ENGINEERING TEST REPORT

RADIO TRANSCEIVER
Model No.: 9710A
FCC ID: E5MDS9710-1

Applicant: **MICROWAVE DATA SYSTEMS INC.**
175 Science Parkway
Rochester, New York 14620-4261
USA

Tested in Accordance With

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

UltraTech's File No.: MIC31-FTX

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: September 7, 2000	
Report Prepared by: Dan Huynh . Issued Date: August 28, 2000	Tested by: Mr. Hung Trinh, RFI/EMI Technician Test Dates: July 27-28, August 9, 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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EXHIBIT 1. SUBMITTAL CHECK LIST

Exhibit No.	Exhibit Type	Description of Contents	Quality Check (OK)
1 through 8	Test Report	Exhibit 1: Submittal check lists Exhibit 2: Introduction Exhibit 3: Performance Assessment Exhibit 4: EUT Operation and Configuration during Tests Exhibit 5: Summary of test Results Exhibit 6: Measurement Data Exhibit 7: Measurement Uncertainty Exhibit 8: Measurement Methods	OK
9	Test Report – Test Data Plots	- 99% Occupied Bandwidth, plots # 1 to 10 - Emission Mask G, plots # 11 to 16 - Emission Mask J, plots # 17 to 20 - Transmitter Antenna Conducted Emissions, plots # 21 to 30	OK
10	Test Setup Photos	Radiated Emissions Test Setup Photos At 3 Meters	OK
11	External EUT Photos	9710A External Photos	OK
12	Internal Photos of EUT	9710A Internal Photos	OK
13	Cover Letters	Letter from Ultratech for Certification Request Letter from the Applicant to appoint Ultratech to act as an agent Letter from the Applicant to request for Confidentiality Filing	OK
14	Attestation Statements	--	--
15	Application Forms	Form 731 Form 159 Confirmation of Exhibits sent to FCC Status of Exhibits sent to FCC	Electronic Filing
16	ID Label/Location Info	ID Label Location of ID Label	OK
17	Block Diagrams	9710 A Block Diagram	OK
18	Schematic Diagrams	Schematic diagrams	OK
19	Parts List/Tune Up Info	--	--
20	Operational Description	Technical Report	OK
21	RF Exposure Info	Refer to User's Manual	OK
22	User's Manual	MDS 4710A/9710A Installation and Operation Guide	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 90 (Subpart 90): 1999
Title	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 90
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in 806-821, 851-866, 896-901and 935-940 MHz frequency bands (25 and 12.5 kHz Channel Spacing).
Test Procedures	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

2.2. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	1999	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:	MICROWAVE DATA SYSTEMS, INC.
Address:	175 Science Parkway Rochester, NY 14620-4261 USA
Contact Person:	Mr. James Hastings Phone #: +1-716-242-8393 Fax #: +1-716-241-5590 Email Address: jhastings@microwavedata.com

MANUFACTURER	
Name:	MICROWAVE DATA SYSTEMS, INC.
Address:	175 Science Parkway Rochester, NY 14620-4261 USA
Contact Person:	Mr. James Hastings Phone #: +1-716-242-8393 Fax #: +1-716-241-5590 Email Address: jhastings@microwavedata.com

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

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

Brand Name	MICROWAVE DATA SYSTEMS INC.
Product Name	RADIO TRANSCEIVER
Model Name or Number	9710A
Serial Number	Preproduction
Type of Equipment	Radio Communication Equipment
External Power Supply	13.8 VDC
Transmitting/Receiving Antenna Type	Non-integral
Primary User Functions of EUT:	The essential function of the EUT is to correctly communicate data to and from radios over RF link.

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Mobile Base station (fixed use)
Intended Operating Environment:	Commercial
Power Supply Requirement:	13.8 VDC
RF Output Power Rating:	6 Watts Max.
Operating Frequency Range:	806-940 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	25 and 12.5 kHz
Occupied Bandwidth (99%):	10.29 kHz (25 kHz channel spacing) 10.36 kHz (12.5 kHz channel spacing)
***Emission Designation:**	11K2F1D, 11K2F2D, 11K2F3D
Radio Oscillator Frequency:	16 MHz (TCXO)
Antenna Connector Type:	N

* Please refer to Technical Report, page 8 for explanations.

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	Data Interface	1	DB25	Shielded
2	Diagnostics	1	RJ11	Non-shielded
3	Antenna	1	N	Terminated with 50 Ω load
4	Power	1	2 PIN	Non-shielded

NOTES:

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

(2) ***Ports which are not connected to cables during normal intended operation*** *(for factory/technical services uses only): None*

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

None

3.6. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

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

None

3.8. ANCILLARY EQUIPMENT

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

Ancillary Equipment # 1	
Description:	Kepco Power Supply
Brand name:	Kepco
Model Name or Number:	JQE-36-8M
Serial Number:	124926
Cable Length & Type:	6 FT
Connected to EUT's Port:	Power Port

Ancillary Equipment # 2	
Description:	Laptop Computer
Brand name:	Hewlett Packard
Cable Length & Type:	6 FT
Connected to EUT's Port:	Serial Port (DB 9)

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:	101 kPa
Power input source:	13.8 VDC

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	MICROWAVE DATA SYSTEMS, INC. test software.
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohm RF Load.

Transmitter Test Signals	
Frequencies: ▪ 806 - 821 MHz band: ▪ 851 - 866 MHz band: ▪ 896 - 901 MHz band: ▪ 935 - 940 MHz band:	Near lowest, near middle & near highest frequencies each frequency bands that the transmitter covers: ▪ 806, 813.5 and 821 MHz ▪ 851, 858.5 and 866 MHz ▪ 896 and 901 MHz ▪ 935 and 940 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 6.0 Watts ▪ Binary CPFSK ▪ Internal Binary CPFSK

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)
90.205 & 2.985	RF Power Output	Yes
90.213 & 2.995	Frequency Stability	Yes
90.242(b)(8) & 2.987(a)	Audio Frequency Response	Not applicable
90.210 & 2.987(b)	Modulation Limiting	Yes
90.209, 90.210 & 2.989	Emission Limitation & Emission Masks	Yes
90.210, 2.997 & 2.991	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
90.210, 2.997 & 2.993	Emission Limits - Field Strength of Spurious Emissions	Yes
90.214	Transient Frequency Behavior	Not applicable

RADIO TRANSCEIVER, **Model No.: 9710A**, by **MICROWAVE DATA SYSTEMS INC.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices**. The engineering test report has been documented and kept in file and it is available 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 @ FCC 2.985 & 90.205

6.5.1. Limits @ FCC 90.205

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

6.5.2. Method of Measurements

FCC @ 2.985 – The rf output power of the transmitter was measured at the RF output terminals when the transmitter is adjusted by the manufacturer in accordance with the tune-up procedure to give the values of the current and voltage on the circuit elements specified in 2.983(d)(5). The electrical characteristics of the radio frequency load attached to the output terminals was 50 Ohms.

