (OTHER) _____ | | |

2.1 EUT OPERATION MODE - EMISSIONS TESTS:

- ☐ Standby
☐ Test program (H-Pattern)
☐ Test program (color bar)
☐ Test program (customer specific)
☐ Practice operation
☐ Normal operation Mode:
☒ As per manufacturer's instructions
☐ other

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2.1.1 Conducted Emissions Tests:

☐ Test Applicable ☒ Test Not Applicable

2.1.2 Conducted Click Emissions Tests:

☐ Test Applicable ☒ Test Not Applicable

2.2.1 Reserved for Future Use

2.2.2 Radiated Emissions Test (10 Meter Semi-Anechoic Chamber):

☒ Test Applicable ☐ Test Not Applicable

All Data Pages located in Appendix A.

The measurement antenna distance ☒ 3 ☐ 10 meters from the EUT.

Tests were performed on the Transmitter in accordance with the limitations set forth by CFR47 FCC Part 15, Subpart B, Class B, Paragraph 15.231 and tested in accordance with the test procedures and methodologies in ANSI C63.4:1992.

Test equipment used for final radiated emissions tests:

☒ HP 8574A	Hewlett-Packard	EMI Receiver,	Equipment No.: ME5A-461
Consisting of:			
☒ HP - 8566B	Hewlett-Packard	Resolution BW: 1MHz	Spectrum Analyzer,
☒ HP - 85662A	Hewlett-Packard	Video BW: 1MHz	
☒ HP - 85650A	Hewlett-Packard	BW: 120kHz	Analyzer Display
☒ HP - 85685A	Hewlett-Packard		Quasi-Peak Adapter,
☐ R3261C	Advantest	Spectrum Analyzer	Preselector
		Resolution BW: 1MHz	Equipment No.: ME5A-228
		Video BW: 1MHz	
		QP BW: 120kHz	
☐ R3551	Advantest	Pre-Selector	Equipment No.: ME5A-229

For Measurements above 1GHz: (1-5GHz)

☒ HP - 8566B	Hewlett-Packard	Spectrum Analyzer,	Equipment No.: ME5A-461
	Resolution BW: 1MHz		
	Video BW: 1MHz		
☒ HP - 85662A	Hewlett-Packard	Analyzer Display	Equipment No. ME5A-461
☒ HP - 8449B	Hewlett-Packard	Pre-Amplifier	Equipment No. ME5-914

Test Accessories:

☐ 3104C	EMCO	Biconnical Antenna	Equipment No.: ME5-810
☒ 94455-1	Ailtech	Biconnical Antenna	Equipment No.: ME5-439
☒ 3146	EMCO	Log Periodic Antenna	Equipment No.: ME5-451
☐ 3146	EMCO	Log Periodic Antenna	Equipment No.: ME5-811
☐ 3142	EMCO	BiconiLog Antenna	Equipment No.:ME5A-131
☒ RGA-180	EMCO	BiconiLog Antenna	Equipment No.:ME5A-565

2.2.3 RFI Power Measurements:

☐ Test Applicable ☒ Test Not Applicable

2.2.4 Harmonic Disturbances:

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☐ **Test Applicable**

☒ **Test Not Applicable**

2.3 EMISSIONS TEST RESULTS

☐ Conducted Emissions

☐ Voltage(Section 2.1.1)☐ MET☐ NOT MET☐ Current(Section 2.1.1)☐ MET☐ NOT MET☐ Clicks(Section 2.1.2)☐ MET☐ NOT MET

☒ Radiated Emissions(Section 2.2.2)

☒ MET☐ NOT MET

☐ RFI Power(Section 2.2.3)

☐ MET☐ NOT MET

☐ Harmonic Disturbances

☐ Steady State(Section 2.2.4)☐ MET☐ NOT MET☐ Fluctuating(Section 2.2.4)☐ MET☐ NOT MET

The tractability of the measurements contained in this report is achieved by the use of calibrated equipment which is traceable back to NIST.

