



31040/SIT



C-1376



46390-2049



200093-0



00-034



Feb. 20, 2003

**TIMCO ENGINEERING INC.**

P O BOX 370  
849 N.W. STATE ROAD 45  
NEWBERRY, FLORIDA  
USA 32669

Subject: FCC Certification Authorization Application under FCC PART 15, Subpart C, Sec. 15.247 - Intentional Radiators operating in the frequency band 5.735 - 5.815 GHz.

**Product: AN-50 SYSTEM**

**Model No.: AN50S**

**FCC ID: QC8-AN50S**

Dear Sir/Madam

As appointed agent for REDLINE COMMUNICATIONS INC., we would like to submit the application to FCC for certification of the above product. Please review all necessary files uploaded to TIMCO UPLOAD SITE site for detailed information.

**Grant Note: The power is conducted. This device requires professional installation with specified antennas and output power levels certified under this Grant for Point-to-Point and Point-to-Multipoint operations. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2.1 meters from all persons during normal operation. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.**

If you have any queries, please do not hesitate to contact us.

Yours truly,



Tri Minh Luu, P. Eng.,  
V.P., Engineering

Encl

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Oakville, Ontario,  
Canada L6H 6G4

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Feb. 20, 2003

**REDLINE COMMUNICATIONS INC.**

90 Tiverton Court, Suite 102  
Markham, Ontario  
Canada, L3R 9V2

**Attn.: Mr. Ryan Pereira**

**Subject:** FCC Certification Application Testing under FCC PART 15, Subpart C, Sec. 15.247 - Intentional Radiators operating in the frequency band 5.735 - 5.815 GHz.

**Product: AN-50 SYSTEM**

**Model No.: AN50S**

**FCC ID: QC8-AN50S**

Dear Mr. Pereira,

The product sample, as provided by you, has been tested and found to comply with **FCC PART 15, Subpart C, Sec. 15.247 - Intentional Radiators operating in the frequency band 5.735 - 5.815 GHz.**

**Grant Note:** The power is conducted. This device requires professional installation with specified antennas and output power levels certified under this Grant for Point-to-Point and Point-to-Multipoint operations. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2.1 meters from all persons during normal operation. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Enclosed you will find copies of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,



Tri Minh Luu, P. Eng.,  
V.P., Engineering

Encl

# ENGINEERING TEST REPORT



## AN-50 SYSTEM Model No.: AN50S

**FCC ID: QC8-AN50S**

*Applicant:*

**REDLINE COMMUNICATIONS INC.**  
*90 Tiverton Court, Suite 102  
Markham, Ontario  
Canada, L3R 9V2*

*In Accordance With*

**FEDERAL COMMUNICATIONS COMMISSION (FCC)**  
**PART 15, SUBPART C, SEC. 15.247**  
**Intentional Radiators**  
**operating in: 5.735 - 5.815 GHz**

**UltraTech's File No.: RCI-012-FCC15C**

This Test report is Issued under the Authority of  
Tri M. Luu, Professional Engineer,  
Vice President of Engineering  
UltraTech Group of Labs

Date: June 03, 2002



Report Prepared by: Tri M. Luu

Tested by: Hung Trinh, RFI Technician

Issued Date: Feb. 20, 2003

Test Dates: Feb. 05 - Feb. 17, 2003

- The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

## UltraTech

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Website: [www.ultratech-labs.com](http://www.ultratech-labs.com) Email: [vic@ultratech-labs.com](mailto:vic@ultratech-labs.com), Email: [tri.luu@sympatico.ca](mailto:tri.luu@sympatico.ca)



