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

CERTIFICATION TEST REPORT

FOR

60GHz WirelessHD Display Mini Card Transmitter

MODEL NUMBER: SK9210TX-HS

FCC ID: UK2-SK9210TX-HS
IC: 6705A-SK9210TXHS

REPORT NUMBER: 10U13482-1, Revision A1

ISSUE DATE: NOVEMBER 18, 2010

Prepared for
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555 NORTH MATHILDA AVE
SUNNYVALE
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/3/2010	Initial Issue	M. Heckrotte
A	11/18/2010	Revised MPE Calculations	M. Heckrotte
A1	11/18/2010	Revised section 8.4 description	M. Heckrotte

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SIBEAM WIRELESS
555 NORTH MATHILDA AVE
SUNNYVALE, CA, 94085, U.S.A.

EUT DESCRIPTION: 60GHz WirelessHD Display Mini Card Transmitter

MODEL: SK9210TX-HS

SERIAL NUMBER: SK9200-HD-7035

DATE TESTED: OCTOBER 27- NOVEMBER 3, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 13	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:

MICHAEL HECKROTTE
DIRECTOR OF ENGINEERING
UL CCS

Tested By:

MONICA HARRISON
SENIOR RF 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, FCC KDB 200443 Millimeter Wave Test Procedure, 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. 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 device.

The EUT transmits High Definition Audio/Video data on a single High Rate Physical (HRP) channel at either 60.48 GHz or 62.64 GHz. The integral HRP transmit antenna is an adaptive beam-steering array with a maximum gain of 22 dBi.

The EUT transmits and receives control and management signals on one of three Low Rate Physical (LRP) channels from either 60.32 to 60.64 GHz (for HRP at 60.48 GHz) or 62.48 to 62.80 GHz (for HRP at 62.64 GHz). The integral LRP transmit/receive antenna is a scanning beam-steering array with a maximum gain of 16 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 13.1 dBm (20.4 mW).

The peak output power for HRP is 14.0 dBm (25.1 mW).

5.3. WORST-CASE CONFIGURATION AND MODE

The 1080p video mode was determined to be the worst case mode for emissions below 1 GHz, because it produced the highest emission level.

The 480p video mode was determined to be the worst case mode for emissions above 1 GHz, including fundamental emissions, because it is the mode with the highest output power.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Test Jig	SiBEAM	N/A	N/A	N/A
Power Supply	Agilent	E3632A	MY40012979	N/A
BD Player	Sony	BDP-S360	5/29/5614	DoC
WiHD Sink	SIBEAM	Prototype	Prototpye	N/A
TV	Samsung	T260HD	TD26HVLQC00792Y	DoC

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Un-Shielded	2.0 m	N/A
2	DC	1	DC	Un-Shielded	0.5 m	N/A
3	I/O	1	HDMI	Shielded	9 m	Excess bundled inside shielded box
4	AC	1	AC	Un-Shielded	1.0 m	N/A

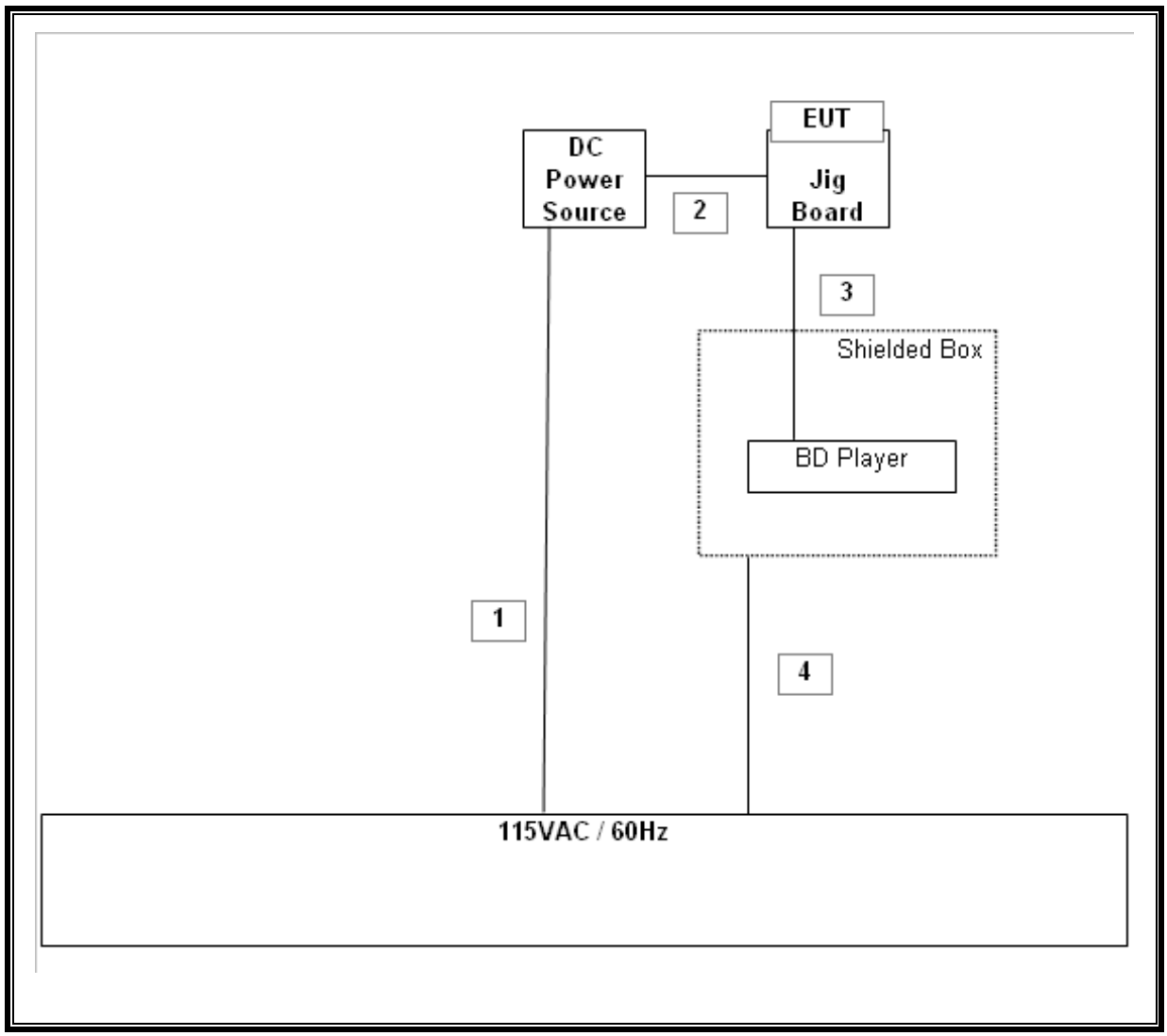
TEST SETUP

The BD player was placed inside a shielded box. High Definition Audio / Video was sent from the BD player to the EUT via a conducted HDMI cable connection to the test jig, then sent from the EUT to the Television via an over-the-air link to the WiHD Sink.

The Television and WiHD Sink were placed behind the measuring antenna.

A laptop computer was utilized to adjust the EUT for testing purposes. This computer was not connected during measurements.

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**
Spectrum Analyzer, 44 GHz	Agilent	E4446A	C00996	10/29/2011
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	7/12/2011
Preamp, 1000MHz	Sonoma	310N	N02891	1/6/2011
Antenna, Horn, 18 GHz	EMCO	3115	C00783	4/22/2009
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	7/14/2011
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	6/25/2011
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	6/8/2011
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	7/15/2011
Downconverter, 67 GHz	Agilent	MT-463	12020	10/3/2011
Millimeter-Wave Source, 75 GHz	OML	S15MS-AG	80708-4	CNR
Signal Generator, 40 GHz	Agilent	E8257D	MY480506	2/4/2011
Harmonic Mixer, 50 GHz	Agilent / HP	11970Q	C00769	5/5/2011
Harmonic Mixer, 75 GHz	Agilent / HP	11970V	C00768	12/19/2011
Harmonic Mixer, 110 GHz	Agilent / HP	11970W	C00770	12/18/2011
Harmonic Mixer, 140 GHz	OML	M08HWA	C00868	CNR
Harmonic Mixer, 220 GHz	OML	M05HWA	C00867	CNR
Mixer Diplexer for HP	OML	DPL.313B	N02429	CNR
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	4/11/2011

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 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

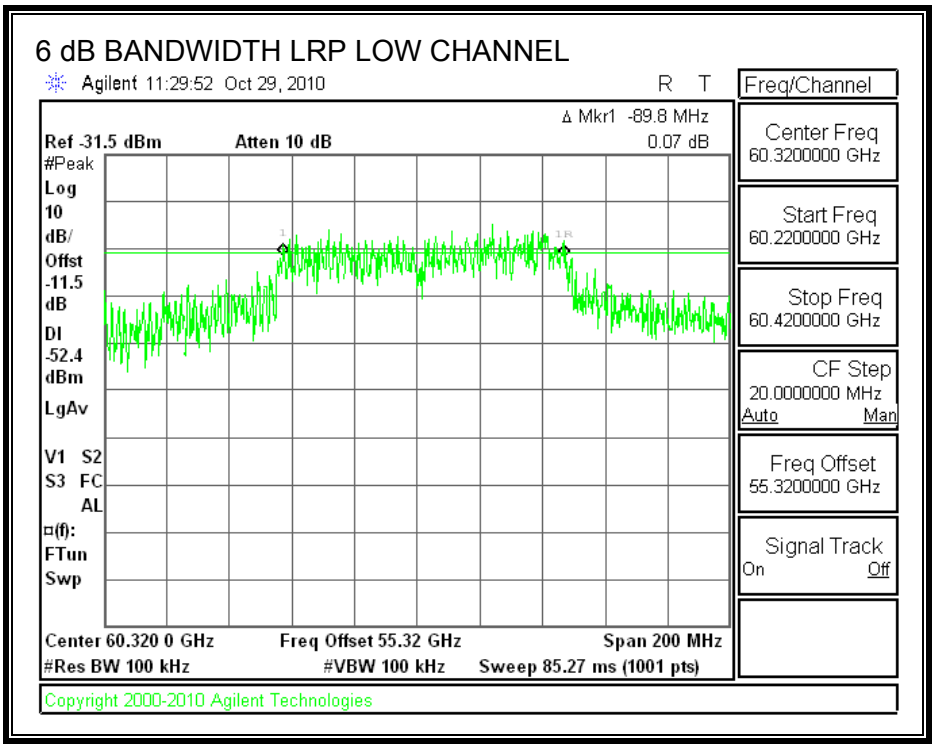
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

