FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8
AS/NZS 4268:2008 + A1:2010

CERTIFICATION TEST REPORT

FOR

802.11a/b/g/n/ad+BT module

MODEL NUMBER: QCA9005

FCC ID: PPD-QCA9005
IC: 4104A-QCA9005

REPORT NUMBER: 12U14501-3, REVISION B

ISSUE DATE: AUGUST 27, 2012

Prepared for
QUALCOMM ATHEROS, INC.
1700 TECHNOLOGY DRIVE
SAN JOSE, CA 95110, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/04/2012	Initial Issue	T. LEE
A	03/22/2013	Corrected Conducted Power	T. LEE
B	08/27/2013	Corrected Transmitter Identification Results	T. LEE

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: QUALCOMM ATHEROS, INC
1700 TECHNOLOGY DRIVE
SAN JOSE, CA 95110

EUT DESCRIPTION: 802.11a/b/g/n/ad+BT module

MODEL: QCA9005

SERIAL NUMBER: 0257 AND 0260

DATE TESTED: JUNE 19TH TO JULY 10, 2012

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
AS/NZS 4268:2008 + A1:2010	Pass
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
STAFF ENGINEER
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, RSS-210 Issue 8, and AS/NZS 4268:2008 + A1:2010.

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 Qualcomm Atheros 802.11a/b/g/n/ad+BT module which also incorporates WLAN and Bluetooth.

5.2. OUTPUT POWER

The highest peak conducted output power for Channel 2 is 275.4mW.

The highest peak conducted output power for Channel 3 is 173.8mW.

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

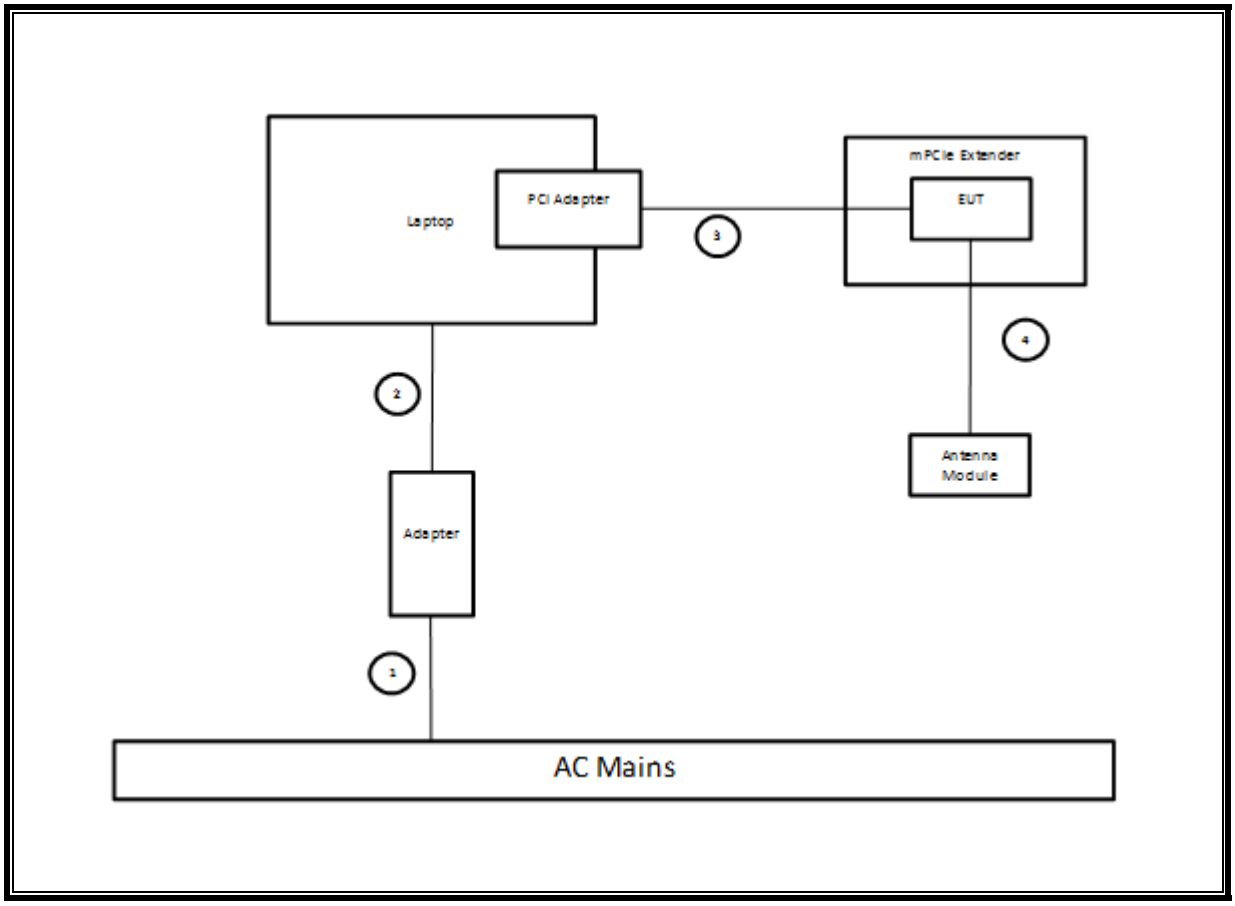
PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop	HP	6930P	C2C9476K17
AC Adapter	HP	608425-002	F12921117197097
PCI Card Adapter	Wilocity	LABPCB008ECARD-0062	--
mPCIe Extender	Wilocity	W0060	00601010014

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**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

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 / HP	E4446A	C01012	9/2/2012
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	5/11/2013
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	3/22/2013
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	8/4/2012
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01171	1/26/2013
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	11/11/2012
Antenna, Horn, 18 GHz	EMCO	3115	C00945	10/6/2012
Antenna, Horn, 18 GHz	EMCO	3115	C00783	6/29/2012
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	7/12/2012
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	7/12/2012
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	7/28/2012
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	6/14/2013
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	8/2/2012
Downconverter, 67 GHz	Agilent	MT-463	12020	10/10/2012
Analog Signal Generator, 40 GHz	Agilent / HP	E8257D	C01177	8/18/2012
Harmonic Mixer, 50 GHz	Agilent / HP	11970Q	C00769	5/11/2013
Harmonic Mixer, 75 GHz	Agilent / HP	11970V	C00768	1/31/2014
Harmonic Mixer, 110 GHz	Agilent / HP	11970W	C00770	2/9/2014
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	10/20/2012
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

Note: Horn Antenna, EMCO, Model 3115, Serial # C00783 was used prior to June 29, 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.

