FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

60 GHz WIRELESS MODULE

MODEL NUMBER: WIL6110

FCC ID: PJ8-WIL6110
IC: 10579A-WIL86110

REPORT NUMBER: 12U14649-1, Revision D

ISSUE DATE: January 9, 2013

Prepared for

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/16/2012	Initial Issue	T. LEE
A	12/11/2012	Updated model number	G. Persons
B	12/13/2012	Corrected customer address	G.Persons
C	01/02/2013	Added 75GHz Horn Antenna	T. LEE
D	01/09/2013	Corrected mW in Section 5.2	T. LEE

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Wilocity Ltd.
21 Bareket Street
Caesarea, Israel 38900

EUT DESCRIPTION: 60 GHz Module

MODEL: WIL6110

SERIAL NUMBER: 1052

DATE TESTED: OCTOBER 3rd TO OCTOBER 15th, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 13	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

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:

TIM LEE
WiSE PROGRAM MANAGER
UL CCS

Tested By:

STEVE AGUILAR
EMC TECHNICIAN
UL CCS

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, FCC KDB 200443 Millimeter Wave Test Procedure, RSS-GEN Issue 3, and RSS-210 Issue 8.

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 Wilocity 60 GHz WiGig Module.

5.2. OUTPUT POWER

The highest peak output power for Channel 2 is 35.6 dBm EIRP (3630.8 mW EIRP).

The highest peak output power for Channel 3 is 34.1 dBm EIRP (2570.4 mW EIRP).

5.3. DESCRIPTION OF ANTENNA

The antenna is an integral phased-array antenna with a maximum gain of 12 dBi.

5.4. WORST-CASE CONFIGURATION AND MODE

The worst-case data rate is determined to be MCS 1, based on baseline test results.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop	HP	6930P	C2C9476K12
AC Adapter	HP	608425-002	F12921115161530
PCI Card Adapter	Wilocity	LABPCB008ECARD-0048	--
mPCIe Extender	Wilocity	W0060	00601010015

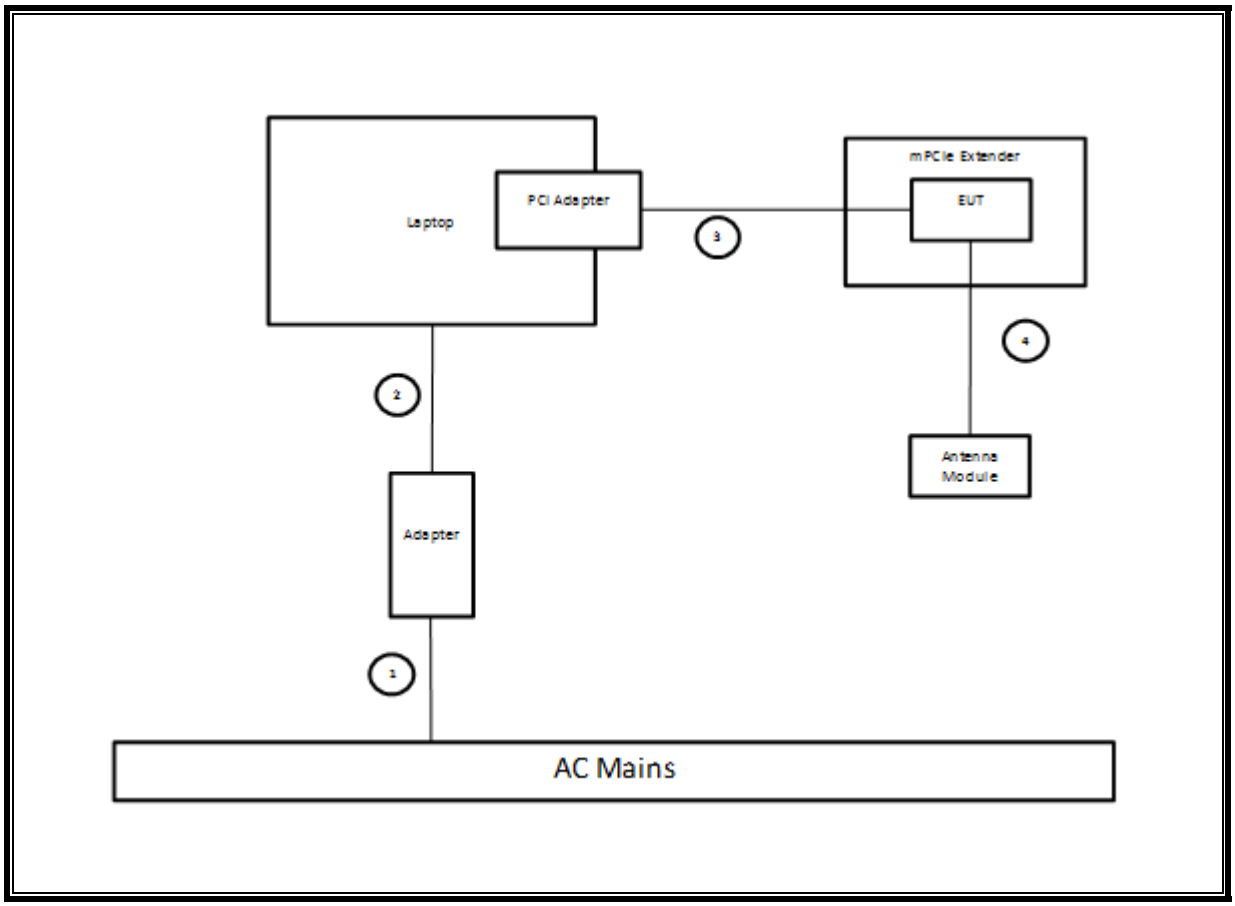
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Unshielded	1.8m	None
2	DC	1	DC	Shielded	1.8m	None
3	Data	1	Signal	Shielded-Ribbon	71cm	None
4	RF	1	U.FL-R	Shielded	55cm	None

TEST SETUP

A laptop computer was utilized to adjust the EUT for testing purposes. Connection to the EUT was by the use of a PCI Card adapter and mPCIe Extender exclusive for testing only.