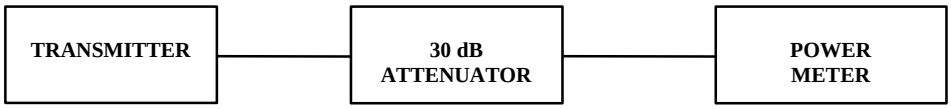
The detailed test method is as follows:

- *The transmitter terminal was coupled to the Spectrum Analyzer through a 30 dB attenuator*
- *Power of the transmitter channel near the lowest, middle and highest of each frequency block/band were measured using the power meter, and the reading was corrected by added the calibrated attenuator's attenuation value and cable loss.*
- *The RF Output was turned on with standard modulation applied.*

6.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Power Meter	Hewlett Packard	436A	2016A07747	0.1 – 18 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz

6.5.4. Test Arrangement



6.5.5. Test Data

Transmitter Channel Output	Fundamental Frequency (MHz)	Measured Average Power (Watts)	Average Power Rating (Watts)
Test Frequency Band: 806 – 820 MHz			
Lowest	806	5.9	5
Middle	813.5	6.0	5
Highest	821	5.9	5
Test Frequency Band: 851 – 866 MHz			
Lowest	851	4.6	5
Middle	858.5	4.2	5
Highest	866	4.1	5
Test Frequency Band: 896 – 901 MHz			
Lowest	896	5.2	5
Highest	901	5.2	5
Test Frequency Band: 935 – 940 MHz			
Lowest	935	4.5	5
Highest	940	4.3	5

6.6. FREQUENCY STABILITY @ FCC 2.995 & 90.213

6.6.1. Limits @ FCC 90.213

Please refer to FCC CFR 47, Part 90, Subpart I, Para. 90.213 for specification details.

FREQUENCY RANGE (MHz)	FIXED & BASE STATIONS (ppm)	MOBILE STATIONS (ppm)	
		> 2 W	≤ 2 W
806-821	1.5	2.5	2.5
821-824	1.0	1.5	1.5
851-866	1.5	2.5	2.5
866-869	1.0	1.5	1.5
896-901	[14]0.1	1.5	1.5
902-928[13]	2.5	2.5	2.5
929-930	1.5	…	…
935-940	0.1	1.5	1.5
Above 940	…	…	…

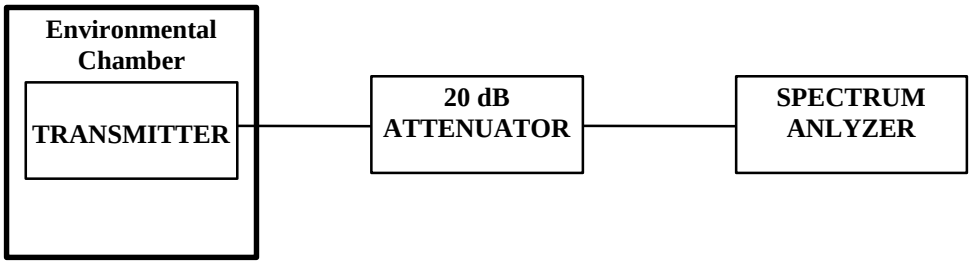
6.6.2. Method of Measurements

Refer to Exhibit 8 Sec. 8.2 & FCC @ 2.995 for method of measurements

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

Remark: The following listed compliance according to limit of 1.5 ppm:

806-821 MHz Frequency Band (Fixed & Base Stations)
851-866 MHz Frequency Band (Fixed & Base Stations)
896-901 MHz Frequency Band (Control Station associated with mobile frequencies.)
935-940 MHz Frequency Band (Mobile Stations)

Product Name **Model No.**	**RADIO TRANSCEIVER** **9710A**
Center Frequency	806 MHz (lowest of the band)
Full Power Level	5.9 Watts
Frequency Tolerance Limit	1.5 ppm or 1209 Hz at 806 MHz
Max. Frequency Tolerance Measured	-1023 Hz or 1.3 ppm
Input Voltage Rating	13.8 VDC nominal

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (^oC)	**KEYED-ON TIME (Minutes)**	**Supply Voltage (Nominal) 13.8 Volts dc**		**Supply Voltage (85% of Nominal) 11.7 Volts dc**		**Supply Voltage (115% of Nominal) 15.9 Volts dc**	
		Hz	**dB**	**Hz**	**dB**	**Hz**	**dB**
-30	**0**	-1018	-0.6	N/A	N/A	N/A	N/A
	1	-1018	-0.6	N/A	N/A	N/A	N/A
	2	-1023	-0.6	N/A	N/A	N/A	N/A
	3	-1023	-0.6	N/A	N/A	N/A	N/A
	4	-1023	-0.6	N/A	N/A	N/A	N/A
	5	-1023	-0.6	N/A	N/A	N/A	N/A
	6	-1023	-0.6	N/A	N/A	N/A	N/A
	7	-1023	-0.6	N/A	N/A	N/A	N/A
	8	-1023	-0.6	N/A	N/A	N/A	N/A
	9	-1023	-0.6	N/A	N/A	N/A	N/A
	10	-1023	-0.6	N/A	N/A	N/A	N/A
-20	**0**	-740	-0.4	N/A	N/A	N/A	N/A
	1	-735	-0.4	N/A	N/A	N/A	N/A
	2	-735	-0.4	N/A	N/A	N/A	N/A
	3	-735	-0.4	N/A	N/A	N/A	N/A
	4	-735	-0.4	N/A	N/A	N/A	N/A
	5	-735	-0.4	N/A	N/A	N/A	N/A
	6	-735	-0.4	N/A	N/A	N/A	N/A
	7	-735	-0.4	N/A	N/A	N/A	N/A
	8	-735	-0.4	N/A	N/A	N/A	N/A
	9	-735	-0.4	N/A	N/A	N/A	N/A
	10	-735	-0.4	N/A	N/A	N/A	N/A