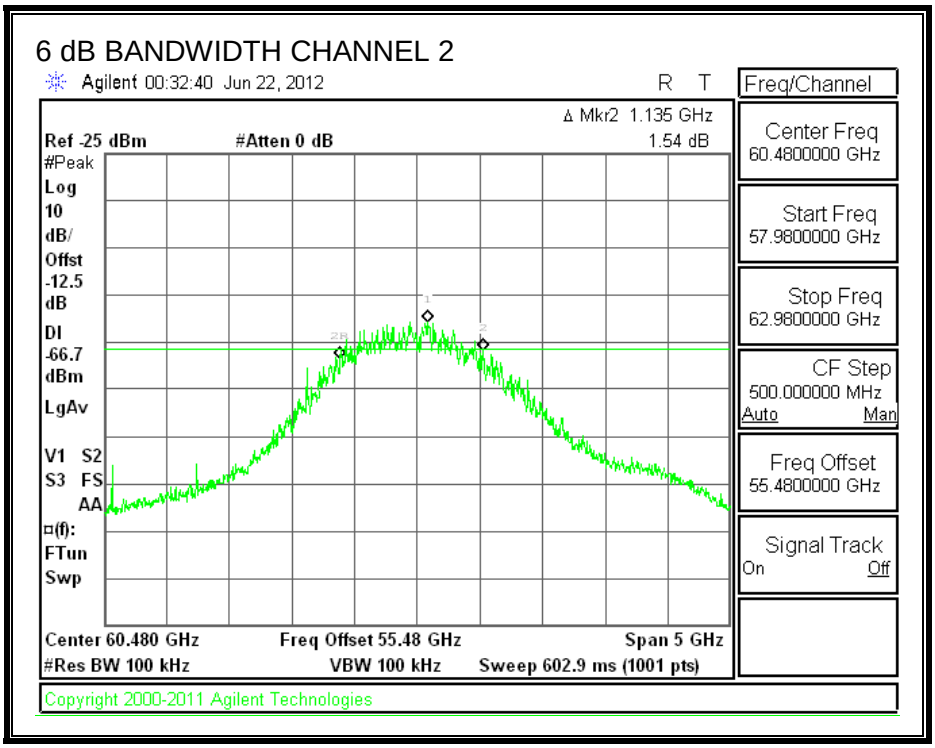
TEST PROCEDURE

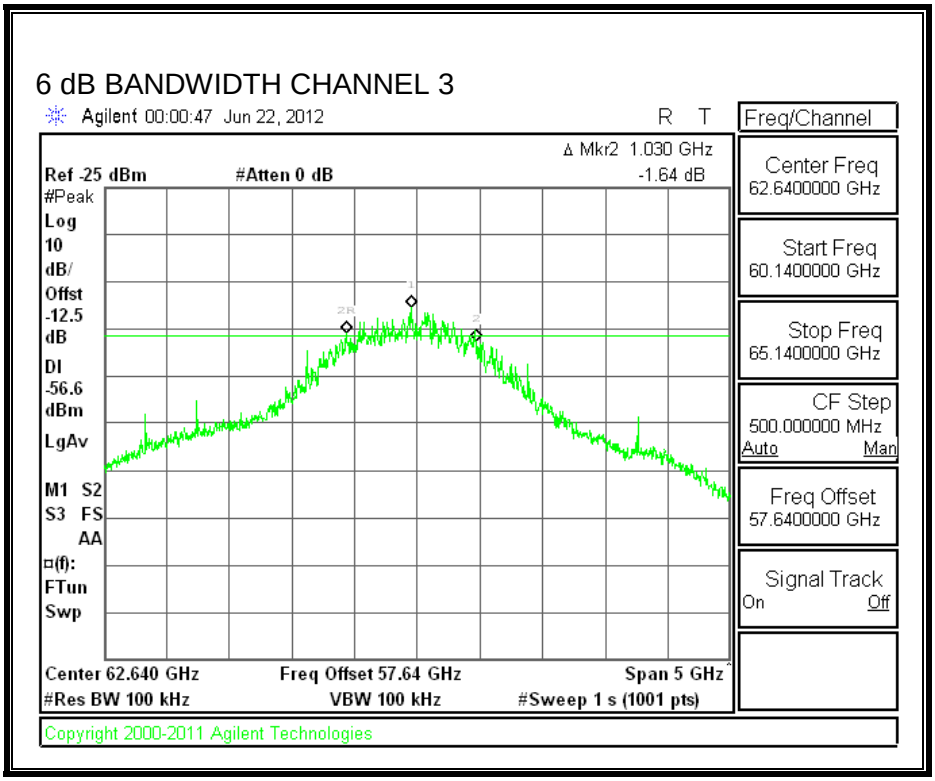
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

RESULTS

Channel	Frequency (GHz)	6 dB Bandwidth (MHz)
Low	60.48	1135.00
High	62.64	1030.00

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.

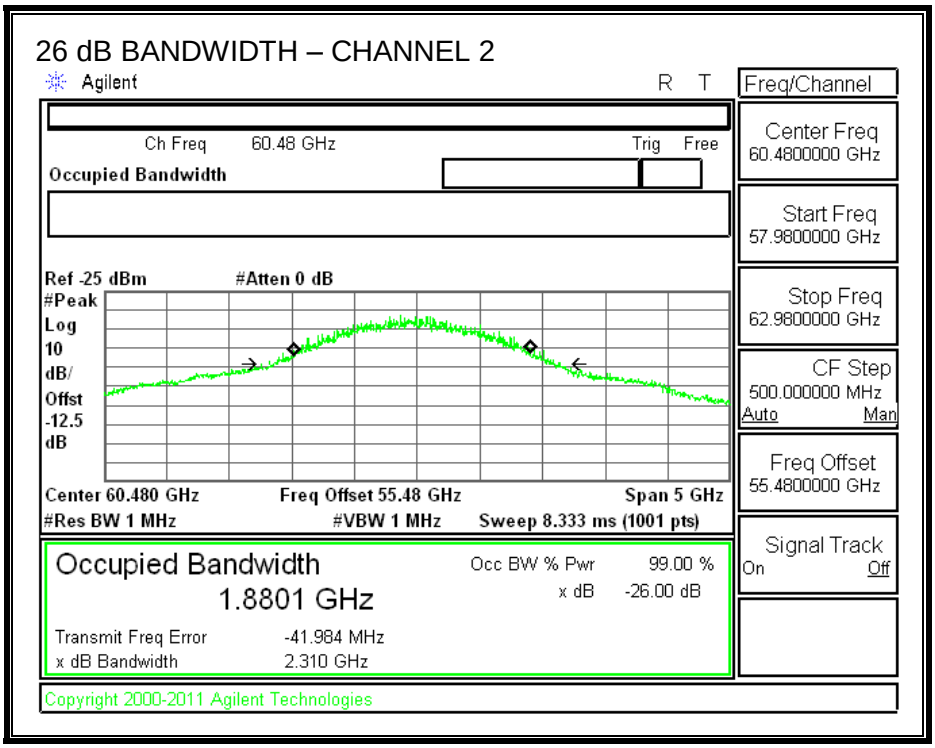
TEST PROCEDURE

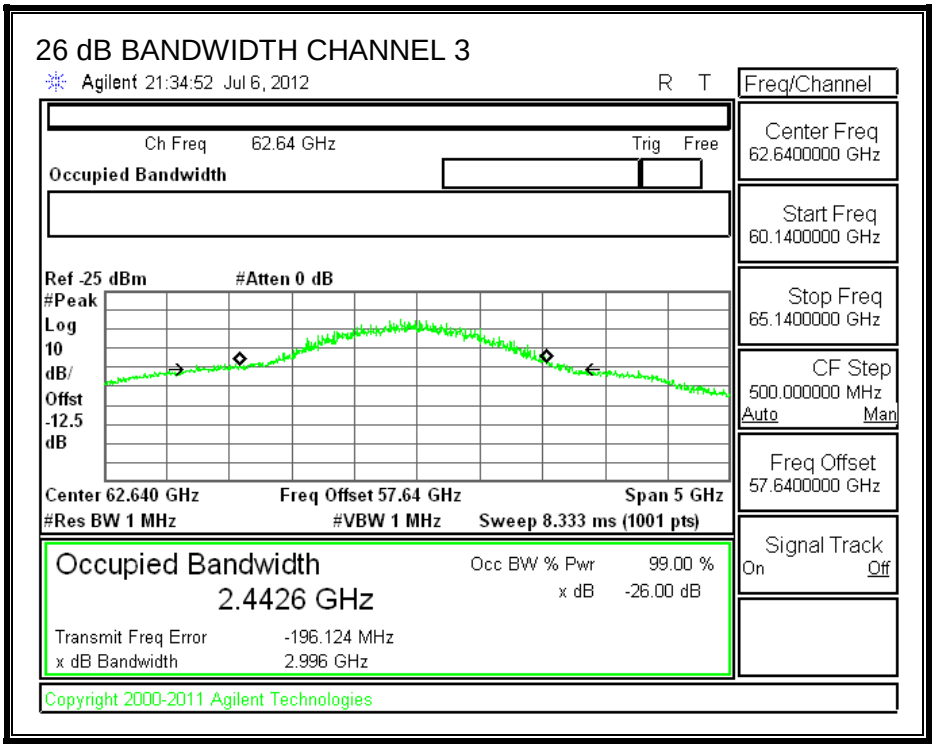
The spectrum analyzer and external mixer are set up to measure the radiated output of the transmitter.

