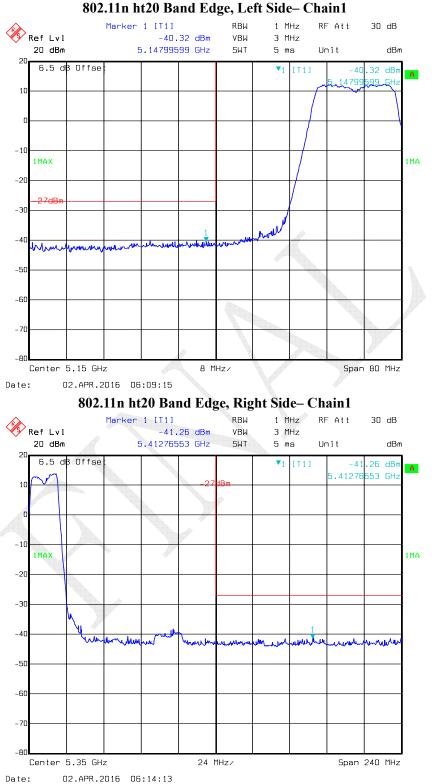


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802.11a Band Edge, Left Side - Chain1 Marker 1 [T1] RBW 1 MHz RF Att 30 dB 🖲 Ref Lvl -38.43 dBm ٧ВЫ 3 MHz 5.14863727 GHz 20 dBm 5 ms SWT Unit dBm 20 6.5 dB Offse  $\mathbf{v}_1$ [T1] 43 dBr 3 A 10 -1 1MAX 1MA -20 14 merton Mar -30 -40 multil -50 -60 -70 -8 Center 5.15 GHz 8 MHz/ Span 80 MHz 02.APR.2016 06:24:30 Date: 802.11a Band Edge, Right Side- Chain1 RBW 1 MHz RF Att Marker 1 [T1] 30 dB ×> -40.74 dBm Ref Lvl VBW 3 MHz 5.41661323 GHz 20 dBm SWT 5 ms Unit dBm 20 6.5 dB Offse **v**1 -40 74 dBr A 5.41661 323 GH: 10 0 -10 1MAX 1MA -20 -30 -40 under har Man manu mh -50 -60 -70 -80 Center 5.35 GHz 24 MHz/ Span 240 MHz 02.APR.2016 06:18:24 Date:

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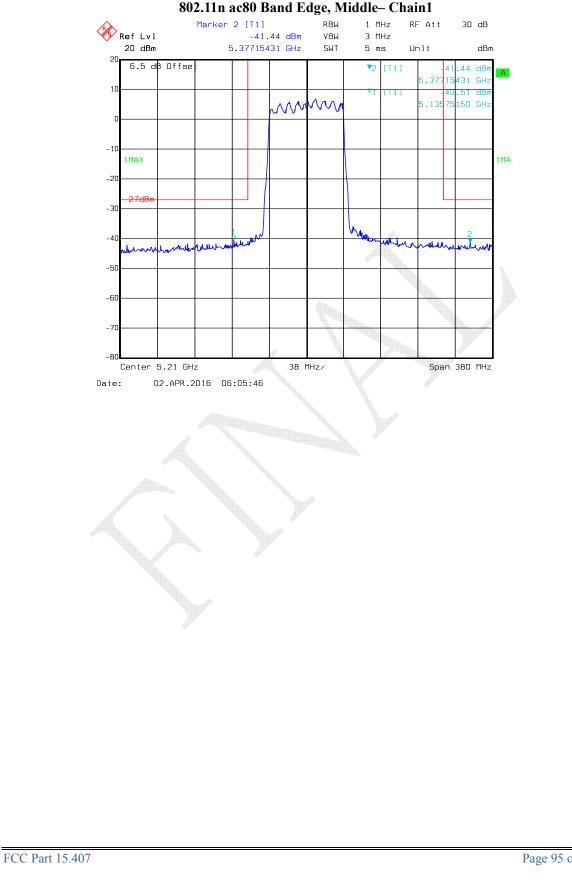
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802.11n ht40 Band Edge, Left Side- Chain1

