ENGINEERING TEST REPORT

CamLite Video System
Model No.: R-1
FCC ID: QIH-CL0201

Applicant:

CamLite Corporation
10221 N 32nd St, Suite A
Phoenix, Arizona
United States, 85028

Tested in Accordance With

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

UltraTech's File No.: K&A-006F90

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

Date: .....

Report Prepared by: Dan Huynh	Tested by: Hung Trinh, EMI/RFI Technician
Issued Date: July 19, 2002	Test Dates: July 8-10, 2002

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
Website: www.ultratech-labs.com Email: vic@ultratech-labs.com, Email: tri.luu@sympatico.ca

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EXHIBIT 1. SUBMITTAL CHECK LIST

Annex Number	Exhibit Type	Description of Contents	Quality Check (OK)
--	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
1	Test Report – Test Data Plots	• 99% Emission Bandwidth, Plots 1 to 4 • Emission Mask, Plots 5 to 8 • Frequency Stability, Plots 9 to 14	OK
2	Test Setup Photos	Radiated Emissions Test Setup Photos	OK
3	External EUT Photos	External EUT Photos	OK
4	Internal EUT Photos	Internal EUT Photos	OK
5	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
6	Attestation Statements	--	--
7	ID Label/Location Info	• ID Label • Location of ID Label	OK
8	Block Diagrams	CamLite Block Diagram	OK
9	Schematic Diagrams	• K & A FM Module Schematic • Power Amplifier Board	OK
10	Parts List/Tune Up Info	• K & A FM Module Parts List • CamLite PA Parts List	OK
11	Operational Description	Technical Description	OK
12	RF Exposure Info	See section 6.6 of this Test Report for details	OK
13	Users Manual	CamLite Video System Operating Instructions	OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Parts 2 and 90
Title:	Telecommunication – 47 Code of Federal Regulations (CFR) Parts 2 & 90
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency band 2450-2483.52 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

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

None

2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2001	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1	1999	Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT	
Name:	CamLite Corporation
Address:	10221 North 32nd St., SuiteA Phoenix, AZ USA, 85028
Contact Person:	David LaBau Phone #: 602-494-6311 Fax #: 602-494-6314 Email Address: davelabau@camlite.com

MANUFACTURER	
Name:	K&A Wireless, LLC
Address:	2617 Juan Tabo Blvd. NE, Suite A Albuquerque, NM USA, 87112
Contact Person:	Kamil Agi Phone #: 505-338-2380 Fax #: 505-338-2382 Email Address: kagi@ka-wireless.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:	CamLite Corporation
Product Name:	CamLite Video System
Model Name or Number:	R-1
Serial Number:	Test Sample
Type of Equipment:	Licensed Non-Broadcast Radio Communication Equipment
External Power Supply:	N/A
Transmitting Antenna Type:	Integral
Primary User Functions of EUT:	Transmit video information

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	[x] Portable [ ] Mobile [ ] Base station (fixed use)
Intended Operating Environment:	[x] Commercial
Power Supply Requirement:	4.8Vdc (nominal), four ½ D size NiCad Batteries
RF Output Power Rating:	32.4 mW ERP
Operating Frequency Range:	2450-2483.52 MHz
Number of Channel:	2 channels (2458 MHz and 2474 MHz)
RF Output Impedance:	50 Ohm
Channel Spacing:	16 MHz
***Occupied Bandwidth (99%):**	2.86 MHz
Emission Designation:	2M86F3F
Oscillator Frequency:	20 MHz
Antenna Connector Type:	Integral
Antenna Description:	Manufacturer: K&A Wireless, LLC Type: Printed dipole antenna P/N: FM-TX-0042 Frequency Range: 2400-2500 MHz Gain: 0 dBi

* Please refer to Plots # 1 to 4 in Annex 1 for details of 99% occupied bandwidth 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:	4.8Vdc (nominal), four ½ D size NiCad Batteries

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier FM modulated with an external NTSC video signal
Special Test Software:	None
Special Hardware Used:	None
Transmitter Test Antenna:	The EUT is tested with the integral printed dipole antenna.