RESULTS

Channel	Frequency (GHz)	26 dB Bandwidth (MHz)
CH 2	60.48	2310.00
CH 3	62.64	2996.00

26 dB BANDWIDTH





7.3. POWER DENSITY

LIMIT

AS/NZS 4268 Within the 57-66 GHz band, emission levels shall not exceed the following:
§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

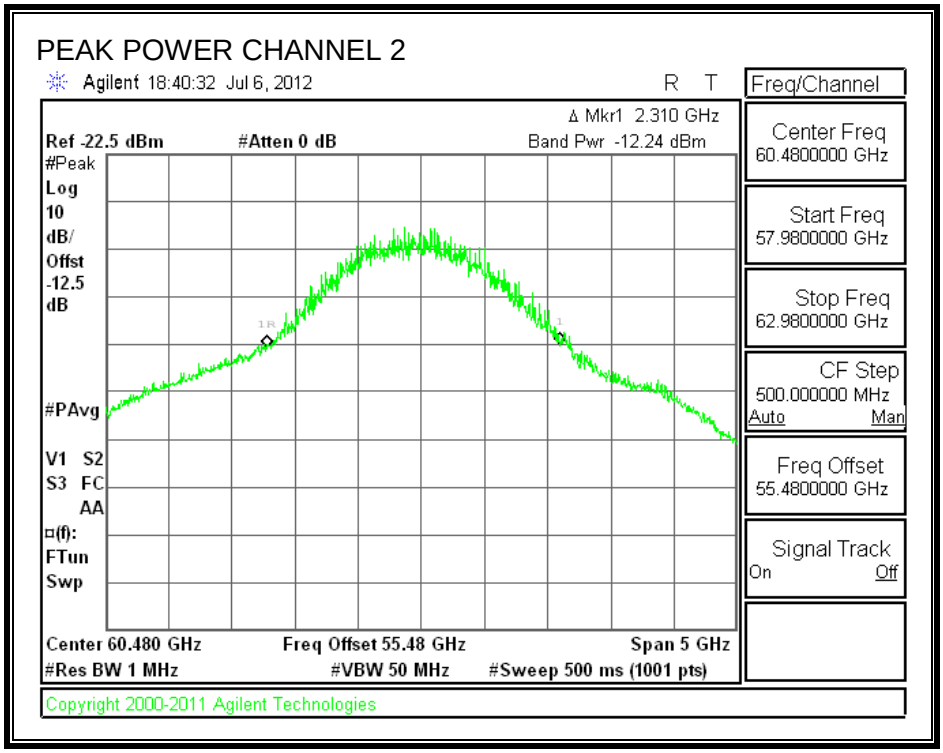
PEAK POWER DENSITY-LOW channel 2

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
60.48	1.50	-12.24	23.00	36.4
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**
4.317	3.0	0.0382	3.82	18

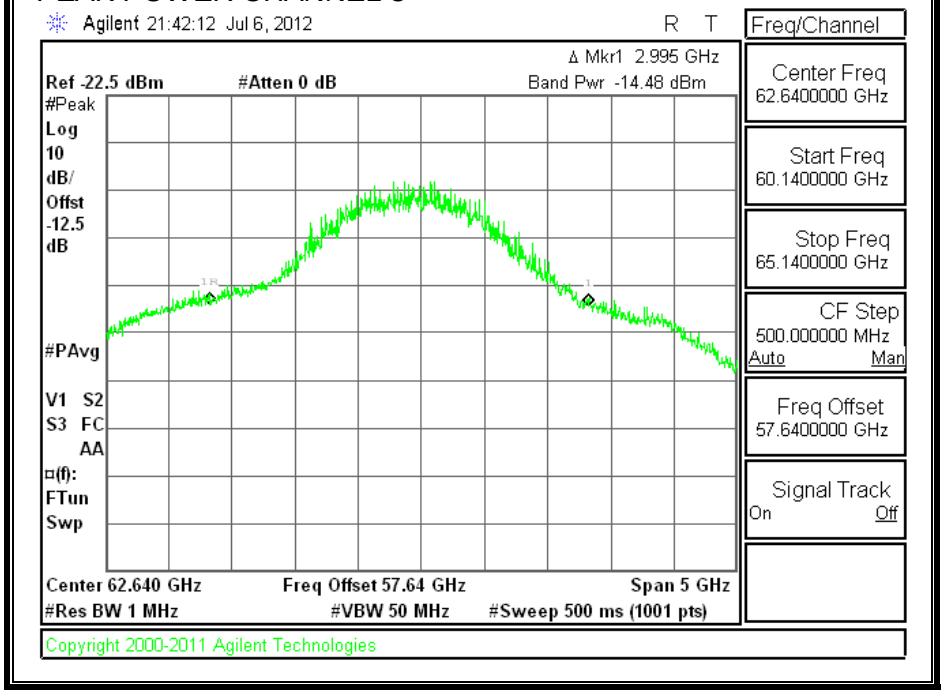
PEAK POWER DENSITY-HIGH - channel 3

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
62.64	1.50	-14.48	23.00	34.4
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Peak Limit (uW/cm^2)**
2.765	3.0	0.0245	2.45	18

