ENGINEERING TEST REPORT

800 MHz CDMA/AMPS Cellular Phone
Model No.: MX-1111
FCC ID: F3JMX1111

Applicant: **Maxon America Inc.**
10828 NW AirWorld Drive, Suite 218
Kansas, MO
USA, 64153

Tested in Accordance With

Federal Communications Commission (FCC)
CELLULAR RADIOTELEPHONE SERVICE
CFR 47, PARTS 2 and 22 (Subpart H)

UltraTech's File No.: MXA-002F22

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 25, 2000	
Report Prepared by: Mr. Tri M. Luu, P.Eng. Issued Date: July 21, 2000	Tested by: Mr. Hung Trinh, Test Technician Test Dates: June 06 - 08, 2000

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

UltraTech

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TABLE OF CONTENTS

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 OK OK OK OK OK OK OK
9	Test Report - Plots of Measurement Data	Plots # 1 to 13	OK
10	Test Setup Photos	Photos # 1 to 3	OK
11	External Photos of EUT	Photos # 1 to 3	OK
12	Internal Photos of EUT	Photos # 1 to 11	OK
13	Cover Letters	• Letter from Ultratech for Certification Request • Letter from the Applicant to appoint Ultratech to act as an agent	OK OK
14	Attestation Statements	• Manufacturer's Declaration for Equipment Specifications, Installation (if it is professionally installed) and Production Quality Production Assurance. • Manufacturer's Declaration of Conformity (FCC DoC) for compliance with FCC Part 15, Sub. B, Class B - Computing Devices - if required	None None
15	Application Forms	• Form 731 • Form 159 • Confirmation of Exhibits sent to FCC • Status of Exhibits sent to FCC	OK OK OK OK
16	ID Label/Location Info	• ID Label (Exb9a) • Location of ID Label (Exb9b)	OK OK
17	Block Diagrams	• Block diagrams # 1 of 1	OK
18	Schematic Diagrams	• Schematic diagrams # 2 of 2	OK
19	Parts List/Tune Up Info	• Parts list (Exb19a & Exb19b) • Alignment Procedures (Exb19c)	OK OK
20	Operational Description	• Circuit description & Theory of Operation • Product Specification	OK
21	RF Exposure Info	• SAR test report	Comply with SAR tests
22	Users Manual	Users' Manual	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 22 (SubPart 22): 1999
Title	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 22
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency bands 824-849 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.
SPECIAL REMARKS:	This report only contains tests for Analogue and Wideband digital modulations, tests for CDMA mode was performed by Maxon and it was attached into this application in a separate file.

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:	Maxon America Inc.
Address:	10828 NW AirWorld Drive, Suite 218 Kansas, MO USA, 64153
Contact Person:	Mr. Roger Bisby Phone #: 816-891-3434 (721) Fax #: 816-891-8815 Email Address: roger.bisby@maxonusa.com

MANUFACTURER:	
Name:	Maxon America Inc.
Address:	10828 NW Airworld Drive, Suite 218 Kansas, MO USA, 64153
Contact Person:	Mr. Roger Bisby Phone #: 816-891-3434 (721) Fax #: 816-891-8815 Email Address: roger.bisby@maxonusa.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	Maxon America Inc.
Product Name	800 MHz CDMA/AMPS Cellular Phone
Model Name or Number	MX-1111
Serial Number	Pre-production
Type of Equipment	Radio Communication Equipment
External Power Supply	None
Transmitting/Receiving Antenna Type	Integral
Primary User Functions of EUT:	Voice and data communication through air.

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Portable
Intended Operating Environment:	Residential, commercial, light industry & heavy industry
Power Supply Requirement:	3.6 Vdc nominal battery
RF Output Power Rating:	0.5 Watts
Operating Frequency Range:	824-849 MHz
RF Output Impedance:	50 Ohms
Occupied Bandwidth (99%):	20.4 kHz (Audio), 24.9 kHz (SAT), 20.7 kHz (ST), 20 kHz (digital)
Emission Designation*:	26K0F3E (Analogue), 29K6F1D (Digital), 1M5F9W (CDMA)
Antenna Connector Type:	Integral / permanently attached
Antenna Description:	Permanently attached Helical Antenna. The information will be provided upon FCC's request.

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

1. For FM Voice Modulation:

   D = 10 KHz max., K = 1, M = 3 KHz
   B_n = 2M + 2DK = 2(3) + 2(10)(1) = 26 kHz
   Emission designation: 26K0F3E

2. For FM Digital Modulation:

   D = 10 kHz Max., K=1, M = 9.6/2 kb/s
   B_n = 2M + 2DK = 2(9.6/2) + 2(10)(1) = 29.6 kHz
   Emission designation: 29K6F1D

3.4. LIST OF EUT'S PORTS

* RS-232 for technical services only.

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

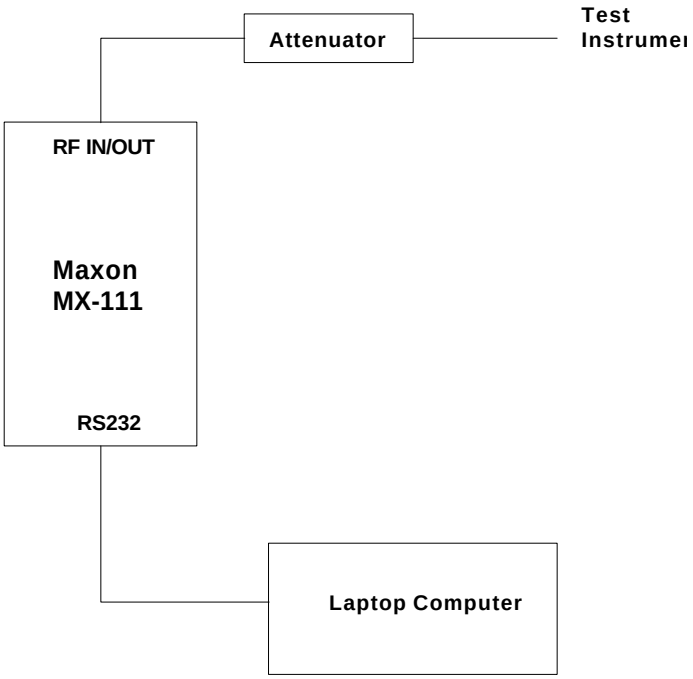
The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Laptop computer
Connected to EUT's Port:	RS-232
Notes:	This PC is only use for changing the EUT's channel frequency and modes of operations for testing purpose.

Ancillary Equipment # 2	
Description:	Digital and Audio In/Out Maxon Test Jig
Connected to EUT's Port:	RSS-232
Notes:	This PC is only use for changing the EUT's channel frequency and modes of operations for testing purpose.

