ENGINEERING TEST REPORT

MDS LEDR700S
Model No.: LEDR700S
FCC ID: E5MDS-LEDR700S

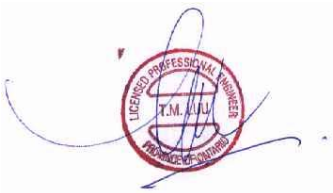
Applicant:

Microwave Data Systems Inc.
175 Science Parkway
Rochester, NY
14620-4261, USA

Tested in Accordance With

Federal Communications Commission (FCC)
47 CFR, PARTS 2 and 27 (Subpart C)
Miscellaneous Wireless Communications Services
Licenses for the Guard Bands: 746-747, 762-764, 776-777 and 792-794 MHz
(25 kHz and 150 kHz Channel Spacings)

UltraTech's File No.: MIC-061FCC27

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: February 20, 2003	
Report Prepared by: Dan Huynh Issued Date: February 20, 2003	Tested by: Hung Trinh, RFI Technician Test Dates: Nov. 10-14, 2002

- *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.*

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EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	▪ Exhibit 1: Submittal check lists ▪ Exhibit 2: Introduction ▪ Exhibit 3: Performance Assessment ▪ Exhibit 4: EUT Operation and Configuration during Tests ▪ Exhibit 5: Summary of test Results ▪ Exhibit 6: Measurement Data ▪ Exhibit 7: Measurement Uncertainty ▪ Exhibit 8: Measurement Methods	OK
1	Test Report – Test Data Plots	▪ 99% Occupied Bandwidth, plots # 1 to 24 ▪ Out-of-Band Emissions, plots # 25 to 36	OK
2	Test Setup Photos	Radiated Emissions Test Setup Photos	OK
3	External Photos of EUT	External EUT Photos	OK
4	Internal Photos of EUT	Internal EUT Photos	OK
5	Cover Letters	▪ Letter from Ultratech for Certification Request ▪ Letter from the Applicant to appoint Ultratech to act as an agent ▪ Letter from the Applicant to request for Confidentiality Filing	OK
6	Attestation Statements	--	--
7	ID Label/Location Info	▪ ID Label ▪ Location of ID Label	OK
8	Block Diagrams	Block diagrams	OK
9	Schematic Diagrams	Schematics	OK
10	Parts List/Tune Up Info	▪ Bill of Materials ▪ Tune Up Information	OK
11	Operational Description	Theory of Operation	OK
12	RF Exposure Info	See Installation and Operation Guide for details	OK
13	Users Manual	LEDR Series Digital Microwave Radios Installation and Operation Guide	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 27
Title:	Telecommunication – 47 Code of Federal Regulations (CFR), Parts 2 & 27
Purpose of Test:	To gain FCC Certification Authorization for Miscellaneous Wireless Communications Services, Licenses for the Guard Bands 746-747, 762-764, 776-777 and 792-794 MHz (25 kHz and 150 kHz Channel Spacings).
Test Procedures:	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.
Type of Authorization:	FCC Sec. 27.51 Equipment authorization: (a) Each transmitter utilized for operation under this part must be of a type that has been authorized by the Commission under its certification procedure. (b) Any manufacturer of radio transmitting equipment to be used in these services may request equipment authorization following the procedures set forth in **subpart** J of part 2 of this chapter. Equipment authorization for an individual transmitter may be requested by an applicant for a station authorization by following the procedures set forth in part 2 of this chapter
FCC Notice:	**Sec. 27.66 Discontinuance, reduction, or impairment of service:** (a) Involuntary act. If the service provided by a fixed common carrier licensee, or a fixed common carrier operating on spectrum licensed to a Guard Band Manager, is involuntarily discontinued, reduced, or impaired for a period exceeding 48 hours, the licensee must promptly notify the Commission, in writing, as to the reasons for discontinuance, reduction, or impairment of service, including a statement when normal service is to be resumed. When normal service is resumed, the licensee must promptly notify the Commission. (b) Voluntary act by common carrier. If a fixed common carrier licensee, or a fixed common carrier operating on spectrum licensed to a Guard Band Manager, voluntarily discontinues, reduces, or impairs service to a community or part of a community, it must obtain prior authorization as provided under Sec. 63.71 of this chapter. An application will be granted within 31 days after filing if no objections have been received. (c) Voluntary act by non-common carrier. If a fixed non-common carrier licensee, or a fixed non-common carrier operating on spectrum licensed to a Guard Band Manager, voluntarily discontinues, reduces, or impairs service to a community or part of a community, it must given written notice to the Commission within seven days. (d) Notifications and requests. Notifications and requests identified in paragraphs(a) through (**c**) of this section should be sent to: Federal Communications Commission, Common Carrier Radio Services, 1270 Fairfield Road, Gettysburg, Pennsylvania, 17325.