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (^oC)	**KEYED-ON TIME (Minutes)**	**Supply Voltage (Nominal) 13.8 Volts dc**		**Supply Voltage (85% of Nominal) 11.7 Volts dc**		**Supply Voltage (115% of Nominal) 15.9 Volts dc**	
		Hz	**dB**	**Hz**	**dB**	**Hz**	**dB**
-10	**0**	-372	-0.2	N/A	N/A	N/A	N/A
	1	-375	-0.2	N/A	N/A	N/A	N/A
	2	-369	-0.2	N/A	N/A	N/A	N/A
	3	-372	-0.2	N/A	N/A	N/A	N/A
	4	-372	-0.2	N/A	N/A	N/A	N/A
	5	-369	-0.2	N/A	N/A	N/A	N/A
	6	-369	-0.2	N/A	N/A	N/A	N/A
	7	-372	-0.2	N/A	N/A	N/A	N/A
	8	-375	-0.2	N/A	N/A	N/A	N/A
	9	-375	-0.2	N/A	N/A	N/A	N/A
	10	-375	-0.2	N/A	N/A	N/A	N/A
0	**0**	-270	-0.3	N/A	N/A	N/A	N/A
	1	-264	-0.3	N/A	N/A	N/A	N/A
	2	-264	-0.3	N/A	N/A	N/A	N/A
	3	-264	-0.3	N/A	N/A	N/A	N/A
	4	-267	-0.3	N/A	N/A	N/A	N/A
	5	-264	-0.3	N/A	N/A	N/A	N/A
	6	-264	-0.3	N/A	N/A	N/A	N/A
	7	-264	-0.3	N/A	N/A	N/A	N/A
	8	-264	-0.3	N/A	N/A	N/A	N/A
	9	-264	-0.3	N/A	N/A	N/A	N/A
	10	-258	-0.3	N/A	N/A	N/A	N/A
+10	**0**	-138	+0.2	N/A	N/A	N/A	N/A
	1	-138	+0.2	N/A	N/A	N/A	N/A
	2	-138	+0.2	N/A	N/A	N/A	N/A
	3	-141	+0.2	N/A	N/A	N/A	N/A
	4	-135	+0.2	N/A	N/A	N/A	N/A
	5	-135	+0.2	N/A	N/A	N/A	N/A
	6	-135	+0.2	N/A	N/A	N/A	N/A
	7	-132	+0.2	N/A	N/A	N/A	N/A
	8	-129	+0.2	N/A	N/A	N/A	N/A
	9	-132	+0.2	N/A	N/A	N/A	N/A
	10	-132	+0.2	N/A	N/A	N/A	N/A

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (^oC)	**KEYED-ON TIME (Minutes)**	**Supply Voltage (Nominal) 13.8 Volts dc**		**Supply Voltage (85% of Nominal) 11.7 Volts dc**		**Supply Voltage (115% of Nominal) 15.9 Volts dc**	
		Hz	**dB**	**Hz**	**dB**	**Hz**	**dB**
+20	**0**	0	0	0	-0.7	0	+0.1
	1	0	0	0	-0.7	0	+0.1
	2	0	0	0	-0.7	0	+0.1
	3	0	0	0	-0.7	0	+0.1
	4	0	0	0	-0.7	0	+0.1
	5	0	0	0	-0.7	0	+0.1
	6	0	0	0	-0.7	0	+0.1
	7	0	0	0	-0.7	0	+0.1
	8	0	0	0	-0.7	0	+0.1
	9	0	0	0	-0.7	0	+0.1
	10	0	0	0	-0.7	0	+0.1
+30	**0**	-138	0	N/A	N/A	N/A	N/A
	1	-143	0	N/A	N/A	N/A	N/A
	2	-140	0	N/A	N/A	N/A	N/A
	3	-143	0	N/A	N/A	N/A	N/A
	4	-140	0	N/A	N/A	N/A	N/A
	5	-138	0	N/A	N/A	N/A	N/A
	6	-140	0	N/A	N/A	N/A	N/A
	7	-140	0	N/A	N/A	N/A	N/A
	8	-140	0	N/A	N/A	N/A	N/A
	9	-138	0	N/A	N/A	N/A	N/A
	10	-138	0	N/A	N/A	N/A	N/A
+40	**0**	+38	-0.3	N/A	N/A	N/A	N/A
	1	+43	-0.3	N/A	N/A	N/A	N/A
	2	+40	-0.3	N/A	N/A	N/A	N/A
	3	+40	-0.3	N/A	N/A	N/A	N/A
	4	+43	-0.3	N/A	N/A	N/A	N/A
	5	+43	-0.3	N/A	N/A	N/A	N/A
	6	+43	-0.3	N/A	N/A	N/A	N/A
	7	+43	-0.3	N/A	N/A	N/A	N/A
	8	+43	-0.3	N/A	N/A	N/A	N/A
	9	+43	-0.3	N/A	N/A	N/A	N/A
	10	+43	-0.3	N/A	N/A	N/A	N/A

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP.	KEYED-ON TIME	Supply Voltage (Nominal) 13.8 Volts dc		Supply Voltage (85% of Nominal) 11.7 Volts dc		Supply Voltage (115% of Nominal) 15.9 Volts dc	
(^{o}C)	(Minutes)	Hz	dB	Hz	dB	Hz	dB
+50	**0**	+15	-0.2	N/A	N/A	N/A	N/A
	1	+18	-0.2	N/A	N/A	N/A	N/A
	2	+18	-0.2	N/A	N/A	N/A	N/A
	3	+20	-0.2	N/A	N/A	N/A	N/A
	4	+18	-0.2	N/A	N/A	N/A	N/A
	5	+20	-0.2	N/A	N/A	N/A	N/A
	6	+20	-0.2	N/A	N/A	N/A	N/A
	7	+13	-0.2	N/A	N/A	N/A	N/A
	8	+13	-0.2	N/A	N/A	N/A	N/A
	9	+13	-0.2	N/A	N/A	N/A	N/A
	10	+13	-0.2	N/A	N/A	N/A	N/A
+60	**0**	-53	-0.2	N/A	N/A	N/A	N/A
	1	-53	-0.2	N/A	N/A	N/A	N/A
	2	-51	-0.2	N/A	N/A	N/A	N/A
	3	-51	-0.2	N/A	N/A	N/A	N/A
	4	-51	-0.2	N/A	N/A	N/A	N/A
	5	-51	-0.2	N/A	N/A	N/A	N/A
	6	-53	-0.2	N/A	N/A	N/A	N/A
	7	-58	-0.2	N/A	N/A	N/A	N/A
	8	-56	-0.2	N/A	N/A	N/A	N/A
	9	-56	-0.2	N/A	N/A	N/A	N/A
	10	-56	-0.2	N/A	N/A	N/A	N/A

6.7. MODULATION LIMITING @ FCC 2.987(B) & 90.210

6.7.1. Limits @ FCC 2.987(b) and 90.210

The EUT shall be installed with a modulation limiter, which limits the deviation of the FM carrier less than manufacturer's setting provided that the rf output spectrum must meet the required MASK

Recommendation:

- 1.25 kHz for 6.25 kHz Channel Spacing System,
- 2.5 kHz for 12.5 kHz Channel Spacing ,
- 5 kHz for 25 kHz Channel Spacing System).