3.0 IMMUNITY TEST REGULATIONS:

- ☒ NOT APPLICABLE
- ☐ EN50082-1: 1992 (Date of Withdrawal: 2001 - 07 - 01)
- ☐ EN50082-1: 1997
- ☐ EN50082-2: 1995
- ☐ EN55014-2: 1997
- ☐ EN55014-2: 1998
- ☐ CISPR 14-2: 1997
- ☐ FDA - Reviewer Guide
- ☐ Bellcore GR-1089-CORE: Issue 2, 12/1997 with Rev. 1, 2/1999
- ☐ EN 60601-1-2: 1993

In accordance with:

- | | | |
|--------------------------------------|--|---------------------------------|
| ☐ IEC 801-2, | ☐ IEC 1000-4-2 | Electrostatic Discharge (ESD) |
| ☐ IEC 801-3, | ☐ ENV50140 | RF Immunity |
| ☐ IEC 801-4, | ☐ IEC 1000-4-4 | Electrical Fast Transient (EFT) |
| ☐ IEC 801-5, | ☐ IEC 1000-4-5 | Surge (Lighting) |
| ☐ IEC 801-6, | ☐ ENV50141 | Conducted Immunity |
| ☐ IEC 801-11, | ☐ IEC 1000-4-11 | Voltage Dips and Interruptions |

3.1 EUT OPERATION MODE - IMMUNITY TESTS:

- ☐ Standby
- ☐ Test program (H-Pattern)
- ☐ Test program (color bar)
- ☐ Test program (customer specific)
- ☐ Practice operation
- ☐ Normal operating Mode:
- ☐ As per manufacture's instructions

3.1.1 Electrostatic Discharge (ESD) Test:

☐ Test Applicable ☒ Test Not Applicable

3.1.2 Radiated Field (RF Immunity) Test:

☐ Test Applicable ☒ Test Not Applicable

3.1.3 Electrical Fast Transient (EFT)/Burst test:

☐ Test Applicable ☒ Test Not Applicable

3.1.4 Voltage Surge Test:

☐ Test Applicable ☒ Test Not Applicable

3.1.5 Conducted Immunity Test:

☐ Test Applicable ☒ Test Not Applicable

3.1.6 Voltage Dips and Interruptions:

☐ Test Applicable ☒ Test Not Applicable

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4.0 SUMMARY:

The equipment under test has

☒ met the technical requirements as defined under section(s) ☒ 2.0 and ☐ 3.0

☐ not met the technical requirements as defined under section(s) ☐ 2.0 and ☐ 3.0.

Test Start Date: 12/1/99

Test Completion Date: 2/4/00

- UNDERWRITERS LABORATORIES, INC. -

Project Engineer

Reviewer

William Wack (Ext.23057)
EMC Associate Project Engineer
International EMC & NEBS Services
Conformity Assessment Services-3014AMEL

Bob DeLisi (Ext.22452)
EMC Engineering Group Leader
International EMC & NEBS Services
Conformity Assessment Services-3014AMEL

