ENGINEERING TEST REPORT

Radio Transceiver
Model No.: RM20M
FCC ID: PASRM20M

Applicant: **PowerLOC Technologies Inc.**
30 Leek Crescent, Suite 103
Richmond Hill, Ontario
Canada, L4B 4N4

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 90 (Subpart I)

UltraTech's File No.: PWL-8FTX

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

Date: May 17, 2001

Report Prepared by: Dan Huynh	Tested by: Mr Hung Trinh, RFI/EMI Technician
Issued Date: May 17, 2001	Test Dates: March 3 & April 13, 2001

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.

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TABLE OF CONTENTS

EXHIBIT 1. SUBMITTAL CHECK LIST 1

EXHIBIT 2. INTRODUCTION 2

2.1. SCOPE 2
2.2. NORMATIVE REFERENCES 2

EXHIBIT 3. PERFORMANCE ASSESSMENT 3

3.1. CLIENT INFORMATION 3
3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION 3
3.3. EUT'S TECHNICAL SPECIFICATIONS 4
3.4. LIST OF EUT'S PORTS 4
3.5. SPECIAL CHANGES ON THE EUT'S HARDWARE/SOFTWARE FOR TESTING PURPOSES 4
3.6. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES 4
3.7. RELATED SUBMITAL(S)/GRANT(S) 5
3.8. ANCILLARY EQUIPMENT 5

EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS 6

4.1. CLIMATE TEST CONDITIONS 6
4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS 6

EXHIBIT 5. SUMMARY OF TEST RESULTS 7

5.1. LOCATION OF TESTS 7
5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS 7

EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS 8

6.1. TEST PROCEDURES 8
6.2. MEASUREMENT UNCERTAINTIES 8
6.3. MEASUREMENT EQUIPMENT USED: 8
6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER: 8
6.5. RF POWER OUTPUT @ FCC 2.1046 & 90.205 9
6.5.1. Limits @ FCC 90.205 9
6.5.2. Method of Measurements 9
6.5.3. Test Equipment List 9
6.5.4. Test Arrangement 9
6.5.5. Test Data 10
6.6. RADIOFREQUENCY RADIATION EXPOSURE EVALUATION @ 1.1310 & 2.1091 11
6.6.1. Limits 11
6.6.2. Method of Measurements 11
6.6.3. Test Data 12
6.7. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 90.210 13
6.7.1. Limits @ FCC 90.210 13
6.7.2. Method of Measurements 13
6.7.3. Test Equipment List 13

6.7.4. Test Arrangement *14*
6.7.5. Test Data *15*
6.7.5.1. Near Lowest Frequency (896 MHz) 15
6.7.5.2. Near Highest Frequency (901 MHz) 17

EXHIBIT 7. MEASUREMENT UNCERTAINTY 19

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY 19

EXHIBIT 8. MEASUREMENT METHODS 20

8.1. SPURIOUS EMISSIONS (RADIATED) 20

EXHIBIT 9. TEST SETUP PHOTOS 22

EXHIBIT 10. EXTERNAL EUT PHOTOS 23

EXHIBIT 11. INTERNAL EUT PHOTOS 24

EXHIBIT 12. COVER LETTERS 25

EXHIBIT 13. ID LABEL/LOCATION INFO 26

EXHIBIT 14. USER'S MANUAL 27

EXHIBIT 1. SUBMITTAL CHECK LIST

Exhibit No.	Exhibit Type	Description of Contents	Quality Check (OK)
1 through 8	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
9	Test Setup Photos	Radiated Emissions Test Setup	OK
10	External EUT Photos	External RM20M Photos	OK
11	Internal EUT Photos	Internal RM20M Photos	OK
12	Cover Letters	• Letter from Ultratech for Certification Request • Letter from the Applicant to appoint Ultratech to act as an agent	OK
13	ID Label/Location Info	• ID Label • Location of ID Label	OK
14	User's Manual	Information/instructions that will be intended in the installation/operation pertains to: • Correct output power settings required for compliance operation for every antenna proposed for use with EUT • RF exposure compliance requirements	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 90 (Subpart 90)
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 90
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency band 896-901 MHz.
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.