6.7.2. Method of Measurements

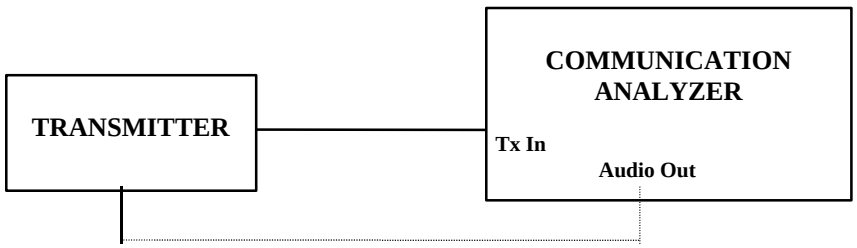
For Audio Transmitter:- The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

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.

6.7.3. 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

6.7.4. Test Arrangement



6.7.5. Test Data

6.7.5.1. Data Modulation Limiting: FM modulation with random data and Modulation Limiter set at a Maximum Frequency Deviation (Factory Setting).

DATA BAUD RATE	PEAK DEVIATION (KHz)		MAXIMUM LIMIT (KHz)
	25 kHz channel spacing	12.5 kHz channel spacing	
9600	4.2	4.1	None

6.8. EMISSION LIMITATION & EMISSION MASK @ FCC 2.989, 90.209 & 90.910

6.8.1. Limits @ 90.209 & 90.910

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

Frequency Range (MHz)	Maximum Authorized BW (KHz)	Channel Spacing (KHz)	Recommended Max. Freq. Deviation (KHz)	FCC Applicable Mask @ FCC 90.210
806-821/ 851-866	20	25	5	MASK B (Voice) & MASK G (Data)
821-824/866-869	20	12.5	5	MASK B (Voice) & MASK H (Data)
896-901/935-940	13.6	12.5	2.5	MASK I (Voice) & MASK J (Data)
902-928	Note 1	..	..	Mask K (Voice & Data)
929-930	20	25	5	MASK B (Voice) & MASK G (Data)
Above 940	…	…	..	MASK B (Voice) & MASK C (Data)

Note 1: See note 4 of 90.209 for non-multilateration and multilateration LMS operations

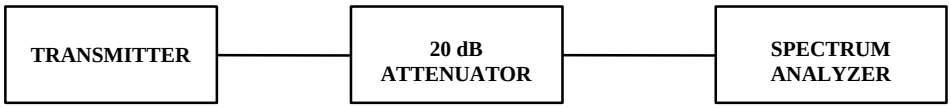
6.8.2. Method of Measurements

Refer to Exhibit 8 Sec. 8.3 of this report for measurement details.

6.8.3. 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

6.8.4. Test Arrangement



6.8.5. Test Data

Conform. Please refer to Exhibit 9. Test Data Plots, plots # 11 - 20 for detailed information.

6.9. TRANSMITTER ANTENNA POWER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 90.210

6.9.1. Limits @ 90.210

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

FCC RULES	WORST CASE EMISSIONS LIMIT	ATTENUATION LIMIT (dBc)
FCC 90.210 (b),(c)(g),(h),(i),(j),(k)	FCC 90.210 (j)	50 + 10log (P) or –20 dBm

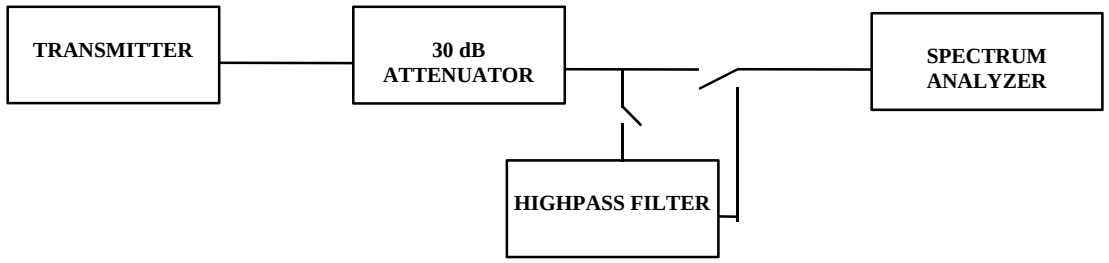
6.9.2. Method of Measurements

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

6.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator(s)	Tenuline	8323	428	DC – 22 GHz
Audio Oscillator	Hewlett Packard	HP 204C	0989A08798	DC to 1.2 MHz
Highpass Filter	KCL	11SH10-1500/T8000	2	Cut-off Frequency at 900 MHz

6.9.4. Test Arrangement



6.9.5. Test Data

Remark: Emissions were scanned for 10 MHz to 10 GHz and all emissions less 30 dB below the limit were recorded. The most stringent limit of –20 dBm was used for compliance with both 12.5 kHz and 25 kHz channel spacing.

6.9.5.1. Test Configuration 1: 806 – 821 MHz Frequency Band

Fundamental Frequency: 806 MHz (lowest frequency)
RF Output Power: 5.9 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
778.0	-25.59	-20	-5.59	PASS
837.4	-29.09	-20	-9.09	PASS
888.3	-28.72	-20	-8.72	PASS
919.4	-25.66	-20	-5.66	PASS
1604.0	-35.16	-20	-15.16	PASS
2414.0	-51.25	-20	-31.25	PASS
3224.0	-47.53	-20	-27.53	PASS
4034.0	-46.81	-20	-26.81	PASS
4831.0	-50.34	-20	-30.34	PASS

Fundamental Frequency: 813.5 MHz (middle frequency)
RF Output Power: 6.0 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
778.0	-26.47	-20	-6.47	PASS
851.5	-29.91	-20	-9.91	PASS
896.8	-29.41	-20	-9.41	PASS
926.5	-25.91	-20	-5.91	PASS
1617.0	-35.84	-20	-15.84	PASS
2440.0	-48.13	-20	-28.13	PASS
3250.0	-47.81	-20	-27.81	PASS
4060.0	-48.50	-20	-28.50	PASS
4870.0	-51.34	-20	-31.34	PASS

Fundamental Frequency: 821 MHz (highest frequency)
RF Output Power: 5.9 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
778.0	-27.72	-20	-7.72	PASS
869.1	-31.19	-20	-11.19	PASS
903.8	-30.31	-20	-10.31	PASS
933.5	-27.72	-20	-7.72	PASS
1643.0	-35.56	-20	-15.56	PASS
2453.0	-45.38	-20	-25.38	PASS
3276.0	-41.53	-20	-21.53	PASS
4099.0	-47.91	-20	-27.91	PASS

6.9.5.2. Test Configuration 2: 851 – 866 MHz Frequency Band

Fundamental Frequency: 851 MHz (lowest frequency)
RF Output Power: 4.6 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1694	-50.75	-20	-30.75	PASS
2543	-24.16	-20	-4.16	PASS
3404	-51.78	-20	-31.78	PASS
5101	-47.22	-20	-27.22	PASS
7660	-45.97	-20	-25.97	PASS
9370	-46.59	-20	-26.59	PASS
1694	-50.75	-20	-30.75	PASS