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## EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
	Test Report	<ul style="list-style-type: none"> <li>Exhibit 1: Submittal check lists</li> <li>Exhibit 2: Introduction</li> <li>Exhibit 3: Performance Assessment</li> <li>Exhibit 4: EUT Operation and Configuration during Tests</li> <li>Exhibit 5: Summary of test Results</li> <li>Exhibit 6: Measurement Data</li> <li>Exhibit 7: Measurement Uncertainty</li> <li>Exhibit 8: Measurement Methods</li> </ul>	OK
1	Test Report - Plots of Measurement Data	Plots # 1 to 182	OK
2	Test Setup Photos	Photos # 1 to 20	OK
3	External Photos of EUT	Photos # 1 to 24	OK
4	Internal Photos of EUT	Photos of 1 to 12	OK
5	Cover Letters	<ul style="list-style-type: none"> <li>Letter from Ultratech for Certification Request</li> </ul>	OK
6	Attestation Statements	<ul style="list-style-type: none"> <li>Manufacturer's Declaration for Equipment Specifications, Installation (if it is professionally installed) and Production Quality Production Assurance.</li> <li>Request for Confidentiality Filing</li> <li>Authority to act as an Agent</li> </ul>	OK OK OK
7	ID Label/Location Info	<ul style="list-style-type: none"> <li>ID Label</li> <li>Location of ID Label</li> </ul>	OK OK
8	Block Diagrams	Block Diagrams	OK
9	Schematic Diagrams	Schematic Diagrams	OK
10	Parts List/Tune Up Info	Parts List/Tune Up Info	OK
11	Operational Description	Operational Description	OK
12	RF Exposure Info	RF Exposure Info	OK
13	Users Manual	Information/instructions that will be intended in the installation/operation pertains to: <ul style="list-style-type: none"> <li>Correct output power settings required for compliance operation for every antenna proposed for use with EUT</li> <li>Point-to-point operational requirements and responsibilities</li> <li>RF exposure compliance requirements, if any</li> </ul>	OK OK OK

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## EXHIBIT 2. INTRODUCTION

### 2.1. SCOPE

<b>Reference:</b>	FCC Part 15, Subpart C, Sec. 15.247 - Intentional Radiators
<b>Title</b>	Telecommunication - Code of Federal Regulations, CFR 47, Part 15, Subpart C, Sec. 15.247
<b>Purpose of Test:</b>	This report is covered test results for Certification compliance with FCC regulations for NEW TECHNOLOGY DIGITAL MODULATION devices operating in the 5.735 - 5.815 GHz band.
<b>Test Procedures</b>	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
<b>Environmental Classification:</b>	<ul style="list-style-type: none"><li>Light-industry, Commercial</li><li>Industry</li></ul>
<b>Grant Note:</b>	<b>The power is conducted. This device requires professional installation with specified antennas and output power levels certified under this Grant for Point-to -Point and Point-to-Multipoint operations. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 2.1 meters from all persons during normal operation. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.</b>

### 2.2. NORMATIVE REFERENCES

Publication	YEAR	Title
FCC CFR Parts 0-19	2002	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	1997	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1	1998	Specification for Radio Disturbance and Immunity measuring apparatus and methods

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## EXHIBIT 3. PERFORMANCE ASSESSMENT

### 3.1. CLIENT INFORMATION

APPLICANT:	
<b>Name:</b>	REDLINE COMMUNICATIONS INC.
<b>Address:</b>	90 Tiverton Court, Suite 102 Markham, Ontario Canada, L3R 9V2
<b>Contact Person:</b>	Mr. Ryan Pereira Phone #: 905-479-8344 (x228) Fax #: 905-479-7432 Email Address: rpereira@redlinecommunications.com

MANUFACTURER:	
<b>Name:</b>	REDLINE COMMUNICATIONS
<b>Address:</b>	90 Tiverton Court, Suite 102 Markham, Ontario Canada, L3R 9V2
<b>Contact Person:</b>	Mr. Ryan Pereira Phone #: 905-479-8344 (x228) Fax #: 905-479-7432 Email Address: rpereira@redlinecommunications.com

### 3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

<b>Brand Name</b>	REDLINE COMMUNICATIONS INC.
<b>Product Name</b>	AN-50 SYSTEM
<b>Model Name or Number</b>	AN50S
<b>Serial Number</b>	Preproduction
<b>Type of Equipment</b>	New Technology Digital Modulation Device.
<b>Input Power Supply Type</b>	AC Mains
<b>Primary User Functions of EUT:</b>	Fixed, Point to Multipoint and Point to Point application wireless access. Please refer to attached Technical Description for details.