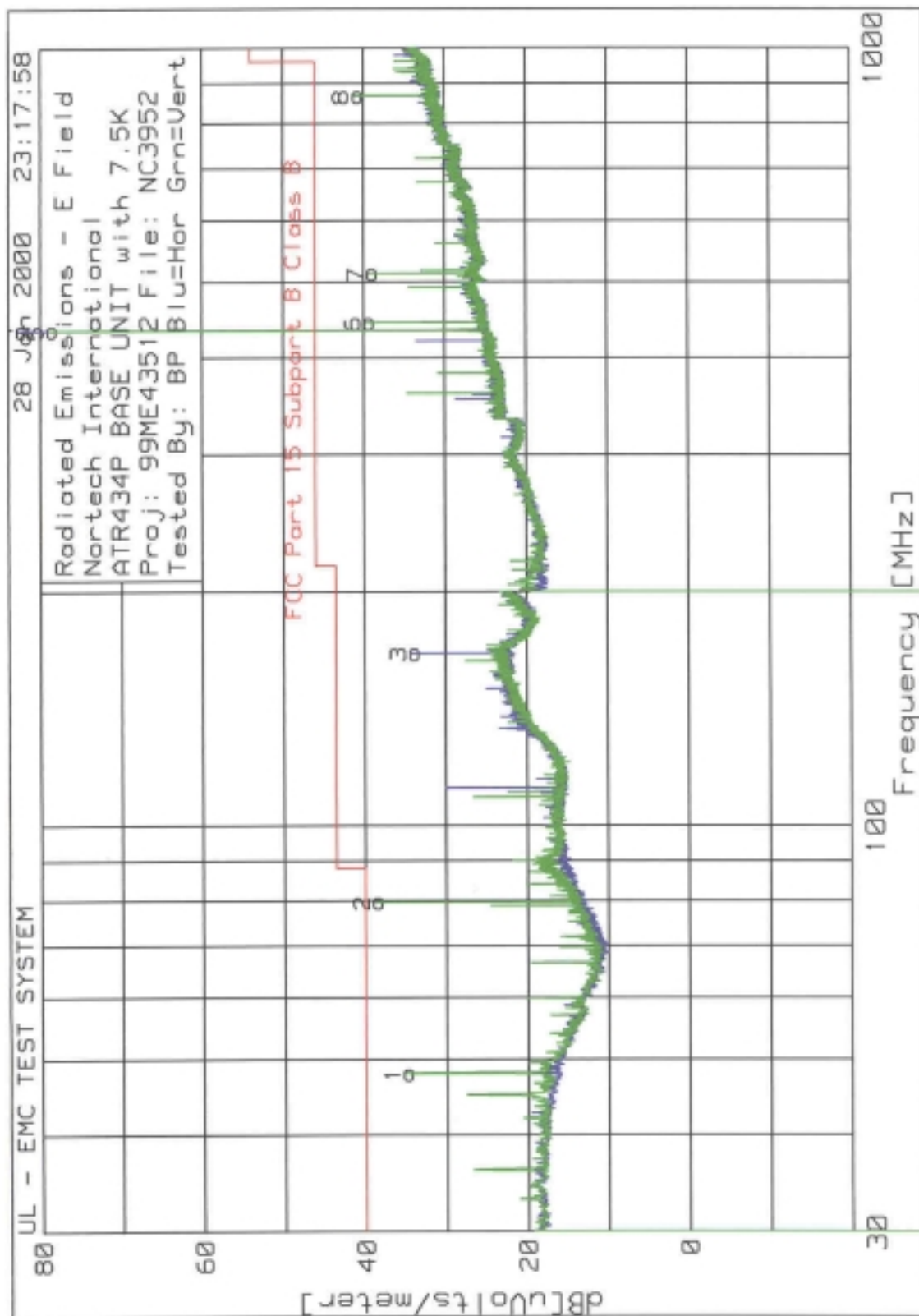
APPENDIX A

EMISSIONS TEST DATA

1. ☐ Conducted Emissions ☐ voltage ☐ current
 - ☐ Peak traces, Data Pages A___ and/through A___
 - ☐ Quasi-Peak traces, Data Pages A___ and/through A___
 - ☐ Average traces, Data Pages A___ and/through A___
☐ Discontinuous Interference (Clicks)
 - ☐ No clicks exceeded the steady state quasi-peak limit
 - ☐ Clicks exceeded the steady state quasi-peak limit. The limit was adjusted to _____dB and no clicks exceeded the adjusted limit.
 - ☐ Clicks exceeded the adjusted limit. See Data Page A___ for details.
2. ☒ Radiated Emissions
 - ☒ Peak traces, Data Pages A1 and A4.
 - ☐ Quasi-Peak traces, Data Pages A___ and/through A___
 - ☐ Open Area Test Data, Data Pages A___ and/through A___.
 - ☒ Discrete Peak Frequencies Data, Data Pages A2 and A5.
 - ☒ Discrete Average Frequencies Data, Data Pages A3 and A6.
 - ☒ Fundamental Bandwidth with Measurement Data, Data Page A7.
3. ☐ RFI Power Measurements
 - ☐ Peak traces, Data Pages A___ and/through A___
 - ☐ Quasi-Peak traces, Data Pages A___ and/through A___
 - ☐ Average Traces, Data Pages A___ and/through A___
4. ☐ Harmonic Disturbances
 - ☐ Steady State Harmonics, Data Pages A___ and/through A___
 - ☐ Fluctuating Harmonics, Data Pages A___ and/through A___
 - ☐ Changing Voltage, Data Pages A___ and/through A___

