FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

60 GHz WirelessHD (HIGH DEFINITION) SOURCE

MODEL NUMBER: VM101T

FCC ID: MQ4-VM101T01

REPORT NUMBER: 09U12531-1, Revision B

ISSUE DATE: JUNE 1, 2009

Prepared for
ABOCOM
NO.77, YOUYI RD, JHUNAN TOWNSHIP
MIAOLI COUNTY 35059, TAIWAN

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	5/7/2009	Initial Issue	M. Heckrotte
A	5/12/2009	Revised spurious emission table	M. Heckrotte
B	6/1/2009	Revised measurement equipment list	M. Heckrotte

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ABOCOM
NO.77, YOUYI RD
JHUNAN TOWNSHIP, MIAOLI COUNTY 35059, TAIWAN

EUT DESCRIPTION: 60 GHz WiirelessHD (HIGH DEFINITION) SOURCE

MODEL: VM101T

SERIAL NUMBER: TX 049

DATE TESTED: APRIL 21 TO 30, 2009

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

Compliance Certification Services, Inc. (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 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by 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 CCS By:

MICHAEL HECKROTTE
DIRECTOR OF ENGINEERING
COMPLIANCE CERTIFICATION SERVICES

Tested By:

MENGISTU MEKURIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and FCC KDB 200443 Millimeter Wave Test Procedure.

3. FACILITIES AND ACCREDITATION

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

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 WirelessHD Source radio module. It is designed to operate as part of a Wireless Video Audio Network (WVAN) in the 57 to 64 GHz band. The EUT sends High Definition Audio/Video to a WirelessHD Sink radio module.

The EUT transmits and receives control and management signals on one of three Low Rate Physical (LRP) channels from 60.32 to 60.64 GHz. The integral LRP transmit/receive antenna is a scanning beam-steering array with a maximum gain of 13 dBi.

The EUT transmits High Definition Audio/Video data on a single High Rate Physical (HRP) channel at 60.48 GHz. The integral HRP transmit antenna is an adaptive beam-steering array with a maximum gain of 17 dBi.

The LRP modulation is BPSK. The HRP modulation can be either QPSK or 16-QAM. Three system data rates are implemented: QPSK at 0.952 Gb/s (Quarter Rate), QPSK at 1.904 Gb/s (Half Rate) and 16-QAM at 3.807 Gb/s (Full Rate).

5.2. OUTPUT POWER

The antenna is integral thus radiated measurements are made. The EIRP was measured at the worst-case condition, thus the EIRP measurement conditions correspond to the maximum EUT antenna gain. Therefore the maximum antenna gain is used to calculate the Peak Output Power.

The highest peak output power for LRP is 10 dBm (10 mW).

The peak output power for HRP is 16.0 dBm (39.8 mW).

5.3. WORST-CASE CONFIGURATION AND MODE

Two units, a WirelessHD Source, and a WirelessHD Sink, are configured to form a WVAN. All transmitters and receivers in this WVAN operate simultaneously.

To facilitate LRP measurements the EUT was maintained in the WVAN setup phase by turning on the Source while the Sink remained powered down. The highest level was measured on the LRP Mid Channel.

During normal operation of the WVAN, with HRP established and active, the bandwidth of the LRP signal (for all three LRP channels) falls entirely within the bandwidth of the HRP signal. Thus the LRP signal in this mode is inherently and simultaneously measured with the HRP signal. The LRP was set to the Mid Channel during all measurements of HRP, based on the worst-case of the LRP measurements during the WVAN setup phase.

Preliminary measurements were performed at all three data rates (Full, Half and Quarter). The highest level was measured in the Quarter Rate mode. All final measurements were performed with the system set to the Quarter Rate mode.

Preliminary measurements were performed with the HRP antenna beam set to various orientations, then aligning the measurement receiver to find the maximum level. The orientation with the highest radiated level was with the main lobe of the beam normal (perpendicular) to the plane of the antenna array. All final in-band HRP measurements were performed with the main lobe oriented and locked in the direction normal to the plane of the antenna array.

Preliminary measurements were performed by placing the measurement receiver at various orientations of the LRP antenna beam, then aligning the measurement receiver to find the maximum level. All orientations yielded similar levels. All final in-band LRP measurements were performed with the measurement receiver directly in front of and normal to the plane of the antenna array.

6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
TELEVISION SET	LG	32LG70-UA	910MXJX3A268	DoC
BLU-RAY PLAYER	SONY	BDP-S350	1673727 8D	N/A
AC/DC	SPEC LIN	SW1201500-W01	S080209000346	DoC
AC/DC	DVE	DSA-20P-US	1209HB	DoC

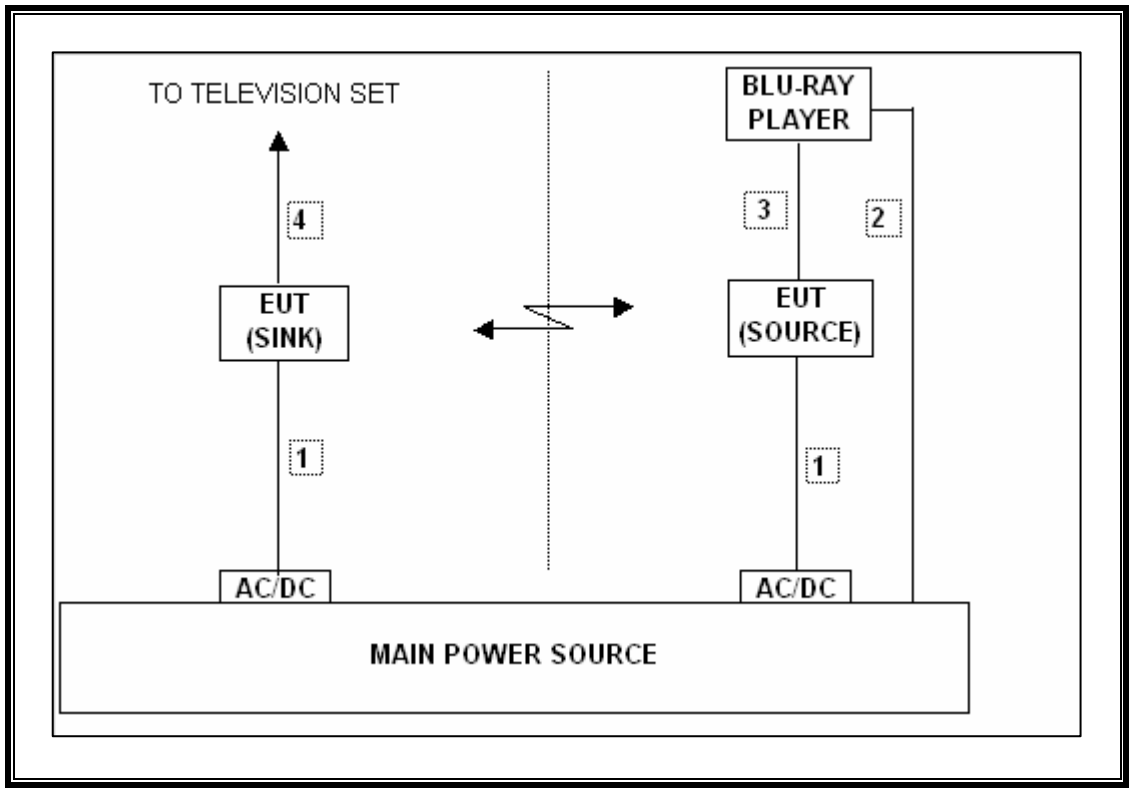
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	DC	2	DC	Un-Shielded	2.0 m	N/A
2	AC	1	AC	Un-Shielded	2.0 m	N/A
3	HDMI	1	HDMI	Shielded	1.0 m	N/A
4	HDMI	1	HDMI	Shielded	8.0 m	N/A

TEST SETUP

High Definition Audio / Video in the 1080p format was sent from the Source to the Sink via the wireless link. A Blu-Ray player furnished HD A/V to the Source. The Sink furnished HD A/V to the television. The television was placed outside the chamber. A laptop computer with test software was utilized to vary the radio configuration and antenna beam orientation for testing purposes. This computer was not connected during measurements. For Extreme environmental tests, an external Variable DC power supply was utilized in place of the AC/DC adapter to furnish power to the EUT.

SETUP DIAGRAM FOR TESTS



7. 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**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	11/14/200
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4407B	C01098	11/7/2010
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	1/14/2010
Preamp, 1000 MHz	Sonoma	310N	N02891	12/16/2009
Antenna, Horn, 18 GHz	EMCO	3115	C00872	1/29/2010
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	2/4/2010
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	1/29/2010
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	4/29/2009
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	2/3/2010
Harmonic Mixer, 50 GHz	Agilent / HP	11970Q	C00769	5/9/2009
Antenna, Horn, 50 GHz	ATM	22-442-6	N02336	NCR
Downconverter, 60 GHz	Agilent / HP	MT-463	C01187	4/20/2010
Antenna, Horn, 50 GHz	ATM	22-442-6	N02336	NCR
Signal Generator, 67 GHz	Agilent / HP	E8257D	US49060035	3/19/2010
Harmonic Mixer, 75 GHz	Agilent / HP	11970V	C00768	12/1/2009
Antenna, Horn, 75 GHz	ATM	15-442-6	N023342	NCR
Harmonic Mixer, 110 GHz	Agilent / HP	11970W	C00770	12/1/2009
Antenna, Horn, 110 GHz	ATM	10-442-6	N023343	CNR
Harmonic Mixer, 140 GHz	OML	M08HWA	C00868	CNR
Antenna, Horn, 140 GHz	OML	M08HWA	C00868	CNR
Harmonic Mixer, 220 GHz	OML	M05HWA	C00867	CNR
Antenna, Horn, 220 GHz	OML	M05HWA	C00867	CNR
Mixer Diplexer for HP	OML	DPL.313B	N02429	CNR
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	5/13/2009

8. APPLICABLE LIMITS AND TEST RESULTS

8.1. 6 dB BANDWIDTH

APPLICABLE RULE

§15.255 (e) (1) For the purposes of this paragraph (e)(1), emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g. for frequency hopping devices).