3.9. TEST SETUP (DRAWINGS)

3.9.1. Test Setup for Conducted Measurements



3.9.2. Test Setup for Radiated Measurements

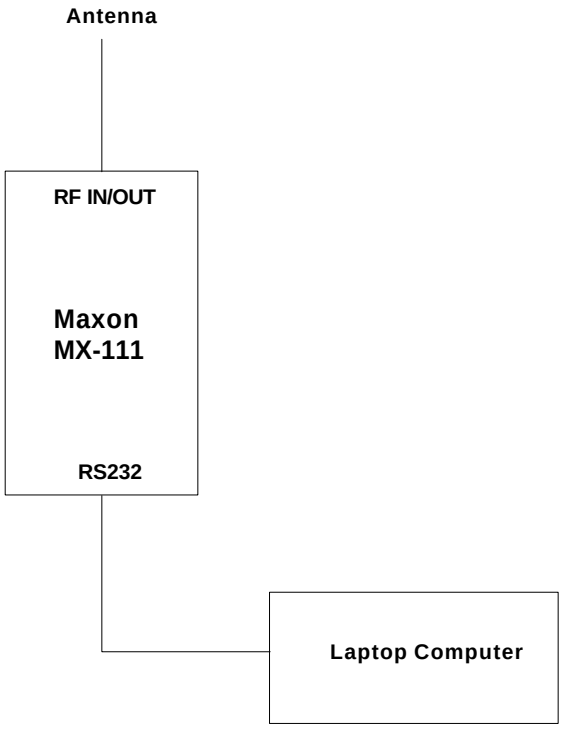


EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

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:	3.6 Vdc nominal battery

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:	Maxon test software is used for changing channel frequency and modes of operation of the EUT
Special Hardware Used:	Special test jig provided by Maxon for modulating signal input
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohm RF Load.

Transmitter Test Signals:	
Frequencies: ▪ 824 – 849 MHz band:	Near lowest, near middle & near highest frequencies each frequency bands that the transmitter covers: 824.975, 836.4951 & 848.944 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 0.5 Watts ▪ FM ▪ external

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: Sep. 20, 1999.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
22.913 & 2.985	Effective Radiated Power LIMITS	Yes
??? & 2.995	Frequency Stability	Yes
22.915(d) & 2.987(a)	Audio Filter Characteristics	Yes
22.915 (a), (b) & (c) & 2.987(b)	Modulation Requirements	Yes
22.917(a),(b),(c)& 9(d) & 2.989	Emission Limitation/Emission Masks	Yes
22.917(e), (f) & (g), 2.997 & 2.991	Emission Limits – Spurious Emissions at Antenna Terminal	Yes
22.917(e), (f) & (g), 2.997 & 2.993	Emission Limits - Field Strength of Spurious Emissions	Yes

800 MHz CDMA/AMPS Cellular Phone, **Model No.: MX-1111**, by **Maxon America Inc.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class B 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 7 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 6 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. EFFECTIVE RADIATED POWER LIMITS @ FCC 2.985 & 22.913

6.5.1. Limits @ FCC 22.913

The effective radiated power (EIRP) 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

6.5.2. Method of Measurements

Please refer to Exhibit 8, Sec. 8.1 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	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Dipole Antenna	EMCO	3121C	8907-434	20-1000 MHz
Dipole Antenna	EMCO	3121C	8907-440	20-1000 MHz

6.5.4. Test Data

TRANSMITTER CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	MEASURED AVERAGE POWER (P) (dBm)	AVERAGE POWER RATING (dBm)	Maximum Allowable EIRP (dBm)	Calculated Maximum Allowable Antenna Gain (dBi)
Lowest	824.9750	27.0	27.0	38.5	Nil
Middle	836.4951	26.6	27.0	38.5	Nil
Highest	848.9440	24.8	27.0	38.5	Nil
Note: None					

6.6. FREQUENCY STABILITY @ FCC 2.995 & 22.101(A)

6.6.1. Limits

Please refer to FCC CFR 47, Part 22, Subpart H, Sec. 101(a)

FREQUENCY RANGE (MHz)	FREQUENCY TOLERANCE (ppm)
824-849 (Mobile)	±1.5
869-894 (base)	±2.5

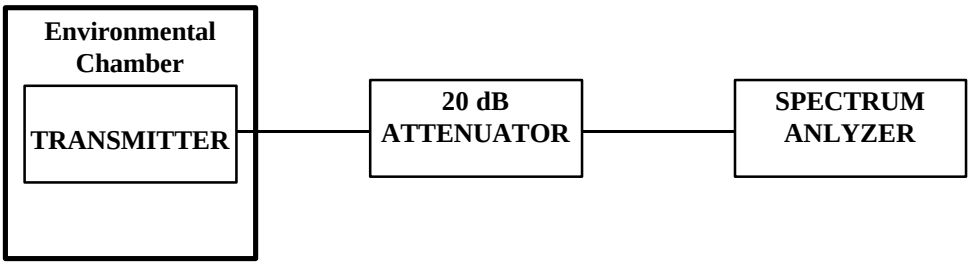
6.6.2. Method of Measurements

Refer to FCC @ 2.995 and Exhibit 8, Sec. 8.2 of this report for detailed test procedures.

6.6.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Temperature & Humidity Chamber	Tenney	T5	9723B	-40° to +60° C range

6.6.4. Test Arrangement



6.6.5. Test Data

Frequency Band	824 – 849 MHz
Center Frequency	824 MHz
Full Power Level	0.5 Watts or 27 dBm
Frequency Tolerance Limit	1.5ppm or 1236 Hz
Max. Frequency Tolerance Measured	890 Hz or 1.1 ppm
Input Voltage Rating	3.6 Vdc nominal

		CENTER FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (°C)	**KEYED-ON TIME (Minutes)**	**Supply Voltage (Nominal) 3.6 Volts**		**Supply Voltage (85% of Nominal) 3.06 Volts**		**Supply Voltage (115% of Nominal) 4.14 Volts**	
		Hz	**dB**	**Hz**	**dB**	**Hz**	**dB**
-30	0	-570	N/A	N/A	N/A	N/A	N/A
	1	-550	N/A	N/A	N/A	N/A	N/A
	2	-460	N/A	N/A	N/A	N/A	N/A
	3	-400	N/A	N/A	N/A	N/A	N/A
	4	-370	N/A	N/A	N/A	N/A	N/A
	5	-370	N/A	N/A	N/A	N/A	N/A
	6	-350	N/A	N/A	N/A	N/A	N/A
	7	-400	N/A	N/A	N/A	N/A	N/A
	8	-370	N/A	N/A	N/A	N/A	N/A
	9	-370	N/A	N/A	N/A	N/A	N/A
	10	-370	N/A	N/A	N/A	N/A	N/A
-20	0	-890	N/A	N/A	N/A	N/A	N/A
	1	-860	N/A	N/A	N/A	N/A	N/A
	2	-830	N/A	N/A	N/A	N/A	N/A
	3	-830	N/A	N/A	N/A	N/A	N/A
	4	-830	N/A	N/A	N/A	N/A	N/A
	5	-800	N/A	N/A	N/A	N/A	N/A
	6	-770	N/A	N/A	N/A	N/A	N/A
	7	-770	N/A	N/A	N/A	N/A	N/A
	8	-770	N/A	N/A	N/A	N/A	N/A
	9	-750	N/A	N/A	N/A	N/A	N/A
	10	-750	N/A	N/A	N/A	N/A	N/A