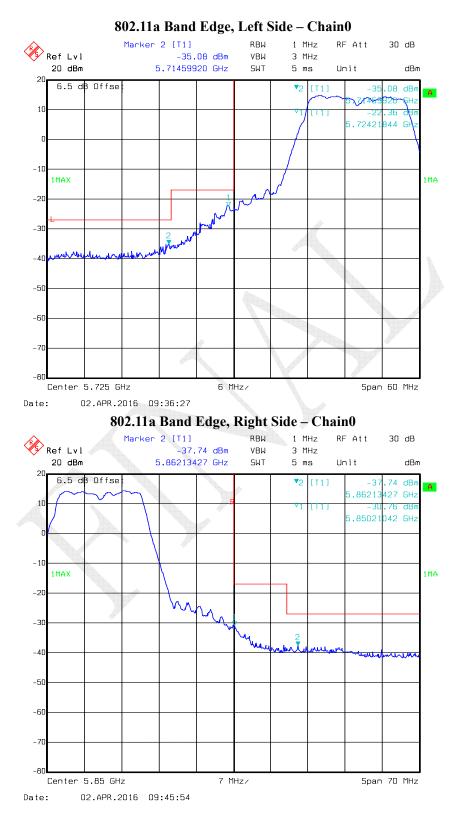
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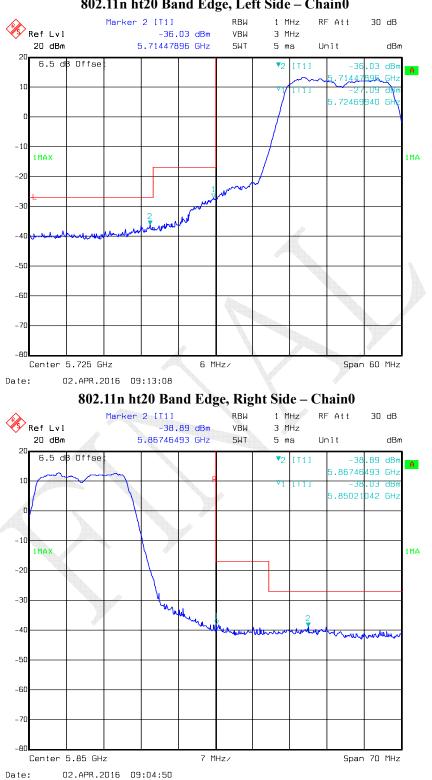
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### 5725MHz-5850MHz:



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### 802.11n ht20 Band Edge, Left Side - Chain0

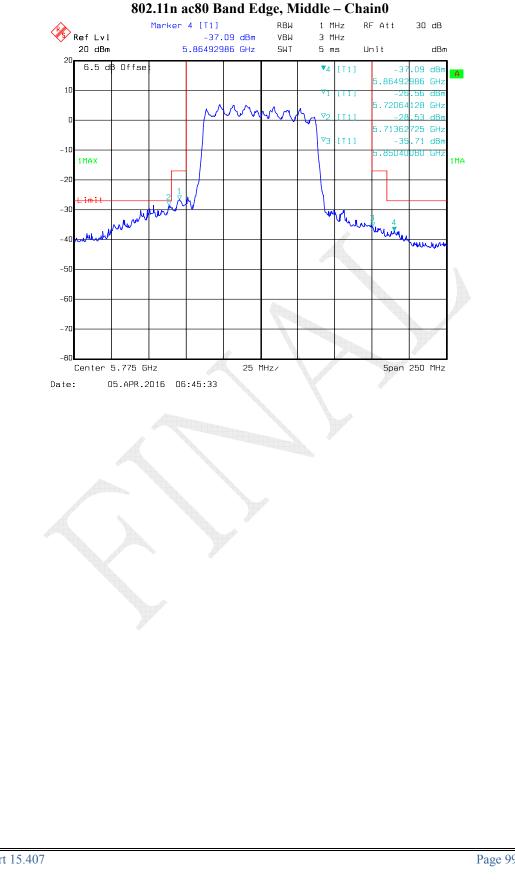
FCC Part 15.407

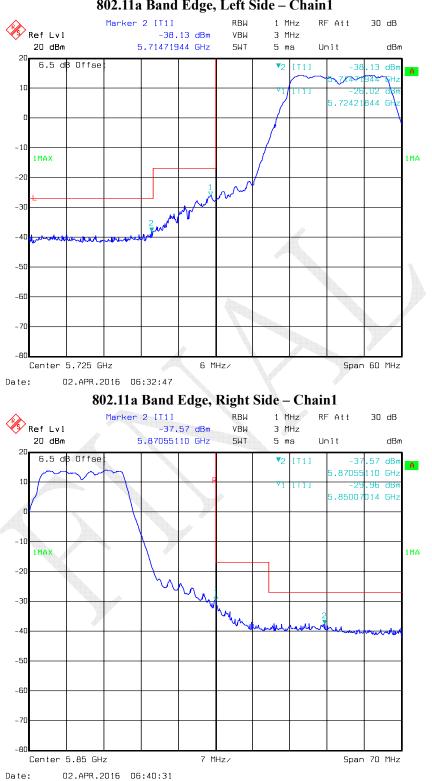
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Bay Area Compliance Laboratories Corp. (Dongguan)