Transmitter Test Signals	
Frequency Band(s): ▪ 2450 – 2483.52 MHz	Near lowest, near middle & near highest frequencies in each frequency bands that the transmitter covers: ▪ 2458 & 2474 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): 32.4 mWatts ERP ▪ Normal Test Modulation: Video NTSC ▪ Modulating Signal Source: Internal	

EXHIBIT 5. SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above site have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: August 08, 2001.

5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC 47 CFR SECTION(S)	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.205 & 2.1046	RF Power Output	Yes
1.1307, 1.1310, 2.1091 & 2.1093	Radiofrequency Radiation Exposure Evaluation	Yes
90.213 & 2.1055	Frequency Stability	Yes
90.242(b)(8) & 2.1047(a)	Audio Frequency Response	Not applicable
90.210 & 2.1047(b)	Modulation Limiting	Not applicable
90.210 & 2.1049	Emission Limitation & Emission Masks	Yes
90.210, 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Not applicable
90.210, 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
CamLite Video System, Model No.: **R-1,** by **CamLite Corporation** has also been tested and found to comply with FCC Part 15, Subpart B - Class B Digital Devices. The engineering test report has been documented and kept in file and it is available upon FCC request.		

5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

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

6.1. TEST PROCEDURES

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

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

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

6.5. RF POWER OUTPUT @ FCC 2.1046 & 90.205(L)

6.5.1. Limits @ FCC 90.205(l)

Please refer to FCC 47 CFR, Part 90, Subpart I, Para. 90.205(l) for specification details. The maximum transmitter power is 5 Watts.

6.5.2. Method of Measurements

Please refer to section 8.2 (Radiated) of this test report 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 8546A	…	9 kHz to 5.6 GHz with built-in 30 dB Gain Pre-selector, QP, Average & Peak Detectors.
Attenuator(s)	Bird	…	…	DC – 22 GHz
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz – 26.5 GHz
Attenuator(s)	Weinschel Corp	24-20-34	BJ2357	DC – 8.5 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 MHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 MHz – 1 GHz
Power Meter	Hewlett Packard	436A	1725A02249	10 kHz – 50 GHz, sensor dependent
Power Sensor	Hewlett Packard	8481A	2702A68983	10 MHz – 18 GHz
Synthesize Sweeper	Hewlett Packard	83752B	3610A00457	0.01 – 20 GHz

6.5.4. Test Arrangement

Please refer to section 8.2 of this test report for test arrangement and measurement method.

6.5.5. Test Data

Frequency (MHz)	Peak E-Field @ 3m (dBµV/m)/MHz	Antenna Polarization (V/H)	Peak Power From Signal Generator (dBm)	Substitution Antenna Gain (dBi)	Measured Peak ERP/MHz (dBm)
2458	110.20	V	6.55	8.00	12.40
2458	112.69	H	9.35	7.70	14.90
2474	***112.47***	***V***	***9.25***	***8.00***	***15.10***
2474	110.00	H	6.50	7.70	12.05

The maximum measured ERP is 15.10 dBm (32.4 mWatts), as indicated in the above table.

Note: The conducted power is not measurable since there is no available RF output port connector.

6.6. RF EXPOSURE REQUIREMENTS @ 1.1310 & 2.1091

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	Compliance with FCC Rules
SAR Tests for Portable Transmitters	This device operate at low power level (32.4 mWatts ERP), compliance with RF Exposure will be demonstrated by providing operating instructions and warning instructions to ensure that the device will not expose users or nearby persons above the applicable MPE limits.
Minimum separation distance between antenna and persons required to ensure compliance with RF Exposure limits is **2.5 cm**	Please refer to page 3 of the Operating Instructions Manual for RF Exposure information.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Please refer to page 3 of the Operating Instructions Manual for RF Exposure information.

6.7. FREQUENCY STABILITY @ FCC 2.1055 & 90.213

6.7.1. Limits @ FCC 90.213

The frequency stability will be specified in the station authorization.