Continued …

		CENTER FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP.	KEYED-ON TIME	Supply Voltage (Nominal) 3.6 Volts		Supply Voltage (85% of Nominal) 3.06 Volts		Supply Voltage (115% of Nominal) 4.14 Volts	
(^{o}C)	(Minutes)	Hz	dB	Hz	dB	Hz	dB
-10	0	-350	N/A	N/A	N/A	N/A	N/A
	1	-370	N/A	N/A	N/A	N/A	N/A
	2	-370	N/A	N/A	N/A	N/A	N/A
	3	-370	N/A	N/A	N/A	N/A	N/A
	4	-350	N/A	N/A	N/A	N/A	N/A
	5	-370	N/A	N/A	N/A	N/A	N/A
	6	-370	N/A	N/A	N/A	N/A	N/A
	7	-370	N/A	N/A	N/A	N/A	N/A
	8	-370	N/A	N/A	N/A	N/A	N/A
	9	-370	N/A	N/A	N/A	N/A	N/A
	10	-370	N/A	N/A	N/A	N/A	N/A
0	0	-400	N/A	N/A	N/A	N/A	N/A
	1	-400	N/A	N/A	N/A	N/A	N/A
	2	-400	N/A	N/A	N/A	N/A	N/A
	3	-370	N/A	N/A	N/A	N/A	N/A
	4	-400	N/A	N/A	N/A	N/A	N/A
	5	-370	N/A	N/A	N/A	N/A	N/A
	6	-370	N/A	N/A	N/A	N/A	N/A
	7	-370	N/A	N/A	N/A	N/A	N/A
	8	-370	N/A	N/A	N/A	N/A	N/A
	9	-370	N/A	N/A	N/A	N/A	N/A
	10	-350	N/A	N/A	N/A	N/A	N/A
+10	0	-60	N/A	N/A	N/A	N/A	N/A
	1	-60	N/A	N/A	N/A	N/A	N/A
	2	-60	N/A	N/A	N/A	N/A	N/A
	3	-30	N/A	N/A	N/A	N/A	N/A
	4	-60	N/A	N/A	N/A	N/A	N/A
	5	0	N/A	N/A	N/A	N/A	N/A
	6	0	N/A	N/A	N/A	N/A	N/A
	7	0	N/A	N/A	N/A	N/A	N/A
	8	0	N/A	N/A	N/A	N/A	N/A
	9	0	N/A	N/A	N/A	N/A	N/A
	10	0	N/A	N/A	N/A	N/A	N/A
+20	0	+30	0	Transmitter	Transmitter	50	+0.2
	1	+50	0	Went of	went of	50	+0.2
	2	+50	0	at this low	at this low	50	+0.3
	3	+50	0	Voltage	Voltage	80	+0.2
	4	+50	0	Supply	Supply	50	+0.4
	5	+80	0			30	+0.2
	6	+30	0			50	+0.2
	7	+50	0			50	+0.2
	8	+50	0			80	+0.2
	9	+50	0			50	+0.3

	10	+50	0			50	+0.2

		CENTER FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (^{o}C)	KEYED-ON TIME (Minutes)	Supply Voltage (Nominal) 3.6 Volts		Supply Voltage (85% of Nominal) 3.06 Volts		Supply Voltage (115% of Nominal) 4.14 Volts	
		Hz	dB	Hz	dB	Hz	DB
+30	0	+110	N/A	N/A	N/A	N/A	N/A
	1	+80	N/A	N/A	N/A	N/A	N/A
	2	+80	N/A	N/A	N/A	N/A	N/A
	3	+80	N/A	N/A	N/A	N/A	N/A
	4	+50	N/A	N/A	N/A	N/A	N/A
	5	+50	N/A	N/A	N/A	N/A	N/A
	6	+50	N/A	N/A	N/A	N/A	N/A
	7	+50	N/A	N/A	N/A	N/A	N/A
	8	+30	N/A	N/A	N/A	N/A	N/A
	9	+50	N/A	N/A	N/A	N/A	N/A
	10	+30	N/A	N/A	N/A	N/A	N/A
+40	0	-30	N/A	N/A	N/A	N/A	N/A
	1	-30	N/A	N/A	N/A	N/A	N/A
	2	-30	N/A	N/A	N/A	N/A	N/A
	3	-30	N/A	N/A	N/A	N/A	N/A
	4	-30	N/A	N/A	N/A	N/A	N/A
	5	-30	N/A	N/A	N/A	N/A	N/A
	6	-30	N/A	N/A	N/A	N/A	N/A
	7	-30	N/A	N/A	N/A	N/A	N/A
	8	-30	N/A	N/A	N/A	N/A	N/A
	9	-30	N/A	N/A	N/A	N/A	N/A
	10	-30	N/A	N/A	N/A	N/A	N/A
+50	0	-30	N/A	N/A	N/A	N/A	N/A
	1	-120	N/A	N/A	N/A	N/A	N/A
	2	-150	N/A	N/A	N/A	N/A	N/A
	3	-150	N/A	N/A	N/A	N/A	N/A
	4	-150	N/A	N/A	N/A	N/A	N/A
	5	-150	N/A	N/A	N/A	N/A	N/A
	6	-150	N/A	N/A	N/A	N/A	N/A
	7	-150	N/A	N/A	N/A	N/A	N/A
	8	-150	N/A	N/A	N/A	N/A	N/A
	9	-170	N/A	N/A	N/A	N/A	N/A
	10	-170	N/A	N/A	N/A	N/A	N/A

6.7. AUDIO FILTER CHARACTERISTICS @ FCC 2.987(A) & 22.915(D)

6.7.1. Limits @ 22.915(d)

Radiotelephony signals applied to the modulator from the modulation limiter must be attenuated as a function of frequency as specified in this paragraph.

For mobile stations, these signal must be attenuated, relative to the level at 1 kHz, as follows:

Frequency Ranges	Attenuation (dB) wrt. 1 kHz
3.0 - 5.9 kHz	40*log(f/3), f in kHz
5.9 - 6.1 kHz	35
6.1 - 15.0 kHz	40*log(f/3), f in kHz
Above 15 kHz	20 dB

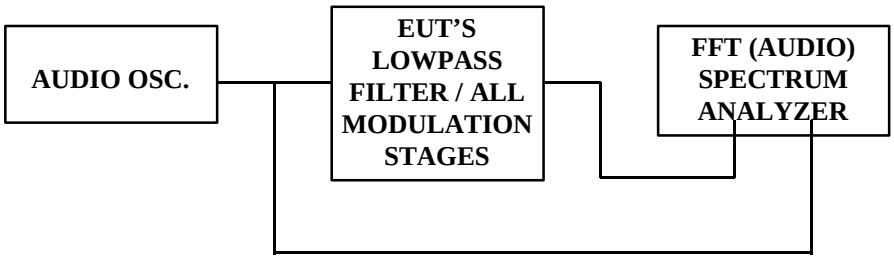
6.7.2. Method of Measurements

The rated audio input signal was applied to the input of the audio lowpass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT (Audio) spectrum analyzer. Tests were repeated at different audio signal frequencies from 0 to 50 kHz.