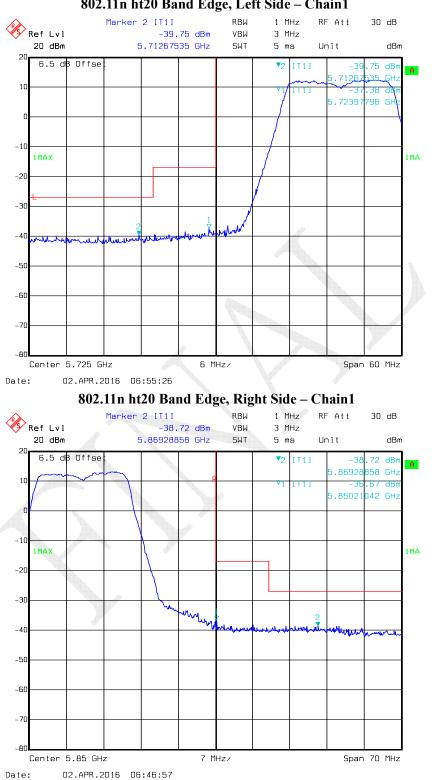




802.11a Band Edge, Left Side - Chain1

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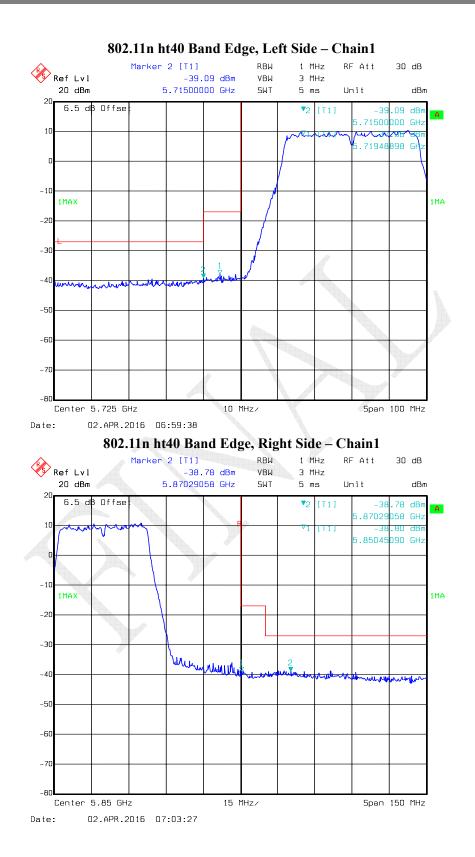
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802.11n ht20 Band Edge, Left Side - Chain1

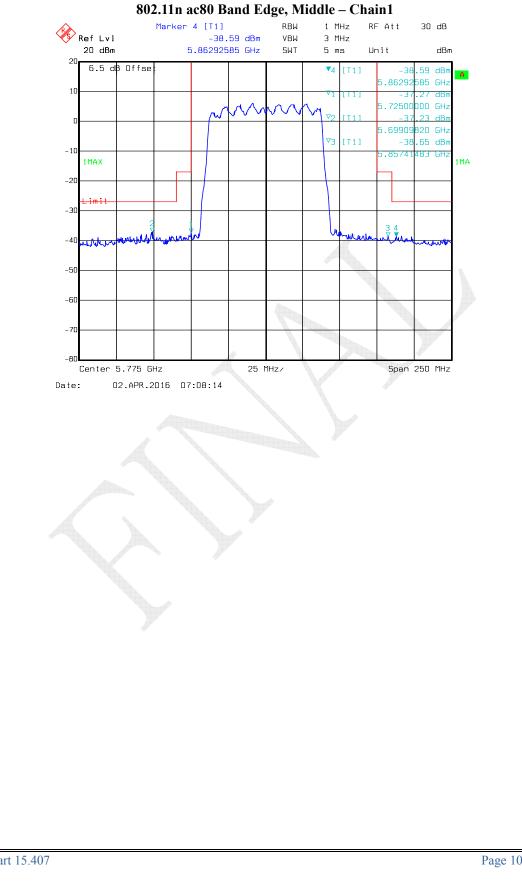
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Bay Area Compliance Laboratories Corp. (Dongguan)



# FCC §15.407(a) –EMISSION BANDWIDTH AND OCCUPIED BANDWIDTH

### **Applicable Standard**

15.407(a) (e)

### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### **Test Procedure**

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r01

### Test Data

### **Environmental Conditions**

Temperature:	24.6 °C		
<b>Relative Humidity:</b>	50 %		
ATM Pressure:	100.9 kPa		

The testing was performed by Dean Liu on 2015-04-02.

#### Test Result: Pass.

Please refer to the following tables and plots.