Fundamental Frequency: 858.5 MHz (middle frequency)
RF Output Power: 4.2 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1707	-49.38	-20	-29.38	PASS
2569	-26.50	-20	-6.50	PASS
3430	-48.91	-20	-28.91	PASS
4279	-48.63	-20	-28.63	PASS
5140	-40.91	-20	-20.91	PASS
6001	-50.03	-20	-30.03	PASS
7724	-46.16	-20	-26.16	PASS
9447	-42.44	-20	-22.44	PASS
1707	-49.38	-20	-29.38	PASS

Fundamental Frequency: 866 MHz (highest frequency)
RF Output Power: 4.1 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1720	-38.91	-20	-18.91	PASS
2594	-42.19	-20	-22.19	PASS
3456	-50.19	-20	-30.19	PASS
4317	-50.44	-20	-30.44	PASS

6.9.5.3. Test Configuration 3: 896 – 901 MHz Frequency Band

Fundamental Frequency: 896 MHz (lowest frequency)
RF Output Power: 5.2 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
449.8	-30.78	-20	-10.78	PASS
785.0	-32.69	-20	-12.69	PASS
814.7	-33.75	-20	-13.75	PASS
857.2	-21.16	-20	-1.16	PASS
937.8	-26.72	-20	-6.72	PASS
1784.0	-52.66	-20	-32.66	PASS
2684.0	-41.06	-20	-21.06	PASS
3597.0	-40.59	-20	-20.59	PASS
4471.0	-44.97	-20	-24.97	PASS

Fundamental Frequency: 901 MHz (highest frequency)
RF Output Power: 5.2 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
448.4	-30.97	-20	-10.97	PASS
792.1	-32.69	-20	-12.69	PASS
820.4	-33.00	-20	-13.00	PASS
855.7	-21.16	-20	-1.16	PASS
947.7	-26.41	-20	-6.41	PASS
2697.0	-42.06	-20	-22.06	PASS
3597.0	-43.56	-20	-23.56	PASS
4497.0	-42.00	-20	-22.00	PASS

6.9.5.4. Test Configuration: 935 – 940 MHz Frequency Band

Fundamental Frequency: 935 MHz (lowest frequency)
RF Output Power: 4.5 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
819.0	-31.16	-20	-11.16	PASS
823.2	-31.66	-20	-11.66	PASS
1861.0	-36.19	-20	-16.19	PASS
2800.0	-40.66	-20	-20.66	PASS
3726.0	-40.63	-20	-20.63	PASS
4677.0	-49.69	-20	-29.69	PASS
5603.0	-39.66	-20	-19.66	PASS
9370.0	-37.22	-20	-17.22	PASS

Fundamental Frequency: 940 MHz (highest frequency)
RF Output Power: 4.3 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
817.6	-30.22	-20	-10.22	PASS
828.9	-29.81	-20	-9.81	PASS
1874.0	-36.19	-20	-16.19	PASS
2826.0	-45.72	-20	-25.72	PASS
3764.0	-41.31	-20	-21.31	PASS
4690.0	-42.72	-20	-22.72	PASS
5641.0	-50.34	-20	-30.34	PASS
7519.0	-44.47	-20	-24.47	PASS
9409.0	-40.13	-20	-20.13	PASS

6.9.6. Plots

Please refer to plots # 21 - 30 in Exhibit 9 Test Data Plots for details of measurements

6.10. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 90.210

6.10.1. Limits @ FCC 90.210

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

FCC RULES	WORST CASE EMISSIONS LIMIT	ATTENUATION LIMIT (dBc)
FCC 90.210 (b),(c)(g),(h),(i),(j),(k)	FCC 90.210 (j)	50 + 10log (P) or –20 dBm

6.10.2. Method of Measurements

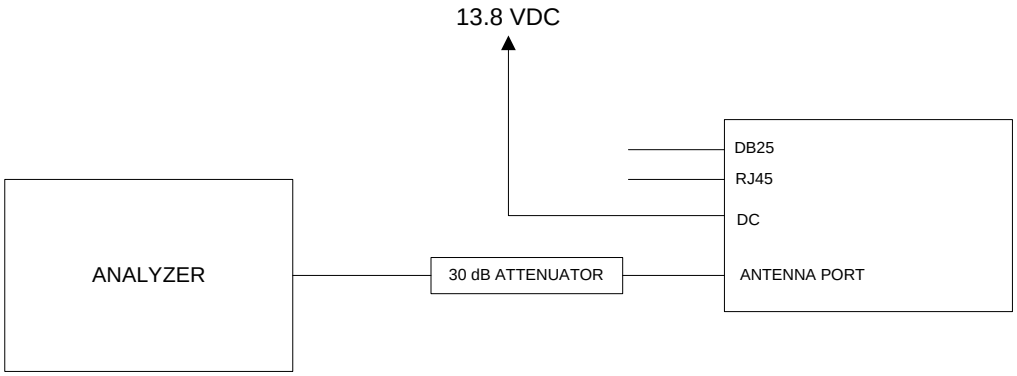
Refer to Exhibit 8, Sec. 8.5 of this report and ANSI C63-4:1992 for radiated emissions test method.

6.10.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz to 32 GHz with external mixer for frequency above 32 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A		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

6.10.4. Test Arrangement

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



6.10.5. Test Data

Remark: Emissions were scanned for 10 MHz to 10 GHz and all emissions less 30 dB below the limit were recorded. The most stringent limit of –20 dBm was used for compliance with both 12.5 kHz and 25 kHz channel spacing.

6.10.5.1. 806 – 821 MHz Frequency Band

Fundamental Frequency: 806 MHz
RF Output Power: 5.9 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1612	71.31	-26.19	Peak	V	-20.0	-6.2	Pass
1612	69.84	-27.66	Peak	H	-20.0	-7.7	Pass
2418	56.41	-41.09	Peak	V	-20.0	-21.1	Pass
2418	51.81	-45.69	Peak	H	-20.0	-25.7	Pass
3224	56.84	-40.66	Peak	V	-20.0	-20.7	Pass
3224	51.16	-46.34	Peak	H	-20.0	-26.3	Pass
4030	52.88	-44.62	Peak	V	-20.0	-24.6	Pass
4030	52.72	-44.78	Peak	H	-20.0	-24.8	Pass
4836	56.69	-40.81	Peak	V	-20.0	-20.8	Pass
4836	57.53	-39.97	Peak	H	-20.0	-20.0	Pass
5642	57.34	-40.16	Peak	V	-20.0	-20.2	Pass
5642	57.81	-39.69	Peak	H	-20.0	-19.7	Pass
6448	55.41	-42.09	Peak	V	-20.0	-22.1	Pass
6448	55.66	-41.84	Peak	H	-20.0	-21.8	Pass
7254	54.81	-42.69	Peak	V	-20.0	-22.7	Pass
7254	56.00	-41.50	Peak	H	-20.0	-21.5	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