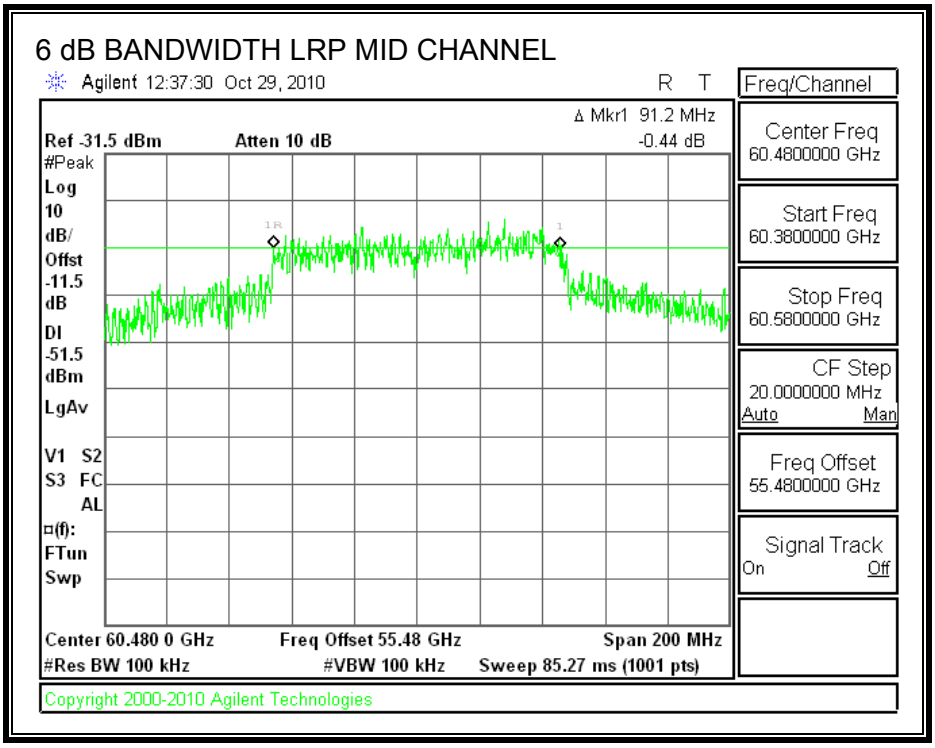
7.1.1. Results for HRP Channel 2 (Low) and associated LRP Channels

LRP RESULTS

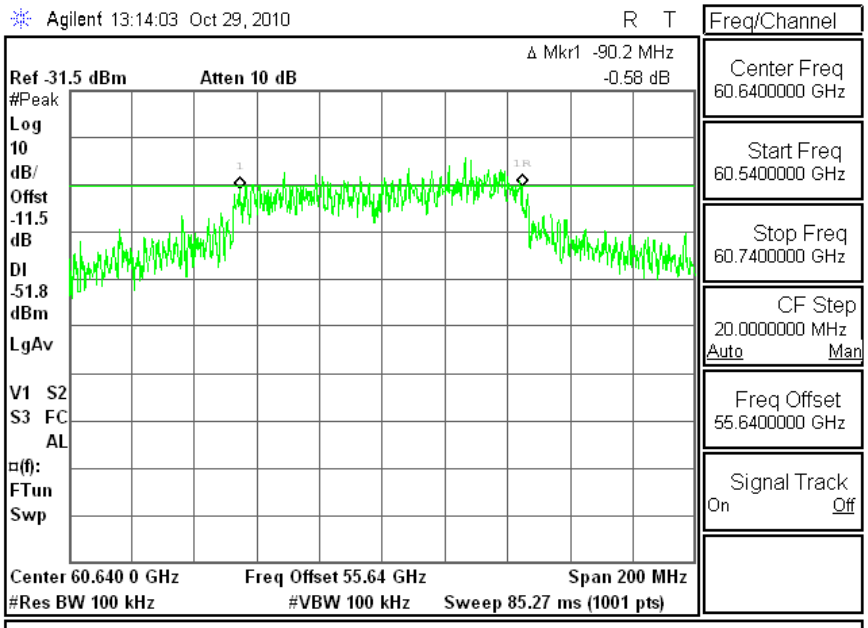
Channel	Frequency (GHz)	6 dB Bandwidth (MHz)
Low	60.32	89.80
Mid	60.48	91.20
High	60.64	90.20

6 dB BANDWIDTH





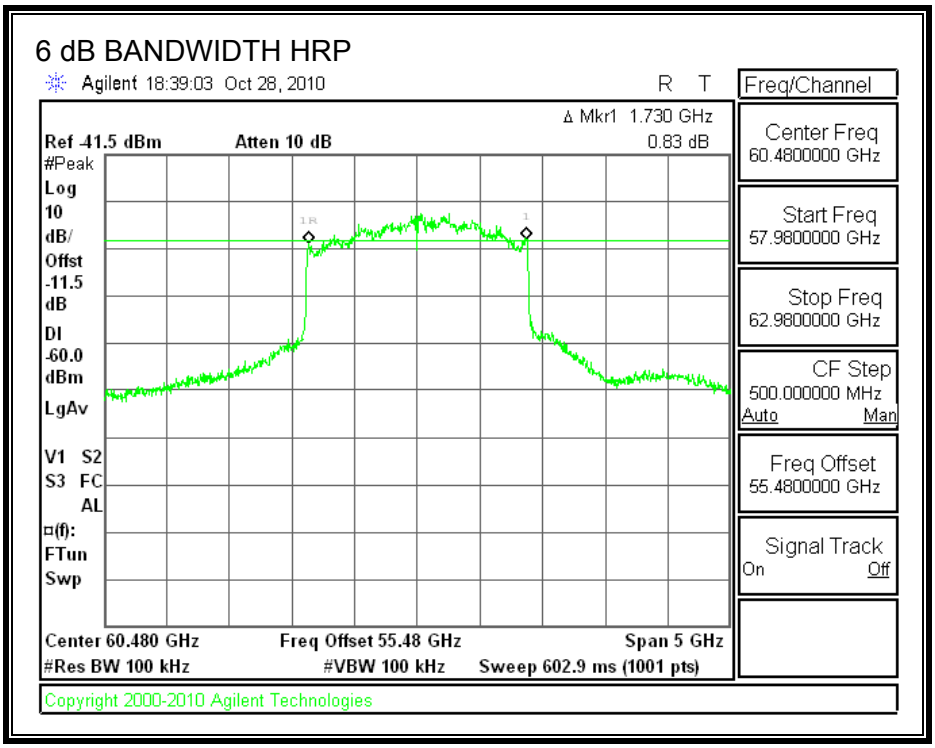
6 dB BANDWIDTH LRP HIGH CHANNEL



HRP RESULTS

Channel	Frequency (GHz)	6 dB Bandwidth (GHz)
HRP	60.48	1.73

6 dB BANDWIDTH

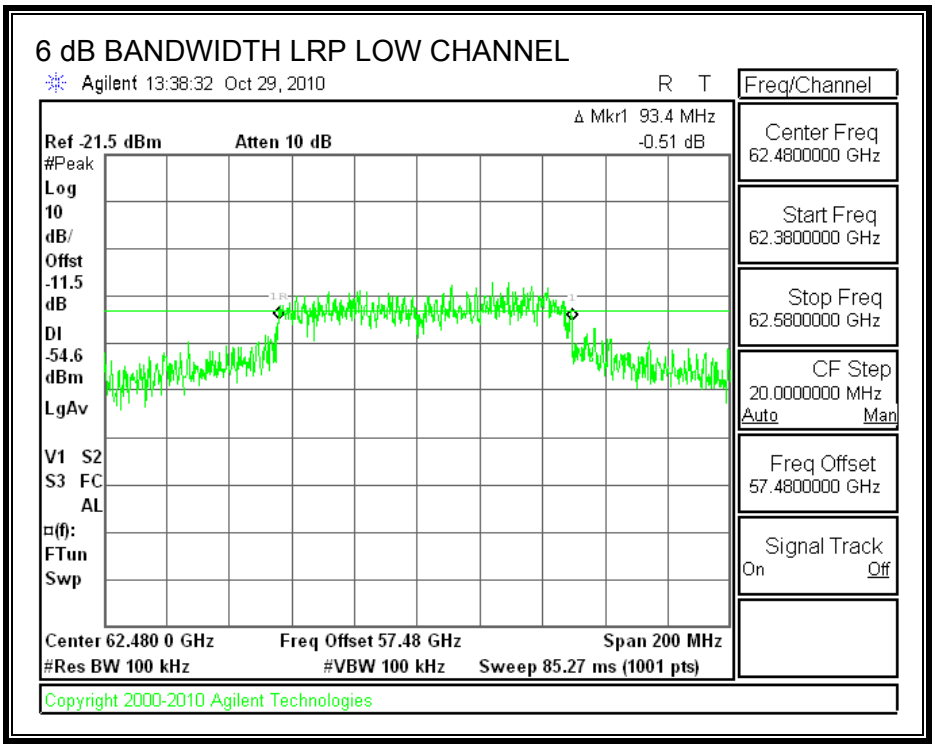


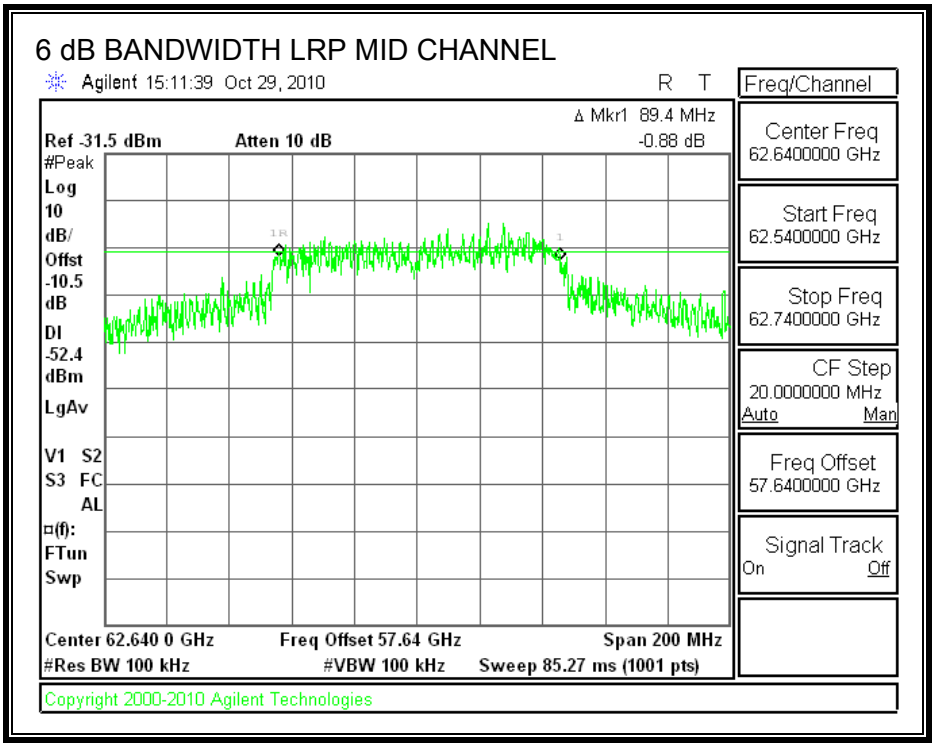
7.1.2. Results for HRP Channel 3 (High) and associated LRP Channels

LRP RESULTS

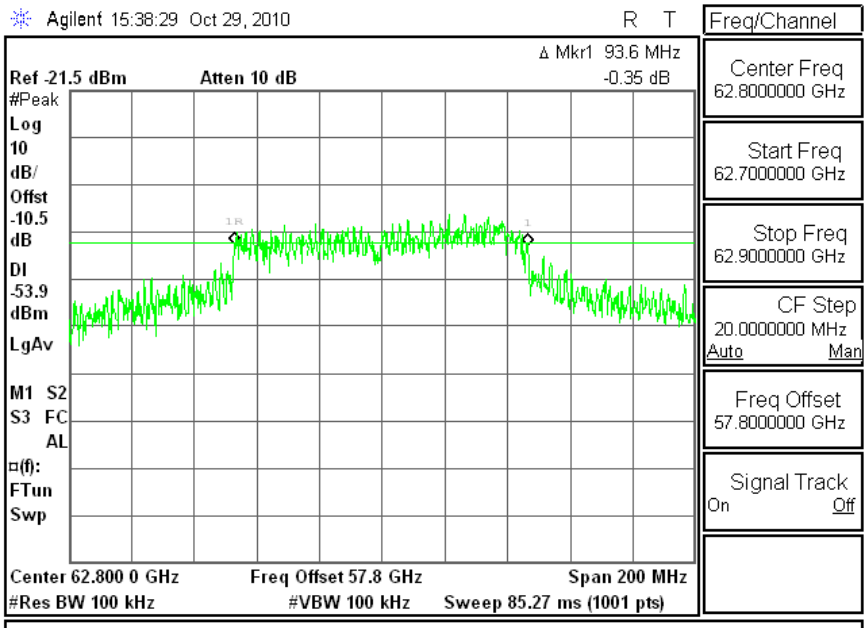
Channel	Frequency (GHz)	6 dB Bandwidth (MHz)
Low	62.48	93.40
Mid	62.64	89.40
High	62.8	93.60

