EMC COMPLIANCE ENGINEERING AND TESTING

NVLAP Accredited

APPLICATION FOR PART 90 CERTIFICATION TRANSMITTER

Backgrounds Unlimited, Incorporated
Old Town Hall, Rt. 11 South
P.O. Box 327
Mt. Sidney, VA 24467

MODEL: TXBD-12A
FCC ID: NH5FWVTXBD12A

November 22, 1999

This report concerns (check one): **Original Grant:** X **Class II Change:** **Equipment Type**: **Transmitter**	
Deferred grant requested per 47 CFR 0.457 (d) (1) (ii)? **Yes:** **No**: X **If yes, defer until:** _____ *Date* **Company name agrees to notify the Commission by: _____(date) of the intended date of announcement of the product so that the grant can be issued on that date.**	

REPORT PREPARED BY:

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Document Number: 990484
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1.0 GENERAL INFORMATION

The following application for Certification of a Part 90 FCC Transmitter 2450-2483 MHz Band is prepared on behalf of Backgrounds Unlimited, Incorporated in accordance with Part 2 and Part 90 of the Federal Communications Commission's rules and regulations. The Equipment Under Test (EUT) was M/N: TXBD12A, FCC ID: NH5FWVTXBD12A. The test results reported in this document relate only to the item that was tested.

All measurements contained in this application were conducted in accordance with CFR 47, Part 90, ANSI C63.4 Methods of Measurement of Radio Noise Emissions, 1992. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instruments. These are explained in the appendix of this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurement were performed manually at Rhein Tech Incorporated. The radiated emissions measurements required by the rules were performed on the three meter, open field test range maintained by Rhein Tech Laboratories, Inc., 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission. The power line conducted emission measurements were performed in a shielded enclosure also located at the Herndon, Virginia facility. Rhein Tech Laboratories, Inc. is on the FCC accepted laboratory list as a facility available to do measurement work for others on a contract basis.

1.1 PRODUCT DESCRIPTION

The EUT was developed from the commercially available transmitter printed circuit board manufactured by RF Link. The identical power supply voltages and filtering components were maintained. Only the size was reduced and other features such as channel selection were not necessary.

Twelve volt (12V) power from an AC adapter or Battery Pack is brought to the PCB via solder pads. Two 22 MFD electrolytic capacitors and a 0.1 MFD capacitor provide power supply filtering at the PCB. The 12V input is then regulated to 8 volts by the LM7808 voltage regulator. The 8.0 volt power is filtered via two 47 MFD electrolytic capacitors and a 0.1 MFD capacitor and feeds pin 7 of the transmitter module. The transmitter module contains a 10 pin header which is soldered to the PCB. Pin 10 is attached to ground, NTSC video from the CCD camera is hardwired to pin 6, and if audio is utilized it is hard wired to pin 9. The transmitter module's antenna pad is left intact and utilized in the applications.

Note: All PCB trace runs were reduced and a tight ground plane maintained.

1.2 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application.

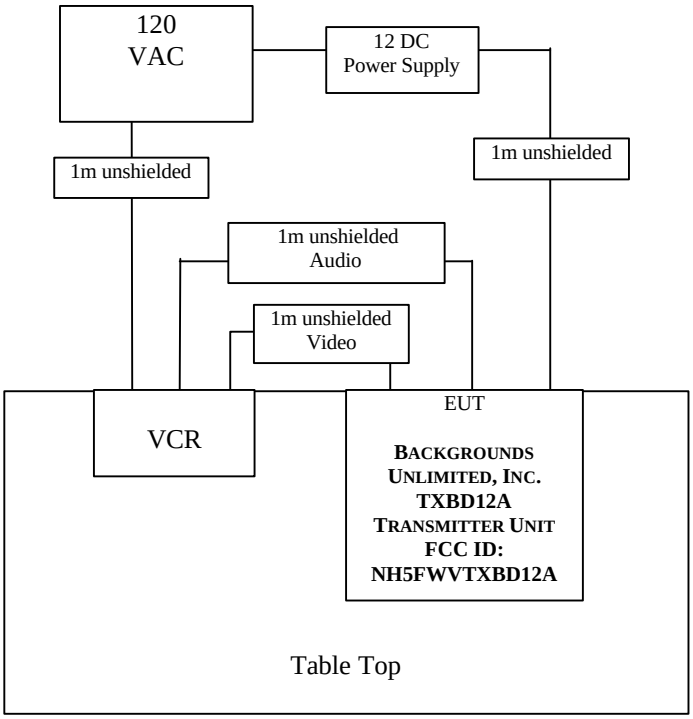
1.3 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

TABLE 1: TEST SYSTEM DETAILS

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
PATCH ANTENNA	FIRST WITNESS VIDEO	C1905001-0001 REV. A	2472.7 MHz	N/A	COAXIAL CABLE	011181
TRANSMITTER (EUT)	**FIRST WITNESS VIDEO**	**TXBD-12A**	**2472.7 MHz**	**NH5FWVTXBD12A**	**UNSHIELDED I/O**	**011183**
POWER SUPPLY	FIRST WITNESS VIDEO	SCP41-120500	N/A	N/A	UNSHIELDED POWER	011193
TRANSMITTER (EUT)	**FIRST WITNESS VIDEO**	**TXBD-12A**	**2452.7 MHz**	**NH5FWVTXBD12A**	**UNSHIELDED I/O**	**011186**
PATCH ANTENNA	FIRST WITNESS VIDEO	C1905001-0001 REV. A	2452.7 MHz	N/A	COAXIAL CABLE	011184
RECEIVER	RF-LINK	WCJ30-102	RF10107-01 9E214	N/A	UNSHIELDED POWER	011192
VCR	JVC	HR-S5100U	15920318	ASIP50024	UNSHIELDED POWER	900161

1.4 CONFIGURATION OF TESTED SYSTEM

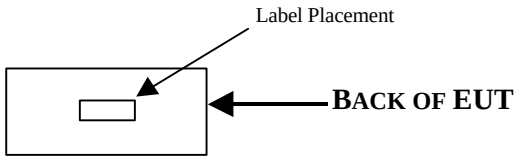


2.0 PRODUCT LABELING

FIGURE 1: FCC ID LABEL

Backgrounds Unlimited, Incorporated
TXBD-12A
FCC ID: NH5FWVTXBD12A

FIGURE 2: LOCATION OF LABEL ON EUT



3.0 SYSTEM TEST CONFIGURATION

3.1 JUSTIFICATION

To complete the test configuration required by the FCC, the transmitter was connected to the external video/audio base band output of a VCR. With the EUT's antenna installed and the AC/DC power supply connected, a receiver attached to an external monitor was used to monitor the EUT's data. The EUT was tested in all three orthogonal planes in order to determine worst case emissions. The EUT was investigated and tested from 9KHz to 22.5GHz. Both the 2.4527 and the 2.4727 GHz devices were investigated and worst case data was identified and is presented for the 2.4727 GHz transmitter.

3.2 EUT EXERCISE SOFTWARE

The EUT was enabled to continuously transmit data with base band video and audio from the VCR directly connected to the transmitters video and audio inputs in order to modulate the RF carrier. The carrier was also checked to verify that the information was being transmitted on an external monitor connected to an RF receiver. Worst case emissions are recorded in the data tables.

3.3 CONFORMANCE STATEMENT

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this attached test record. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to or exclusions from the FCC Part 90 Certification 2450-2483MHz Band test methodology.

Signature:  Date: November 22, 1999

Typed/Printed Name: Bruno Clavier Position: Quality Manager
(NVLAP Signatory)

Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 20061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

4.0 STANDARD REQUIREMENTS

TYPE ACCEPTANCE FCC PART 90: PRIVATE LAND MOBILE RADIO SERVICES SUBPART I : GENERAL TECHNICAL STANDARDS AND FCC PART 2 SUBPART J: EQUIPMENT AUTHORIZATION PROCEDURES

4.1 FCC PART 90.211(C) AND PART 2.987: MODULATION REQUIREMENTS AND CHARACTERISTICS

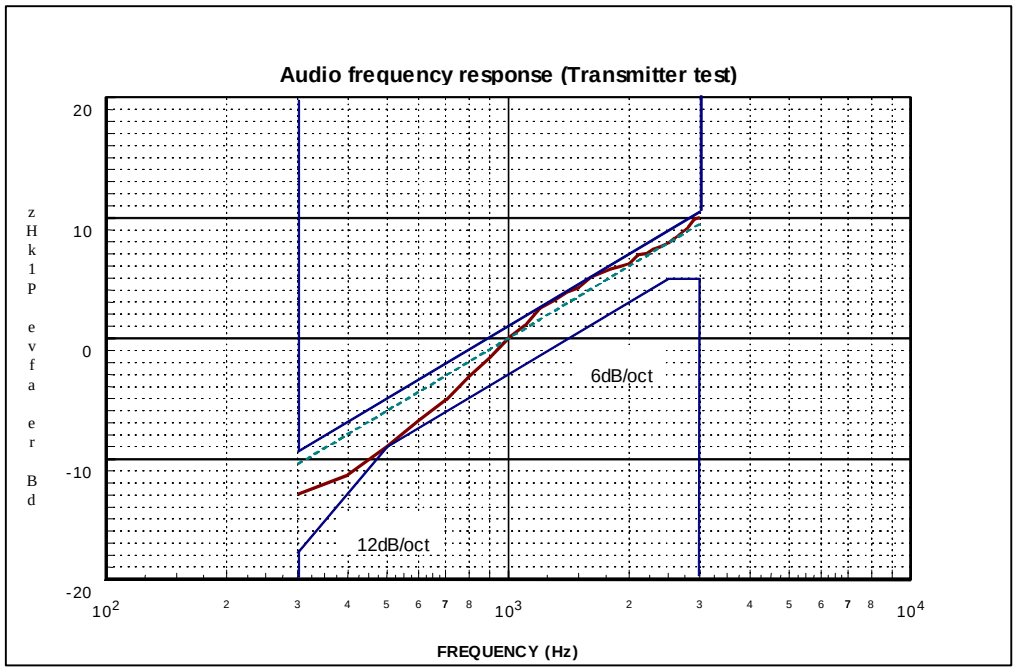
4.1.1 FCC Part 2.987(a): Audio Frequency Response

4.1.1.1 Method of Measurement:

The method used is referenced in the following publication ANSI/TIA/EIA-603: 1992 Land Mobile for PM Communications Equipment Measurement and Procedure Standard (Section 2.2.6 and 5.2.6)

4.1.1.2 Test Results:

FIGURE 3: AUDIO FREQUENCY RESPONSE



4.2 FCC Part 2.202(a) OCCUPIED BANBWIDTH per ANSI C63.4 section 13.1.7

The occupied bandwidth that is the frequency bandwidth such that, below its lower and above its upper frequency limit the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission shall be measured under the following condition as applicable. The occupied bandwidth was measured per ANSI 63.4 section 13.1.7 to be 9.26 MHz see occupied bandwidth plots.