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Issued: March 13, 2000

Project Number: 99ME43512

Model Number: ATR434P/0990426880,FCC ID:OW9ATR434P

UL - EMC TEST SYSTEM

Date Tested: 28 Jan 20
23:17:58

Nortech International
ATR434P BASE UNIT with 7.5K
Proj: 99ME43512 File: NC3952
Tested By: BP Blu=Hor Grn=Vert

MKR	TEST	METER	GAIN/LOSS	TRANSDUCER	LEVEL	LIMIT:1	2	3	4
NO.	FREQUENCY	READING	FACTOR	FACTOR					
	[MHz]	[dB(uV)]	[dB]	[dB]			dB[uVolts/meter]		
1	47.9171	22.5 pk	.4	12.2	35.1	40	N/A	N/A	N/A
2	79.6541	29.9 pk	.7	8.2	38.8	40	N/A	N/A	N/A
3	166.5162	17.2 pk	1	16	34.2	43.5	N/A	N/A	N/A
4	433.6996	64.2 pk	1.8	16.7	82.7	46	N/A	N/A	N/A
5	433.6996	60.4 pk	1.8	16.7	78.9	46	N/A	N/A	N/A
6	443.8228	20.8 pk	1.8	17.1	39.7	46	N/A	N/A	N/A
7	512.9537	18 pk	2	19.3	39.3	46	N/A	N/A	N/A
8	867.2737	15.1 pk	2.7	23.3	41.1	46	N/A	N/A	N/A

pk - Peak detector
qp - Quasi-peak detector
av - Average detector
tm - Trace Math Result

LIMIT 1 : FCC Part 15 Subpart B Class B
LIMIT 2 : NONE
LIMIT 3 : NONE
LIMIT 4 : NONE

File Number: NC3952

Issued: March 13, 2000

Project Number: 99ME43512

Model Number: ATR434P/0990426880,FCC ID:OW9ATR434P

UL – EMC TEST SYSTEM

Nortech International
ATR434P BASE UNIT with 7.5K
Proj : 99ME43512 File: NC3952
Tested by : GB Blu-Hor Grn-Vert

Date Tested: 28 Jan 2000
23:17:58

DATA POINT [No.]	TEST FREQUENCY [MHz]	METER READING [dB(uV)]	GAIN/ LOSS FACTOR [dB]	TRANSDUCER FACTOR [dB]	LEVEL	Level Limits			
						1	2	3	4
						dB [uVolts/meter]			
1	47.91800	7.1	.4	12.2	19.7	40.0	0.0	0.0	0.0
Azimuth : 343		Height : 100 V		Margin [dB]	-20.3	---	---	---	---
2	78.69000	3.3	.6	7.9	11.8	40.0	0.0	0.0	0.0
Azimuth : 210		Height : 123 V		Margin [dB]	-28.2	---	---	---	---
3	433.89000	61.3	1.8	16.7	79.8	80.8	0.0	0.0	0.0
Azimuth : 191		Height : 100 H		Margin [dB]	-1	---	---	---	---
4	433.89350	61.5	1.8	16.7	80.0	80.8	0.0	0.0	0.0
Azimuth : 265		Height : 126 V		Margin [dB]	-16.4	---	---	---	---
5	867.87200	18.4	2.7	23.3	44.4	60.8			
Azimuth : 257		Height : 126V		Margin [dB]	-16.4	---	---	---	---

