FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7

CERTIFICATION TEST REPORT

FOR

905-925 MHZ EMBEDDED LOW POWER RADIO MODEM

MODEL NUMBER: MU-D1-R

FCC ID: V9X-MUD1R

REPORT NUMBER: 10J13509-1, Revision A

ISSUE DATE: DECEMBER 06, 2010

Prepared for
CIRCUIT DESIGN, INC.
7557-1 HOTAKA, AZUMINO
NAGANO, 399-8303, JAPAN

Prepared by
COMPLIANCE CERTIFICATION SERVICES (UL CCS)
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/23/10	Initial Issue	T. Chan
A	12/06/10	Updated MPE Section	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CIRCUIT DESIGN, INC
7557-1 HAKOTA, AZUMINO
NAGANO 399-8303, JAPAN

EUT DESCRIPTION: 905-925 MHZ EMBEDED LOW POWER RADIO MODEM

MODEL: MU-DR1

SERIAL NUMBER: A00000101 and A00000102

DATE TESTED: NOVEMBER 17- 23, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:

THANH NGUYEN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Direct Sequence Spread Spectrum transceiver that operates in the 900 MHz ISM band embedded low power radio modem.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Modulation	Output Power (dBm)	Output Power (mW)
905.5- 924.5	DSSS @PA ON and @PA10	BPSK	15.94	39.26
905.5- 924.5	DSSS @PA ON and @PA01	BPSK	13.42	21.98
905.5- 924.5	DSSS @PA OFF and @PA10	BPSK	9.72	9.38
905.5- 924.5	DSSS @PA OFF and @PA01	BPSK	3.97	2.49

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes Whip antenna with maximum peak gains of 1.8dBi gain.

5.4. SOFTWARE AND FIRMWARE

The Firmware software installed during testing was Elecom Ltd Co., V2.0.2.8.

The test utility software used during testing was Hyper Terminal Applet.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case mode is determined at 40mW (@PA ON and @PA 10) with port A as highest output power.

The EUT with the highest gain of Whip antenna (ANT-RIG-03-R) have been investigated on X, Y and Z position. The worst case was found to be at X orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	IBM Think Pad	T61	L3-A1589 07/87	DoC
AC Adapter	Lenovo	92P1105	11S92P1105Z1ZBW973VOK	DoC

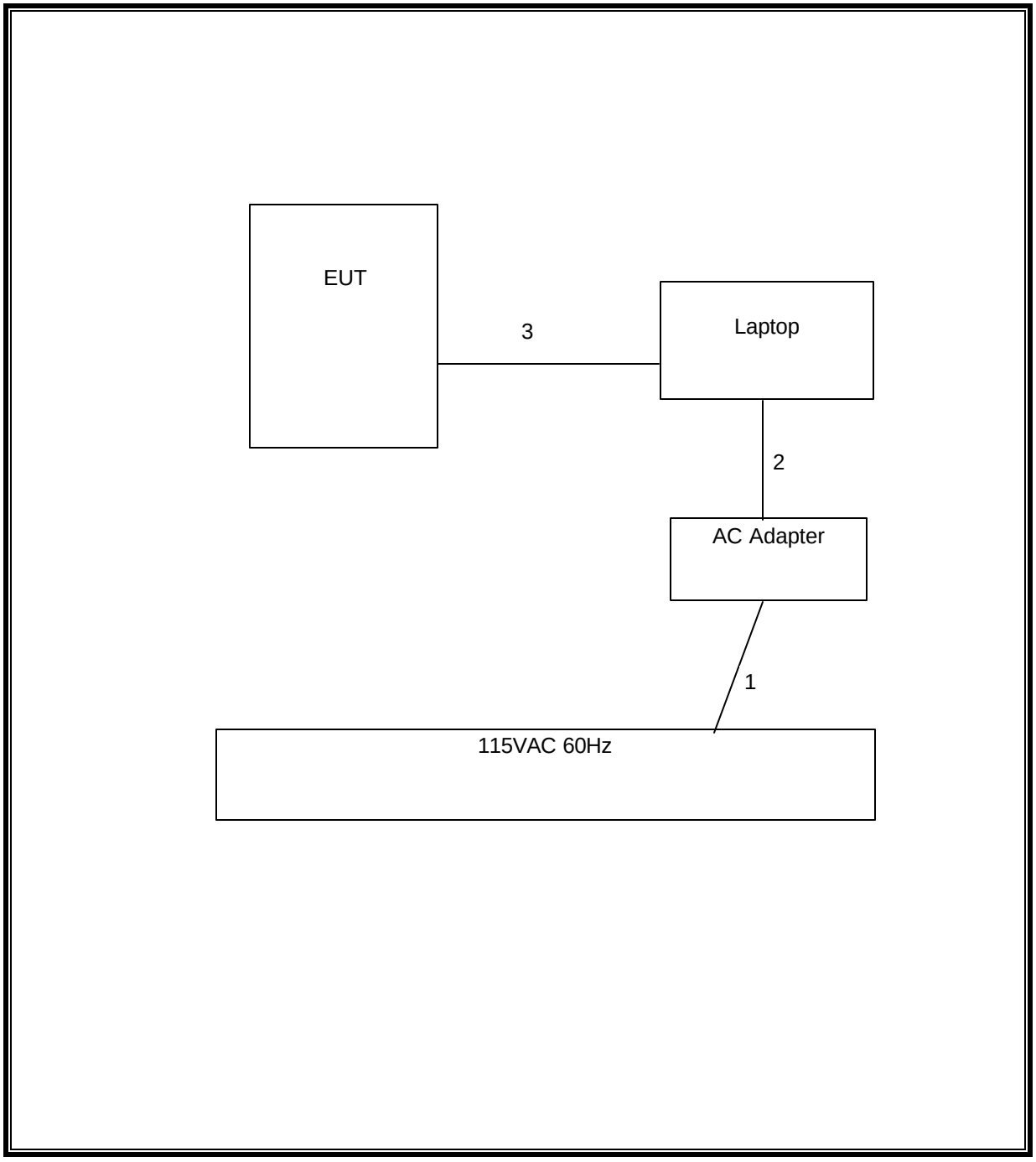
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identic Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	2m	One ferrite at Laptop's end.
2	DC	1	DC	Un-shielded	2m	NA
3	USB	1	EUT	Un-shielded	2m	NA

TEST SETUP

The EUT is connected to a host laptop computer during setting the test command, and move out site the EMI chamber for emissions test. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/14/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/04/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	12/31/10
Antenna, Horn, 18 GHz	EMCO	3115	C00945	07/29/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/06/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRC13192	N02683	CNR
Peak Power Meter	Boonton	4541	C01186	03/01/11
Peak Power Sensor	Boonton	57318	C01202	02/23/11

7. ANTENNA PORT TEST RESULTS

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

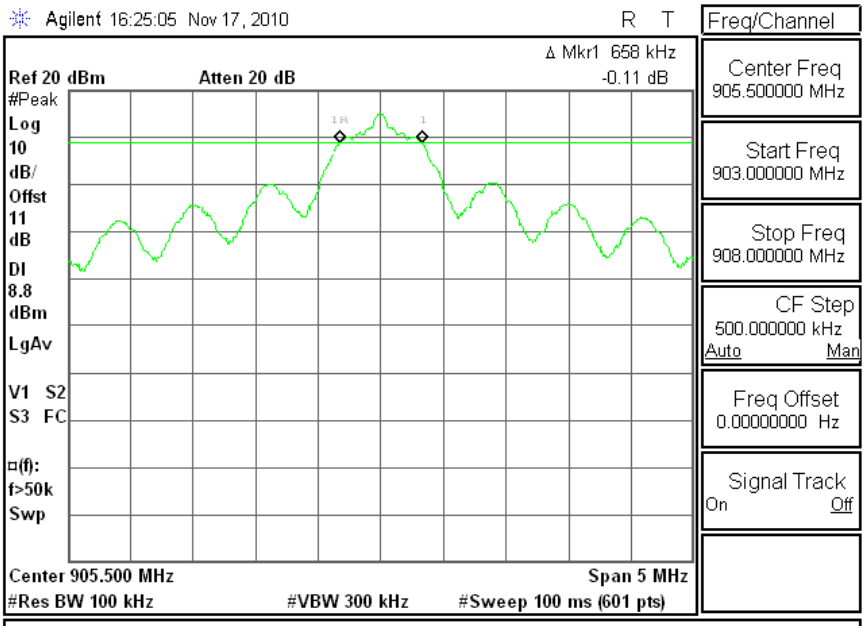
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

