ENGINEERING TEST REPORT

BT-GPRS-S Modem
Model No.: BT-GPRS-S
FCC ID: QWV-BTGPRS

Applicant: **Blue Tree Wireless Data Inc.**
2405, 46th Avenue
Ville Lachine, Quebec
Canada, H8T 3C9

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, Parts 2, 22 (Subpart H) and 24 (Subpart E)
Radio Services in 824 - 849 MHz (Cellular) and 1850 - 1910 MHz (PCS)

UltraTech's File No.: BLT-003FCC22-24

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

Date: Feb. 13, 2003

Report Prepared by: Tri Luu, P.Eng.	Tested by: Hung Trinh, RFI Technician
Issued Date: Feb. 13, 2003	Test Dates: Feb. 10-11, 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.

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EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Quality Check (OK)
-	Test Reports	OK
1	Test Setup Photos	OK
2	External Photos of EUT	OK
3	Internal Photos of EUT	OK
4	Cover Letters	OK
5	Attestation Statements	OK
6	ID Label/Location Info	OK
7	Block Diagrams	Be submitted directly by RIM
8	Schematic Diagrams	Be submitted directly by RIM
9	Parts List/Tune Up Info	Be submitted directly by RIM
10	Operational Description	Be submitted directly by RIM
11	RF Exposure Info	OK
12	Users Manual	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2, 22 (Subpart H) and 24 (Subpart E)
Title	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2, 22 & 24
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency band 824 - 849 MHz (Cellular) and 1850 - 1910 MHz (PCS).
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.
Grant Notes:	Antenna is not to exceed 5.15 dBi. This device must be used in mobile configurations. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and Installers must be provided with antenna installation instruction and transmitter operating conditions for satisfying RF exposure compliance.

2.2. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 2 and 24	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		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	Blue Tree Wireless Data Inc.
Address:	2405, 46th Avenue Ville Lachine, Quebec Canada, H8T 3C9
Contact Person:	Mr. Ziad Nader Phone #: 514-422-9110 Fax #: 514-422-3338 Email Address: znader@bluetreewireless.com

MANUFACTURER	
Name:	Blue Tree Wireless Data Inc.
Address:	2405, 46th Avenue Ville Lachine, Quebec Canada, H8T 3C9
Contact Person:	Mr. Ziad Nader Phone #: 514-422-9110 Fax #: 514-422-3338 Email Address: znader@bluetreewireless.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:	Blue Tree Wireless Data Inc.
Product Name:	BT-GPRS-S Modem
Model Name or Number:	BT-GPRS-S
Serial Number:	Pre-production
Type of Equipment:	GSM Mobile Wireless Modem
External Power Supply:	N/A
Transmitting/Receiving Antenna Type:	Non-integral
Primary User Functions of EUT:	Radio-communication link through air

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Power Supply Requirement:	12 Vdc nominal
Conducted RF Output Power Ratings:	0.676 Watts for 824-849 MHz Band 0.394 Watts for 1850-1910 MHz Band
EIRP Ratings:	2.24 Watts for 824-849 MHz Band 1.41 Watts for 1850-1910 MHz Band
Operating Frequency Range:	824 - 849 MHz (Cellular) 1850 - 1910 MHz (PCS)
RF Output Impedance:	50 Ohms
Occupied Bandwidth (99%):	245 MHz for both 824-849 MHz and 1850-1910 MHz bands
Modulation:	GSM
Emission Designation:	247KGXW for 824-849 MHz 245KGXW for 1850-1910 MHz bands
Digital Oscillator Frequencies:	Please refer to RIM's test report and block diagrams
Radio Oscillator Frequencies:	Please refer to RIM's test report and block diagrams
Antenna Connector Type:	TNC
Antenna Description:	Any antenna with gain less than 5.15 dBi as per FCC original Grant Limit for the RIM 1902G/1902GS Modular Transmitter, FCC ID: L6AR6420GN

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	RS-232 Remote Control Ports	2	DB9	Shielded
2	RF Input/Output {Port	1	TNC	Shielded
3	DC Input Port	1	Terminal Block	Non-shielded wireleads

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:	Wavetek 4202S GSM Test Set
Brand name:	Wavetek
Model Name or Number:	4201S
Serial Number:	0113091
Cable Length & Type:	Shielded coaxial
Connected to EUT's Port:	RF In/Out Port