H - indicates horizontal antenna polarization

V - indicates vertical antenna polarization

LIMIT 1 : FCC Part 15 Subpart C

LIMIT 2 : NONE

LIMIT 3 : NONE

LIMIT 4 : NONE

Measurements 1,2 & 5 are Quasi Peak Measurements

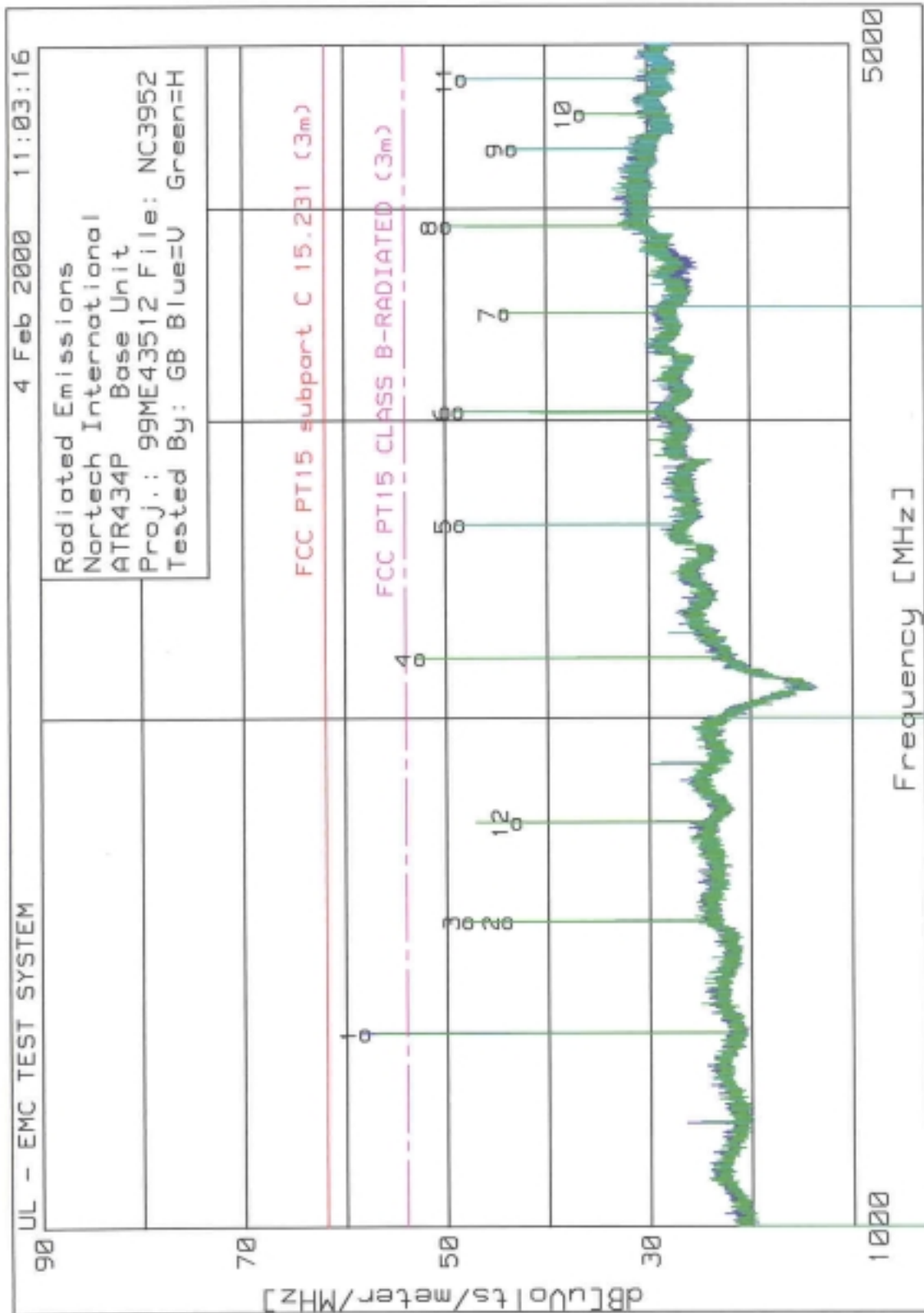
Measurements 3 & 4 are average Measurements