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### 3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
<b>Equipment Type:</b>	<ul style="list-style-type: none"> <li>Base station (fixed, point to Multipoint and Point to Point)</li> </ul>
<b>Intended Operating Environment:</b>	<ul style="list-style-type: none"> <li>Commercial, light industry &amp; heavy industry</li> </ul>
<b>Power Supply Requirement:</b>	120V 60Hz
<b>RF Peak Conducted Power Rating:</b>  <i>Note: Please refer to the following Table for Power Ratings versus Antenna Gain</i>	<ul style="list-style-type: none"> <li>Minimum: -18.6 dBm (0.014 mWatts) for all different antennas and applications</li> <li>Maximum for Point to Multipoint: +21.3 dBm (135 mwatts) varied with different antennas.</li> <li>Maximum for Point to Point: +26.0 dBm (398 mwatts) varied with different antennas.</li> </ul>
<b>RF Peak EIRP Ratings:</b>  <i>Note: Please refer to the following Table for Power Ratings versus Antenna Gain</i>	<ul style="list-style-type: none"> <li>Maximum for Point to Multipoint: 3.7 Watts.</li> <li>Maximum for Point to Point: 524.8 Watts.</li> </ul>
<b>Operating Frequency Range:</b>	5.735-5.815 GHz
<b>RF Output Impedance:</b>	50 Ohms
<b>Total number of Channels:</b>	9
<b>Channel Spacing:</b>	10 MHz
<b>Duty Cycle:</b>	Continuous (as worst case)
<b>6 dB Bandwidth:</b>	15.5 MHz max.
<b>Modulation Type (Maximum Data Rate):</b>	<ul style="list-style-type: none"> <li>64 QAM (54 Mb/s maximum)</li> <li>16 QAM (36 Mb/s maximum)</li> <li>QPSK (18 Mb/s maximum)</li> <li>BPSK (9 Mb/s maximum)</li> </ul>
<b>Environmental Temperature:</b>	<ul style="list-style-type: none"> <li>Indoor Unit: 0°C to +55°C</li> <li>Outdoor Unit: -40°C to +60°C</li> </ul>
<b>Antenna Connector Type:</b>	<ul style="list-style-type: none"> <li>Standard TNC connector (transmitter side) and N connector (antenna side). Professional Installation is required by the manufacturer. Please refer to the User's manual for detailed instruction of antenna installation and RF Exposure Warning.</li> </ul>
<b>Antenna Description:</b>	Please refer to the table below for available antennas provide for this EUT. This equipment and its antenna are required to be professionally installed by the manufacturer or its subcontracted professional installer.

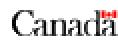
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### 3.4. CERTIFIED RF CONDUCTED OUTPUT POWER & EIRP WRT. TO SELECTED ANTENNAS

Supplier's Antenna Part Number	Redline's Part Number	Antenna Gain (dBi)	Antenna Type	Maker	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Conducted Power Ratings (mWatts)	Calculated EIRP (mWatts)	(Watts)	EIRP Limit (Watts)
<b>Antennas and Power Ratings for Point to Multipoint Application</b>										
484025	10-0007	14.0	Omni-directional	MTI Wireless Edge	-20	21.33	135.8	3.41	4	
484026	10-0006	15.0	Omni-directional	MTI Wireless Edge	-20	19.96	99.1	3.13	4	
485002	10-0004	23.0	Directional	MTI Wireless Edge	-20	12.74	18.8	3.75	4	
486001	10-0003	28.0	Directional	MTI Wireless Edge	-20	7.71	5.9	3.72	4	
SP1-5.2NS	10-0058	22.5	Directional	Radiowaves	-20	12.74	18.8	3.34	4	
SP2-5.2NS	10-0057	29.0	Directional	Radiowaves	-20	6.33	4.3	3.41	4	
SP3-5.2NS	10-0059	31.2	Directional	Radiowaves	-20	4.15	2.6	3.43	4	
MPR58029PTNF	10-0068	29.0	Directional	MaxRad	-20	6.33	4.3	3.41	4	
MPR68031PTNF	10-0069	31.0	Directional	MaxRad	-20	4.15	2.6	3.27	4	
<b>Antennas and Power Ratings for Point to Point Application</b>										
485002	10-0004	23.0	Directional	MTI Wireless Edge	-20	26.03	400.9	79.98	No Limit	
486001	10-0003	28.0	Directional	MTI Wireless Edge	-20	26.03	400.9	252.93	No Limit	
SP1-5.2NS	10-0058	22.5	Directional	Radiowaves	-20	26.03	400.9	71.29	No Limit	
SP2-5.2NS	10-0057	29.0	Directional	Radiowaves	-20	26.03	400.9	318.42	No Limit	
SP3-5.2NS	10-0059	31.2	Directional	Radiowaves	-20	26.03	400.9	528.45	No Limit	
MPR58029PTNF	10-0068	29.0	Directional	MaxRad	-20	26.03	400.9	318.42	No Limit	
MPR68031PTNF	10-0069	31.0	Directional	MaxRad	-20	26.03	400.9	504.66	No Limit	

**Notes:**

- (1) The maximum RF output power is pre-programmed by the manufacturer or its professional installer with respect to the selected antenna as indicated in the above table.
- (2) The antenna is required professional installation provided by manufacturer or its professional installer.