6 dB BANDWIDTH





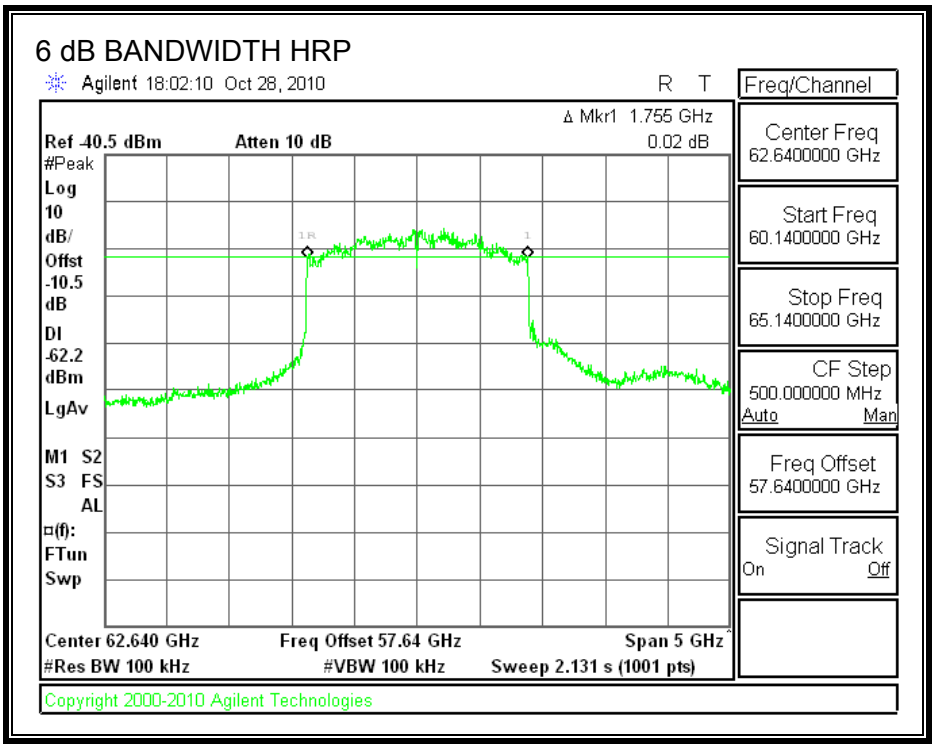
6 dB BANDWIDTH LRP HIGH CHANNEL



HRP RESULTS

Channel	Frequency (GHz)	6 dB Bandwidth (GHz)
HRP	62.64	1.755

6 dB BANDWIDTH



7.2. 99% and 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

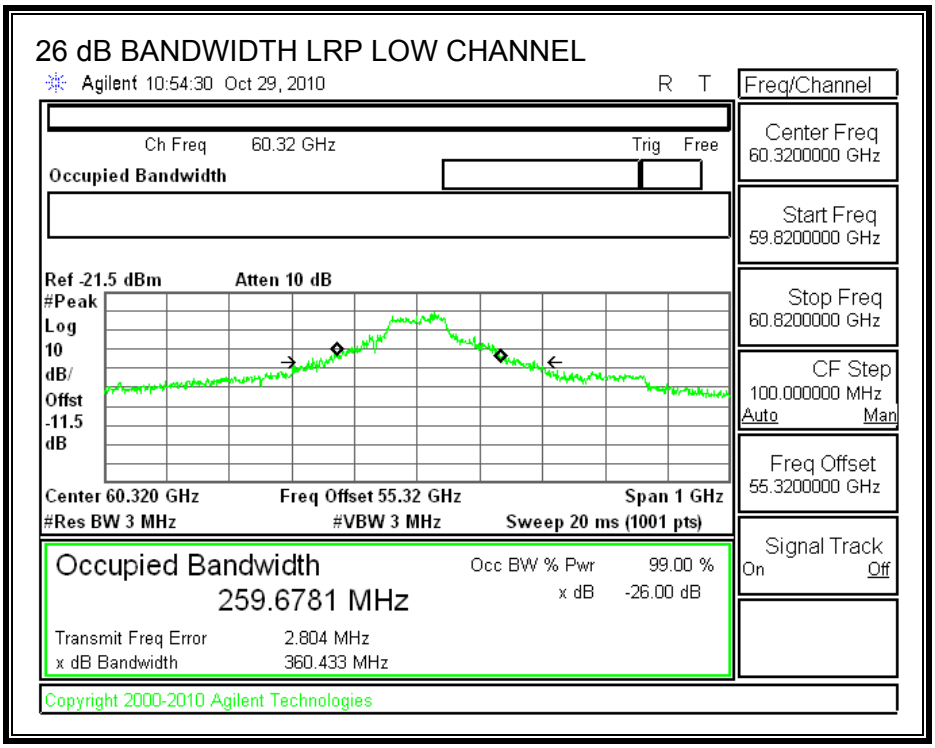
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

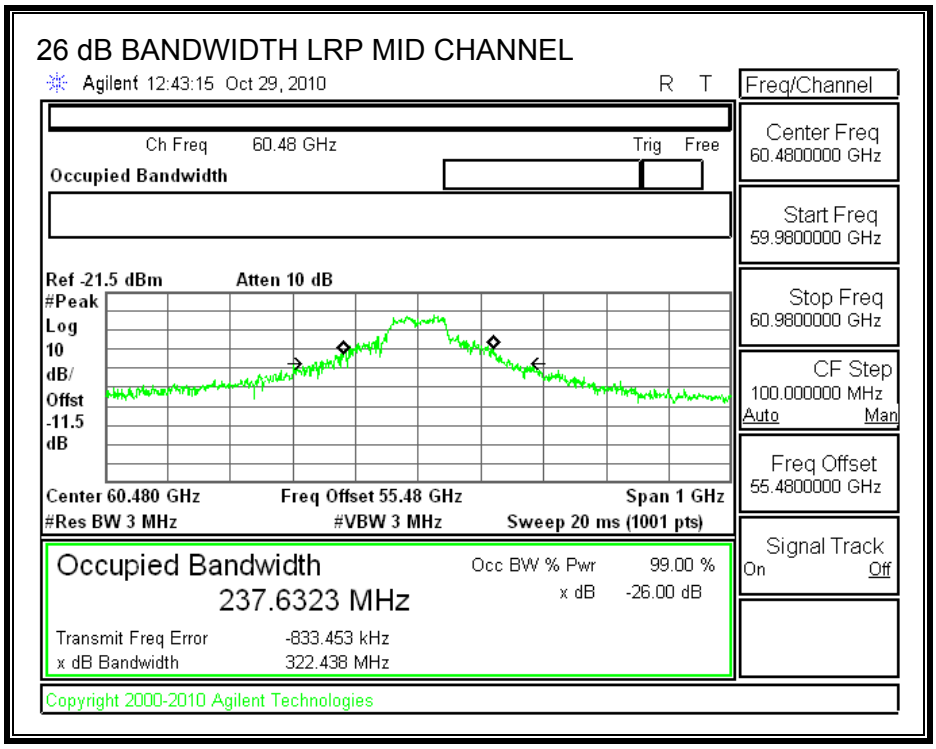
7.2.1. Results for HRP Channel 2 (Low) and associated LRP

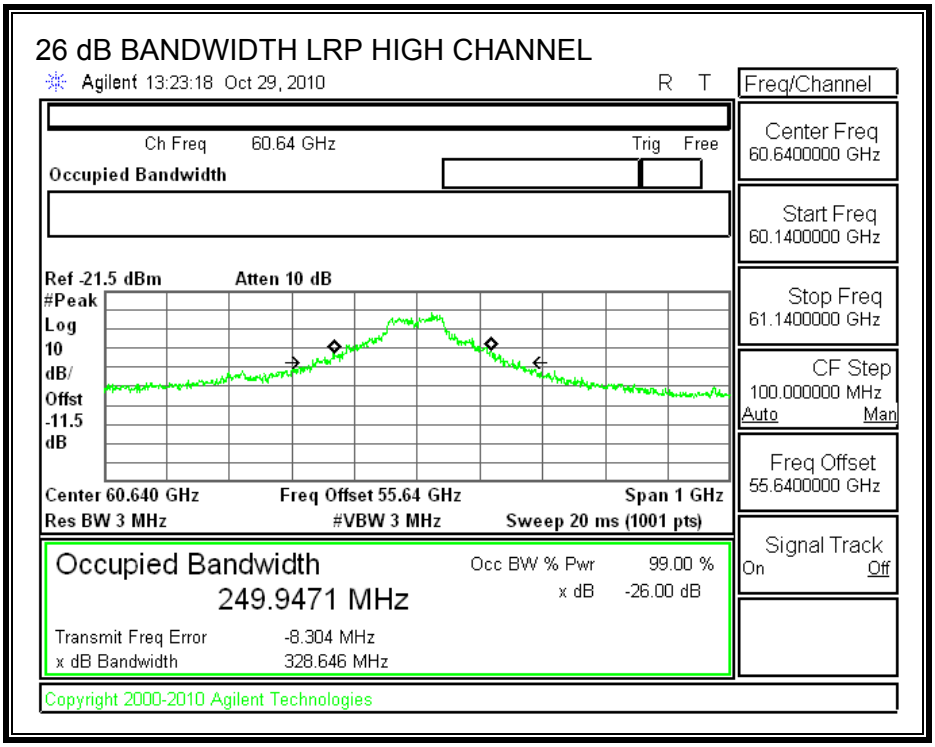
LRP RESULTS

Channel	Frequency (GHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
Low	60.32	259.68	360.43
Mid	60.48	237.63	322.44
High	60.64	249.95	328.65

99% and 26 dB BANDWIDTH



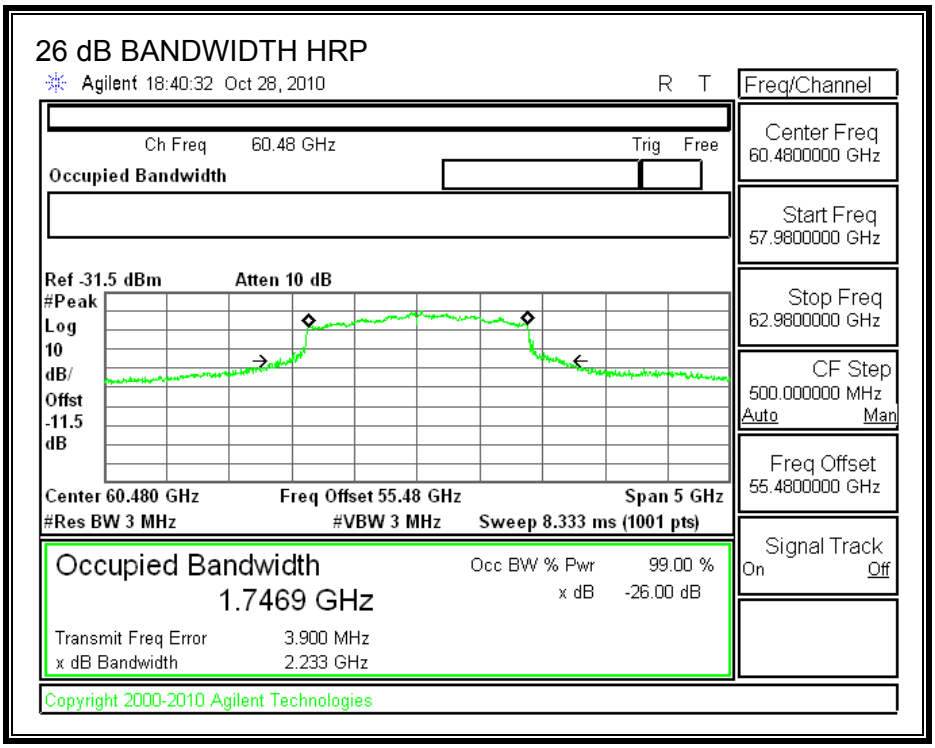




HRP RESULTS

Channel	Frequency (GHz)	99% Bandwidth (GHz)	26 dB Bandwidth (GHz)
HRP	60.48	1.747	2.233