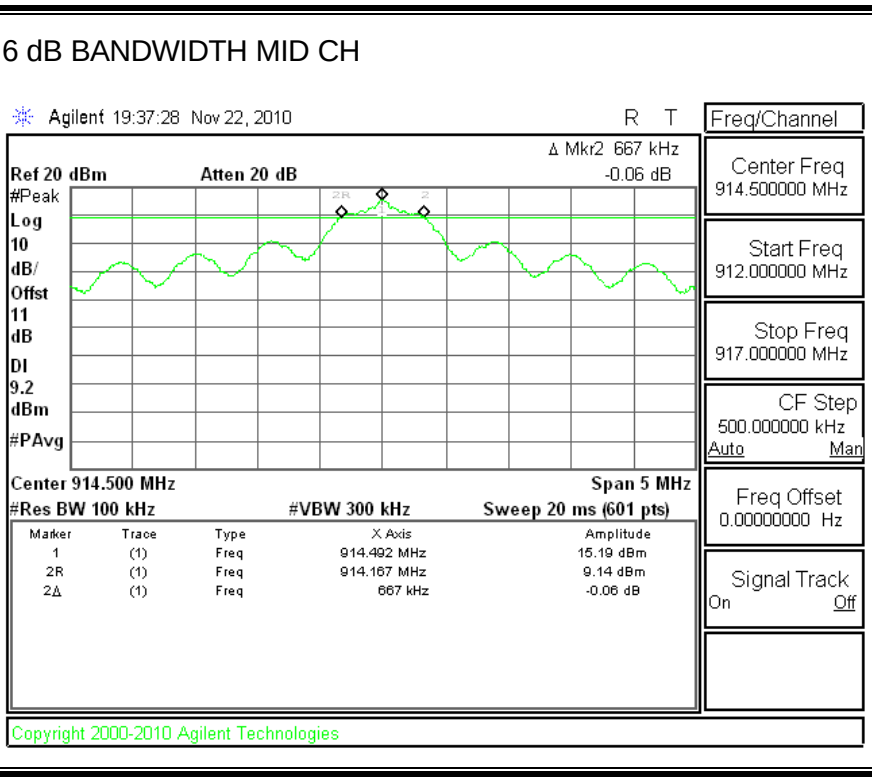
Channel	Frequency (MHz)	6 dB Bandwidth (KHz)	Minimum Limit (MHz)
Low	905.500	658	0.5
Middle	914.500	667	0.5
High	924.500	658	0.5

6 dB BANDWIDTH

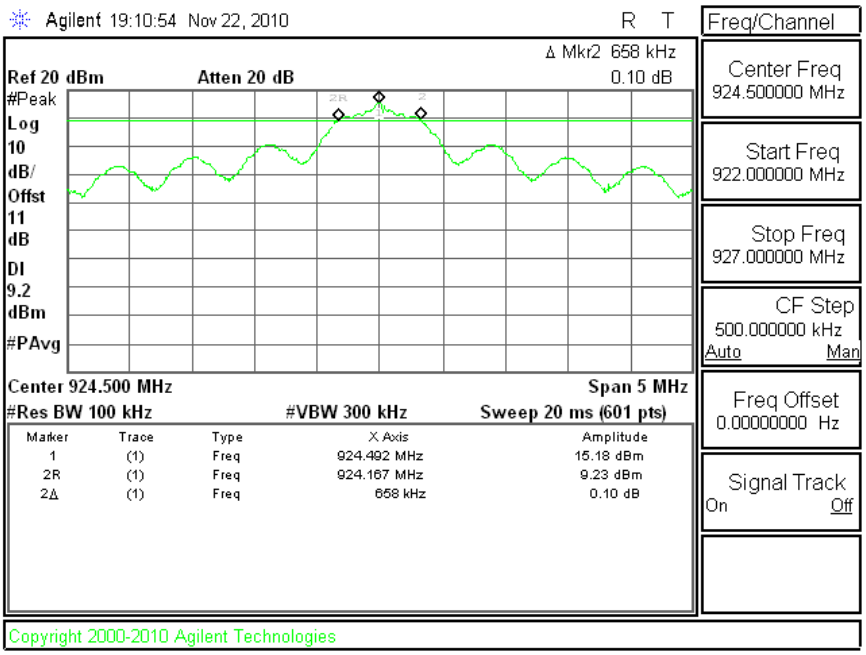
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

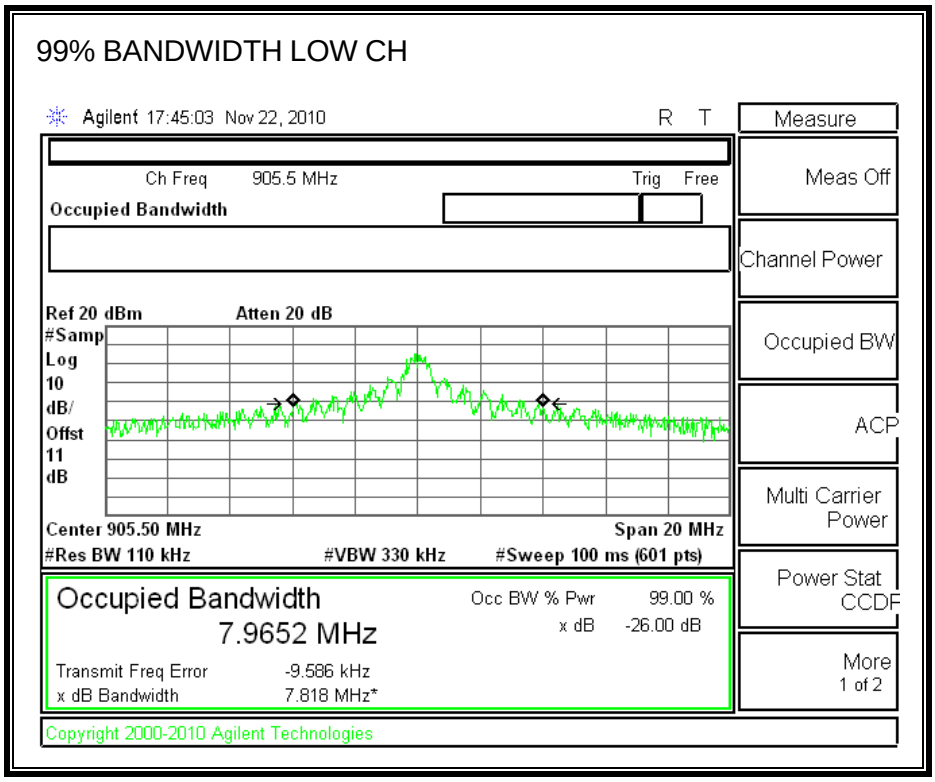
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

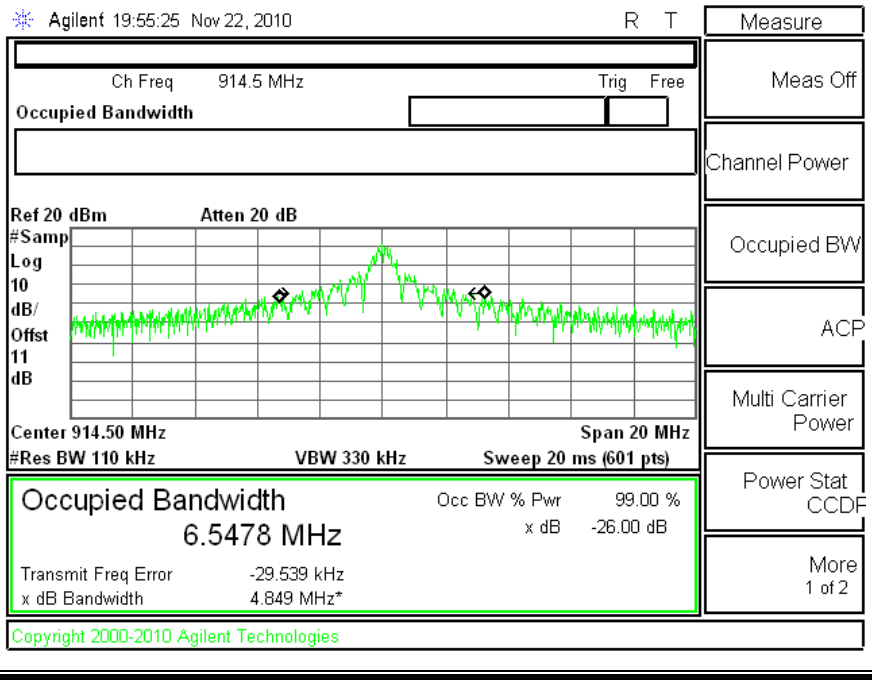
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (KHz)
Low	905.500	7965.2
Middle	914.500	6547.8
High	924.500	7533.3