LIMIT

None; for reporting purposes only.

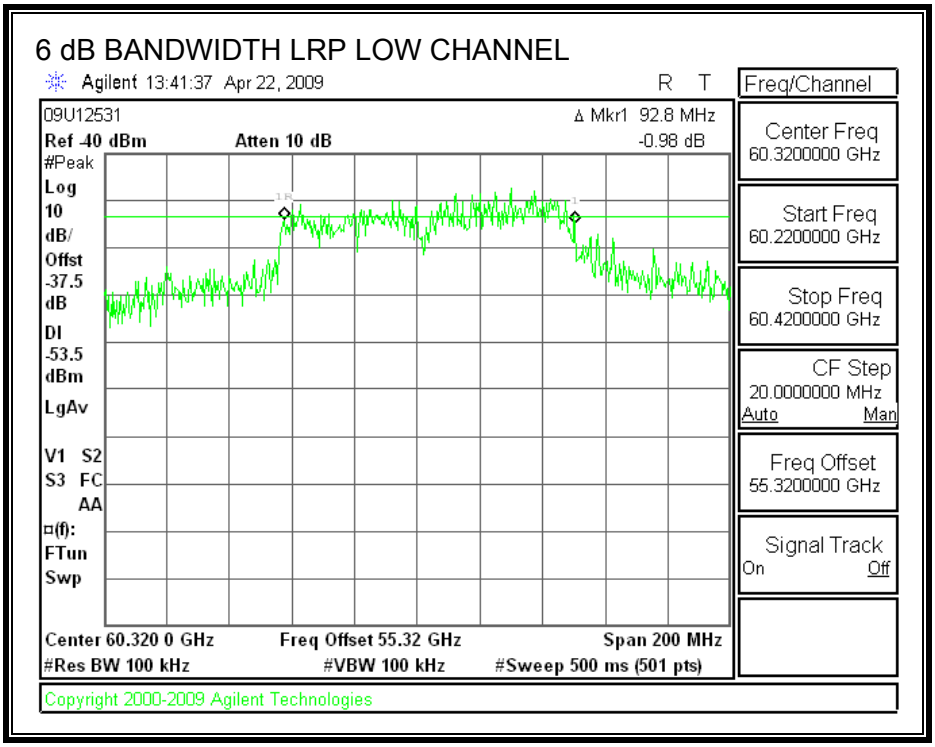
TEST PROCEDURE

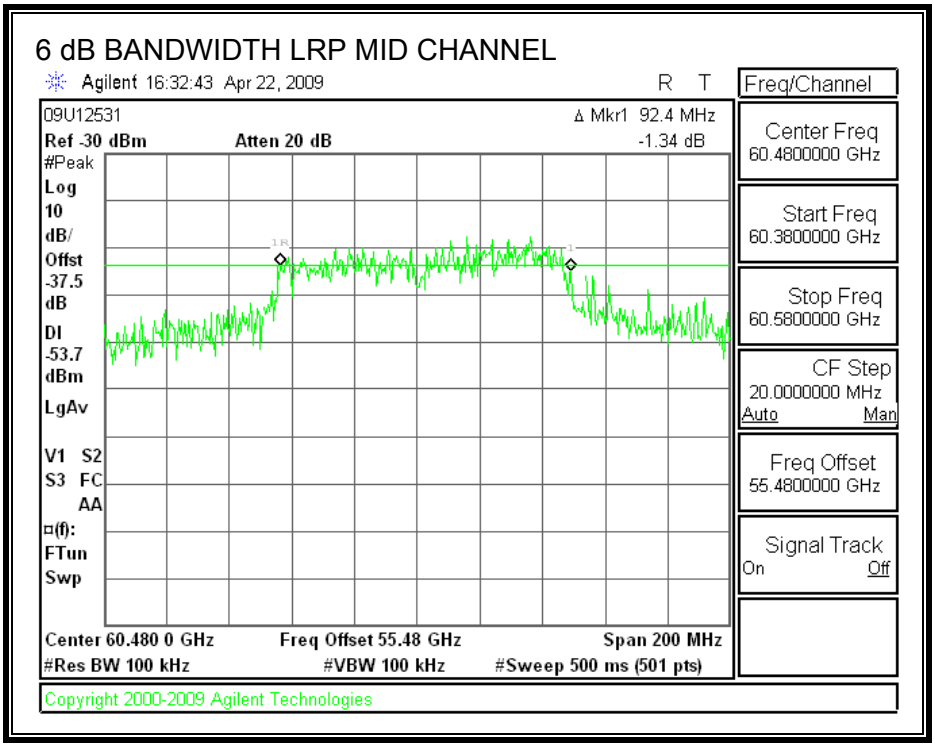
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

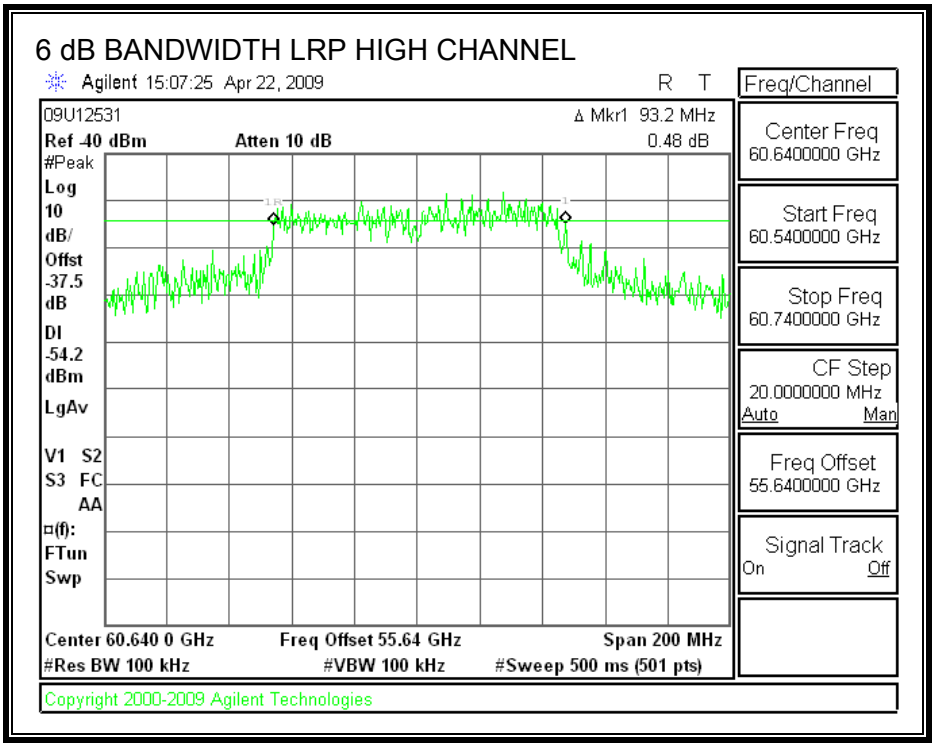
LRP RESULTS

Channel	Frequency (GHz)	6 dB Bandwidth (MHz)
Low	60.32	92.80
Mid	60.48	92.40
High	60.64	93.20