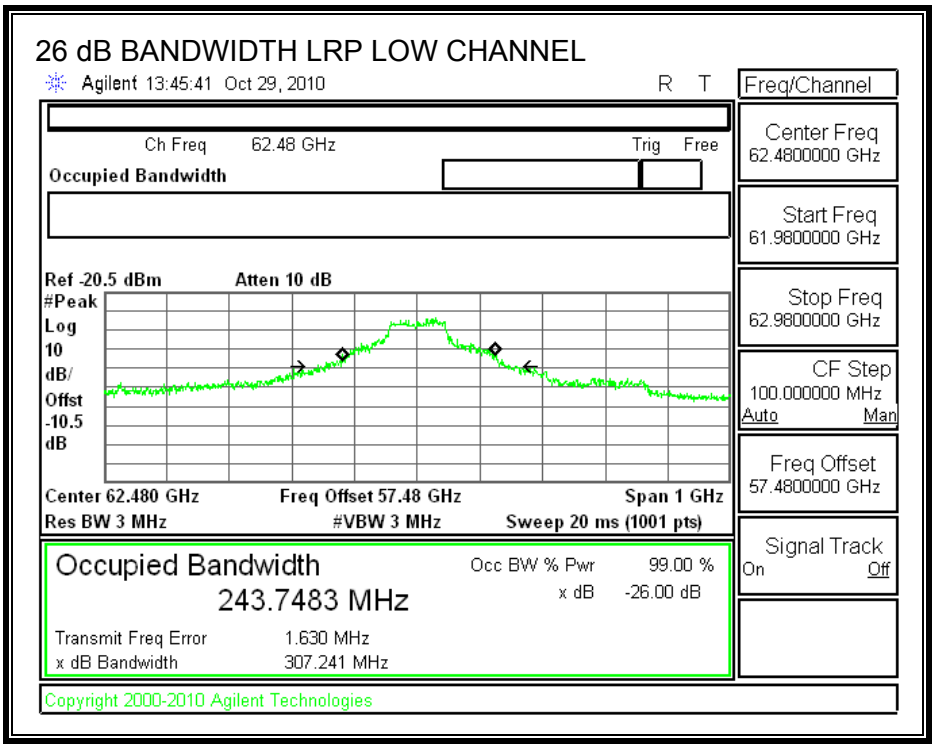
99% and 26 dB BANDWIDTH

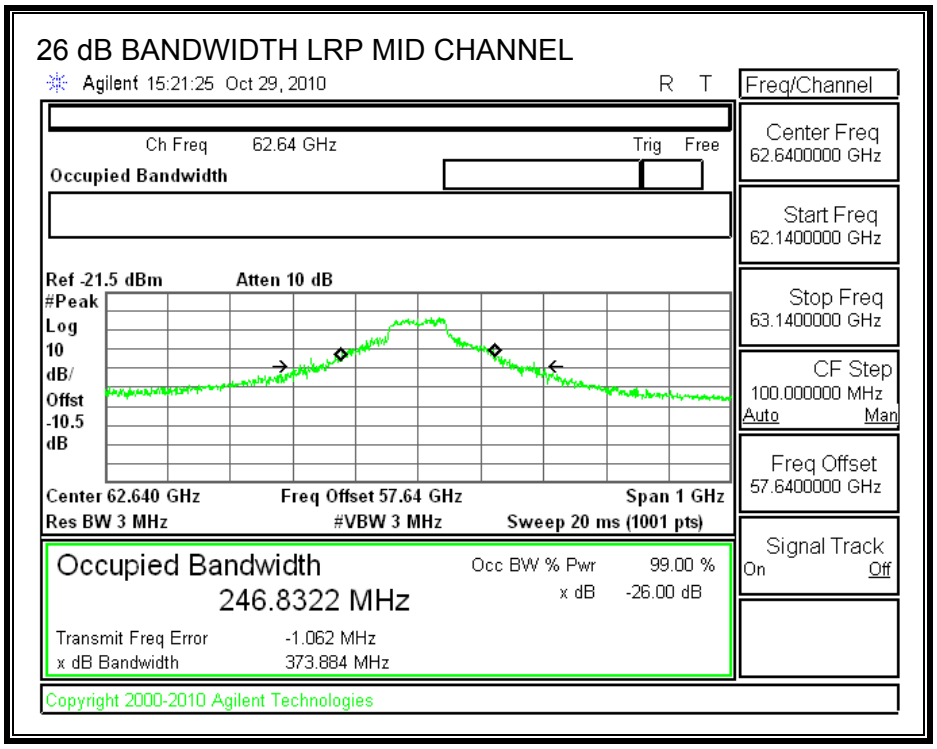


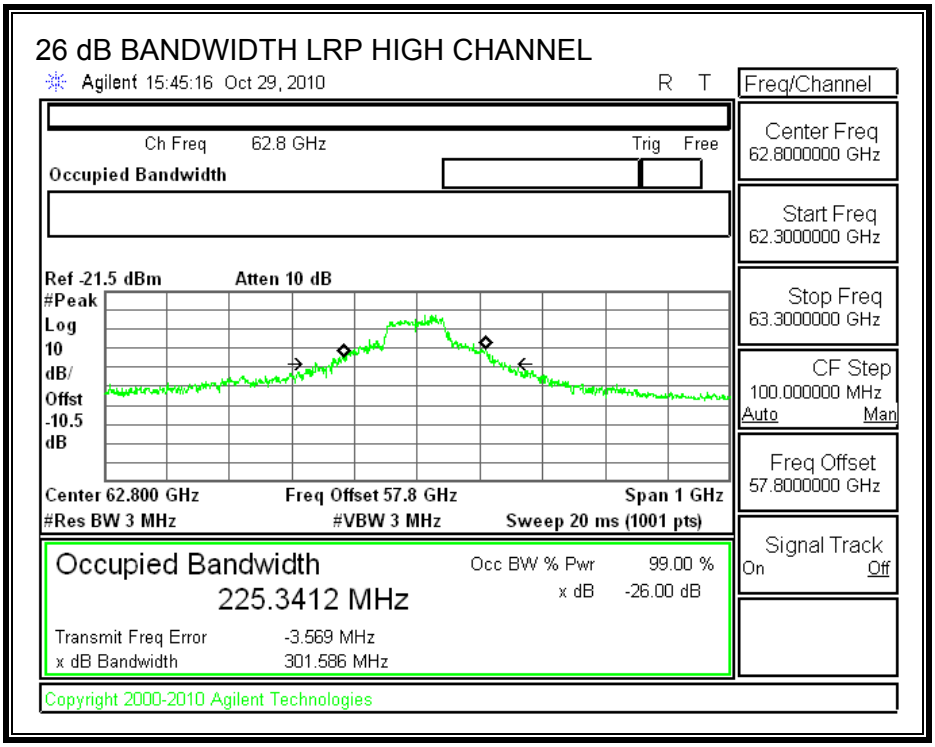
LRP RESULTS

Channel	Frequency (GHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
Low	62.48	243.75	307.24
Mid	62.64	246.83	373.88
High	62.8	225.34	301.59

99% and 26 dB BANDWIDTH



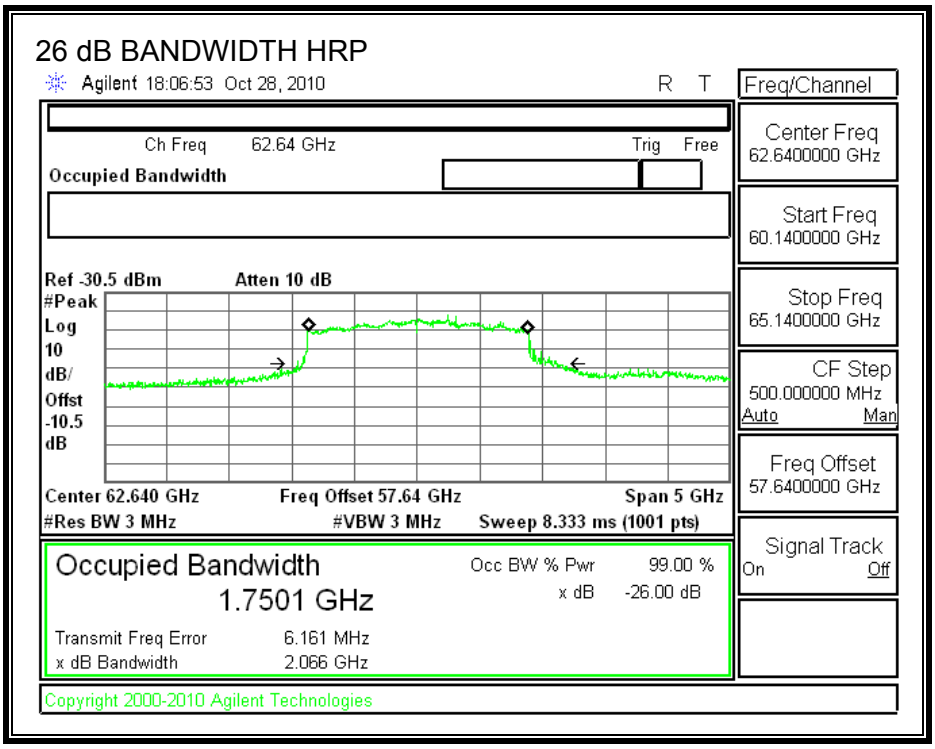




HRP RESULTS

Channel	Frequency (GHz)	99% (GHz)	26 dB Bandwidth (GHz)
HRP	62.64	1.75	2.066

99% and 26 dB BANDWIDTH



7.3. 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	0.020	0.0050	0.16
62.64	0.020	0.0048	0.17

7.3.1. Results for HRP Channel 2 (Low) and associated LRP

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	1.50	-19.51	23.00	29.1	
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)**
0.805	3.0	0.0071	0.71	18	9