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, Horn, 40 GHz	ARA	MWH-2640/B	C00981	6/14/2013
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	8/2/2013
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	4/23/2013
Antenna, Horn, 18 GHz	EMCO	3115	C00945	11/6/2012
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	11/11/2012
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	11/11/2012
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	1/26/2013
Harmonic Mixer, 75 GHz	Agilent / HP	11970V	C00768	1/31/2013
Harmonic Mixer, 50 GHz	Agilent / HP	11970Q	C00769	5/21/2013
Harmonic Mixer, 110 GHz	Agilent / HP	11970W	C00770	2/9/2013
Mixer Diplexer for HP	OML	DPL.313B	N02429	CNR
Harmonic Mixer, 140 GHz	OML	M08HWA	C00868	CNR
Harmonic Mixer, 220 GHz	OML	M05HWA	C00867	CNR
Peak Power Meter	Boonton	4541	C01189	5/30/2013
Peak Power Sensor	Boonton	57006	C01202	5/29/2013
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	10/20/2012
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	5/11/2013
Analog Signal Generator, 40 GHz	Agilent / HP	E8257D	C01177	9/9/2013
mmWave Source 50 ~ 75 GHz	OML	S15MS-AG	C01187	CNR
Antenna, Horn, 75 GHz	CMI	HO15R	107	CNR
Down Converter, 67 GHz	Agilent / HP	MT-463	C01188	10/10/2013
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01161	12/16/2012
Antenna, Horn, 18 GHz	EMCO	3115	C00945	11/6/2012
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	11/11/2012
DMM	Fluke	77-11	N02303	10/31/2012
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	8/19/2013
LISN, 30 MHz	FCC	50/250-25-2	C00626	12/13/2012

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.

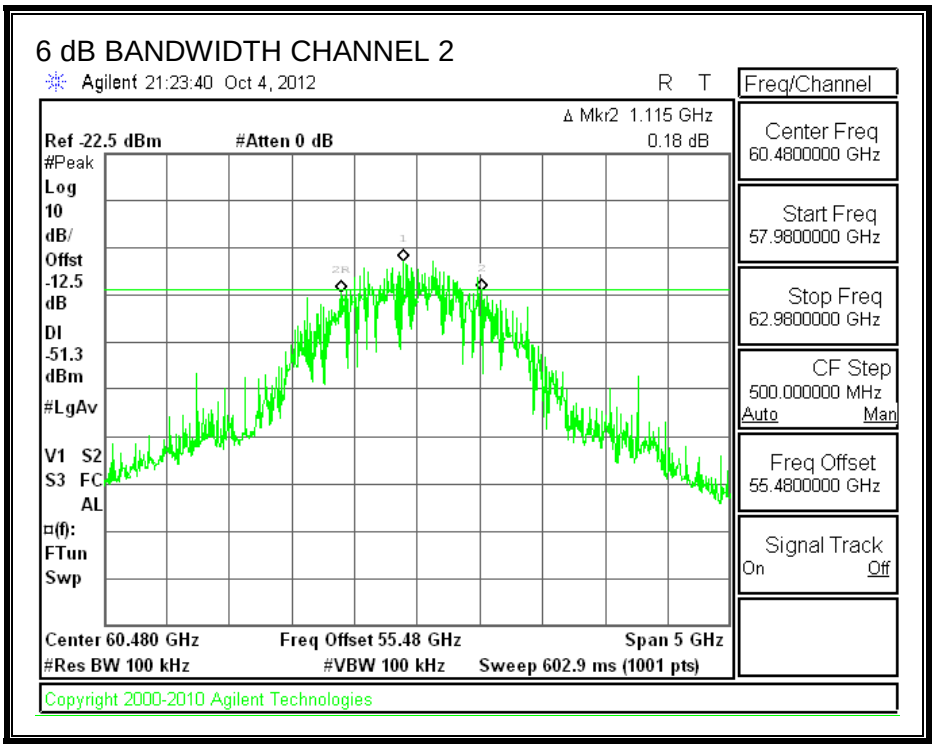
TEST PROCEDURE

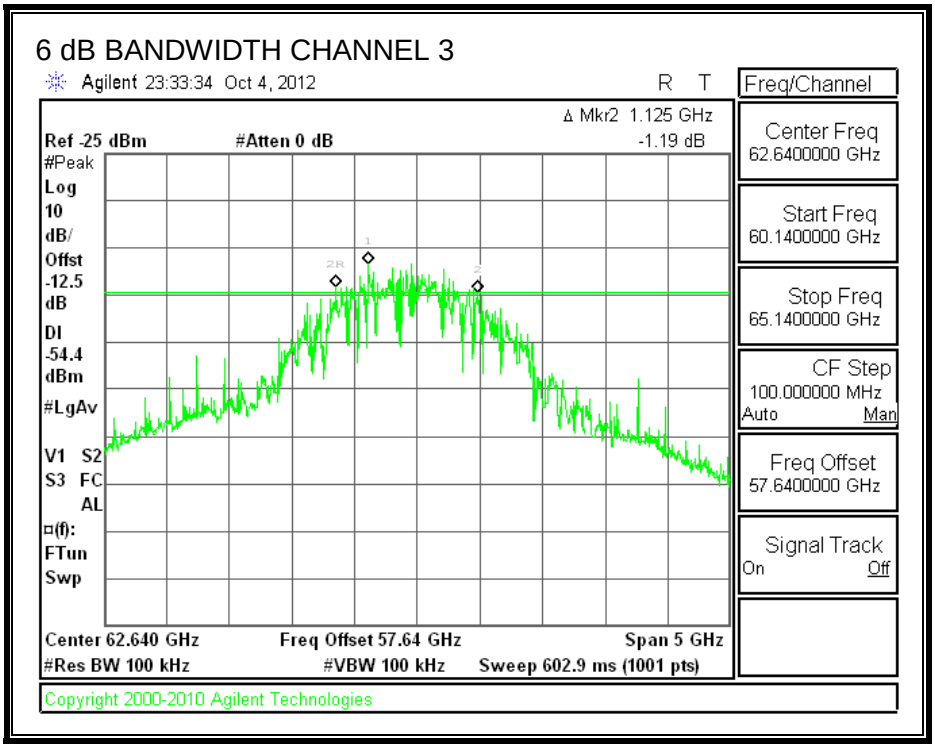
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

RESULTS

Channel	Frequency (GHz)	6 dB Bandwidth (MHz)
Low	60.48	1115.00
High	62.64	1125.00

6 dB BANDWIDTH





7.2. 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.