2.2. RELATED SUBMITTAL(S)/GRANT(S)

None

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 20-39, 80-End	2001	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 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1	1999	Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	Microwave Data Systems Inc.
Address:	175 Science Parkway Rochester, NY USA, 14620-4261
Contact Person:	Mr. Dennis McCarthy Phone #: 585-242-8440 Fax #: 585-241-5590 Email Address: dmccarthy@microwavedata.com

MANUFACTURER	
Name:	Microwave Data Systems Inc.
Address:	175 Science Parkway Rochester, NY USA, 14620-4261
Contact Person:	Mr. Dennis McCarthy Phone #: 585-242-8440 Fax #: 585-241-5590 Email Address: dmccarthy@microwavedata.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.

Brand Name:	Microwave Data Systems Inc.
Product Name:	MDS LEDR700S
Model Name or Number:	LEDR700S
Serial Number:	Pre-production
Type of Equipment:	Miscellaneous Wireless Communications Services
External Power Supplies;	▪ 24 Vdc Power Supply, by Lambda Electronics Inc., Model: DT 100PW240P, AC IN: 120V 60Hz, DC Out: 24 Vdc. or ▪ 48 Vdc Power Supply, by Lambda Electronics Inc., Model: DT 100PW480P, AC IN: 120V 60Hz, DC Out: 48 Vdc.
Transmitting/Receiving Antenna Type:	Non-integral, Female N-Type Connector

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Base station (fixed use)
Intended Operating Environment:	Commercial, Light Industry & Heavy Industry
Power Supply Requirement:	24 Vdc or 48 Vdc
RF Output Power Rating:	1.2 Watts Average
Operating Frequency Range:	▪ 746-747 MHz ▪ 762-764 MHz ▪ 776-777 MHz ▪ 794-792 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	▪ 25 kHz ▪ 150 kHz
Occupied Bandwidth (99%):	▪ 21.1 kHz for 20K0D1W ▪ 38.4 kHz for 40K0D1W ▪ 74.7 kHz for 75K0D1W ▪ 112 kHz for 110K0D1W
Modulations:	16 QAM
Data Rate:	▪ 64 kbps for 20K0D1W ▪ 128 kbps for 40K0D1W ▪ 256 kbps for 75K0D1W ▪ 384 kbps for 110K0D1W
Emissions Designator:	▪ 20K0D1W (25 kHz Channel Spacing) ▪ 40K0D1W (150 kHz Channel Spacing) ▪ 75K0D1W (150 kHz Channel Spacing) ▪ 110K0D1W (150 kHz Channel Spacing)
Antenna Connector Type:	Non-integral, Female N-Type Connector

3.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
Connectors on the Front Panel of the EUT				
1	Orderwire Handset	1	RJ-11	Non-shielded
2	Console (Computer)	1	Female DB9	Shielded
Connectors on the Back Panel of the EUT				
3	RF Input/Output Port	1	Female N	Shielded
4	G.703/Expansion Data	4	RJ-45	Non-shielded
5	Ethernet NMS	1	RJ-45	Non-shielded
6	EIA-530-A	1	Female DB25	Shielded
7	Service Channel	1	Male DB9	Shielded
8	Alarm I/O	1	Female DB9	Shielded
9	DC Power Input	1	3-pin Keyed	Non-shielded

3.5. 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:	HP Omni Book Laptop Computer
Brand name:	Hewlett Packard
Model Name or Number:	5500CS
Serial Number:	TW63403246
Cable Length & Type:	6 feet shielded cable
Connected to EUT's Port:	EUT;s Service Channel

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:	24 Vdc or 48 Vdc

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Special test software provided by Microwave data for selecting channel frequencies
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Band(s):	Test Frequencies in each sub-band:
▪ 746-747 MHz	▪ 746.5 MHz
▪ 762-764 MHz	▪ 762.025 MHz, 763.975 MHz 762.050 MHz, 763.950 MHz 762.100 MHz, 763.900 MHz 762.075 MHz, 763.925 MHz
▪ 776-777 MHz	▪ 776.5 MHz
▪ 792-794 MHz	▪ 792.025 MHz, 793.975 MHz 792.050 MHz, 793.950 MHz 792.100 MHz, 793.900 MHz 792.075 MHz, 793.925 MHz
Transmitter Wanted Output Test Signals:	
▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation: ▪ Modulating Signal Source:	▪ 1.2 Watts Average ▪ 16QAM at maximum data rate of each Channel Spacing Operations ▪ Internal

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: August 10, 2002.

