

Digital Path

TEST REPORT FOR

GEN6 CPE

Models: 2x-24 and 2x-29

Tested to The Following Standards:

FCC Part 15 Subpart E Section(s)

15.407

(NII 5.725 – 5.850GHz)

Report No.: 99466-4

Date of issue: March 15, 2017



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

TABLE OF CONTENTS

Administrative Information	3
Test Report Information	3
Report Authorization	3
Test Facility Information	4
Software Versions.....	4
Site Registration & Accreditation Information	4
Summary of Results	5
Modifications During Testing.....	5
Conditions During Testing.....	5
Equipment Under Test.....	6
General Product Information.....	6
FCC Part 15 Subpart E.....	7
15.407(a) Output Power	7
15.407(a) Power Spectral Density	16
15.407(b) Radiated Emissions & Band Edge	25
Supplemental Information.....	41
Measurement Uncertainty	41
Emissions Test Details.....	41

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Digital Path
275 Air Park Blvd, Suite 500
Chico, CA 95973

Representative: Brock Eastman
Customer Reference Number: DP-CA-126

REPORT PREPARED BY:

Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 99466

DATE OF EQUIPMENT RECEIPT:
DATE(S) OF TESTING:

March 1, 2017
March 1, 2017

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Mariposa A, CA	US0103	SL2-IN-E- 1147R	3082A-2	US1024	A-0136

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart E - 15.407 (NII)

Test Procedure	Description	Modifications	Results
15.407(e)	6dB Bandwidth	NA	NA1
15.407(a)	Output Power	NA	Pass
15.407(a)	Power Spectral Density	NA	Pass
15.407(g)	Frequency Stability	NA	NA1
15.407(b)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA1

NA = Not applicable

NA1 = Not applicable because this is a limited test suite for PCII evaluation in accordance with KDB requirement.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions

No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions

None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
POE Power Adapter	Generic	FAS24000050-C44	NA
GEN6 CPE	Digital Path	2x-24	C6:A6
GEN6 CPE	Digital Path	2x-29	C6:A6

Support Equipment:

Device	Manufacturer	Model #	S/N
AC/DC power Adapter	HP	Series PPP012H-S	F12941126327228
Laptop Computer	HP	Probook 6565b	NA

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Point to Point System
Operating Frequency Range:	5735-5840MHz
Modulation Type(s):	OFDM
Maximum Duty Cycle:	99%
Number of TX Chains:	2
Antenna Type(s) and Gain:	Dish antenna, 24dBi, 29dBi
Beamforming Type:	NA
Antenna Connection Type:	Antenna port
Nominal Input Voltage:	110/60 (POE supplied with the product)
Firmware / Software used for Test:	ART2 client software – version 2.28.7bin Art binary on CPE device – “Linux MDK driver 1.0”

FCC Part 15 Subpart E

15.407(a) Output Power

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 789033	Test Date(s):	3/1/2017
Configuration:	1		
Test Setup:	<p>This is a PCII of previously certified product identified by FCCID: RHK-G6CPE. Original authorized under 15.247 in the 5.8 GHz band test report # 96184 line 10. This evaluation is to upgrade certification to 15.407 5.8 GHz band in accordance with FCC KDB 926956, limited testing.</p> <p>FCCID: RHK-G6CPE</p> <p>The EUT is placed on the test bench, RF characteristic evaluate at antenna port Chain 0 and Chain 1.</p> <p>5735-5840MHz</p> <p>Modulation: OFDM</p> <p>TX Freq: 5735 MHz, 5785MHz, 5840MHz</p> <p>Channel BW /Data Rate: 10MHz/13Mbps.</p> <p>TX power setting 24dBm for 24dBi antenna, 20dBm for 29dBi antenna.</p> <p>Test method: ANSI C63.10-2013, KDB: 926956 DO1 U-NII transition Plan V2 August 22, 2016.</p>		

Environmental Conditions			
Temperature (°C)	23	Relative Humidity (%):	52

Test Equipment					
Asset# / Serial#	Description	Manufacturer	Model	Cal Date	Cal Due
02668	Spectrum Analyzer	Agilent	E4446A	8/26/2016	8/26/2017
03011	Cable	AstroSteel	32022-2-2909K-24TC	2/9/2017	2/9/2019

Test Data Summary - RF Conducted Measurement

Measurement Option: AVGSA-1

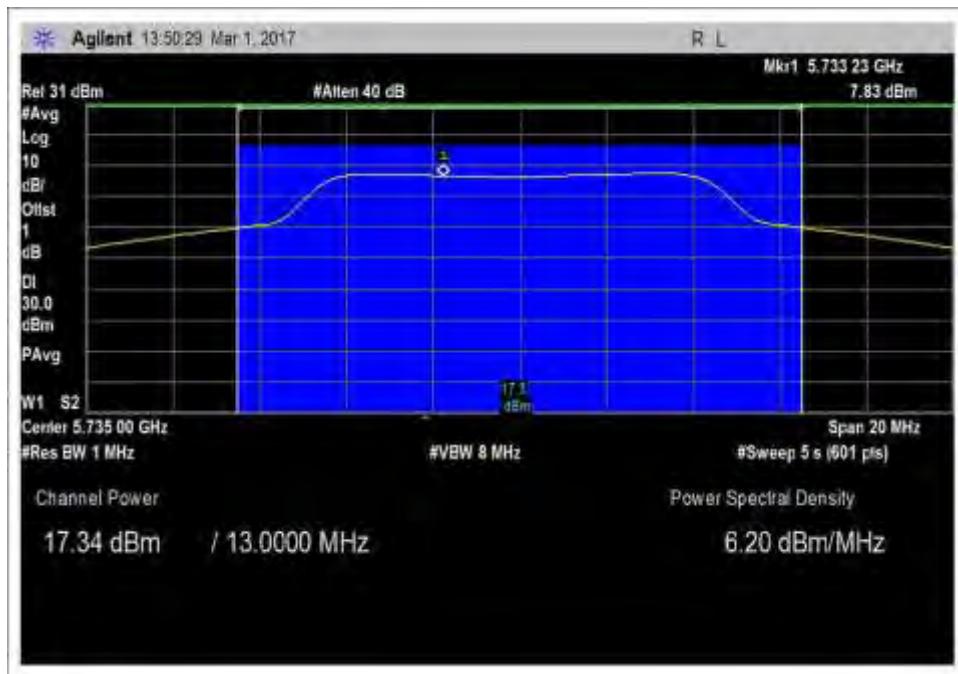
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
Chain 0					
5735	OFDM	Dish 24dBi	18.37	≤30	Pass
5785	OFDM	Dish 24dBi	17.95	≤30	Pass
5840	OFDM	Dish 24dBi	17.25	≤30	Pass
Chain 1					
5735	OFDM	Dish 24dBi	18.90	≤30	Pass
5785	OFDM	Dish 24dBi	19.57	≤30	Pass
5840	OFDM	Dish 24dBi	19.26	≤30	Pass

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm)	Limit (dBm)	Results
Chain 0					
5735	OFDM	Dish 29dBi	17.34	≤30	Pass
5785	OFDM	Dish 29dBi	16.90	≤30	Pass
5840	OFDM	Dish 29dBi	16.79	≤30	Pass
Chain 1					
5735	OFDM	Dish 29dBi	18.63	≤30	Pass
5785	OFDM	Dish 29dBi	18.63	≤30	Pass
5840	OFDM	Dish 29dBi	18.15	≤30	Pass

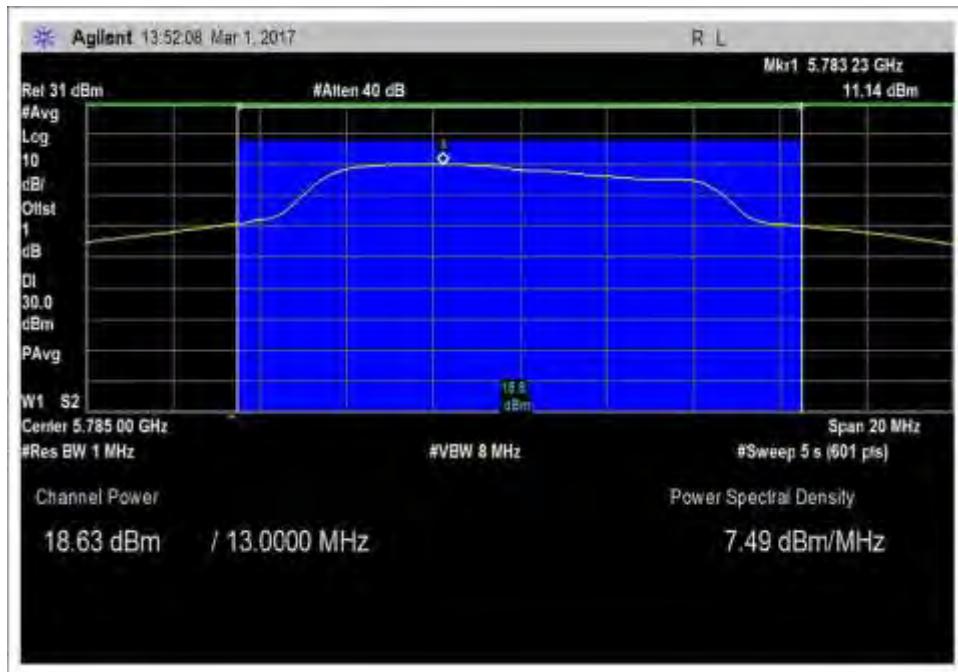
For equipment using antennas other than in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(3):