6.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
FFT (audio) Spectrum Analyzer	Advantest	R9211E	…	10 mHz – 100 kHz, 1 MHz Input Impedance
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz

6.7.4. Test Arrangement



6.7.5. Test Data

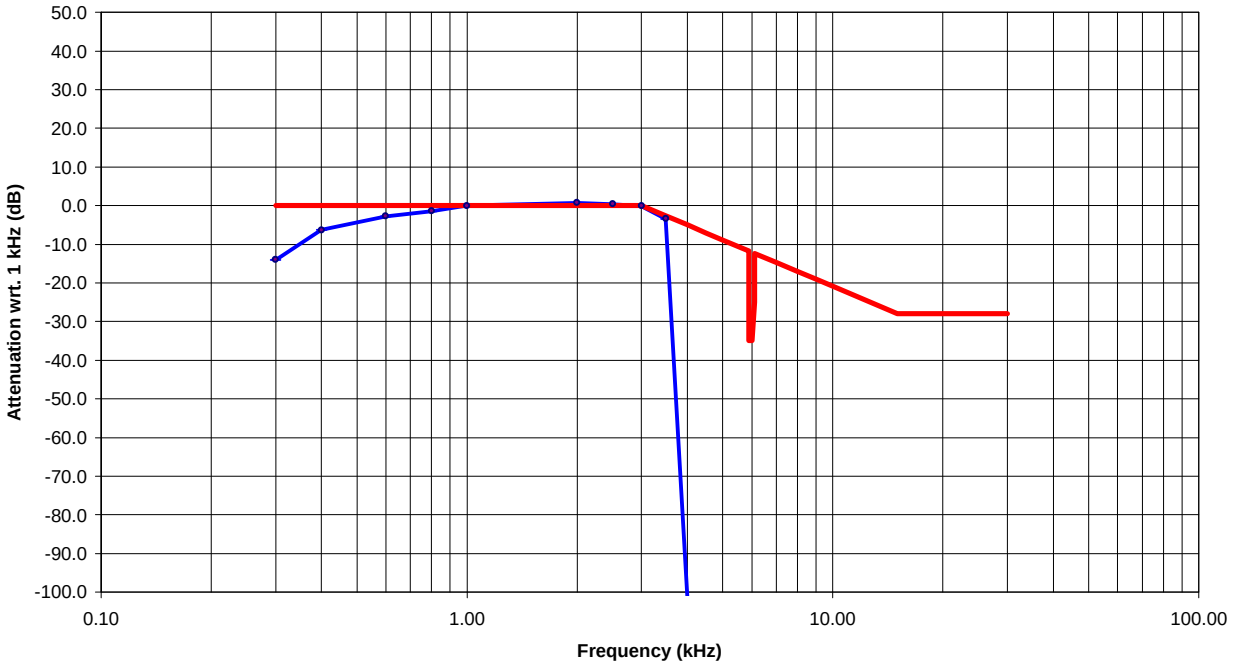
AUDIO FILTER CHARACTERISTICS OF A LOW PASS FILTER / ALL MODULATION STATES

FREQUENCY (kHz)	AUDIO IN (dBV)	AUDIO OUT (dBV)	ATTEN. (OUT - IN) (dB)	ATTEN. wrt. 1 kHz (dB)	FCC LIMIT @22.915D (dB)	PASS/ FAIL
0.30	-10.3	-12.6	-2.3	-14.0	0	PASS
0.40	-10.3	-4.9	5.4	-6.3	0.0	PASS
0.60	-10.3	-1.4	8.9	-2.8	0.0	PASS
0.80	-10.3	0.0	10.3	-1.4	0.0	PASS
1.00	-10.3	1.4	11.7	0.0	0.0	PASS
2.00	-10.3	2.1	12.4	0.7	0.0	PASS
2.50	-10.3	1.8	12.1	0.4	0.0	PASS
3.00	-10.3	1.3	11.6	-0.1	0.0	PASS
3.50	-10.3	-2.0	8.3	-3.4	-2.7	PASS
4.00	-10.3	<-100.0	<-89.7	<-101.4	-5.0	PASS
4.50	-10.3	<-100.0	<-89.7	<-101.4	-7.0	PASS
5.00	-10.3	<-100.0	<-89.7	<-101.4	-8.9	PASS
5.90	-10.3	<-100.0	<-89.7	<-101.4	-11.7	PASS
5.90	-10.3	<-100.0	<-89.7	<-101.4	-35.0	PASS
6.00	-10.3	<-100.0	<-89.7	<-101.4	-35.0	PASS
6.10	-10.3	<-100.0	<-89.7	<-101.4	-35.0	PASS
6.10	-10.3	<-100.0	<-89.7	<-101.4	-12.3	PASS
7.00	-10.3	<-100.0	<-89.7	<-101.4	-14.7	PASS
8.00	-10.3	<-100.0	<-89.7	<-101.4	-17.0	PASS
9.00	-10.3	<-100.0	<-89.7	<-101.4	-19.1	PASS
10.00	-10.3	<-100.0	<-89.7	<-101.4	-20.9	PASS
15.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
15.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
20.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
22.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
24.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
26.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
28.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS
30.00	-10.3	<-100.0	<-89.7	<-101.4	-28.0	PASS

6.7.6. Plots

The following plots graphically represent the test results recorded in the above Test Data Table.

AUDIO FREQUENCY REPSONSE @ FCC 2.987(a) & 22.915 (Portable/Mobile)
800 MHz CDMA/AMPS Cellular Phone, Model MX-1111, FCC ID: F3JMX111



6.8. MODULATION REQUIREMENTS @ FCC 2.987(B) & 22.915(A),(B) & (C)

6.8.1. Limits @ FCC 22.915

(a) **Non-voice modulating signals**. Modulating signals other than voice signals such as data signals, may be transmitted, provided the resulting modulated emission exhibits spectral characteristics not exceeding those resulting from voice modulation.

(b) **Modulation Levels**. The level of the modulating signals must be set to the values specified in this paragraph and must be maintained within ±10% of those values:
(1) The instantaneous frequency deviation resulting from the main modulating signal must be ±12 kHz.
(2) The instantaneous frequency deviation resulting from the supervisory audio tones must be ±2 kHz.
(3) The instantaneous frequency deviation resulting from the signaling tone must be ±8 kHz.
(4) The instantaneous frequency deviation resulting from the wideband data signals must be ±8 kHz.

(c) **Deviation Limitation Circuitry**. Cellular transmitters must be equipped with circuitry that automatically prevents modulation levels for voice transmission from exceeding the limits specified in this section.

6.8.2. Method of Measurements

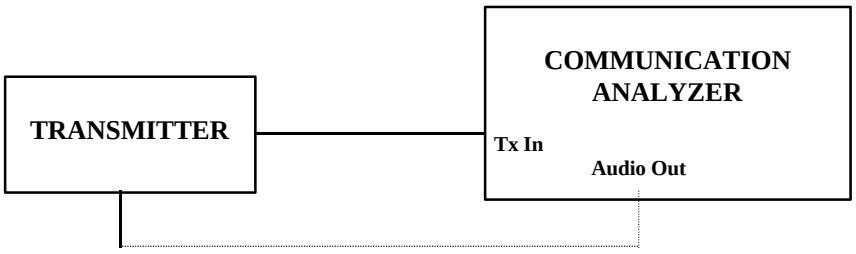
For Audio Transmitter:- The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

For Data Transmitter with Maximum Frequency Deviation set by Factory:- The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

6.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Communication Analyzer	Rohde & Schawrz	SMF02	879988/057	400 kHz - 1000 MHz including AF & RF Signal Generators, SINAD, DISTORTION, DEVIATION meters and etc