5.2. APPLICABILITY & SUMMARY OF EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Applicability (Yes/No)
27.50 & 2.1046	Power and Antenna Height Limits	Yes
27.53, 1.1307(b), 1.1310, 2.1091 & 2.1093	RF Safety	Yes
27.53 & 2.1049	99% Occupied Bandwidth & Emission Limits / Adjacent Channel Coupled Power	Yes
27.53, 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
27.53, 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
27.54 & 2.1055	Frequency Stability	Yes
MDS LEDR700S, **Model No.: LEDR700S**, by **Microwave Data Systems Inc.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices**. The engineering test report has been documented and kept in file and it is available upon FCC request.		

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

5.4. DEVIATION OF STANDARD TEST PROCEDURES

None.

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

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 C63.4:1992 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.

6.5. RF POWER OUTPUT @ FCC 2.1046 & 27.50

6.5.1. Limits

Sec. 27.50 Power and antenna height limits.

(b) The following power and antenna height limits apply to transmitters operating in the 746-764 MHz and 776-794 MHz bands:

(1) **Fixed and base stations** transmitting in the 746-764 MHz band and the 777-792 MHz band must not exceed an effective radiated power (ERP) of 1000 watts and an antenna height of 305 m height above average terrain (HAAT), except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section;

(4) Maximum composite transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of RMS-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true maximum composite measurement for the emission in question over the full bandwidth of the channel.

(g) Peak transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

TABLE 1—PERMISSIBLE POWER AND ANTENNA HEIGHTS FOR BASE AND FIXED STATIONS IN THE 698–764 MHZ AND 777–792 MHZ BANDS

Antenna height (AAT) in meters (feet)	Effective Radiated Power (ERP) (Watts)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (4000)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

6.5.2. Method of Measurements

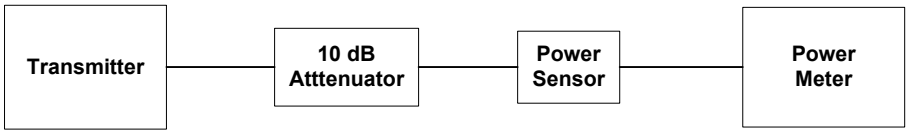
Refer to Exhibit 8, § 8.1 (Conducted) of this report for measurement details

6.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Attenuator	Macom	3082-6193-10	--	DC – 18 GHz
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz

6.5.4. Test Arrangement

Power at RF Power Output Terminals



6.5.5. Test Data

Remark: The following power measurements were repeated with 2 alternatives 24 Vdc / 48Vdc output, external power supplies and the results were found unchanged.

6.5.5.1. Operating Configuration #1: 25 kHz Channel Spacing, BW = 20 kHz, Modulation: 16QAM, Data Rate: 64 kbps, Emission Designation: 20K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured Average Conducted Power (dBm)	Antenna Gain Limit Specified by Manufacturer (dBi)	Calculated ERP (dBm)
746-747	746.500	30.3	30	58.2
762-764	762.025	30.6	30	58.5
	763.975	30.3	30	58.2
776-777	776.500	30.5	30	58.4
792-794	792.025	30.0	30	57.9
	793.975	30.4	30	58.3

6.5.5.2. Operating Configuration #2: 150 kHz Channel Spacing, BW= 40 kHz, Modulation: 16QAM, Data Rate: 128 kbps, Emission Designation: 40K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured Average Conducted Power (dBm)	Antenna Gain Limit Specified by Manufacturer (dBi)	Calculated ERP (dBm)
746-747	746.500	30.3	30	58.2
762-764	762.050	30.6	30	58.5
	763.950	30.3	30	58.2
776-777	776.500	30.5	30	58.4
792-794	792.050	30.1	30	58.0
	793.950	30.4	30	58.3

6.5.5.3. Operating Configuration #3: 150 kHz Channel Spacing, BW=75 kHz, Modulation: 16QAM, Data Rate: 256 kbps, Emission Designation: 75K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured Average Conducted Power (dBm)	Antenna Gain Limit Specified by Manufacturer (dBi)	Calculated ERP (dBm)
746-747	746.500	30.3	30	58.2
762-764	762.100	30.7	30	58.6
	763.975	30.1	30	58.0
776-777	776.500	30.5	30	58.4
792-794	792.100	30.1	30	58.0
	793.900	30.5	30	58.4