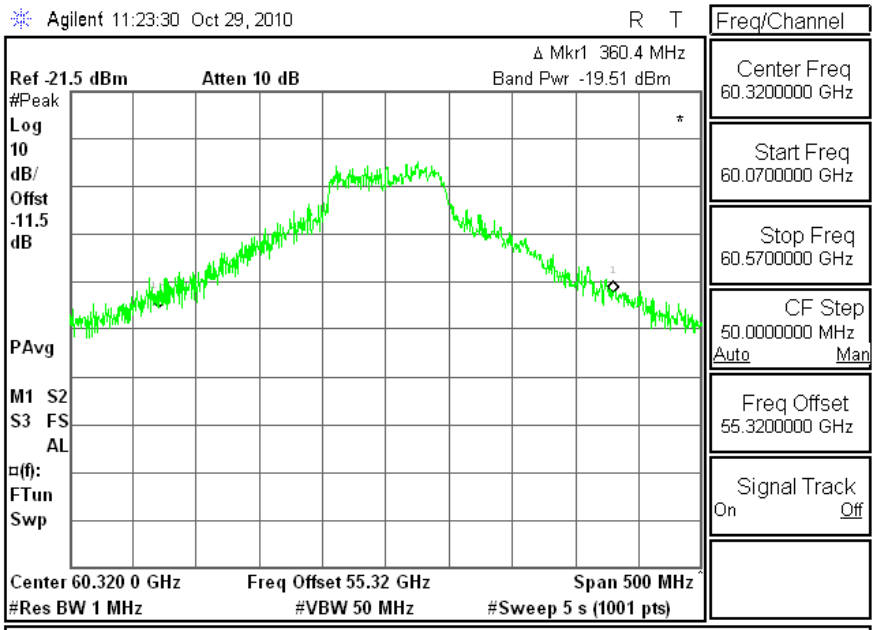
MID CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
60.48	1.50	-20.58	23.00	28.0	
EIRP (W)	**Specification Distance (m)**	**Power Density 23**	**3 Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.633	3.0	0.0056	0.56	18	9

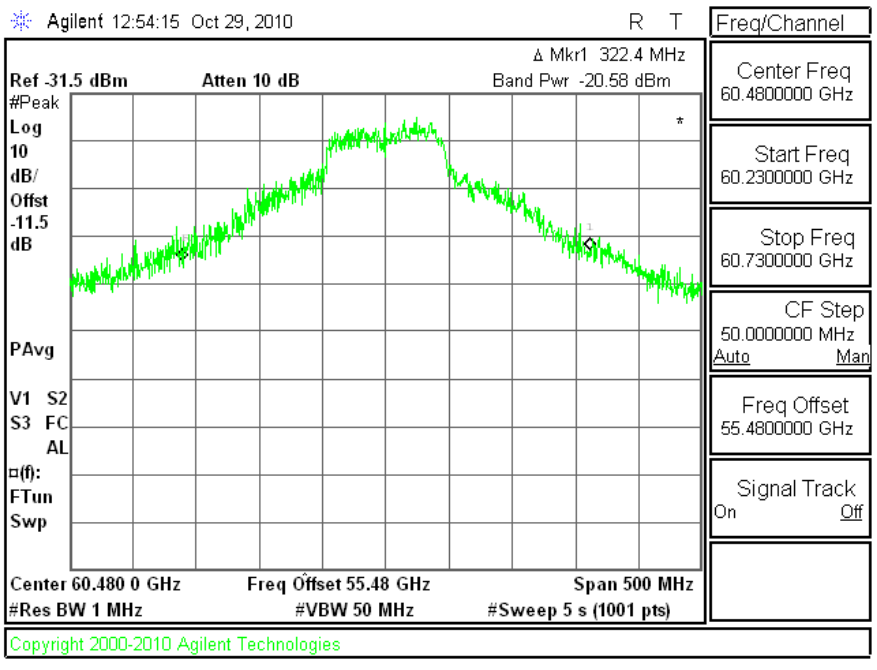
HIGH CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
60.64	1.50	-21.10	23.00	27.5	
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)**
0.564	3.0	0.0050	0.50	18	9

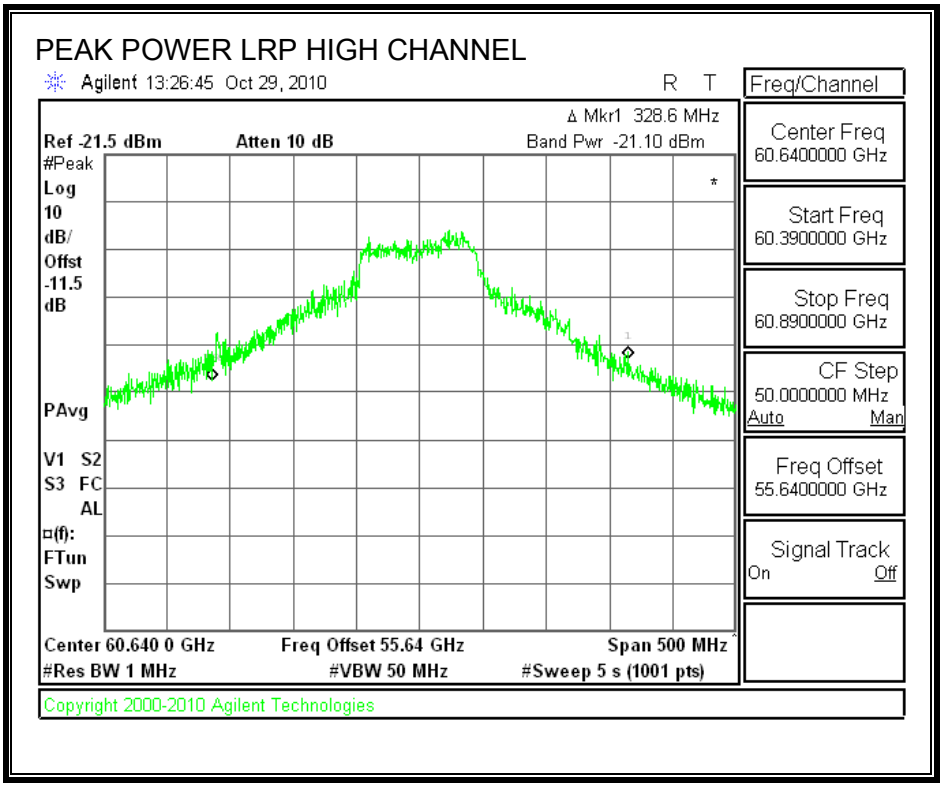
PEAK POWER LRP LOW CHANNEL



PEAK POWER LRP MID CHANNEL

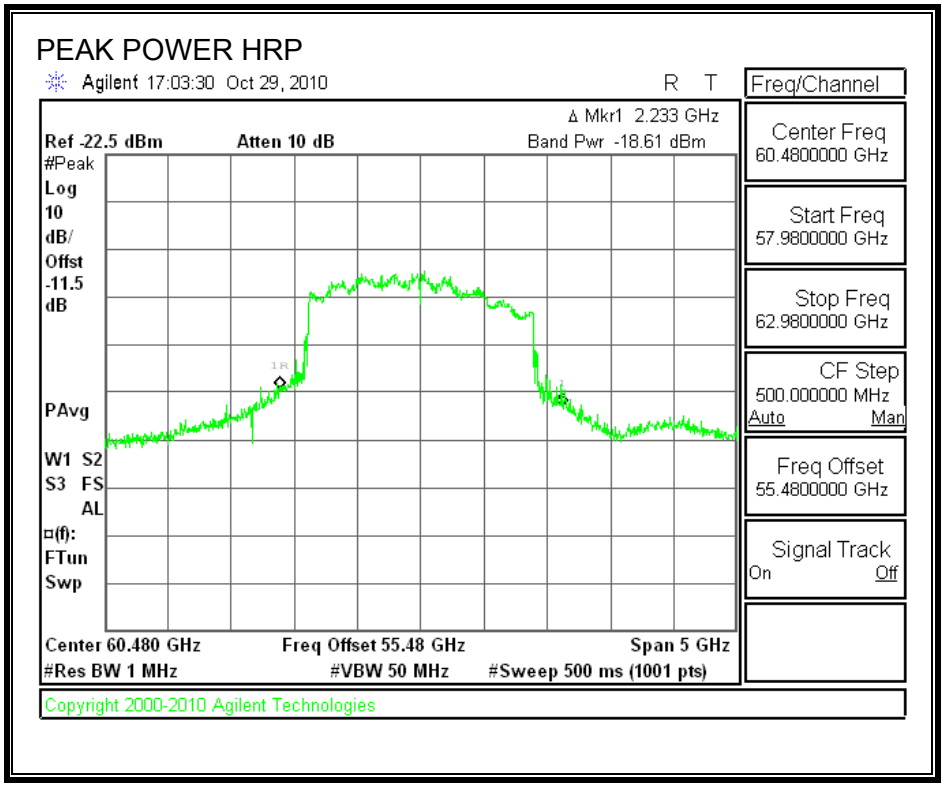


PEAK POWER LRP HIGH CHANNEL



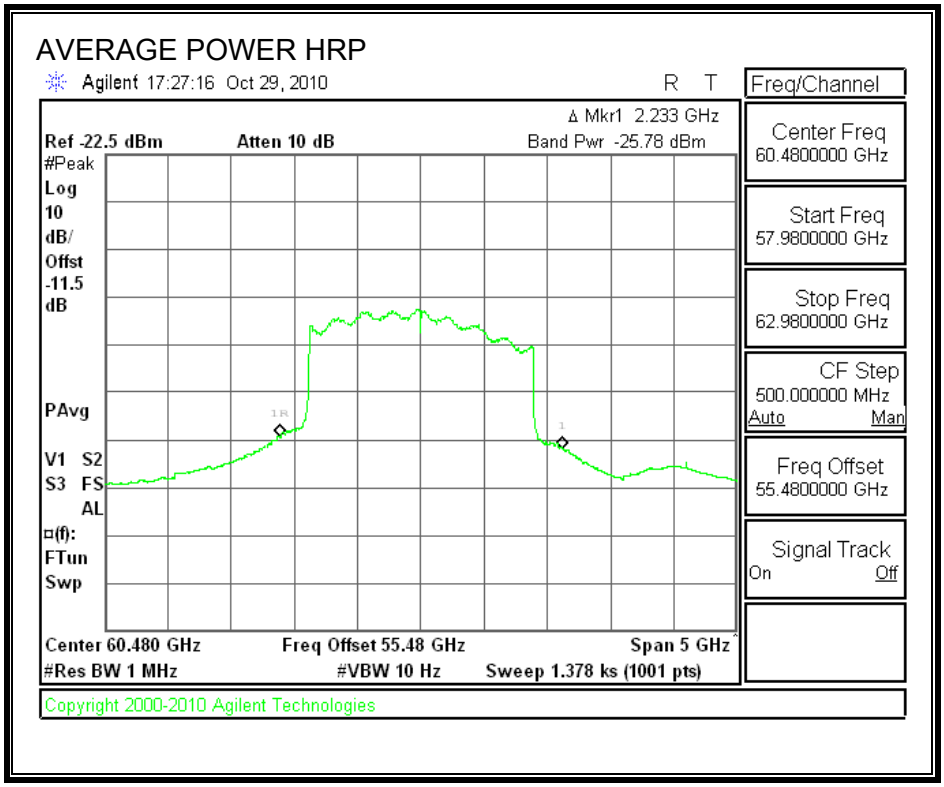
HRP PEAK POWER DENSITY RESULTS

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
60.48	3.00	-18.61	23.00	36.0
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**
3.983	3.0	0.0352	3.52	18



HRP AVERAGE POWER DENSITY RESULTS

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
60.48	3.00	-25.78	23.00	28.8
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.764	3.0	0.0068	0.68	9



7.3.2. Results for HRP Channel 3 (High) and associated LRP

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)	
62.48	1.50	-21.72	23.00	27.2	
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)**
0.519	3.0	0.0046	0.46	18	9