FIGURE 4: BANDWIDTH DETERMINATION 9.26 MHZ

FCC Part 2.202 (b): Necessary Bandwidth

NECESSARY BANDWIDTH			
Description of emission	Formula	Calculation	Designation of emission
Single channel with analog information Frequency Modulation Video and Audio	Bn=2M+2D	10.6 MHz*	10M6

With D peak frequency deviation (i.e. half the difference between the maximum and minimum value of the instantaneous frequency – the instantaneous frequency in Hz is the time rate of change in phase in radians divided by 2), M maximum modulation frequency in Hz, and Bn Necessary bandwidth in Hz.

*Calculations and data test results: $D=(2x\Delta fp) / 2 = 1.42 / 2 = 0.71$ MHz and fm = 4.6 MHz = M

4.3 FCC PART 90.205(L) AND PART 2.985:

4.3.1 RF POWER OUTPUT (ERP):

The RF power output is 99.8mW and therefore it complies with the 5 Watt limit.

4.3.2 METHOD OF MEASUREMENT:

DIRECT CONDUCTED MEASUREMENT TO HP437B POWER METER

Transmitter	Level (dBm)	Output Power (mW)
2.4727 GHz	20	99.8
2.4527 GHz	19.7	91.4

4.4 FCC PART 90.207: TYPE OF EMISSIONS - EMISSION DESIGNATOR

The first symbol indicates the type of modulation on the transmitter carrier. The second symbol indicates the type of signal modulating the transmitter carrier. The third symbol indicates the type of transmitted information.

Designator for the Transmitter (EUT)M/N:TXBD12A, FCCID: NH5FWVTXBD12A , is : F3F

4.5 FCC PART 2.997(A)(1): FREQUENCY SPECTRUM TO BE INVESTIGATED

(a) In all of the measurements set forth in 2.991 and 2.993, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9kHz, up to at least the frequency shown below:

(1) If the equipment operates below 10GHz: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

4.6 FCC PART 90.210(B) AND PART 2.991: EMISSION MASKS AND SPURIOUS EMISSIONS AT ANTENNA TERMINAL

4.6.1 Method of Measurement:

The transmitter was properly loaded with a 50 Ohm termination and operated under normal conditions in its intended use. That is the maximum rated conditions under which the equipment will be operated.

For measuring emissions up to and including 50kHz from the edge of the authorized the resolution bandwidth, bandwidth was adjusted to 100Hz with the measuring instrument in a peak hold mode. A sufficient number of sweeps was measured to insure that the emission profile is developed. If video filtering is used, its bandwidth must be no less than the instrument resolution bandwidth. For frequencies more than 50kHz removed from the edge of the authorized bandwidth a resolution of at least 10kHz was used for frequencies below 1000 MHz. Above 1000 MHz, the resolution bandwidth of the instrumentation was at least 1 MHz.

Applicable emission mask for equipment designed to operate with a 25kHz channel bandwidth:

Frequency (MHz)	Mask for equipment with audio low pass filter
2.473 and 2.453	C

4.7 FCC Part 90.210 (B)(1)(2)(3):

The power of any emission must be attenuated below the unmodulated carrier power P as follows:

Frequency Range (kHz) Displacement Frequency	Reference unmodulated output level (dBuV/mW)	Attenuation (dB) from reference level
Fo+5kHz<Fd<Fo+10kHz Fo-10kHz<Fd<Fo-5kHz	127.0/99.8	83 log (Fd/5)=0 to 25
Fo+10kHz<Fd<Fo+250% of ABW Fo-250% of ABW*<Fd<Fo-10kHz	127.0/99.8	29 log (Fd^2/11) or 50; whichever is the lesser attenuation = 27.8 to 50
Fo+250% of ABW*<Fd<24.727GHz 9KHz<Fd<Fo-250% of ABW	127.0/99.8	43+10 log (P)=33

Measurements of emission power are expressed with the same parameters used to specify the unmodulated transmitter carrier power.
*: ABW is the Authorized Bandwidth (Note that no value is provided in this part.)
Fo: Carrier fundamental frequency (MHz)
Fd: Displacement frequency
P: Output power in watt

Figures 3 through 35, Section 5.0 demonstrate compliance with the emission mask C.

4.8 FCC PART 2.993: FIELD STRENGTH OF SPURIOUS RADIATION

4.8.1 Method of Measurement

A 50 Ohm dummy load is used to terminate the transmitter antenna output port. A second antenna is placed adjacent to the device under test and is connected to a signal generator providing a reference power level. The requirement assumes that all emissions are radiated from half-wave dipole antennas. See section 1.5 and Section 8 for additional information concerning the radiated emission test methodology.

Data test results are provided in Table 2, Section 5.2.

4.9 FCC PART 90.213 AND PART 2.995(A): FREQUENCY STABILITY AS A FUNCTION OF TEMPERATURE

4.9.1 Method of Measurement

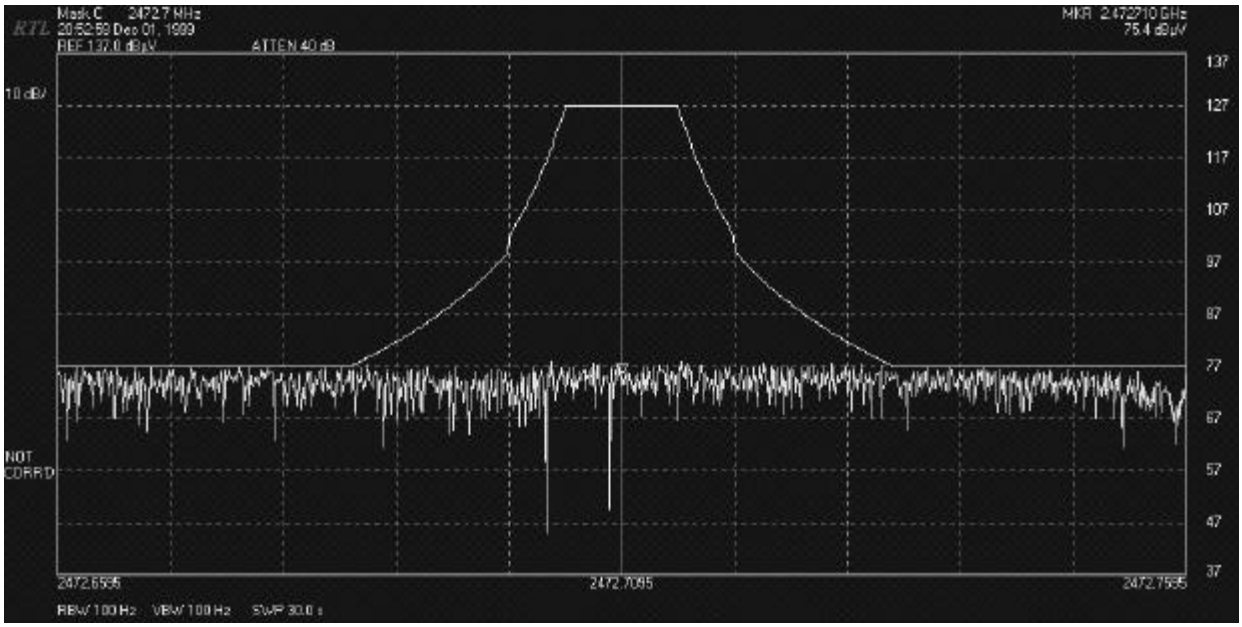
The transmitter is set in operation with the maximum rated output power specified by the manufacturer. A Thermotron temperature chamber is used to perform the test. The transmitter is exercised with a transmission mode providing a continuous stream of data. The ambient temperature is varied from -30° to +60°C. The device under test is operated for 15 minutes prior to testing. A sufficient period of time (about 30 minutes) before any measurements were taken was observed to stabilize all transmitter components for each temperature level.

4.9.2 Minimum Frequency stability (ppm)

See Table 3, Section 5.4 for data test results.