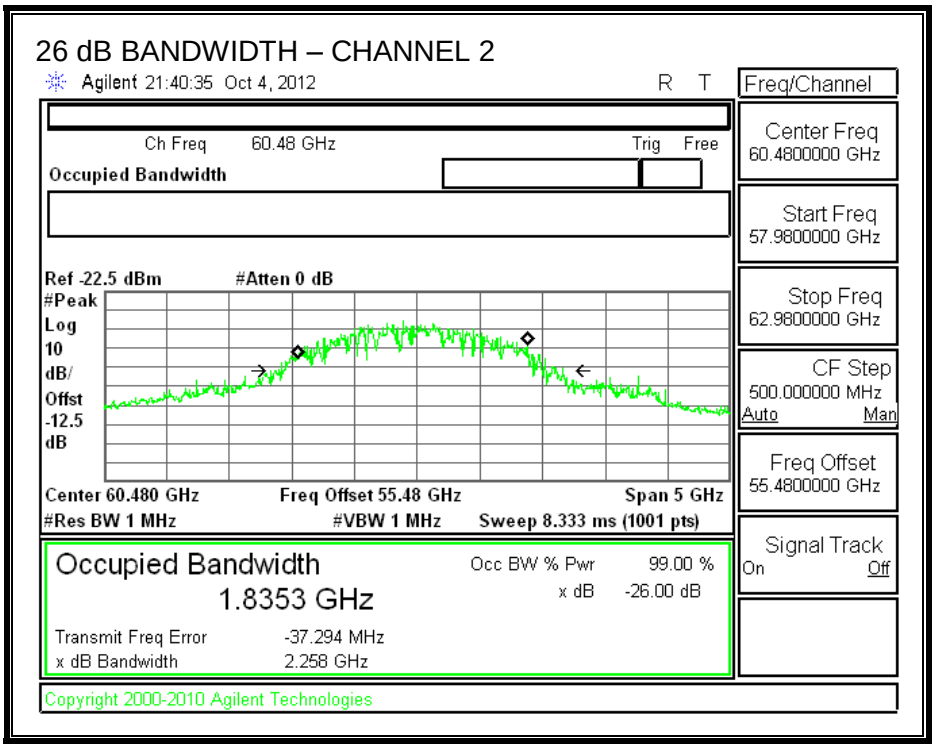
TEST PROCEDURE

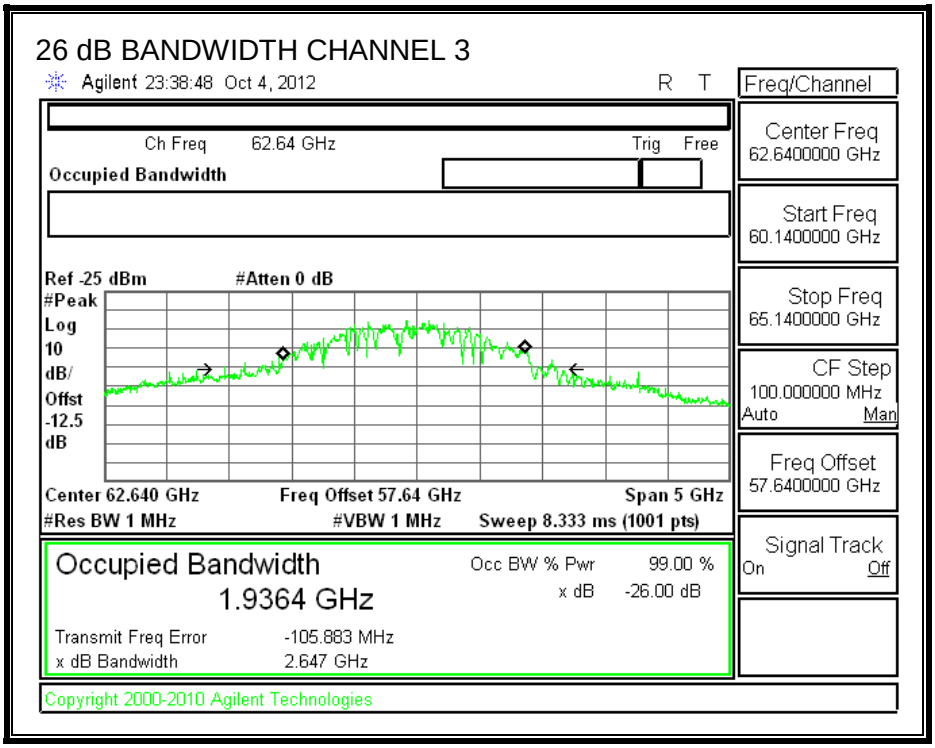
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

RESULTS

Channel	Frequency (GHz)	26 dB Bandwidth (MHz)
CH 2	60.48	2258.00
CH 3	62.64	2647.00

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	0.033	0.0050	0.44
62.64	0.033	0.0048	0.45

7.3.1. Peak Power Density

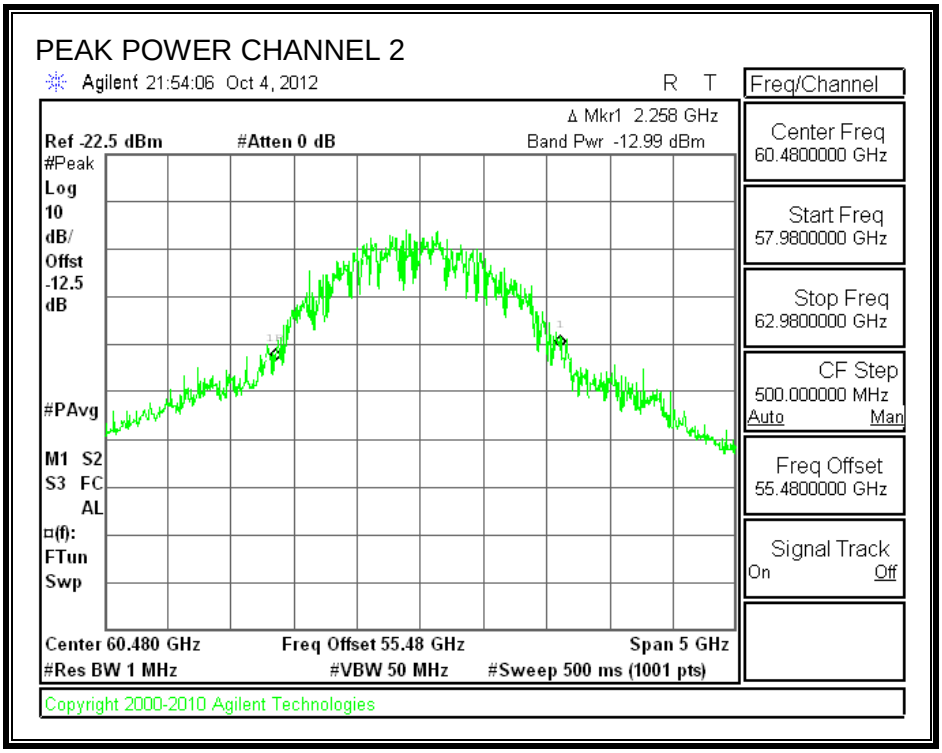
PEAK POWER DENSITY-LOW channel 2

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
60.48	1.50	-12.99	23.00	35.6
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**
3.632	3.0	0.0321	3.21	18