$$\text{Limit} = 30 - \text{Roundup}(G - 6)$$

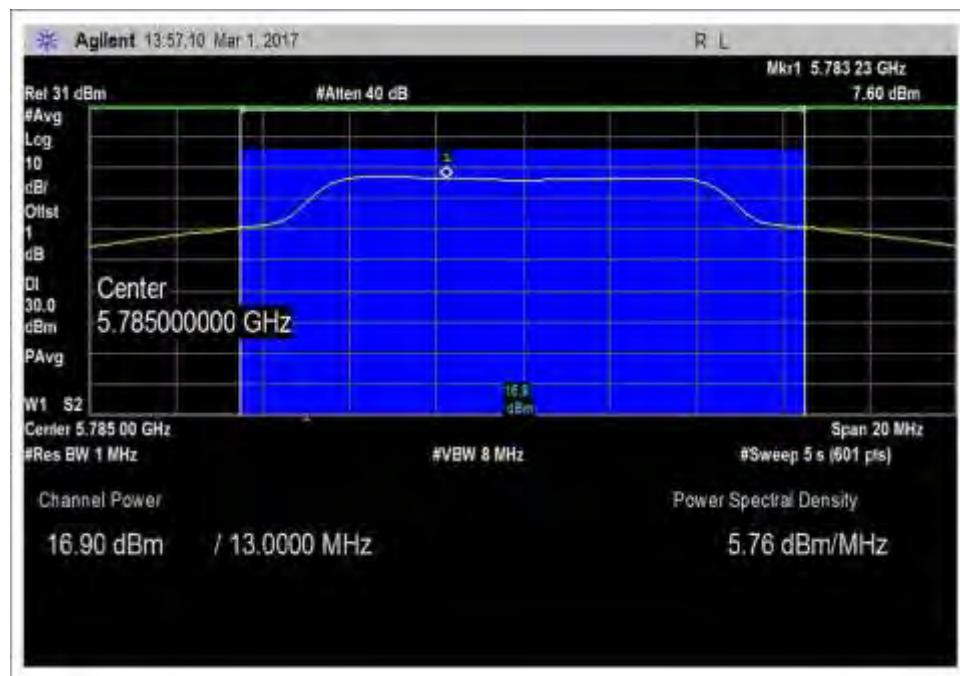
Plot Data – RF Conducted Measurement



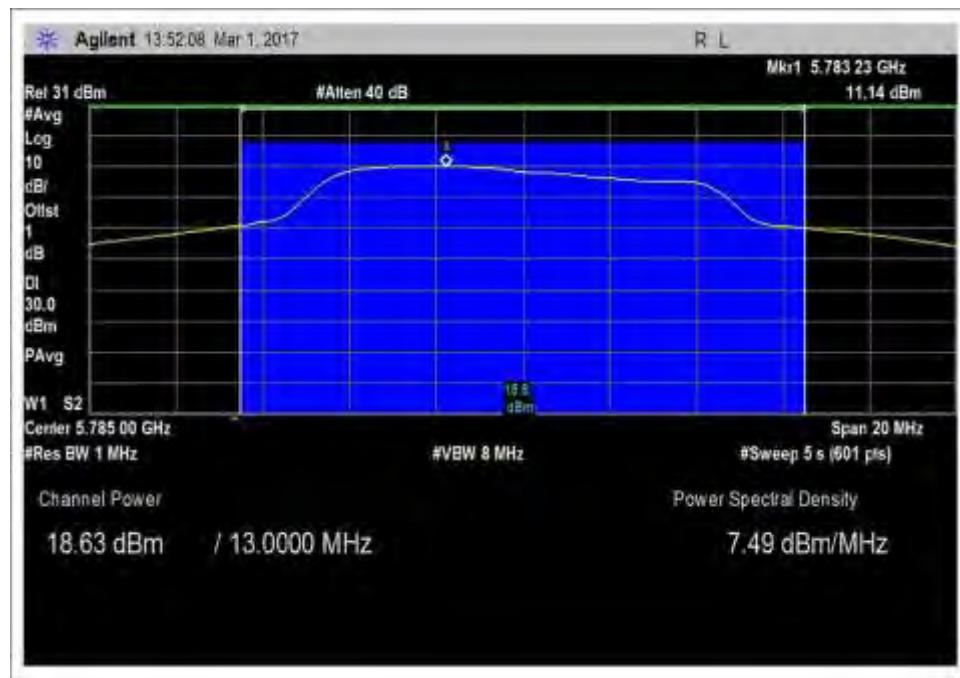
Power_TX20dBm_5735MHz_chain 0_RMS



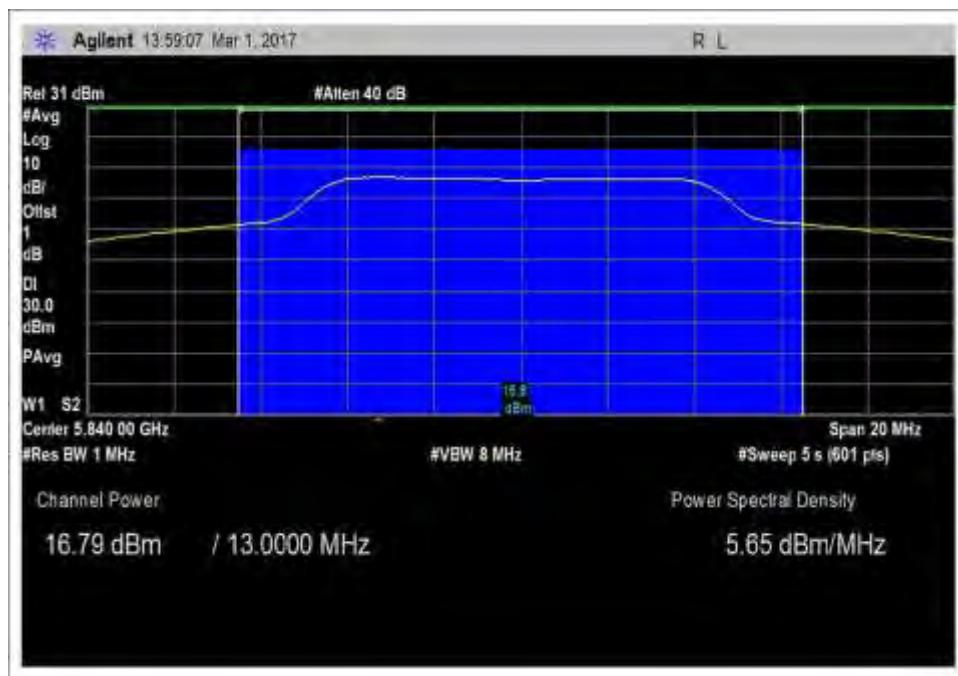
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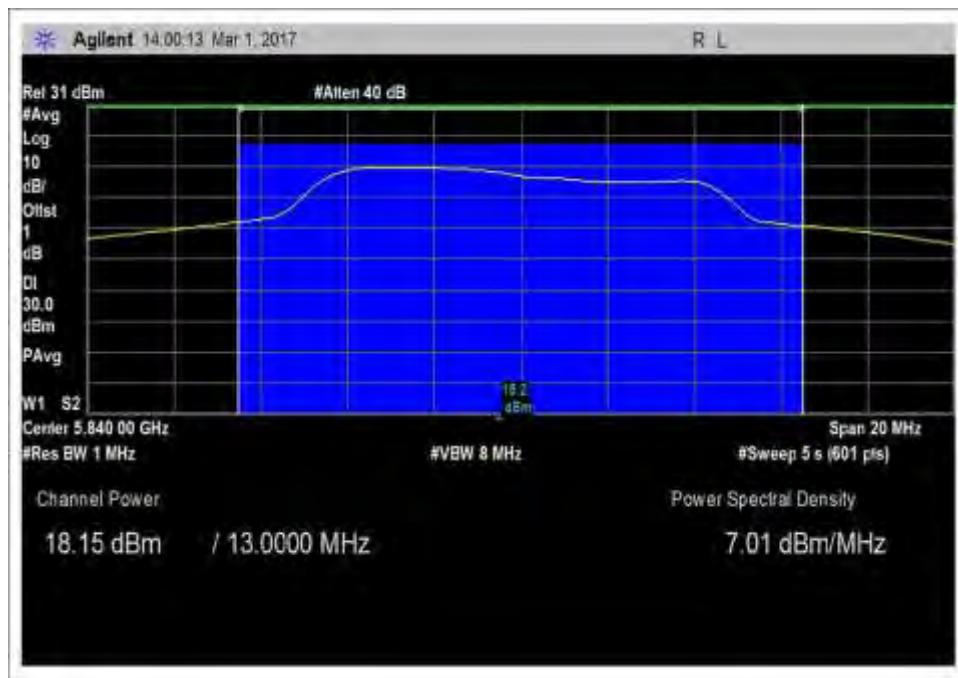
Power_TX20dBm_5785MHz_chain 0 RMS