2.2. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	1998	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		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	PowerLOC Technologies Inc.
Address:	30 Leek Crescent, Suite 103 Richmond Hill, Ontario Canada, L4B 4N4
Contact Person:	Mr. Ron Miller Phone #: (905) 764-3701 ext. 276 Fax #: (905) 764-3680 Email Address: rmiller@powerloc.com

MANUFACTURER	
Name:	Research In Motion Limited
Address:	295 Phillip Street Waterloo, Ontario Canada, N2L 3W8
Contact Person:	Mr. Masud Attayi Phone #: (519) 888-7465 x2442 Fax #: (519) 888-6906 Email Address: mattayi@rim.net

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:	PowerLOC Technologies Inc.
Product Name:	Radio Transceiver
Model Name or Number:	RM20M
Serial Number:	Preproduction
Type of Equipment:	Radio Communication Equipment
External Power Supply:	N/A
Transmitting/Receiving Antenna Type:	Non-Integral
Primary User Functions of EUT:	Correctly communicate data to and from radios over RF link

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Mobile Base station (fixed use)
Intended Operating Environment:	Residential, Commercial, light industry & heavy industry
Power Supply Requirement:	12 VDC
RF Output Power Rating:	2 Watts (direct at antenna terminal)
Operating Frequency Range:	896-901 MHz
RF Output Impedance:	50 Ohms
Emission Designation*:	12K8F1D
Digital Oscillator Frequency:	50 MHz
Radio Oscillator Frequencies:	90 MHz
Antenna Connector Type:	MMCX

3.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Antenna Port	1	MMCX	Terminated with 50 Ω load
2	Serial Com	1	22-pin FPC Connector	Non-shielded

NOTES:

(1) ***Ports of the EUT which in normal operation*** *were connected to ancillary equipment through interconnecting cables via a representative interconnecting cable to simulate the input/output characteristics. RF input/output was correctly terminated to the 50 Ohms RF Load.*

(2) ***Ports which are not connected to cables during normal intended operation*** *(for factory/technical services uses only)*

None.

3.5. SPECIAL CHANGES ON THE EUT'S HARDWARE/SOFTWARE FOR TESTING PURPOSES

None

3.6. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

3.7. RELATED SUBMITAL(S)/GRANT(S)

None

3.8. 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:	Laptop
Brand name:	IBM
Model Name or Number:	2625
Serial Number:	78-WWM4896/05
Connected to EUT's Port:	RS232

Ancillary Equipment 2	
Description:	Interface Test Board
Brand name:	Research In Motion Limited
Model Name or Number:	RIM 902M
Serial Number:	Preproduction
Connected to EUT's Port:	Serial Com

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:	12 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:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequencies: ▪ 896-901 MHz band	Near lowest & near highest frequencies each frequency bands that the transmitter covers: ▪ 896 and 901 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Modulating signal source:	 ▪ 2 Watts (direct at antenna terminal) ▪ 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.

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 site 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: Sep. 20, 1999.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.205 & 2.1046	RF Power Output	Yes
2.1091 & 1.1310	Radiofrequency Radiated Exposure Evaluation	Yes
90.213 & 2.1055	Frequency Stability	Yes (Note)
90.242(b)(8) & 2.1047(a)	Audio Frequency Response	Yes (Note)
90.210 & 2.1047(b)	Modulation Limiting	Yes (Note)
90.209, 90.210 & 2.1049	Emission Limitation & Emission Masks	Yes (Note)
90.210, 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminals	Yes (Note)
90.210, 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
90.214	Transient Frequency Behavior	Yes (Note)

Radio Transceiver, **Model No.: RM20M**, by **PowerLOC Technologies Inc.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers**. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.