PEAK POWER CHANNEL 2



PEAK POWER CHANNEL 3



7.3.1. Average Power Density

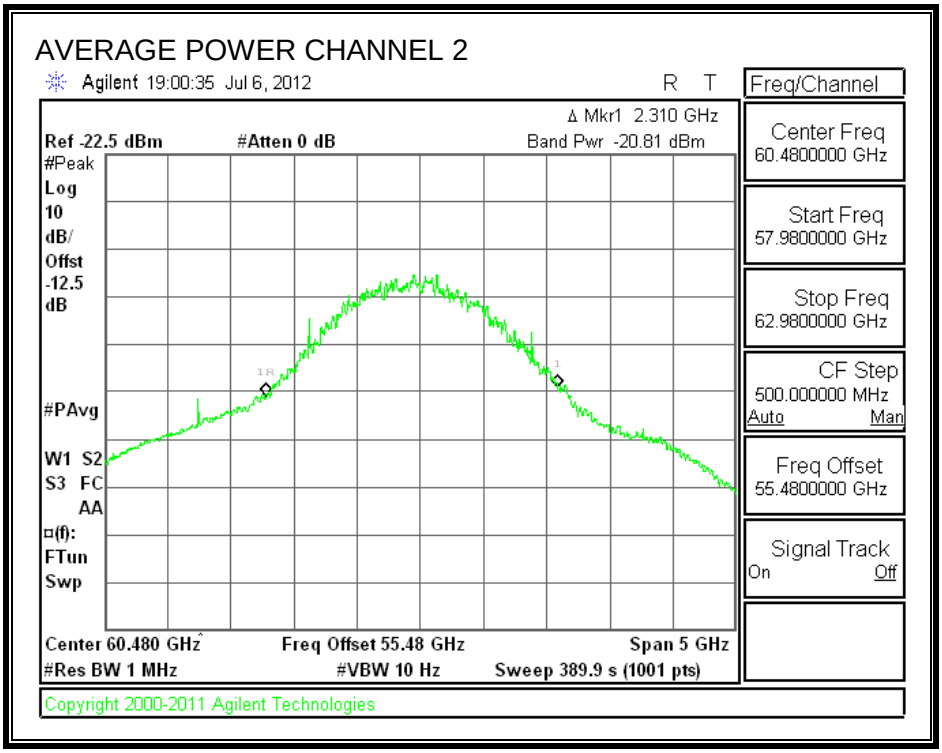
AVERAGE POWER DENSITY-LOW channel 2

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
60.48	1.50	-20.81	23.00	27.8
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.600	3.0	0.0053	0.53	9

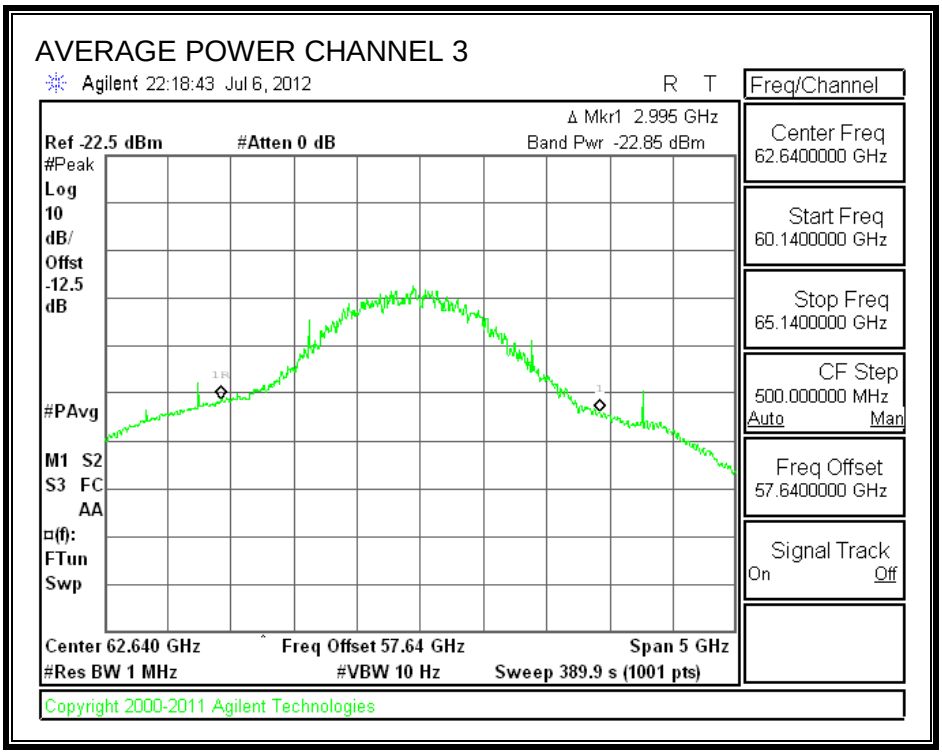
AVERAGE POWER DENSITY-HIGH - channel 3

Frequency (GHz)	Measurement Distance (m)	Measured Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
62.64	1.50	-22.85	23.00	26.0
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (uW/cm^2)**	**Average Limit (uW/cm^2)**
0.402	3.0	0.0036	0.36	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	36.4	12.00	24.40	275.4	1135	500
62.64	34.4	12.00	22.40	173.8	1030	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

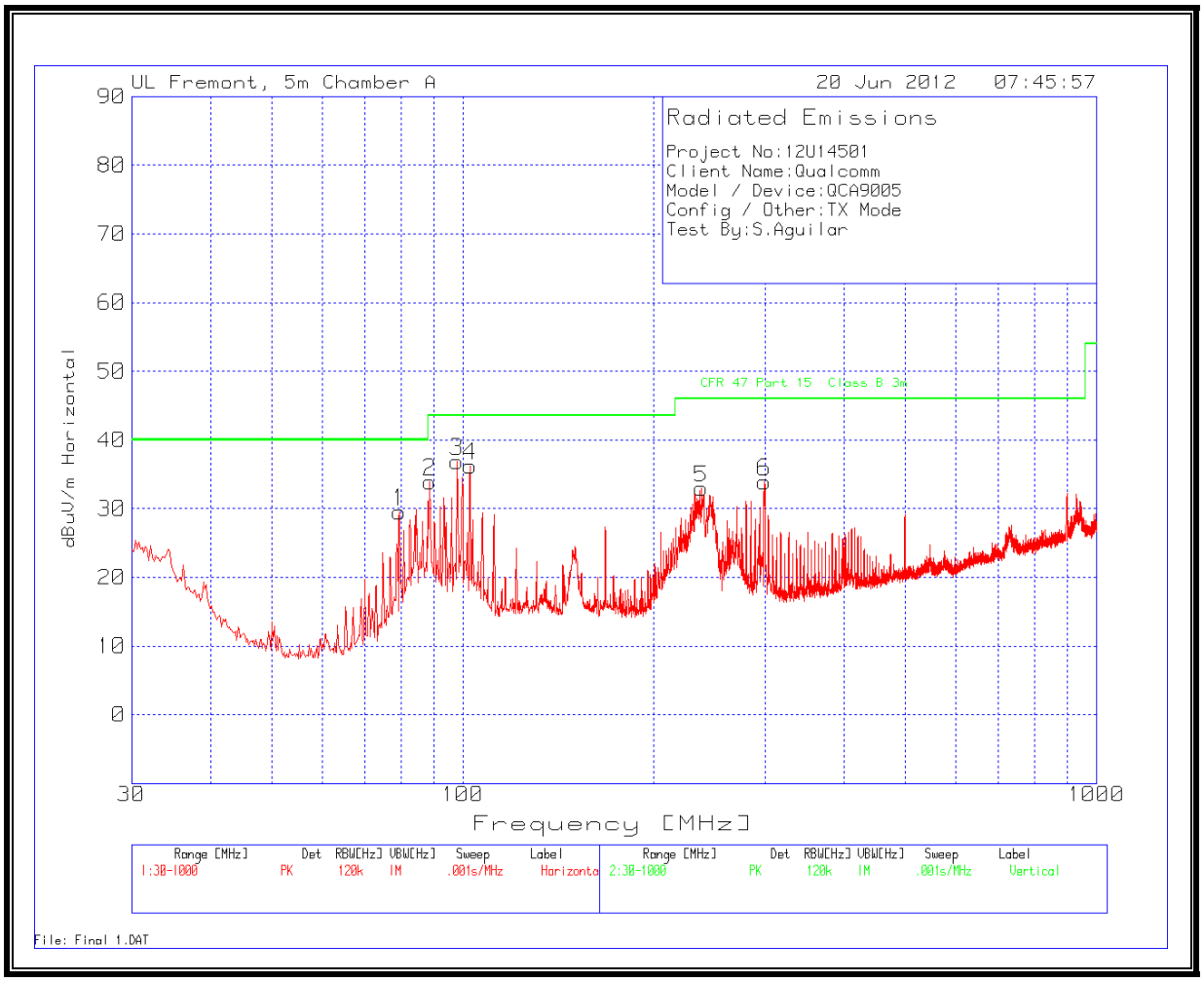
External mixers are utilized.