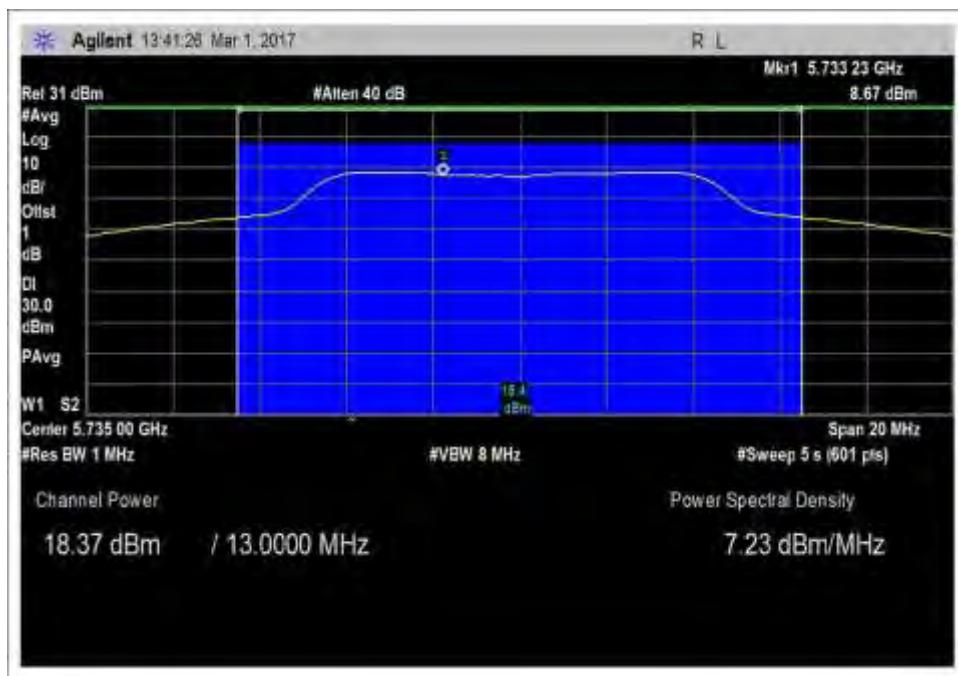
Power_TX20dBm_5785MHz_chain 1 RMS



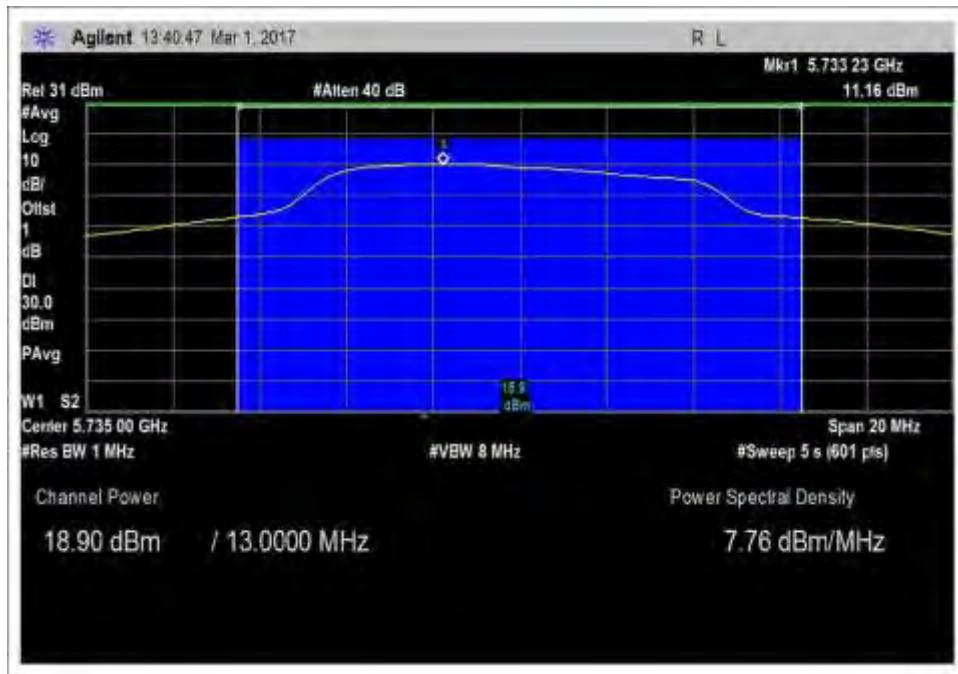
Power_TX20dBm_5840MHz_chain 0 RMS



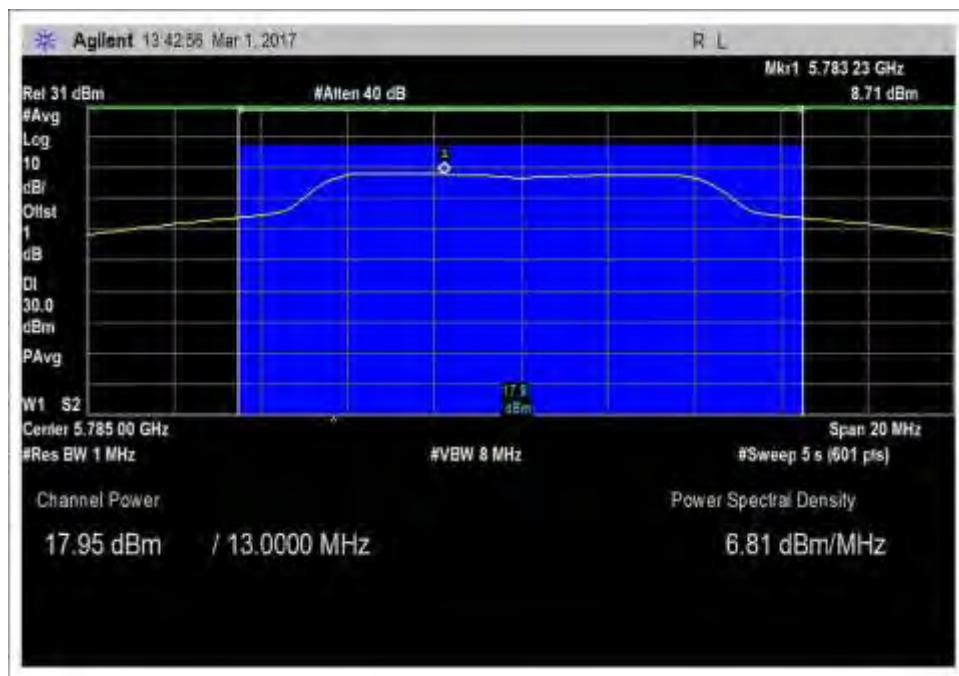
Power_TX20dBm_5840MHz_chain 1 RMS



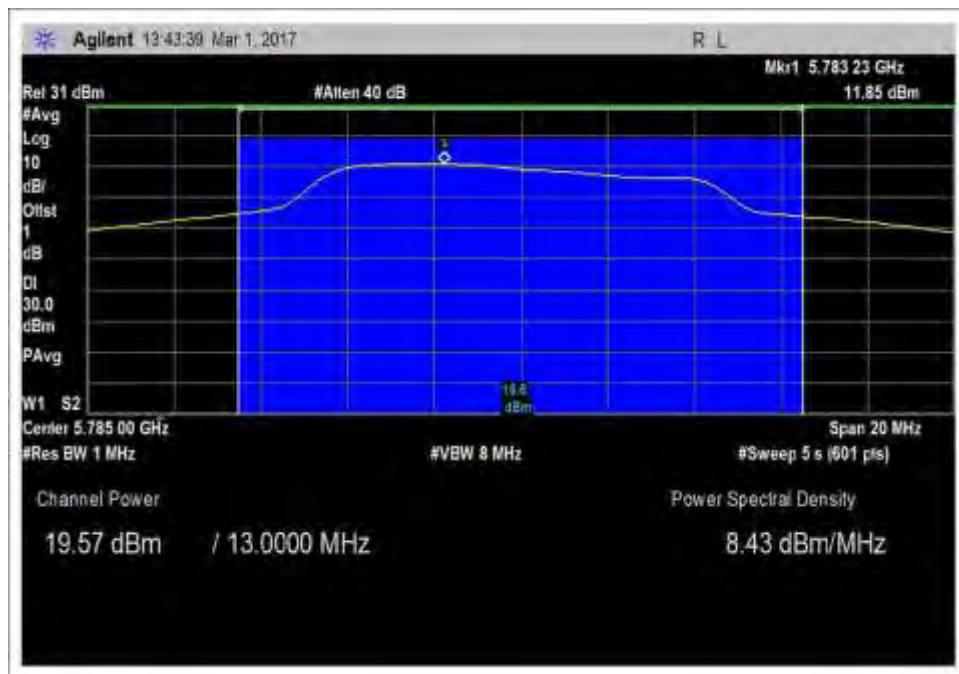
Power_TX24dBm_5735MHz_chain 0_RMS



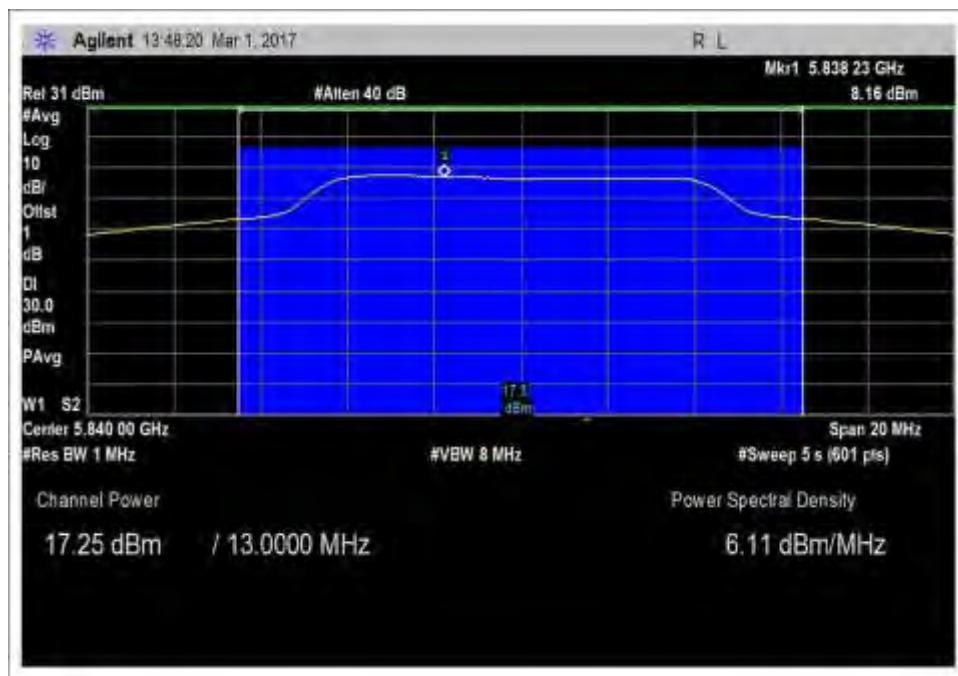
Power_TX24dBm_5735MHz_chain 1_RMS



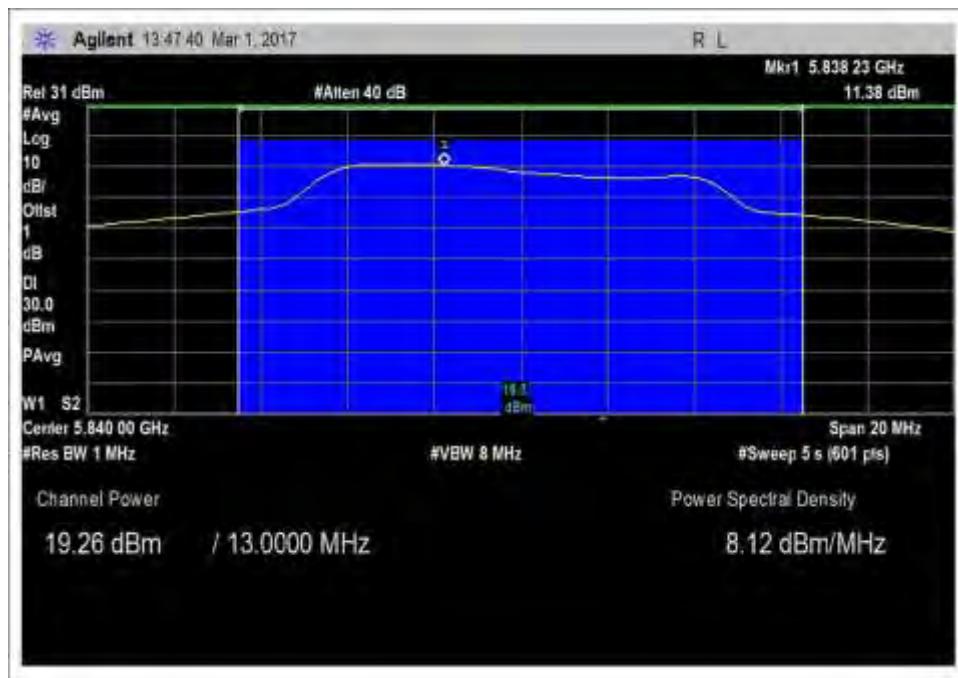
Power_TX24dBm_5785MHz_chain 0_RMS



Power_TX24dBm_5785MHz_chain 1_RMS

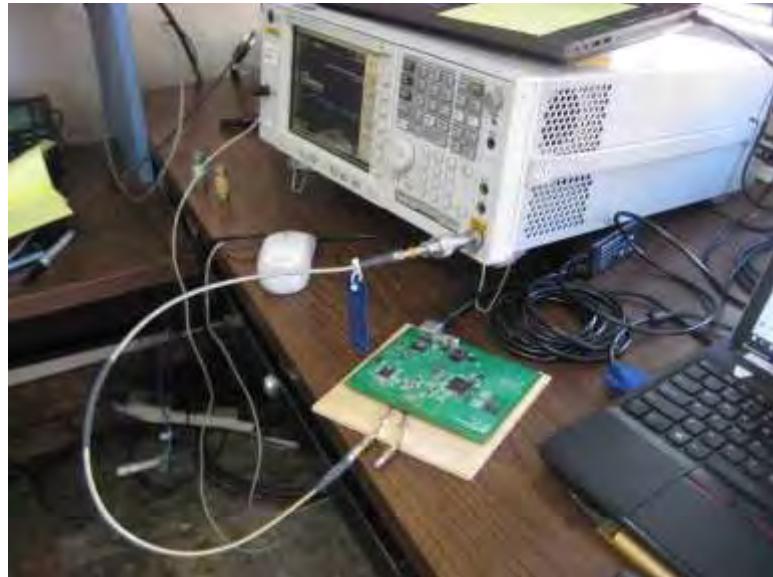


Power_TX24dBm_5840MHz_chain 0_RMS



Power_TX24dBm_5840MHz_chain 1_RMS

Test Setup Photo(s) - RF Conducted Measurement



15.407(a) Power Spectral Density

Test Setup/Conditions			
Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 789033	Test Date(s):	3/1/2017
Configuration:	1		
Test Setup:	<p>This is a PCII of previously certified product identified by FCCID: RHK-G6CPE. Original authorized under 15.247 in the 5.8 GHz band test Report 96184 line 10. This evaluation is to upgrade certification to 15.407 5.8 GHz band in accordance with FCC KDB 926956, limited testing.</p> <p>FCCID: RHK-G6CPE</p> <p>The EUT is placed on the test bench, RF characteristic evaluate at antenna port Chain 0 and Chain 1.</p> <p>5735-5840MHz</p> <p>Modulation: OFDM</p> <p>TX Freq: 5735 MHz, 5785MHz, 5840MHz</p> <p>Channel BW /Data Rate: 10MHz/13Mbps.</p> <p>TX power setting 24dBm for 24dBi antenna, 20dBm for 29dBi antenna.</p> <p>Test method: ANSI C63.10-2013 , KDB: 926956 DO1 U-NII transition Plan V2 August 22, 2016</p>		

Environmental Conditions			
Temperature (°C)	23	Relative Humidity (%):	52

Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02668	Spectrum Analyzer	Agilent	E4446A	8/26/2016	8/26/2017
03011	Cable	AstroSteel	32022-2-2909K-24TC	2/9/2017	2/9/2019

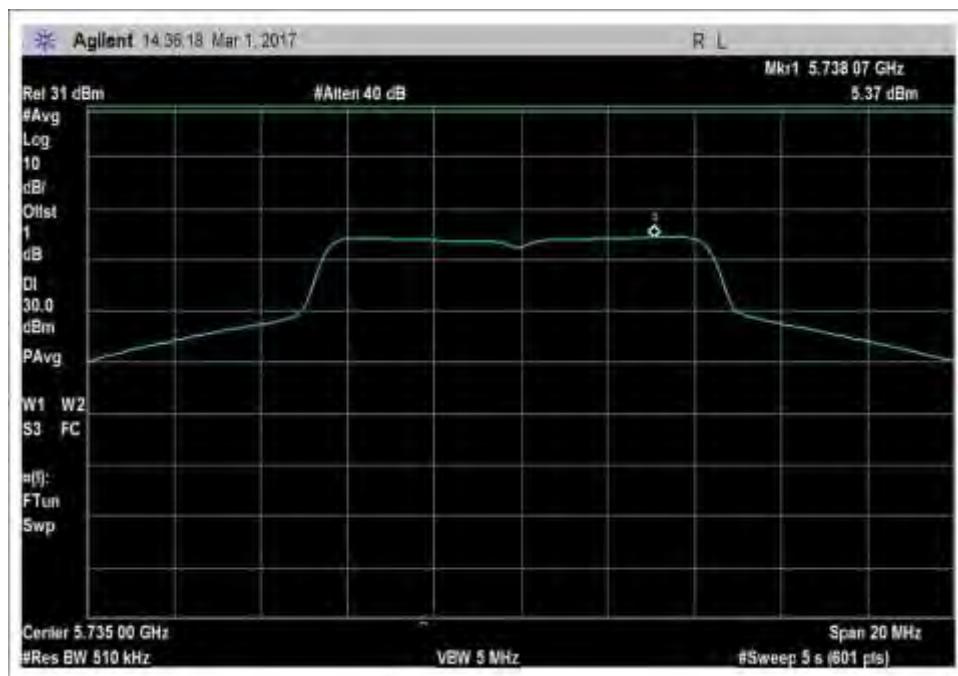
Test Data Summary - RF Conducted Measurement