Note: Since, there is no changes in RF characteristic, circuitry and functional capabilities in the RIM 902M radio modem module (FCC ID: L6AR902M-2-O) approved by FCC as a Modular Transceiver, tests are not required to be repeated. Refer to exhibits uploaded by Research In Motion Limited for further details.

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 & 90.205

6.5.1. Limits @ FCC 90.205

Please refer to FCC CFR 47, Part 90, Subpart I, Para. 90.205 for specification details.

6.5.2. Method of Measurements

FCC @ 2.1046 – The rf output power of the transmitter was measured at the RF output terminals when the transmitter is adjusted by the manufacturer in accordance with the tune-up procedure to give the values of the current and voltage on the circuit elements specified in 2.1033(c)(8). The electrical characteristics of the radio frequency load attached to the output terminals were 50 Ohms.

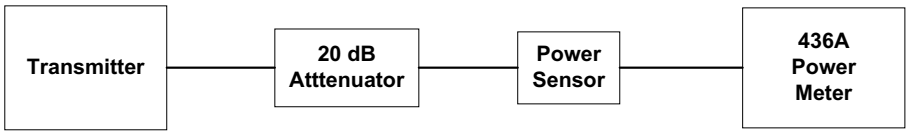
The detailed test method is as follows:

- *The transmitter terminal was coupled to the Power Meter through a 20 dB attenuator*
- *Power of the transmitter channel near the lowest and highest of each frequency block/band were measured using the power meter, and the reading was corrected by added the calibrated attenuator's attenuation value and cable loss.*
- *The RF Output was turned on with standard modulation applied.*

6.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz
Attenuator(s)	Weinschel Corp	24-20-34	BJ2357	DC – 8.5 GHz

6.5.4. Test Arrangement



6.5.5. Test Data

Conducted Power

Transmitter Channel Output	Fundamental Frequency (MHz)	Measured Power (dBm)	Power Rating (dBm)
Lowest	896	33	33
Highest	901	33	33

6.6. RADIOFREQUENCY RADIATION EXPOSURE EVALUATION @ 1.1310 & 2.1091

6.6.1. Limits

- **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).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300-1500	...	...	F/300	6
1500-100,000	...	...	5	6
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	...	...	F/1500	6
1500-100,000	...	...	1.0	30

F = Frequency in MHz

6.6.2. Method of Measurements

Refer to FCC @ 1.1310, 2.1091 and Public Notice DA 00-705 (March 30, 2000)

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers, and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

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

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

FCC radio frequency exposure limits may not be exceeded at distances further than r cm from the antenna of this device

6.6.3. Test Data

When installed as directed, this equipment complies with radiation exposure limits for general population/uncontrolled exposure. To ensure user's safety and to satisfy RF exposure requirements, this unit must be installed so that a minimum separation distance as listed in the table below is always secured between the transmitting structure and the body of the user or nearby persons.

Antenna Gain (dBi)	*Minimum Separation Distance (cm)
≤ 1	20
>1 and ≤ 2	21
>2 and ≤ 3	24
> 3 and ≤ 4	26
>4 and ≤ 5	29
> 5 and ≤ 6	33

***** Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 \quad ==> \quad r = \sqrt{PG/4\Pi S}$

Where: P: power input to the antenna in mW
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to center of radiation in cm

Sample calculation for 6dBi antenna gain:

$P = 33\ dBm = 10^{(33/10)}$ mW (maximum power measured at antenna terminal)
$G = 6\ dBi = 10^{(6/10)}$ numeric
$S = 896/1500\ mW/cm^2$ (limits for general population/uncontrolled exposure)

$r = \sqrt{PG/4\Pi S} = \sqrt{(10^{(33/10)} * 10^{(6/10)}) / (4\Pi(896/1500))} = 33$ cm

Please refer to user's manual for RF exposure warning statement (page iii).