6 dB BANDWIDTH



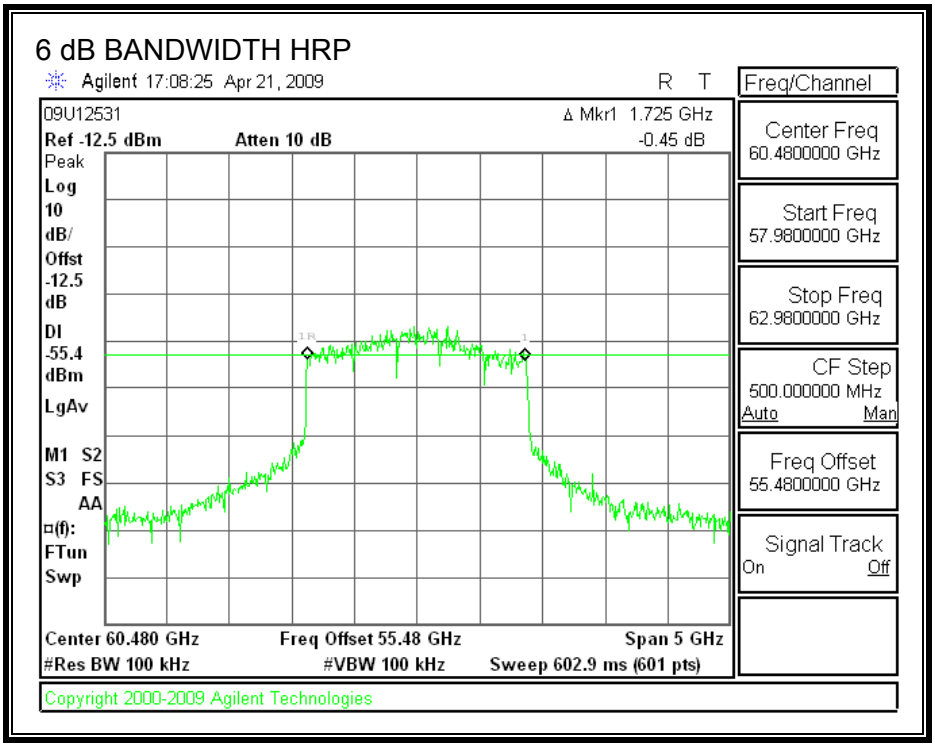




HRP RESULTS

Channel	Frequency (GHz)	6 dB Bandwidth (GHz)
HRP	60.48	1.725

6 dB BANDWIDTH



8.2. 26 dB BANDWIDTH

APPLICABLE RULE

§ 15.403 (c) as referenced by FCC KDB Publication 200443, Millimeter Wave Test Procedures

LIMIT

None; for reporting purposes only.

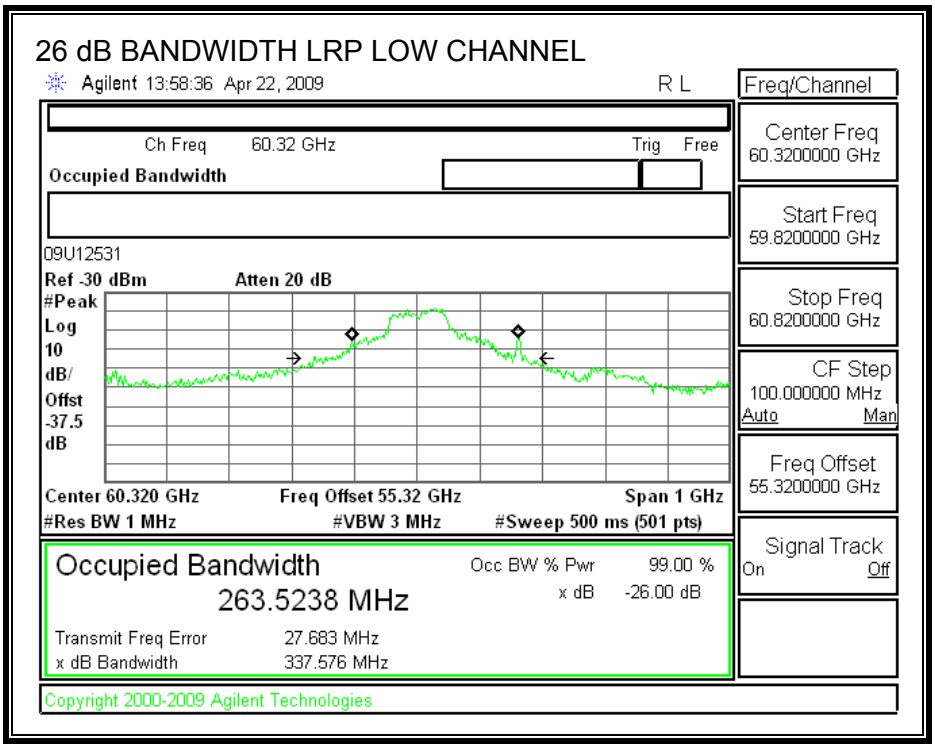
TEST PROCEDURE

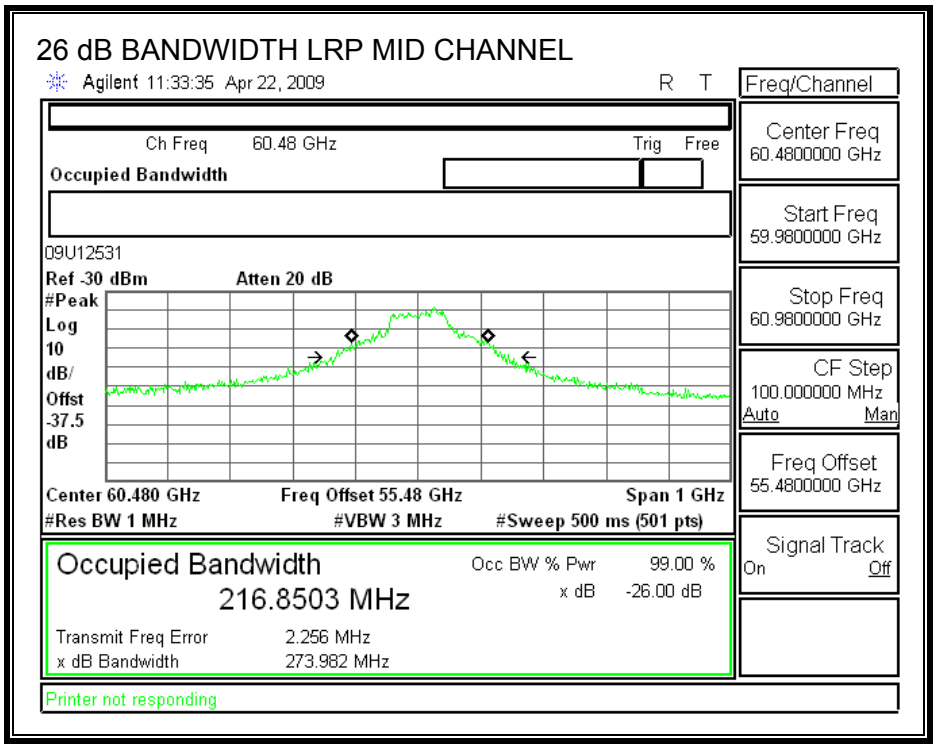
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

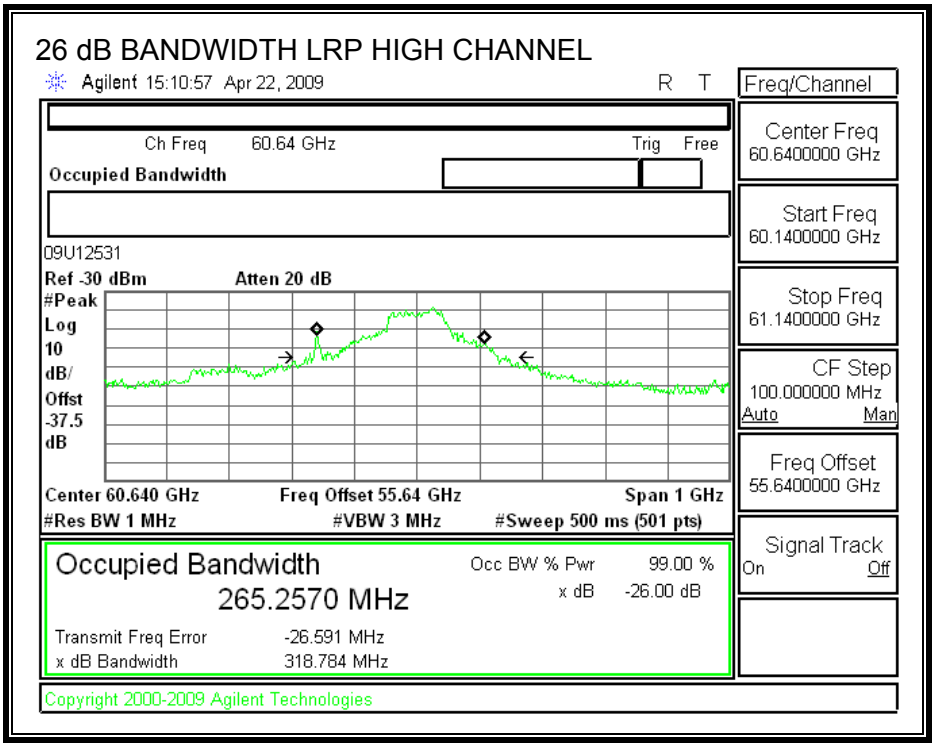
LRP RESULTS

Channel	Frequency (GHz)	26 dB Bandwidth (MHz)
Low	60.32	337.58
Mid	60.48	273.96
High	60.64	318.78