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.

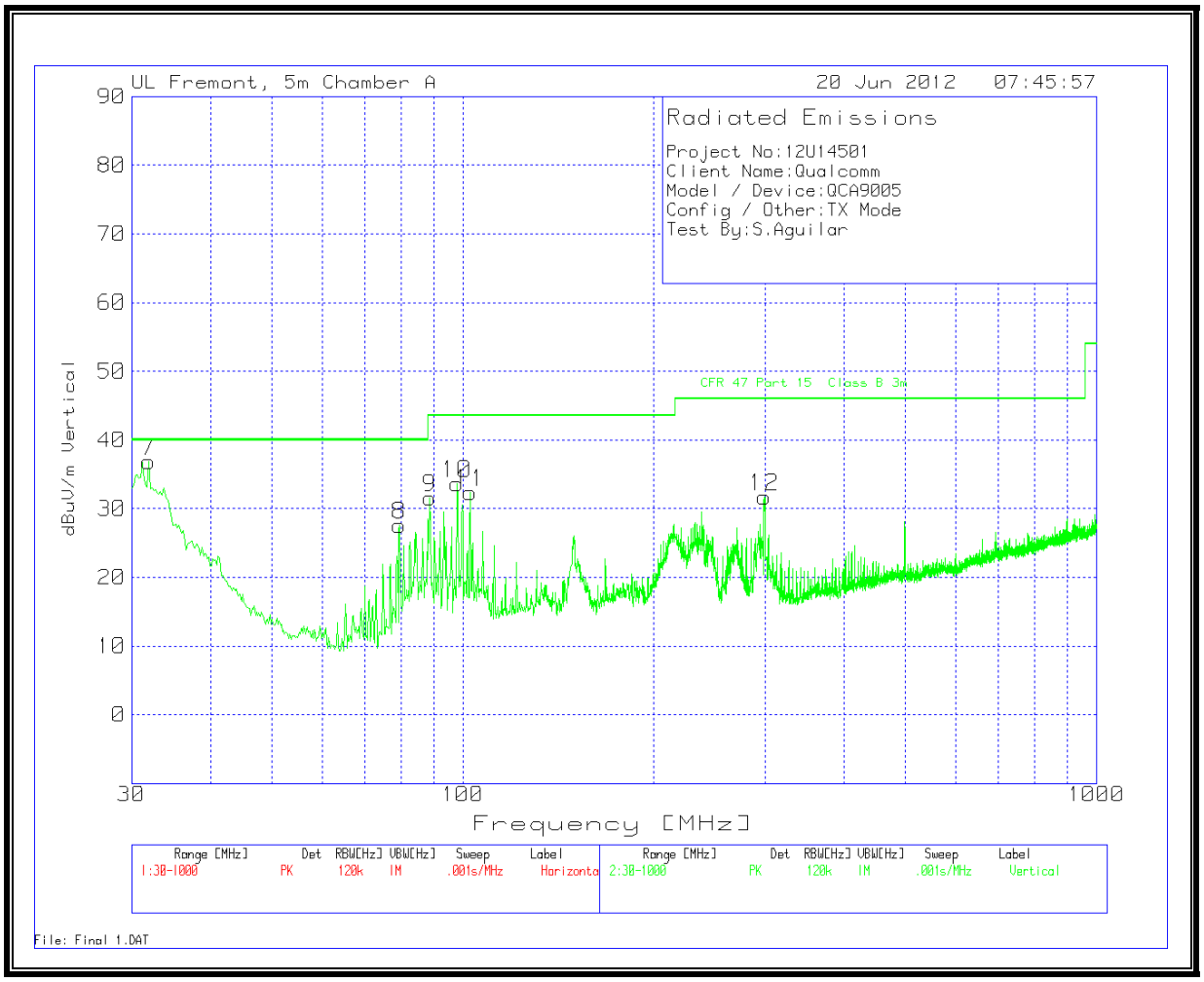
A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each mixer band that yields a minimum system noise floor at least 6 dB below the spurious emissions limit.

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: Qualcomm
Project: 112U14501
Date: 3/26/2012
Configuraiton: EUT + Laptop
Mode: TX, worst case
Tested by: S.Aguilar

Test Frequency [MHz]	Meter Reading [dB(µV)]	Detector	Pre Amp Factor [dB]	Antenna Factor [dB/m]	Corrected [dB(µV/m)]	Class B PK limit [dB(µV/m)]	QP Margin [dB]	Height [cm]	Polarity
Range 1 30 - 1000MHz									
79.4305	48.87	PK	-27.1	7.8	29.57	40	-10.43	399	Horz
88.735	53.43	PK	-27	7.5	33.93	43.5	-9.57	399	Horz
98.0396	54.45	PK	-26.9	9.3	36.85	43.5	-6.65	201	Horz
102.6918	52.29	PK	-26.8	10.7	36.19	43.5	-7.31	201	Horz
238.1894	46.95	PK	-25.5	11.5	32.95	46	-13.05	101	Horz
299.6383	45.85	PK	-25.2	13.3	33.95	46	-12.05	101	Horz
Range 2 30 - 1000MHz									
31.9384	44.58	PK	-27.5	19.8	36.88	40	-3.12	99	Vert
79.4305	46.86	PK	-27.1	7.8	27.56	40	-12.44	301	Vert
88.735	51.13	PK	-27	7.5	31.63	43.5	-11.87	201	Vert
98.0396	51.28	PK	-26.9	9.3	33.68	43.5	-9.82	201	Vert
102.6918	48.47	PK	-26.8	10.7	32.37	43.5	-11.13	301	Vert
299.6383	43.58	PK	-25.2	13.3	31.68	46	-14.32	99	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: Qualcomm
Project #: 12U14501
Date: 6-20-2012
Test Engineer: S.Aguilar
Configuration: 60 GHz TX , Marlon Triton
Mode: TX channel 2 and 3