6.7. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 90.210

6.7.1. Limits @ FCC 90.210

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC RULES	WORST CASE EMISSIONS LIMIT	ATTENUATION LIMIT (dBc)
FCC 90.210 (j)	FCC 90.210 (j)	50 + 10log(P), P is in Watts (or -20 dBm)

6.7.2. Method of Measurements

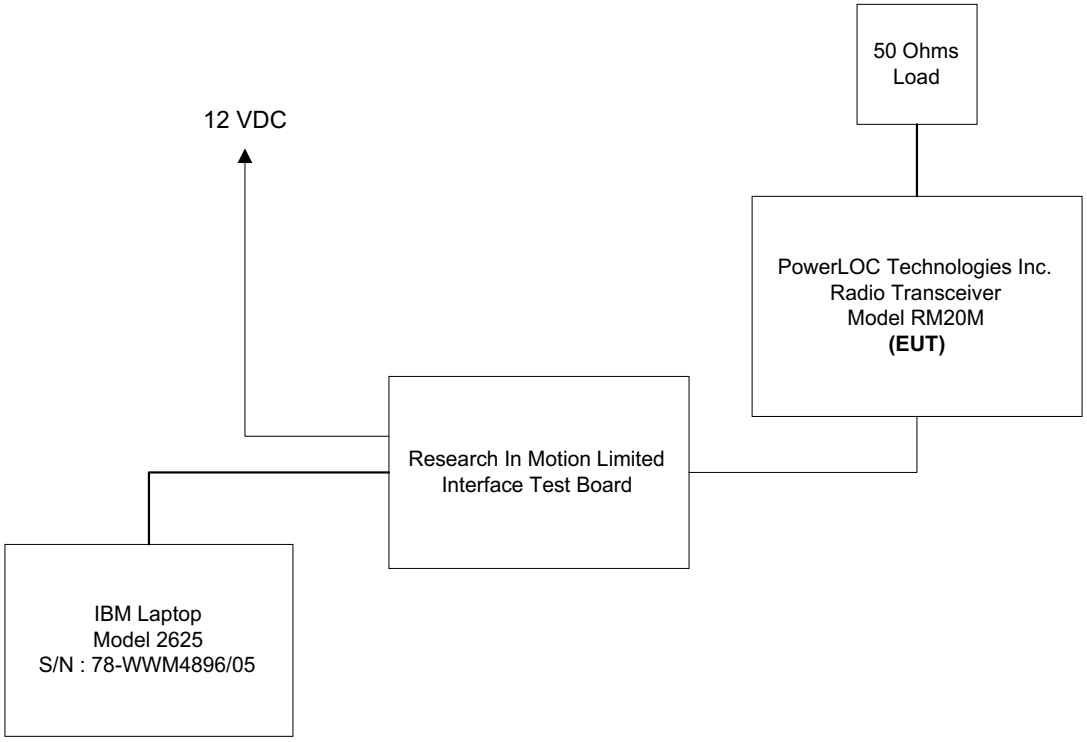
Refer to Exhibit 8, section 8.1 of this report and ANSI C63-4:1992 for radiated emissions test method.

6.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz to 32 GHz with external mixer for frequency above 32 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A	3116A00661	1 GHz to 26.5 GHz
Active Loop Antenna	EMCO	6507	8906-1167	1 kHz – 30 MHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna with Mixer	EMCO	3160-09	1007	18 GHz – 26.5 GHz
Horn Antenna with Mixer	EMCO	3160-10	1001	26.5 GHz – 40 GHz

6.7.4. Test Arrangement

The following drawings show details of the test setup for radiated emissions measurements