6.5.5.4. Operating Configuration #4: 150 kHz Channel Spacing, BW=110 kHz, Modulation: 16QAM, Data Rate: 384 kbps, Emission Designation: 110K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured Average Conducted Power (dBm)	Antenna Gain Limit Specified by Manufacturer (dBi)	Calculated ERP (dBm)
746-747	746.500	30.1	30	58.0
762-764	762.075	30.7	30	58.6
	763.925	30.2	30	58.1
776-777	776.500	30.5	30	58.4
792-794	792.075	30.1	30	58.0
	793.925	30.5	30	58.4

6.6. RF SAFETY @ 27.52, 1.1310

6.6.1. Requirements

Sec. 27.52 RF Safety: Licensees and manufacturers are subject to the radio frequency radiation exposure requirements specified in sections 1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

$r = \sqrt{PG/4\Pi S}$

6.6.2. MPE Evaluation

Antenna Gain Limit specified by Manufacturer: 30 dBi

Maximum Measured RF Conducted (dBm)	Calculated EIRP (dBm)	Laboratory's Recommended Minimum RF Safety Distance r (cm)
30.7	60.7	433.4

Note 1: RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$
$S = F/1500 = 746.5/1500 = 0.498\ mW/cm^2$

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: **433.4 cm**	Manufacturer' instruction for separation distance between antenna and persons required: **434 cm**. Please refer to page v of the Installation and Operation Guide Manual for details
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	See Installation and Operation Guide Manual, section 3.0 Hardware Installation and Basic Interface Requirements for details
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Please refer to page v of the Installation and Operation Guide Manual for details
Any other RF exposure related issues that may affect MPE compliance	None.

6.7. 99% OCCUPIED BANDWIDTH & EMISSION LIMITS/ADJACENT CHANNEL COUPLED POWER @ FCC 27.53 & 2.1049

6.7.1. Limits

(d) **Emissions Limitation and Adjacent Channel Coupled Power (ACCP) for operations in the 746-747 MHz, 762-764 MHz, 776-777 MHz, and 792-794 MHz bands**, transmitters must meet the following emission limitations:

(1) The adjacent channel coupled power (ACCP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to handheld, car mounted and control station units. The tables specify a maximum value for the ACCP relative to maximum output power as a function of the displacement from the channel center frequency. In addition, the ACCP for a mobile station transmitter at the specified frequency displacement must not exceed the value shown in the tables. For transmitters that have power control, the latter ACCP requirement can be met at maximum power reduction. In the following charts, ``(s)'' means that a swept measurement is to be used.

25 kHz Base Transmitter ACCP Requirements

Offset From Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACCP (dBc)
15.625	6.25	-40
21.875	6.25	-60
37.500	25.00	-60
62.500	25.00	-65
87.500	25.00	-65
150.000	100.00	-65
250.000	100.00	-65
> 400 to receive band	30 (s)	-80 (continuous @ -6 dB/oct)
In receive band	30 (s)	-100

150 kHz Base Transmitter ACCP Requirements

Offset From Center Frequency (kHz)	Measurement Bandwidth (kHz)	Maximum ACCP (dBc)
100	50	-40
200	50	-50
300	50	-55
400	50	-60
600 to 1000	30 (s)	-65
1000 to receive band	30 (s)	-75 (continuous @ -6 dB/oct)
In the receive band	30 (s)	-100

6.7.2. Method of Measurements

The following procedures are to be followed for making ACCP transmitter measurements. For time division multiple access (TDMA) systems, the measurements are to be made under TDMA operation only during time slots when the transmitter is on. All measurements must be made at the input to the transmitter's antenna. Measurement bandwidth used below implies an instrument that measures the power in many narrow bandwidths (e.g. 300 Hz) and integrates these powers across a larger band to determine power in the measurement bandwidth.

(i) Setting reference level: Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth to the channel size. For example, for a 6.25 kHz transmitter, set the measurement bandwidth to 6.25 kHz; for a 150 kHz transmitter, set the measurement bandwidth to 150 kHz. Set the frequency offset of the measurement bandwidth to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth. Record this power level in dBm as the ``reference power level''.

(ii) Measuring the power level at frequency offsets 600kHz: Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth as shown in the tables above. [[Page 386]] Measure the ACCP in dBm. These measurements should be made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power measured in the previous step. The absolute ACCP values must be less than the values given in the table for each condition above.

(iii) Measuring the power level at frequency offsets >600kHz: Set a spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and sample mode detection. Sweep <plus-minus>6 MHz from the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the absolute power. The response at frequencies greater than 600 kHz must be less than the values in the tables above.