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File Number: NC3952

Issued: March 13, 2000

Project Number: 99ME43512

Model Number: ATR434P/0990426880,FCC ID:OW9ATR434P

UL - EMC TEST SYSTEM

Date Tested: 4 Feb 200
11:03:16

MARK TRACE - POSITIONS

MARKER NO.	TEST FREQUENCY	LEVEL	LIMIT:1	2	3	4	TABLE AZIMUTH(deg)	TOWER HEIGHT
1	1301.434	58.49 pk	61.9	54	N/A	N/A	195	100 H
2	1516.106	44.35 pk	61.9	54	N/A	N/A	212	100 H
3	1515.664	48.22 pk	61.9	54	N/A	N/A	0	201 V
4	2169.849	52.88 pk	61.9	54	N/A	N/A	0	200 V
5	2602.595	48.88 pk	61.9	54	N/A	N/A	111	189 V
6	3035.575	48.96 pk	61.9	54	N/A	N/A	108	189 V
7	3471.188	44.41 pk	61.9	54	N/A	N/A	0	200 V
8	3905.276	50.14 pk	61.9	54	N/A	N/A	97	188 V
9	4338.022	43.65 pk	61.9	54	N/A	N/A	113	188 V
10	4547.966	36.89 pk	61.9	54	N/A	N/A	232	188 V
11	4771.002	48.57 pk	61.9	54	N/A	N/A	102	188 V
12	1734.518	43.39 pk	61.9	54	N/A	N/A	181	100 H

pk - Peak detector

qp - Quasi-peak detector

LIMIT 1 : FCC PT15 subpart C 15.231 (3m)

LIMIT 2 : FCC PT15 CLASS B-RADIATED (3m)

LIMIT 3 : NONE

LIMIT 4 : NONE

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Model Number: ATR434P/0990426880,FCC ID:OW9ATR434P

UL - EMC TEST SYSTEM

Date Tested: 4 Feb 200
11:03:16

Nortech International
ATR434P Base Unit
Proj.: 99ME43512 File: NC3952
Tested By: GB Blue=V Green=H

DATA POINT [No.]	TEST FREQUENCY [MHz]	METER READING [dB(uV)]	GAIN/LOSS FACTOR [dB]	TRANSDUCER FACTOR [dB]	LEVEL dB [uVolts/meter/MHz]	LIMITS:1	2	3	4
1	1301.92250	69.0	-34.8	25.9	60.1	61.9	54.0	0.0	0.0
Azimuth : 313		Height : 99 H		Margin [dB]		-1.8	6.1	---	---
2	1301.92250	70.6	-34.8	25.9	61.7	61.9	54.0	0.0	0.0
Azimuth : 88		Height : 102 V		Margin [dB]		-.2	7.7	---	---

H - indicates horizontal antenna polarization.
V - indicates vertical antenna polarization.