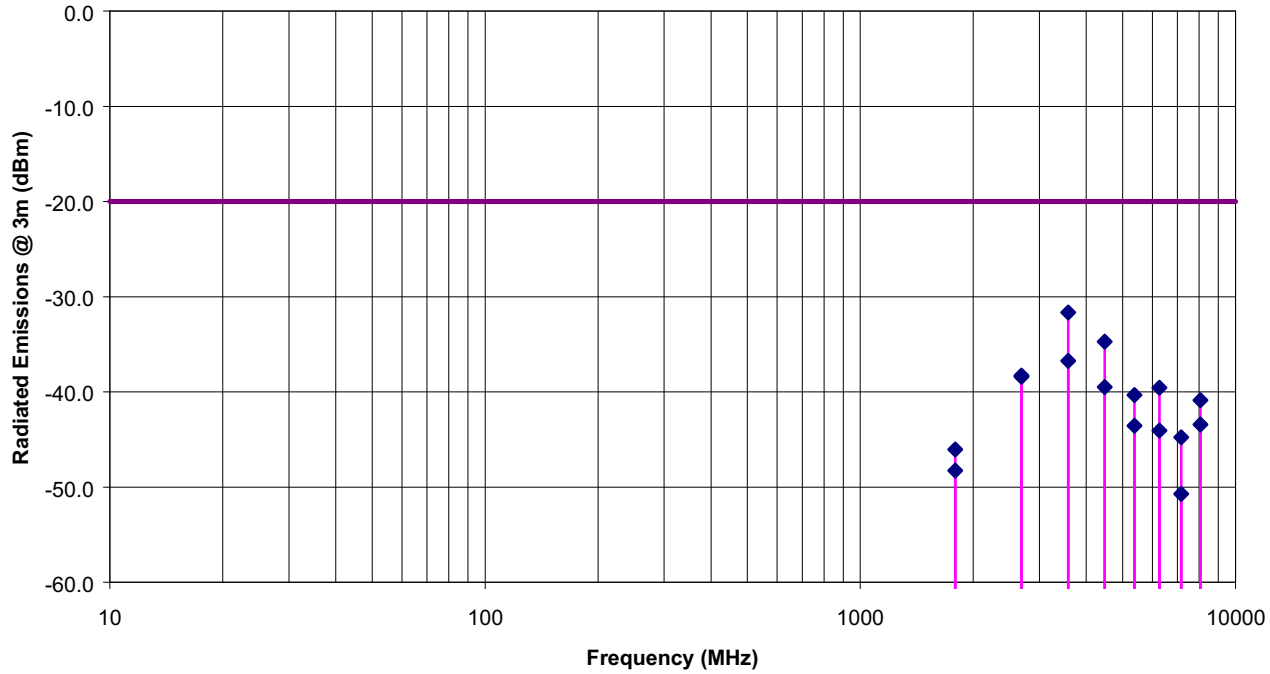


6.7.5. Test Data

6.7.5.1. Near Lowest Frequency (896 MHz)

Fundamental Frequency:	896 MHz						
RF Output Power:	2 Watts						
Frequency (MHz)	RF Field Strength Level (dBµV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBm)	Margin (dB)	Pass/Fail
1792	51.44	-46.1	Peak	V	-20.0	-26.1	Pass
1792	49.22	-48.3	Peak	H	-20.0	-28.3	Pass
2688	59.22	-38.3	Peak	V	-20.0	-18.3	Pass
2688	59.09	-38.4	Peak	H	-20.0	-18.4	Pass
3584	65.83	-31.7	Peak	V	-20.0	-11.7	Pass
3584	60.75	-36.8	Peak	H	-20.0	-16.8	Pass
4480	62.78	-34.7	Peak	V	-20.0	-14.7	Pass
4480	58.00	-39.5	Peak	H	-20.0	-19.5	Pass
5376	57.16	-40.3	Peak	V	-20.0	-20.3	Pass
5376	53.94	-43.6	Peak	H	-20.0	-23.6	Pass
6272	57.95	-39.6	Peak	V	-20.0	-19.6	Pass
6272	53.44	-44.1	Peak	H	-20.0	-24.1	Pass
7168	52.72	-44.8	Peak	V	-20.0	-24.8	Pass
7168	46.78	-50.7	Peak	H	-20.0	-30.7	Pass
8064	56.63	-40.9	Peak	V	-20.0	-20.9	Pass
8064	54.06	-43.4	Peak	H	-20.0	-23.4	Pass
The emissions were scanned from 10 MHz to 10 GHz and all emissions within 35 dB below the limits were recorded.							