(iv) Upper Power Limit Measurement: The absolute coupled power in dBm measured above must be compared to the table entry for each given frequency offset. For those mobile stations with power control, these measurements should be repeated with power control at maximum power reduction. The absolute ACCP at maximum power reduction must be less than the values in the tables above.

6.7.3. Test Equipment List

- **99% Occupied Bandwidth**

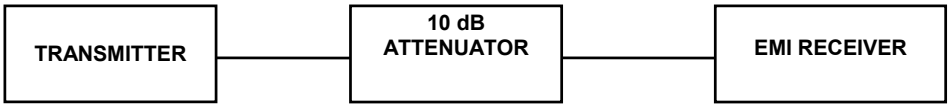
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver/ Spectrum Analyzer	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator	Macom	3082-6193-10	--	DC – 18 GHz

- **Emission Limits/Adjacent Channel Coupled Power**

See Microwave Data Systems Inc. MDS LEDR700S ACCP test report.

6.7.4. Test Arrangement

- **99% Occupied Bandwidth**



- **Emission Limits/Adjacent Channel Coupled Power**

See Microwave Data Systems Inc. MDS LEDR700S ACCP test report.

6.7.5. Test Data

6.7.5.1. 99% OCCUPIED BANDWIDTH MEASUREMENTS

6.7.5.1.1. Operating Configuration #1: 25 kHz Channel Spacing, BW = 20 kHz, Modulation: 16QAM, Data Rate: 64 kbps, Emission Designation: 20K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured 99% OBW (kHz)	Measurement Plot Number in Annex 1
746-747	746.500	21.1	1
762-764	762.025	21.0	2
	763.975	21.0	3
776-777	776.500	20.9	4
792-794	792.025	20.9	5
	793.975	20.9	6

6.7.5.1.2. Operating Configuration #2: 150 kHz Channel Spacing, BW= 40 kHz, Modulation: 16QAM, Data Rate: 128 kbps, Emission Designation: 40K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured 99% OBW (kHz)	Measurement Plot Number in Annex 1
746-747	746.500	38.4	7
762-764	762.050	38.2	8
	763.950	38.2	9
776-777	776.500	38.1	10
792-794	792.050	38.1	11
	793.950	38.1	12

6.7.5.1.3. Operating Configuration #3: 150 kHz Channel Spacing, BW=75 kHz, Modulation: 16QAM, Data Rate: 256 kbps, Emission Designation: 75K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured 99% OBW (kHz)	Measurement Plot Number in Annex 1
746-747	746.500	74.7	13
762-764	762.100	73.6	14
	763.900	74.3	15
776-777	776.500	74.6	16
792-794	792.100	73.9	17
	793.900	73.1	18

6.7.5.1.4. Operating Configuration #4: 150 kHz Channel Spacing, BW=110 kHz, Modulation: 16QAM, Data Rate: 384 kbps, Emission Designation: 110K0D1W

Channel Frequency Sub-Band (MHz)	Channel Frequency (MHz)	Measured 99% OBW (kHz)	Measurement Plot Number in Annex 1
746-747	746.500	112.0	19
762-764	762.075	110.0	20
	763.925	111.1	21
776-777	776.500	111.1	22
792-794	792.075	110.0	23
	793.925	109.4	24

6.7.5.2. ADJACENT CHANNEL COUPLED POWER

See Microwave Data Systems Inc. MDS LEDR700S ACCP test report.

6.8. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 27.53

6.8.1. Limits

FCC §27.53(d)(3) - Out-of-band emission limit: On any frequency outside of the frequency ranges covered by the ACCP tables in this section, the power of any emission must be reduced below the unmodulated carrier power (P) by at least 43 + 10 log (P) dB.

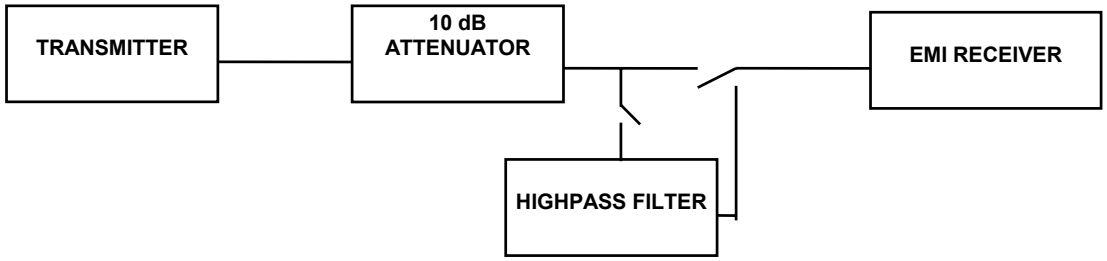
6.8.2. Method of Measurements

Refer to Exhibit 8, § 8.3 of this report for measurement details

6.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver/ Spectrum Analyzer	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator	Macom	3082-6193-10	--	DC – 18 GHz
Highpass Filter	K & L Microwave	11SH10-1500/T8000-O/O	2	Cut-off Frequency at 800 MHz