6.8.4. Test Arrangement



6.8.5. Test Data

6.8.5.1. Main Modulating Signal:

1kHz MODULATING SIGNAL LEVEL (mV)	PEAK FREQUENCY DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
110	6.9	12.0
120	7.3	12.0
130	7.6	12.0
140	7.7	12.0
150	7.9	12.0
160	8.1	12.0
170	8.1	12.0
180	8,4	12.0
190	8.4	12.0
200	8,5	12.0
210	8.6	12.0
220	8.7	12.0
230	9.0	12.0
240	9.0	12.0
250	9.1	12.0
260	9.1	12.0
270	9.2	12.0
280	9.5	12.0
290	9.7	12.0
300	10.0	12.0
320	10.0	12.0
340	10.0	12.0
360	9.9	12.0
380	9.8	12.0
400	9.9	12.0

Voice Signal Input Level = 300 mili-Volts

MODULATING FREQUENCY (KHz)	PEAK FREQUENCY DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
0.3	1.7	12.0
0.4	0.8	12.0
0.6	7.8	12.0
0.8	9.5	12.0
1.0	10.0	12.0
1.2	9.6	12.0
1.4	9.5	12.0
1.6	9.3	12.0
1.8	9.3	12.0
2.0	9.3	12.0
2.5	9.5	12.0
3.0	7.7	12.0

6.8.5.2. Supervisory Audio Tones (Factory Setting @ 2 kHz):

MEASURED PEAK DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
1.98 Khz	±2 kHz

6.8.5.3. Signaling Tone (Factory Setting @ 8 kHz).

PEAK DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
6.5 KHz	±8 kHz

6.8.5.4. Wideband Data Signal (Factory Setting 8 kHz).

DATA BAUD RATE	MEASURED PEAK DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
10 kB/s	8 kHz	±8 kHz

6.9. EMISSION LIMITATION/EMISSION MASK @ FCC 2.989, 22.917(A), (B), (C) & (D)

6.9.1. Limits @ 22.917(a),(b),(c)&(d)

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

	EMISISON MASK @ FCC 22.917	
EMISSION TYPE	**Frequency removed from the carrier frequency**	**Attenuation wrt Carrier Level**
F3E/F3D Emission Mask for use with audio filter	▪ 20 kHz to 45 kHz ▪ 45 kHz to 2*Fc	▪ 26 dBc ▪ 60 dBc or 43+10*log(P) dBc (P in Watts) whichever is less
Alternative F3E/F3D Emission Mask for use with audio filter	▪ 12 kHz to 20 kHz ▪ 20 kHz to 2*Fc	▪ 117*log(f_d+12) dBc ▪ 100*log(f_d+11) dBc or 60 dBc or 43+10*log(P) dBc (P in Watts) whichever is less
F1D Emission Mask	▪ 20 kHz to 45 kHz ▪ 45 kHz to 90 kHz ▪ 90 kHz to 2*Fc	▪ 26 dBc ▪ 45 dBc ▪ 60 dBc or 43+10*log(P) dBc (P in Watts) whichever is less

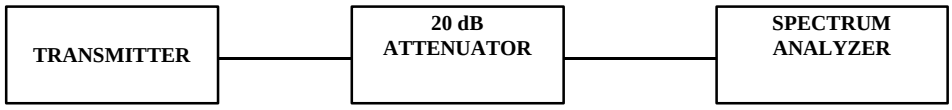
6.9.2. Method of Measurements

Please refer to FCC 2.917(h) and Exhibit 8, Sec. 8.3 for detailed test procedures.

6.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz

6.9.4. Test Arrangement



6.9.5. Test Data

Conform. Please refer to the plots below for detailed information.

6.9.6. Plots

Please refer to Exhibit 9 for Plots of measurements

6.10. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 22.917(E), (F) & (G)

6.10.1. Limits @ 22.917(e), (f) & (g)

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

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.

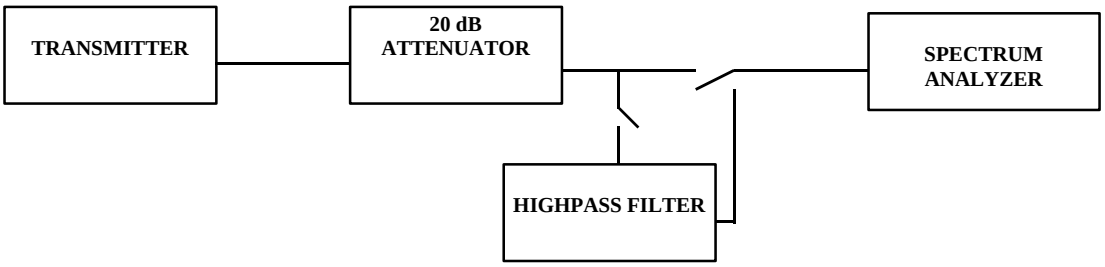
6.10.2. Method of Measurements

Please refer to FCC 2.917(h) and Exhibit 8, Sec. 8.4 for detailed test procedures.

6.10.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz
Hihpass Filter, Microphase	Microphase	CR220HID	IITI11000AC	Cut-off Frequency at 600 MHz, 1.3 GHz or 4 GHz

6.10.4. Test Arrangement



6.10.5. Test Data

6.10.5.1. Near Lowest Frequency (824.9755 MHz)

Fundamental Frequency: 824.9755 MHz
RF Output Power: 0.5 Watts
Modulation: FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1649.75	-66.9	-13.0	-53.9	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less 40 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.
- Refer to Plots # 11 in Exhibit 9 for detailed measurement data.
- The above tests were checked with different modulating signal such as supervisory audio tones, signaling tone and wideband digital, and rf spurious and harmonic emissions were found no difference.

6.10.5.2. Near Middle Frequency (836.4951 MHz)

Fundamental Frequency: 836.4951 MHz
RF Output Power: 0.5 Watts
Modulation: FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1672.9902	-62.5	-13.0	-49.5	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less 40 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.
- Refer to Plots # 12 in Exhibit 9 for detailed measurement data.
- The above tests were checked with different modulating signal such as supervisory audio tones, signaling tone and wideband digital, and rf spurious and harmonic emissions were found no difference.

6.10.5.3. Near Highest Frequency (848.944 MHz)

Fundamental Frequency: 848.9444 MHz
RF Output Power: 0.5 Watts
Modulation: FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1697.888	-60.6	-13.0	-47.6	PASS
4244.720	-63.8	-13.0	-50.8	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less 40 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.
- Refer to Plots # 13 in Exhibit 9 for detailed measurement data.
- The above tests were checked with different modulating signal such as supervisory audio tones, signaling tone and wideband digital, and rf spurious and harmonic emissions were found no difference.

6.11. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 22.917(E), (F) & (G)

6.11.1. Limits @ 22.917(e), (f) & (g)

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

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.

6.11.2. Method of Measurements

Please refer to the Exhibit 8, Sec. 8. 5 of this test report and ANSI C63-4:1992 for radiated emissions test method.