Measurement Option: AVGSA-1

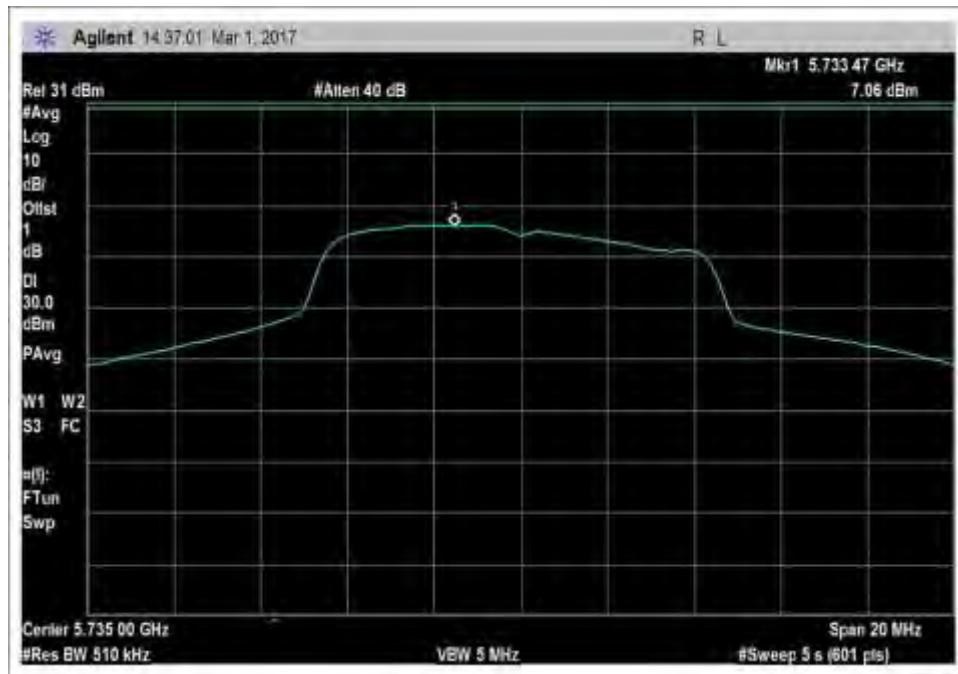
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Measured (dBm/500kHz)	Limit (dBm/500kHz)	Results
Chain 0					
5735	OFDM	Dish 24dBi	6.54	≤ 30	Pass
5785	OFDM	Dish 24dBi	5.99	≤ 30	Pass
5840	OFDM	Dish 24dBi	5.31	≤ 30	Pass
Chain 1					
5735	OFDM	Dish 24dBi	8.75	≤ 30	Pass
5785	OFDM	Dish 24dBi	9.39	≤ 30	Pass
5840	OFDM	Dish 24dBi	9.36	≤ 30	Pass

Chain 0					
5735	OFDM	Dish 29dBi	5.37	≤ 30	Pass
5785	OFDM	Dish 29dBi	5.06	≤ 30	Pass
5840	OFDM	Dish 29dBi	4.96	≤ 30	Pass
Chain 1					
5735	OFDM	Dish 29dBi	7.06	≤ 30	Pass
5785	OFDM	Dish 29dBi	7.85	≤ 30	Pass
5840	OFDM	Dish 29dBi	7.90	≤ 30	Pass