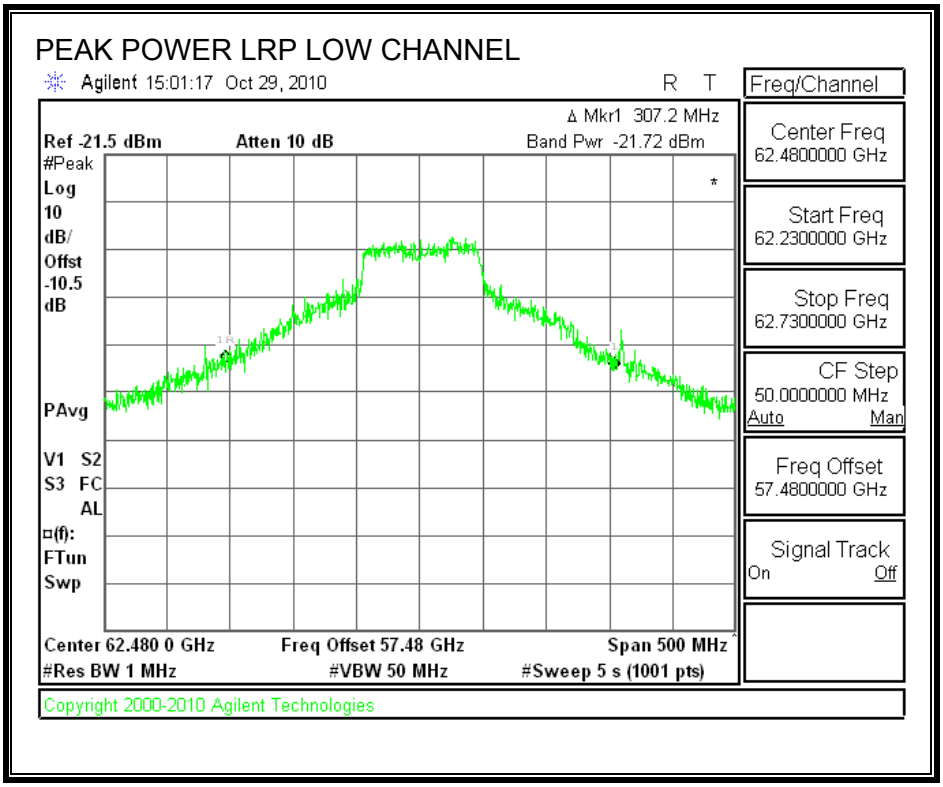
MID CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
62.64	1.50	-21.49	23.00	27.4	
EIRP (W)	**Specification Distance (m)**	**Power Density 23**	**3 Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.550	3.0	0.0049	0.49	18	9

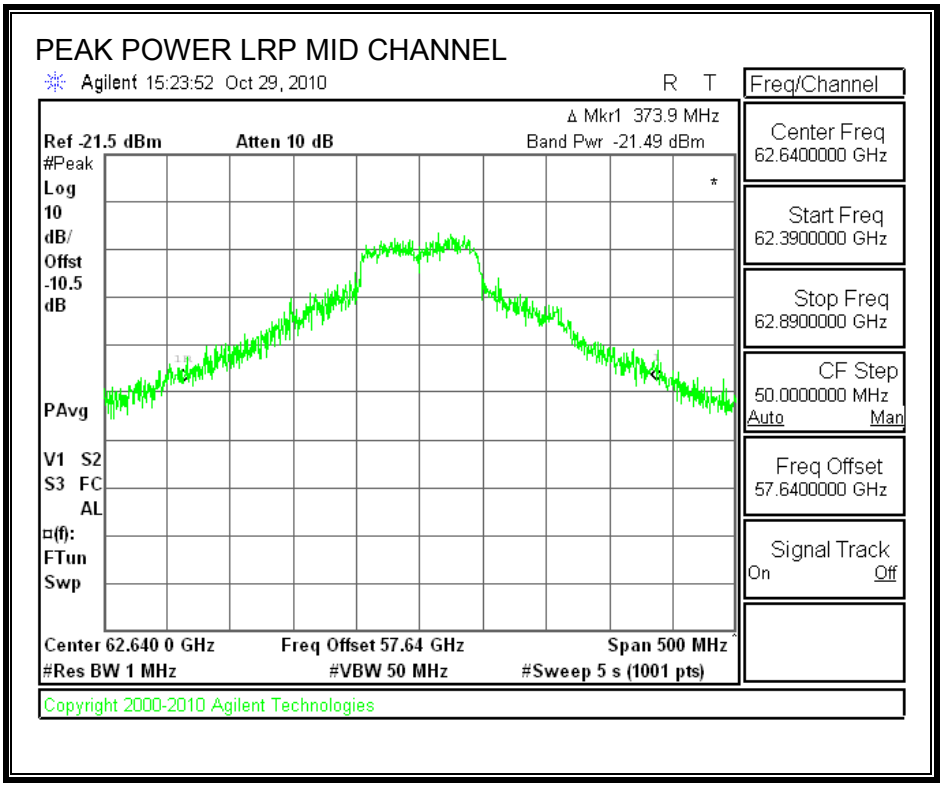
HIGH CHANNEL

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)	
62.8	1.50	-22.41	23.00	26.5	
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)**
0.448	3.0	0.0040	0.40	18	9

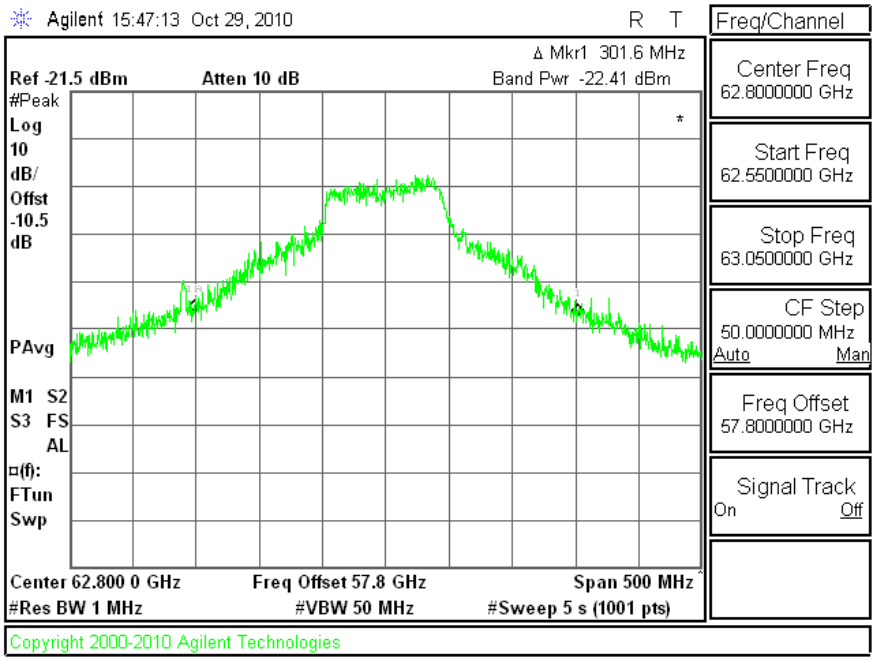
PEAK POWER LRP LOW CHANNEL



PEAK POWER LRP MID CHANNEL

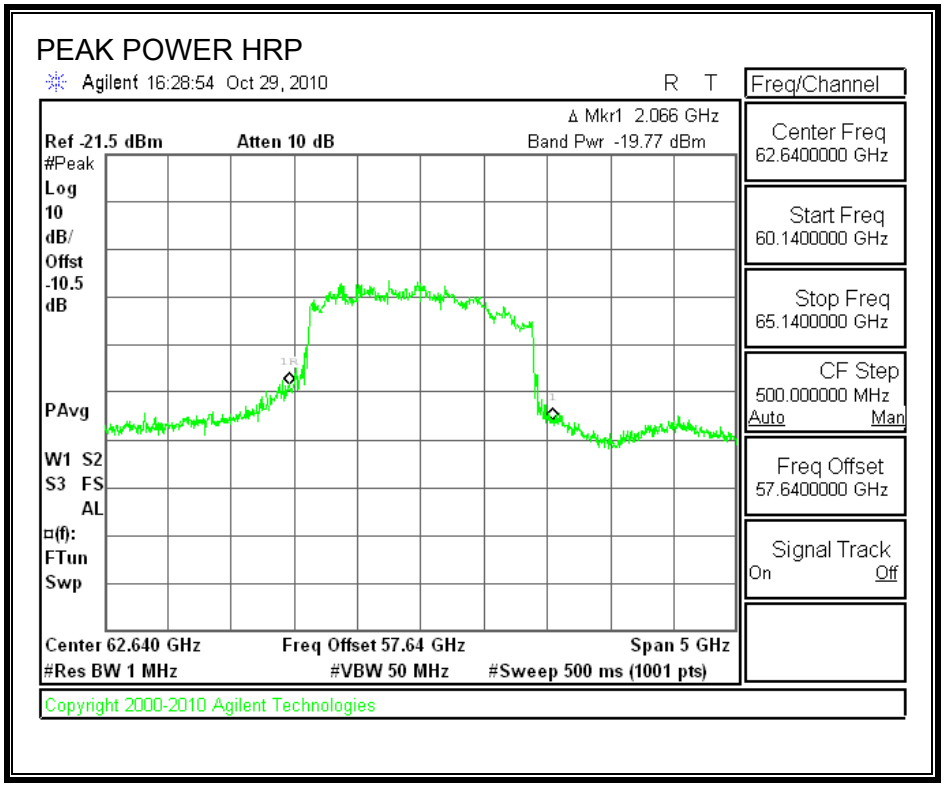


PEAK POWER LRP HIGH CHANNEL



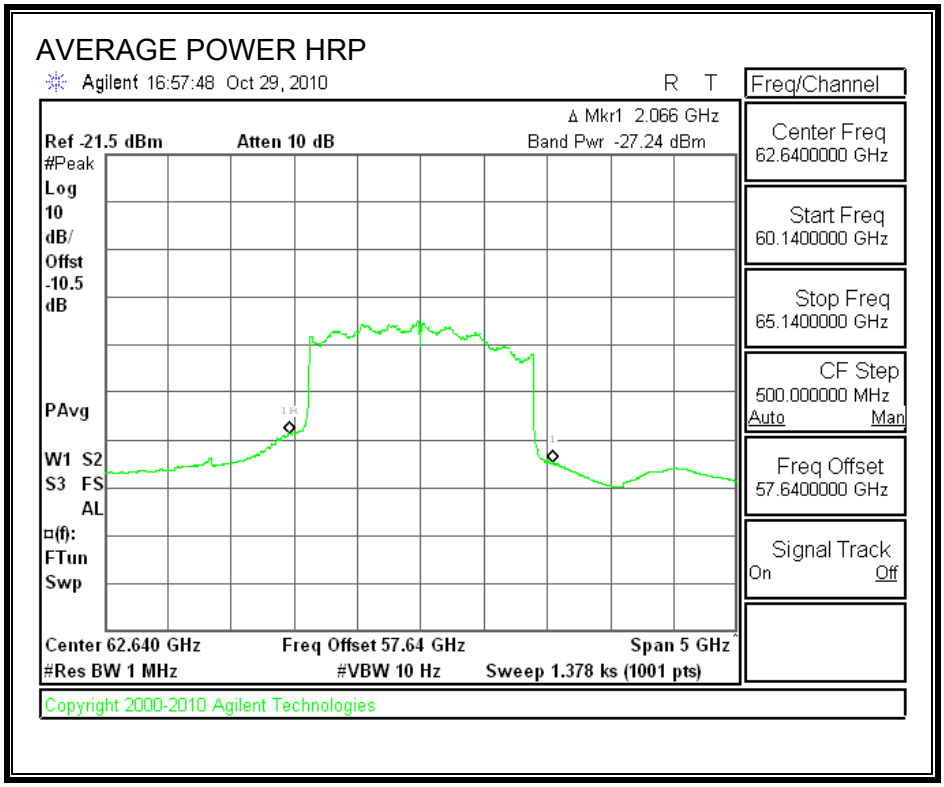
HRP PEAK POWER DENSITY RESULTS

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
62.64	3.00	-19.77	23.00	35.1
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**
3.271	3.0	0.0289	2.89	18



HRP AVERAGE POWER DENSITY RESULTS

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
62.64	3.00	-27.24	23.00	27.7
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.586	3.0	0.0052	0.52	9



7.4. 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.