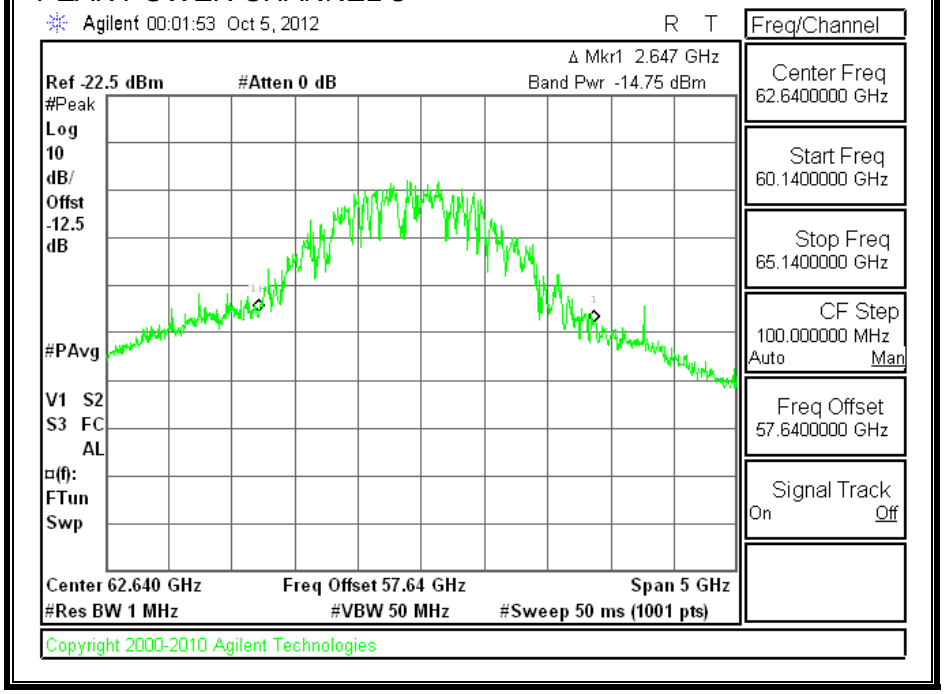
PEAK POWER DENSITY-HIGH - channel 3

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
62.64	1.50	-14.75	23.00	34.1
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**
2.598	3.0	0.0230	2.30	18

PEAK POWER CHANNEL 2



PEAK POWER CHANNEL 3



7.3.1. Average Power Density

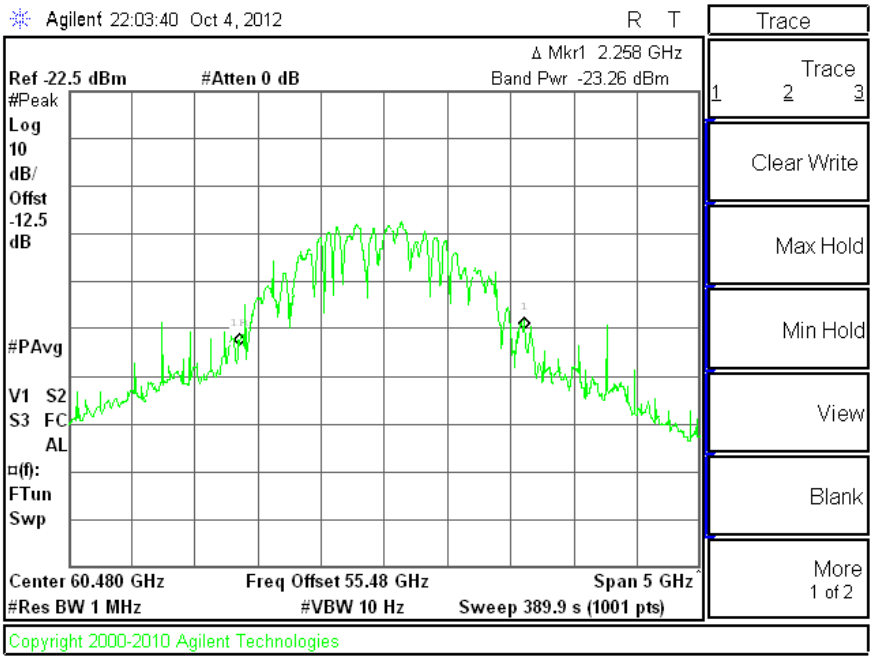
AVERAGE POWER DENSITY-LOW channel 2

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
60.48	1.50	-23.26	23.00	25.3
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.341	3.0	0.0030	0.30	9

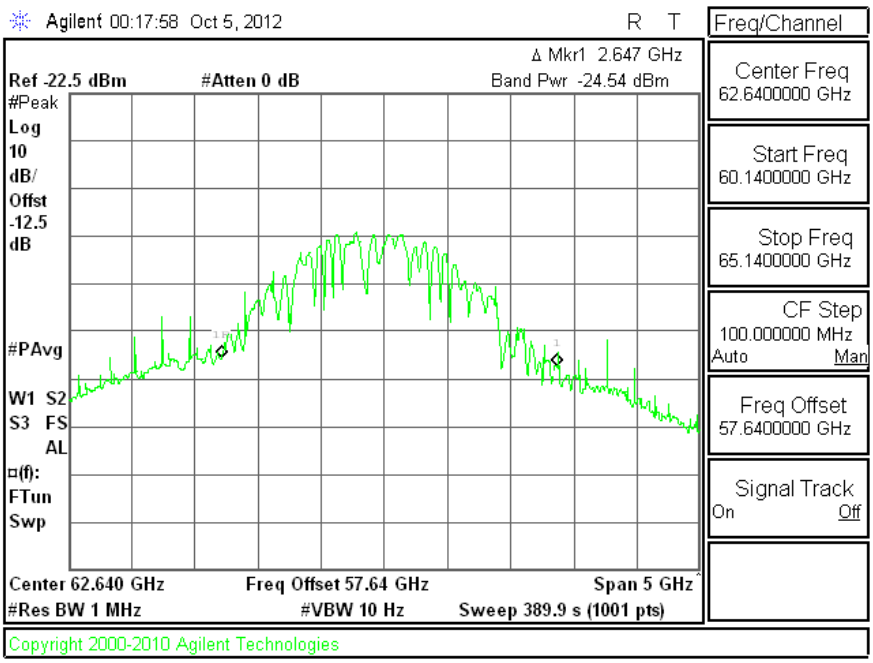
AVERAGE POWER DENSITY-HIGH - channel 3

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
62.64	1.50	-24.54	23.00	24.4
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.273	3.0	0.0024	0.24	9

AVERAGE POWER CHANNEL 2



AVERAGE POWER CHANNEL 3



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.