5.0 MEASUREMENT PLOTS

5.1 MEASUREMENT PLOTS FCC PART 90.210 (B) / PART 2.993



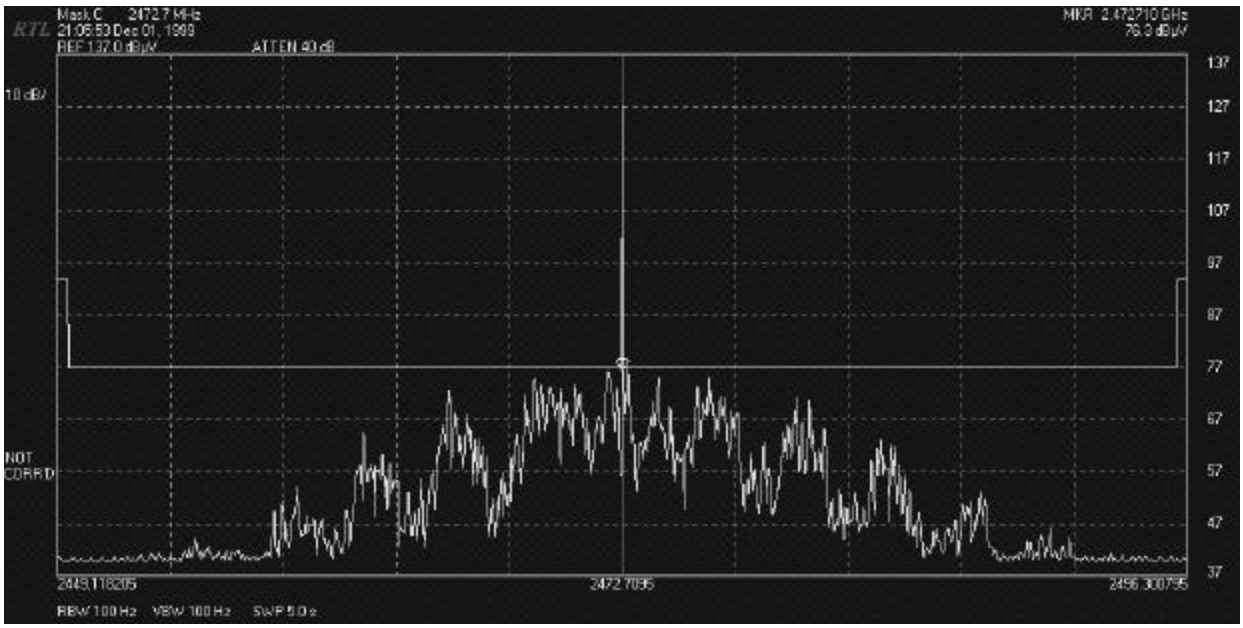


FIGURE 5: 2472.7 MHZ MASK C

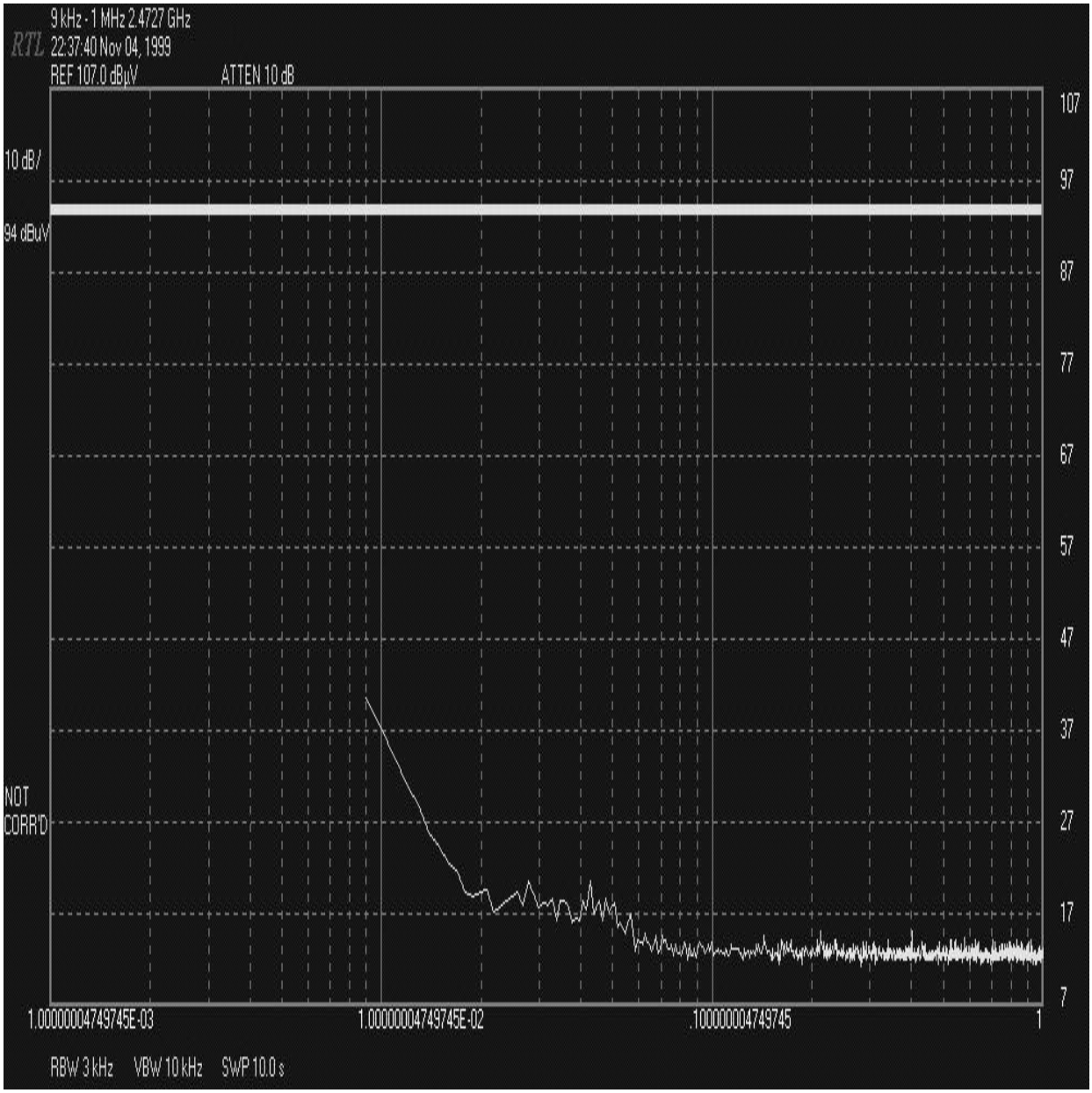


FIGURE 6: 9 KHZ TO 1 MHZ

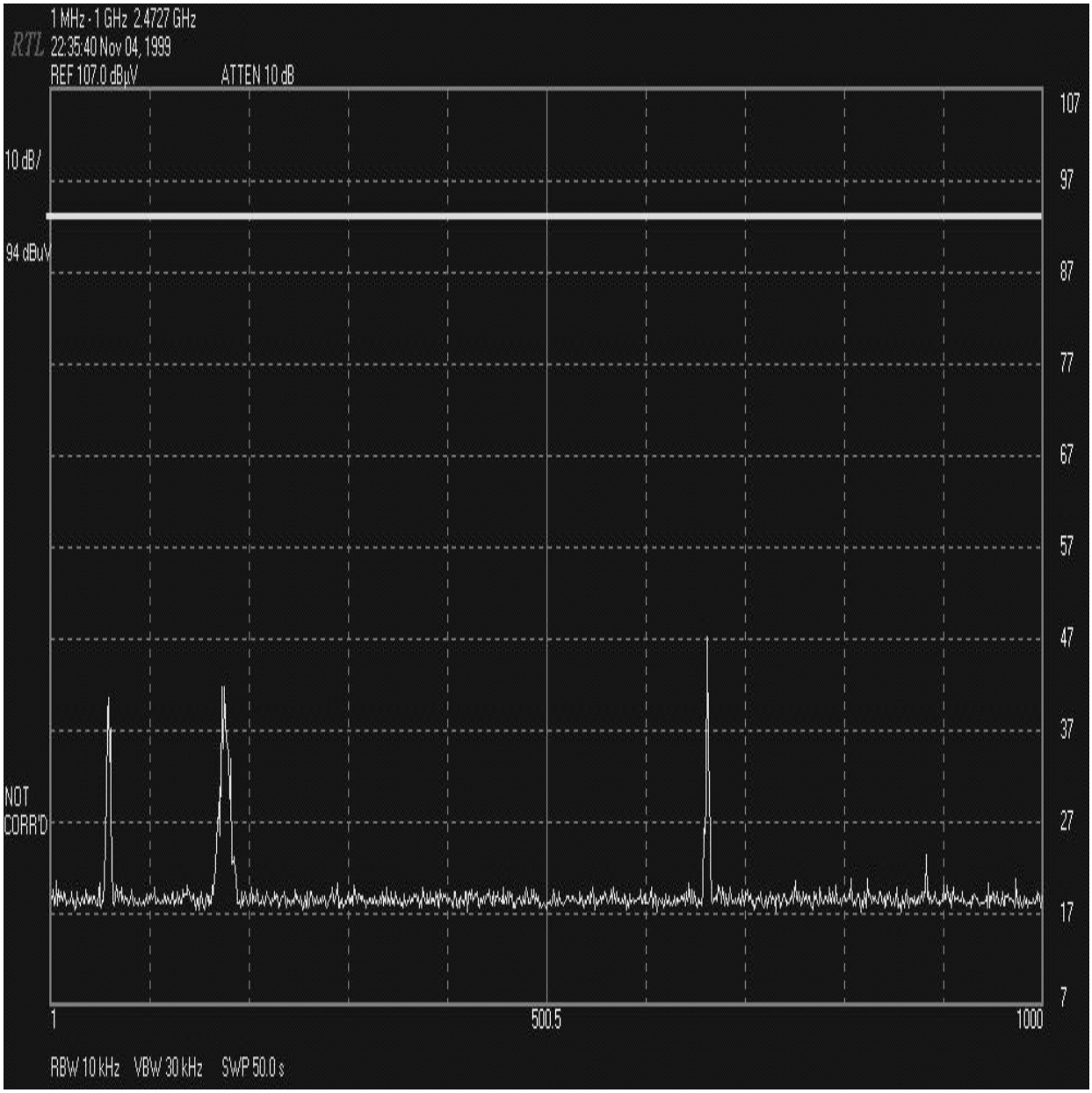


FIGURE 7: 1 MHz to 1 GHz