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### 3.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Serial Port	1	DB9	Shielded
2	IF Out Port	1	F	Shielded
3	Sync Out Port	1	BNC	Shielded
4	Sync In Port	1	BNC	Shielded
5	Ethernet Port	1	RJ-45	Non-shielded
6	RF input/output port	1	TNC (female)	Shielded

### 3.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	ThinkPad Laptop
Brand name:	IBM
Model Name or Number:	2625
FCC ID:	ANOKAJIPENCP
Serial Number:	78-WWM4A
Connected to EUT's Port:	RS-232
Notes:	This laptop computer is used for technical services only; therefore, and it is used for control purpose only but not for testing.

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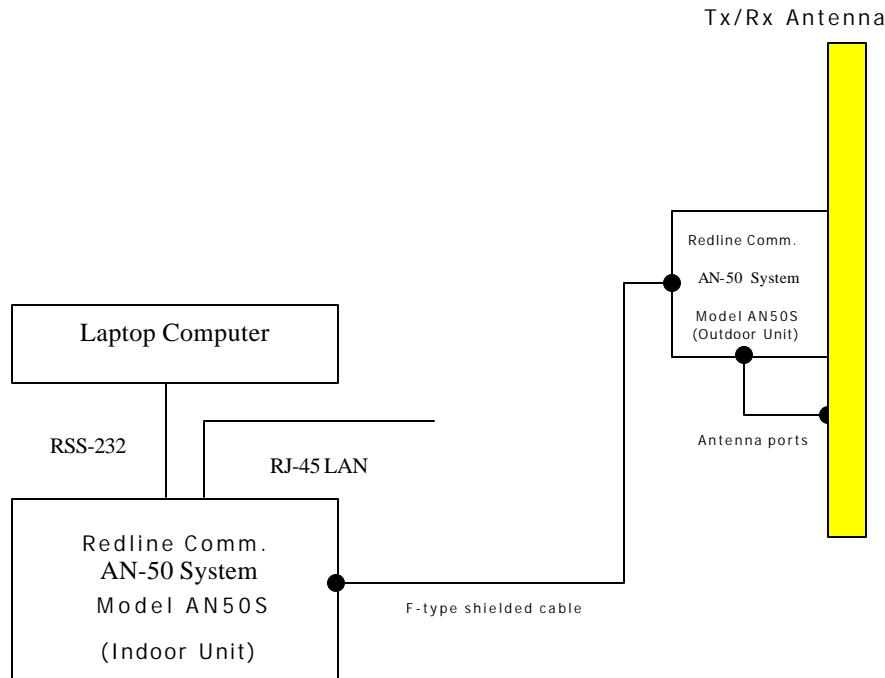
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### 3.7. BLOCK DIAGRAM OF TEST SETUP

The equipment under test is arranged as intended set up for normal operation. The Indoor AN50S Unit is located indoor and connect to the Outdoor AN50S (transmitter) Unit using a minimum 100 foot, F-type shielded cable. The Outdoor AN50S (Transmitter) is mounted on the antenna and its RF output port is connected to the antenna using a short TNC-to-N cable.



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## EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

### 4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	120V 60Hz

### 4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

<b>Operating Modes:</b>	<ul style="list-style-type: none"><li>Each channel from the transmitter is tested for worst case emissions since the maximum power rating of each channel is different. The transmitter is transmitted continuously in a test mode configuration for worst case and convenience of measurements</li></ul>
<b>Special Test Software:</b>	<ul style="list-style-type: none"><li>Special software is provided by the Applicant to select and operate the EUT at each channel frequency continuously.</li></ul>
<b>Special Hardware Used:</b>	N/A
<b>Transmitter Test Antenna:</b>	The EUT is tested with the antenna fitted in a manner typical of normal intended use as a non-integral antenna equipment. The professional installation is required field installation and operation

<b>Transmitter Test Signals:</b>	
<b>Frequencies:</b> <ul style="list-style-type: none"><li>5.735-5.815 GHz</li></ul>	<ul style="list-style-type: none"><li>All channel will be tested since they have different maximum output power ratings.</li></ul>
<b>Transmitter Wanted Output Test Signals:</b> <ul style="list-style-type: none"><li>RF Power Output:</li><li>Normal Test Modulation</li><li>Modulating signal source:</li></ul>	<ul style="list-style-type: none"><li>Please refer to test data for details of rf output power with respect to antenna gain</li><li>64QAM, 16QAM, QPSK &amp; BPSK</li><li>Internal</li></ul>

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## EXHIBIT 5. SUMMARY OF TEST RESULTS

### 5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).
- Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Aug. 10, 2002.