RESULTS

Frequency (GHz)	EIRP (dBm)	EUT Antenna Gain (dBi)	Output Power (dBm)	Output Power (mW)	6 dB Bandwidth (MHz)	Output Power Limit (mW)
60.48	35.6	12.00	23.60	229.1	1115	500
62.64	34.1	12.00	22.10	162.2	1125	500

7.5. 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

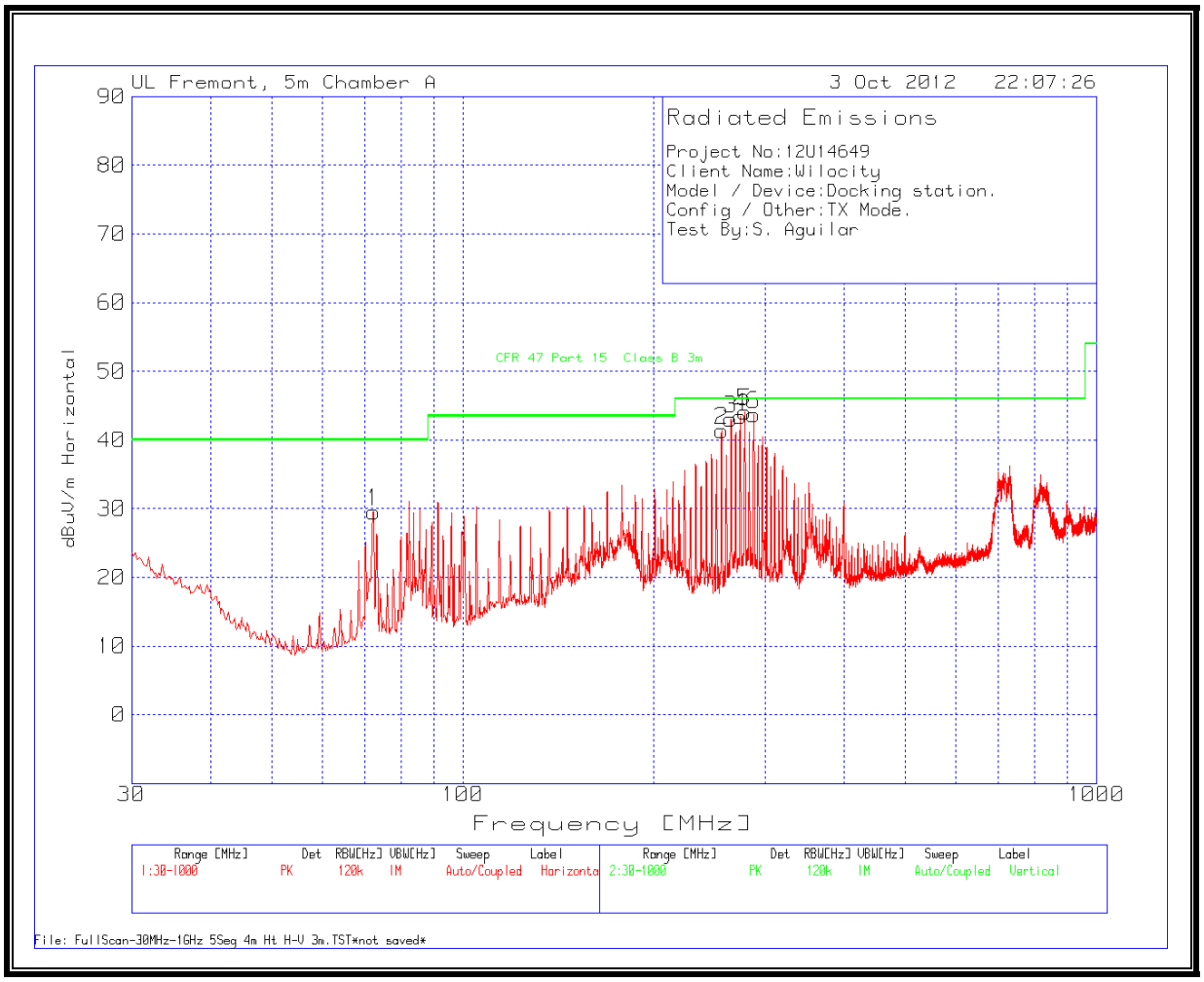
External mixers are utilized.

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.