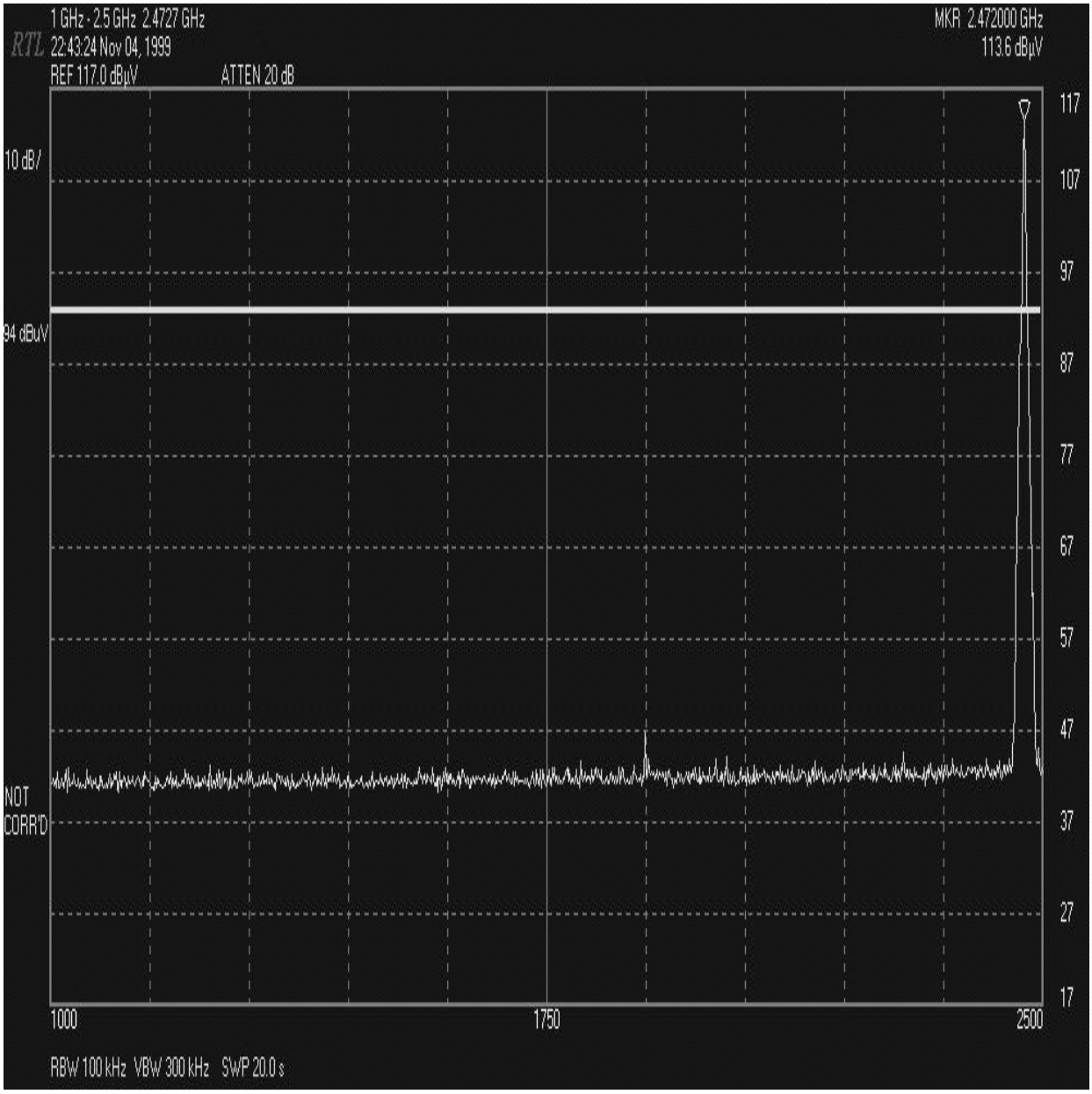


FIGURE 8: 2.5 TO 5 GHZ

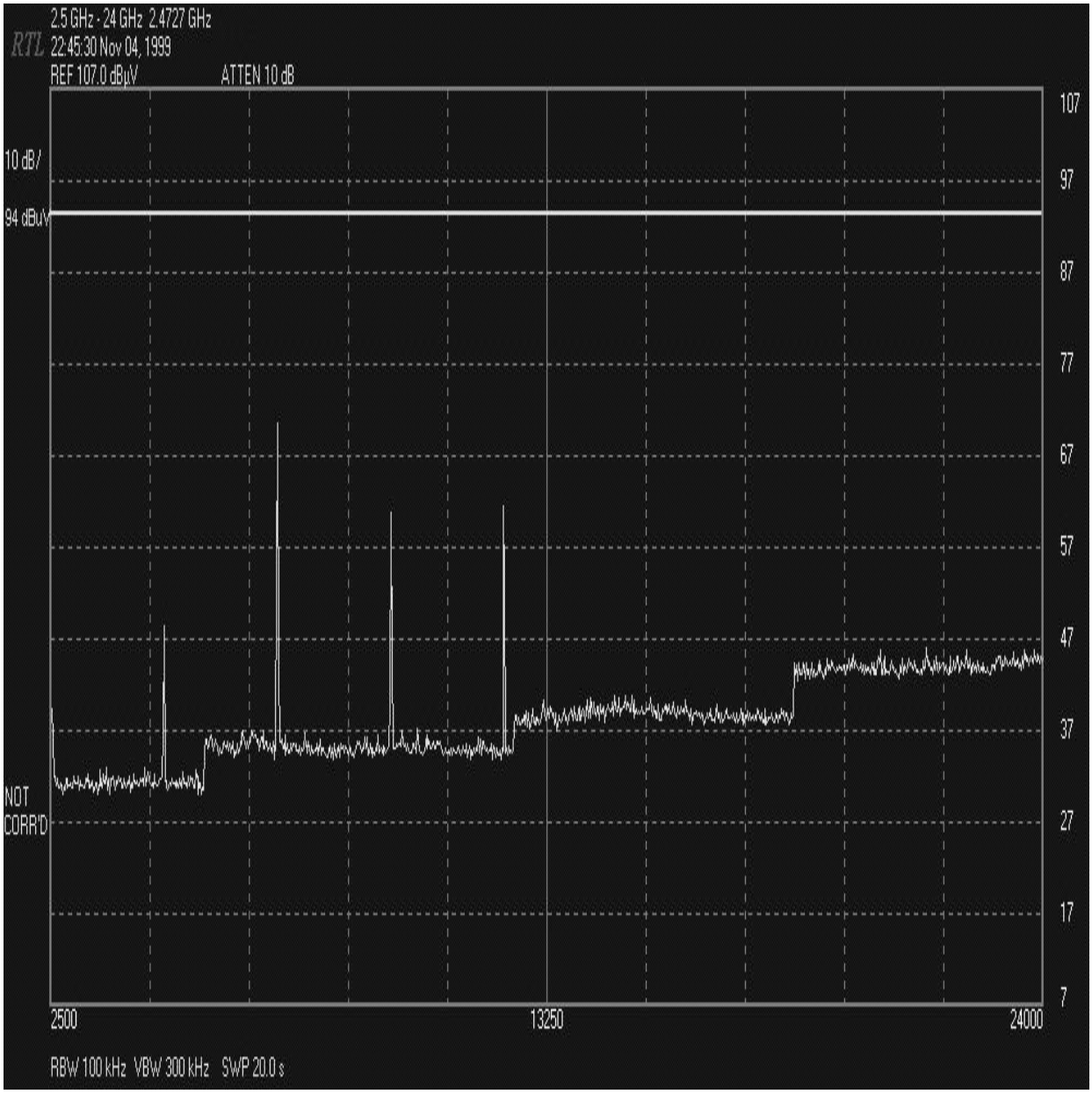


FIGURE 9: 2.5 TO 24 GHZ

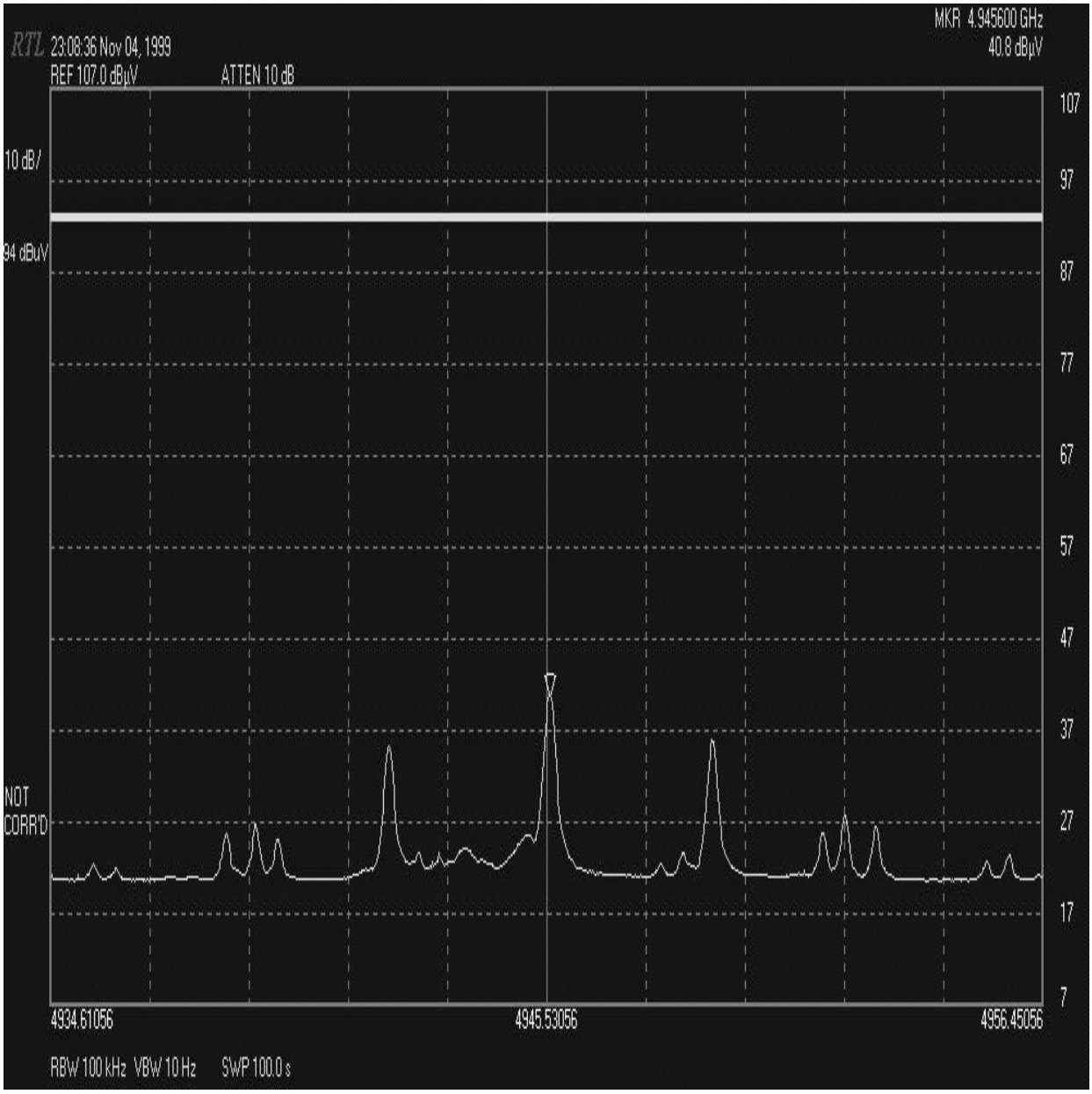


FIGURE 10: 4.905 GHZ SECOND HARMONIC

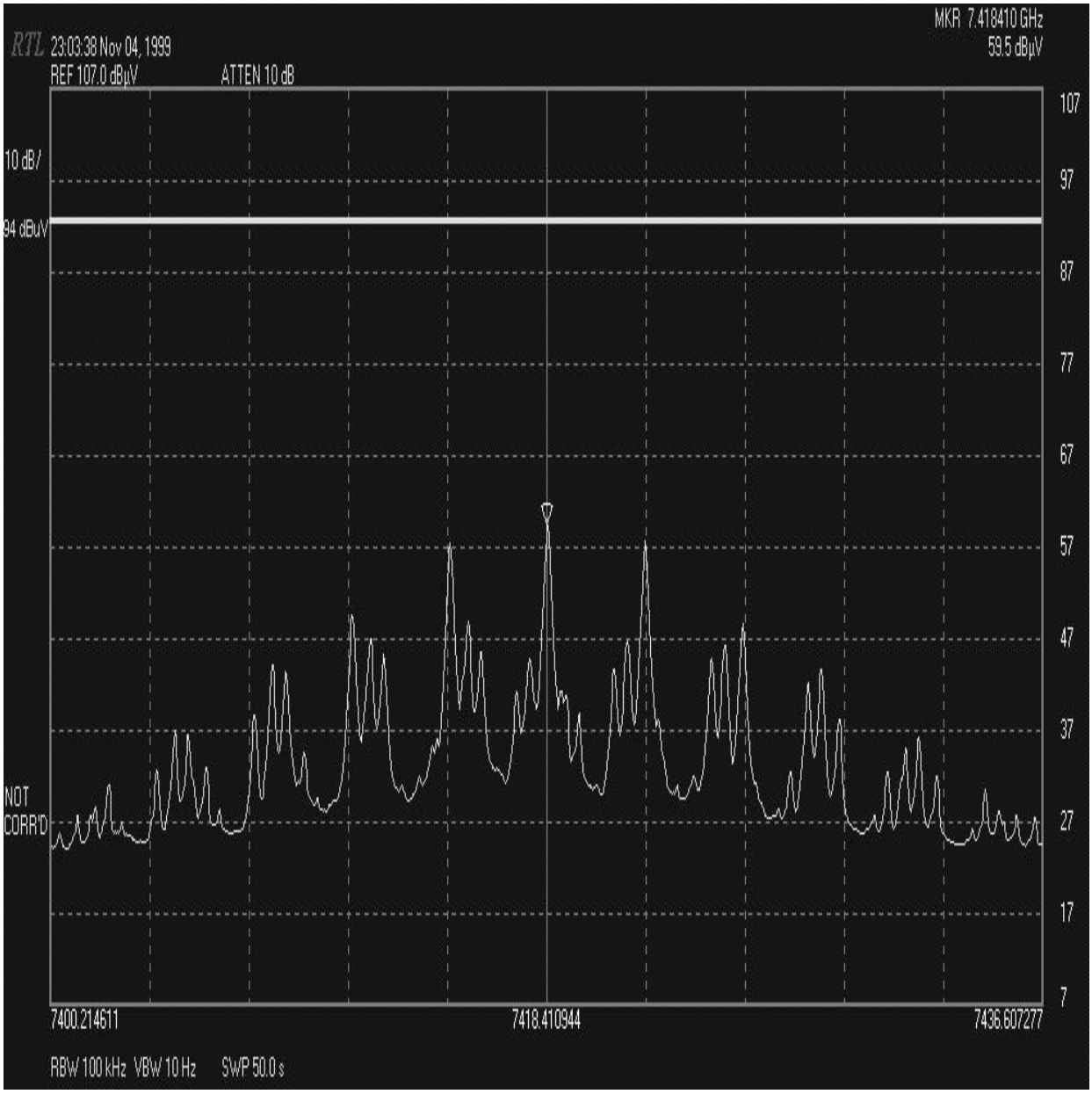


FIGURE 11: 7.418 GHZ THIRD HARMONIC