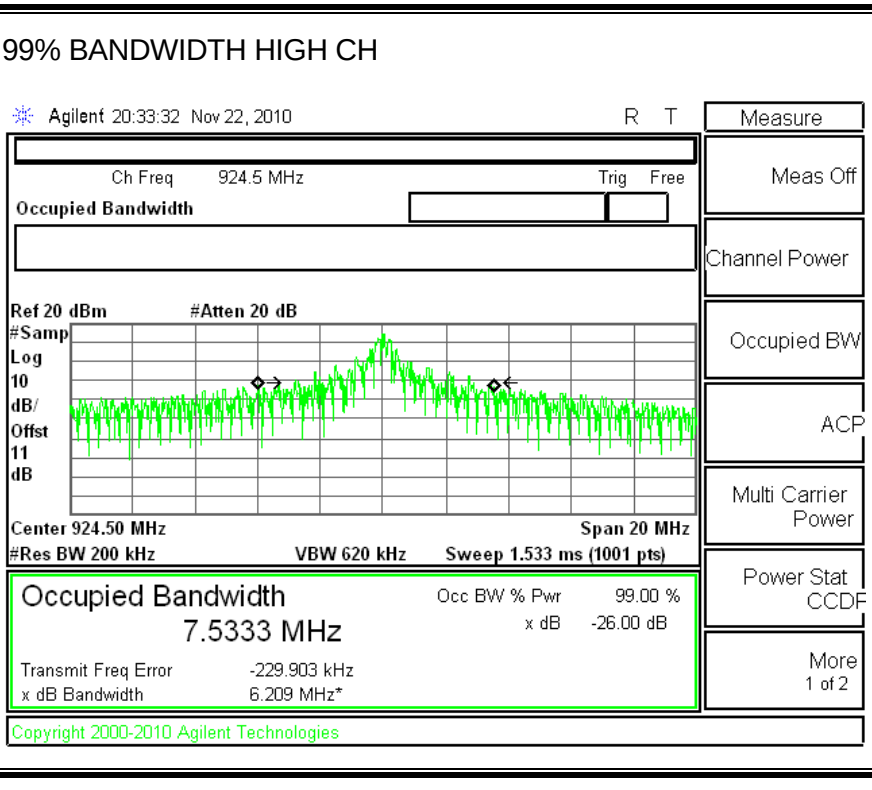
99% BANDWIDTH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

Peak power is measured by the power meter.

RESULTS

@PA ON and @PA 10 (40mW Highest Output Power)

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	15.79	30	-14.21
Middle	914.500	15.70	30	-14.30
High	924.500	15.94	30	-14.06

@PA ON and @PA 01

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	13.01	30	-16.99
Middle	914.500	13.42	30	-16.58
High	924.500	12.97	30	-17.03

@PA OFF and @PA 10

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	9.57	30	-20.43
Middle	914.500	9.72	30	-20.28
High	924.500	9.58	30	-20.42

@PA OFF and @PA 01

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	3.42	30	-26.58
Middle	914.500	3.97	30	-26.03
High	924.500	3.81	30	-26.19

7.1.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 1dB was entered as an offset in the power meter to allow for direct reading of power.

@PA ON and @PA 10 (40mW Highest Output Power)

Channel	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	15.60	30	-14.40
Middle	914.500	15.60	30	-14.40
High	924.500	15.80	30	-14.20

@PA ON and @PA 01

Channel	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	12.80	30	-17.20
Middle	914.500	13.30	30	-16.70
High	924.500	12.80	30	-17.20

@PA OFF and @PA 10

Channel	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	9.35	30	-20.65
Middle	914.500	9.60	30	-20.40
High	924.500	9.40	30	-20.60

@PA OFF and @PA 01

Channel	Frequency (MHz)	Average Power (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	3.25	30	-26.75
Middle	914.500	3.85	30	-26.15
High	924.500	3.65	30	-26.35

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE

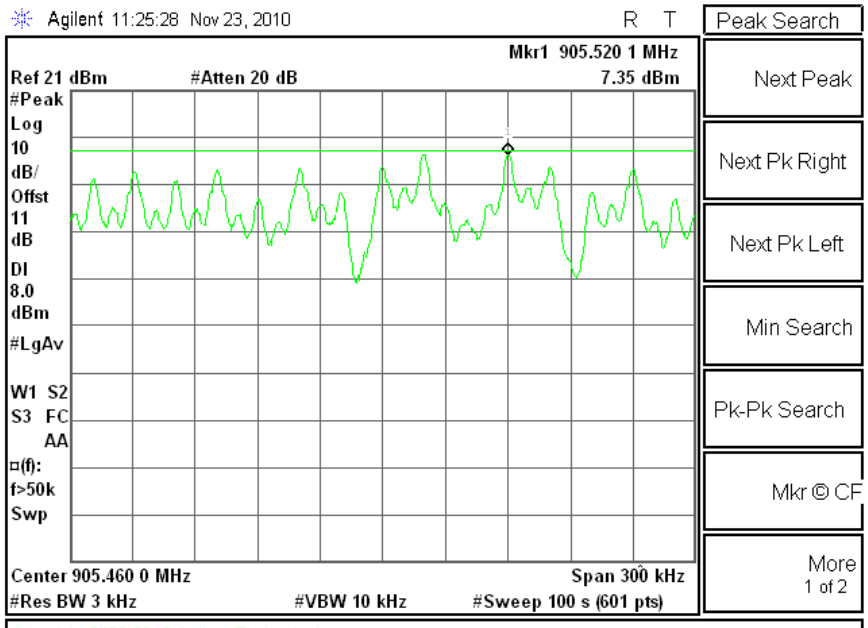
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

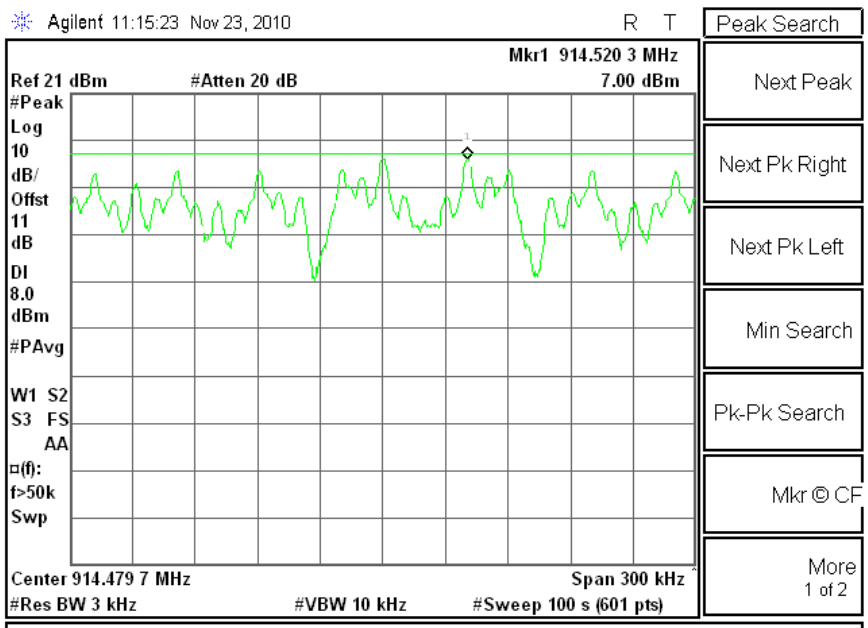
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	905.500	7.35	8	-0.65
Middle	914.500	7.00	8	-1.00
High	924.500	6.86	8	-1.14