26 dB BANDWIDTH



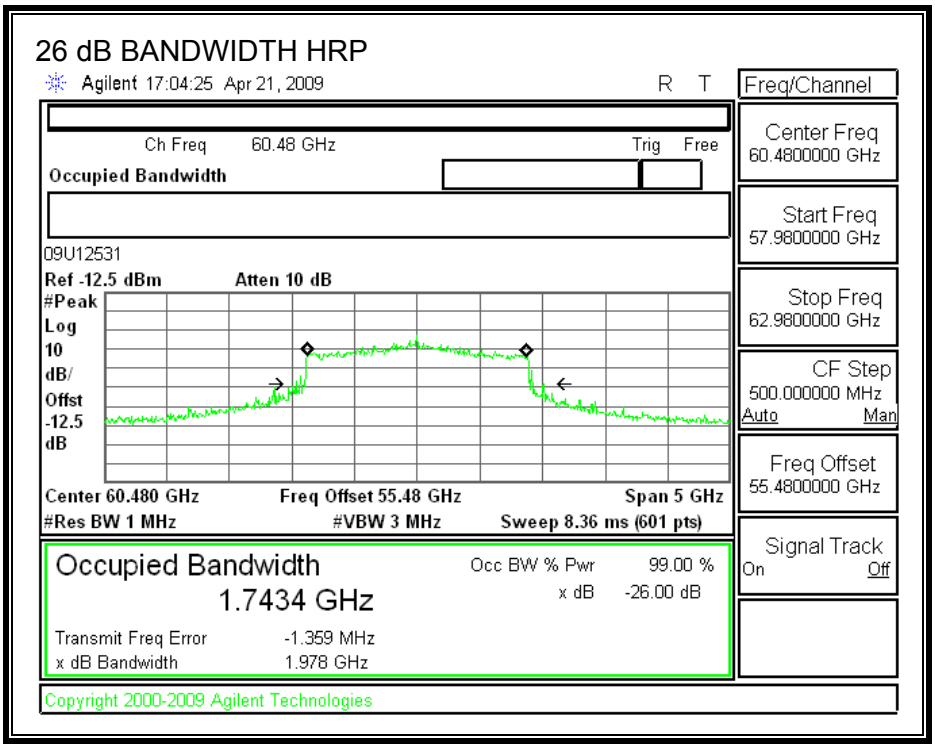




HRP RESULTS

Channel	Frequency (GHz)	26 dB Bandwidth (GHz)
HRP	60.48	1.978

26 dB BANDWIDTH



8.3. POWER DENSITY

LIMIT

§15.255 (b) Within the 57-64 GHz band, emission levels shall not exceed the following:

(1) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed 9 uW/cm^2, as measured 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 uW/cm^2, as measured 3 meters from the radiating structure.

(4) Peak power density shall be measured with an RF detector that has a detection bandwidth that encompasses the 57-64 GHz band and has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

(5) The average emission limits shall be calculated, based on the measured peak levels, over the actual time period during which transmission occurs.

Per FCC KDB Publication 200443, Millimeter Wave Test Procedures, If the emission under investigation is not pulsed, then the average levels may be measured by using a video filtering technique (i.e., VBW << RBW).

TEST PROCEDURE

Measurements are made at a distance greater than or equal to the far field boundary distance.

The peak power is measured by integrating the spectral envelope over the 26 dB EBW.

The measured power level is converted to EIRP using the Friis equation:

$EIRP = P_T * G_T = (P_R / G_R) * (4 * Pi * D / \lambda)^2$
where:
G_R is the gain of the receive measurement antenna
D is the measurement distance
λ is the wavelength

The EIRP is converted to Power Density using the equation:

$P_D = EIRP / (4 * Pi * D_S^2)$
where:
D_S is the specification distance

FAR FIELD BOUNDARY CALCULATIONS

The far-field boundary is given in FCC KDB Publication 200443 as:

$R_{far\ field} = (2 * L^2) / \lambda$

where:

L = Largest Antenna Dimension, including the reflector, in meters
λ = wavelength in meters

Frequency (GHz)	L (m)	Lambda (m)	R (Far Field) (m)
60.48	0.025	0.0050	0.25

LRP POWER DENSITY RESULTS

PEAK POWER MEASUREMENTS

Note: The Peak Power Density complies with both the peak and average limits

LOW CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
60.32	1.00	-22.01	23.00	23.0	
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.201	3.0	0.0018	0.18	18	9

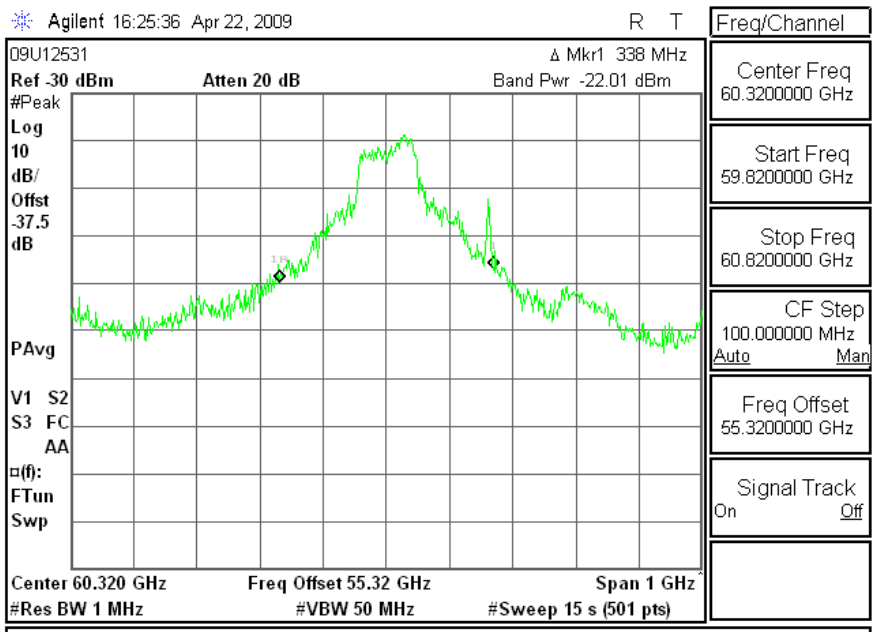
MID CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
60.48	1.00	-23.69	23.00	21.4	
EIRP (W)	**Specification Distance (m)**	**Power Density 23**	**3 Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.137	3.0	0.0012	0.12	18	9

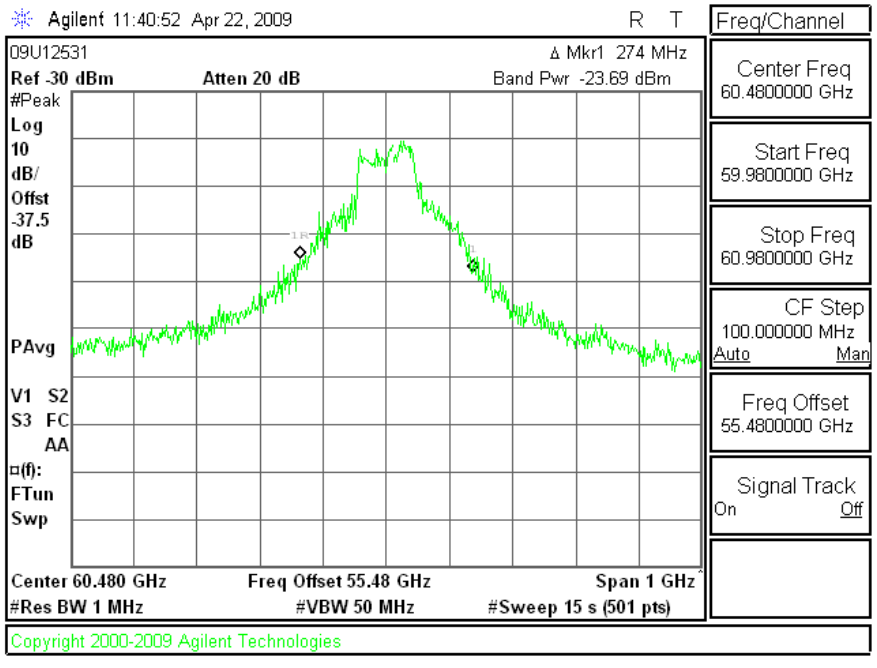
HIGH CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
60.64	1.00	-22.27	23.00	22.8	
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.192	3.0	0.0017	0.17	18	9