6.8.4. Test Arrangement



6.8.5. Test Data

Remarks: Tests were performed when the transmitter was set to operate with 150 kHz Channel Spacing, Emission Designator: 110K0D1W for the worst case. Since, the transmitter's parameters at this mode is the worst case of:

1. Highest power
2. Widest bandwidth
3. Highest data rate

6.8.5.1. 746-747 MHz Sub-Band

Fundamental Frequency:	746.5 MHz
RF Output Power:	1.2 Watts (conducted)
Channel Spacing:	150 kHz
Modulation:	16-QAM, 384 kbps data rate

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit. See plots # 25 to # 26 in Annex 1 for measurement details.

6.8.5.2. 762-764 MHz Sub-Band

Fundamental Frequency:	762.075 MHz
RF Output Power:	1.2 Watts (conducted)
Channel Spacing:	150 kHz
Modulation:	16-QAM, 384 kbps data rate

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit. See plots # 27 to # 28 in Annex 1 for measurement details.

Fundamental Frequency:	763.925 MHz
RF Output Power:	1.2 Watts (conducted)
Channel Spacing:	150 kHz
Modulation:	16-QAM, 384 kbps data rate

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit. See plots # 29 to # 30 in Annex 1 for measurement details.

6.8.5.3. 776-777 MHz Sub-Band

Fundamental Frequency:	776.5 MHz
RF Output Power:	1.2 Watts (conducted)
Channel Spacing:	150 kHz
Modulation:	16-QAM, 384 kbps data rate

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit. See plots # 31 to # 32 in Annex 1 for measurement details.

6.8.5.4. 792-794 MHz Sub-Band

Fundamental Frequency:	792.075 MHz
RF Output Power:	1.2 Watts (conducted)
Channel Spacing:	150 kHz
Modulation:	16-QAM, 384 kbps data rate

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit. See plots # 33 to # 34 in Annex 1 for measurement details.

Fundamental Frequency:	793.925 MHz
RF Output Power:	1.2 Watts (conducted)
Channel Spacing:	150 kHz
Modulation:	16-QAM, 384 kbps data rate

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit. See plots # 35 to # 36 in Annex 1 for measurement details.

6.9. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 27.53

6.9.1. Limits @ FCC 27.53

FCC Sec. 27.53(d)(3) - Out-of-band emission limit: On any frequency outside of the frequency ranges covered by the ACCP tables in this section, the power of any emission must be reduced below the unmodulated carrier power (P) by at least 43 + 10 log (P) dB.

6.9.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 8, § 8.2 of this report and its value in dBc is calculated as follows:

(1) If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
(2) If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:
Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
(3) Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

ERP of spurious/harmonic (dBc) = ERP of carrier (dBm) – ERP of spurious/harmonic emission (dBm)

6.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8546A	…	9 kHz to 5.6 GHz with built-in 30 dB Gain Pre-selector, QP, Average & Peak Detectors.
RF Amplifier	Com-Power	PA-102		1 MHz to 1 GHz, 30 dB gain nomimal
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz, 30 dB nominal
Biconilog Antenna	EMCO	3142	10005	30 MHz to 2 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 GHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 GHz – 1 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz
RF Signal Generator	Hewlett Packard	HP 83752B	3610A00457	0.01 – 20 GHz

6.9.4. Test Data

Remarks: Tests were performed when the transmitter was set to operate with 150 kHz Channel Spacing, Emission Designator: 110K0D1W for the worst case. Since, the transmitter's parameters at this mode is the worst case of:

1. Highest power
2. Widest bandwidth
3. Highest data rate

6.9.4.1. 746-747 MHz Sub-Band

Fundamental Frequency:	746.5 MHz
RF Output Power:	28.6 dBm (ERP)
Modulation:	16-QAM, 384 kbps data rate
Limit:	-(43 + 10*log(0.724 Watts ERP)) = -41.6 dBc

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit.

6.9.4.2. 762-764 MHz Sub-Band

Fundamental Frequency:	762.075 MHz
RF Output Power:	28.6 dBm (ERP)
Modulation:	16-QAM, 384 kbps data rate
Limit:	-(43 + 10*log(0.724 Watts ERP)) = -41.6 dBc

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit.

