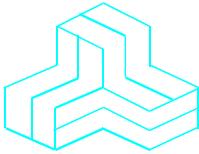


ENGINEERING TEST REPORT



MOBEXCOM DVR Vehicular Repeater Model No.: MOBEXCOM DVRS 800

FCC ID: LO6-DVRS800

Applicant:

Futurecom Systems Group Inc
3277 Langstaff Road
Concord, Ontario
Canada, L4K 5P8

Tested in Accordance With

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

UltraTech's File No.: FSG-080F90

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

Date: June 12, 2008



Report Prepared by: Dharmajit Solanki

Tested by: Mr. Wayne Wu, RFI/EMC Technician

Issued Date: June 12, 2008

Test Dates: May 29, 2008

- 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. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 90 (Subpart S)
Title:	Code of Federal Regulations (CFR) Title 47 Telecommunication, Parts 2 & 90
Purpose of Test:	To obtain FCC Certification Authorization for Radio operating in the frequency bands 806-824 MHz and 851-869 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.

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

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2007	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	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
TIA/EIA 603, Edition C	2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Futurecom Systems Group Inc.
Address:	3277 Langstaff Road Concord, Ontario Canada L4K 5P8
Contact Person:	Mr. Tony Bombera Phone #: 905-660-5548 Ext 225 Fax #: 905-660-1380 Email Address: tonyb@futurecom.com

MANUFACTURER	
Name:	Futurecom Systems Group Inc.
Address:	3277 Langstaff Road Concord, Ontario Canada, L4K 5P8
Contact Person:	Mr. Tony Bombera Phone #: 905-660-5548 Fax #: 905-660-1380 Email Address: tonyb@futurecom.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

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

Brand Name:	Futurecom Systems Group Inc.
Product Name:	MOBEXCOM DVR Vehicular Repeater
Model Name or Number:	MOBEXCOM DVRS 800
Serial Number:	Test Sample
Type of Equipment:	Non-broadcast Radio Communication Equipment
External Power Supply:	None
Transmitting/Receiving Antenna Type:	Non-integral
Operational Description:	The Futurecom MOBEXCOM DVR Vehicular Repeater is designed to interface to a range of mobile radios. It permits expanded operation of portable radios. The MOBEXCOM DVR Vehicular Repeater communicates with the mobile radio using a serial data protocol.

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Mobile
Intended Operating Environment:	<input checked="" type="checkbox"/> Commercial <input checked="" type="checkbox"/> Light Industry & Heavy Industry
Power Supply Requirement:	13.8 Vdc
RF Output Power Rating:	1 to 20 W (programmable per channel)
Operating Frequency Range:	806-824 MHz, 851-869 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	12.5 kHz & 25.0 kHz
Type Of Modulation:	Analog Voice and P25 Digital (voice, data)
Occupied Bandwidth (99%):	<ul style="list-style-type: none"> ▪ 6.54 kHz for 12.5 kHz channel spacing ▪ 10.89 kHz for 25 kHz channel spacing ▪ 7.06 kHz for 12.5 kHz & 25 kHz channel spacing (digital)
Emission Designation*:	<ul style="list-style-type: none"> ▪ 11K0F3E for 12.5 kHz channel spacing (Analog Voice) ▪ 16K0F3E for 25 kHz channel spacing (Analog Voice) ▪ 8K10F1E, 8K10F2E, 8K10F1D & 8K10F2D for 12.5kHz & 25kHz Channel spacing (Digital Voice, Data)
Oscillator Frequencies:	<p>Digital signal frequencies: 32.768 kHz, 16.0 MHz, 29.4912 MHz, 144.0 MHz and 120 MHz</p> <p>Analogue signal frequency: LO1: Rx Freq - 109.65 MHz (Rx), LO2: 107.85 MHz & LO3: Tx Freq + 110.51875 MHz</p> <p>Reference Oscillator: 14.4 MHz</p>
Antenna Connector Type:	TNC female

* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:

For FM Voice Modulation:

Channel Spacing = 12.5 KHz, D = 2.5 KHz max., K = 1, M = 3 KHz
 $B_N = 2M + 2DK = 2(3) + 2(2.5)(1) = \underline{11 \text{ KHz}}$
 emission designation: 11K0F3E

Channel Spacing = 25 KHz, D = 5 KHz max., K = 1, M = 3 KHz
 $B_N = 2M + 2DK = 2(3) + 2(5)(1) = \underline{16 \text{ KHz}}$
 emission designation: 16K0F3E

For P25 Digital Modulation:

Emission Designation: Voice: 8K10F1E, 8K10F2E & Data: 8K10F1D, 8K10F2D

2.3.1. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	DC Input Port	1	6 pin male circular	Non-shielded
2	RF IN/OUT Port	2	TNC female	Shielded
3	AUX Port (RS-232)	1	9 pin male circular	Non-shielded
4	Mobile Radio Port	1	20 pin male circular	Non-shielded
5	USB Port	1	USB	Non-shielded

2.4. ANCILLARY EQUIPMENT

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

None

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	13.8 Vdc

3.2. 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:	Operating software provided by Futurecom for selecting operating channel frequency and power
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):	▪ 806-809 & 809-824 MHz ▪ 851-854 & 854-869 MHz
Transmitter Wanted Output Test Signals:	<ul style="list-style-type: none">▪ Normal Test Modulation: FM Voice & Data▪ Modulating signal source: External

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. 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 10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site 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 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049-1). Last Date of Site Calibration: June 10, 2007.