Ancillary Equipment # 2	
Description:	Toshiba Laptop Computer
Brand name:	Toshiba
Model Name or Number:	PAS403CA
Serial Number:	59016072
Cable Length & Type:	Shielded
Connected to EUT's Port:	RS-232 (COM1)

3.6. DRAWING OF TEST SETUP

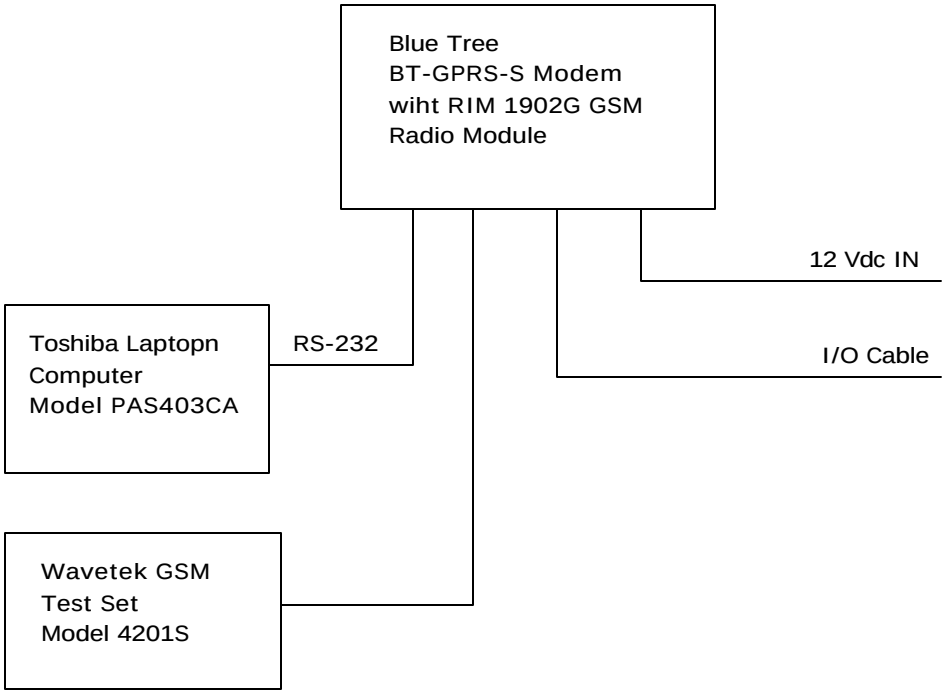


EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

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 nominal

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the GSM modulation.
Special Test Software:	Microsoft hyper terminal software
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	
Frequency Band(s): 824 - 849 MHz: 1850 – 1910 MHz:	Near lowest, near middle & near highest frequencies each frequency bands that the transmitter covers: 824.2, 837.6 & 848.8 MHz 1850.2 MHz, 1880.0 MHz and 1909.8 MHz
Transmitter Wanted Output Test Signals: Conducted RF Power Output (measured maximum output power): Normal Test Modulation: Modulating signal source:	 0.676 Watts for 824-849 MHz Band 0.394 Watts for 1850-1910 MHz Band GSM 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: Aug. 10, 2002.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

Remarks:

The Model BT-GPRS-S Modem employs a GPRS OEM Radio Module, Model 1902G/1902GS, by Research in Motion (RIM). This modular transmitter has already bee certified by FCC, FCC ID: L6AR6420GN, as a modular transmitter with antenna gain less than 5.15 dBi and antenna separation distance of at least 20 cm. However, RIM does not allow their clients to use their FCC ID as per FCC Rules for Modular Approved Transmitter; therefore, this application is made for a new FCC Grant under Blue Tree Wireless Data Inc.

Since there is no change in the RIM 1902G/1902GS modular transmitter as well as its power rating, the rf output power measurements and transmitter radiated emissions measurements to ensure continuing compliance with FCC Parts 22 & 24 when RIM 1902G/1902GS modem is installed inside another enclosure. All other conducted tests per FCC Parts 22 and 24 are3 referred to RIM's test report.