Fundamental Frequency:	763.925 MHz
RF Output Power:	28.6 dBm (ERP)
Modulation:	16-QAM, 384 kbps data rate
Limit:	-(43 + 10*log(0.724 Watts ERP)) = -41.6 dBc

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit.

6.9.4.3. 776-777 MHz Sub-Band

Fundamental Frequency:	776.5 MHz
RF Output Power:	28.6 dBm (ERP)
Modulation:	16-QAM, 384 kbps data rate
Limit:	-(43 + 10*log(0.724 Watts ERP)) = -41.6 dBc

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit.

6.9.4.4. 792-794 MHz Sub-Band

Fundamental Frequency:	792.075 MHz
RF Output Power:	28.6 dBm (ERP)
Modulation:	16-QAM, 384 kbps data rate
Limit:	-(43 + 10*log(0.724 Watts ERP)) = -41.6 dBc

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit.

Fundamental Frequency:	793.925 MHz
RF Output Power:	28.6 dBm (ERP)
Modulation:	16-QAM, 384 kbps data rate
Limit:	-(43 + 10*log(0.724 Watts ERP)) = -41.6 dBc

The emissions were scanned from 10 MHz to 10 GHz and no significant emissions were found. All emissions are more than 20 dB below the limit.

6.10. FREQUENCY STABILITY @ FCC 2.1055 & 27.54

6.10.1. Limits

FCC §27.54 Frequency Stability: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

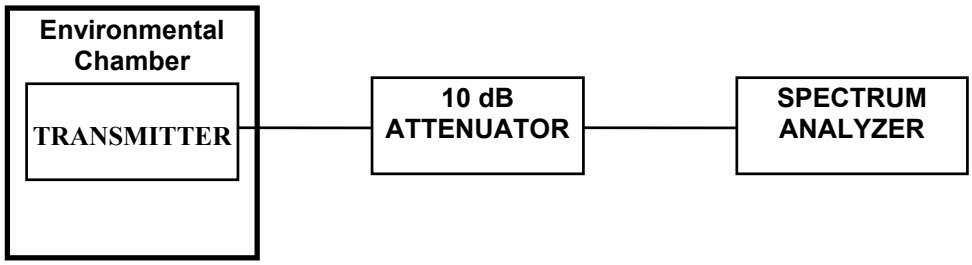
6.10.2. Method of Measurements

Refer to Exhibit 8, § 8.4 of this report for measurement details

6.10.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
EMI Receiver/ Spectrum Analyzer	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator	Macom	3082-6193-10	--	DC – 18 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40° to +60 ° C range

6.10.4. Test Arrangement



6.10.5. Test Data

Product Name: **Model No.:**	**MDS LEDR700S** **LEDR700S**
Center Frequency:	746.5 MHz
Full Power Level:	1 Watt
Frequency Tolerance Limit:	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation
Max. Frequency Tolerance Measured:	1.879kHz, comply with frequency tolerance requirement.
Input Voltage Rating:	48 Vdc

CENTER FREQUENCY & RF POWER OUTPUT VARIATION			
Ambient Temperature (^oC)	**Supply Voltage (Nominal) 48 Volts dc**	**Supply Voltage (85% of Nominal) Volts**	**Supply Voltage (115% of Nominal) Volts**
	Hz	**Hz**	**Hz**
-30	+1879	N/A	N/A
-20	+1437	N/A	N/A
-10	+993	N/A	N/A
0	+700	N/A	N/A
+10	+236	N/A	N/A
+20	+22	+22	+22
+30	-150	N/A	N/A
+40	-300	N/A	N/A
+50	+300	N/A	N/A

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k = 2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 8. MEASUREMENT METHODS

8.1. CONDUCTED POWER MEASUREMENTS

- The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
- I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
- The following method of measurement shall apply to both conducted and radiated measurements.
- The radiated measurements are performed at the Ultratech Calibrated Open Field Test Site.
- The measurement shall be performed using normal operation of the equipment with modulation.

Test procedure shall be as follows:

Step 1: Duty Cycle measurements if the transmitter's transmission is transient

- Using a EMI Receiver with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

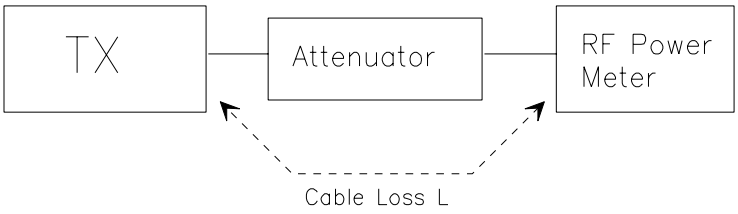
Step 2: Calculation of Average EIRP. See Figure 1

- The average output power of the transmitter shall be determined using a wideband, calibrated RF average power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);
- The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

EIRP = A + G + 10log(1/x)

{ X = 1 for continuous transmission => 10log(1/x) = 0 dB}

Figure 1.