Fundamental Frequency: 813.5 MHz
RF Output Power: 6.0 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (PEAK/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1627.0	65.91	-31.59	Peak	V	-20.0	-11.6	Pass
1627.0	59.19	-38.31	Peak	H	-20.0	-18.3	Pass
2440.5	56.56	-40.94	Peak	V	-20.0	-20.9	Pass
2440.5	57.28	-40.22	Peak	H	-20.0	-20.2	Pass
3254.0	56.63	-40.87	Peak	V	-20.0	-20.9	Pass
3254.0	53.59	-43.91	Peak	H	-20.0	-23.9	Pass
4067.5	52.75	-44.75	Peak	V	-20.0	-24.8	Pass
4067.5	53.09	-44.41	Peak	H	-20.0	-24.4	Pass
4881.0	56.31	-41.19	Peak	V	-20.0	-21.2	Pass
4881.0	56.63	-40.87	Peak	H	-20.0	-20.9	Pass
5694.5	57.25	-40.25	Peak	V	-20.0	-20.3	Pass
5694.5	57.31	-40.19	Peak	H	-20.0	-20.2	Pass
6508.0	55.25	-42.25	Peak	V	-20.0	-22.3	Pass
6508.0	55.06	-42.44	Peak	H	-20.0	-22.4	Pass
7321.5	54.13	-43.37	Peak	V	-20.0	-23.4	Pass
7321.5	53.28	-44.22	Peak	H	-20.0	-24.2	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

Fundamental Frequency: 821 MHz
RF Output Power: 5.9 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1642	63.19	-34.31	Peak	V	-20.0	-14.3	Pass
1642	59.72	-37.78	Peak	H	-20.0	-17.8	Pass
2463	57.91	-39.59	Peak	V	-20.0	-19.6	Pass
2463	60.34	-37.16	Peak	H	-20.0	-17.2	Pass
3284	57.72	-39.78	Peak	V	-20.0	-19.8	Pass
3284	54.03	-43.47	Peak	H	-20.0	-23.5	Pass
4105	52.59	-44.91	Peak	V	-20.0	-24.9	Pass
4105	53.47	-44.03	Peak	H	-20.0	-24.0	Pass
4926	55.06	-42.44	Peak	V	-20.0	-22.4	Pass
4926	55.53	-41.97	Peak	H	-20.0	-22.0	Pass
5747	56.94	-40.56	Peak	V	-20.0	-20.6	Pass
5747	57.88	-39.62	Peak	H	-20.0	-19.6	Pass
6568	56.50	-41.00	Peak	V	-20.0	-21.0	Pass
6568	54.47	-43.03	Peak	H	-20.0	-23.0	Pass
7389	55.97	-41.53	Peak	V	-20.0	-21.5	Pass
7389	56.44	-41.06	Peak	H	-20.0	-21.1	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

6.10.5.2. 851 – 866 MHz Frequency Band

Fundamental Frequency: 851 MHz
RF Output Power: 4.6 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1702	60.28	-37.22	Peak	V	-20.0	-17.2	Pass
1702	59.47	-38.03	Peak	H	-20.0	-18.0	Pass
2553	53.34	-44.16	Peak	V	-20.0	-24.2	Pass
2553	52.56	-44.94	Peak	H	-20.0	-24.9	Pass
3404	59.88	-37.62	Peak	V	-20.0	-17.6	Pass
3404	56.91	-40.59	Peak	H	-20.0	-20.6	Pass
4255	61.38	-36.12	Peak	V	-20.0	-16.1	Pass
4255	56.03	-41.47	Peak	H	-20.0	-21.5	Pass
5106	68.22	-29.28	Peak	V	-20.0	-9.3	Pass
5106	62.07	-35.43	Peak	H	-20.0	-15.4	Pass
5957	68.53	-28.97	Peak	V	-20.0	-9.0	Pass
5957	66.97	-30.53	Peak	H	-20.0	-10.5	Pass
6808	60.94	-36.56	Peak	V	-20.0	-16.6	Pass
6808	56.81	-40.69	Peak	H	-20.0	-20.7	Pass
7659	62.06	-35.44	Peak	V	-20.0	-15.4	Pass
7659	60.81	-36.69	Peak	H	-20.0	-16.7	Pass
8510	60.38	-37.12	Peak	V	-20.0	-17.1	Pass
8510	59.53	-37.97	Peak	H	-20.0	-18.0	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

Fundamental Frequency: 858.5 MHz
RF Output Power: 4.2 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1717.0	59.81	-37.69	Peak	V	-20.0	-17.7	Pass
1717.0	57.63	-39.87	Peak	H	-20.0	-19.9	Pass
2575.5	60.47	-37.03	Peak	V	-20.0	-17.0	Pass
2575.5	56.41	-41.09	Peak	H	-20.0	-21.1	Pass
3434.0	57.75	-39.75	Peak	V	-20.0	-19.8	Pass
3434.0	58.84	-38.66	Peak	H	-20.0	-18.7	Pass
4292.5	65.28	-32.22	Peak	V	-20.0	-12.2	Pass
4292.5	60.34	-37.16	Peak	H	-20.0	-17.2	Pass
5151.0	68.34	-29.16	Peak	V	-20.0	-9.2	Pass
5151.0	68.06	-29.44	Peak	H	-20.0	-9.4	Pass
6009.5	67.31	-30.19	Peak	V	-20.0	-10.2	Pass
6009.5	65.88	-31.62	Peak	H	-20.0	-11.6	Pass
6868.0	61.47	-36.03	Peak	V	-20.0	-16.0	Pass
6868.0	58.06	-39.44	Peak	H	-20.0	-19.4	Pass
7726.5	59.84	-37.66	Peak	V	-20.0	-17.7	Pass
7726.5	61.44	-36.06	Peak	H	-20.0	-16.1	Pass
8585.0	62.72	-34.78	Peak	V	-20.0	-14.8	Pass
8585.0	61.34	-36.16	Peak	H	-20.0	-16.2	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