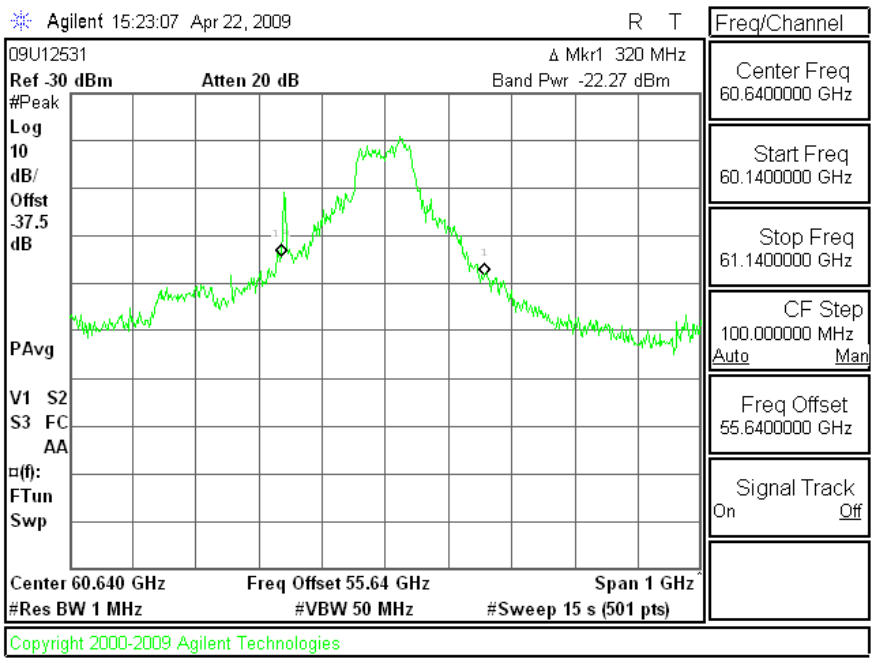
PEAK POWER LRP LOW CHANNEL



PEAK POWER LRP MID CHANNEL



PEAK POWER LRP HIGH CHANNEL



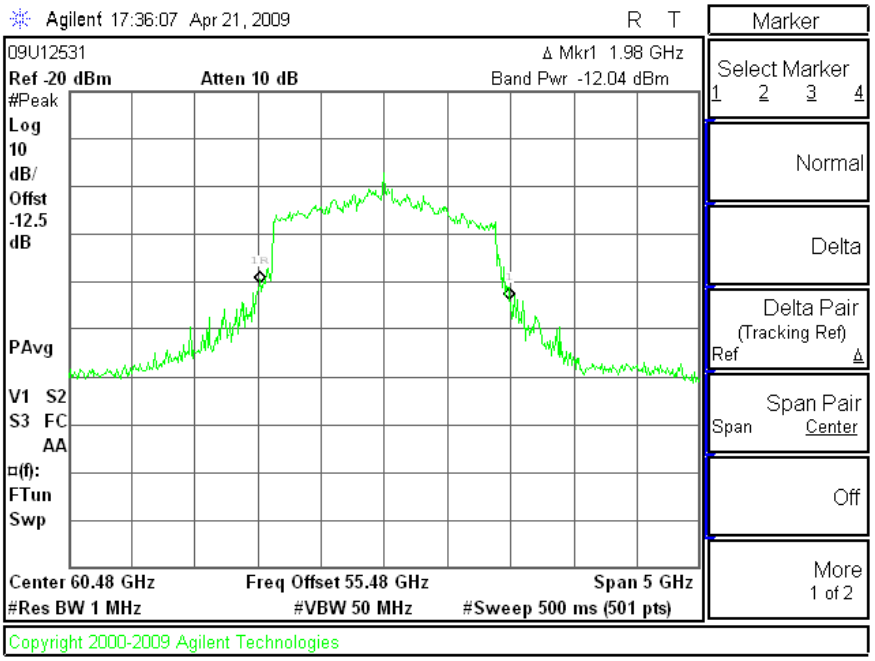
HRP POWER DENSITY RESULTS

PEAK POWER MEASUREMENTS

Note: The Peak Power Density complies with both the peak and average limits

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
60.48	1.00	-12.04	23.00	33.0	
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**	**Average Limit (uW/cm^2)**
2.009	3.0	0.0178	1.78	18	9

PEAK POWER HRP



8.4. PEAK OUTPUT POWER

LIMIT

§15.255 (e) Except as specified elsewhere in this paragraph (e), the total peak transmitter output power shall not exceed 500 mW.

§15.255 (e) (1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph (e)(1), emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g. for frequency hopping devices).

§15.255 (e) (2) Peak transmitter output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57–64 GHz band and that has a video bandwidth of at least 10 MHz, or using an equivalent measurement method.

§15.255 (e) (2) For purposes of demonstrating compliance with this paragraph (e), corrections to the transmitter output power may be made due to the antenna and circuit loss.

PROCEDURE

The maximum EUT antenna gain is subtracted from the Peak EIRP.

LRP RESULTS

PEAK OUTPUT POWER

LOW CHANNEL

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
60.32	23.0	13.00	10.00	10.0	90.0	450

MID CHANNEL

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
60.48	21.4	13.00	8.40	6.9	91.0	455

HIGH CHANNEL

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
60.64	22.8	13.00	9.80	9.5	92.0	460

HRP RESULTS

PEAK OUTPUT POWER

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
60.48	33.0	17.00	16.00	39.8	1800	500

8.5. SPURIOUS EMISSIONS

LIMITS

§15.255 (c) (1) The power density of any emissions outside the 57–64 GHz band shall consist solely of spurious emissions.

§15.255 (c) (2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

§15.255 (c) (3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

§15.255 (c) (4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

§15.255 (d) Only spurious emissions and transmissions related to a publicly accessible coordination channel, whose purpose is to coordinate operation between diverse transmitters with a view towards reducing the probability of interference throughout the 57–64 GHz band, are permitted in the 57–57.05 GHz band.

Note to paragraph (d): The 57–57.05 GHz is reserved exclusively for a publicly-accessible coordination channel. The development of standards for this channel shall be performed pursuant to authorizations issued under part 5 of this chapter.

PROCEDURE FOR 30 MHz TO 40 GHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables.

PROCEDURE FOR 40 TO 200 GHz

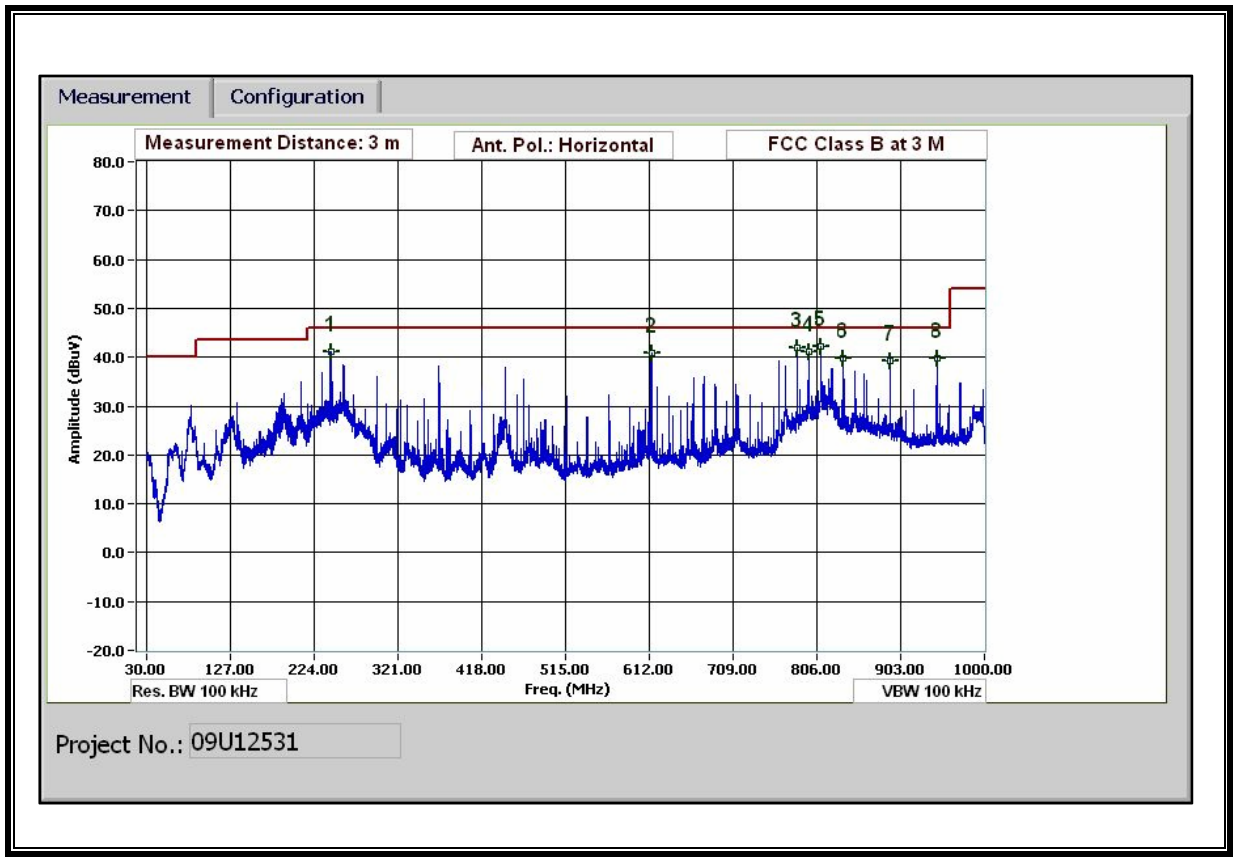
External harmonic mixers are utilized.

The antenna is scanned around the entire perimeter surface of the EUT, in both horizontal and vertical polarizations, at a maximum distance of 5 cm from the EUT.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each mixer band that yields a minimum system noise floor at least 6 dB below the spurious emissions limit.