### 5.2. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

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### 5.3. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.107 & 15.207	Class B - AC Power Conducted Emissions on Tx, Rx and standby modes	Yes
15.247(a)(2)	6dB Bandwidth of a Digital Modulation System	Yes
15.247(b) & 1.1310	Maximum Peak Power (Conducted)	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
15.247(c)	Transmitter Band-edge and RF Conducted Spurious Emissions measured at the Transmitter Antenna Terminal	Yes
15.247(d)	Transmitted Power Density of a Digital Modulation System	Yes
15.247(c), 15.209 & 15.205	Transmitter Band-edge and Radiated Emissions @ 3m	Yes
15.109(b)	Class A - Radiated Emissions from Unintentional Radiators	Yes. A separate test report will be provided upon request.

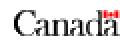
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## EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

### 6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report and ANSI C63-4:1992

### 6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

### 6.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C64-3:1992, FCC 15.247 and CISPR 16-1.

### 6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

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## 6.5. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	
15.203	<p>Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.</p> <p>The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed:</p> <ul style="list-style-type: none"><li>• The application (or intended use) of the EUT</li><li>• The installation requirements of the EUT</li><li>• The method by which the EUT will be marketed</li></ul>	Model AN50S's rf input/output port is a TNC (female) standard connector and it is required Professional installation.
15.204	<p>Provided the information for every antenna proposed for use with the EUT:</p> <ul style="list-style-type: none"><li>(a) type (e.g. Yagi, patch, grid, dish, etc...),</li><li>(b) manufacturer and model number</li><li>(c) gain with reference to an isotropic radiator</li></ul>	Please refer to Sec. 3.4 of this test report for a list of antennas' specification

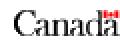
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## 6.6. AC POWERLINE CONDUCTED EMISSIONS @ FCC PART 15, SUBPART B, PARA.15.207 & 15.107(A)

### 6.6.1. Limits

The equipment shall meet the limits of the following table:

Test Frequency Range	Test Limits Rx active & Tx active	EMI Detector Used	Measuring Bandwidth
0.15 to 0.5 MHz	66 to 56 dB <sub>μ</sub> V 56 to 46 dB <sub>μ</sub> V	Quasi-Peak Average	B = 9 kHz B = 9 kHz
> 0.5 to 5 MHz	56 dB <sub>μ</sub> V 46 dB <sub>μ</sub> V	Quasi-Peak Average	B = 9 kHz B = 9 kHz
> 5 to 30 MHz	60 dB <sub>μ</sub> V 50 dB <sub>μ</sub> V	Quasi-Peak Average	B = 9 kHz B = 9 kHz

### 6.6.2. Method of Measurements

Refer to Exhibit 8, Sec. 8.3 of this test report & ANSI C63-4:1992

### 6.6.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Transient Limiter	Hewlett Packard	11947A	310701998	9 kHz – 200 MHz 10 dB attenuation
L.I.S.N.	EMCO	3825/2	89071531	9 kHz – 200 MHz 50 Ohms / 50 μH
12'x16'x12' RF Shielded Chamber	RF Shielding	...	..	...

### 6.6.4. Photographs of Test Setup

Refer to Photographs # 1 & 2 in Annex 2 for setup and arrangement of equipment under tests and its ancillary equipment.

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### 6.6.5. Test Data

- The emissions were scanned from 150 KHz to 30 MHz at AC mains Terminal via a LISN, and all emissions less than 30 dB below the limits were recorded.
- Please refer to Plots # 181 to 182 in Annex 1 for measurement details.