## Bay Area Compliance Laboratories Corp. (Dongguan)

### Report No.:RDG160329003-00B

## Test mode: Transmitting

### 5150MHz-5250MHz:

Mode	Channel	Frequency MHz	26 dB Emission Bandwidth (MHz)		Result
			Chain0	Chain1	
802.11a	Low	5180	21.56	22.12	PASS
	Middle	5200	21.48	22.12	PASS
	High	5240	21.33	22.28	PASS
802.11n20	Low	5180	21.96	21.56	PASS
	Middle	5200	21.88	21.48	PASS
	High	5240	21.92	21.3	PASS
802.11n40	Low	5190	43.13	42	PASS
	High	5230	43.33	42.53	PASS
802.11ac80	Middle	5210	82.79	82.4	PASS

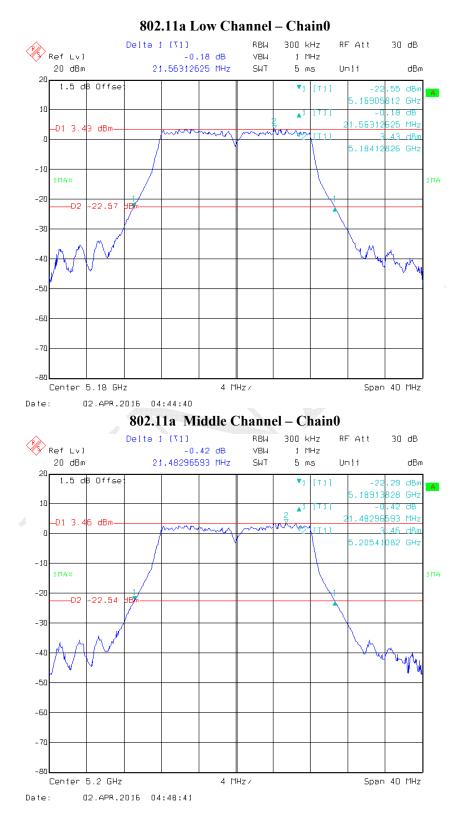
### 5725MHz-5850MHz:

5850MHz:					
Mode	Channel	Frequency MHz	6dB Emission Bandwidth (MHz)		Result
			Chain0	Chain1	
	Low	5745	16.59	16.59	PASS
802.11a	Middle	5785	16.59	16.59	PASS
	High	5825	16.59	16.59	PASS
	Low	5745	17.8	17.72	PASS
802.11n20	Middle	5785	17.8	17.8	PASS
	High	5825	17.88	17.72	PASS
802.11n40	Low	5755	36.55	36.71	PASS
	High	5795	36.71	36.71	PASS
802.11ac80	Middle	5775	75.67	75.99	PASS

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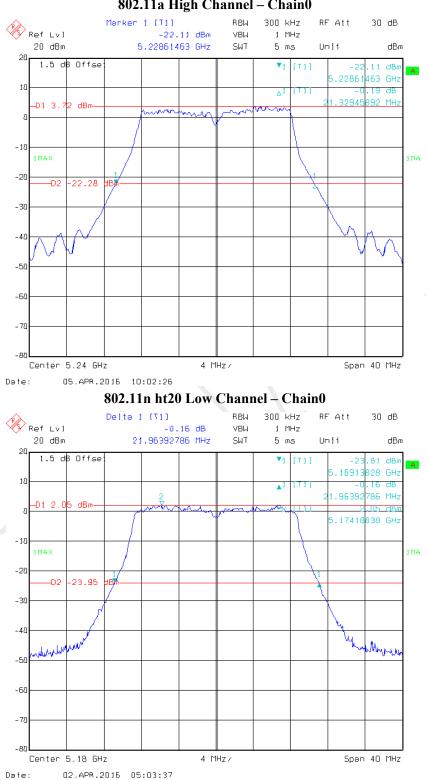
#### Report No.:RDG160329003-00B

### 5150MHz-5250MHz:



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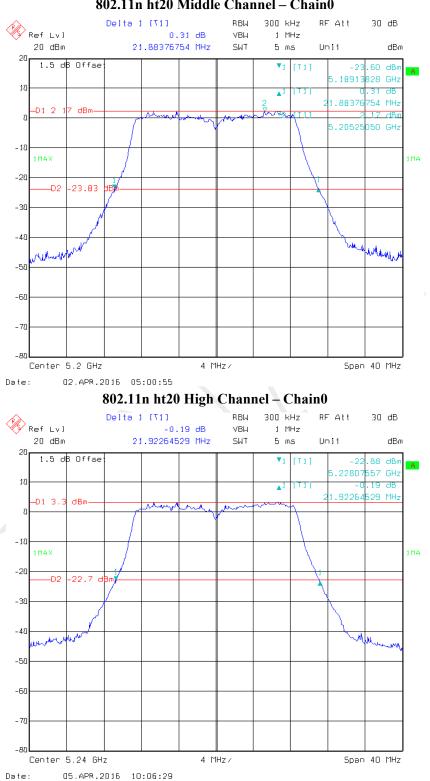
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#### 802.11a High Channel – Chain0