Fundamental Frequency: 866 MHz
RF Output Power: 4.1 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1732	57.88	-39.62	Peak	V	-20.0	-19.6	Pass
1732	54.19	-43.31	Peak	H	-20.0	-23.3	Pass
2598	55.78	-41.72	Peak	V	-20.0	-21.7	Pass
2598	57.75	-39.75	Peak	H	-20.0	-19.8	Pass
3464	57.84	-39.66	Peak	V	-20.0	-19.7	Pass
3464	55.41	-42.09	Peak	H	-20.0	-22.1	Pass
4330	59.03	-38.47	Peak	V	-20.0	-18.5	Pass
4330	55.22	-42.28	Peak	H	-20.0	-22.3	Pass
5196	57.97	-39.53	Peak	V	-20.0	-19.5	Pass
5196	57.09	-40.41	Peak	H	-20.0	-20.4	Pass
6062	63.78	-33.72	Peak	V	-20.0	-13.7	Pass
6062	61.72	-35.78	Peak	H	-20.0	-15.8	Pass
6928	56.84	-40.66	Peak	V	-20.0	-20.7	Pass
6928	55.75	-41.75	Peak	H	-20.0	-21.8	Pass
7794	58.44	-39.06	Peak	V	-20.0	-19.1	Pass
7794	57.47	-40.03	Peak	H	-20.0	-20.0	Pass
8660	57.25	-40.25	Peak	V	-20.0	-20.3	Pass
8660	57.66	-39.84	Peak	H	-20.0	-19.8	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

6.10.5.3. 896 – 901 MHz Frequency Band

Fundamental Frequency: 896 MHz
RF Output Power: 5.2 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1792.0	54.66	-42.84	Peak	V	-20.0	-22.8	Pass
1792.0	52.16	-45.34	Peak	H	-20.0	-25.3	Pass
2688.0	61.59	-35.91	Peak	V	-20.0	-15.9	Pass
2688.0	60.47	-37.03	Peak	H	-20.0	-17.0	Pass
3584.0	61.94	-35.56	Peak	V	-20.0	-15.6	Pass
3584.0	61.56	-35.94	Peak	H	-20.0	-15.9	Pass
4480.0	60.16	-37.34	Peak	V	-20.0	-17.3	Pass
4480.0	57.94	-39.56	Peak	H	-20.0	-19.6	Pass
5376.0	53.53	-43.97	Peak	V	-20.0	-24.0	Pass
5376.0	52.72	-44.78	Peak	H	-20.0	-24.8	Pass
6272.0	59.25	-38.25	Peak	V	-20.0	-18.3	Pass
6272.0	63.06	-34.44	Peak	H	-20.0	-14.4	Pass
7168.0	57.94	-39.56	Peak	V	-20.0	-19.6	Pass
7168.0	57.06	-40.44	Peak	H	-20.0	-20.4	Pass
8064.0	57.06	-40.44	Peak	V	-20.0	-20.4	Pass
8064.0	56.88	-40.62	Peak	H	-20.0	-20.6	Pass
8960.0	58.69	-38.81	Peak	V	-20.0	-18.8	Pass
8960.0	60.03	-37.47	Peak	H	-20.0	-17.5	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

Fundamental Frequency: 901 MHz
RF Output Power: 5.2 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1802.0	52.97	-44.53	Peak	V	-20.0	-24.5	Pass
1802.0	51.69	-45.81	Peak	H	-20.0	-25.8	Pass
2703.0	58.94	-38.56	Peak	V	-20.0	-18.6	Pass
2703.0	58.69	-38.81	Peak	H	-20.0	-18.8	Pass
3604.0	60.97	-36.53	Peak	V	-20.0	-16.5	Pass
3604.0	58.81	-38.69	Peak	H	-20.0	-18.7	Pass
4505.0	60.19	-37.31	Peak	V	-20.0	-17.3	Pass
4505.0	55.16	-42.34	Peak	H	-20.0	-22.3	Pass
5406.0	53.84	-43.66	Peak	V	-20.0	-23.7	Pass
5406.0	52.94	-44.56	Peak	H	-20.0	-24.6	Pass
6307.0	59.41	-38.09	Peak	V	-20.0	-18.1	Pass
6307.0	59.84	-37.66	Peak	H	-20.0	-17.7	Pass
7208.0	57.63	-39.87	Peak	V	-20.0	-19.9	Pass
7208.0	55.63	-41.87	Peak	H	-20.0	-21.9	Pass
8109.0	56.81	-40.69	Peak	V	-20.0	-20.7	Pass
8109.0	55.56	-41.94	Peak	H	-20.0	-21.9	Pass
9010.0	58.16	-39.34	Peak	V	-20.0	-19.3	Pass
9010.0	56.09	-41.41	Peak	H	-20.0	-21.4	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

6.10.5.4. 935 – 940 MHz Frequency Band

Fundamental Frequency: 935 MHz
RF Output Power: 4.5 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1870.0	59.66	-37.84	Peak	V	-20.0	-17.8	Pass
1870.0	58.34	-39.16	Peak	H	-20.0	-19.2	Pass
2805.0	58.16	-39.34	Peak	V	-20.0	-19.3	Pass
2805.0	60.66	-36.84	Peak	H	-20.0	-16.8	Pass
3740.0	67.06	-30.44	Peak	V	-20.0	-10.4	Pass
3740.0	64.00	-33.50	Peak	H	-20.0	-13.5	Pass
4675.0	65.72	-31.78	Peak	V	-20.0	-11.8	Pass
4675.0	65.78	-31.72	Peak	H	-20.0	-11.7	Pass
5610.0	75.50	-22.00	Peak	V	-20.0	-2.0	Pass
5610.0	69.84	-27.66	Peak	H	-20.0	-7.7	Pass
6545.0	61.63	-35.87	Peak	V	-20.0	-15.9	Pass
6545.0	60.72	-36.78	Peak	H	-20.0	-16.8	Pass
7480.0	64.16	-33.34	Peak	V	-20.0	-13.3	Pass
7480.0	64.16	-33.34	Peak	H	-20.0	-13.3	Pass
8415.0	61.81	-35.69	Peak	V	-20.0	-15.7	Pass
8415.0	57.88	-39.62	Peak	H	-20.0	-19.6	Pass
9350.0	62.66	-34.84	Peak	V	-20.0	-14.8	Pass
9350.0	67.41	-30.09	Peak	H	-20.0	-10.1	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

Fundamental Frequency: 940 MHz
RF Output Power: 4.3 Watts
Modulation: FM modulation at 9600 baud rate with binary CPFSK internal random data source

Frequency (MHz)	RF Field Level @ 3 m (dBuV/m)	RF Power Level (dBm)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Limit @ 3 m (dBm)	Margin (dB)	Pass/ Fail
1880.0	59.47	-38.03	Peak	V	-20.0	-18.0	Pass
1880.0	58.53	-38.97	Peak	H	-20.0	-19.0	Pass
2820.0	57.59	-39.91	Peak	V	-20.0	-19.9	Pass
2820.0	60.53	-36.97	Peak	H	-20.0	-17.0	Pass
3760.0	63.72	-33.78	Peak	V	-20.0	-13.8	Pass
3760.0	61.69	-35.81	Peak	H	-20.0	-15.8	Pass
4700.0	64.78	-32.72	Peak	V	-20.0	-12.7	Pass
4700.0	66.03	-31.47	Peak	H	-20.0	-11.5	Pass
5640.0	73.19	-24.31	Peak	V	-20.0	-4.3	Pass
5640.0	72.38	-25.12	Peak	H	-20.0	-5.1	Pass
6580.0	61.91	-35.59	Peak	V	-20.0	-15.6	Pass
6580.0	57.91	-39.59	Peak	H	-20.0	-19.6	Pass
7520.0	66.56	-30.94	Peak	V	-20.0	-10.9	Pass
7520.0	65.88	-31.62	Peak	H	-20.0	-11.6	Pass
8460.0	63.97	-33.53	Peak	V	-20.0	-13.5	Pass
8460.0	66.56	-30.94	Peak	H	-20.0	-10.9	Pass
9400.0	64.69	-32.81	Peak	V	-20.0	-12.8	Pass
9400.0	69.00	-28.50	Peak	H	-20.0	-8.5	Pass

The emissions were scanned from 10 MHz to 10 GHz and all emissions less 30 dB below the limits were recorded.