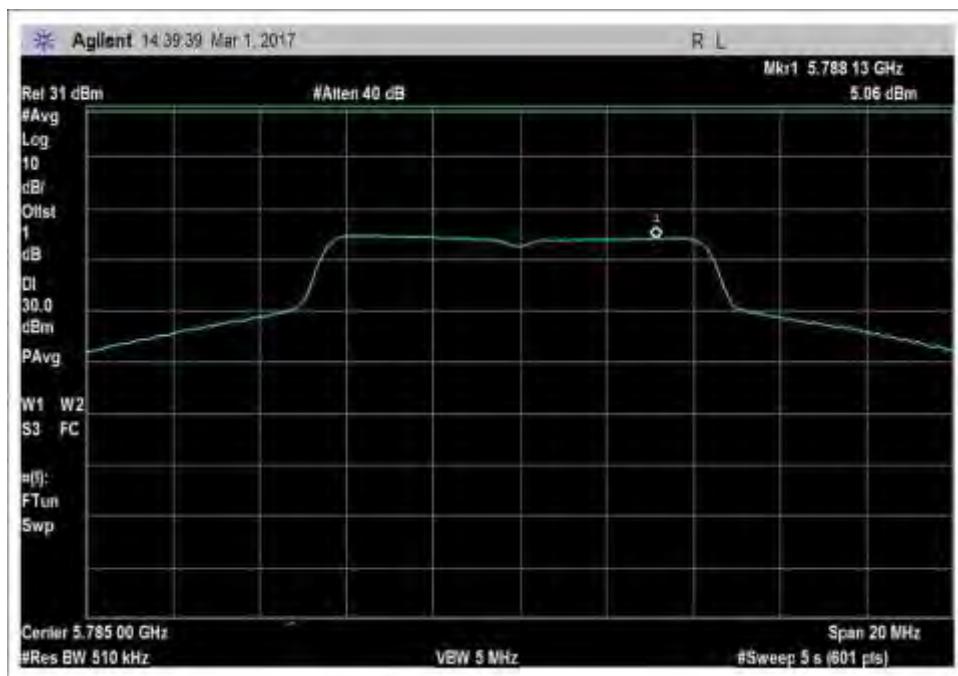
Plot Data



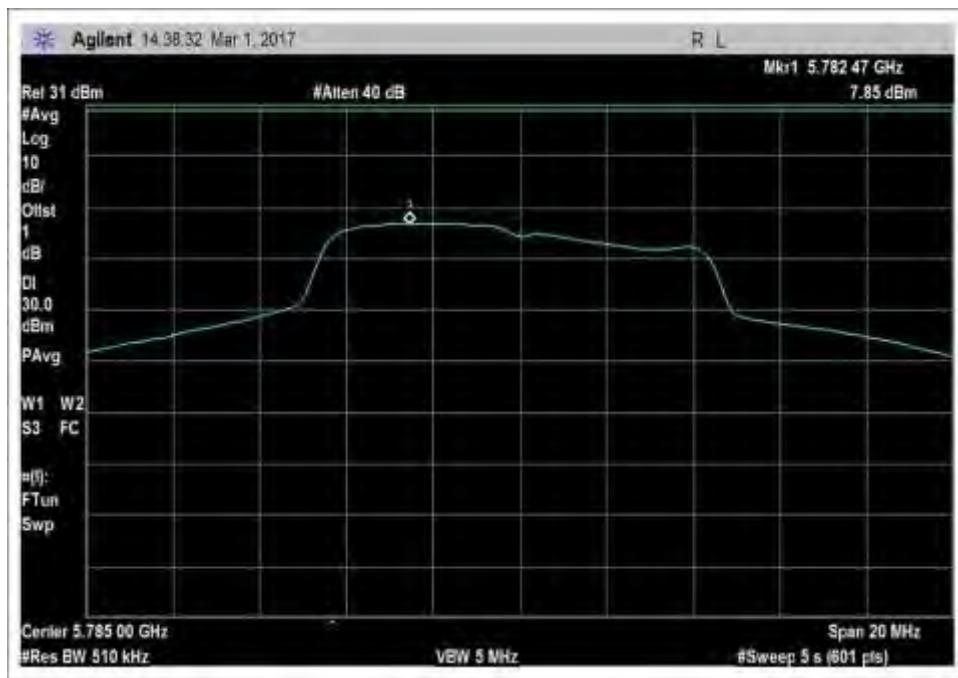
PSD_TX20dBm_5735MHz_chain 0_RMS



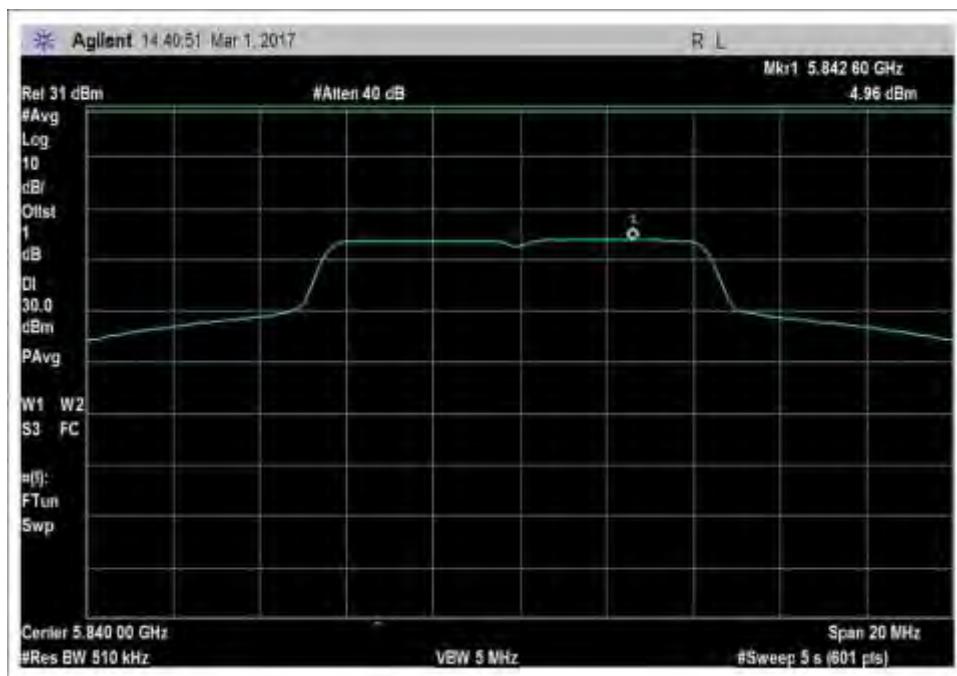
PSD_TX20dBm_5735MHz_chain 1_RMS



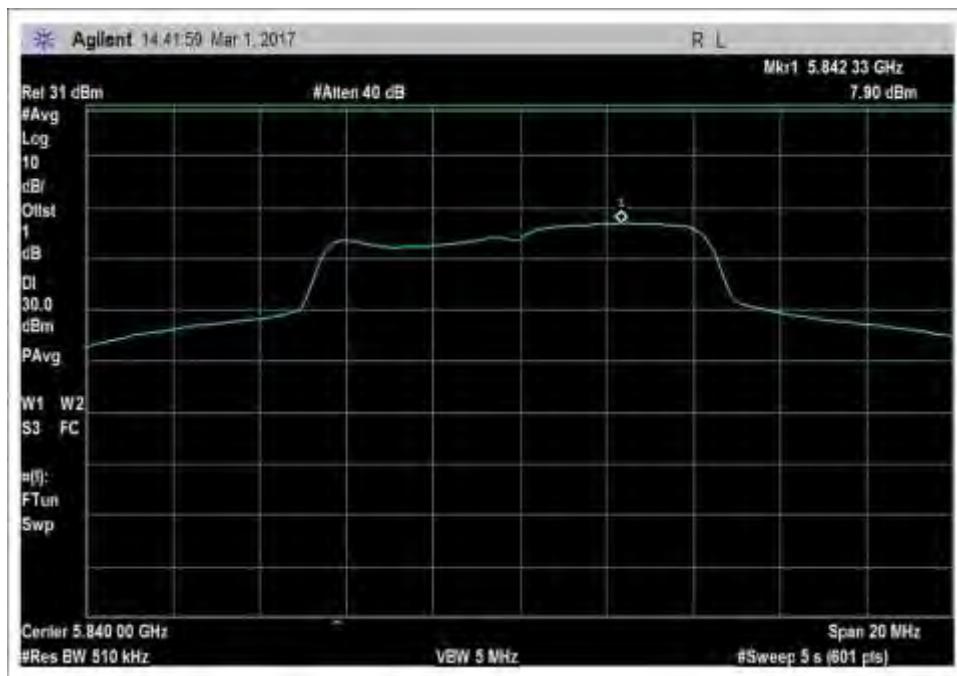
PSD_TX20dBm_5785MHz_chain 0_RMS



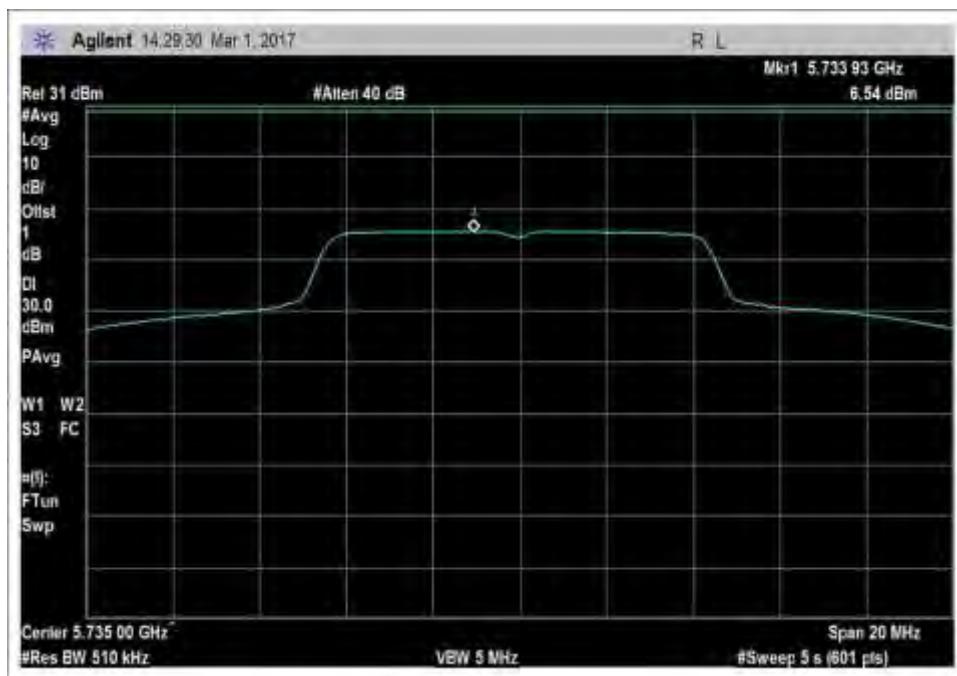
PSD_TX20dBm_5785MHz_chain 1_RMS



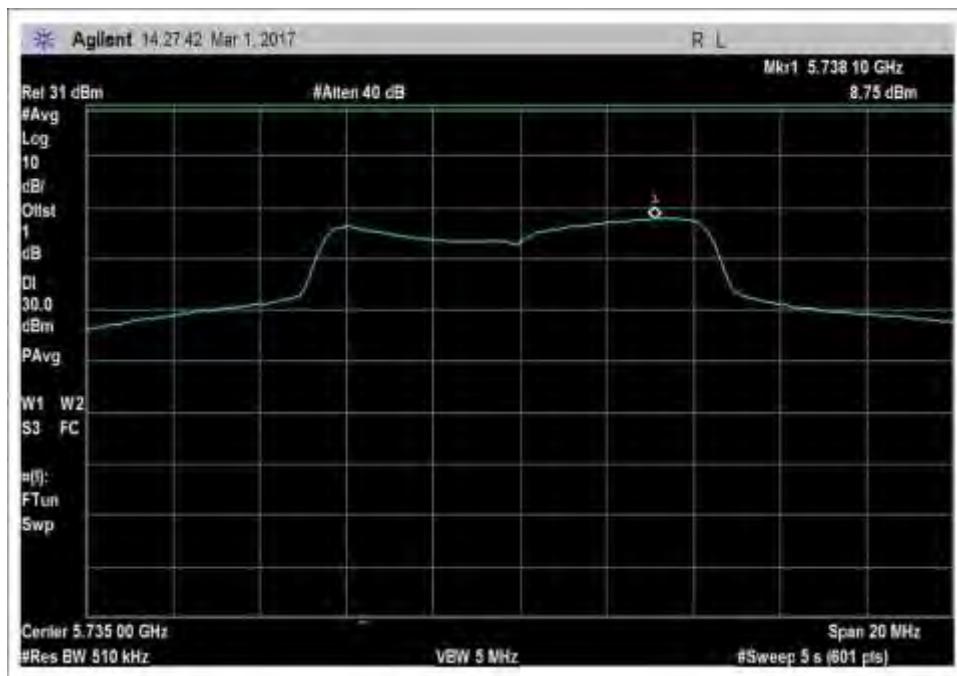
PSD_TX20dBm_5840MHz_chain 0_RMS



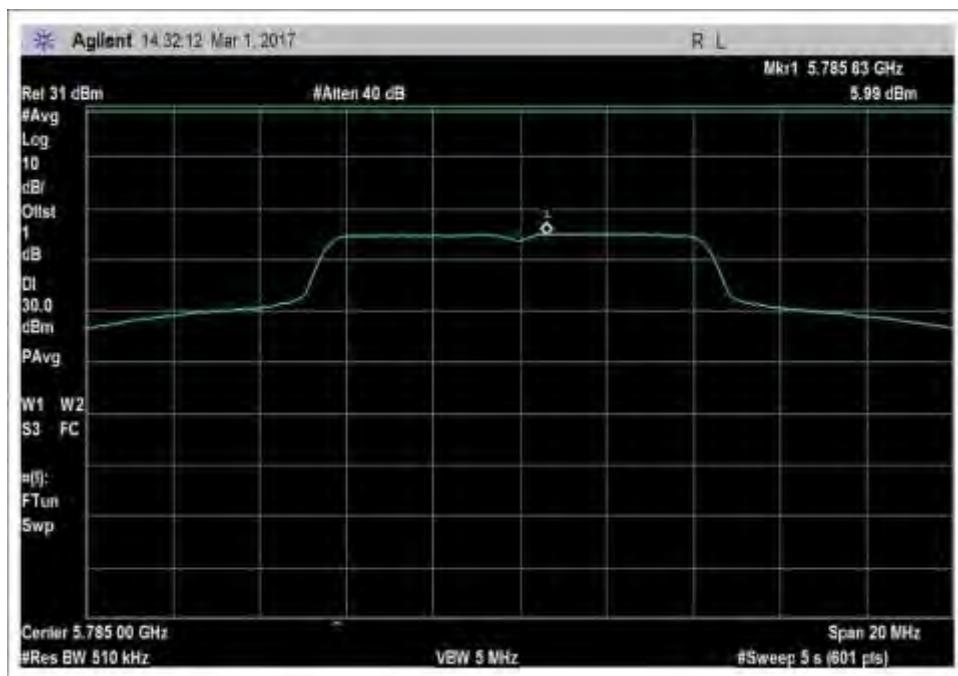
PSD_TX20dBm_5840MHz_chain 1_RMS



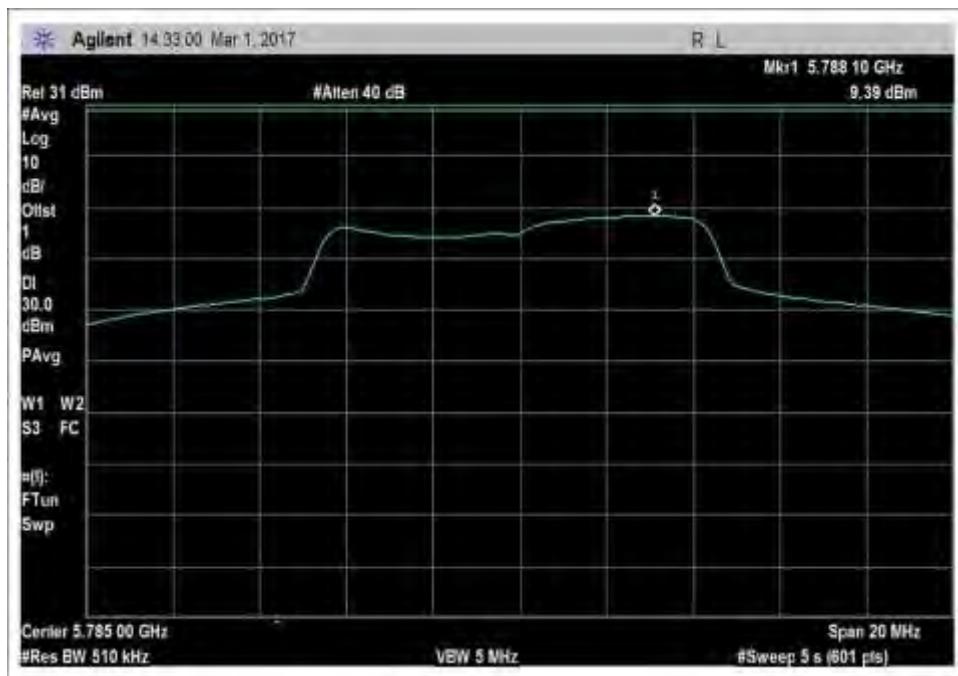
PSD_TX24dBm_5735MHz_chain 0_RMS



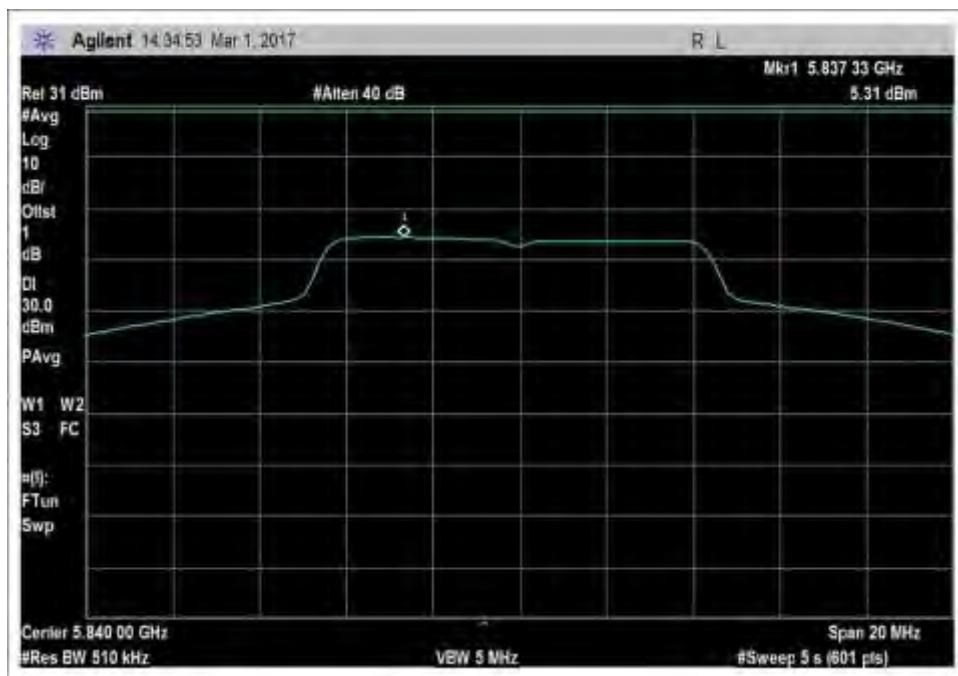
PSD_TX24dBm_5735MHz_chain 1_RMS



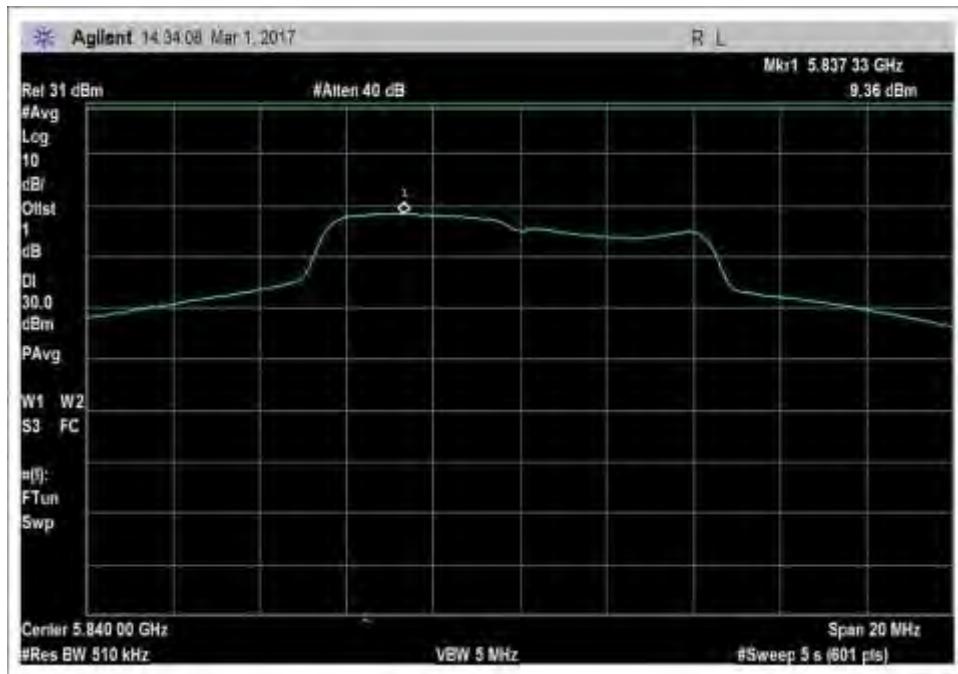
PSD_TX24dBm_5785MHz_chain 0_RMS



PSD_TX24dBm_5785MHz_chain 1_RMS

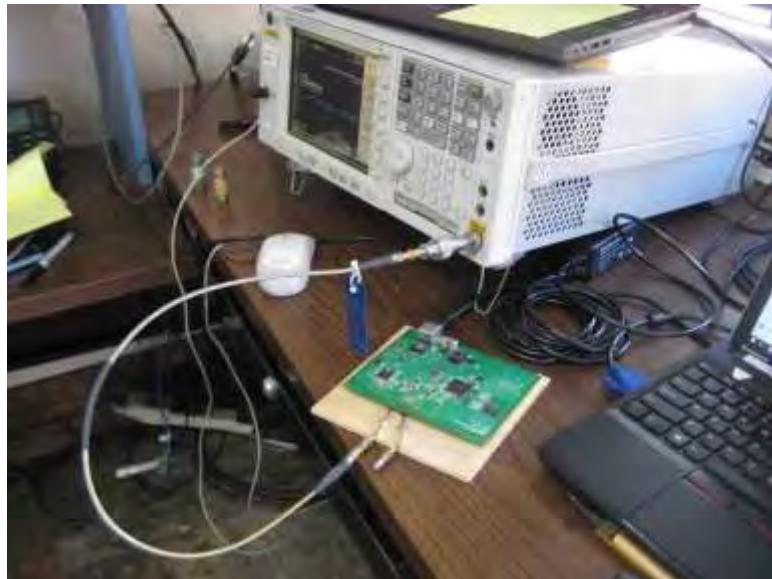


PSD_TX24dBm_5840MHz_chain 0_RMS



PSD_TX24dBm_5840MHz_chain 1_RMS

Test Setup Photo(s)



15.407(b) Radiated Emissions & Band Edge

Test Setup/Conditions			
Test Location:	Mariposa Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2013), KDB 789033	Test Date(s):	3/1/2017
Configuration:	1		
Test Setup:	Conducted Bandedge and Conducted emission This is a PCII of previously certified product identified by FCCID: RHK-G6CPE. Original authorized under 15.247 in the 5.8 GHz band Test Report 96184 line 10. This evaluation is to upgrade certification to 15.407 5.8 GHz band in accordance with FCC KDB 926956, limited testing. FCCID: RHK-G6CPE The EUT is placed on the test bench, RF characteristic evaluate at antenna port Chain 0 and Chain 1. 5735-5840MHz Modulation: OFDM TX Freq: 5735 MHz, 5785MHz, 5840MHz Channel BW /Data Rate: 10MHz/13Mbps. TX power setting 24dBm for 24dBi antenna, 20dBm for 29dBi antenna. Test method: ANSI C63.10-2013, KDB: 926956 DO1 U-NII transition Plan V2 August 22, 2016.		

Environmental Conditions			
Temperature (°C)	23	Relative Humidity (%):	52

See data sheets for test setup and test equipment.

Test Data

Test Location: CKC Laboratories, Inc • 5046 Sierra Pines Drive • Mariposa, CA 95338 •
 Customer: **Digital Path**
 Specification: **15.407(b)(4) / 15.209 Radiated Spurious Emissions**
 Work Order #: **99466** Date: 3/2/2017
 Test Type: **Radiated Scan** Time: 11:16:35
 Tested By: E. Wong Sequence#: 1
 Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Config 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Config 1			

Test Conditions / Notes:

The EUT is mounted on a pole, antenna at height of 1.5m from ground plane, Horizontal and vertical element of the EUT are connected to antenna port Chain 0 and Chain 1 respectively.

TX: 5735-5840MHz

Modulation: OFDM

TX Freq: 5735 MHz, 5785MHz, 5840MHz

Channel BW /Data Rate: 10MHz/13Mbps.

TX power setting 24dBm for 24dBi antenna, 20dBm for 29dBi antenna.

Mariposa A

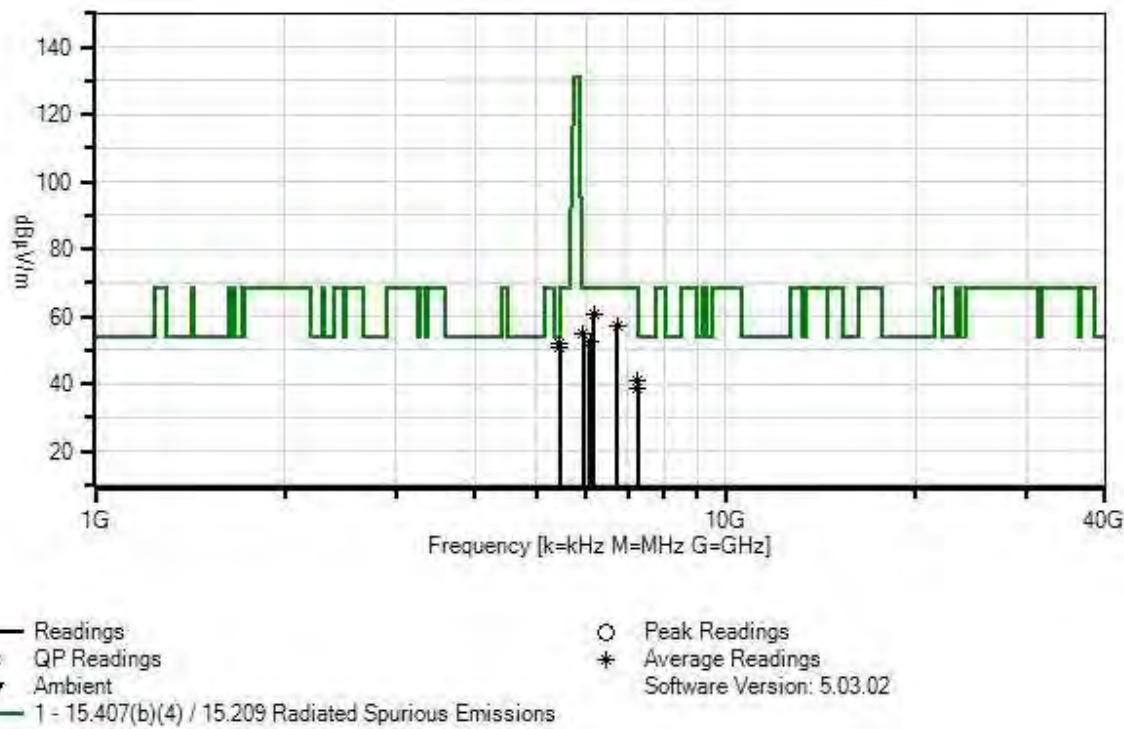
Test method: ANSI C63.10-2013, KDB: 926956 DO1 U-NII transition Plan V2 August 22, 2016

Test environment conditions: 23°C, 52% Relative Humidity, 100kPa

Frequency range of measurement = 9 kHz- 40GHz.

9 kHz -150 kHz; RBW=200 Hz, VBW=200 Hz;150 kHz-30 MHz; RBW=9 kHz, VBW=9 kHz; 30 MHz-1000 MHz; RBW=120 kHz, VBW=120 kHz,1000 MHz-40000MHz; RBW=1 MHz, VBW=1 MHz.

Digital Path WO#: 99466 Sequence#: 1 Date: 3/2/2017
15.407(b)(4) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02668	Spectrum Analyzer	E4446A	8/26/2016	8/26/2017
T2	AN00327	Horn Antenna	3115	3/4/2016	3/4/2018
T3	AN03543	Cable	32022-29094K-29094K-10M	11/2/2015	11/2/2017
T4	AN03155	Preamp	83017A	6/30/2015	6/30/2017
T5	AN03357	Cable	32022-2-29094K-36TC	2/9/2017	2/9/2019
	AN02045	Horn Antenna-ANSI C63.5 Calibration	MWH-2640/B	5/7/2015	5/7/2017
	AN02046	Horn Antenna	MWH-1826/B	10/7/2016	10/7/2018
	AN03366	Horn Antenna-ANSI C63.5 Calibration	GH-62-25	2/9/2016	2/9/2018
T6	AN01993	Biconilog Antenna	CBL6111C	11/1/2016	11/1/2018
T7	ANP05656	Attenuator	PE7004-6	12/22/2015	12/22/2017
T8	ANP04249	Cable	CXTA04A-50	3/3/2016	3/3/2018
T9	ANP06230	Cable-Amplitude +15C to +45C (dB)	CXTA04A-50	11/29/2016	11/29/2018
T10	ANP06847	Cable	LMR195-FR-6	7/9/2015	7/9/2017
T11	AN00449	Preamp-Top Amp (dB)	8447F	2/18/2016	2/18/2018
T12	ANP06883	Cable	LMR195-FR-3	10/27/2015	10/27/2017
	AN00226	Loop Antenna	6502	4/4/2016	4/4/2018
	AN02115	Preamp	83051A	2/27/2017	2/27/2019
	AN02118	High Pass Filter	84300-80039	2/22/2017	2/22/2019

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7	T8					
			T9	T10	T11	T12	Table	dB μ V/m	dB μ V/m	dB	Ant
	MHz	dB μ V	dB	dB	dB	dB					
1	5460.000M	43.6	+0.0	+31.1	+8.8	-32.6	+0.0	51.9	54.0	-2.1	Vert
	Ave		+1.0	+0.0	+0.0	+0.0			24dBi		
			+0.0	+0.0	+0.0	+0.0			ant bandedge		
2	5460.000M	42.7	+0.0	+31.1	+8.8	-32.6	+0.0	51.0	54.0	-3.0	Vert
	Ave		+1.0	+0.0	+0.0	+0.0			29dBi		
			+0.0	+0.0	+0.0	+0.0			ant Bandedge		
^	5460.000M	56.2	+0.0	+31.1	+8.8	-32.6	+0.0	64.5	54.0	+10.5	Vert
			+1.0	+0.0	+0.0	+0.0			24dBi		
			+0.0	+0.0	+0.0	+0.0			ant bandedge		
^	5460.000M	53.5	+0.0	+31.1	+8.8	-32.6	+0.0	61.8	54.0	+7.8	Vert
			+1.0	+0.0	+0.0	+0.0			29dBi		
			+0.0	+0.0	+0.0	+0.0			ant Bandedge		