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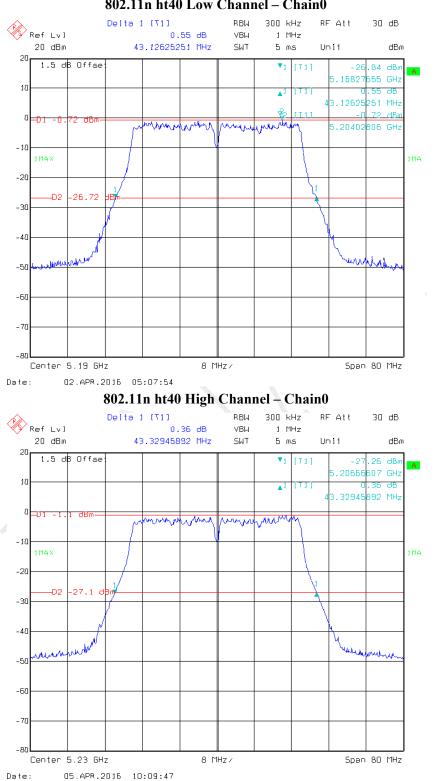
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802.11n ht20 Middle Channel – Chain0

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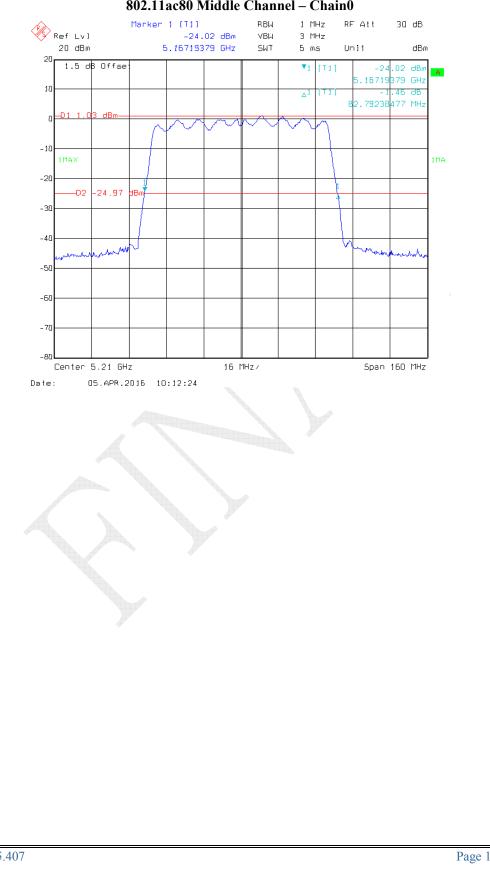
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802.11n ht40 Low Channel - Chain0

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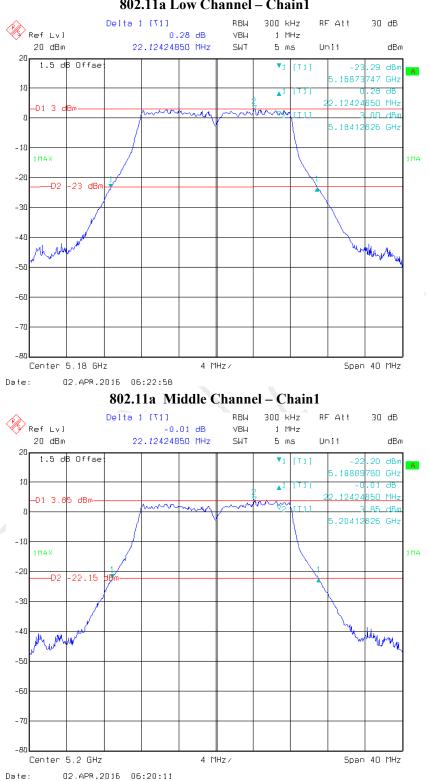
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#### 802.11ac80 Middle Channel - Chain0

FCC Part 15.407

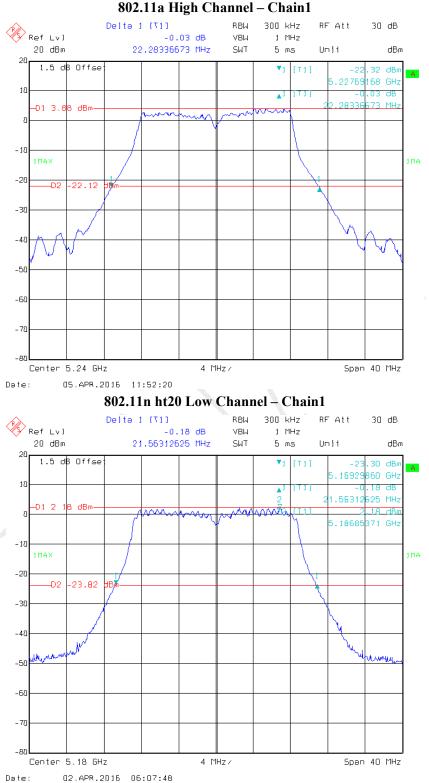
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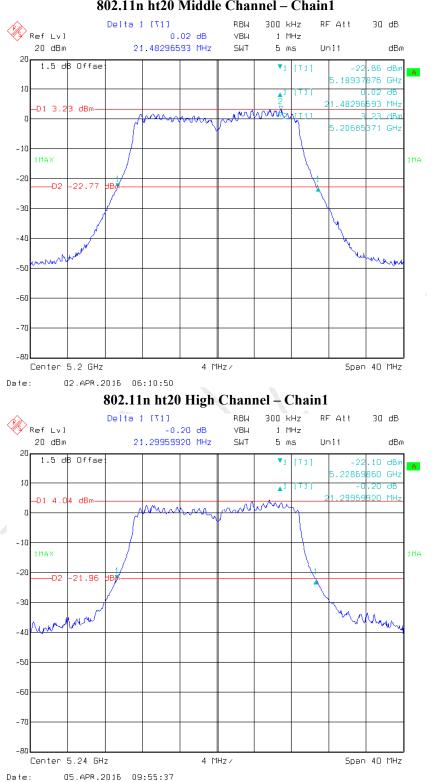
802.11a Low Channel – Chain1