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
22.913 & 2.1046	RF Power Output	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
22.101(a) & 2.1055	Frequency Stability	Refer to RIM's test report
22.915(d) & 2.1047(a)	Audio Frequency Response	N/A
22.915(a), (b) & (c) & 2.1047(b)	Modulation Limiting	Refer to RIM's test report
22.917(a),(b),(c) & (d) & 2.1049	Emission Limitation & Emission Mask	Refer to RIM's test report
22.917(e), (f) & (g), 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Refer to RIM's test report
22.917(e), (f) & (g), 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
24.229	Frequencies	Refer to RIM's test report
24.232 & 2.1046	Effective Radiated Power (ERP) Limits	Yes
24.235 & 2.1055	Frequency Stability	Refer to RIM's test report
24.238 & 2.1051	Emission Limits (Conducted)	Refer to RIM's test report
24.236 & 24.238, 2.1057 & 2.1053	Emission Limits (Radiated)	Yes

BT-GPRS-S Modem, Model No.: BT-GPRS-S, by **Blue Tree Wireless Data 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 anytime upon FCC request.

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 MANUACTURER:

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

6.5. RF POWER OUTPUT AND EIRP @ FCC §2.1046, 22.913 & 24.232

6.5.1. Limits

FCC 22.913:- The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section:

	Maximum ERP (Watts)
Base Transmitters (869-894 MHz)	500 Watts
Mobile Transmitters & Auxiliary TestTransmitters (824-849 MHz)	7 Watts or 38.5 dBm

FCC 24.232:- The equivalent isotropic radiated power (EIRP) of transmitters in the Personal Communications Services must not exceed the limits in this section:

	Maximum Peak ERP (Watts)	**Antenna Height**
Base Transmitters (1930-1975 MHz)	1640 Watts ….	300 meters ….
Portable & Mobile Transmitters & Auxiliary Test Transmitters (1850-1910 MHz)	2 Watts or 33 dBm	N/A

6.5.2. Method of Measurements

Please refer to Exhibit 8, § 8.1 (Conducted) and § 8.2 (Radiated) for test procedures and test setup.

6.5.3. Test Equipment List

Test Instruments	**Manufacturer**	**Model No.**	**Serial No.**	**Frequency Range**
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz
Synthesize Sweeper	Hewlett Packard	83752B	3610A00457	0.01 – 20 GHz
RF Power Amplifier	OPHIR	GRF5058	1009	0.8-4.2 GHz, 41 dB gain, 13W max.

6.5.4. Test Data

6.5.4.1. PEAK POWER MEASUREMENTS

Transmitter Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)	Antenna Gain Limit (dBi)	Maximum EIRP (dBm)	EIRP Limit (dBm)
Operation in 824 - 849 MHz Band					
Lowest	824.2	28.3	5.15	33.5	38.5
Middle	837.6	28.1	5.15	33.3	38.5
Highest	848.8	27.9	5.15	33.1	38.5
Operation in 1850 - 1910 MHz Band					
Lowest	1850.2	26.0	5.15	31.2	33.0
Middle	1880.0	25.0	5.15	30.2	33.0
Highest	1909.8	24.8	5.15	30.0	33.0

6.6. RF EXPOSURE REQUIRMENTS @ 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
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	...	...	F/1500	6

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)

- Spread spectrum transmitters operating under section 15.247 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits. These devices are not exempted from compliance (As indicated in Section 15.247(b)(4), these transmitters are required to operate in a manner that ensures that exposure to public users and nearby persons) does not exceed the Commission's RF exposure guidelines (see Section 1.1307 and 2.1093). Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

- 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 (professional/unskilled users), 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

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

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

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

- For portable transmitters (see Section 2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones., an SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that an SAR evaluation be performed, as provided for in Section 1.1307(d)

6.6.3. Test Data

Antenna Gain Limit specified by Manufactuer: 5.15 dBi dBi

Channel Frequency wrt. Maximum rf conducted power (MHz)	Maximum Measured RF Conducted within the band (dBm)	Calculated Maximum EIRP (dBm)	Laboratory's Recommended Minimum RF Safety Distance r General Population/Uncontrolled Exposure
824.2	28.3	33.5	18 cm
1850.2	26.0	31.2	5 cm

Note 1: **RF EXPOSURE DISTANCE LIMITS:** $r = (PG/4\pi S)^{1/2} = (EIRP/4\pi S)^{1/2}$

$S = f/1500 = 824.2/1500 = 0.549$ mW/cm^2

$S = f/1500 = 1850.2/1500 = 1.23$ 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: 18 cm	Manufacturer' instruction for separation distance between antenna and persons required: 20 cm.