7.4.1. Results for HRP Channel 2 (Low) and associated LRP

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	29.1	16.00	13.10	20.4	89.8	449

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	28.0	16.00	12.00	15.8	91.2	456

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	27.5	16.00	11.50	14.1	90.2	451

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	36.0	22.00	14.00	25.1	1730	500

7.4.2. Results for HRP Channel 3 (High) and associated LRP

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)
62.48	27.2	16.00	11.20	13.2	93.4	467

MID CHANNEL

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
62.64	27.4	16.00	11.40	13.8	89.4	447

HIGH CHANNEL

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
62.8	26.5	16.00	10.50	11.2	93.6	468

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)
62.64	35.1	22.00	13.10	20.4	1755	500

7.5. AVERAGE OUTPUT POWER

LIMIT

For reporting purposes.

PROCEDURE

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

HRP RESULTS

AVERAGE OUTPUT POWER

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)
60.48	28.8	22.00	6.80	4.79
62.64	27.7	22.00	5.70	3.72

7.6. 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

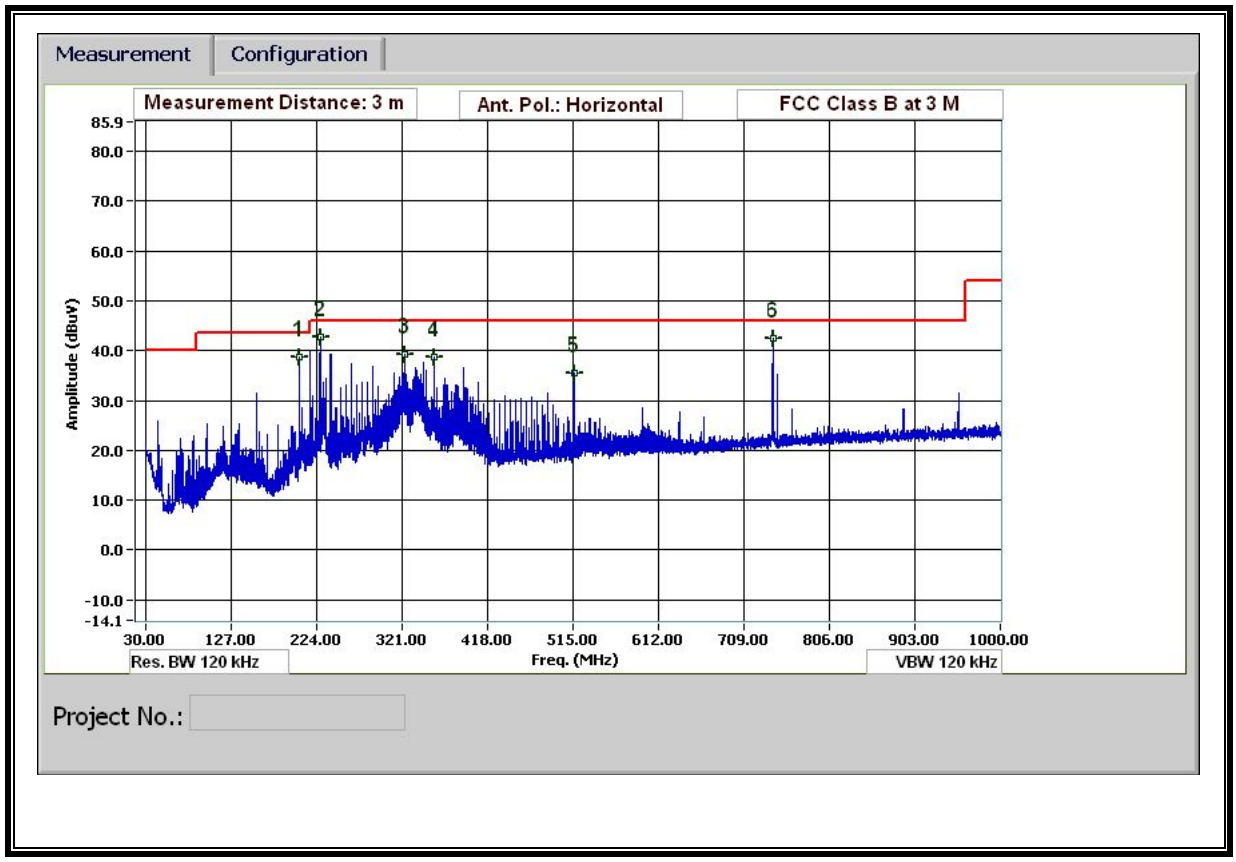
External harmonic mixers are utilized.

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.

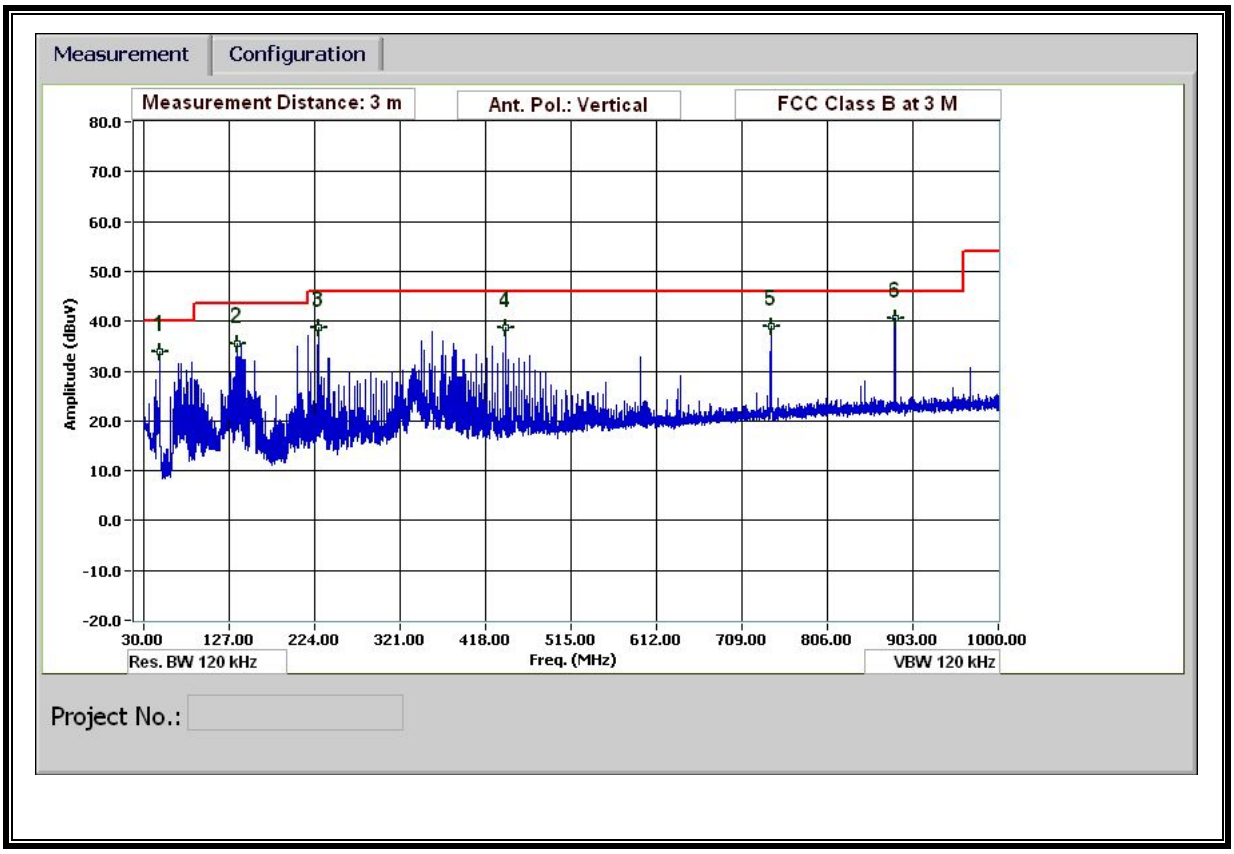
A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each mixer band that yields a minimum system noise floor at least 6 dB below the spurious emissions limit.

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

TX AND RX SPURIOUS EMISSION 30 TO 1000 MHz (HORIZONTAL PLOT)



TX AND RX SPURIOUS EMISSION 30 TO 1000 MHz (VERTICAL PLOT)



TX AND RX SPURIOUS EMISSION 30 TO 1000 MHz VERTICAL AND HORIZONTAL DATA

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

Test Engr: Monica Harrison
Date: 10/27/10
Project #: 10U13482
Company: siBEAM
Test Target: FCC Class B
Mode Oper: TX 1080p

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
48.001	3.0	52.2	9.3	0.6	28.4	0.0	0.0	33.8	40.0	-6.2	V	P
136.684	3.0	49.2	13.3	1.1	28.3	0.0	0.0	35.4	43.5	-8.1	V	P
228.008	3.0	53.7	11.9	1.3	28.2	0.0	0.0	38.7	46.0	-7.3	V	P
441.377	3.0	49.2	15.7	1.9	28.0	0.0	0.0	38.8	46.0	-7.2	V	P
741.749	3.0	43.5	20.2	2.5	27.3	0.0	0.0	38.9	46.0	-7.1	V	P
882.635	3.0	43.7	21.7	2.8	27.7	0.0	0.0	40.5	46.0	-5.5	V	P
204.007	3.0	53.8	12.0	1.3	28.2	0.0	0.0	38.8	43.5	-4.7	H	P
228.008	3.0	57.8	11.9	1.3	28.2	0.0	0.0	42.7	46.0	-3.3	H	P
324.012	3.0	52.1	13.8	1.6	28.1	0.0	0.0	39.3	46.0	-6.7	H	P
357.013	3.0	51.0	14.3	1.7	28.1	0.0	0.0	38.8	46.0	-7.2	H	P
515.78	3.0	44.3	17.0	2.1	27.8	0.0	0.0	35.6	46.0	-10.4	H	P
741.749	3.0	47.0	20.2	2.5	27.3	0.0	0.0	42.4	46.0	-3.6	H	P

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

TX AND RX SPURIOUS EMISSIONS 1 TO 40 GHz VERTICAL AND HORIZONTAL DATA

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: siBEAM
Project #: 10U13482
Date: 10/27/2010
Test Engineer: Monica Harrison
Configuration: FCC
Mode: 480pTX

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931	T88 Miteq 26-40GHz	T39-T88 ARA 18-40GHz & Mixer > 40GHz	FCC 15.209