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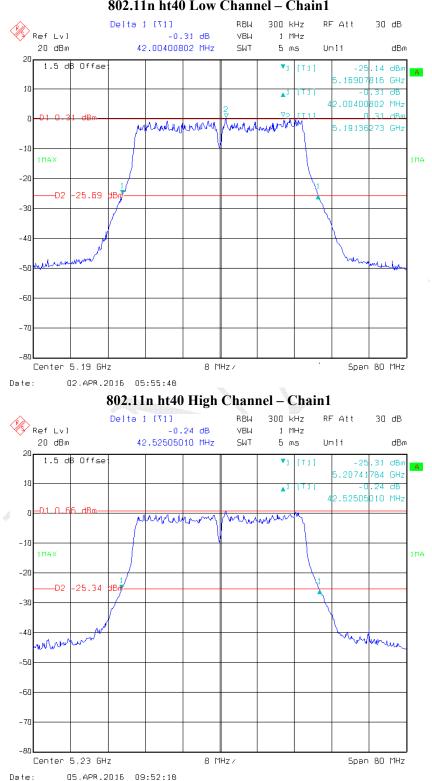
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802.11n ht20 Middle Channel – Chain1

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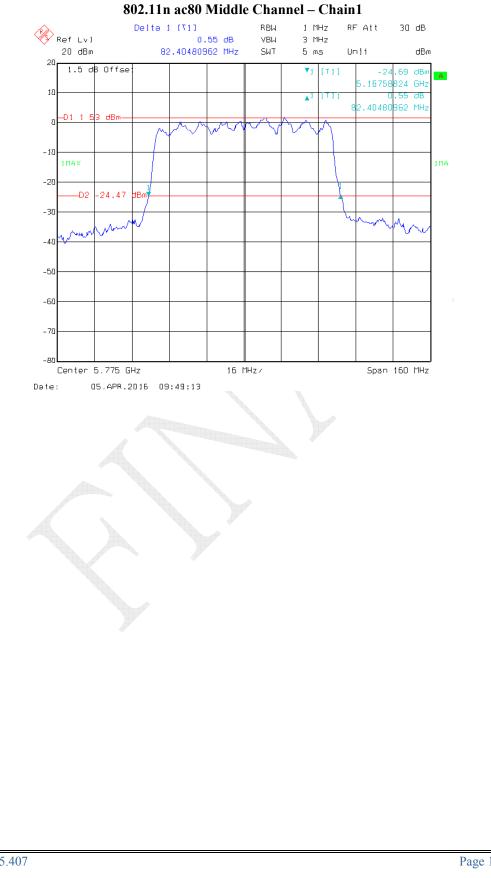
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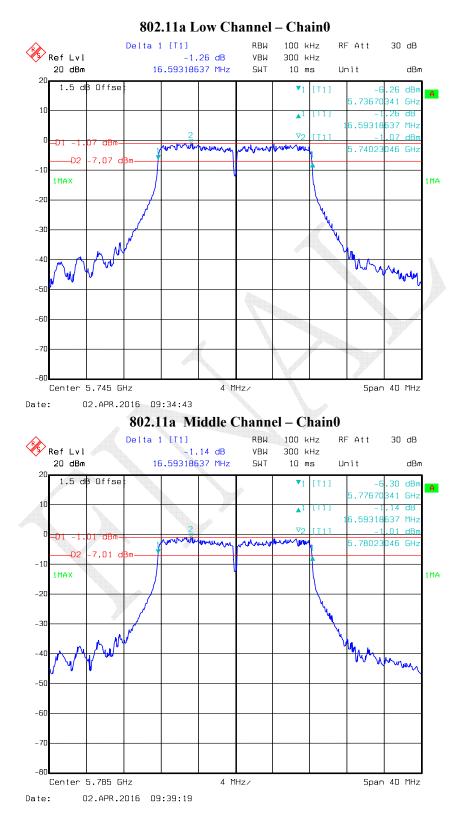
802.11n ht40 Low Channel – Chain1