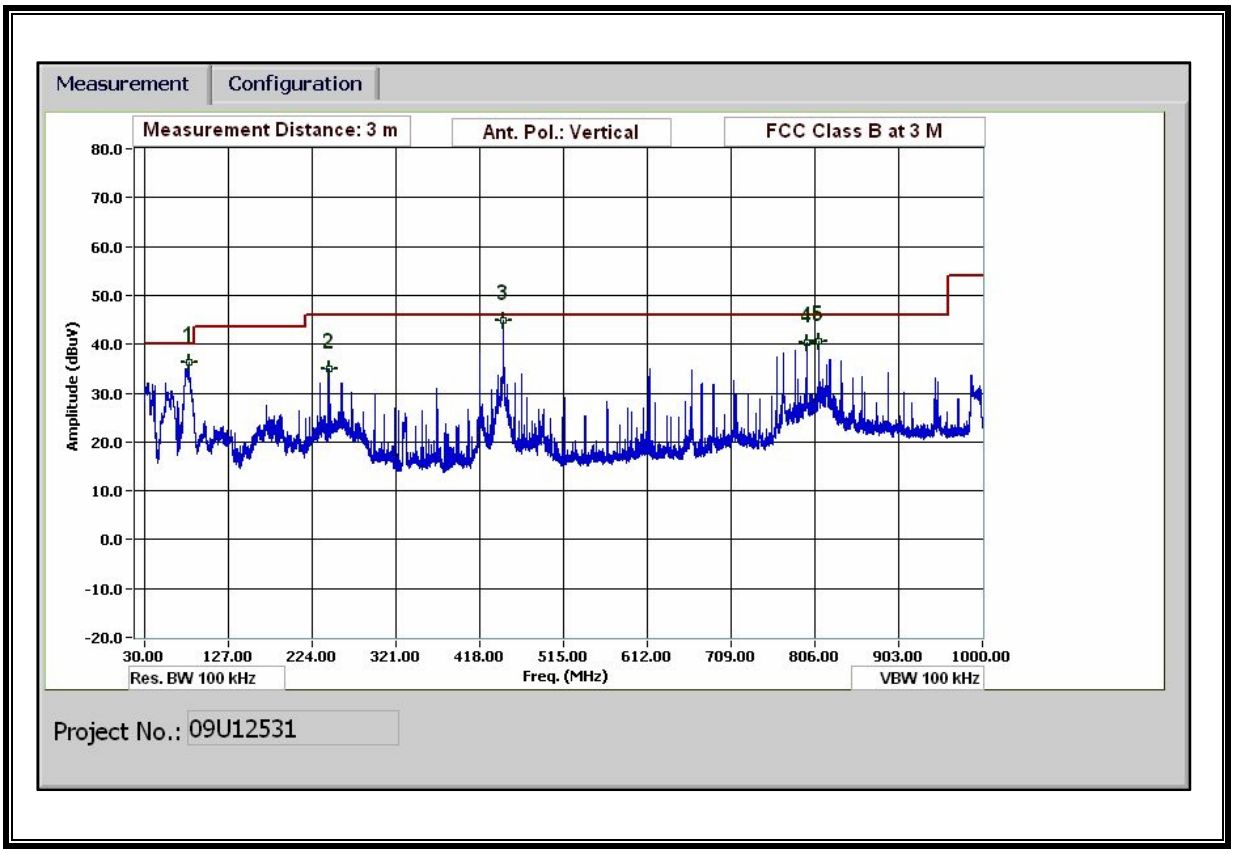
The power is measured, the EIRP is calculated, then the extrapolated power density at a 3 meter distance is calculated.

SPURIOUS EMISSION 30 TO 1000 MHz (HORIZONTAL PLOT)



Note: Measurements in this frequency range are made simultaneously on both Source and Sink modules.

SPURIOUS EMISSION 30 TO 1000 MHz (VERTICAL PLOT)



Note: Measurements in this frequency range are made simultaneously on both Source and Sink modules.

SPURIOUS EMISSION 30 TO 1000 MHz VERTICAL AND HORIZONTAL DATA

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

Test Engr: MENGISTU MEKURIA
Date: 04/24/09
Project #: 09U12531
Company: ABOCOM
EUT Description: BOTH SOURCE AND SINK WITH SUPPOT EQUIPMENT
EUT M/N: B-VB303T/B-VB303R
Test Target: FCC CLASS B
Mode Oper: VIDEO AND AUDIO TX AND RX

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	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Notes
243.009	3.0	60.5	11.8	1.4	32.6	0.0	0.0	41.2	46.0	-4.8	H	
614.424	3.0	52.8	18.4	2.4	32.9	0.0	0.0	40.7	46.0	-5.3	H	
783.031	3.0	50.9	20.7	2.8	32.6	0.0	0.0	41.8	46.0	-4.2	H	
796.472	3.0	50.0	20.9	2.8	32.5	0.0	0.0	41.2	46.0	-4.8	H	
810.992	3.0	50.7	21.1	2.8	32.4	0.0	0.0	42.1	46.0	-3.9	H	
837.033	3.0	47.9	21.2	2.9	32.3	0.0	0.0	39.7	46.0	-6.3	H	
890.916	3.0	46.8	21.5	3.0	32.0	0.0	0.0	39.3	46.0	-6.7	H	
945.038	3.0	46.3	22.0	3.1	31.7	0.0	0.0	39.7	46.0	-6.3	H	
81.002	3.0	60.6	7.6	0.8	32.6	0.0	0.0	36.3	40.0	-3.7	V	
243.009	3.0	54.2	11.8	1.4	32.6	0.0	0.0	34.8	46.0	-11.2	V	
445.457	3.0	59.7	15.8	2.0	32.7	0.0	0.0	44.9	46.0	-1.1	V	
796.472	3.0	49.0	20.9	2.8	32.5	0.0	0.0	40.3	46.0	-5.8	V	
810.992	3.0	49.1	21.1	2.8	32.4	0.0	0.0	40.5	46.0	-5.5	V	

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

SPURIOUS EMISSIONS 1 TO 12 GHz HORIZONTAL

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: ABOCOM
Project #: 09U12531
Date: 4/23/2009
Test Engineer: MENGISTU MEKURIA
Configuration: SOURCE AND SINK UNITS, AC ADAPTER AND BLUERAY PLAYER
Mode: VIDEO AND AUDIO TX AND RX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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)
1.039	3.0	62.1	55.0	24.6	2.4	-38.2	0.0	0.0	50.9	43.8	74	54	-23.1	-10.2	H
1.187	3.0	55.8	47.2	25.1	2.6	-38.0	0.0	0.0	45.5	36.8	74	54	-28.5	-17.2	H
1.315	3.0	52.8	39.3	25.5	2.7	-37.8	0.0	0.0	43.2	29.7	74	54	-30.8	-24.3	H
1.333	3.0	57.9	51.7	25.6	2.8	-37.8	0.0	0.0	48.4	42.2	74	54	-25.6	-11.8	H
1.483	3.0	60.7	56.0	26.1	2.9	-37.6	0.0	0.0	52.1	47.4	74	54	-21.9	-6.6	H
1.633	3.0	53.3	48.0	26.6	3.1	-37.4	0.0	0.0	45.6	40.3	74	54	-28.4	-13.7	H
1.783	3.0	54.5	38.8	27.1	3.2	-37.2	0.0	0.0	47.6	31.9	74	54	-26.4	-22.1	H
1.928	3.0	57.6	44.8	27.6	3.4	-37.0	0.0	0.0	51.6	38.8	74	54	-22.4	-15.2	H
2.077	3.0	57.5	40.6	27.9	3.5	-36.8	0.0	0.0	52.1	35.2	74	54	-21.9	-18.8	H
2.225	3.0	62.2	44.9	27.9	3.7	-36.6	0.0	0.0	57.2	40.0	74	54	-16.8	-14.0	H
2.375	3.0	58.9	44.4	28.0	3.8	-36.4	0.0	0.0	54.4	39.9	74	54	-19.6	-14.1	H
2.817	3.0	52.4	44.6	29.2	4.2	-36.0	0.0	0.0	49.7	42.0	74	54	-24.3	-12.0	H
2.967	3.0	59.3	53.1	29.6	4.3	-35.9	0.0	0.0	57.2	51.0	74	54	-16.8	-3.0	H
3.116	3.0	46.9	37.2	29.9	4.4	-35.8	0.0	0.0	45.4	35.8	74	54	-28.6	-18.2	H
3.856	3.0	45.7	37.6	31.7	5.0	-35.1	0.0	0.0	47.4	39.3	74	54	-26.6	-14.7	H
4.450	3.0	46.6	42.4	32.4	5.5	-34.9	0.0	0.0	49.6	45.4	74	54	-24.4	-8.6	H
5.933	3.0	41.4	33.8	33.7	6.5	-34.8	0.0	0.0	46.8	39.1	74	54	-27.2	-14.9	H
7.420	3.0	41.2	34.0	35.6	7.3	-34.1	0.0	0.0	50.1	42.8	74	54	-23.9	-11.2	H
8.010	3.0	42.0	31.3	36.2	7.6	-33.8	0.0	0.0	52.1	41.3	74	54	-21.9	-12.7	H
8.160	3.0	45.3	34.8	36.4	7.7	-34.1	0.0	0.0	55.4	44.9	74	54	-18.6	-9.1	H
8.307	3.0	42.1	30.0	36.6	7.8	-34.3	0.0	0.0	52.2	40.1	74	54	-21.8	-13.9	H

Rev. 11.10.08

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		

Note: Measurements in this frequency range are made simultaneously on both Source and Sink modules.