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)
HRP High															
1.115	3.0	46.8	46.8	24.2	2.5	-39.3	0.0	0.0	34.2	34.2	74	54	-39.8	-19.8	V
4.730	3.0	41.0	41.0	33.0	5.7	-36.5	0.0	0.0	43.2	43.2	74	54	-30.8	-10.8	V
7.620	3.0	38.7	38.7	35.8	7.4	-36.2	0.0	0.0	45.7	45.7	74	54	-28.3	-8.3	V
15.096	3.0	36.2	36.2	39.9	11.1	-35.2	0.0	0.0	52.1	52.1	74	54	-21.9	-1.9	V
19.114	3.0	34.3	34.3	32.7	13.0	-34.5	0.0	0.0	45.5	45.5	74	54	-28.5	-8.5	V
25.981	3.0	35.3	35.3	34.2	15.7	-32.3	0.0	0.0	52.9	52.9	74	54	-21.1	-1.1	V
1.105	3.0	51.3	51.3	24.2	2.5	-39.3	0.0	0.0	38.7	38.7	74	54	-35.3	-15.3	H
3.390	3.0	42.7	42.7	30.9	4.7	-37.1	0.0	0.0	41.1	41.1	74	54	-32.9	-12.9	H
7.344	3.0	38.9	38.9	35.3	7.3	-36.2	0.0	0.0	45.3	45.3	74	54	-28.7	-8.7	H
11.796	3.0	36.8	36.8	38.8	9.6	-35.6	0.0	0.0	49.6	49.6	74	54	-24.4	-4.4	H
19.173	3.0	34.8	34.8	32.7	13.0	-34.5	0.0	0.0	46.0	46.0	74	54	-28.0	-8.0	H
25.701	3.0	36.0	36.0	34.0	15.6	-32.5	0.0	0.0	53.2	53.2	74	54	-20.8	-0.8	H
HRP Low															
1.270	3.0	46.9	46.9	24.8	2.7	-39.1	0.0	0.0	35.3	35.3	74	54	-38.7	-18.7	H
7.860	3.0	38.6	38.6	36.1	7.6	-36.2	0.0	0.0	46.1	46.1	74	54	-27.9	-7.9	H
14.880	3.0	35.9	35.9	40.3	11.0	-35.3	0.0	0.0	51.8	51.8	74	54	-22.2	-2.2	H
19.583	3.0	34.5	34.5	32.7	13.2	-34.7	0.0	0.0	45.7	45.7	74	54	-28.3	-8.3	H
21.336	3.0	35.5	35.5	33.1	13.9	-35.1	0.0	0.0	47.4	47.4	74	54	-26.6	-6.6	H
25.547	3.0	35.5	35.5	34.0	15.5	-32.6	0.0	0.0	52.4	52.4	74	54	-21.6	-1.6	H
1.270	3.0	50.0	50.0	24.8	2.7	-39.1	0.0	0.0	38.4	38.4	74	54	-35.6	-15.6	V
3.710	3.0	42.6	42.6	31.6	4.9	-36.8	0.0	0.0	42.3	42.3	74	54	-31.7	-11.7	V
5.075	3.0	42.5	42.5	33.3	6.0	-36.4	0.0	0.0	45.4	45.4	74	54	-28.6	-8.6	V
7.608	3.0	40.3	40.3	35.7	7.4	-36.2	0.0	0.0	47.2	47.2	74	54	-26.8	-6.8	V
13.704	3.0	36.2	36.2	40.3	10.5	-35.3	0.0	0.0	51.7	51.7	74	54	-22.3	-2.3	V
21.341	3.0	35.0	35.0	33.1	13.9	-35.1	0.0	0.0	46.9	46.9	74	54	-27.1	-7.1	V
25.735	3.0	35.6	35.6	34.1	15.6	-32.5	0.0	0.0	52.8	52.8	74	54	-21.2	-1.2	V

No other signal above the noise floor found.
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		

TX AND RX SPURIOUS EMISSIONS 40 TO 200 GHz

PEAK MEASUREMENT

Note: The peak density is less than the average limit

HRP Channel 2 (Low)

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
48.384	0.400	-66.81	20.00	-28.6
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
1.37E-06	3.0	1.21E-08	1.21	90

HRP Channel 3 (High)

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
50.112	0.400	-61.99	20.00	-23.5
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
4.45E-06	3.0	3.94E-08	3.94	90

7.7. RECEIVER SPURIOUS EMISSIONS

LIMITS

The Rx spurious emission limits are the same as the Tx spurious emission limits. All emissions were measured with the transmitters and receivers operating simultaneously. The receiver spurious performance is documented by the transmit spurious results above.

7.8. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207
IC RSS-GEN, Section 7.2.2

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

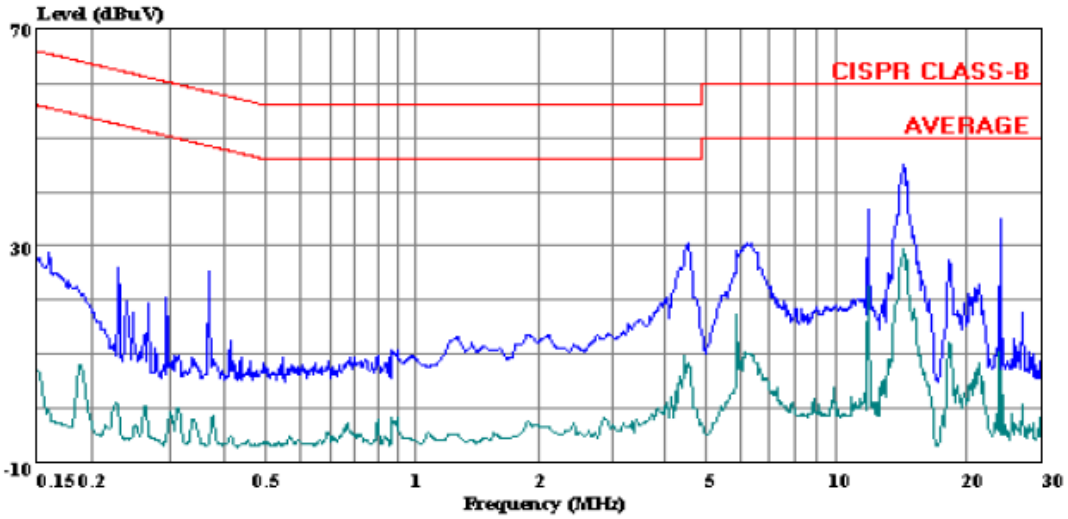
CONDUCTED EMISSIONS DATA (115VAC 60Hz)

Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
11.99	36.59	--	32.06	0.00	60.00	50.00	-23.41	-17.94	L1
14.44	45.23	--	29.54	0.00	60.00	50.00	-14.77	-20.46	L1
24.02	35.19	--	33.03	0.00	60.00	50.00	-24.81	-16.97	L1
12.00	36.59	--	34.69	0.00	60.00	50.00	-23.41	-15.31	L2
14.44	45.23	--	30.22	0.00	60.00	50.00	-14.77	-19.78	L2
24.02	35.19	--	33.72	0.00	60.00	50.00	-24.81	-16.28	L2
6 Worst Data									

LINE 1 RESULTS

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

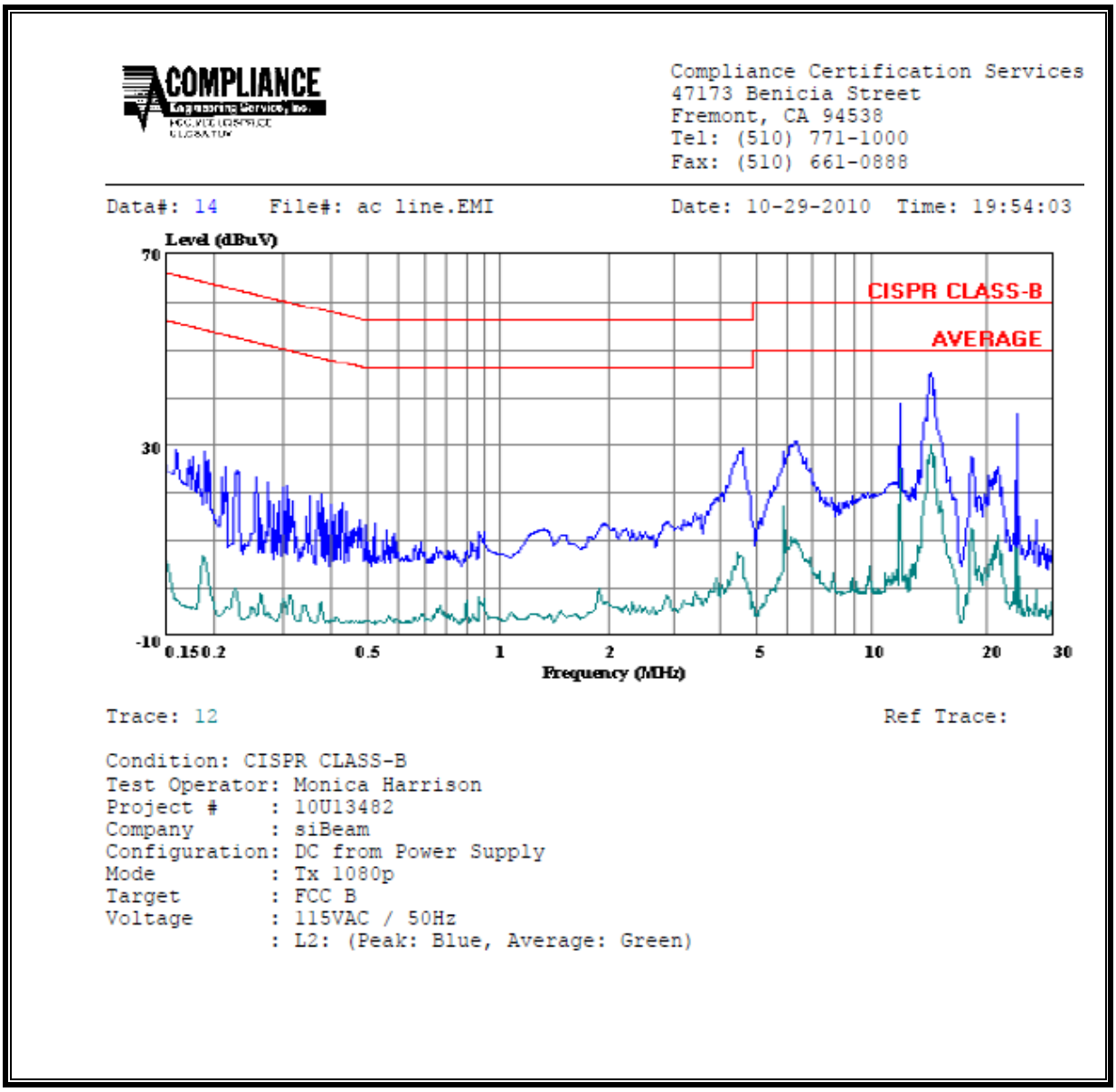
Data#: 7 File#: ac line.EMI Date: 10-29-2010 Time: 19:47:25



Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: Monica Harrison
Project # : 10U13482
Company : siBeam
Configuration: DC from Power Supply
Mode : Tx 1080p
Target : FCC B
Voltage : 115VAC / 50Hz
: L1: (Peak: Blue, Average: Green)

LINE 2 RESULTS



7.9. 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.

APPLIED LIMIT

The EUT is intended for indoor use only with a manufacturer's specified temperature range of 0 to 50 ºC, and for installation in host devices that furnish DC supply voltage regulated to within +/- 10% of the rated input voltage.

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: 3.3VDC @ 20ºC			
Power Supply (VDC)	**Environment Temperature (ºC)**	**Frequency (MHz)**	**Delta (kHz)**
3.30	50	60480.2629428	496.926
3.30	40	60479.9253252	159.308
3.30	30	60479.7552045	-10.812
3.30	***20***	***60479.7660168***	***Reference***
3.30	10	60479.7804574	14.441
3.30	0	60479.8579426	91.926
3.63	20	60479.7709326	4.916
2.97	20	60479.7660851	0.068

7.10. 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.

7.11. 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.