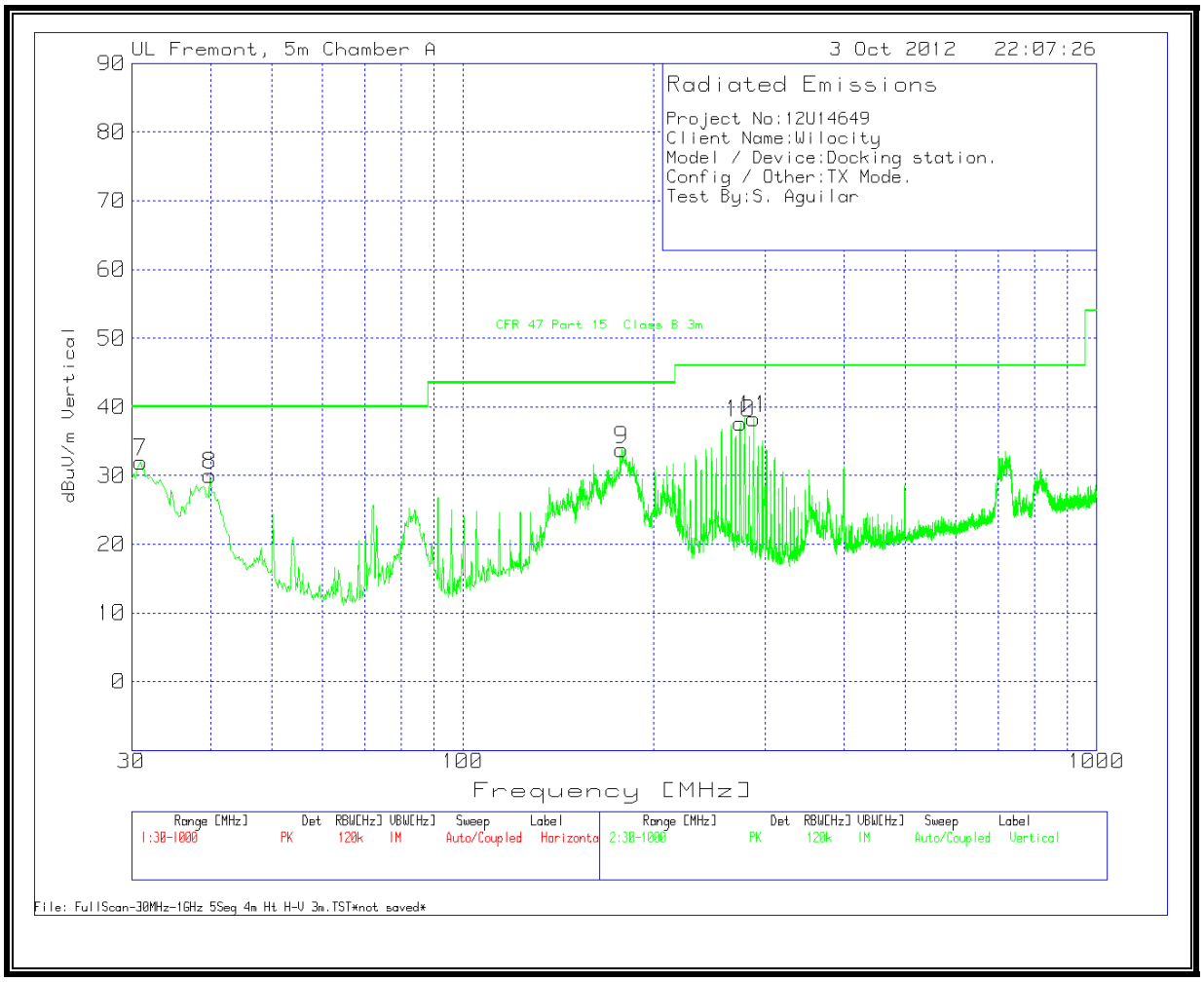
A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each mixer band that yields a minimum system noise floor at least 6 dB below the spurious emissions limit.

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 SPURIOUS EMISSION 30 TO 1000 MHz

Company Name: Wilocity
Project: 12U14649
Model/Device: Docking station.
Date: 10/3/2012
Mode: TX Mode.
Tested by: Steve Aguilar

Test Frequency [MHz]	Meter Reading [dB(µV)]	Detector	Pre Amp Factor [dB]	Antenna Factor [dB/m]	Corrected [dB(µV/m)]	Class B limit [dB(µV/m)]	Margin [dB]	Height [cm]	Polarity
Range 1 30 - 1000MHz									
72.2582	48.59	PK	-27.1	8.1	29.59	40	-10.41	200	Horz
256.0232	55.56	PK	-25.9	11.7	41.36	46	-4.64	100	Horz
265.1339	56.22	PK	-25.9	12.8	43.12	46	-2.88	100	Horz
274.2446	56.03	PK	-25.9	13.3	43.43	46	-2.57	100	Horz
278.8969	56.38	PK	-25.8	13.5	44.08	46	-1.92	100	Horz
288.0076	56.27	PK	-25.9	13.4	43.77	46	-2.23	100	Horz
Range 2 30 - 1000MHz									
30.9692	39.09	PK	-27.5	20.4	31.99	40	-8.01	100	Vert
39.8861	43.37	PK	-27.3	14	30.07	40	-9.93	100	Vert
178.0975	48.97	PK	-26.4	11.2	33.77	43.5	-9.73	100	Vert
274.2446	50.25	PK	-25.9	13.3	37.65	46	-8.35	100	Vert
287.8137	50.81	PK	-25.9	13.4	38.31	46	-7.69	100	Vert

PK - Peak detector
QP - Quasi-peak detector

TX SPURIOUS EMISSIONS 1 TO 40 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Wilocity
Project #: 12U14649
Date: 10-9-2012
Test Engineer: S.Aguilar
Configuration: 60 GHz TX , Dock
Mode: TX , Worst case

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B	T88 Miteq 26-40GHz	T125; ARA 18-26GHz; S/N:1007	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)
Channel 2															
1.320	3.0	55.02	43.57	25.9	3.2	-37.3	0.0	0.0	46.8	35.3	74	54	-27.2	-18.7	H
1.320	3.0	54.62	42.21	25.9	3.2	-37.3	0.0	0.0	46.4	34.0	74	54	-27.6	-20.0	V
7.560	3.0	37.65	33.03	36.6	9.1	-33.0	0.0	0.0	50.4	45.8	74	54	-23.6	-8.2	H
7.560	3.0	42.58	40.98	36.6	9.1	-33.0	0.0	0.0	55.4	53.8	74	54	-18.6	-0.2	V
16.390	3.0	33.95	21.86	39.2	13.4	-31.7	0.0	0.0	54.8	42.8	74	54	-19.2	-11.2	H
16.390	3.0	33.65	21.76	39.2	13.4	-31.7	0.0	0.0	54.5	42.7	74	54	-19.5	-11.3	V
24.910	3.0	36.64	24.11	34.9	18.3	-32.0	0.0	0.0	57.9	45.4	74	54	-16.1	-8.6	H
24.910	3.0	36.22	24.20	34.9	18.3	-32.0	0.0	0.0	57.5	45.5	74	54	-16.5	-8.5	V
Channel 3															
1.320	3.0	55.50	43.75	25.9	3.2	-37.3	0.0	0.0	47.3	35.5	74	54	-26.7	-18.5	H
1.320	3.0	53.18	40.83	25.9	3.2	-37.3	0.0	0.0	44.9	32.6	74	54	-29.1	-21.4	V
7.830	3.0	40.80	38.48	37.0	9.1	-32.8	0.0	0.0	54.1	51.8	74	54	-19.9	-2.2	H
7.830	3.0	41.70	40.21	37.0	9.1	-32.8	0.0	0.0	55.0	53.5	74	54	-19.0	-0.5	V
15.640	3.0	34.52	21.95	38.7	13.0	-31.9	0.0	0.0	54.3	41.8	74	54	-19.7	-12.2	H
15.640	3.0	34.21	22.23	38.7	13.0	-31.9	0.0	0.0	54.0	42.0	74	54	-20.0	-12.0	V
24.930	3.0	36.35	23.92	34.9	18.4	-32.0	0.0	0.0	57.7	45.2	74	54	-16.3	-8.8	H
24.930	3.0	37.78	23.93	34.9	18.4	-32.0	0.0	0.0	59.1	45.3	74	54	-14.9	-8.7	V

Rev. 11.10.11

No emmissons above the noise floor detected between 18-40 GHz.