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013	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															
1.593	3.0	55.08	41.94	26.8	3.5	-36.9	0.0	0.0	48.4	35.3	74	54	-25.6	-18.7	H
1.593	3.0	55.21	36.42	26.8	3.5	-36.9	0.0	0.0	48.6	29.8	74	54	-25.4	-24.2	V
2.487	3.0	51.06	30.94	28.8	4.6	-35.7	0.0	0.0	48.8	28.7	74	54	-25.2	-25.3	H
2.487	3.0	49.30	29.73	28.8	4.6	-35.7	0.0	0.0	47.1	27.5	74	54	-26.9	-26.5	V
5.280	3.0	35.55	27.92	33.9	7.1	-34.1	0.0	0.0	42.5	34.9	74	54	-31.5	-19.1	H
5.280	3.0	40.95	37.38	33.9	7.1	-34.1	0.0	0.0	47.9	44.3	74	54	-26.1	-9.7	V
7.560	3.0	41.97	39.02	36.6	9.1	-33.0	0.0	0.0	54.7	51.8	74	54	-19.3	-2.2	H
7.560	3.0	41.52	38.32	36.6	9.1	-33.0	0.0	0.0	54.3	51.1	74	54	-19.7	-2.9	V
15.120	3.0	41.27	27.42	40.5	12.7	-32.0	0.0	0.0	62.5	48.7	74	54	-11.5	-5.3	H
15.120	3.0	40.95	26.51	40.5	12.7	-32.0	0.0	0.0	62.2	47.8	74	54	-11.8	-6.2	V
22.640	3.0	33.88	21.14	33.4	16.3	-32.4	0.0	0.0	51.1	38.4	74	54	-22.9	-15.6	H
22.640	3.0	33.59	21.15	33.4	16.3	-32.4	0.0	0.0	50.8	38.4	74	54	-23.2	-15.6	V
Channel 3															
1.569	3.0	55.60	44.10	26.7	3.5	-37.0	0.0	0.0	48.8	37.3	74	54	-25.2	-16.7	H
1.569	3.0	53.42	42.99	26.7	3.5	-37.0	0.0	0.0	46.6	36.2	74	54	-27.4	-17.8	V
2.496	3.0	50.65	30.68	28.8	4.6	-35.6	0.0	0.0	48.5	28.5	74	54	-25.5	-25.5	H
2.496	3.0	49.14	40.09	28.8	4.6	-35.6	0.0	0.0	47.0	37.9	74	54	-27.0	-16.1	V
5.280	3.0	38.50	33.53	33.9	7.1	-34.1	0.0	0.0	45.4	40.5	74	54	-28.6	-13.5	H
5.280	3.0	40.17	36.16	33.9	7.1	-34.1	0.0	0.0	47.1	43.1	74	54	-26.9	-10.9	V
7.830	3.0	42.95	39.37	37.0	9.1	-32.8	0.0	0.0	56.3	52.7	74	54	-17.7	-1.3	H
7.830	3.0	42.89	39.95	37.0	9.1	-32.8	0.0	0.0	56.2	53.3	74	54	-17.8	-0.7	V
15.660	3.0	40.90	26.23	38.6	13.0	-31.9	0.0	0.0	60.7	46.0	74	54	-13.3	-8.0	H
15.660	3.0	40.91	26.48	38.6	13.0	-31.9	0.0	0.0	60.7	46.2	74	54	-13.3	-7.8	V
23.520	3.0	34.64	22.49	33.5	16.7	-32.3	0.0	0.0	52.5	40.4	74	54	-21.5	-13.6	H
23.520	3.0	34.52	22.53	33.5	16.7	-32.3	0.0	0.0	52.4	40.4	74	54	-21.6	-13.6	V

Rev. 11.10.11

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	0.400	-79.76	23.00	-43.8
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
4.16E-08	3.0	3.68E-10	0.04	90

CHANNEL 2

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
68.04	0.400	-78.54	23.00	-40.4
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
9.11E-08	3.0	8.06E-10	0.08	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	0.400	-71.99	23.00	-35.7
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
2.67E-07	3.0	2.36E-09	0.24	90

CHANNEL 3

Frequency (GHz)	Measurement Distance (m)	Peak Power (dBm)	Rx Antenna Gain (dBi)	EIRP (dBm)
70.58	0.400	-70.54	23.00	-32.1
EIRP (W)	**Specification Distance (m)**	**Power Density (W/m^2)**	**Power Density (pW/cm^2)**	**Limit (pW/cm^2)**
6.18E-07	3.0	5.47E-09	0.55	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:	Qualcomm
Project:	12U14501
Date:	6/28/2012
Configuraiton:	115VAC/ 60Hz
Mode:	TX worst case
Tested by:	S. 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]
0.195	51.46	PK	0.1	0	51.56	63.8	-12.24	-	-
0.195	33.56	Av	0.1	0	33.66	-	-	53.8	-20.14
6.4185	39.92	PK	0.1	0.1	40.12	60	-19.88	-	-
6.4185	23.41	Av	0.1	0.1	23.61	-	-	50	-26.39
12.6825	44.51	PK	0.2	0.2	44.91	60	-15.09	-	-
12.6825	29.7	Av	0.2	0.2	30.1	-	-	50	-19.9

Line-L2 .15 - 30MHz

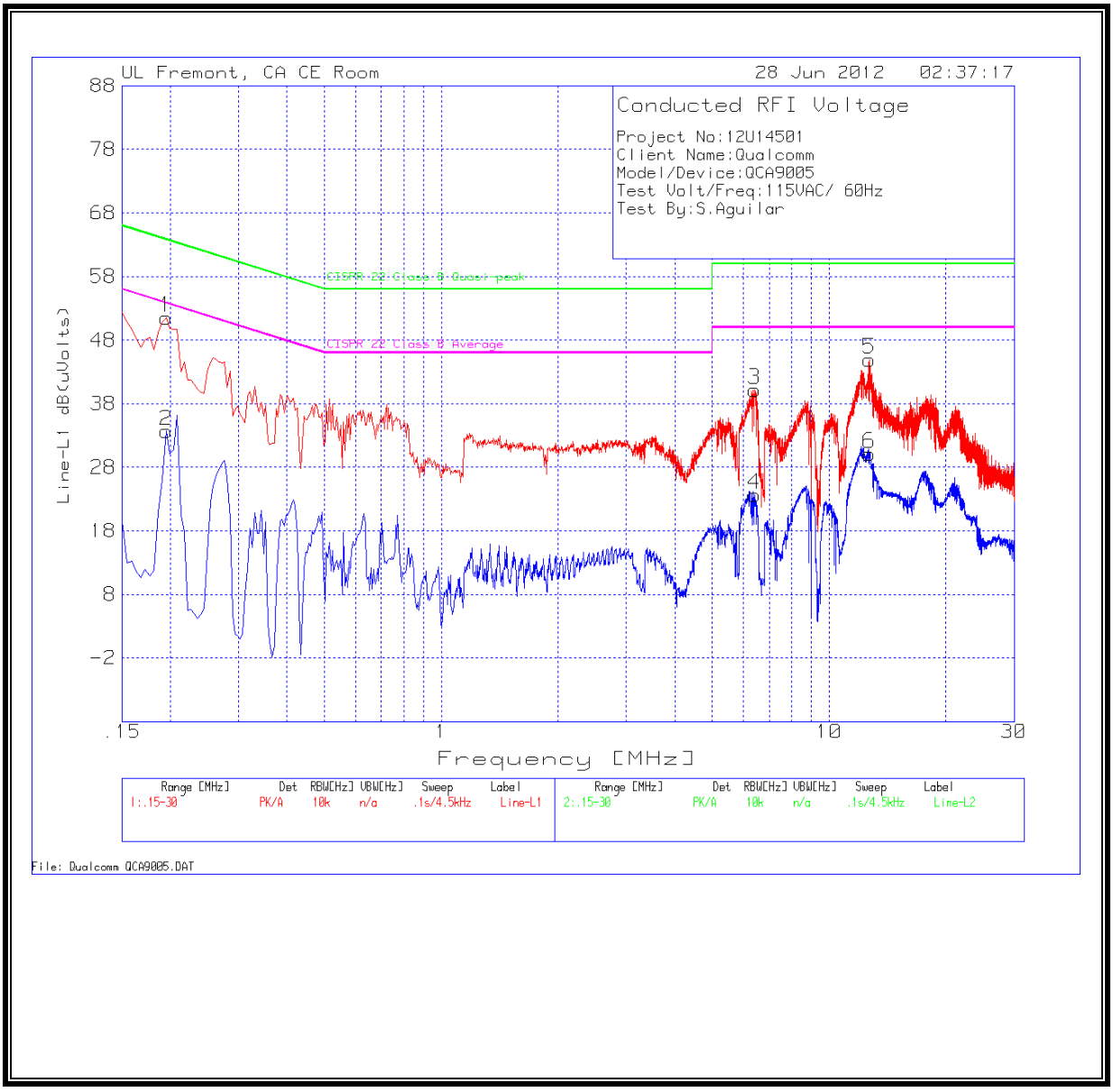
Test Frequency [MHz]	Meter Reading [dBuV]	Detector Type	LISN [dB]	Cables [dB]	Corrected [dB(uV)]	Class B QP Limit	QP Margin	Class B Av Limit [dB(uV)]	Av Margin [dB]
0.1545	49.87	PK	0.1	0	49.97	65.8	-15.83	-	-
0.1545	12.11	Av	0.1	0	12.21	-	-	55.8	-43.59
0.20625	48.13	PK	0.1	0	48.23	63.4	-15.17	-	-
0.20625	34.87	Av	0.1	0	34.97	-	-	53.4	-18.43
0.348	43.48	PK	0.1	0	43.58	59	-15.42	-	-
0.348	25.88	Av	0.1	0	25.98	-	-	49	-23.02