5	6180.833M	50.7	+0.0	+32.5	+9.3	-33.0	+0.0	60.6	68.2	-7.6	Vert
	Ave		+1.1	+0.0	+0.0	+0.0			24dBi ant		
			+0.0	+0.0	+0.0	+0.0					
^	6180.833M	62.2	+0.0	+32.5	+9.3	-33.0	+0.0	72.1	68.2	+3.9	Vert
			+1.1	+0.0	+0.0	+0.0		24dBi ant			
			+0.0	+0.0	+0.0	+0.0					
7	6729.257M	46.1	+0.0	+33.2	+9.7	-33.2	+0.0	56.9	68.2	-11.3	Vert
	Ave		+1.1	+0.0	+0.0	+0.0		29dBi ant			
			+0.0	+0.0	+0.0	+0.0					
^	6729.257M	51.6	+0.0	+33.2	+9.7	-33.2	+0.0	62.4	68.2	-5.8	Vert
			+1.1	+0.0	+0.0	+0.0		29dBi ant			
			+0.0	+0.0	+0.0	+0.0					
9	7250.000M	29.6	+0.0	+33.3	+10.1	-33.4	+0.0	40.8	54.0	-13.2	Vert
	Ave		+1.2	+0.0	+0.0	+0.0		24dBi			
			+0.0	+0.0	+0.0	+0.0		ant_bandedge			
10	5945.000M	45.5	+0.0	+31.9	+9.1	-32.8	+0.0	54.8	68.2	-13.4	Horiz
	Ave		+1.1	+0.0	+0.0	+0.0		24dBi ant			
			+0.0	+0.0	+0.0	+0.0					
^	5945.000M	58.8	+0.0	+31.9	+9.1	-32.8	+0.0	68.1	68.2	-0.1	Horiz
			+1.1	+0.0	+0.0	+0.0		24dBi ant			
			+0.0	+0.0	+0.0	+0.0					
12	7250.000M	27.5	+0.0	+33.3	+10.1	-33.4	+0.0	38.7	54.0	-15.3	Vert
	Ave		+1.2	+0.0	+0.0	+0.0		29dBi			
			+0.0	+0.0	+0.0	+0.0		ant_Bandedge			
^	7250.000M	41.2	+0.0	+33.3	+10.1	-33.4	+0.0	52.4	54.0	-1.6	Vert
			+1.2	+0.0	+0.0	+0.0		24dBi			
			+0.0	+0.0	+0.0	+0.0		ant_bandedge			
^	7250.000M	38.7	+0.0	+33.3	+10.1	-33.4	+0.0	49.9	54.0	-4.1	Vert
			+1.2	+0.0	+0.0	+0.0		29dBi			
			+0.0	+0.0	+0.0	+0.0		ant_Bandedge			
15	6082.833M	43.2	+0.0	+32.2	+9.2	-32.9	+0.0	52.8	68.2	-15.4	Vert
	Ave		+1.1	+0.0	+0.0	+0.0		24dBi ant			
			+0.0	+0.0	+0.0	+0.0					
^	6082.833M	54.6	+0.0	+32.2	+9.2	-32.9	+0.0	64.2	68.2	-4.0	Vert
			+1.1	+0.0	+0.0	+0.0		24dBi ant			
			+0.0	+0.0	+0.0	+0.0					
17	234.000M	23.9	+0.0	+0.0	+0.0	+0.0	+10.5	29.1	46.0	-16.9	Horiz
			+0.0	+11.6	+6.0	+1.2		29 dBi ant			
			+1.7	+0.4	-26.4	+0.2					
18	215.500M	20.1	+0.0	+0.0	+0.0	+0.0	+10.5	23.9	43.5	-19.6	Vert
			+0.0	+10.3	+6.0	+1.2		24dBi ant			
			+1.6	+0.4	-26.4	+0.2					

Conducted Bandedge

Test Equipment					
Asset# / Serial#	Description	Manufacturer	Model	Cal Date	Cal Due
02668	Spectrum Analyzer	Agilent	E4446A	8/26/2016	8/26/2017
03011	Cable	AstroSteel	32022-2-2909K-24TC	2/9/2017	2/9/2019

Result:

No emission detected within 20dB of emission limit -27 dBm/MHz from 9kHz- 75MHz from lower band edges. 75MHz from upper band edges to 40GHz.

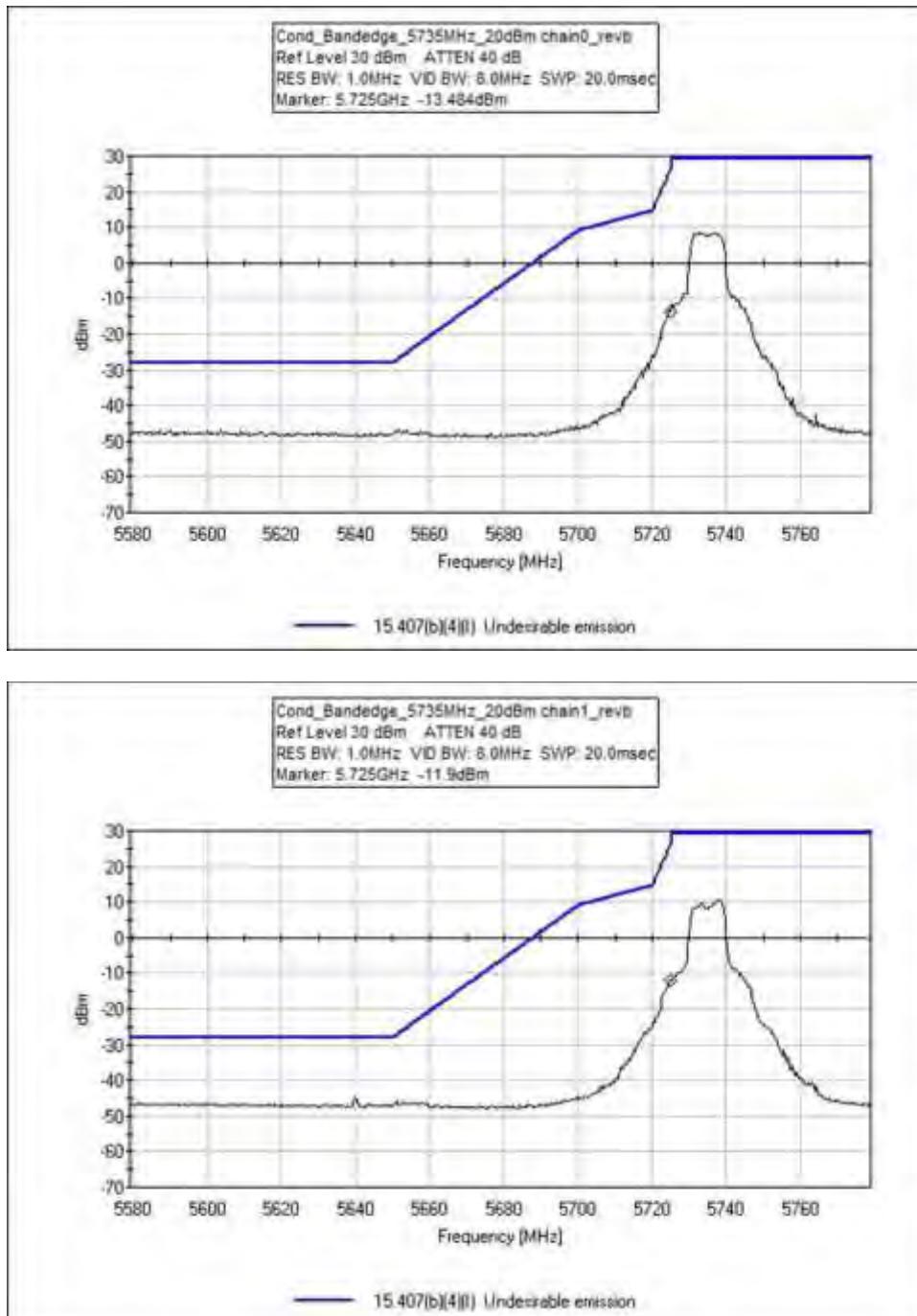
Radiated Band Edge Summary					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
5460	OFDM	Dish 24dBi	51.9	<54	Pass
7250	OFDM	Dish 24dBi	40.8	<54	Pass
5460	OFDM	Dish 29dBi	51.0	<54	Pass
7250	OFDM	Dish 29dBi	38.7	<54	Pass

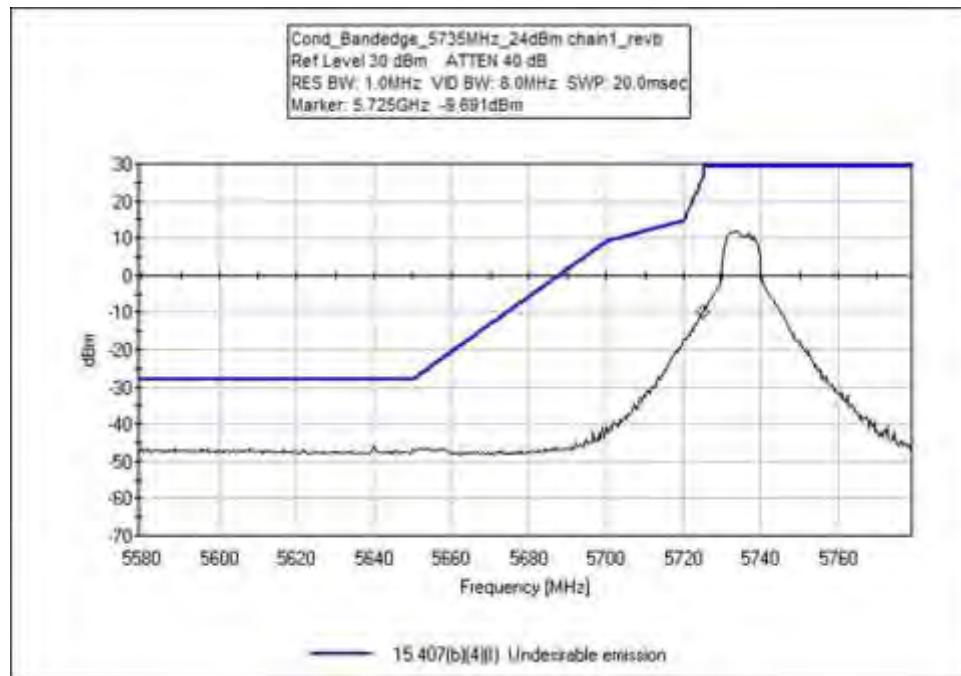
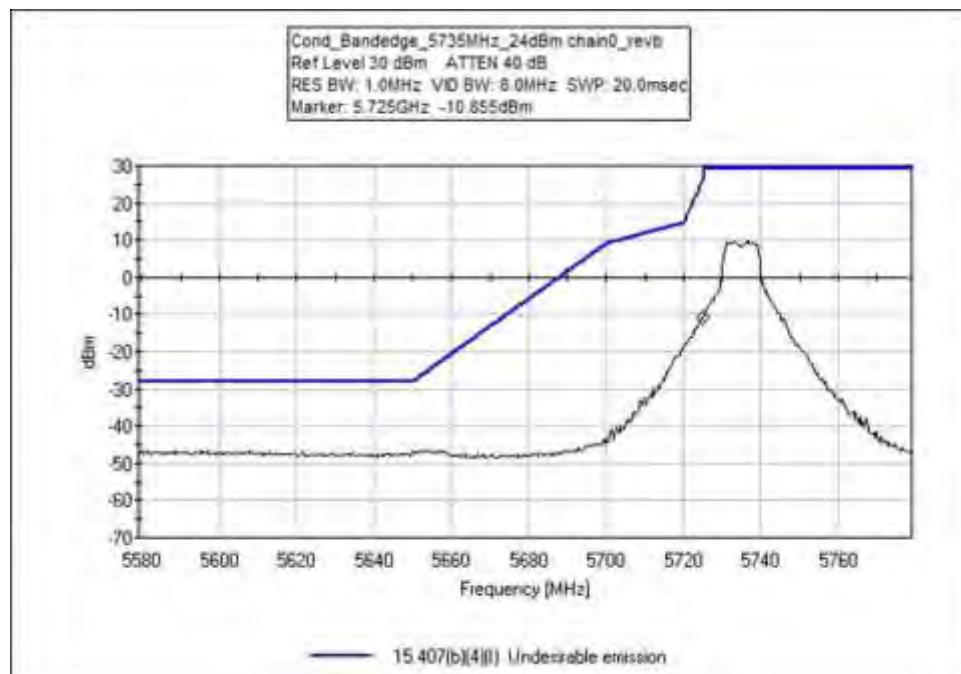
Conducted plot