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

CHANNEL 2

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
52.92	1.000	-76.82	23.00	-32.9
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
5.12E-07	3.0	4.53E-09	0.45	90

CHANNEL 2

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
68.04	1.000	-84.17	23.00	-38.1
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
1.56E-07	3.0	1.38E-09	0.14	90

PEAK MEASUREMENT

Note: The peak density is less than the average limit

CHANNEL 3

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
54.81	1.000	-80.26	23.00	-36.0
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
2.49E-07	3.0	2.20E-09	0.22	90

CHANNEL 3

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
70.58	1.000	-77.25	23.00	-30.8
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
8.24E-07	3.0	7.29E-09	0.73	90

7.6. 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

Company Name:	Wilocity
Project:	12U14649
Model/Device:	Dock
Date:	10/10/2012
Configuraiton:	TX , Worst case
Test Voltage/Frequency:	120VAC. 60 Hz
Tested by:	Steve Aguilar

Line-L1 .15 - 30MHz

Test Frequency [MHz]	Meter Reading [dBuV]	Detector Type	LISN [dB]	Cables [dB]	Corrected [dB(uV)]	Class B QP Limit	QP Margin	Class B Av Limit [dB(uV)]	Av Margin [dB]
0.15	52.96	PK	0.1	0	53.06	66	-12.94	-	-
0.15	17.48	Av	0.1	0	17.58	-	-	56	-38.42
0.1905	51.45	PK	0.1	0	51.55	64	-12.45	-	-
0.1905	27.69	Av	0.1	0	27.79	-	-	54	-26.21
0.2535	44.7	PK	0.1	0	44.8	61.6	-16.8	-	-
0.2535	17.85	Av	0.1	0	17.95	-	-	51.6	-33.65

Line-L2 .15 - 30MHz

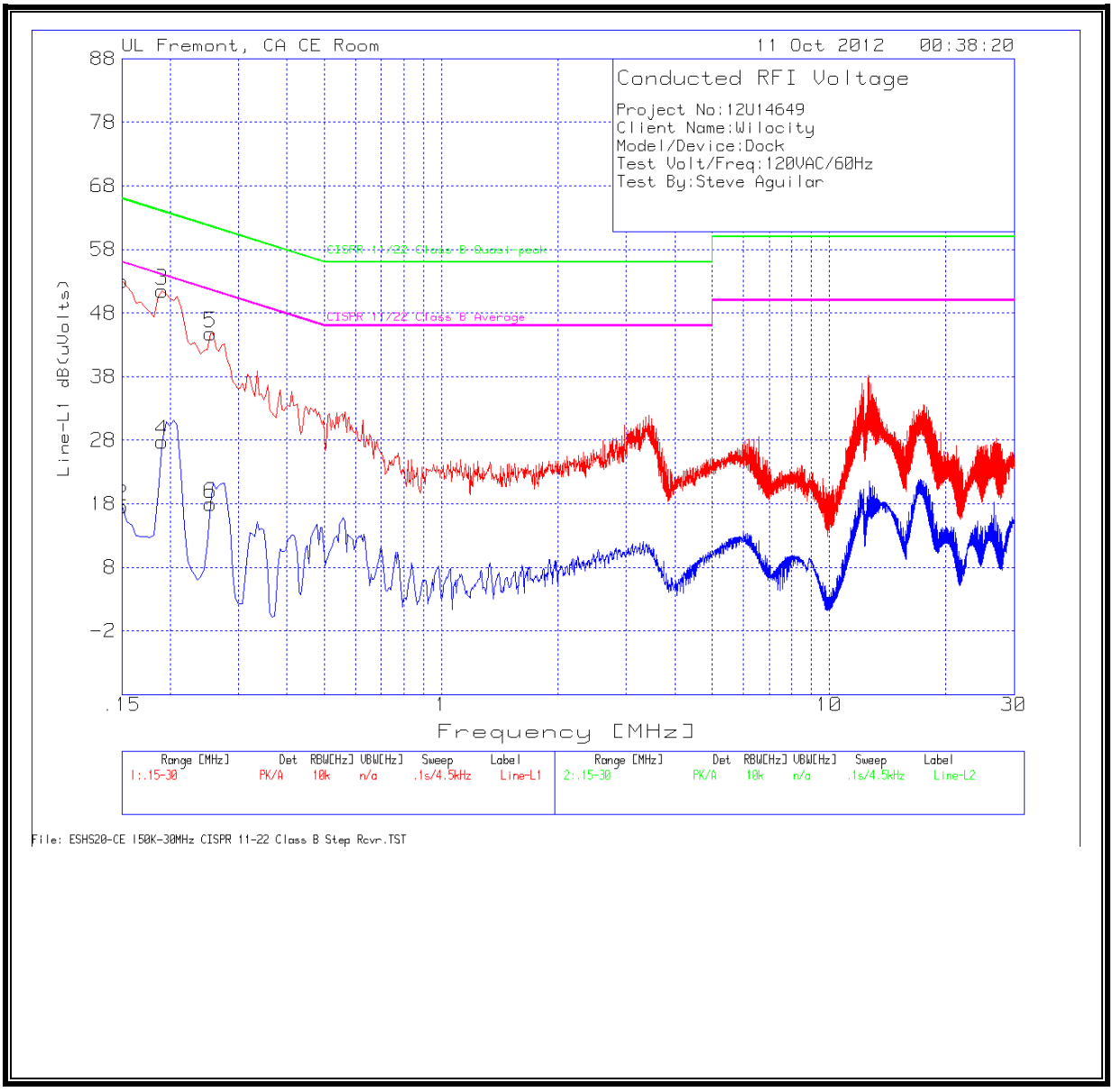
Test Frequency [MHz]	Meter Reading [dBuV]	Detector Type	LISN [dB]	Cables [dB]	Corrected [dB(uV)]	Class B QP Limit	QP Margin	Class B Av Limit [dB(uV)]	Av Margin [dB]
0.15	51.86	PK	0.1	0	51.96	66	-14.04	-	-
0.15	17.3	Av	0.1	0	17.4	-	-	56	-38.6
0.186	51.26	PK	0.1	0	51.36	64.2	-12.84	-	-
0.186	18.55	Av	0.1	0	18.65	-	-	54.2	-35.55
0.258	43.42	PK	0.1	0	43.52	61.5	-17.98	-	-
0.258	19.87	Av	0.1	0	19.97	-	-	51.5	-31.53