PK - Peak detector

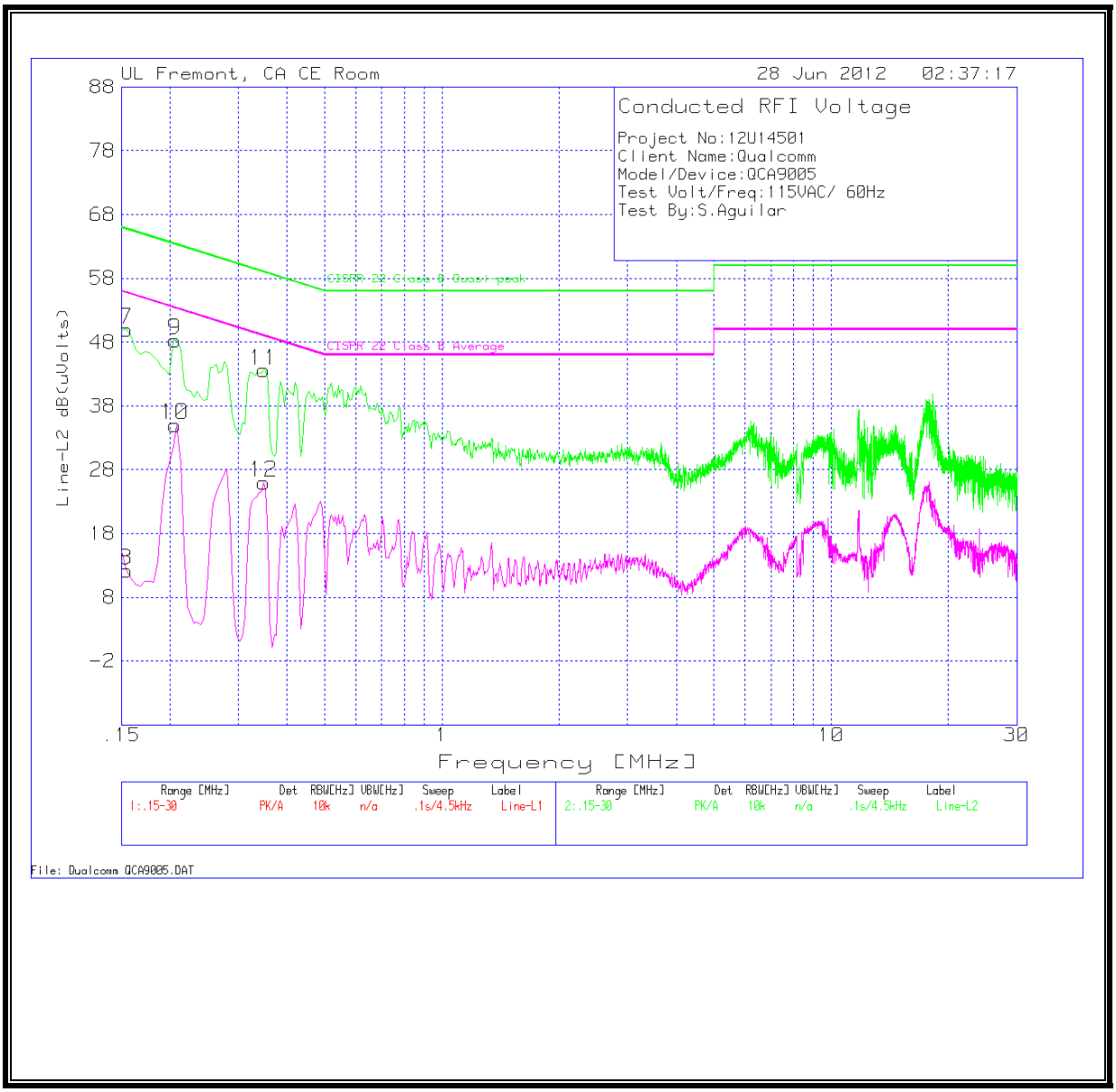
QP - Quasi-Peak detector

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	60481.8661000	2078.700
115.00	50	60480.2194000	432.000
115.00	***20***	***60479.7874000***	***Reference***
115.00	10	60479.8228000	35.400
115.00	0	60479.9814000	194.000
97.15	20	60479.7958000	8.400
132.25	20	60479.7958000	8.400

7.8. 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.

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

See Manufacturer Attestation

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)
27.8	0.603	20	1.20	10	0.12	1

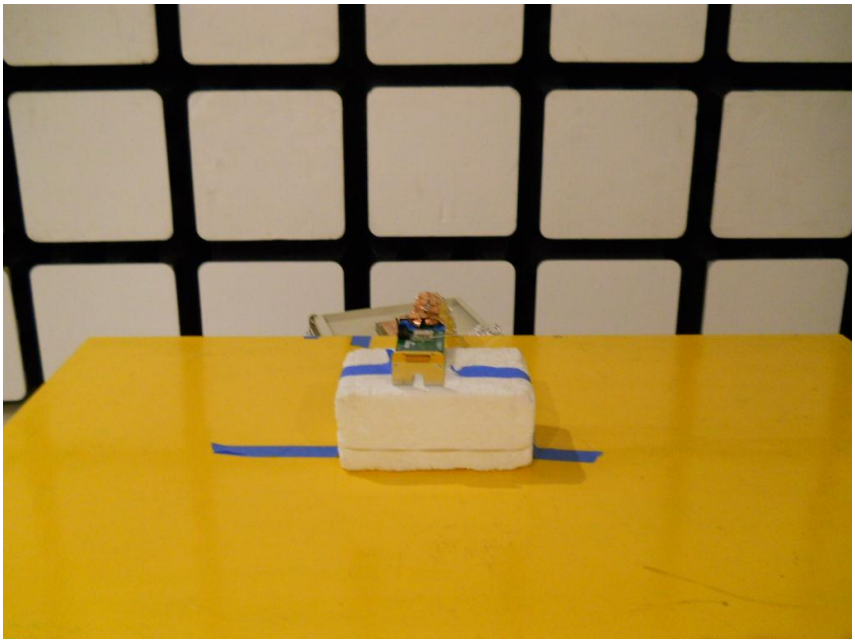
Channel 3

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)
26.0	0.398	20	0.79	10	0.08	1