EXHIBIT 7. MEASUREMENT UNCERTAINTY

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

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

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

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

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

EXHIBIT 8. MEASUREMENT METHODS

8.1. 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

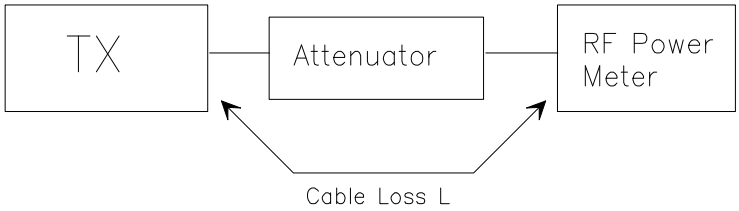
- Using a spectrum analyzer with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal;
- The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test 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

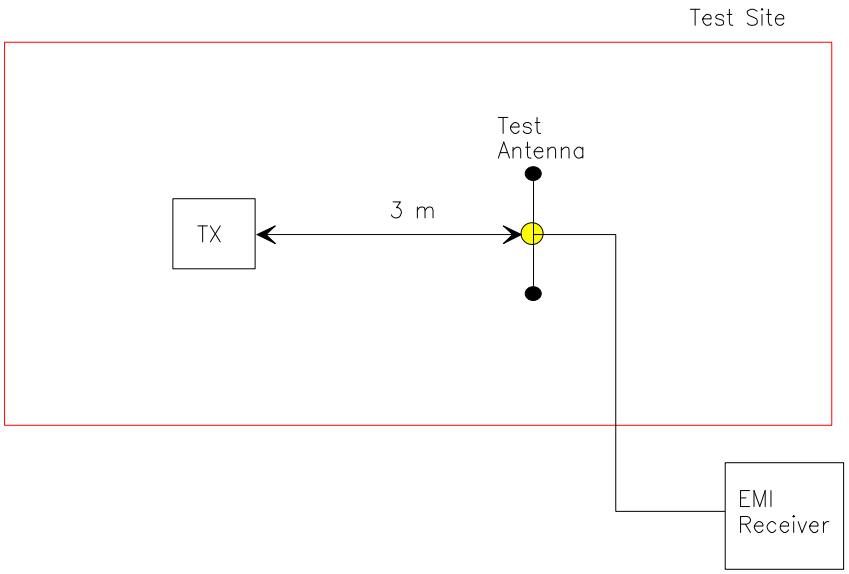
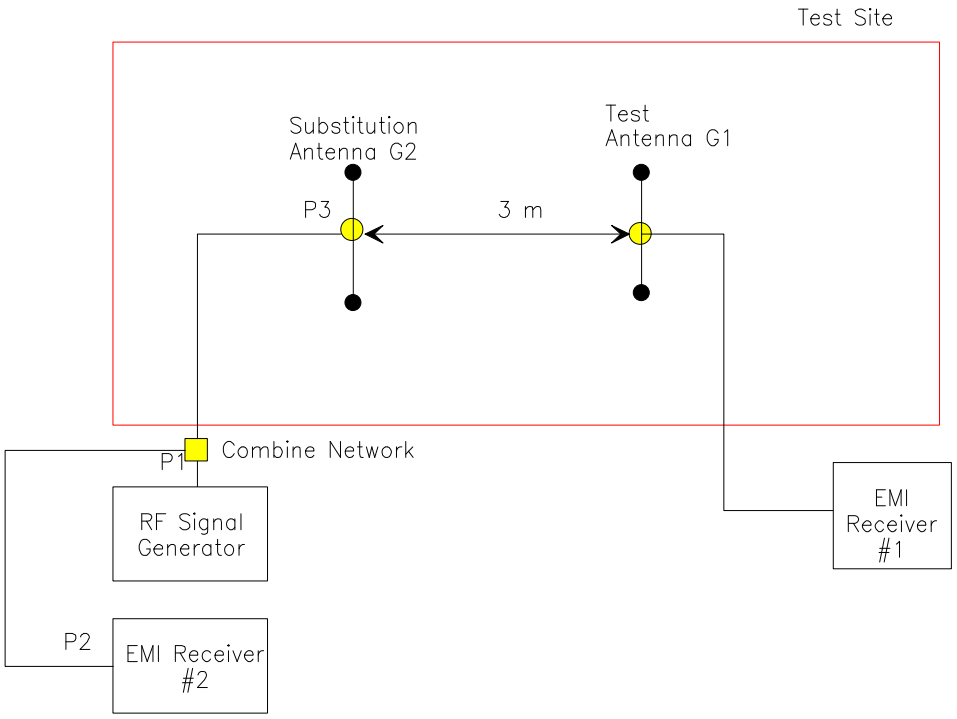


Figure 3



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 Emission Mask/Out-of-Band Emission Measurements:

(1) For 25 kHz Channel Spacing: RBW = 300 Hz
(2) For 12.5 kHz or 6.25 kHz Channel Spacings: RBW = 100 Hz

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

EXHIBIT 9. TEST DATA PLOTS

EXHIBIT 10. TEST SETUP PHOTOS

EXHIBIT 11. EXTERNAL EUT PHOTOS

EXHIBIT 12. INTERNAL EUT PHOTOS

EXHIBIT 13. COVER LETTERS

EXHIBIT 14. ATTESTATION STATEMENTS

None.

EXHIBIT 15. APPLICATION FORMS

EXHIBIT 16. ID LABEL/LOCATION INFO

EXHIBIT 17. BLOCK DIAGRAM (S)

EXHIBIT 18. SCHEMATIC DIAGRAMS

EXHIBIT 19. PARTS LIST/TUNE UP INFO

None.

EXHIBIT 20. OPERATIONAL DESCRIPTION

EXHIBIT 21. RF EXPOSURE INFO

Refer to user's manual, page ii.

EXHIBIT 22. USER'S MANUAL