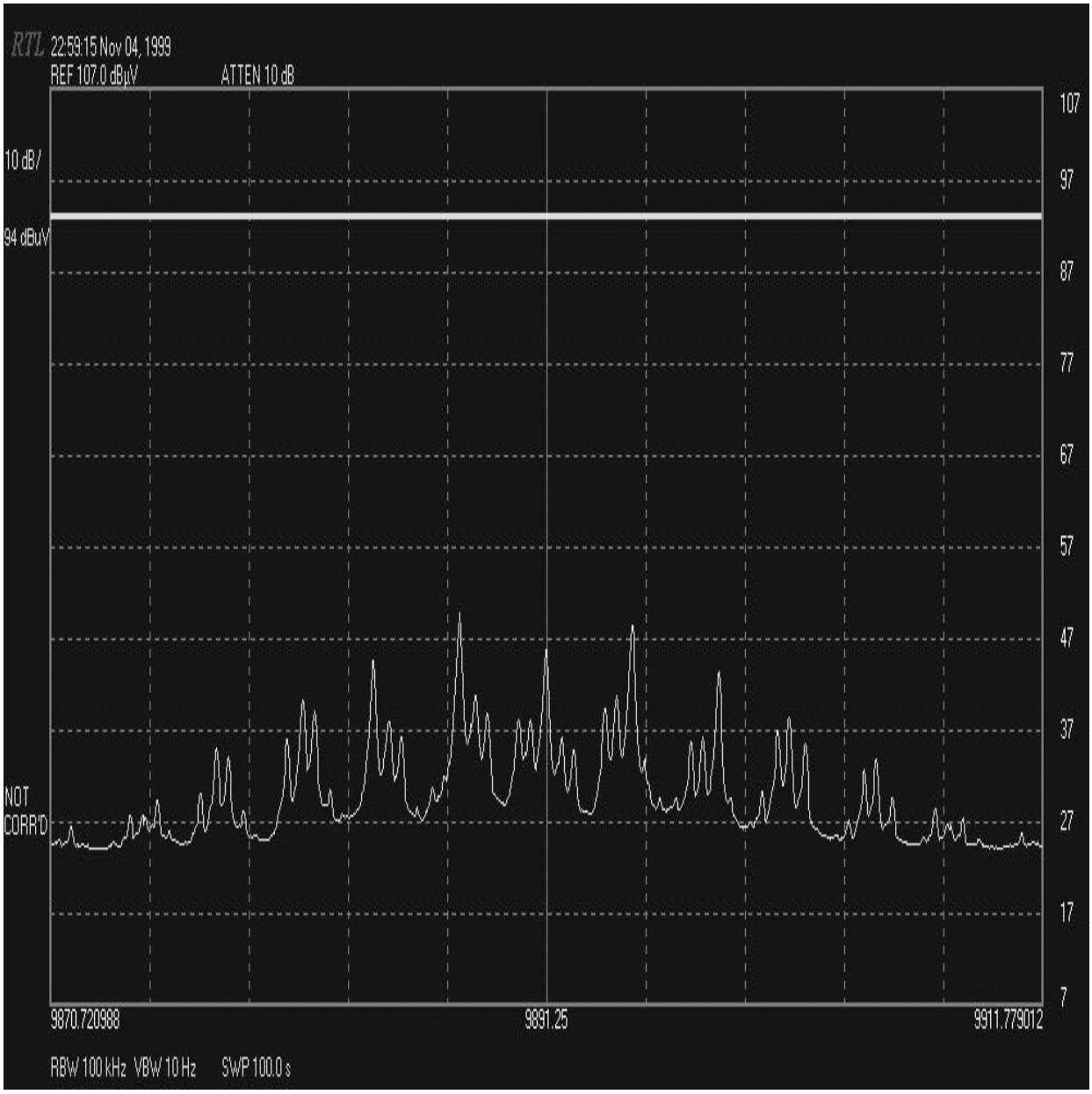


FIGURE 12: 9.891 GHZ FOURTH HARMONIC

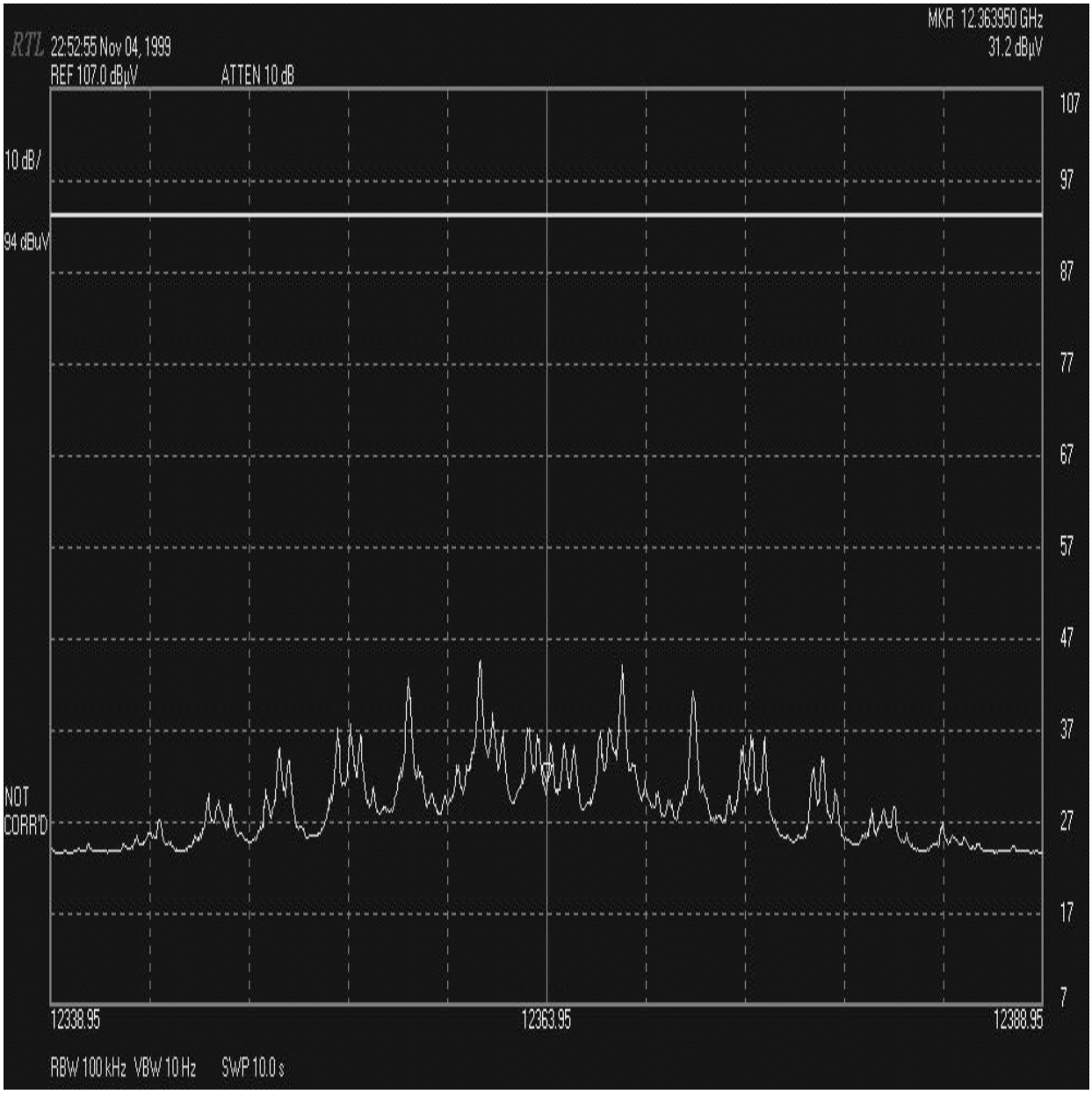


FIGURE 13: 12.364 GHz FIFTH HARMONIC

5.2 FCC PART 2.993: FIELD STRENGTH OF SPURIOUS RADIATION

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit.