Transmitter Spurious/Harmonic Radiated Emissions Measurements at 3 Meters OFTS
Radio Transceiver, Model RM20M
Transmitter Carrier at 896 MHz



6.7.5.2. Near Highest Frequency (901 MHz)

Fundamental Frequency:	901 MHz						
RF Output Power:	2 Watts						
Frequency (MHz)	RF Field Strength Level (dBµV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit (dBm)	Margin (dB)	Pass/Fail
1802	49.97	-47.5	Peak	V	-20.0	-27.5	Pass
1802	50.03	-47.5	Peak	H	-20.0	-27.5	Pass
2703	58.78	-38.7	Peak	V	-20.0	-18.7	Pass
2703	59.53	-38.0	Peak	H	-20.0	-18.0	Pass
3604	64.03	-33.5	Peak	V	-20.0	-13.5	Pass
3604	60.22	-37.3	Peak	H	-20.0	-17.3	Pass
4505	62.22	-35.3	Peak	V	-20.0	-15.3	Pass
4505	59.16	-38.3	Peak	H	-20.0	-18.3	Pass
5406	52.13	-45.4	Peak	V	-20.0	-25.4	Pass
5406	49.44	-48.1	Peak	H	-20.0	-28.1	Pass
6307	53.66	-43.8	Peak	V	-20.0	-23.8	Pass
6307	50.19	-47.3	Peak	H	-20.0	-27.3	Pass
7208	52.55	-45.0	Peak	V	-20.0	-25.0	Pass
7208	50.25	-47.3	Peak	H	-20.0	-27.3	Pass
8109	56.81	-40.7	Peak	V	-20.0	-20.7	Pass
8109	53.63	-43.9	Peak	H	-20.0	-23.9	Pass
The emissions were scanned from 10 MHz to 10 GHz and all emissions within 35 dB below the limits were recorded.							

Transmitter Spurious/Harmonic Radiated Emissions Measurements at 3 Meters OFTS
Radio Transceiver, Model RM20M
Transmitter Carrier at 901 MHz