6.7.2. Method of Measurements

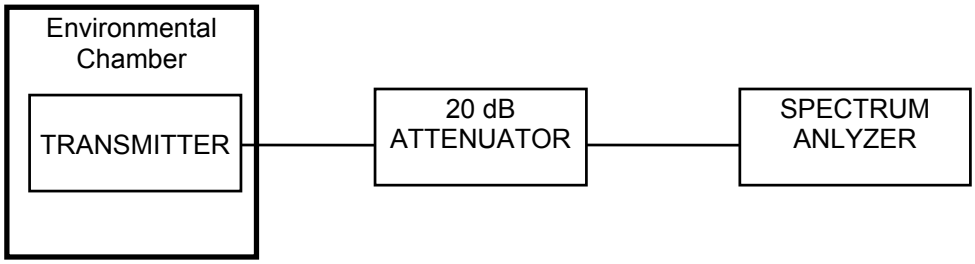
Refer to Exhibit 8, § 8.3 of this report for measurement details

The frequency stability will be specified in the station authorization. For the purpose of compliance, the carrier frequency stability will be checked for out-of-band emissions at room temperature (20°C) and extreme temperatures (-30°C and +50°C).

6.7.3. 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

6.7.4. Test Arrangement



6.7.5. Test Data

Conforms. At room temperature (20°C) and extreme temperature (-30°C and +50°C) conditions, the carrier frequencies were found to remain within the FCC permitted band 2450-2483.52 MHz. Please refer to Plots # 9 to 14 in Annex 1 for detailed measurements.

6.8. EMISSION MASK @ FCC 2.1049, 90.209 & 90.210

6.8.1. Limits @ FCC 90.209 & 90.210

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

Frequency Range (MHz)	FCC Applicable Mask
2450-2483.52	No emission is specified. The attenuation of 43 + 10*log(P) outside the permitted band 2450-2483.52 MHz will be used for compliance evaluation.

* P is the power in watts

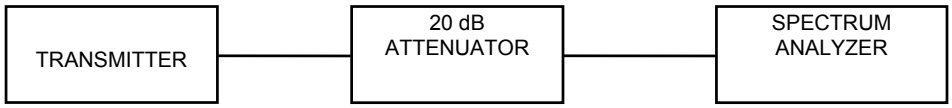
6.8.2. Method of Measurements

Refer to Exhibit 8, section 8.4 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 Plots # 5 to 8 in Annex 1 for details of measurements

6.9. FIELD STRENGTH OF SPURIOUS RADIATION @ FCC 2.1053 & 90.210

6.9.1. Limits @ FCC 90.210

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

FCC Rules	Frequency Range	Attenuation Limit (dBc)
90.210	10 MHz to Lowest frequency of the radio to 10th harmonic of the highest frequency of the radio	43+10*log(P in Watts)

6.9.2. Method of Measurements

The spurious/harmonic ERP measurements, using substitution method specified in Exhibit 8, section 8.2 of this report and its value in dBc is calculated as follows:

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

If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:

Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

ERP of spurious/harmonic (dBc) = ERP of carrier (dBm) – ERP of spurious/harmonic emission (dBm)

6.9.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8546A	…	9 kHz to 5.6 GHz with built-in 30 dB Gain Pre-selector, QP, Average & Peak Detectors.
RF Amplifier	Com-Power	PA-102		1 MHz to 1 GHz, 30 dB gain nomimal
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz, 30 dB nominal
Biconilog Antenna	EMCO	3142	10005	30 MHz to 2 GHz
Dipole Antenna	EMCO	3121C	8907-434	30 GHz – 1 GHz
Dipole Antenna	EMCO	3121C	8907-440	30 GHz – 1 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3155	9911-5955	1 GHz – 18 GHz
RF Signal Generator	Hewlett Packard	HP 83752B	3610A00457	0.01 – 20 GHz

6.9.4. Test Data

6.9.4.1. Channel #1 (2458 MHz)

Fundamental Frequency: 2458 MHz
RF Output Power: 14.90 dBm (ERP)
Modulation: FM modulation with NTSC Video signal

Frequency (MHz)	E-Field @3m (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured by Substitution Method		Limit (dBc)	Margin (dB)
				(dBm)	(dBc)		
4916	81.78	Peak	V	-28.50	43.40	27.90	-15.50
4916	81.28	Peak	H	-30.00	44.90	27.90	-17.00
7374	83.34	Peak	H	-27.40	42.30	27.90	-14.40
2498	82.81	Peak	V	-27.50	42.40	27.90	-14.50
2498	86.06	Peak	H	-25.50	40.40	27.90	-12.50
The emissions were scanned from 10 MHz to 25 GHz and all emissions within 20 dB below the limits were recorded.							