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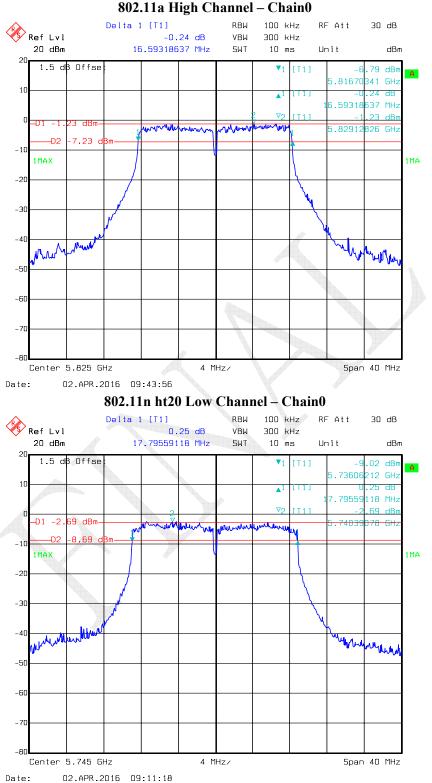


### 5725MHz-5850MHz: 6 dB Bandwidth

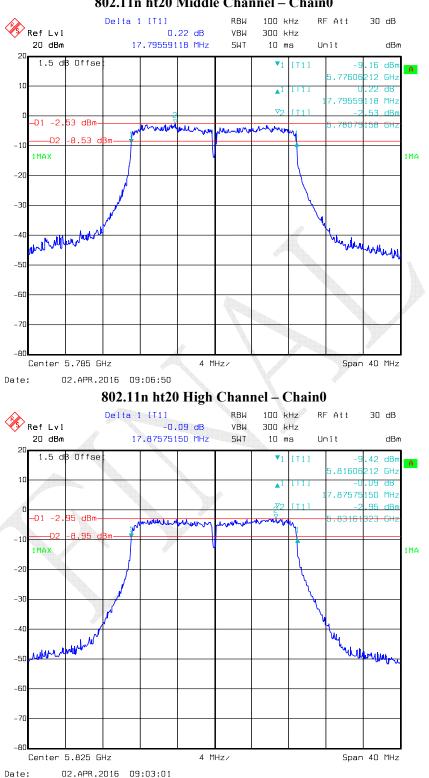


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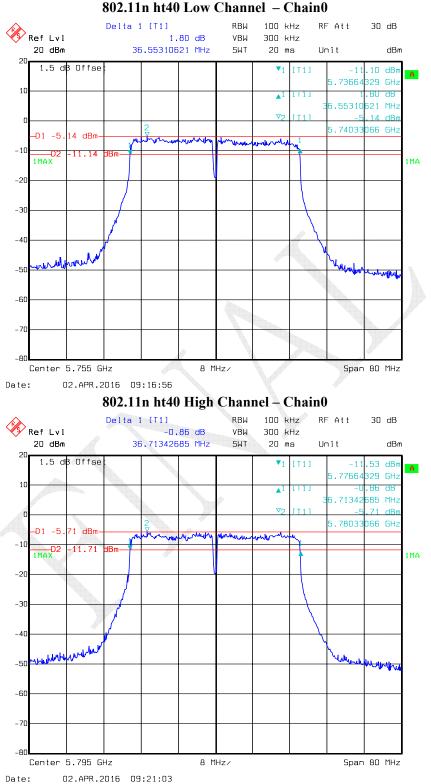


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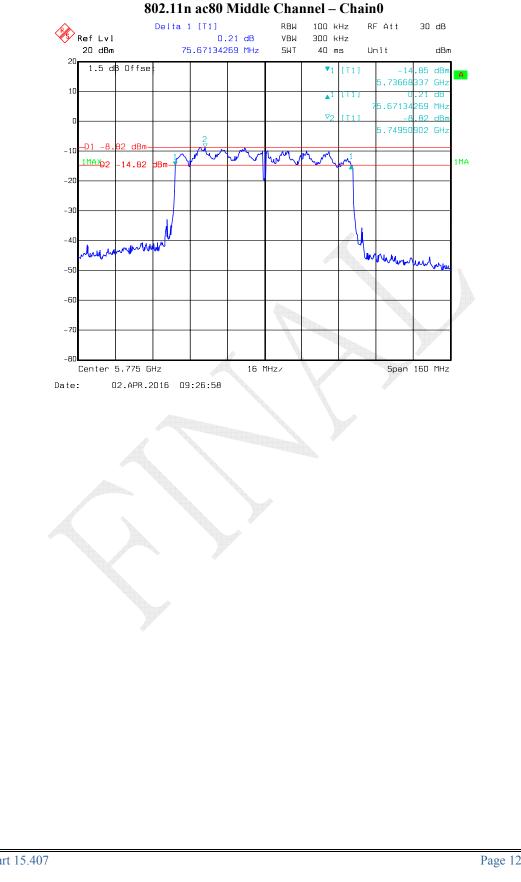