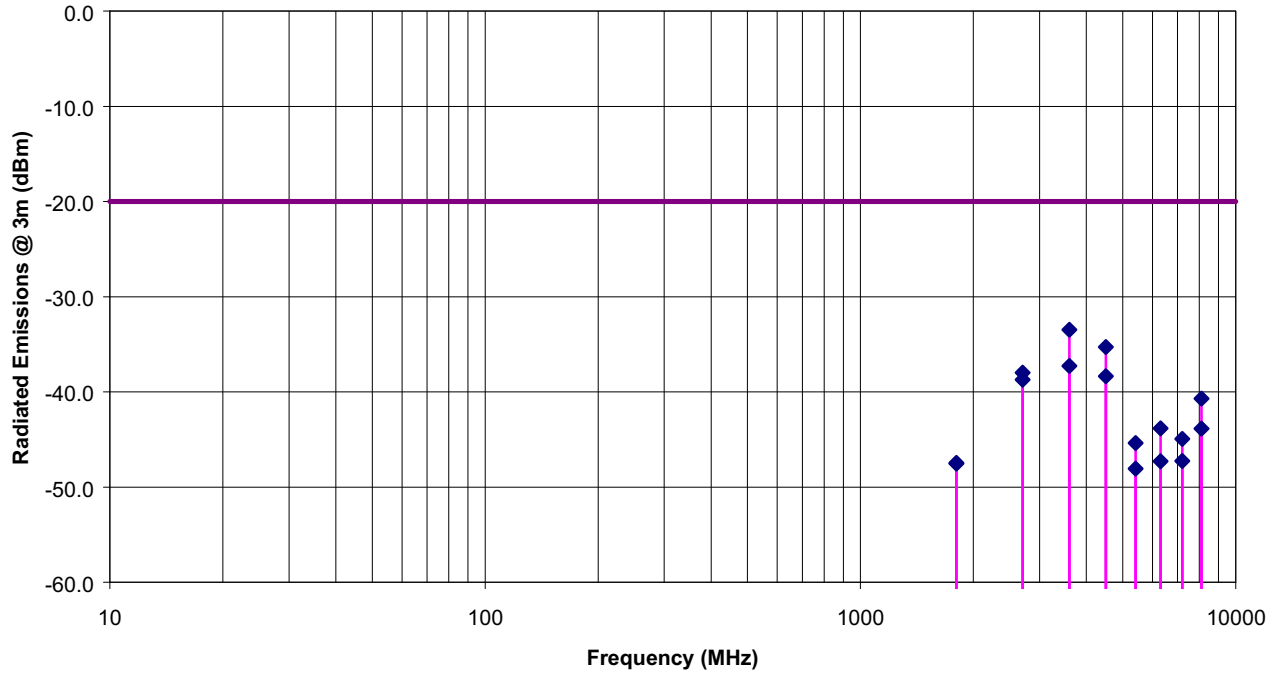


EXHIBIT 7. MEASUREMENT UNCERTAINTY

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. SPURIOUS EMISSIONS (RADIATED)

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 Spectrum Analyzer controls set as RBW = 100 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. 2.1053 - Field Strength Spurious Emissions

(a) Measurements was made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 1 GHz , an Open Field Test is normally required, with the measuring instrument antenna located in the far field at all test frequencies. In event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
(2) All equipment operating on frequencies higher than 25 MHz
(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
(4) Other types of equipment as required, when deemed necessary by the Commission.

Maximizing RF Emission Level:

(a) The measurements was performed with standard 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) The spectrum analyzer was tuned to transmitter carrier frequency. The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.

(f) The transmitter was rotated through 360° about a vertical axis until a higher maximum signal was received.
(g) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(h) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(i) The field strength level measured at 3m is converted to the power in dBm by subtracting a constant factor of 97.5 dB

METHOD OF CALCULATION FOR TRANSMITTED POWER (P) FROM THE MEASURED FIELD STRENGTH LEVEL (E) :

According to IEC 801-3, the power density can be calculated as follows:

$S = P / (4xPIxD^2)$ Where: S: Power density in watts per square feet
P: Transmitted power in watts
PI: 3.14159
D: Distance in meters

The power density S (W/m^2) and electric field E (V/m) is related by:

$S = E^2/(120xPI)$

Accordingly, the field intensity of isotropic radiator in free space can be expressed as follows:

$E = (30xP)^{1/2}/D = 5.5x(P)^{1/2}/D$

For Halfwave dipole antenna or other antennas correlated to dipole in direction of maximum radiation:

$S = (1.64xP)/(4xPIxD^2)$
$E = (49.2xP)^{1/2}xD = 7.01x(P)^{1/2}/D$

$$P = (ExD/7.01)^2$$

Calculation of transmitted power P (dBm) given a measured field intensity E (dBµV/m):

$P(W) = [E(V/m)xD/7.01]^2$
$P(mW) = P(W)x1000$
=> $P(dBm) = 10logP(mW)$
$= 20logE(V/m) + 20log(D) - 20log(7.01) + 10log1000$
$= E(dBV/m) + 20logD + 13$
$= E(dBµV/m) - 120 + 20log(D) + 13$
$= E(dBµV/m) + 20log(D) – 107$

The Transmitted Power @ D = 3 Meters

P(dBm) = E(dBµV/m) - 97.5

EXHIBIT 9. TEST SETUP PHOTOS

Refer to attached test setup photos.

EXHIBIT 10. EXTERNAL EUT PHOTOS

Refer to attached external EUT photos

EXHIBIT 11. INTERNAL EUT PHOTOS

Refer to attached internal EUT photos.

EXHIBIT 12. COVER LETTERS

Refer to attached cover letters.

EXHIBIT 13. ID LABEL/LOCATION INFO

Refer to attached FCC ID label and location information.

EXHIBIT 14. USER'S MANUAL

Refer to attached user's manual.