6.9.4.2. Channel # 2 (2474 MHz)

Fundamental Frequency: 2474 MHz
RF Output Power: 15.10 dBm (ERP)
Modulation: FM modulation with NTSC Video signal

Frequency (MHz)	E-Field @3m (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP Measured by Substitution Method		Limit (dBc)	Margin (dB)
				(dBm)	(dBc)		
7422	88.50	Peak	V	-23.70	38.80	28.10	-10.70
7422	82.91	Peak	H	-27.30	42.40	28.10	-14.30
2514	88.53	Peak	V	-21.25	36.35	28.10	-8.25
2514	86.50	Peak	H	-25.40	40.50	28.10	-12.40
The emissions were scanned from 10 MHz to 25 GHz and all emissions within 20 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 $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

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

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

EXHIBIT 8. MEASUREMENT METHODS

8.1. CONDUCTED POWER MEASUREMENTS

The following shall be applied to the combination(s) of the radio device and its intended antenna(e).
I f the RF level is user adjustable, all measurements shall be made with the highest power level available to the user for that combination.
The following method of measurement shall apply to both conducted and radiated measurements.
The radiated measurements are performed at the Ultratech 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 if the transmitter's transmission is transient

Using a EMI Receiver with the frequency span set to 0 Hz and the sweep time set at a suitable value to capture the envelope peaks and the duty cycle of the transmitter output signal.

The duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.

Step 2: Calculation of Average EIRP (See Figure 1)

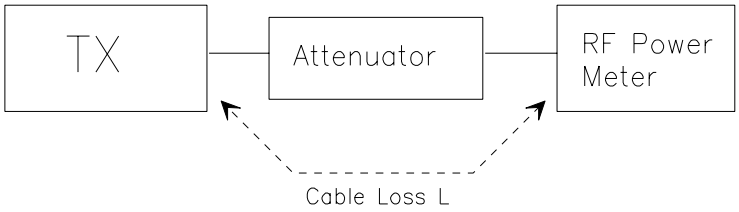
The average output power of the transmitter shall be determined using a wideband, calibrated RF average power meter with the power sensor with an integration period that exceeds the repetition period of the transmitter by a factor 5 or more. The observed value shall be recorded as "A" (in dBm);

The e.i.r.p. shall be calculated from the above measured power output "A", the observed duty cycle x, and the applicable antenna assembly gain "G" in dBi, according to the formula:

EIRP = A + G + 10log(1/x)

{X = 1 for continuous transmission => 10log(1/x) = 0 dB}

Figure 1.



8.2. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

8.2.1. Maximizing RF Emission Level (E-Field)

(a) The measurements were performed with full rf output power and 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) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
- ➢ Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
- ➢ E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver #1 and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies

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

(a) Set the EMI Receiver #1(for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	10 kHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
- ➢ Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
- ➢ E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
- ➢ DIPOLE antenna for frequency from 30-1000 MHz or
- ➢ HORN antenna for frequency above 1 GHz

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna:
- ➢ DIPOLE antenna for frequency from 30-1000 MHz or
- ➢ HORN antenna for frequency above 1 GHz

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculates the ERP/EIRP as follows:

$P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1$
$EIRP = P + G1 = P3 + L2 - L1 + A + G1$
$ERP = EIRP – 2.15\ dB$

Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where:	P:	Actual RF Power fed into the substitution antenna port after corrected.
	P1:	Power output from the signal generator
	P2:	Power measured at attenuator A input
	P3:	Power reading on the Average Power Meter
	EIRP:	EIRP after correction
	ERP:	ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