FREQUENCY (MHz)	RF LEVEL (dBuV)	RECEIVER DETECTOR (P/QP/AVG)	QP LIMIT (dBuV)	AVG LIMIT (dBuV)	MARGIN (dB)	PASS/ FAIL	LINE TESTED (L1/L2)
0.18	57.8	QP	64.4	54.4	-6.6	PASS	L1
0.18	38.1	AVG	64.5	54.5	-16.4	PASS	L1
0.27	50.0	QP	61.1	51.1	-11.1	PASS	L1
0.27	33.6	AVG	61.1	51.1	-17.5	PASS	L1
8.33	33.8	QP	60.0	50.0	-26.2	PASS	L1
8.33	31.7	AVG	60.0	50.0	-18.3	PASS	L1
<hr/>							
0.15	55.9	QP	66.0	56.0	-10.1	PASS	L2
0.15	33.6	AVG	66.0	56.0	-22.4	PASS	L2
0.25	49.9	QP	61.8	51.8	-11.9	PASS	L2
0.25	26.6	AVG	61.8	51.8	-25.2	PASS	L2
8.33	37.1	QP	60.0	50.0	-22.9	PASS	L2
8.33	35.8	AVG	60.0	50.0	-14.2	PASS	L2

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## 6.7. 6 DB BANDWIDTH @ FCC 15.247(A)(2)

### 6.7.1. Limits

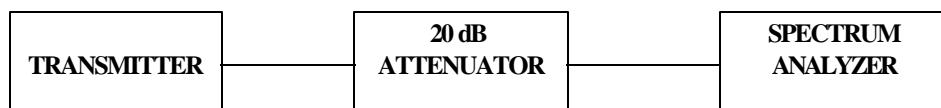
For a Digital Modulation System, the minimum 6 dB bandwidth shall be at least 500 KHz.

### 6.7.2. Method of Measurements

Refer to ANSI C63.4:1992

The transmitter output was connected to the spectrum analyzer through an attenuator. the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 30 KHz RBW, VBW = 100 KHz,. The 6 dB bandwidth was measured and recorded.

### 6.7.3. Test Arrangement



### 6.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz

#### 6.7.5. Test Data

CHANNEL FREQUENCY (MHz)	MODULATION	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
5735	64QAM	15.4	0.5	PASS
5775	64QAM	15.2	0.5	PASS
5815	64QAM	15.6	0.5	PASS
5735	16QAM	15.4	0.5	PASS
5775	16QAM	15.2	0.5	PASS
5815	16QAM	15.4	0.5	PASS
5735	QPSK	15.2	0.5	PASS
5775	QPSK	15.2	0.5	PASS
5815	QPSK	15.5	0.5	PASS
5735	BPSK	15.4	0.5	PASS
5775	BPSK	15.4	0.5	PASS
5815	BPSK	15.5	0.5	PASS

**Observation:** The bandwidth and RF output power were found to be identical with different modulations

#### 6.7.6. Plots

Please refer to Plots # 1 to 12 in Annex 1 for Measurements data

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## 6.8. PEAK OUTPUT POWER (CONDUCTED) @ FCC 15.247(B)

### 6.8.1. Limits

- **FCC 15.247(b)(1):** Maximum peak output power of the transmitter shall not exceed 1 Watt.
- **FCC 15.247(b)(3)(ii):** Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.
- **FCC 15.247(b)(3)(iii):** Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(ii) of this section, excludes the use of point-to- multipoint systems, omnidirectional applications, and multiple co- located intentional radiators transmitting the same information. The operator of the New Technology Digital Modulation intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility

### 6.8.2. Method of Measurements & Test Arrangement

Refer to Exhibit 8, Sec. 8.4 of this test report, FCC 15.247(b)(1)&(3), ANSI C63-4:1992 & ETSI 300 328

**Note:** The conducted peak power measurement method was performed in accordance with ETSI 300 328 since it was proven to be independent with the peak power meter characteristics.

### 6.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
67297 RF Detector (Diode Detector)	Herotex	DZ122-553	63400	..
Storage Oscilloscope	Philips	PM3320A	ST9907959	--