Grant Notes: Antenna is not to exceed 5.15 dBi. This device must be used in mobile configurations. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Users and Installers must be provided with antenna installation instruction and transmitter operating conditions for satisfying RF exposure compliance

6.7. EMISSION LIMITS (RADIATED) @ FCC 2.1049, 22.917, 24.236 & 24.238

6.7.1. Limits

FCC 22.917:-

FCC RULES	ATTENUATION LIMIT
FCC 22.917(e)	43+10*log(P) dBc, P is power in watts
FCC 22.917(f) for Mobile emissions	Mean power in 869-894 MHz band shall be less than –80 dBm
FCC 22.917(g)	If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

FCC 24.236 & 24.238:-

* The predicted or measured field strength at any location on the border of the PCS Service area shall not exceed 47 dBμV/m unless the parties agree to a higher field strength.
* On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43+10lo(P) dB.

6.7.2. 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:

* If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
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

  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)

Measuring Bandwidths:

Outside the permitted band block: RBW = 1 MHz, VBW ≥ RBW
Inside or on the permitted band block: RBW = 1% of -26dBc Bandwidth, VBW ≥ RBW

6.7.3. 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

6.7.4. Photographs of Test Setup

Please refer to Photos # 1 to 2 in Annex 1 for detailed information of the test setup

6.7.5. Test Data

6.7.5.1. 824-849 MHz Band @ 824.2 MHz

Fundamental Frequency:	824.2 MHz
RF Output Power:	29.8 dBm (conducted)
Modulation:	247KGXW

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	EIRP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	**	PEAK	V & H	43.0	**	PASS

** No significant rf emissions were found in the frequency range form 10 MHz to 10 GHz at 3 meters distance

6.7.5.2. Lowest Frequency @ 837.6 MHz

Fundamental Frequency:	837.6 MHz
RF Output Power:	29.6 dBm (conducted)
Modulation:	247KGXW

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	EIRP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	**	PEAK	V & H	43.0	**	PASS

** No significant rf emissions were found in the frequency range form 10 MHz to 10 GHz at 3 meters distance

6.7.5.3. Lowest Frequency @ 848.8 MHz

Fundamental Frequency:	848.8 MHz
RF Output Power:	29.3 dBm (conducted)
Modulation:	247KGXW

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	EIRP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	**	PEAK	V & H	43.0	**	PASS

** No significant rf emissions were found in the frequency range form 10 MHz to 10 GHz at 3 meters distance

6.7.5.4. 824-849 MHz Band @ 1850.2 MHz

Fundamental Frequency:	1850.2 MHz
RF Output Power:	30.8 dBm (conducted)
Modulation:	245KGXW

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	EIRP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	**	PEAK	V & H	43.0	**	PASS

** No significant rf emissions were found in the frequency range form 10 MHz to 20 GHz at 3 meters distance

6.7.5.5. Lowest Frequency @ 837.6 MHz

Fundamental Frequency:	1880.0 MHz
RF Output Power:	29.6 dBm (conducted)
Modulation:	245KGXW

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	EIRP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	**	PEAK	V & H	43.0	**	PASS

** No significant rf emissions were found in the frequency range form 10 MHz to 20 GHz at 3 meters distance

6.7.5.6. Lowest Frequency @ 848.8 MHz

Fundamental Frequency:	1880.0 MHz
RF Output Power:	29.3 dBm (conducted)
Modulation:	245KGXW

FREQUENCY (MHz)	E-FIELD @3m (dBuV/m)	EIRP measured by Substitution Method (dBm)	(dBc)	EMI DETECTOR (Peak/QP)	ANTENNA POLARIZATION (H/V)	LIMIT (dBc)	MARGIN (dB)	PASS/ FAIL
**	**	**	**	PEAK	V & H	43.0	**	PASS

** No significant rf emissions were found in the frequency range form 10 MHz to 20 GHz at 3 meters distance

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 Directivity	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 Ca librated 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.

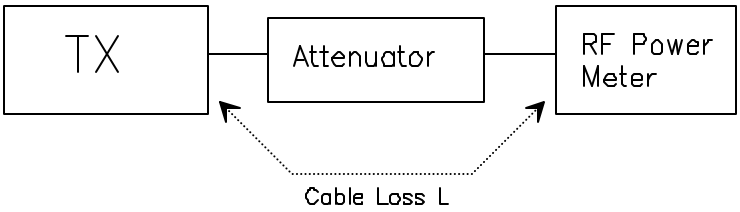
Step 2: Calculation of Average EIRP. See Figure 1

* 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)

* The measurements was performed with full rf output power and modulation.
* Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
* The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
* The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
* 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)

* Set the EMI Receiver #1 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

* The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
* The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
* The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
* The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
* 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.
* Repeat for all different test signal frequencies