TABLE 2: RADIATED EMISSIONS: FCC PART 2.993

Transmitter Section
Distance: 3 Meters
Output Power Measured 127dBuV = 99.8 mW
43+LogP=33 dB down from P thus 127-33=94 dBuV= -13 dBm
Oscillators: 2.4727 GHz

Freq. (GHz)	Polarity	Emission Level (EUT) (dBuV)	S/G level (dBm)	CL Ref. (dB)	Tx Gain (dBi)	Gain Diff. * (dB)	Emission Level Tx Ref. Ant. (dBuV)	Margin (dB)
2472.71	V	109.7	12.9	0.7	8	5.85	125.05	
4945.4	V	56.1	-40.4	0.4	10.3	8.2	74.4	-18.3
7418.2	V	76.5	-20.7	1.7	11	8.9	93.5	-17.0
9890.862	H	66.9	-25.1	1.9	11	8.9	88.9	-22.0
12363.5	H	55.6	-37.2	3.3	12.9	9.9	76.4	-20.8
14836.2	H	41.5	-38.9	6.2	10.5	8.4	70.3	-28.8
17308.9	V	40.3	-40.3	-11.2	10.1	8.0	63.5	-23.2
19781.7	V	37.2	-35.6	13.9	4	1.9	59.4	-22.2

Transmitting Antenna: Electro-Metrics Model RGA-60
*Difference in gain between half-wave dipole and antenna

TEST PERSONNEL:

Signature:  Date: November 10, 1999

Typed/Printed Name: Daniel Baltzell

5.3 RADIATED MEASUREMENT PHOTOS

5.4 CONDUCTED EMISSIONS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. If the quasi-peak measurement is at least 6dB higher than the amplitude in the average mode, the level measured in the quasi-peak mode may be reduced by 13dB before comparing it to the limit.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 450 kHz to 30 MHz on the Neutral Side and Hot Side, herein referred to as L1 and L2, respectively.

TABLE 3: CONDUCTED EMISSIONS: 2472 MHZ

Neutral Side (L1)

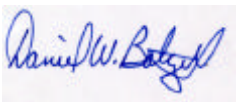
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC Limit (dBuV)	FCC Margin (dBuV)
0.450	Qp	36.6	0.5	37.1	48	-10.9
0.450	Av	8.7	0.5	9.2	48	-38.8
0.510	Qp	36	0.5	36.5	48	-11.5
0.510	Av	8.1	0.5	8.6	48	-39.4
0.630	Pk	44.9	0.5	45.4	48	-2.6
0.812	Pk	35.5	0.6	36.1	48	-11.9
0.995	Pk	33.7	0.7	34.4	48	-13.6
1.220	Pk	39.4	0.8	40.2	48	-7.8
4.350	Pk	25	1.4	26.4	48	-21.6
26.530	Pk	19.8	3.5	23.3	48	-24.7

Hot Side (L2)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC Limit (dBuV)	FCC Margin (dBuV)
0.450	Qp	37.6	0.4	38	48	-10
0.450	Av	8.7	0.4	9.1	48	-38.9
0.637	Pk	46.4	0.5	46.9	48	-1.1
0.637	Qp	37.2	0.5	37.7	48	-10.3
0.637	Av	7.9	0.5	8.4	48	-39.6
0.926	Pk	26.4	0.6	27	48	-21
1.500	Pk	31.4	0.8	32.2	48	-15.8
3.488	Pk	19.3	1.2	20.5	48	-27.5
22.580	Pk	18.9	3.0	21.9	48	-26.1

(1)Pk = Peak; QP = Quasi-Peak; Av = Average

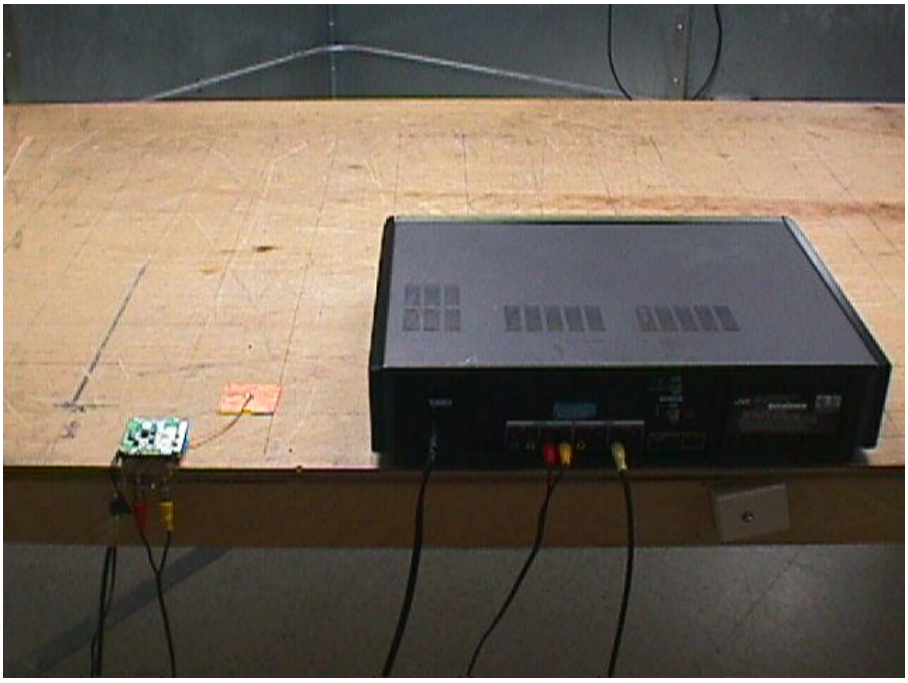
TEST PERSONNEL:

Signature: 

Date: November 10, 1999

Typed/Printed Name: Daniel Baltzell

5.5 CONDUCTED MEASUREMENT PHOTOS



5.6 FREQUENCY STABILITY FUNCTION OF TEMPERATURE

TABLE 4: FCC PART 90.213 AND PART 2.995(A): FREQUENCY STABILITY FUNCTION OF TEMPERATURE AND VOLTAGE

Temperature (°C)	Voltage	MCF (GHz)	Measured level (dBuV)	PPM error [(MCF/ACF)-1]10^6
60	10.2	2.472819	99.7	48.1255308
60	12	2.472819	99.8	48.1255308
60	13.8	2.472819	100	48.1255308
50	10.2	2.472819	99.3	48.1255308
50	12	2.472799	99.5	40.03720629
50	13.8	2.472819	99.2	48.1255308
40	10.2	2.472779	98.9	31.94888179
40	12	2.472779	99.3	31.94888179
40	13.8	2.472809	99.5	44.08136854
30	10.2	2.472829	98.8	52.16969305
30	12	2.472828	99.6	51.76527682
30	13.8	2.472829	99.9	52.16969305
20	10.2	2.472839	98.9	56.2138553
20	12	2.472819	99.1	48.1255308
20	13.8	2.472819	98.9	48.1255308
10	10.2	2.472809	93.7	44.08136854
10	12	2.472829	94.1	52.16969305
10	13.8	2.472849	93.3	60.25801755
0	10.2	2.472849	90.6	60.25801755
0	12	2.472839	91.6	56.2138553
0	13.8	2.472829	92.2	52.16969305
-10	10.2	2.472819	91.4	48.1255308
-10	12	2.472858	91.5	63.89776358
-10	13.8	2.472819	92.9	48.1255308
-20	10.2	2.472759	101	23.86055729
-20	12	2.472829	99.4	52.16969305
-20	13.8	2.472779	99.7	31.94888179
-30	10.2	2.472769	98.6	27.90471954
-30	12	2.472769	100.3	27.90471954
-30	13.8	2.472779	100.7	31.94888179

Where MCF is the Measured Carrier Frequency in GHz, and ACF is the Assigned Carrier Frequency = 2.4727 GHz.

6.0 Field Strength Calculation and Radiated Test Methodology

6.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FI(dBuV/m) = SAR(dBuV) + SCF(dB/m)
FI = Field Intensity
SAR = Spectrum Analyzer Reading
SCF = Site Correction Factor

The Site Correction Factor (SCF) used in the above equation is determined empirically, and is expressed in the following equation:

SCF(dB/m) = - PG(dB) + AF(dB/m) + CL(dB)

SCF = Site Correction Factor
PG = Pre-amplifier Gain
AF = Antenna Factor
CL = Cable Loss

The field intensity in microvolts per meter can then be determined according to the following equation:

$$FI(uV/m) = 10^{FI(dBuV/m)/20}$$

For example, assume a signal at a frequency of 125 MHz has a received level measured as 49.3 dBuV. The total Site Correction Factor (antenna factor plus cable loss minus preamplifier gain) for 125 MHz is -11.5 dB/m. The actual radiated field strength is calculated as follows:

49.3 dBuV - 11.5 dB/m = 37.8 dBuV/m

$$10^{37.8/20} = 10^{1.89} = 77.6 \text{ uV/m}$$

6.2 Radiated measurement

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one meter and three meter distances if necessary in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three-meter, open-field test site. The EUT was placed on a nonconductive turntable approximately 0.8 meters above the ground plane. The spectrum was examined from 30 MHz to 1000 MHz using a Hewlett Packard 8566B spectrum analyzer, a Hewlett Packard 85650A quasi-peak adapter, and an Antenna Research bilog antenna. In order to gain sensitivity, an RTL PR-1040 preamplifier was connected in series between the antenna and the input of the spectrum analyzer.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