6.11.3. Test Arrangement

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

6.11.4. 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		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	EMCO	3160-09	..	18 GHz – 26.5 GHz
Horn Antenna	EMCO	3160-10	..	26.5 GHz – 40 GHz
Mixer	Tektronix	118-0098-00	..	18 GHz – 26.5 GHz
Mixer	Tektronix	119-0098-00	..	26.5 GHz – 40 GHz

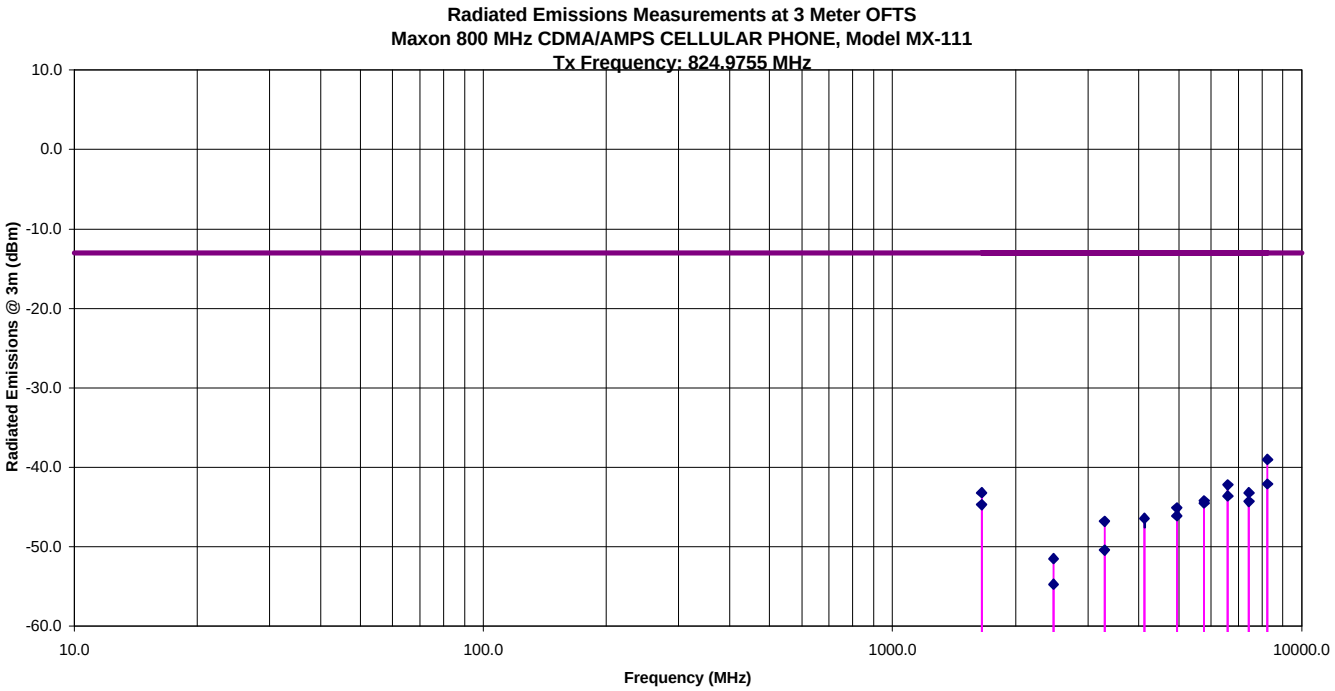
6.11.5. Test Data

6.11.5.1. Near Lowest Frequency (824.9755 MHz)

Fundamental Frequency: 824.9755 MHz
RF Output Power: 0.5 Watts
Modulation: FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF Field Level @3m (dBuV/m)	RF Power Level (dBm)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	LIMIT @3m (dBm)	MARGIN (dB)	PASS/ FAIL
1649.95	54.3	-43.2	PEAK	V	-13.0	-30.2	PASS
1649.95	52.8	-44.7	PEAK	H	-13.0	-31.7	PASS
2474.93	42.8	-54.7	PEAK	V	-13.0	-41.7	PASS
2474.93	46.0	-51.5	PEAK	H	-13.0	-38.5	PASS
3299.90	47.1	-50.4	PEAK	V	-13.0	-37.4	PASS
3299.90	50.7	-46.8	PEAK	H	-13.0	-33.8	PASS
4124.88	50.5	-47.0	PEAK	V	-13.0	-34.0	PASS
4124.88	51.1	-46.4	PEAK	H	-13.0	-33.4	PASS
4949.85	52.4	-45.1	PEAK	V	-13.0	-32.1	PASS
4949.85	51.4	-46.1	PEAK	H	-13.0	-33.1	PASS
5774.83	53.3	-44.2	PEAK	V	-13.0	-31.2	PASS
5774.83	53.0	-44.5	PEAK	H	-13.0	-31.5	PASS
6599.80	55.3	-42.2	PEAK	V	-13.0	-29.2	PASS
6599.80	53.9	-43.6	PEAK	H	-13.0	-30.6	PASS
7424.78	54.3	-43.2	PEAK	V	-13.0	-30.2	PASS
7424.78	53.2	-44.3	PEAK	H	-13.0	-31.3	PASS
8249.76	58.5	-39.0	PEAK	V	-13.0	-26.0	PASS
8249.76	55.4	-42.1	PEAK	H	-13.0	-29.1	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less 40 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.
- The above tests were checked with different modulating signal such as supervisory audio tones, signaling tone and wideband digital, and rf spurious and harmonic emissions were found no difference.

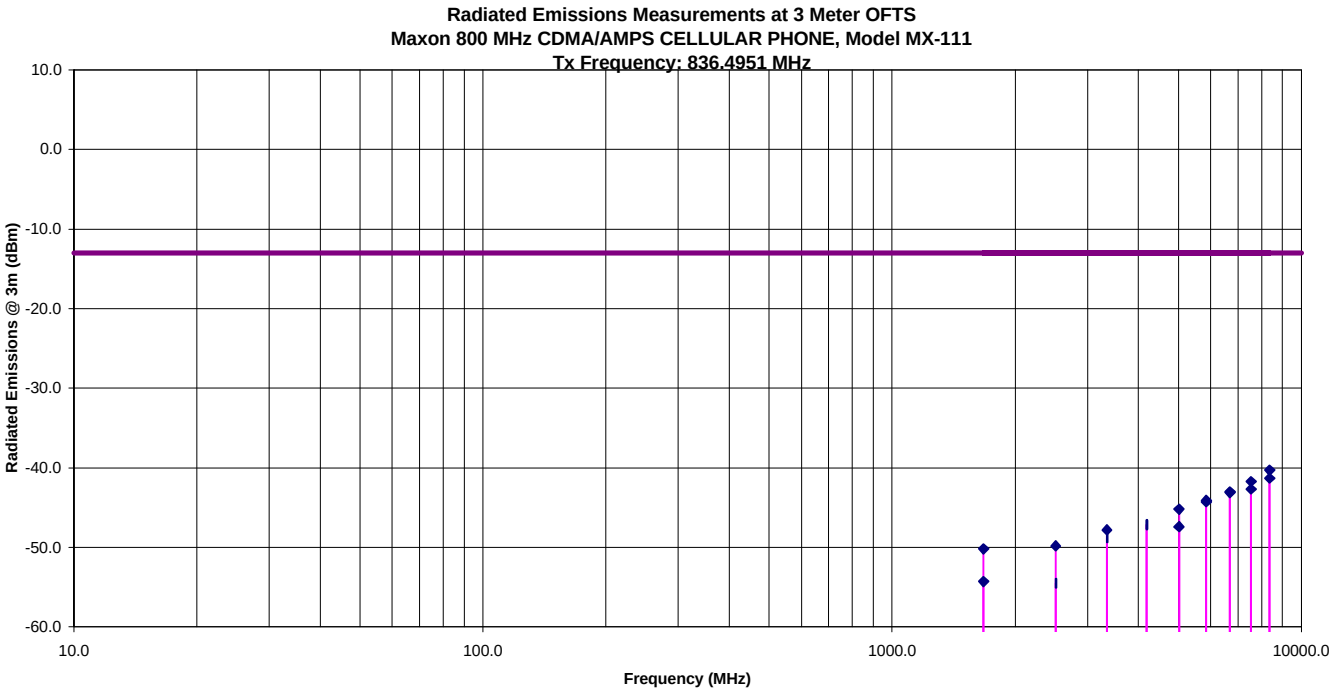

Radiated Emissions Measurements at 3 Meter OFTS
Maxon 800 MHz CDMA/AMPS CELLULAR PHONE, Model MX-111
Tx Frequency: 824.9755 MHz
Radiated Emissions @ 3m (dBm)
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
10.0
100.0
1000.0
10000.0
Frequency (MHz)