POWER SPECTRAL DENSITY

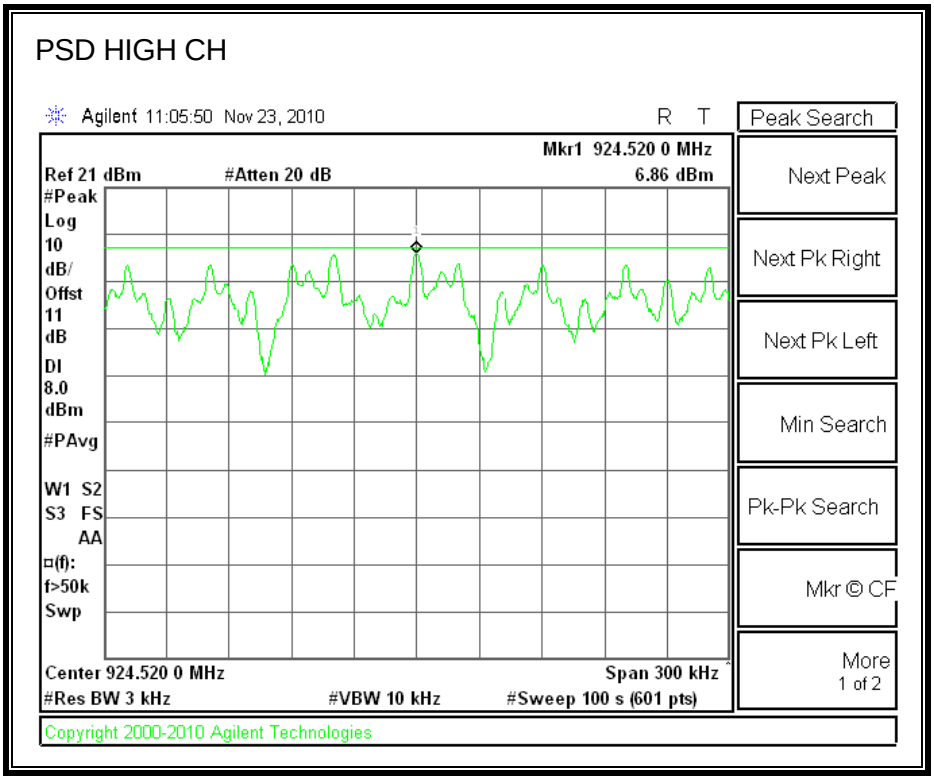
PSD LOW CH



PSD MID CH



PSD HIGH CH



7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

TEST PROCEDURE

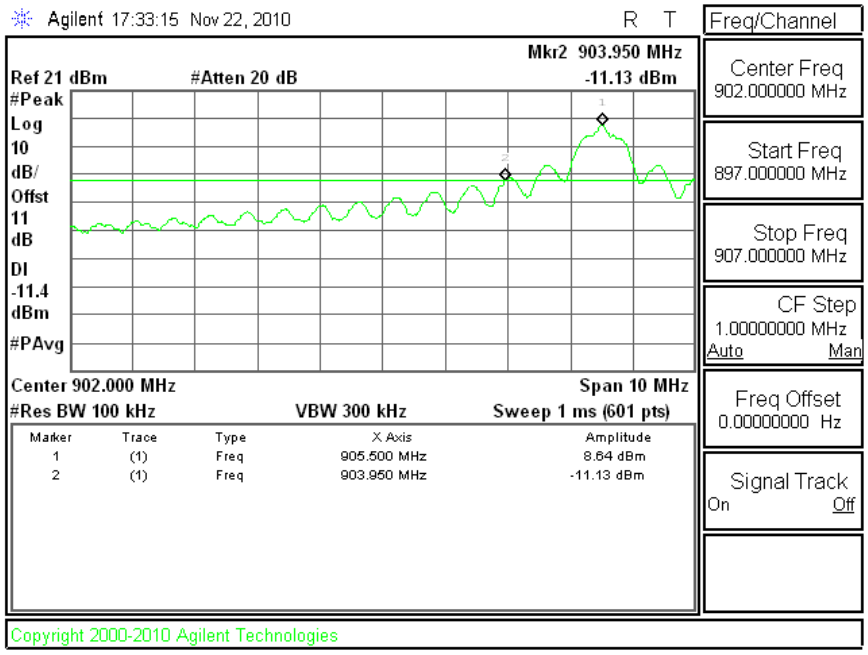
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

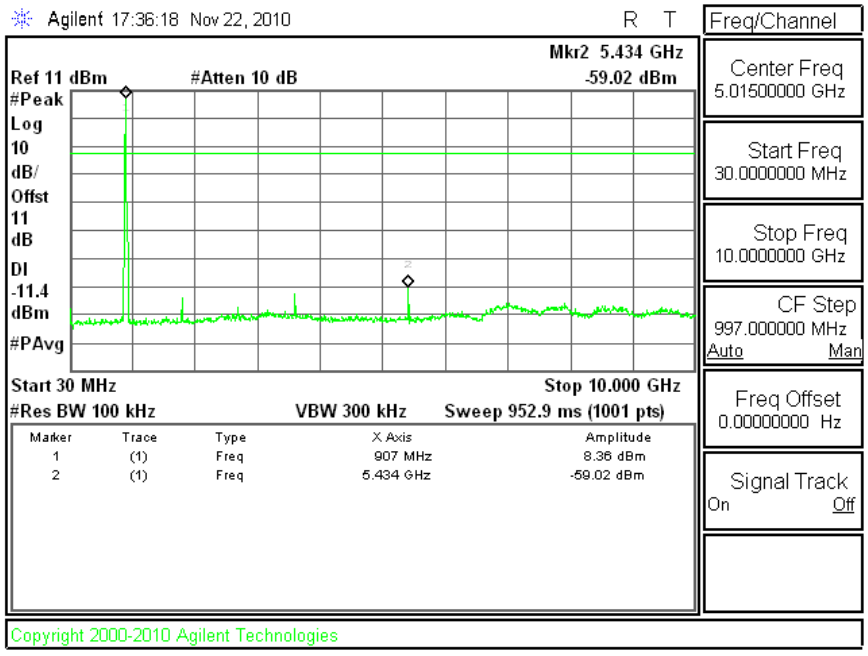
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE

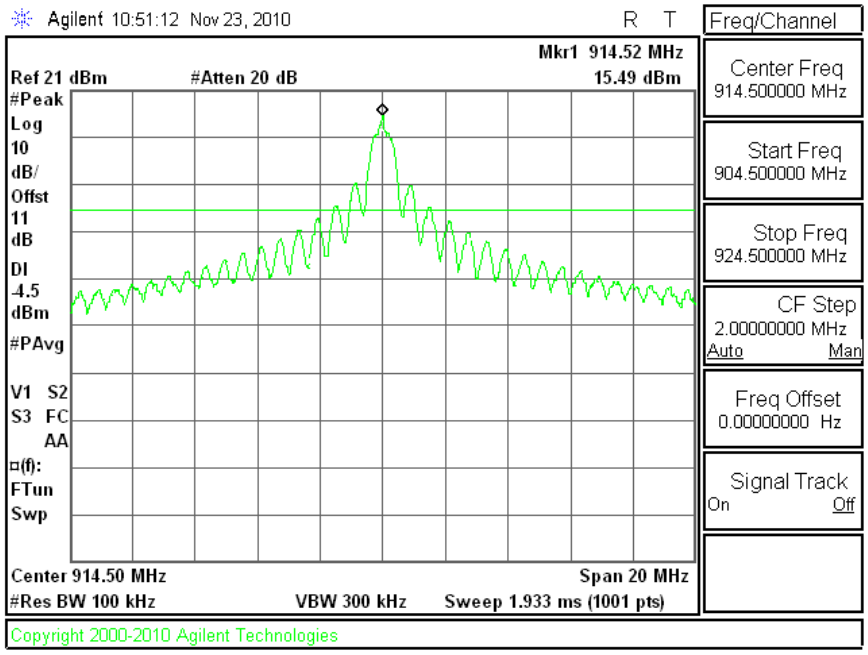


LOW CH SPURIOUS

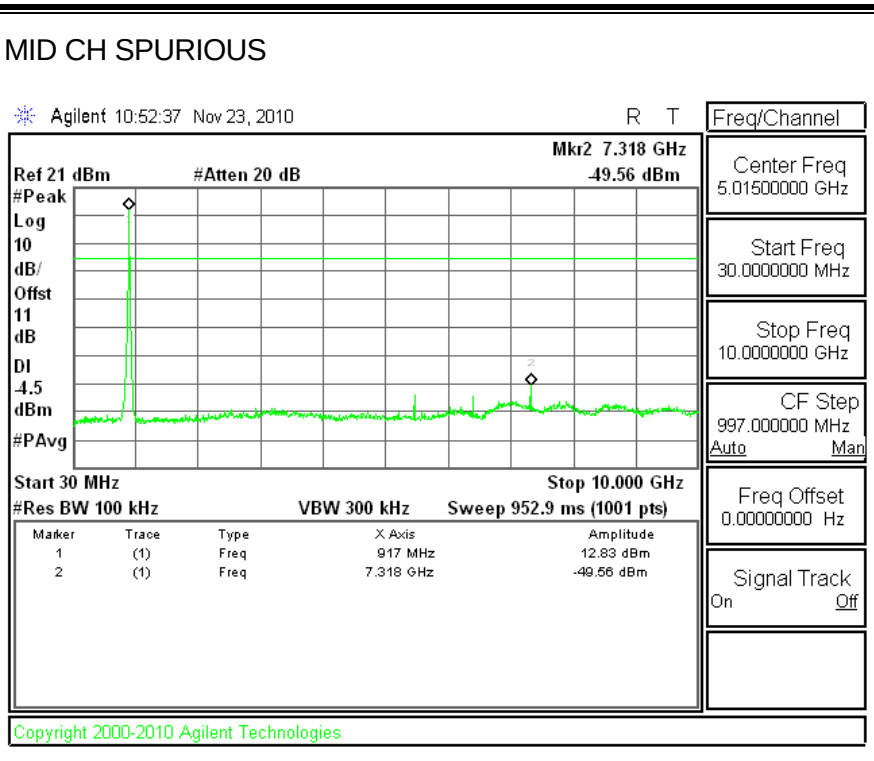


SPURIOUS EMISSIONS, MID CHANNEL

MID CH REFERENCE

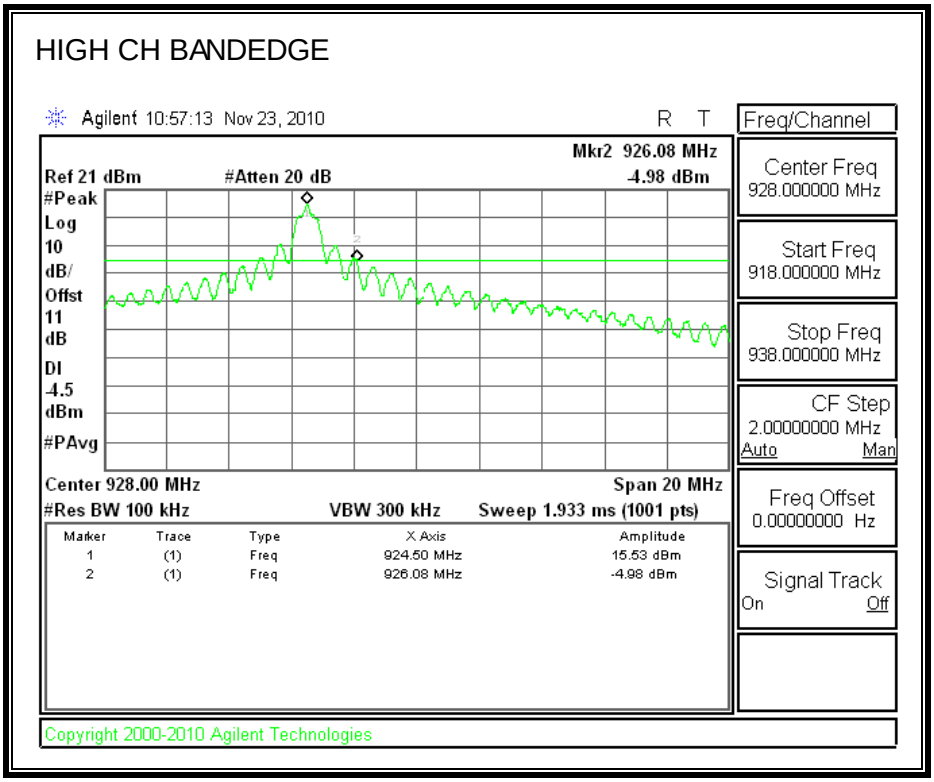


MID CH SPURIOUS

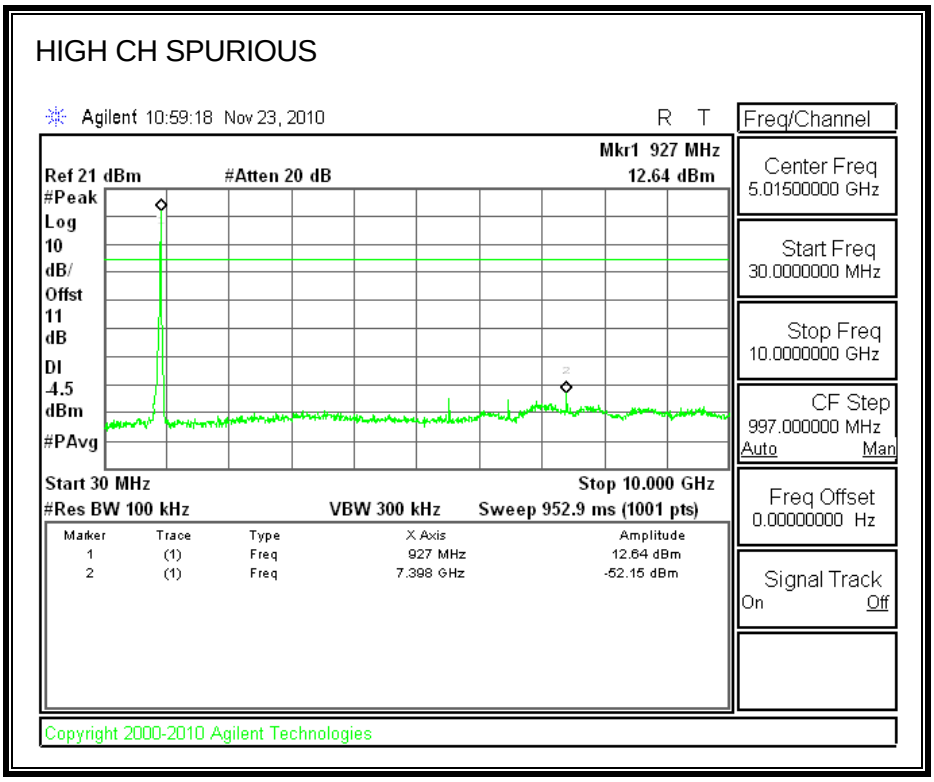


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CH BANDEDGE



HIGH CH SPURIOUS



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

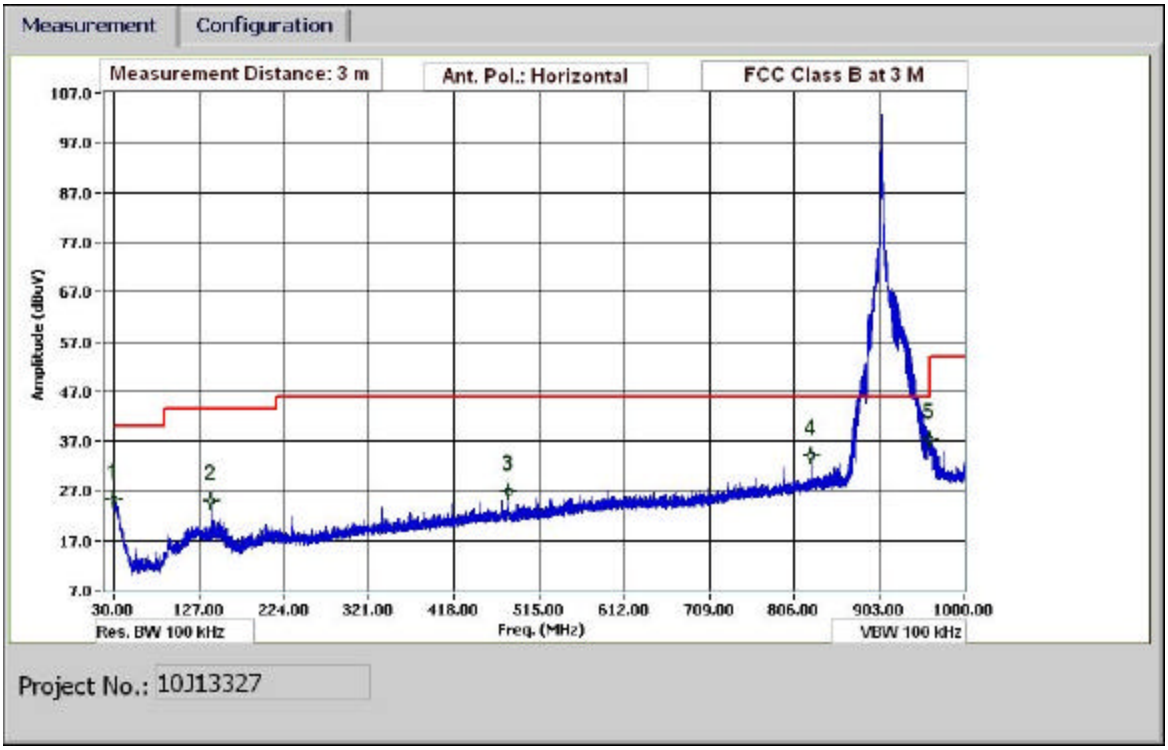
The spectrum from 30 MHz to 10 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 900 MHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

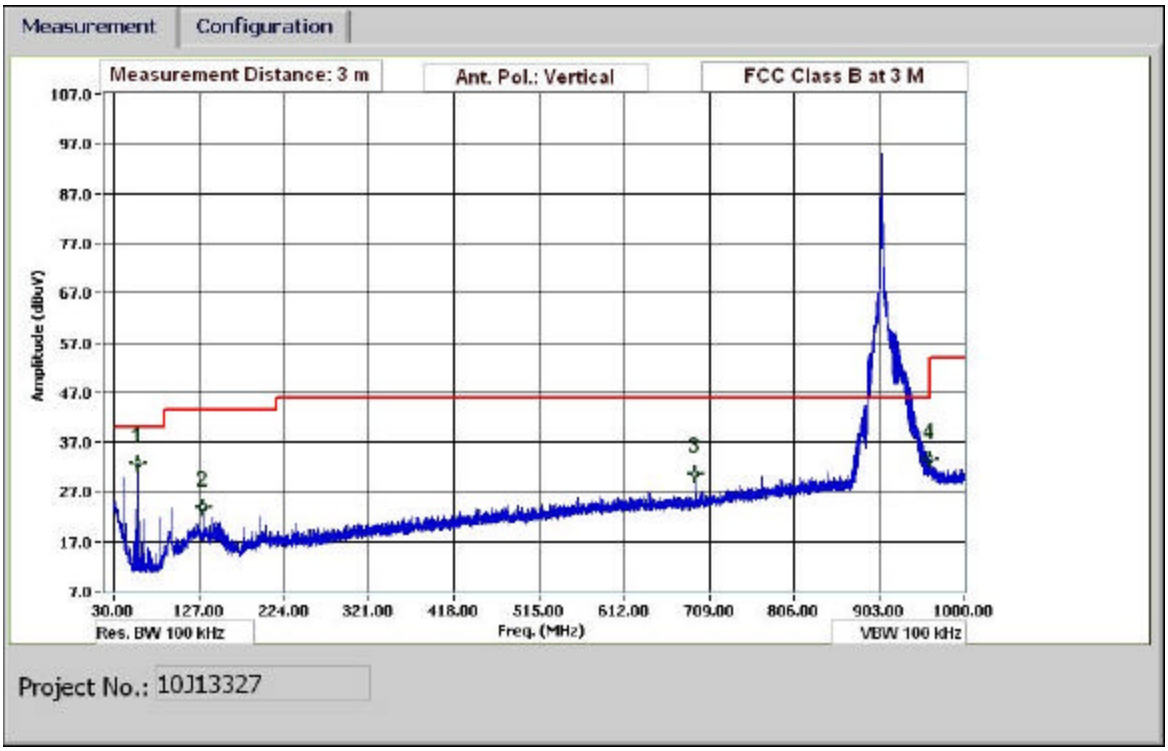
8.2. TRANSMITTER BELOW 1 GHz

LOW CHANNEL

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



LOW CHANNEL (VERTICAL AND HORIZONTAL DATA)