7.0 PHOTOS OF TESTED EUT

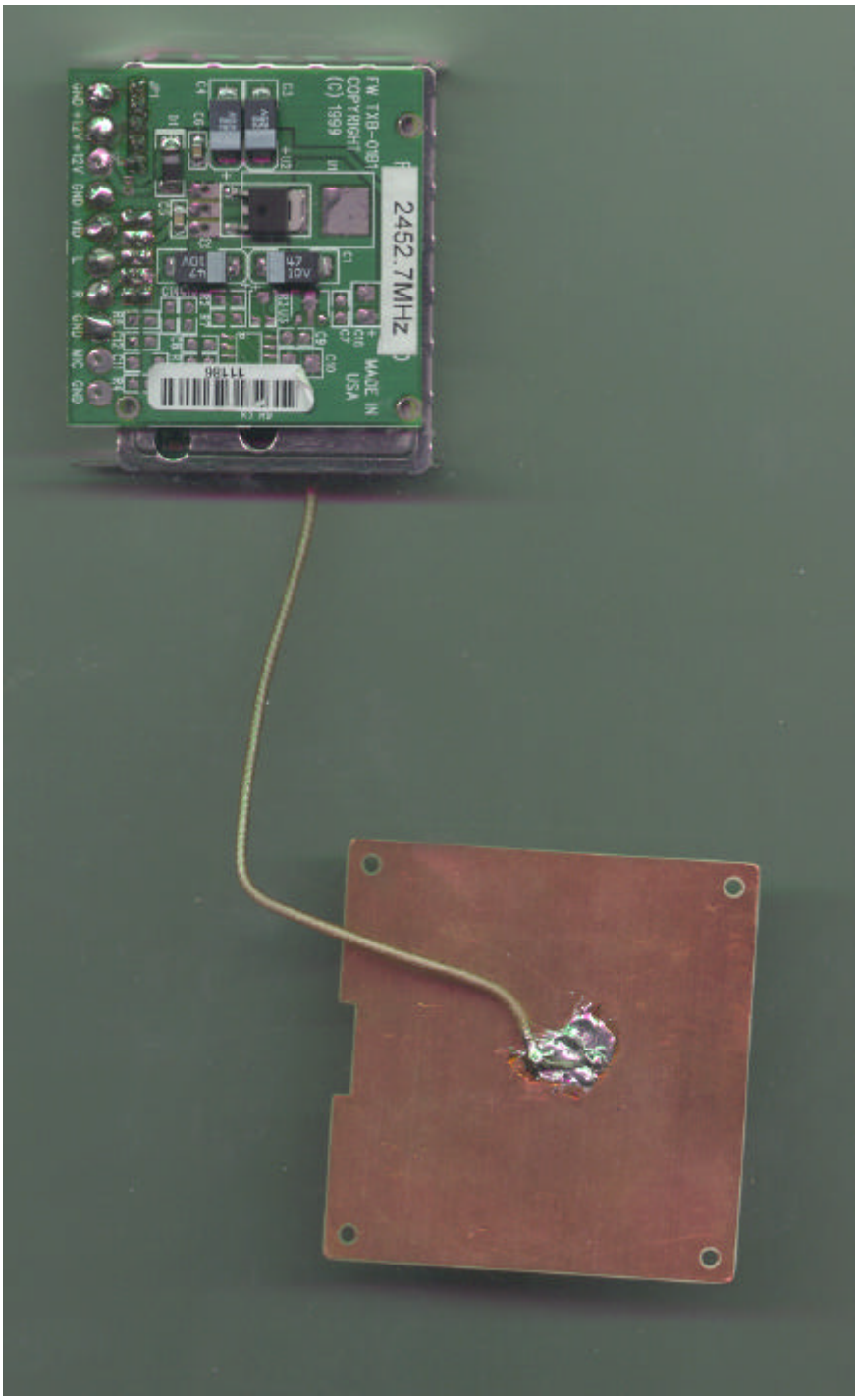


FIGURE 14: FRONT OF EUT

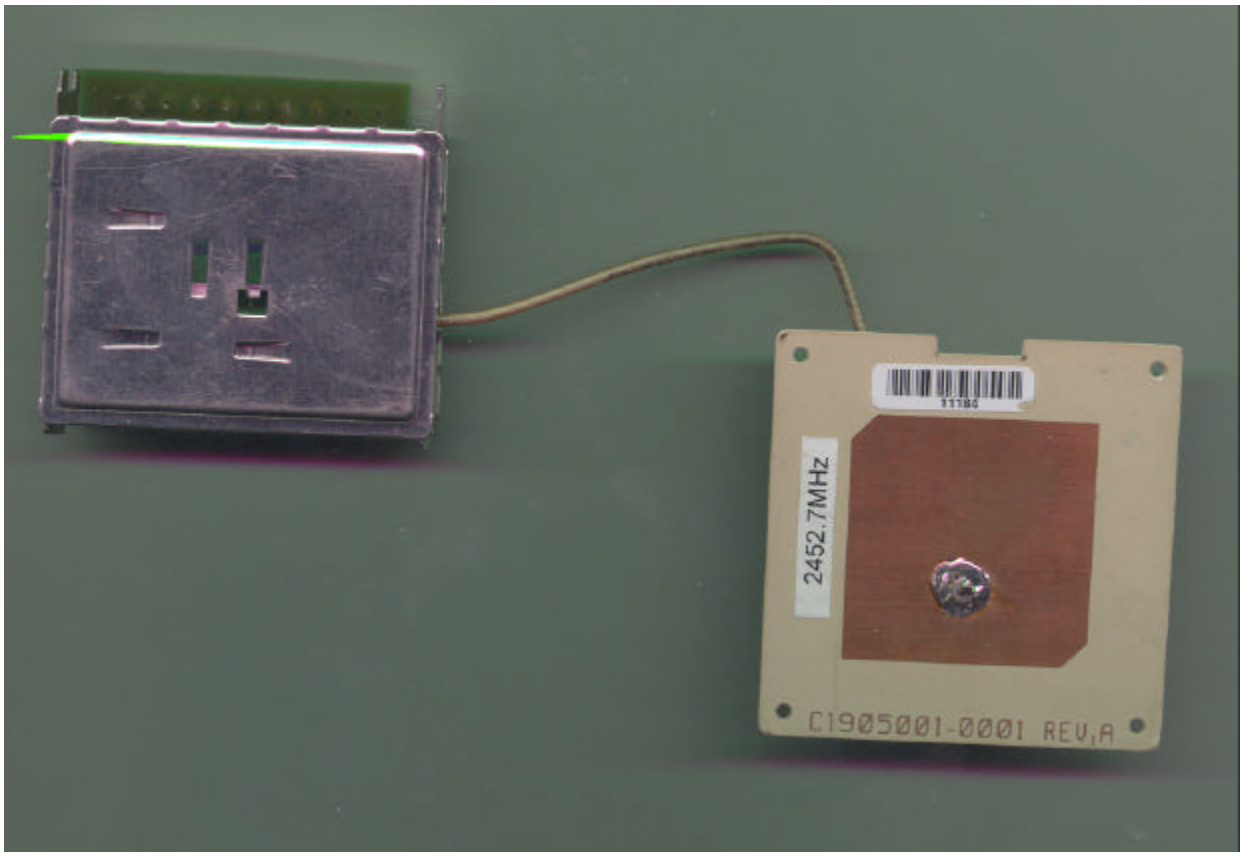


FIGURE 15: BACK OF EUT

FIGURE 16: TOP INSIDE BRACKET

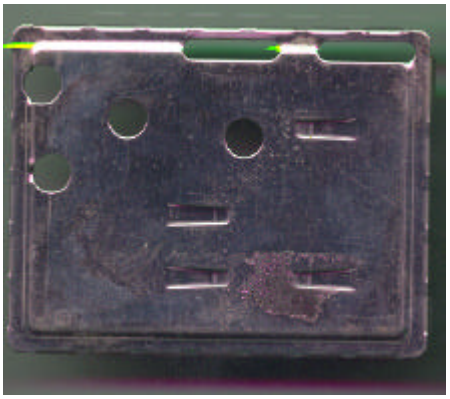


FIGURE 17: TOP OUTSIDE BRACKET

FIGURE 18: BOTTOM PCB BOTTOM SIDE

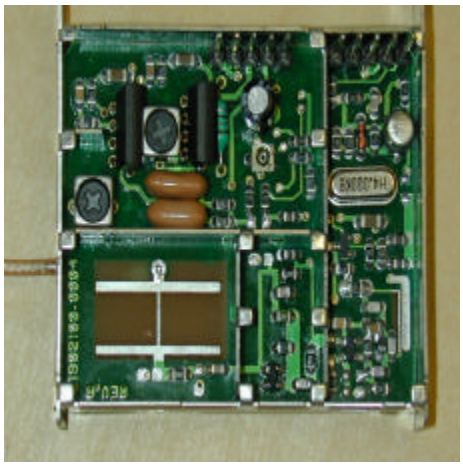


FIGURE 19: BOTTOM PCB TOP SIDE

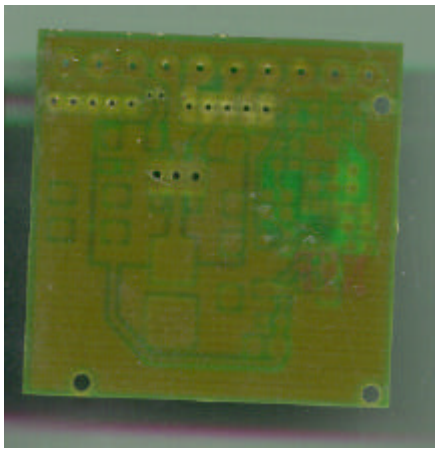


FIGURE 20: BOTTOM SIDE OF TOP PCB

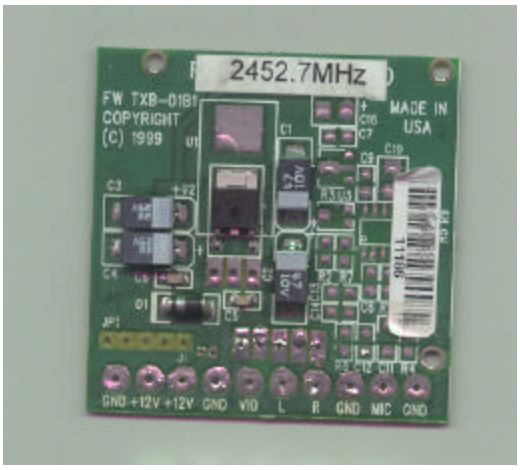


FIGURE 21: COMPONENT SIDE OF TOP PCB

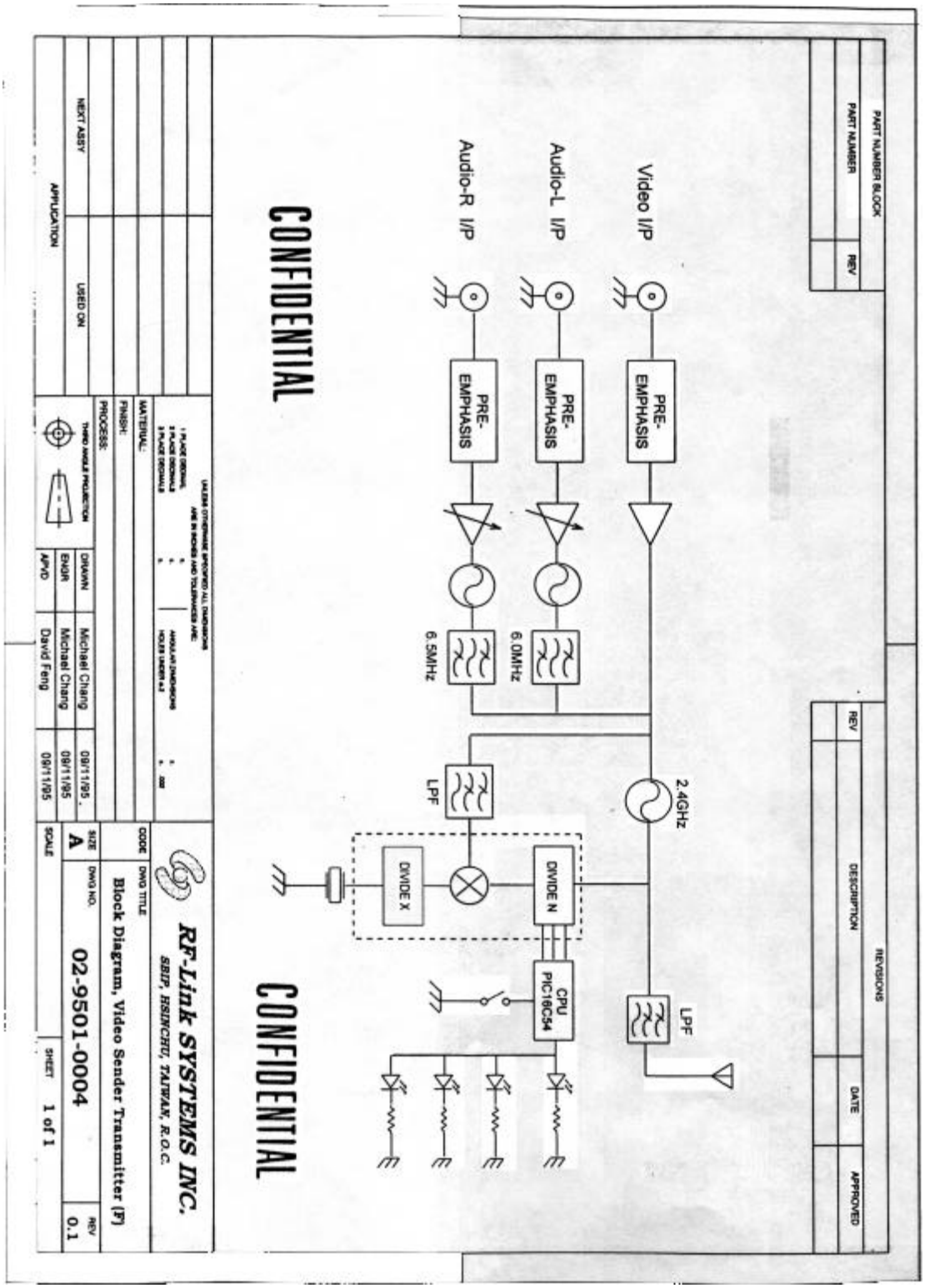
APPENDIX A: Emissions Equipment List

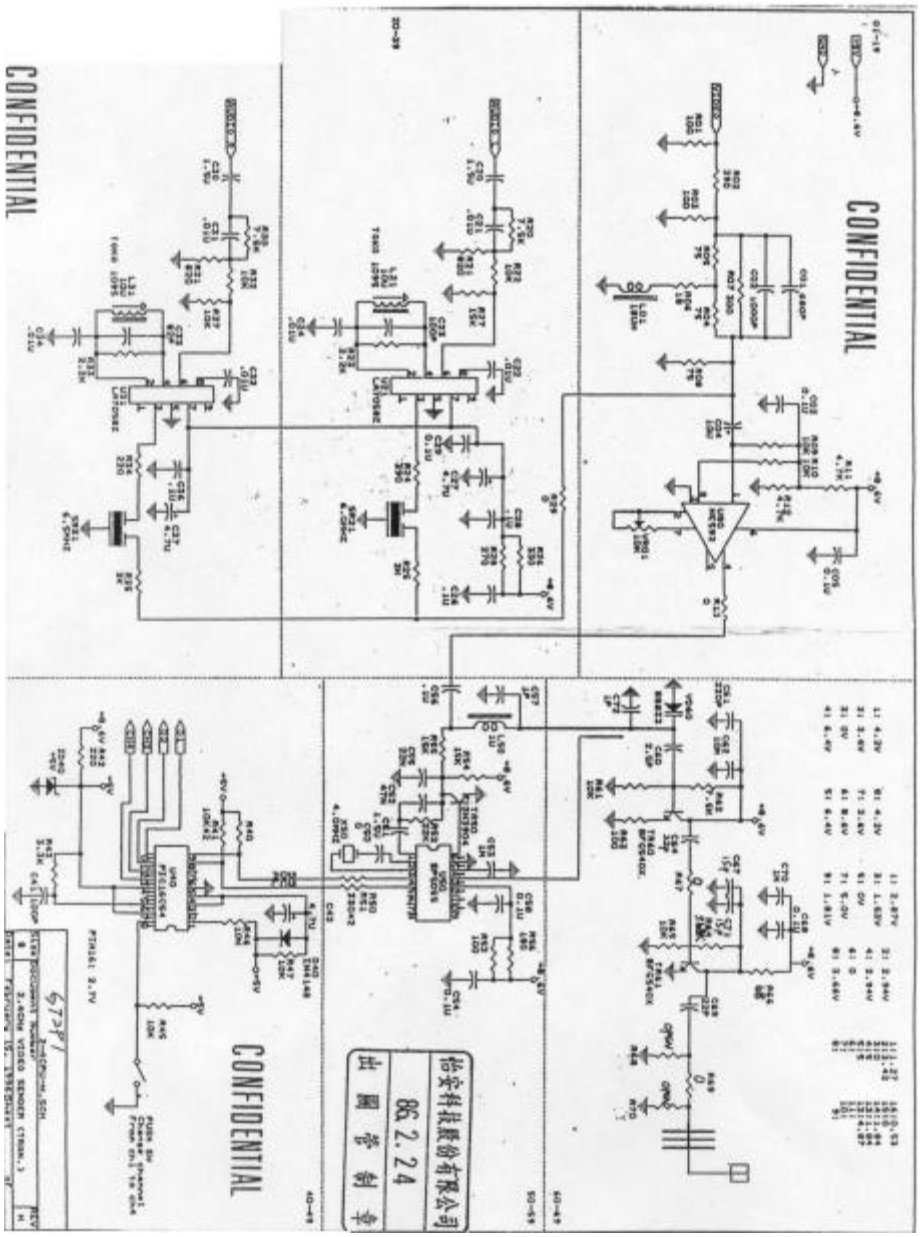
DESCRIPTION	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. LAB
AMPLIFIER	HEWLETT PACKARD	11975A	2304A00348	TEST EQUITY
AMPLIFIER (S/A 1)	RHEIN TECH	PR-1040	00001	RTL
AMPLIFIER (S/A 2)	RHEIN TECH	RTL2	900723	RTL
AMPLIFIER (S/A 3)	RHEIN TECH	8447F	2944A03783	RTL
AMPLIFIER (S/A 4)	RHEIN TECH	8447D	2727A05397	RTL
BICONICAL/LOG ANTENNA 1	ANTENNA RESEARCH	LPB-2520	1037	LIBERTY LABS
BICONICAL/LOG ANTENNA 2	ANTENNA RESEARCH	LPB-2520	1036	LIBERTY LABS
FIELD SITE SOURCE	EMCO	4610	9604-1313	RTL
FILTER (ROOM 1)	SOLAR	8130	947305	RTL
FILTER (ROOM 2)	SOLAR	8130	947306	RTL
HARMONIC MIXER 1	HEWLETT PACKARD	11970K	2332A00563	TELOGY
HARMONIC MIXER 2	HEWLETT PACKARD	11970A	2332A01199	TELOGY
HORN ANTENNA 1	EMCO	3160-10	9606-1033	EMCO
HORN ANTENNA 2	EMCO	3160-9	9605-1051	EMCO
HORN ANTENNA 3	EMCO	3160-7	9605-1054	EMCO