6.11.5.2. Near Middle Frequency (836.4951 MHz)

Fundamental Frequency: 836.4951 MHz
RF Output Power: 0.5 Watts
Modulation: FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF Field Level @3m (dBuV/m)	RF Power Level (dBm)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	LIMIT @3m (dBm)	MARGIN (dB)	PASS/ FAIL
1672.99	47.3	-50.2	PEAK	V	-13.0	-37.2	PASS
1672.99	43.2	-54.3	PEAK	H	-13.0	-41.3	PASS
2509.49	43.0	-54.5	PEAK	V	-13.0	-41.5	PASS
2509.49	47.7	-49.8	PEAK	H	-13.0	-36.8	PASS
3345.98	48.7	-48.8	PEAK	V	-13.0	-35.8	PASS
3345.98	49.7	-47.8	PEAK	H	-13.0	-34.8	PASS
4182.48	50.3	-47.2	PEAK	V	-13.0	-34.2	PASS
4182.48	50.4	-47.1	PEAK	H	-13.0	-34.1	PASS
5018.97	50.1	-47.4	PEAK	V	-13.0	-34.4	PASS
5018.97	52.3	-45.2	PEAK	H	-13.0	-32.2	PASS
5855.47	53.4	-44.1	PEAK	V	-13.0	-31.1	PASS
5855.47	53.2	-44.3	PEAK	H	-13.0	-31.3	PASS
6691.96	54.4	-43.1	PEAK	V	-13.0	-30.1	PASS
6691.96	54.5	-43.0	PEAK	H	-13.0	-30.0	PASS
7528.46	55.8	-41.7	PEAK	V	-13.0	-28.7	PASS
7528.46	54.8	-42.7	PEAK	H	-13.0	-29.7	PASS
8364.95	56.2	-41.3	PEAK	V	-13.0	-28.3	PASS
8364.95	57.2	-40.3	PEAK	H	-13.0	-27.3	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less 40 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.
- The above tests were checked with different modulating signal such as supervisory audio tones, signaling tone and wideband digital, and rf spurious and harmonic emissions were found no difference.

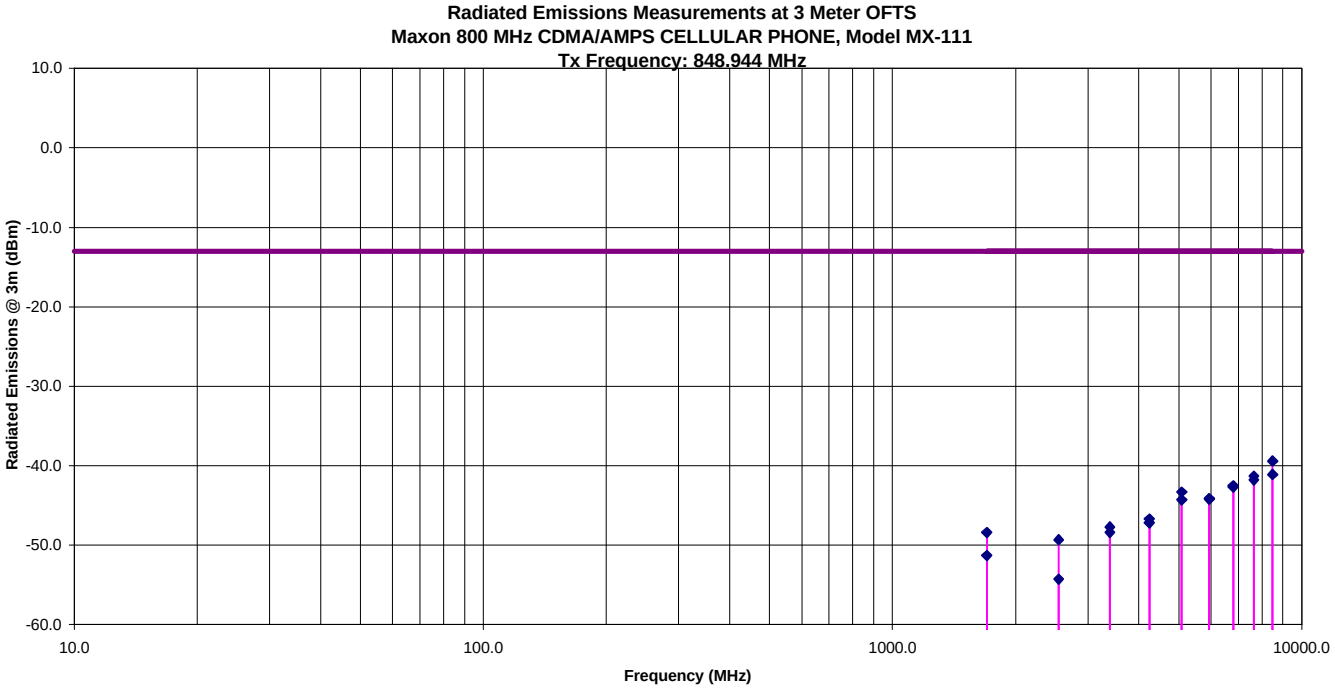

Radiated Emissions Measurements at 3 Meter OFTS
Maxon 800 MHz CDMA/AMPS CELLULAR PHONE, Model MX-111
Tx Frequency: 836.4951 MHz
Radiated Emissions @ 3m (dBm)
10.0
0.0
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
10.0
100.0
1000.0
10000.0
Frequency (MHz)

6.11.5.3. Near Highest Frequency (848.944 MHz)

Fundamental Frequency: 848.9444 MHz
RF Output Power: 0.5 Watts
Modulation: FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF Field Level @3m (dBuV/m)	RF Power Level (dBm)	DETECTOR USED (PEAK/QP)	ANTENNA PLANE (H/V)	LIMIT @3m (dBm)	MARGIN (dB)	PASS/ FAIL
1697.89	49.1	-48.4	PEAK	V	-13.0	-35.4	PASS
1697.89	46.2	-51.3	PEAK	H	-13.0	-38.3	PASS
2546.83	43.2	-54.3	PEAK	V	-13.0	-41.3	PASS
2546.83	48.2	-49.3	PEAK	H	-13.0	-36.3	PASS
3395.78	49.8	-47.7	PEAK	V	-13.0	-34.7	PASS
3395.78	49.1	-48.4	PEAK	H	-13.0	-35.4	PASS
4244.72	50.3	-47.2	PEAK	V	-13.0	-34.2	PASS
4244.72	50.8	-46.7	PEAK	H	-13.0	-33.7	PASS
5093.66	54.2	-43.3	PEAK	V	-13.0	-30.3	PASS
5093.66	53.2	-44.3	PEAK	H	-13.0	-31.3	PASS
5942.61	53.4	-44.1	PEAK	V	-13.0	-31.1	PASS
5942.61	53.3	-44.2	PEAK	H	-13.0	-31.2	PASS
6791.55	54.8	-42.7	PEAK	V	-13.0	-29.7	PASS
6791.55	55.0	-42.5	PEAK	H	-13.0	-29.5	PASS
7640.50	56.2	-41.3	PEAK	V	-13.0	-28.3	PASS
7640.50	55.7	-41.8	PEAK	H	-13.0	-28.8	PASS
8489.44	58.1	-39.4	PEAK	V	-13.0	-26.4	PASS
8489.44	56.4	-41.1	PEAK	H	-13.0	-28.1	PASS

- The emissions were scanned from 10 MHz to 10 GHz and all emissions less 40 dB below the limits were recorded.
- No rf emissions were observed in the base cellular band of 869-894 MHz with the EMI receiver noise floor set at least 90dBc.
- The above tests were checked with different modulating signal such as supervisory audio tones, signaling tone and wideband digital, and rf spurious and harmonic emissions were found no difference.