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 11/23/10
Project #: 10J13327
Company: Circuit Design
Test Target: FCC 15C
Mode Oper: TX Low Channel

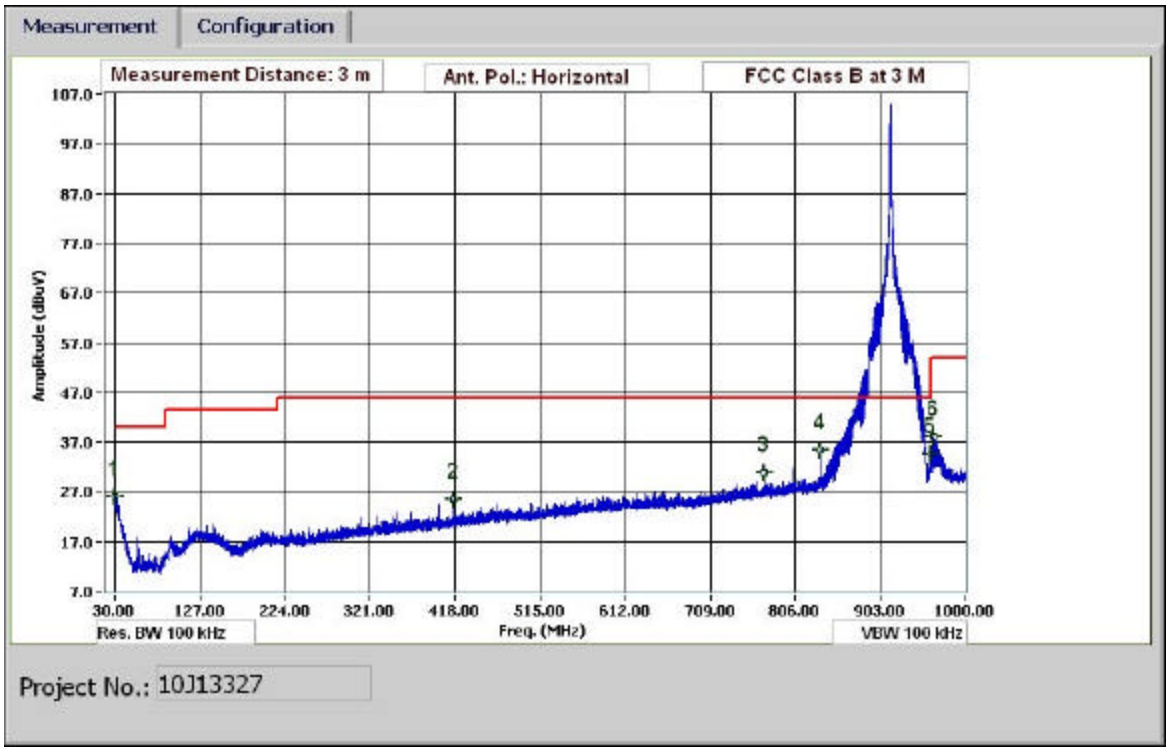
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Low Channel															
30.12	3.0	34.2	20.3	0.5	29.7	0.0	0.0	25.3	40.0	-14.7	H	P			
141.37	3.0	40.1	13.1	1.1	29.4	0.0	0.0	24.9	43.5	-18.6	H	P			
480.02	3.0	37.8	16.4	2.1	29.6	0.0	0.0	26.7	46.0	-19.3	H	P			
825.39	3.0	39.1	21.1	2.9	29.0	0.0	0.0	34.1	46.0	-11.9	H	P			
960.00	3.0	40.6	22.2	3.1	28.5	0.0	0.0	37.4	46.0	-8.6	H	P			
Low Channel															
57.00	3.0	53.7	7.9	0.7	29.6	0.0	0.0	32.6	40.0	-7.4	V	P			
131.40	3.0	38.6	13.6	1.0	29.4	0.0	0.0	23.8	43.5	-19.7	V	P			
693.39	3.0	38.5	19.2	2.6	29.6	0.0	0.0	30.7	46.0	-15.3	V	P			
960.00	3.0	36.8	22.2	3.1	28.5	0.0	0.0	33.7	46.0	-12.4	V	P			

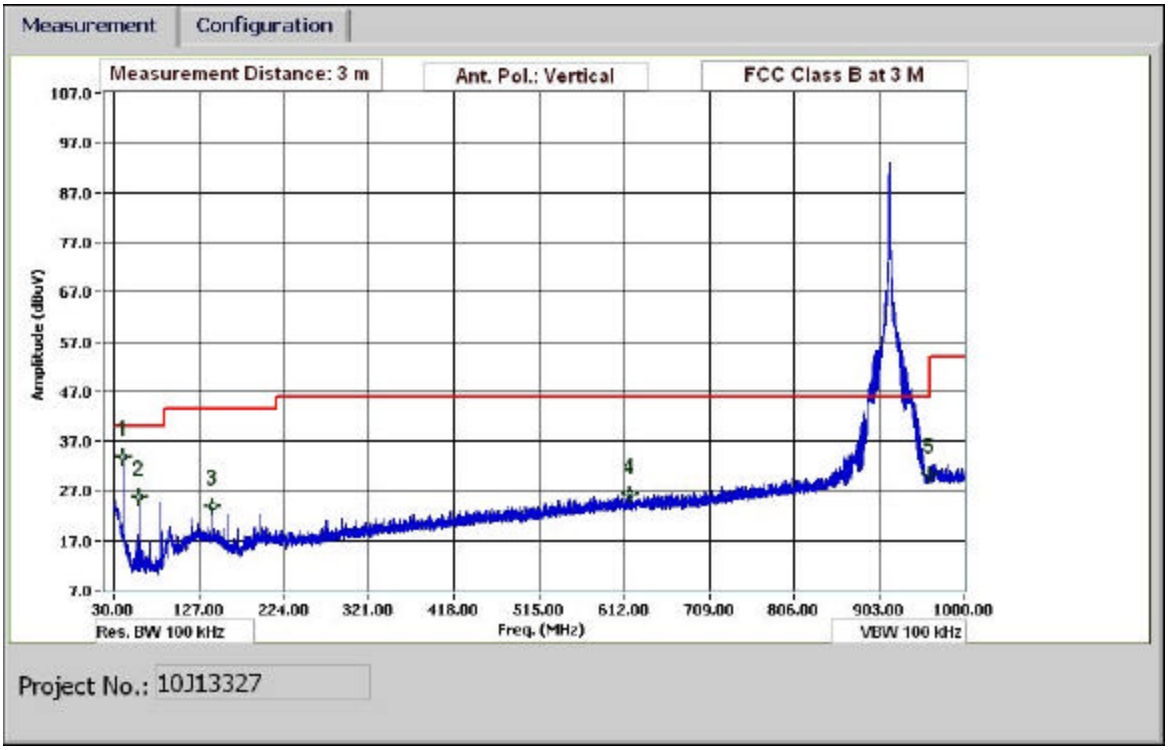
Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

MID CHANNEL

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



MID CHANNEL (VERTICAL AND HORIZONTAL DATA)

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 11/23/10
Project #: 10J13327
Company: Circuit Design
Test Target: FCC 15C
Mode Oper: TX Mid Channel