HORN ANTENNA 4	EMCO	3160-8	9605-1044	EMCO
HORN ANTENNA 5	EMCO	3160-03	9508-1024	EMCO
LISN (ROOM 1/L1)	SOLAR	7225-1	900727	ACUCAL
LISN (ROOM 1/L2)	SOLAR	7225-1	900727	ACUCAL
LISN (ROOM 2/L1)	SOLAR	7225-1	900078	ACUCAL
LISN (ROOM 2/L2)	SOLAR	7225-1	900077	ACUCAL
PRE-AMPLIFIER	HEWLETT PACKARD	8449B OPT	3008A00505	TELOGY
QUASI-PEAK ADAPTER (S/A 1)	HEWLETT PACKARD	85650A	3145A01599	ACUCAL
QUASI-PEAK ADAPTER (S/A 2)	HEWLETT PACKARD	85650A	2811A01276	ACUCAL
QUASI-PEAK ADAPTER (S/A 3)	HEWLETT PACKARD	85650A	2521A00473	ACUCAL
QUASI-PEAK ADAPTER (S/A 4)	HEWLETT PACKARD	85650A	2521A01032	ACUCAL
RF PRESELECTOR (S/A 1)	HEWLETT PACKARD	85685A	3146A01309	ACUCAL
SIGNAL GENERATOR (HP)	HEWLETT PACKARD	8660C	1947A02956	ACUCAL
SIGNAL GENERATOR (WAVETEK)	WAVETEK	3510B	4952044	ACUCAL
SPECTRUM ANALYZER 1	HEWLETT PACKARD	8566B	3138A07771	ACUCAL
SPECTRUM ANALYZER 2	HEWLETT PACKARD	8567A	2841A00614	ACUCAL
SPECTRUM ANALYZER 4	HEWLETT PACKARD	8567A	2727A00535	ACUCAL
TUNABLE DIPOLE	EMCO	3121	274	LIBERTY LABS

APPENDIX B:

BLOCK DIAGRAM / SCHEMATICS

OF THE TXBD-12A


CONFIDENTIAL
CONFIDENTIAL
Video I/P
Audio-L I/P
Audio-R I/P
PRE-EMPHASIS
PRE-EMPHASIS
PRE-EMPHASIS
6.0MHz
6.5MHz
2.4GHz
LPF
LPF
DIVIDE N
DIVIDE X
CPU PIC16C54
RF-Link SYSTEMS INC.
SBIP, HSINCHU, TAIWAN, R.O.C.
Block Diagram, Video Sender Transmitter (F)
02-9501-0004
A
0.1
1 of 1
Michael Chang
Michael Chang
David Feng
08/11/95
08/11/95
09/11/95


CONFIDENTIAL
CONFIDENTIAL
CONFIDENTIAL

APPENDIX C:

USER'S MANUAL