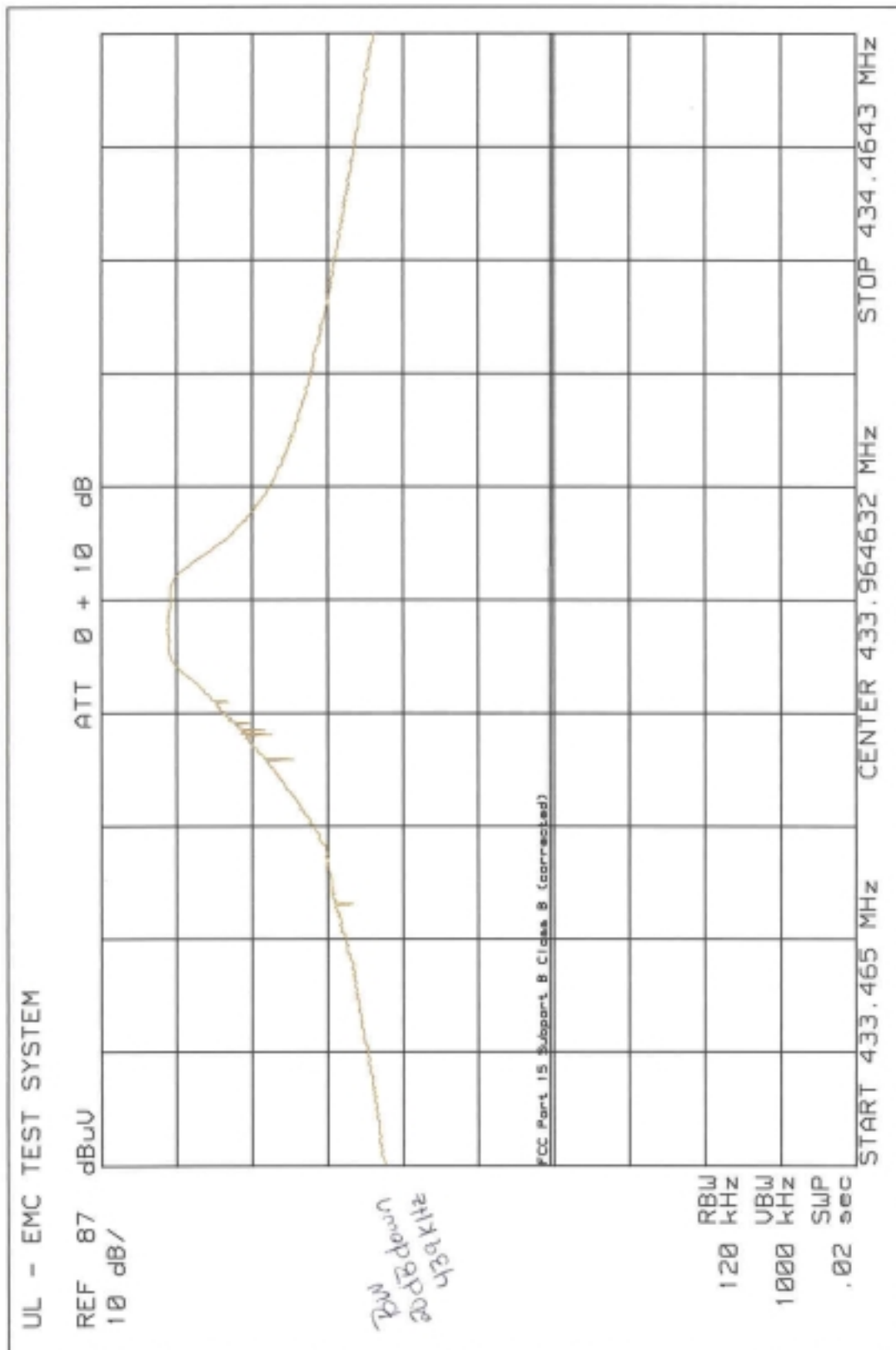
LIMIT 1 : FCC PT15 subpart C 15.231 (3m)
LIMIT 2 : FCC PT15 CLASS B-RADIATED (3m)
LIMIT 3 : NONE
LIMIT 4 : NONE