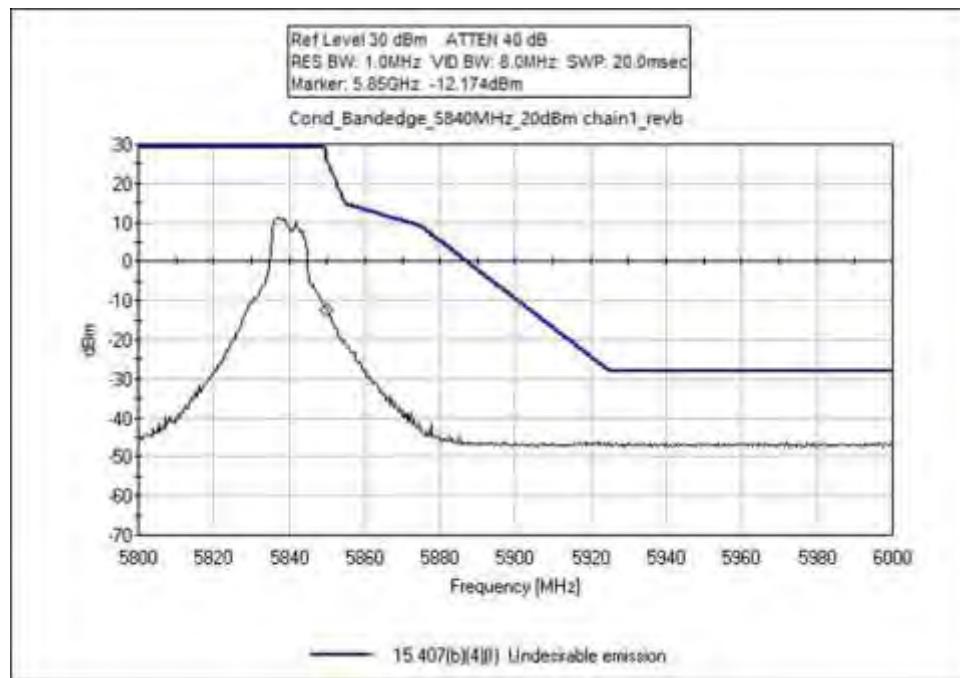
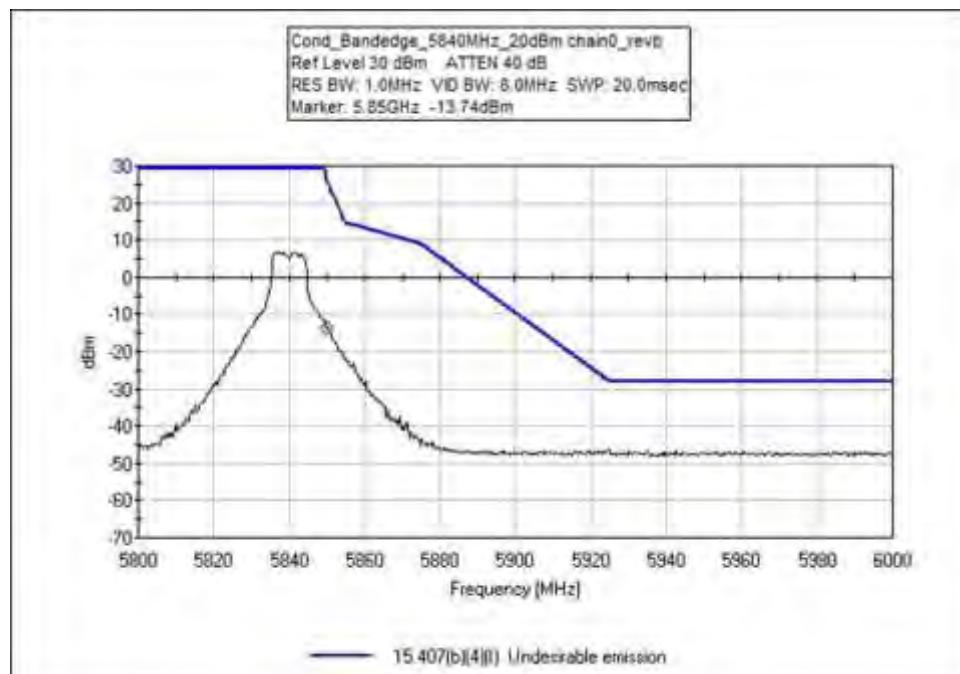
Limit 15.407 (4) For transmitters operating in the 5.725-5.85 GHz band:

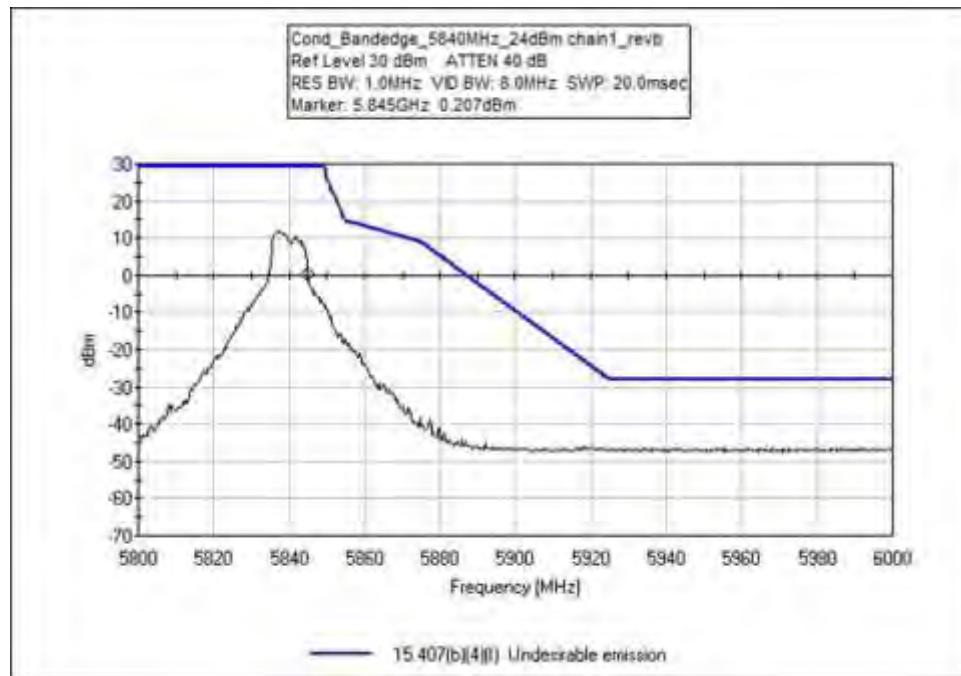
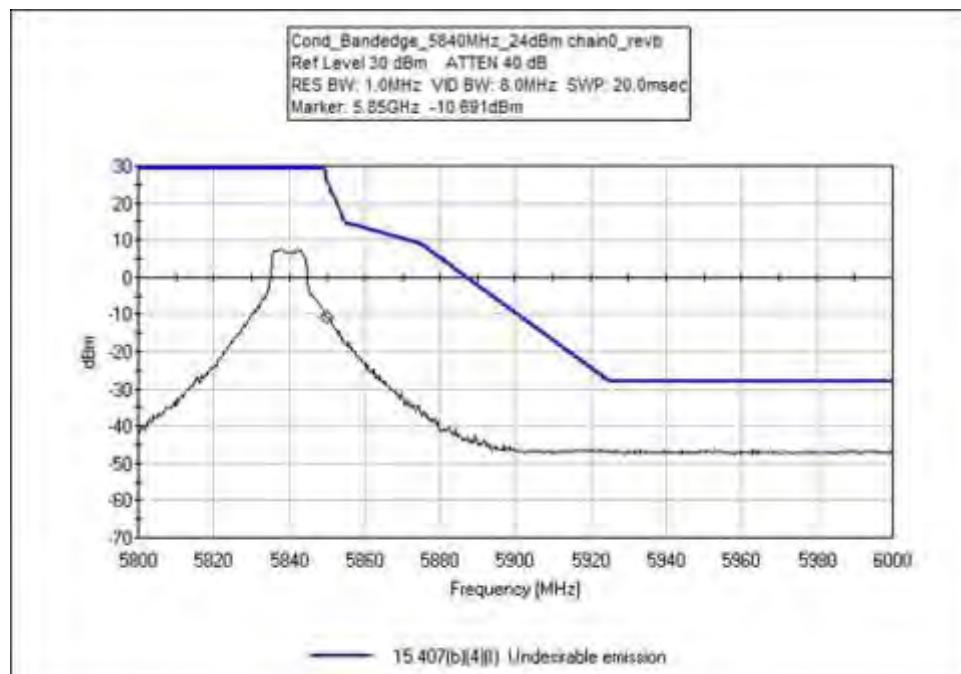
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Band Edge Plots









Test Setup Photo(s)



RE 24dBi, Front



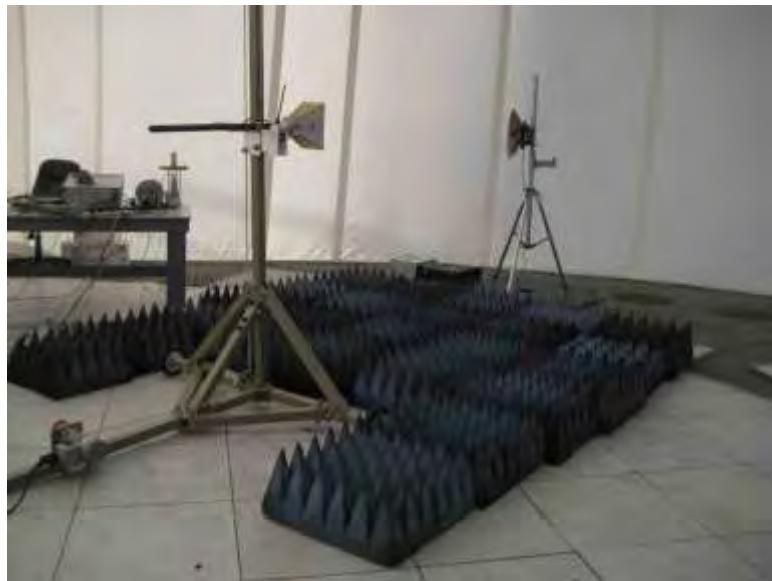
RE 24dBi, Back



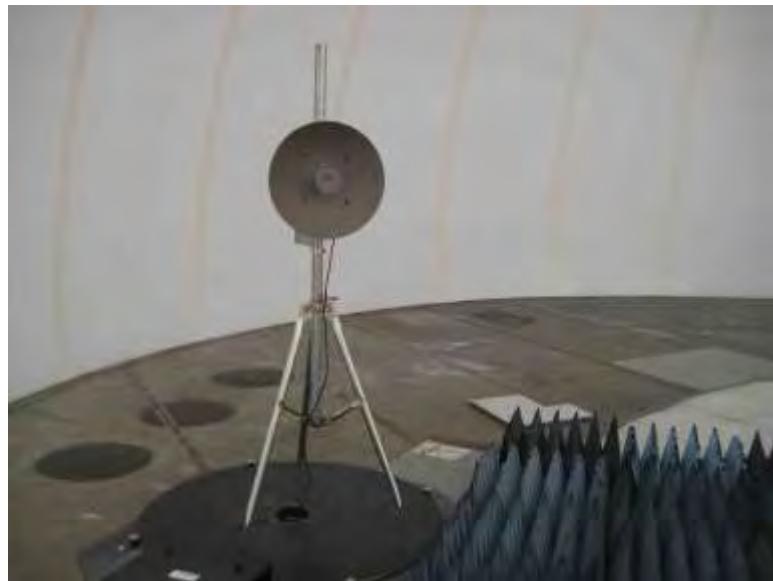
RE 29dBi, Front



RE 29dBi, Back



Above 1 GHz Test Setup



RE Above 1 GHz, 24dBi, Front



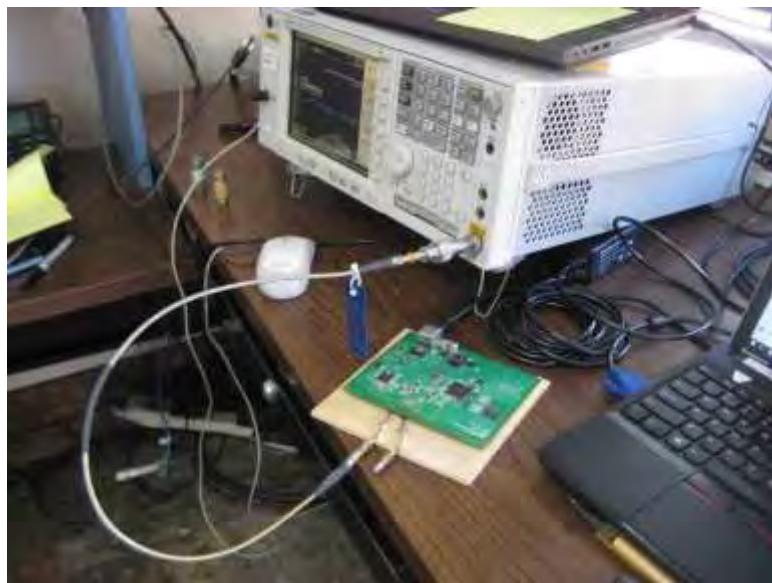
RE Above 1 GHz, 24dBi, Back



RE Above 1 GHz, 29dBi, Front



RE Above 1 GHz, 29dBi, Back



CE Band edge

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS	
Meter reading	(dB μ V)
+ Antenna Factor	(dB/m)
+ Cable Loss	(dB)
- Distance Correction	(dB)
- Preamplifier Gain	(dB)
= Corrected Reading	(dB μ V/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.