SPURIOUS EMISSIONS 1 TO 12 GHz VERTICAL

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: ABOCOM
Project #: 09U12531
Date: 4/23/2009
Test Engineer: MENGISTU MEKURIA
Configuration: SOURCE AND SINK UNITS, AC ADAPTER AND BLUERAY PLAYER
Mode: VIDEO AND AUDIO TX AND RX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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)
1.039	3.0	62.7	54.0	24.6	2.4	-38.2	0.0	0.0	51.5	42.8	74	54	-22.5	-11.2	V
1.315	3.0	58.7	40.7	25.5	2.7	-37.8	0.0	0.0	49.2	31.1	74	54	-24.8	-22.9	V
1.333	3.0	58.9	52.2	25.6	2.8	-37.8	0.0	0.0	49.5	42.7	74	54	-24.5	-11.3	V
1.483	3.0	59.0	52.9	26.1	2.9	-37.6	0.0	0.0	50.4	44.3	74	54	-23.6	-9.7	V
1.633	3.0	52.4	44.1	26.6	3.1	-37.4	0.0	0.0	44.7	36.3	74	54	-29.3	-17.7	V
1.783	3.0	51.9	40.8	27.1	3.2	-37.2	0.0	0.0	45.0	34.0	74	54	-29.0	-20.0	V
1.925	3.0	56.5	44.0	27.6	3.4	-37.0	0.0	0.0	50.5	38.0	74	54	-23.5	-16.0	V
2.075	3.0	58.6	40.2	27.8	3.5	-36.8	0.0	0.0	53.2	34.8	74	54	-20.8	-19.2	V
2.225	3.0	59.9	43.4	27.9	3.7	-36.6	0.0	0.0	54.9	38.5	74	54	-19.1	-15.5	V
2.300	3.0	49.0	36.4	28.0	3.7	-36.5	0.0	0.0	44.3	31.6	74	54	-29.7	-22.4	V
2.375	3.0	55.0	40.7	28.0	3.8	-36.4	0.0	0.0	50.5	36.2	74	54	-23.5	-17.8	V
2.967	3.0	61.1	55.3	29.6	4.3	-35.9	0.0	0.0	59.1	53.3	74	54	-14.9	-0.7	V
3.708	3.0	51.7	40.0	31.4	4.9	-35.2	0.0	0.0	52.8	41.1	74	54	-21.2	-12.9	V
4.450	3.0	51.7	44.2	32.4	5.5	-34.9	0.0	0.0	54.7	47.2	74	54	-19.3	-6.8	V
4.892	3.0	45.8	29.6	32.7	5.9	-34.8	0.0	0.0	49.6	33.3	74	54	-24.4	-20.7	V
5.042	3.0	45.3	32.1	32.9	6.0	-34.7	0.0	0.0	49.3	36.2	74	54	-24.7	-17.8	V
5.192	3.0	48.7	34.7	33.1	6.1	-34.5	0.0	0.0	53.3	39.3	74	54	-20.7	-14.7	V
5.342	3.0	46.1	36.4	33.3	6.2	-34.7	0.0	0.0	50.9	41.2	74	54	-23.1	-12.8	V
5.933	3.0	44.4	36.2	33.7	6.5	-34.8	0.0	0.0	49.7	41.6	74	54	-24.3	-12.4	V
6.675	3.0	44.9	32.6	34.7	6.9	-34.4	0.0	0.0	52.2	39.8	74	54	-21.8	-14.2	V
8.010	3.0	43.0	27.2	36.2	7.6	-33.8	0.0	0.0	53.1	37.2	74	54	-20.9	-16.8	V
8.160	3.0	46.7	27.7	36.4	7.7	-34.1	0.0	0.0	56.7	37.7	74	54	-17.3	-16.3	V

Rev. 11.10.08

Note: Measurements in this frequency range are made simultaneously on both Source and Sink modules.

SPURIOUS EMISSIONS 12 TO 40 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: ABOCOM
Project #: 09U12531
Date: 4/23/2009
Test Engineer: MENGISTU MEKURIA
Configuration: SOURCE UNIT
Mode: VIDEO AND AUDIO TX AND RX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T60; S/N: 2238 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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)
12.096	3.0	38.2	28.9	38.5	9.8	-32.5	0.0	0.0	54.0	44.7	74	54	-20.0	-9.3	H
24.192	3.0	40.6	34.3	33.6	15.0	-32.8	0.0	0.0	56.4	50.1	74	54	-17.6	-3.9	H
12.096	3.0	39.5	31.4	38.5	9.8	-32.5	0.0	0.0	55.3	47.2	74	54	-18.7	-6.8	V
24.192	3.0	39.7	31.9	33.6	15.0	-32.8	0.0	0.0	55.5	47.7	74	54	-18.5	-6.3	V

Rev. 11.10.08

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		

SPURIOUS EMISSIONS 40 TO 200 GHz

PEAK MEASUREMENT

Note: The peak density is less than the average limit

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
48.384	0.300	-68.24	20.00	-32.6
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
5.54E-07	3.0	4.90E-09	0.49	90

8.6. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

ANSI C63.4

6 WORST EMISSIONS

SW1201500-W01

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
0.16	56.69	--	42.79	0.00	65.31	55.31	-8.62	-12.52	L1
0.26	44.66	--	31.96	0.00	61.56	51.56	-16.90	-19.60	L1
0.33	40.71	--	29.90	0.00	59.45	49.45	-18.74	-19.55	L1
0.16	54.78	--	42.76	0.00	65.31	55.31	-10.53	-12.55	L2
0.26	43.09	--	28.73	0.00	61.56	51.56	-18.47	-22.83	L2
0.33	38.65	--	26.74	0.00	59.45	49.45	-20.80	-22.71	L2
6 Worst Data									

DSA-20P-10 US

CONDUCTED EMISSIONS DATA (115VAC 60Hz)

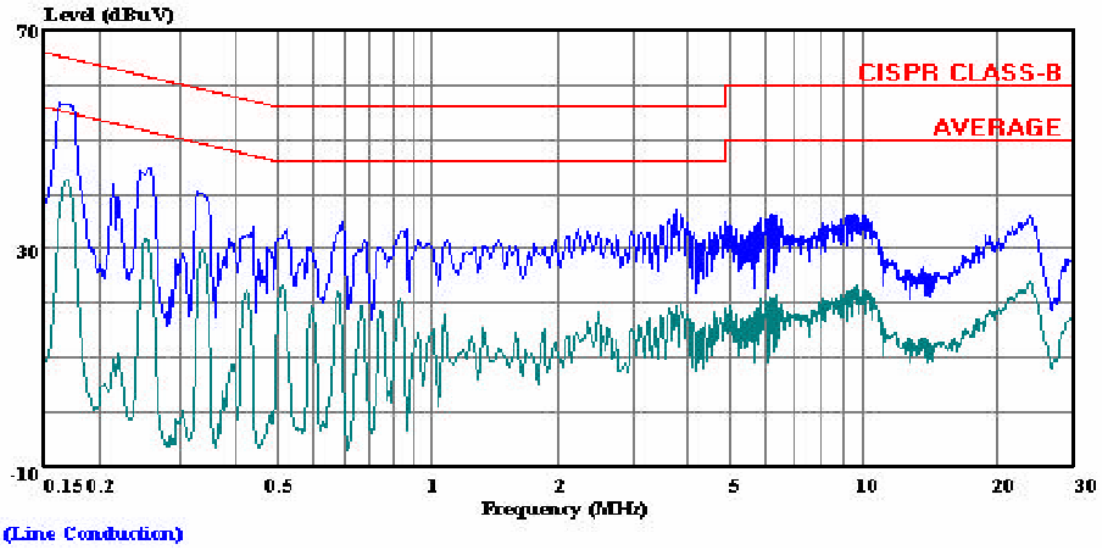
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.16	52.01	--	27.90	0.00	65.31	55.31	-13.30	-27.41	L1
0.25	50.91	--	24.92	0.00	61.89	51.89	-10.98	-26.97	L1
0.36	42.04	--	27.84	0.00	58.82	48.82	-16.78	-20.98	L1
0.16	51.99	--	30.13	0.00	65.46	55.46	-13.47	-25.33	L2
0.25	53.52	--	26.52	0.00	61.82	51.82	-8.30	-25.30	L2
0.35	43.71	--	33.89	0.00	58.96	48.96	-15.25	-15.07	L2
6 Worst Data									

SW1201500-W01

LINE 1 RESULTS

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

Data#: 7 File#: 09U12531_LC.EMI Date: 04-27-2009 Time: 10:13:20



(Line Conduction)