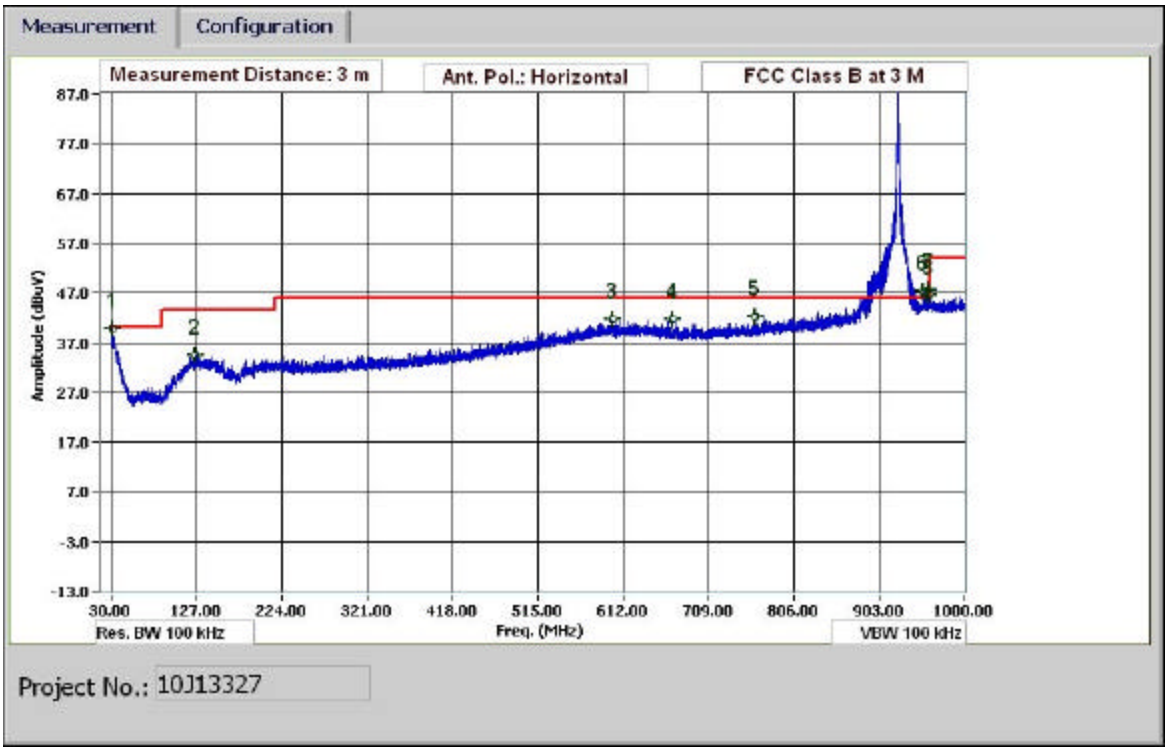
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
40.32	3.0	49.1	13.9	0.6	29.6	0.0	0.0	33.9	40.0	-6.1	V	P			
58.68	3.0	46.9	7.9	0.7	29.6	0.0	0.0	25.8	40.0	-14.2	V	P			
142.57	3.0	39.0	13.1	1.1	29.3	0.0	0.0	23.8	43.5	-19.7	V	P			
618.86	3.0	35.1	18.4	2.4	29.6	0.0	0.0	26.4	46.0	-19.6	V	P			
960.00	3.0	33.6	22.2	3.1	28.5	0.0	0.0	30.4	46.0	-15.6	V	P			
30.36	3.0	35.0	20.2	0.5	29.7	0.0	0.0	26.0	40.0	-14.0	H	P			
415.94	3.0	37.6	15.3	1.9	29.4	0.0	0.0	25.5	46.0	-20.5	H	P			
770.55	3.0	36.9	20.5	2.7	29.3	0.0	0.0	30.9	46.0	-15.1	H	P			
834.51	3.0	40.4	21.2	2.9	29.0	0.0	0.0	35.5	46.0	-10.5	H	P			
960.00	3.0	37.9	22.2	3.1	28.5	0.0	0.0	34.7	46.0	-11.3	H	P			
962.80	3.0	41.3	22.2	3.2	28.5	0.0	0.0	38.2	54.0	-15.8	H	P			

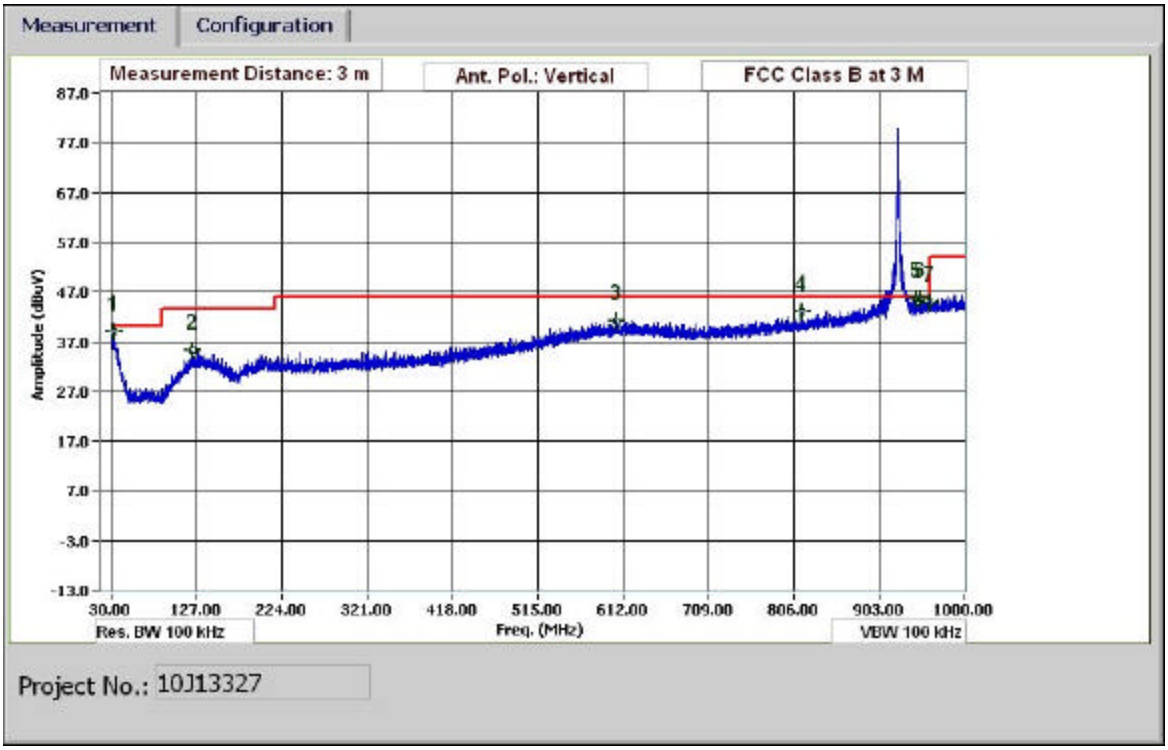
Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

HIGH CHANNEL

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



HIGH CHANNEL (VERTICAL AND HORIZONTAL DATA)

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 11/23/10
Project #: 10J13327
Company: Circuit Design
Test Target: FCC 15C
Mode Oper: TX High Channel

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Filter	Filter Insert Loss
AF	Antenna Factor	Corr.	Calculated Field Strength
CL	Cable Loss	Limit	Field Strength Limit

Margin — Margin vs. Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
31.20	3.0	29.3	19.8	0.5	29.7	0.0	20.0	39.9	40.0	-0.1	H	P			
125.64	3.0	28.9	13.8	1.0	29.4	0.0	20.0	34.3	43.5	-9.2	H	P			
600.26	3.0	30.6	18.3	2.4	29.6	0.0	20.0	41.6	46.0	-4.4	H	P			
668.43	3.0	29.8	18.9	2.5	29.6	0.0	20.0	41.6	46.0	-4.4	H	P			
762.15	3.0	28.4	20.3	2.7	29.3	0.0	20.0	42.2	46.0	-3.8	H	P			
960.00	3.0	29.6	22.2	3.1	28.5	0.0	20.0	46.5	46.0	0.5	H	P			
960.00	3.0	27.0	22.2	3.1	28.5	0.0	20.0	43.8	46.0	-2.2	H	QP			
32.64	3.0	29.1	19.1	0.5	29.7	0.0	20.0	39.1	40.0	-0.9	V	P			
122.40	3.0	29.9	13.8	1.0	29.4	0.0	20.0	35.2	43.5	-8.3	V	P			
603.86	3.0	30.2	18.3	2.4	29.6	0.0	20.0	41.2	46.0	-4.8	V	P			
814.59	3.0	28.1	21.1	2.8	29.1	0.0	20.0	43.0	46.0	-3.0	V	P			
960.00	3.0	28.0	22.2	3.1	28.5	0.0	20.0	44.8	46.0	-1.2	V	P			