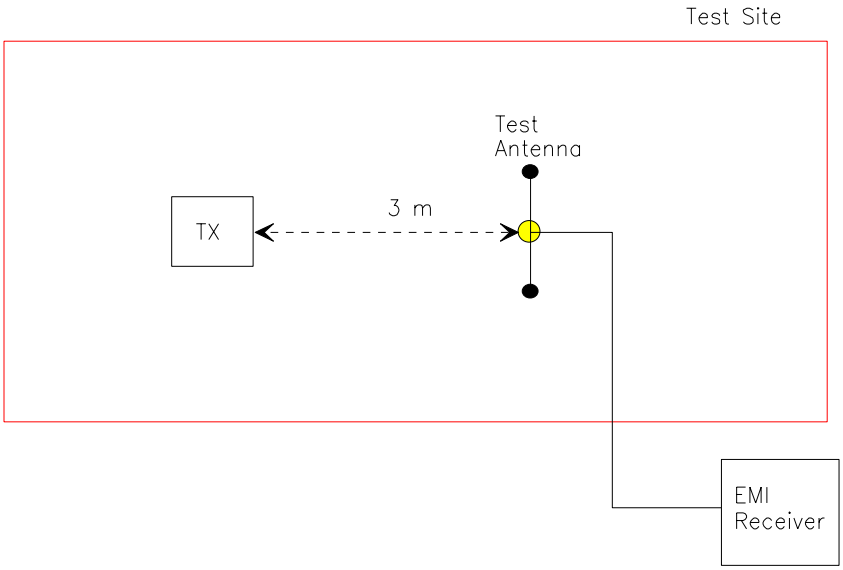
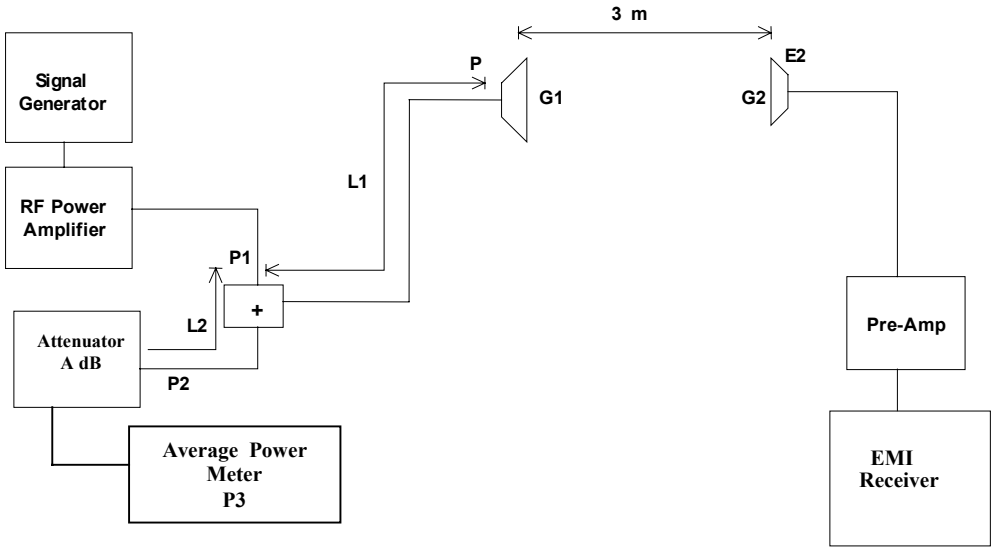


Figure 3



8.3. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

8.4. EMISSION MASK

Voice or Digital Modulation Through a Voice Input Port @ 2.1049(c)(1): 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 @ 2.1049(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 EMI Receiver bandwidth shall be used for measurement of Emission Mask/Out-of-Band Emission Measurements:

For 25 kHz Channel Spacing: RBW = 300 Hz
For 12.5 kHz or 6.25 kHz Channel Spacings: RBW = 100 Hz

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

8.5. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver 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 47 CFR, Para. 2.1057 - Frequency spectrum to be investigated:- The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC 47 CFR, Para. 2.1051 - 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 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.