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

* 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

* 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)

* Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
* 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 }.
* Mount the transmitting antenna at 1.5 meter high from the ground plane.
* 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 }.
* If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
* Adjust both transmitting and receiving antenna in a VERTICAL polarization.
* Tune the EMI Receivers to the test frequency.
* Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
* The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
* Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
* 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.
* 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

* Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
* Repeat step (d) to (o) for different test frequency
* Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
* 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

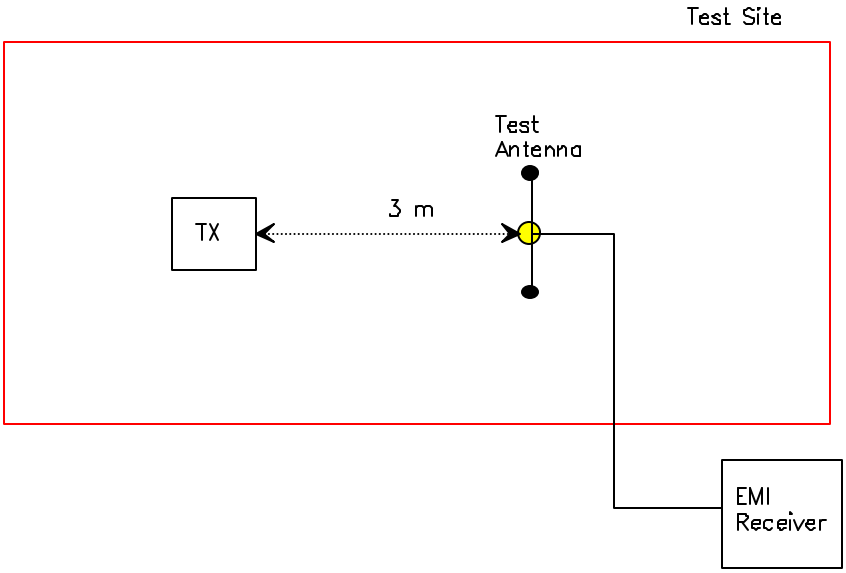
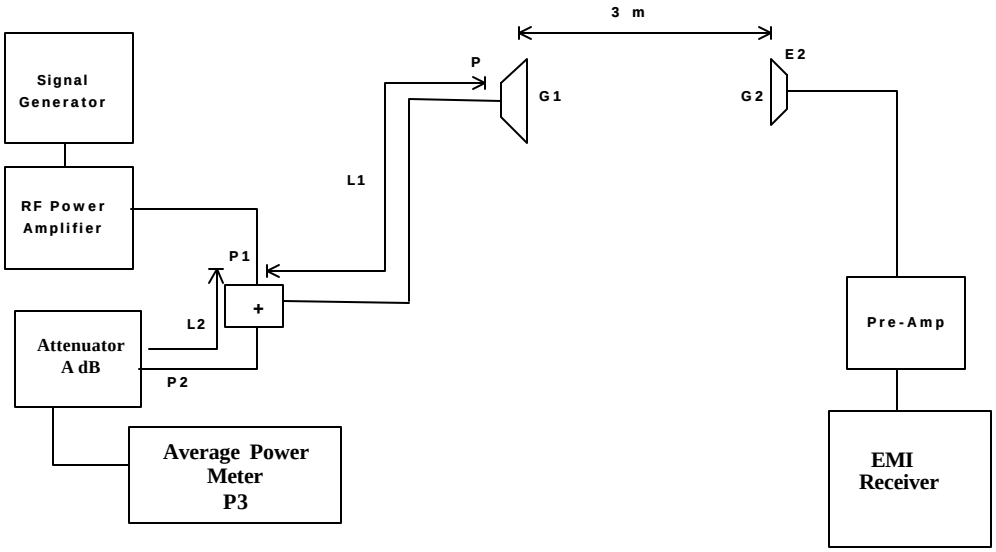


Figure 3



8.3. 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).

8.4. SPURIOUS EMISSIONS & OCCUPIED BANDWIDTH (CONDUCTED)

The transmitter's output was connected to the EMI receiver's input through an attenuator. The spurious and harmonic emissions were measured with the EMI Receiver controls set as follows:

Outside the permitted band block: RBW = 1 MHz, VBW $\geq$ RBW
Inside or on the permitted band block: RBW = 1% of -26dBc Bandwidth, VBW $\geq$ RBW

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.

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.