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6.8.4. Test Data

**Summary of Maximum RF Conducted Output Power and EIRP wrt. Antenna**

Supplier's Antenna Part Number	Redline's Part Number	Antenna Gain (dBi)	Antenna Type	Maker	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Conducted Power Ratings (mWatts)	Calculated EIRP (Watts)	EIRP Limit (Watts)
<b>Antennas and Power Ratings for Point to Multipoint Application</b>									
484025	10-0007	14.0	Omni-directional	MTI Wireless Edge	-20	21.33	135.8	3.41	4
484026	10-0006	15.0	Omni-directional	MTI Wireless Edge	-20	19.96	99.1	3.13	4
485002	10-0004	23.0	Directional	MTI Wireless Edge	-20	12.74	18.8	3.75	4
486001	10-0003	28.0	Directional	MTI Wireless Edge	-20	7.71	5.9	3.72	4
SP1-5.2NS	10-0058	22.5	Directional	Radiowaves	-20	12.74	18.8	3.34	4
SP2-5.2NS	10-0057	29.0	Directional	Radiowaves	-20	6.33	4.3	3.41	4
SP3-5.2NS	10-0059	31.2	Directional	Radiowaves	-20	4.15	2.6	3.43	4
MPR58029PTNF	10-0068	29.0	Directional	MaxRad	-20	6.33	4.3	3.41	4
MPR68031PTNF	10-0069	31.0	Directional	MaxRad	-20	4.15	2.6	3.27	4
<b>Antennas and Power Ratings for Point to Point Application</b>									
485002	10-0004	23.0	Directional	MTI Wireless Edge	-20	26.03	400.9	79.98	No Limit
486001	10-0003	28.0	Directional	MTI Wireless Edge	-20	26.03	400.9	252.93	No Limit
SP1-5.2NS	10-0058	22.5	Directional	Radiowaves	-20	26.03	400.9	71.29	No Limit
SP2-5.2NS	10-0057	29.0	Directional	Radiowaves	-20	26.03	400.9	318.42	No Limit
SP3-5.2NS	10-0059	31.2	Directional	Radiowaves	-20	26.03	400.9	528.45	No Limit
MPR58029PTNF	10-0068	29.0	Directional	MaxRad	-20	26.03	400.9	318.42	No Limit
MPR68031PTNF	10-0069	31.0	Directional	MaxRad	-20	26.03	400.9	504.66	No Limit

**Notes:**

- (1) The maximum RF output power is pre-programmed by the manufacturer or its professional installer with respect to the selected antenna as indicated in the above table.
- (2) The antenna is required professional installation provided by manufacturer or its professional installer.

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**6.8.4.1. Point to Multipoint - Conducted RF Output Power & EIRP wrt. MTI MODEL 484025  
 Omni-Directional Antenna (14 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	20.04	34.04	30	36	Pass
3	5775	-18.6	20.41	34.41	30	36	Pass
4	5795	-18.6	21.33	35.33	30	36	Pass
4A	5805	-18.6	20.83	34.83	30	36	Pass
5	5815	-18.6	21.30	35.30	30	36	Pass

**6.8.4.2. Point to Multipoint - Conducted RF Output Power & EIRP wrt. MTI MODEL 484026  
 Omni-Directional Antenna (15 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	18.81	33.81	30	36	Pass
3	5775	-18.6	19.24	34.24	30	36	Pass
4	5795	-18.6	19.96	34.96	30	36	Pass
4A	5805	-18.6	19.54	34.54	30	36	Pass
5	5815	-18.6	19.87	34.87	30	36	Pass

**6.8.4.3. Point to Multipoint - Conducted RF Output Power & EIRP wrt. MTI MODEL 485002  
 Directional Antenna (23 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	11.17	34.17	30	36	Pass
3	5775	-18.6	11.64	34.64	30	36	Pass
4	5795	-18.6	12.74	35.74	30	36	Pass
4A	5805	-18.6	12.72	35.72	30	36	Pass
5	5815	-18.6	12.72	35.72	30	36	Pass

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**6.8.4.4. Point to Multipoint - Conducted RF Output Power & EIRP wrt. MTI MODEL 486001 Directional Antenna (28 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	6.02	34.02	30	36	Pass
3	5775	-18.6	6.72	34.72	30	36	Pass
4	5795	-18.6	7.71	35.71	30	36	Pass
4A	5805	-18.6	6.99	34.99	30	36	Pass
5	5815	-18.6	7.48	35.48	30	36	Pass

**6.8.4.5. Conducted RF Output Power & EIRP wrt. Radiowaves Mode RADIOWAVES MODEL SP1-5.2NS Directional Antenna (22.5 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	11.17	33.67	30	36	Pass
3	5775	-18.6	11.64	34.14	30	36	Pass
4	5795	-18.6	12.74	35.24	30	36	Pass
4A	5805	-18.6	12.72	35.22	30	36	Pass
5	5815	-18.6	12.72	35.22	30	36	Pass

**6.8.4.6. Conducted RF Output Power & EIRP wrt. Radiowaves Model SP2-5.2NS Directional Antenna (29 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	4.31	33.31	30	36	Pass
3	5775	-18.6	5.19	34.19	30	36	Pass
4	5795	-18.6	6.33	35.33	30	36	Pass
4A	5805	-18.6	6.02	35.02	30	36	Pass
5	5815	-18.6	6.13	35.13	30	36	Pass