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

8.3. HARMONIC AND SPURIOUS ABOVE 1 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: Circuit Design, Inc.
Project #: 10J13509
Date: 11/19/2010
Test Engineer: Thanh Nguyen
Configuration: EUT Alone (40mW)
Mode: TX mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_1.5GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch.															
2.716	3.0	51.3	45.5	29.2	4.1	-35.2	0.0	0.6	50.0	44.2	74	54	-24.0	-9.8	V
2.716	3.0	50.5	46.0	29.2	4.1	-35.2	0.0	0.6	49.1	44.7	74	54	-24.9	-9.3	H
Mid Ch.															
2.744	3.0	55.8	53.6	29.3	4.1	-35.2	0.0	0.6	54.6	52.4	74	54	-19.4	-1.6	V
2.744	3.0	49.5	44.7	29.3	4.1	-35.2	0.0	0.6	48.2	43.5	74	54	-25.8	-10.5	H
High Ch.															
2.773	3.0	42.4	30.6	29.3	4.2	-35.2	0.0	0.6	41.3	29.5	74	54	-32.7	-24.5	V
3.698	3.0	42.0	33.3	31.5	4.9	-34.9	0.0	0.6	44.1	35.4	74	54	-29.9	-18.6	V
4.622	3.0	42.1	34.0	32.6	5.6	-34.8	0.0	0.6	46.1	38.0	74	54	-27.9	-16.0	V
7.396	3.0	47.4	43.4	35.3	7.3	-34.6	0.0	0.6	56.0	52.1	74	54	-18.0	-1.9	V
8.324	3.0	43.9	37.1	36.4	7.8	-34.6	0.0	0.7	54.1	47.4	74	54	-19.9	-6.6	V
2.773	3.0	45.1	37.3	29.3	4.2	-35.2	0.0	0.6	44.0	36.1	74	54	-30.0	-17.9	H
3.698	3.0	41.3	29.0	31.5	4.9	-34.9	0.0	0.6	43.4	31.1	74	54	-30.6	-22.9	H
4.626	3.0	41.8	33.6	32.6	5.6	-34.8	0.0	0.6	45.8	37.6	74	54	-28.2	-16.4	H
7.396	3.0	45.9	41.6	35.3	7.3	-34.6	0.0	0.6	54.5	50.2	74	54	-19.5	-3.8	H
8.324	3.0	43.7	35.5	36.4	7.8	-34.6	0.0	0.7	53.9	45.8	74	54	-20.1	-8.2	H

Rev. 07.22.09

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.4. RECEIVER ABOVE 1 GHz

No emissions were found below 20dB from the limit lines.

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

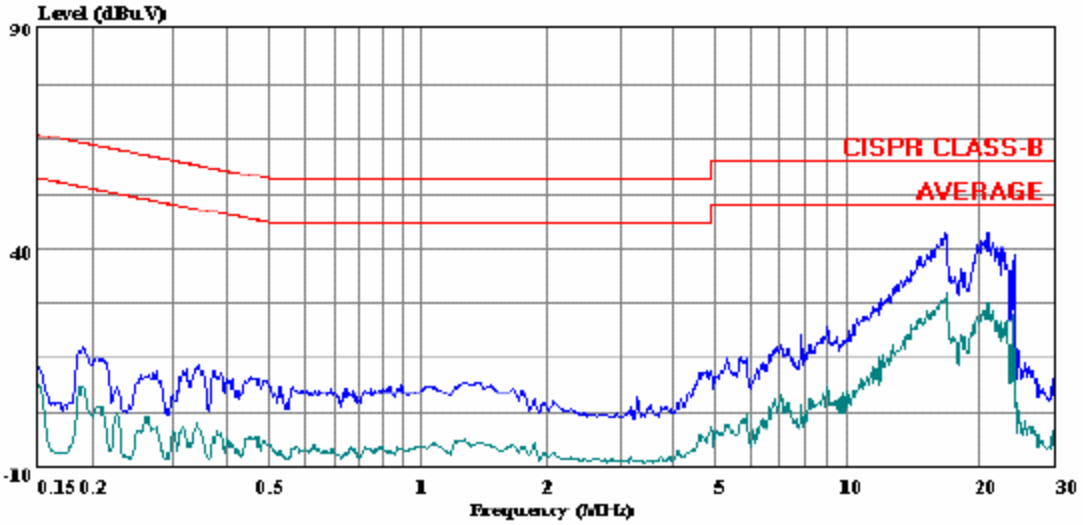
6 WORST EMISSIONS (WORST CASE)

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.19	17.89	--	--	0.00	64.08	54.08	-46.19	-36.19	L1
16.66	43.66	--	29.95	0.00	60.00	50.00	-16.34	-20.05	L1
20.92	43.75	--	27.71	0.00	60.00	50.00	-16.25	-22.29	L1
0.19	16.13	--	--	0.00	64.17	54.17	-48.04	-38.04	L2
16.66	43.50	--	28.60	0.00	60.00	50.00	-16.50	-21.40	L2
20.92	44.72	--	33.25	0.00	60.00	50.00	-15.28	-16.75	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

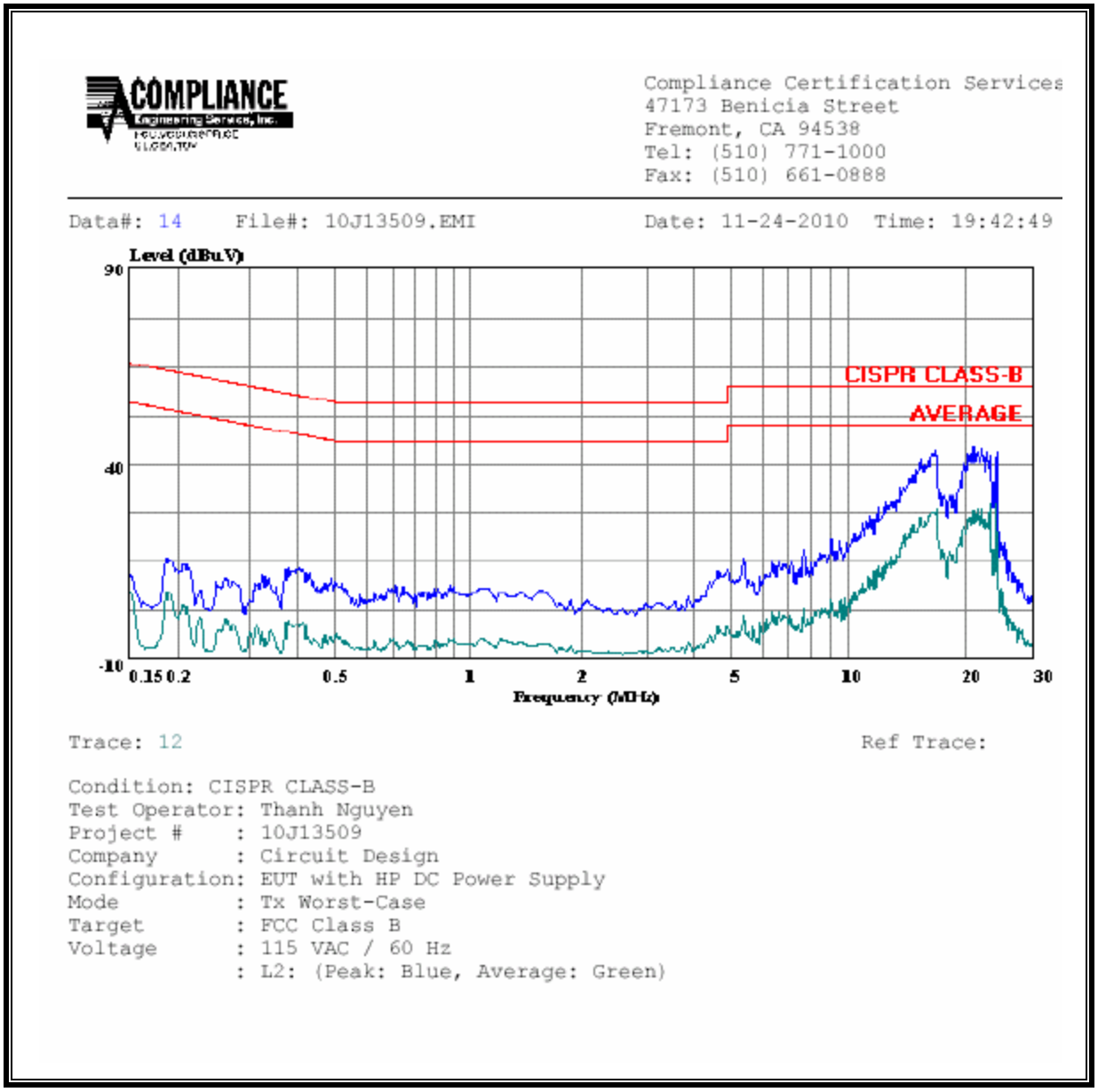
Data#: 7 File#: 10J13509.EMI Date: 11-24-2010 Time: 19:22:37



Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: Thanh Nguyen
Project # : 10J13509
Company : Circuit Design
Configuration: EUT with HP DC Power Supply
Mode : Tx Worst-Case
Target : FCC Class B
Voltage : 115 VAC / 60 Hz
: L1: (Peak: Blue, Average: Green)

LINE 2 RESULTS



10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
900 MHz	DSSS	0.20	15.94	1.80	0.12	0.012