8.2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

8.2.1. Maximizing RF Emission Level (E-Field)

(a) The measurements was performed with full rf output power and modulation.
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

8.2.2. Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	10 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna:
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB

Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where:
- P: Actual RF Power fed into the substitution antenna port after corrected.
- P1: Power output from the signal generator
- P2: Power measured at attenuator A input
- P3: Power reading on the Average Power Meter
- EIRP: EIRP after correction
- ERP: ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

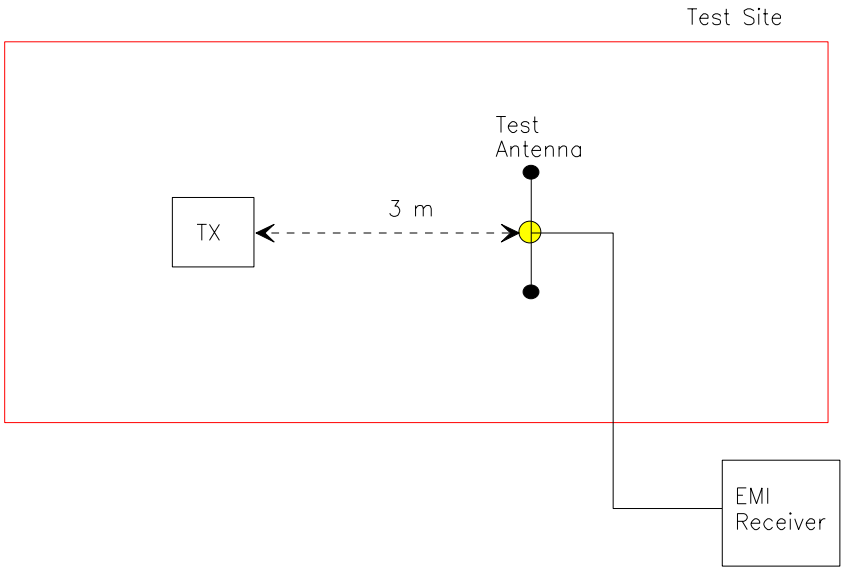
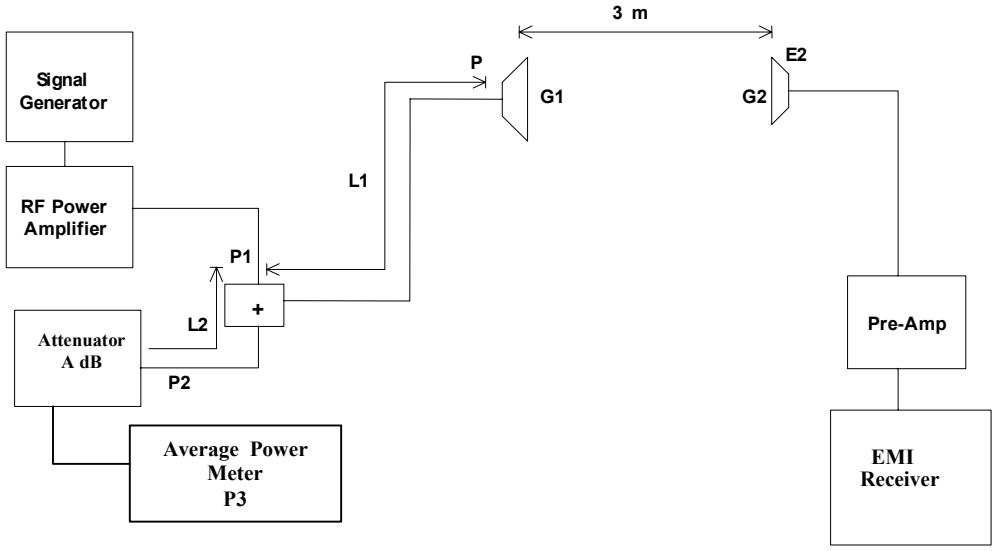


Figure 3



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

8.3. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 30 kHz minimum , VBW ≥ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC CFR 47, Para. 2.1057 - Frequency spectrum to be investigated:- The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The
amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.1051 - Spurious Emissions at Antenna Terminal:- The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

8.4. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).