6.11.6. Photographs of Test Setup

Please refer to Photographs #1 to 3 in Exhibit 10 for photographs of test setups.

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. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	±1.5	±1.5
LISN coupling specification	Rectangular	±1.5	±1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	±0.3	±0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	±0.2	±0.3
System repeatability	Std. deviation	±0.2	±0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	±1.25	±1.30
Expanded uncertainty U	Normal (k=2)	±2.50	±2.60

Sample Calculation for Measurement Accuracy in 150 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB

7.2. 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. EFFECTIVE RADIATED POWER (ERP) 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:

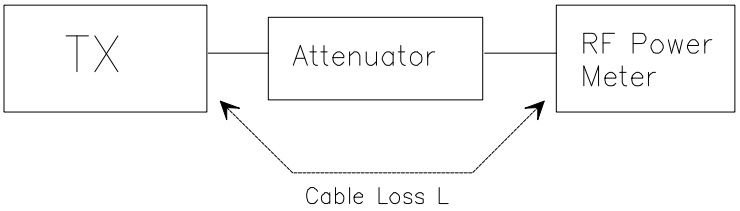
Step 1: Duty Cycle measurements

- Using a spectrum analyzer 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 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)
Figure 1.



Step 3: Substitution Method. See Figure 2

(a) The measurements was performed in the absence of modulation (un-modulated)
(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 dipole test antenna was used and tuned to the transmitter carrier frequency.
(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^{o} 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 substitution dipole antenna and the signal generator replaced the transmitter and antenna under test in the same position, and the substitution dipole antenna was placed in vertical polarization. The test dipole antenna was lowered or raised as necessary to ensure that the maximum signal is stilled received.
(i) The input signal to the substitution antenna was adjusted in level until an equal or a known related level to that detected from the transmitter was obtained in the test receiver. The maximum carrier radiated power is equal to the power supply by the generator.
(j) The substitution antenna gain and cable loss were added to the signal generator level for the corrected ERP level.
(k) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(l) Actual gain of the EUT's antenna is the difference of the measured ERP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

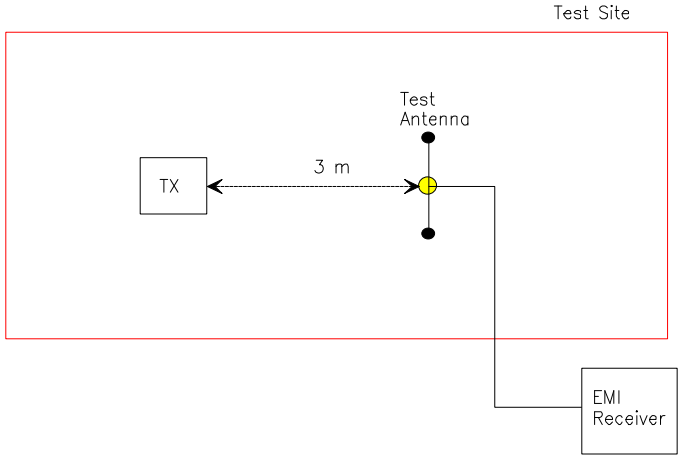
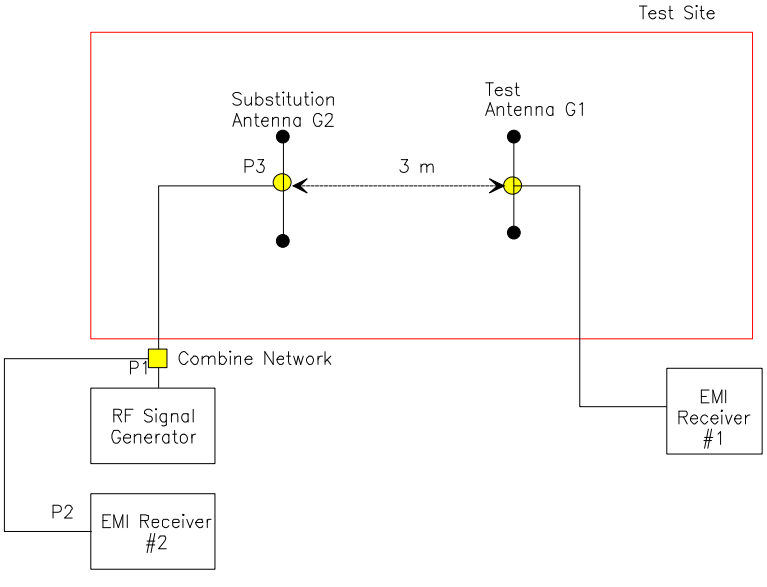


Figure 3



P3 = P2 + Insertion Loss (P1–P3
EIRP = P3 + G2

8.2. FREQUENCY STABILITY

Refer to FCC @ 2.995.

(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).

8.3. EMISSION MASK

Voice or Digital Modulation Through a Voice Input Port @ 2.989(c)(i):- The transmitter was modulated by a 2.5 KHz tone signal at an input level 16 dB greater than that required to produce 50% modulation (e.g.: ±2.5 KHz peak deviation at 1 KHz modulating frequency). The input level was established at the frequency of maximum response of the audio modulating circuit.

Digital Modulation Through a Data Input Port @ 2.989(h):- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

The following spectrum analyzer bandwidth shall be used for measurement of spurious emissions:

(1) When operating in the radio telephony mode or the supervisory audio tome mode:
- (i) Any emission not more than 45 kHz removed from the carrier frequency: 300 Hz
- (ii) Any emission more than 45 kHz removed from the carrier frequency: 30 kHz

(2) When operating in the wideband data mode or the signaling tone mode:
- (iii) Any emission not more than 60 kHz removed from the carrier frequency: 300 Hz
- (iv) Any emission more than 60 kHz removed from the carrier frequency: 30 kHz

The all cases the Video Bandwidth shall be equal or greater than the measuring bandwidth.

8.4. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.989, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the Spectrum Analyzer 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. 2.997 - 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. 2.991 - 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 2.989 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

8.5. SPURIOUS EMISSIONS (RADIATED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.989, 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 $\geq$ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC CFR 47, Para. 2.997 - 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. 2.993 - 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 2.989(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^{o} 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: 13.1415
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 (dBuV/m):

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

The Transmitted Power @ D = 3 Meters

P(dBm) = E(dBuV/m) - 97.5