4.2. SUMMARY OF EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Applicability (Yes/No)
90.635 & 2.1046	RF Power Output	N/A
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	N/A
90.213 & 2.1055	Frequency Stability	Yes
2.1047(a)	Audio Frequency Response	N/A
2.1047(b)	Modulation Limiting	N/A
90.209, 90.210 & 2.1049	99% OBW & Emissions Mask	N/A
90.210, 90.669, 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	N/A
90.210, 90.669, 2.1057 & 2.1051	Emission Limits - Field Strength of Spurious Emissions	N/A
MOBEXCOM DVR Vehicular Repeater, Model No.: MOBEXCOM DVRS 800, by Futurecom Systems Group Inc. has been tested and found to comply with FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices. The engineering test report is kept in file and it is available upon request.		

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None.

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report.

5.2. 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.

5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

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

5.5. FREQUENCY STABILITY [§§ 2.1055 & 90.213]

5.5.1. Limits

Refer to FCC 47 CFR 90.213 for specification details.

Frequency Range	Fixed and Base Stations
(MHz)	(ppm)
806-809/ 851-854	1.0
809-824/854-869	1.5

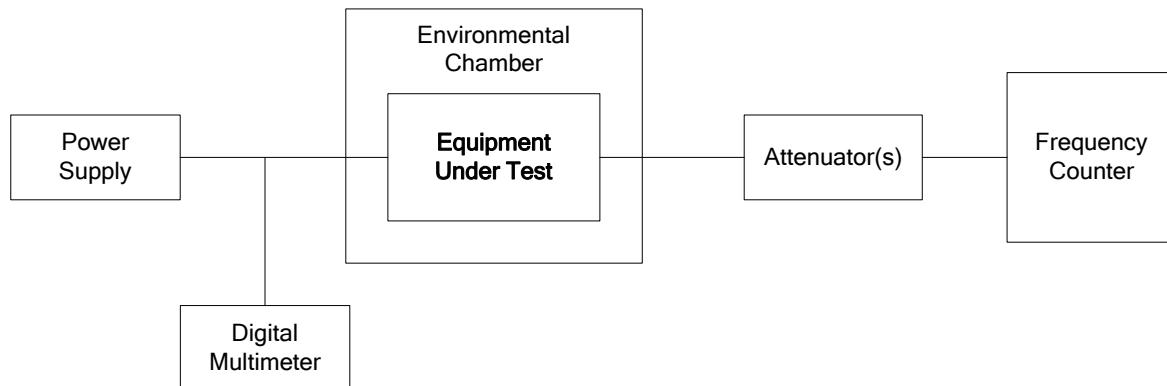
5.5.2. Method of Measurements

Refer to Exhibit 7, Section 7.1 of this report for measurement details.

5.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Frequency Counter	EIP	545A	2683	10 Hz-18 GHz
Attenuator	Weinschel Corp	48-30-34	BM5354	DC-18 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40°C to +60 °C range
Digital Multimeter	Tenma	72-6202	2080027	DC-100 kHz
Power Supply	Tenma	72-6153	--	DC 0-20 V, 0-10A.

5.5.4. Test Arrangement



5.5.5. Test Data

Product Name: Model No.:	MOBEXCOM DVR Vehicular Repeater DVRS 800
Center Frequency:	851 MHz
Full Power Level:	43 dBm
Frequency Tolerance Limit:	1.0 ppm or 806 Hz
Max. Frequency Tolerance Measured:	+207 Hz (0.26 ppm)
Input Voltage Rating:	13.8 Vdc

CENTER FREQUENCY & RF POWER OUTPUT VARIATION			
Ambient Temperature (°C)	Supply Voltage (Nominal) 13.8 Volts	Supply Voltage (85% of Nominal) 11.73 Volts	Supply Voltage (115% of Nominal) 15.87 Volts
	Hz	Hz	Hz
-30	173	n/a	n/a
-20	207	n/a	n/a
-10	187	n/a	n/a
0	82	n/a	n/a
+10	16	n/a	n/a
+20	2	4	4
+30	40	n/a	n/a
+40	42	n/a	n/a
+50	47	n/a	n/a
+60	69	n/a	n/a

EXHIBIT 6. MEASUREMENT UNCERTAINTY

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

6.1. Radiated Emission Measurement Uncertainty

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (\pm 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 $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67(B_i)$ 0.3 (Lp) Uncertainty limits $20\log(1+\Gamma_1\Gamma_R)$	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:

$$U = 2u_c(y) = 2x(+2.19) = +4.38 \text{ dB} \quad \text{And} \quad U = 2u_c(y) = 2x(-2.21) = -4.42 \text{ dB}$$

EXHIBIT 7. MEASUREMENT METHODS

7.1. 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 provided 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).