PK - Peak detector

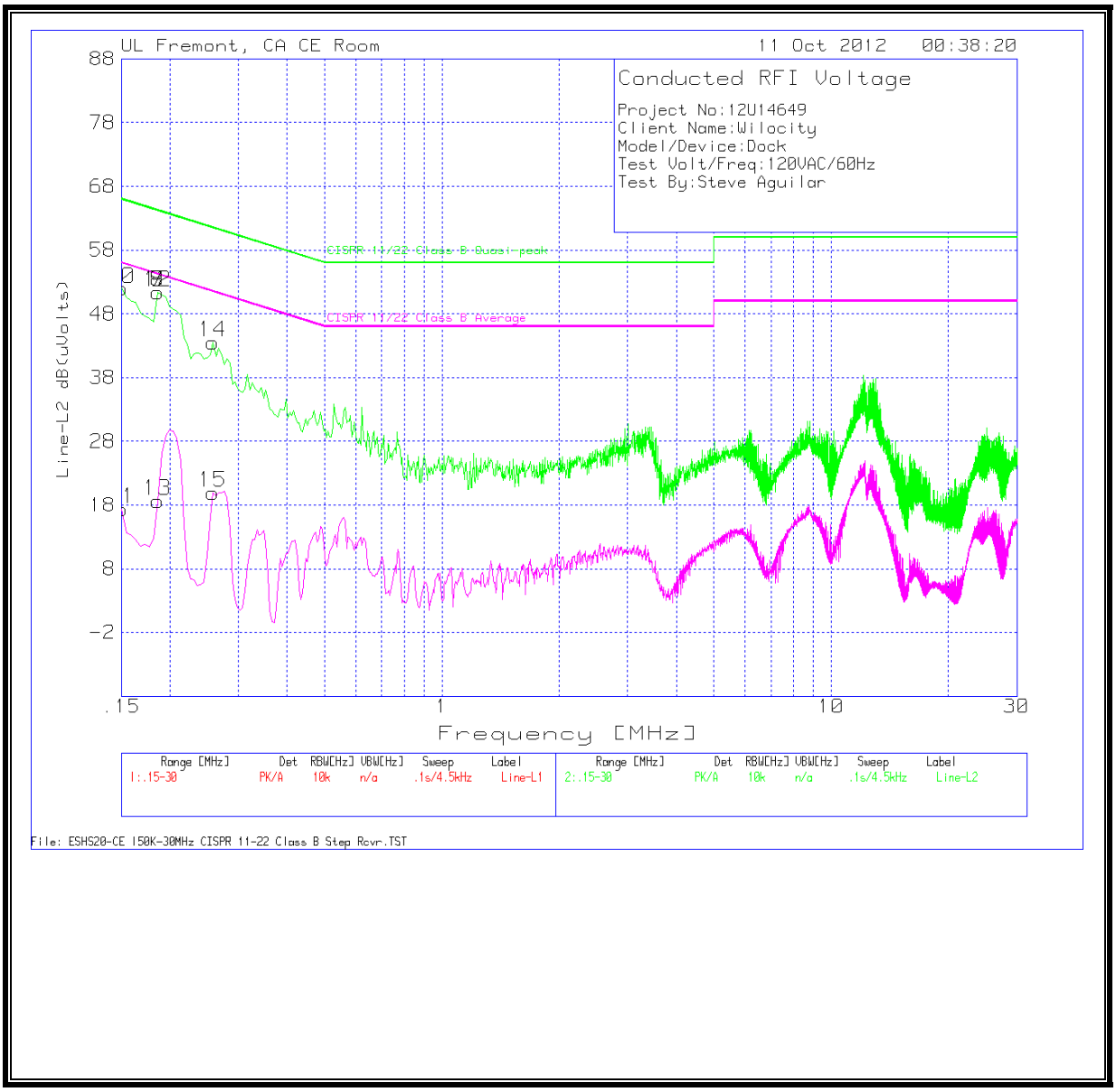
QP - Quasi-Peak detector

Av - Average detector

LINE 1 RESULTS



LINE 2 RESULTS



7.7. 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: 115VAC @ 20ºC			CHANNEL 2
Power Supply (VDC)	**Environment Temperature (ºC)**	**Frequency (MHz)**	**Delta (kHz)**
115.00	70	60481.0000000	1247.000
115.00	60	60480.3330000	580.000
115.00	50	60479.9330000	180.000
115.00	40	60479.7670000	14.000
115.00	30	60479.7330000	-20.000
115.00	***20***	***60479.7530000***	***Reference***
115.00	10	60480.1830000	430.000
115.00	0	60480.0570000	304.000
97.15	20	60479.7531000	0.100
132.25	20	60479.7533000	0.300

Reference Conditions: 115VAC @ 20ºC			CHANNEL 3
Power Supply (VDC)	**Environment Temperature (ºC)**	**Frequency (MHz)**	**Delta (kHz)**
115.00	70	62641.1170000	1380.000
115.00	60	62640.3330000	596.000
115.00	50	62639.9170000	180.000
115.00	40	62639.7500000	13.000
115.00	30	62639.7170000	-20.000
115.00	***20***	***62639.7370000***	***Reference***
115.00	10	62640.2030000	466.000
115.00	0	62640.0700000	333.000
97.15	20	62639.7320000	-5.000
132.25	20	62639.7310000	-6.000

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.

7.9. 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.

All components of the network are for indoor operation only. There are no outdoor units therefore no transmissions are directed outside the building.

8. 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.

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).

CALCULATIONS

EIRP is converted to Power Density using the equation:

$P_D = EIRP / (4 * Pi * D_S^2)$

where:

P_D = power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D_S = separation distance in m

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

RESULTS

Channel 2

Average EIRP (dBm)	Average EIRP (W)	Separation Distance (cm)	Power Density (W/m^2)	IC Limit (W/m^2)	Power Density (mW/cm^2)	FCC Limit (mW/cm^2)
25.3	0.339	20	0.67	10	0.07	1

Channel 3

Average EIRP (dBm)	Average EIRP (W)	Separation Distance (cm)	Power Density (W/m^2)	IC Limit (W/m^2)	Power Density (mW/cm^2)	FCC Limit (mW/cm^2)
24.4	0.275	20	0.55	10	0.05	1