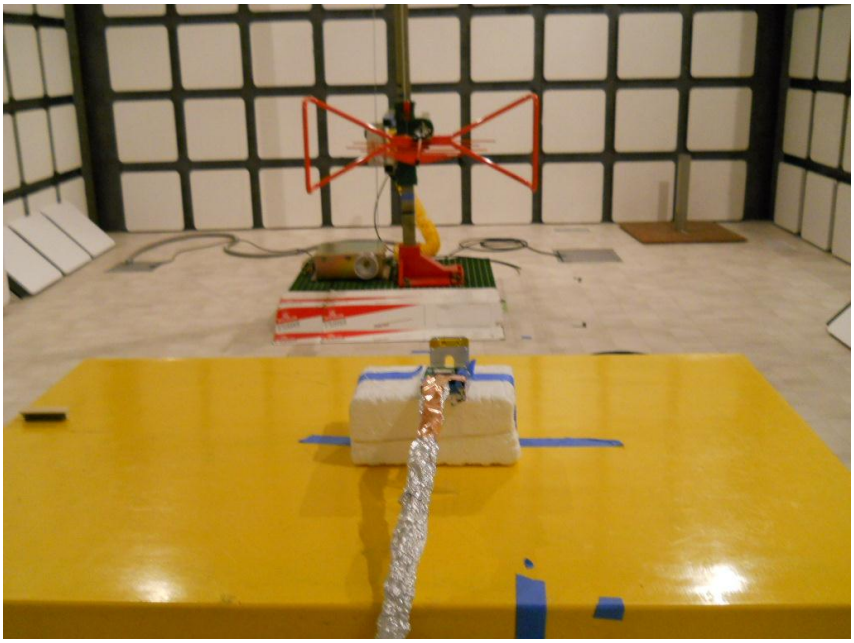
9. SETUP PHOTOS

RADIATED MEASUREMENT SETUP

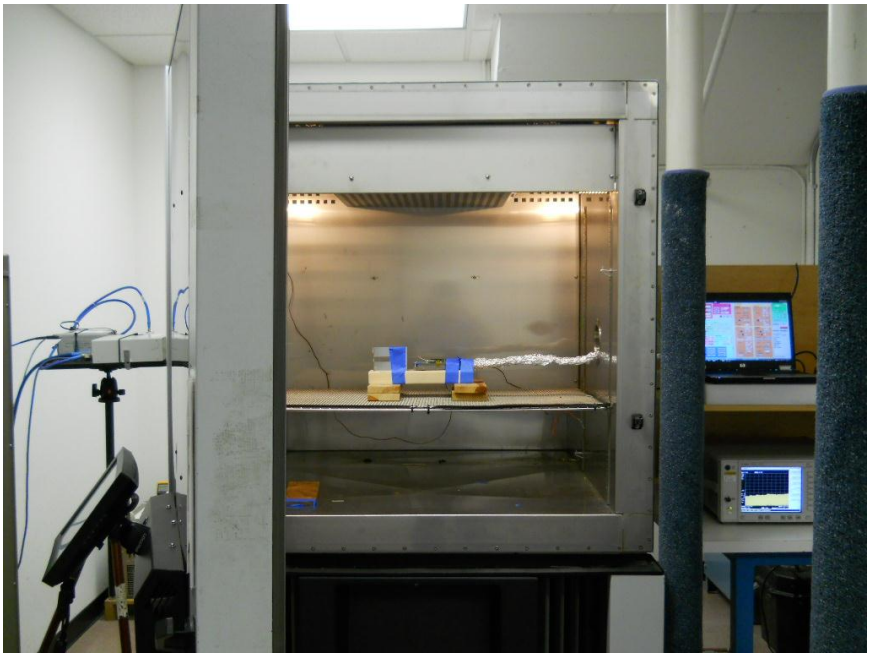
FRONT VIEW



BACK VIEW

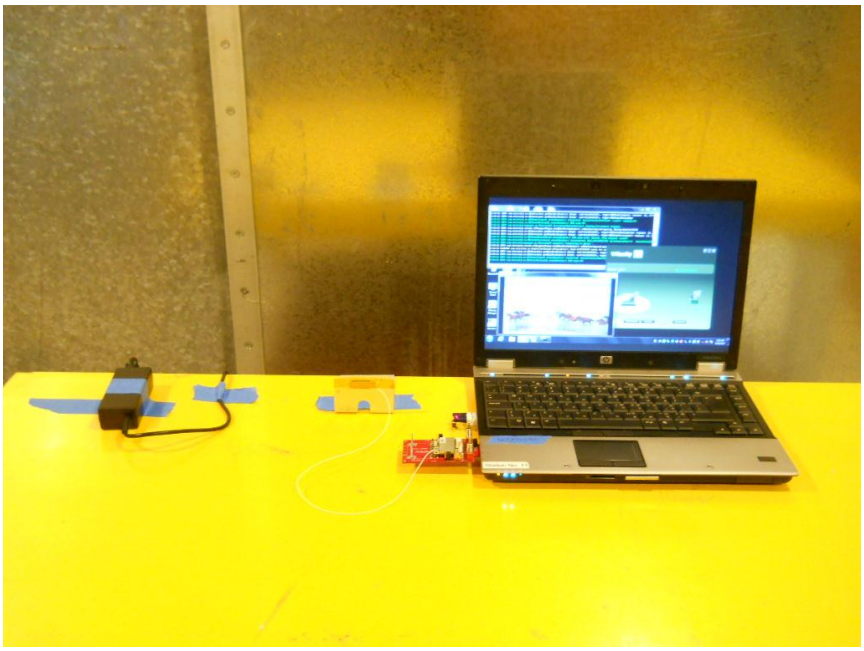


TEMPERATURE CHAMBER MEASUREMENT SETUP

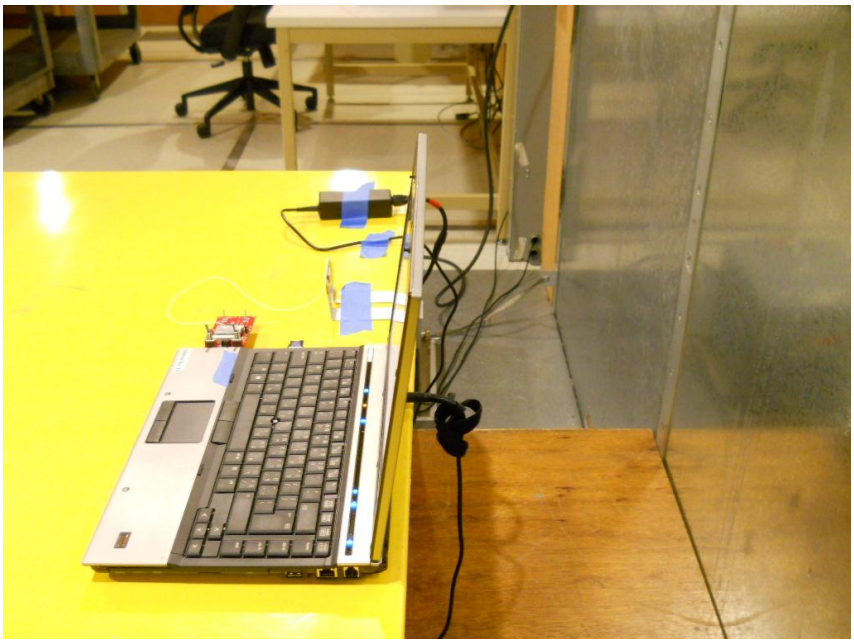


LINE CONDUCTED EMISSIONS SETUP

FRONT VIEW



BACK VIEW



END OF REPORT