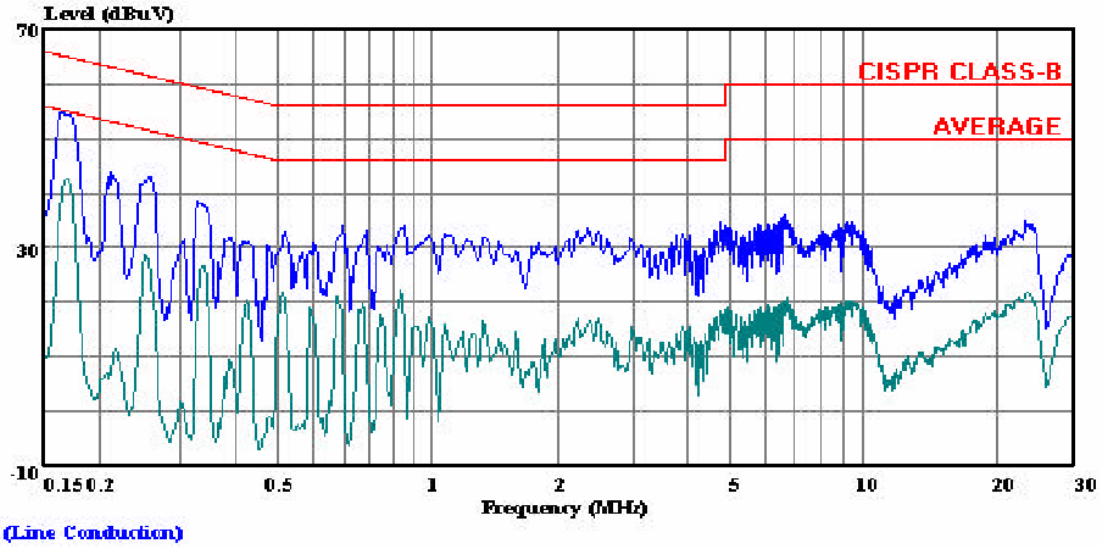
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 09U12531
Company: : Abocom
Configuration:: EUT (Source) with
: AC Adapter (SW1201500-W01)
Mode: : Normal
Target: : FCC Class B
Voltage: : 115VAC/60 Hz
: Line 1:Blue (Peak); Green (Average)

LINE 2 RESULTS

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

Data#: 14 File#: 09U12531_LC.EMI Date: 04-27-2009 Time: 10:22:24



(Line Conduction)

Trace: 12 Ref Trace:

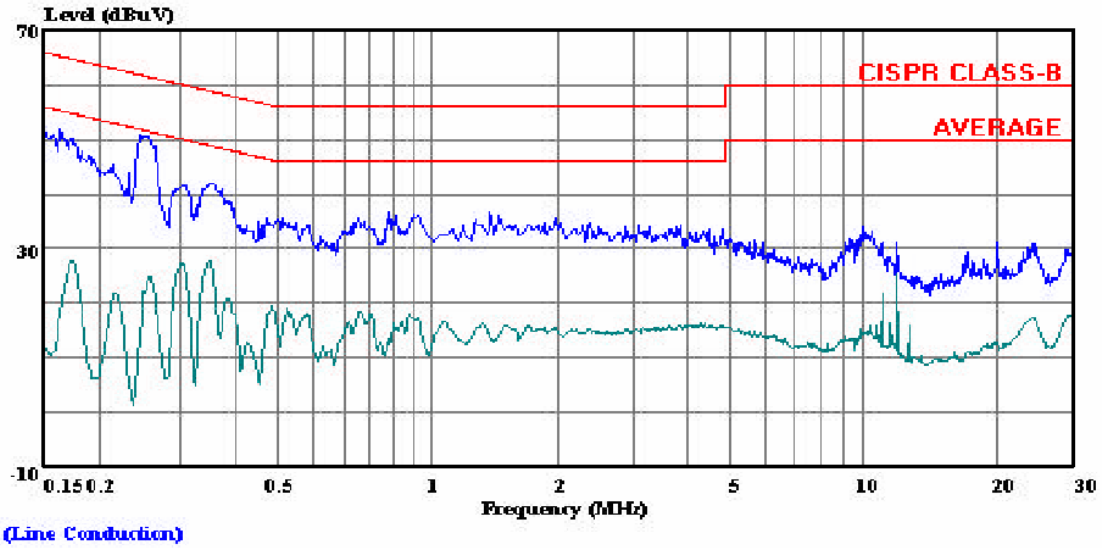
Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 09U12531
Company: : Abocom
Configuration:: EUT (Source) with
: AC Adapter (SW1201500-W01)
Mode: : Normal
Target: : FCC Class B
Voltage: : 115VAC/60 Hz
: Line 2:Blue (Peak); Green (Average)

DSA-20P-10 US

LINE 1 RESULTS

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

Data#: 116 File#: 09U12531_LC.EMI Date: 04-27-2009 Time: 14:20:07



(Line Conduction)

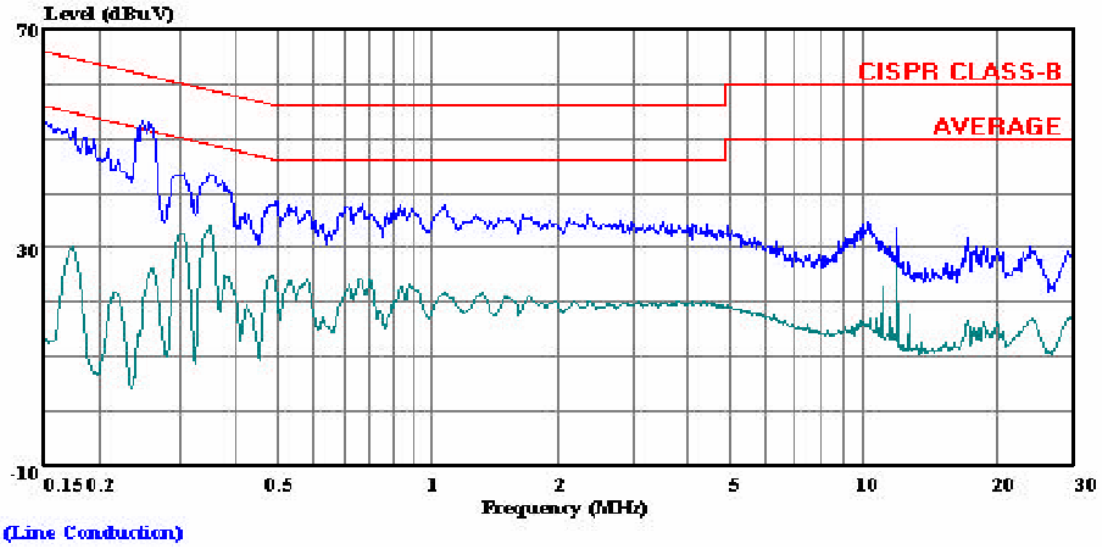
Trace: 114 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 09U12531
Company: : Abocom
Configuration:: EUT (Source) with
: AC Adapter (DSA-20P-10 U.S.A)
Mode: : Normal
Target: : FCC Class B
Voltage: : 115VAC/60 Hz
: Line 1:Blue (Peak); Green (Average)

LINE 2 RESULTS

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

Data#: 123 File#: 09U12531_LC.EMI Date: 04-27-2009 Time: 14:28:03



(Line Conduction)

Trace: 121 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Mengistu Mekuria
Project #: : 09U12531
Company: : Abocom
Configuration:: EUT (Source) with
: AC Adapter (DSA-20P-10 U.S.A)
Mode: : Normal
Target: : FCC Class B
Voltage: : 115VAC/60 Hz
: Line 2:Blue (Peak); Green (Average)

8.7. FREQUENCY STABILITY

LIMIT

§15.255 (f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range - 20 to +50 degrees celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

TEST PROCEDURE

The radio module is placed in an environmental chamber, with power furnished by an adjustable source. The carrier frequency is counted at each condition and compared with the reference condition.

RESULTS

Reference Conditions: 115 VAC @ 20ºC			
Power Supply (VAC)	**Environment Temperature (ºC)**	**Frequency (MHz)**	**Delta (kHz)**
115.00	40	60481.3000000	-325.000
115.00	30	60481.0750000	-550.000
115.00	***20***	***60481.6250000***	***Reference***
115.00	10	60481.4000000	-225.000
115.00	0	60481.4250000	-200.000
97.15	20	60481.5750000	-50.000
132.25	20	60481.6000000	-25.000

Note: The EUT is intended for indoor use only with a manufacturer's specified temperature range of 0 to 40 ºC.

8.8. GROUP INSTALLATION

LIMIT

§15.255 (h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

RESULTS

The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array.

8.9. TRANSMITTER IDENTIFICATION

LIMIT

§15.255 (i) For all transmissions that emanate from inside of a building, within any one second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm2, as measured 3 meters from the radiating structure, must transmit a transmitter identification at least once. Each application for equipment authorization for equipment that will be used inside of a building must declare that the equipment contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields:

(1) FCC Identifier, which shall be programmed at the factory.

(2) Manufacturer's serial number, which shall be programmed at the factory.

(3) Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The grantee must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

RESULTS

Not Applicable.

The EUT is part of a WVAN. All components of the WVAN are for indoor operation only. There are no outdoor units therefore no transmissions are directed outside the building.

9. RF 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.

CALCULATIONS

Peak EIRP is converted to Power Density using the equation:

P_D = EIRP / (4 * Pi * D_S^2)
where:
D_S is the separation distance

RESULTS

The setup phase and normal operation do not occur simultaneously, therefore it is appropriate to consider the RF exposure during these two operating modes independently.

Setup Phase

Peak EIRP (dBm)	Peak EIRP (W)	Separation Distance (cm)	Power Density (W/m^2)	Power Density (mW/cm^2)	FCC Limit (mW/cm^2)
23.0	0.200	20	0.40	0.04	1

Normal Operation

Peak EIRP (dBm)	Peak EIRP (W)	Separation Distance (cm)	Power Density (W/m^2)	Power Density (mW/cm^2)	FCC Limit (mW/cm^2)
33.0	1.995	20	3.97	0.40	1