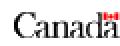
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**6.8.4.7. Point to Multipoint - Conducted RF Output Power & EIRP wrt. Radiowaves Model SP3-5.2NS Directional Antenna (31.2 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	1.46	32.66	30	36	Pass
3	5775	-18.6	2.30	33.50	30	36	Pass
4	5795	-18.6	4.15	35.35	30	36	Pass
4A	5805	-18.6	3.42	34.62	30	36	Pass
5	5815	-18.6	4.15	35.35	30	36	Pass

**6.8.4.8. Point to Multipoint - Conducted RF Output Power & EIRP wrt. MaxRad MaxRad Model MPR58029PTNF Directional Antenna (29 dBi Gain).**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	4.31	33.31	30	36	Pass
3	5775	-18.6	5.19	34.19	30	36	Pass
4	5795	-18.6	6.33	35.33	30	36	Pass
4A	5805	-18.6	6.02	35.02	30	36	Pass
5	5815	-18.6	6.13	35.13	30	36	Pass

**6.8.4.9. Point to Multipoint - Conducted RF Output Power & EIRP wrt. MaxRad MaxRad Model MPR68031PTNF Directional Antenna (31 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	1.46	32.46	30	36	Pass
3	5775	-18.6	2.30	33.30	30	36	Pass
4	5795	-18.6	4.15	35.15	30	36	Pass
4A	5805	-18.6	3.42	34.42	30	36	Pass
5	5815	-18.6	4.15	35.15	30	36	Pass

**ULTRATECH GROUP OF LABS**

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**6.8.4.10. POINT TO POINT - Conducted RF Output Power & EIRP wrt. MTI MODEL 485002  
 Directional Antenna (23 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	24.56	47.56	30	No Limit	Pass
3	5775	-18.6	25.44	48.44	30	No Limit	Pass
4	5795	-18.6	25.84	48.84	30	No Limit	Pass
4A	5805	-18.6	25.95	48.95	30	No Limit	Pass
5	5815	-18.6	26.03	49.03	30	No Limit	Pass

**6.8.4.11. POINT TO POINT - Conducted RF Output Power & EIRP wrt. MTI MODEL 486001  
 Directional Antenna (28 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	24.56	52.56	30	No Limit	Pass
3	5775	-18.6	25.44	53.44	30	No Limit	Pass
4	5795	-18.6	25.84	53.84	30	No Limit	Pass
4A	5805	-18.6	25.95	53.95	30	No Limit	Pass
5	5815	-18.6	26.03	54.03	30	No Limit	Pass

**6.8.4.12. POINT TO POINT - Conducted RF Output Power & EIRP wrt. Radiowaves Mode  
 RADIOWAVES MODEL SP1-5.2NS Directional Antenna (22.5 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	24.56	47.06	30	No Limit	Pass
3	5775	-18.6	25.44	47.94	30	No Limit	Pass
4	5795	-18.6	25.84	48.34	30	No Limit	Pass
4A	5805	-18.6	25.95	48.45	30	No Limit	Pass
5	5815	-18.6	26.03	48.53	30	No Limit	Pass

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**6.8.4.13. POINT TO POINT - Conducted RF Output Power & EIRP wrt. Radiowaves Model SP2-5.2NS Directional Antenna (29 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	24.56	55.56	30	No Limit	Pass
3	5775	-18.6	25.44	56.44	30	No Limit	Pass
4	5795	-18.6	25.84	56.84	30	No Limit	Pass
4A	5805	-18.6	25.95	56.95	30	No Limit	Pass
5	5815	-18.6	26.03	57.03	30	No Limit	Pass

**6.8.4.14. POINT TO POINT - Conducted RF Output Power & EIRP wrt. Radiowaves Model SP3-5.2NS Directional Antenna (31.2 dBi Gain)**

Channel No.	Channel Frequency (MHz)	Minimum Conducted Power (dBm)	Max Conducted Power Ratings (dBm)	Max Calculated EIRP (dBm)	FCC Conducted Power Limit (dBm)	FCC EIRP Limit (dBm)	Pass/Fail
1	5735	-18.6	24.56	55.76	30	No Limit	Pass
3	5775	-18.6	25.44	56.64	30	No Limit	Pass
4	5795	-18.6	25.84	57.04	30	No Limit	Pass
4A	5805	-18.6	25.95	57.15	30	No Limit	Pass
5	5815	-18.6	26.03	57.23	30	No Limit	Pass

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