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APPENDIX B

PHOTOGRAPHS AND DIAGRAMS

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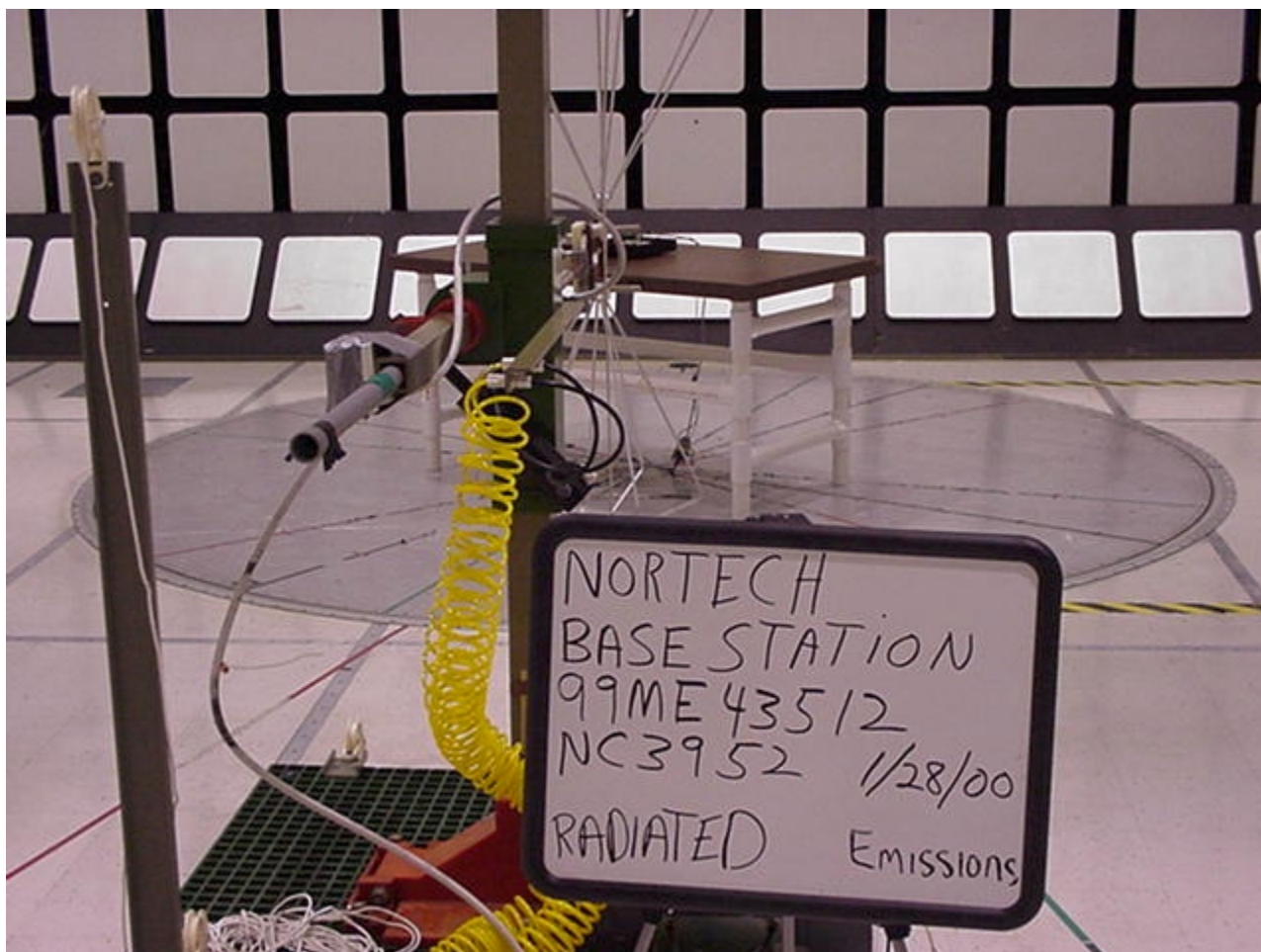
RADIATED EMISSIONS 1 – 5 GHz

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RADIATED EMISSIONS 30 – 1,000 MHz

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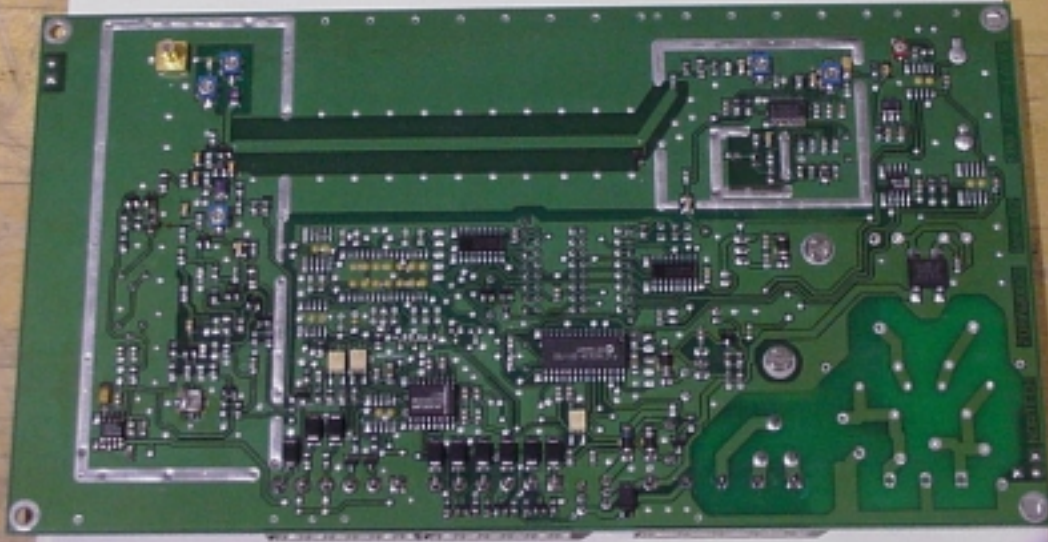
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Nortech International
Base Unit
Model ATR434P
PC Board Underside



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