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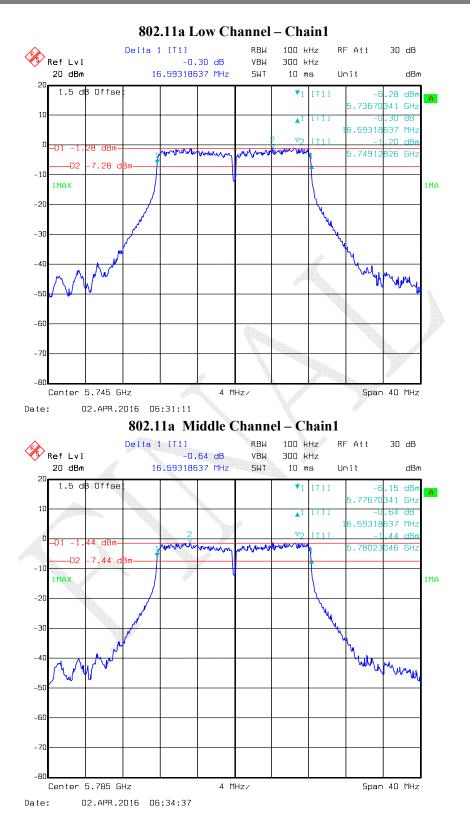
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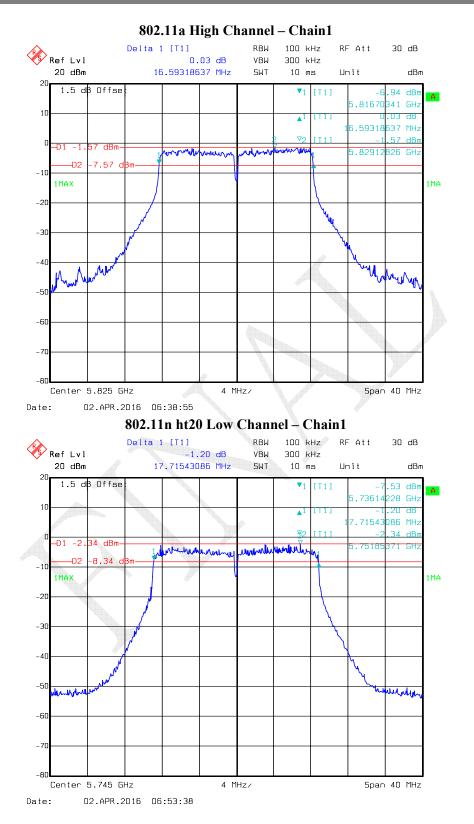


FCC Part 15.407

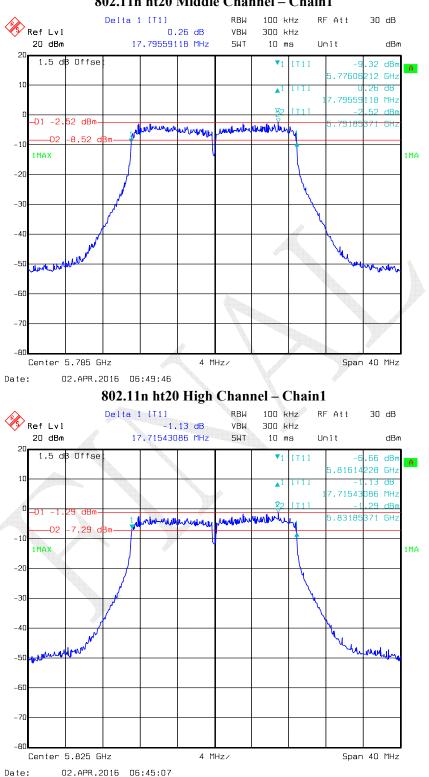
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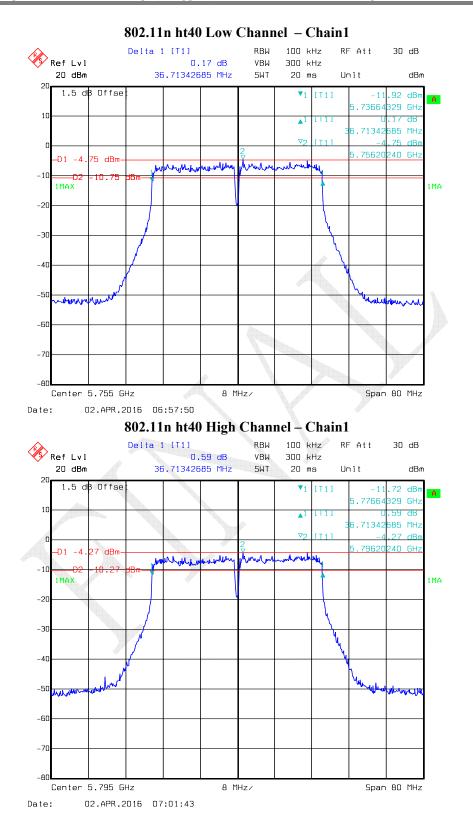
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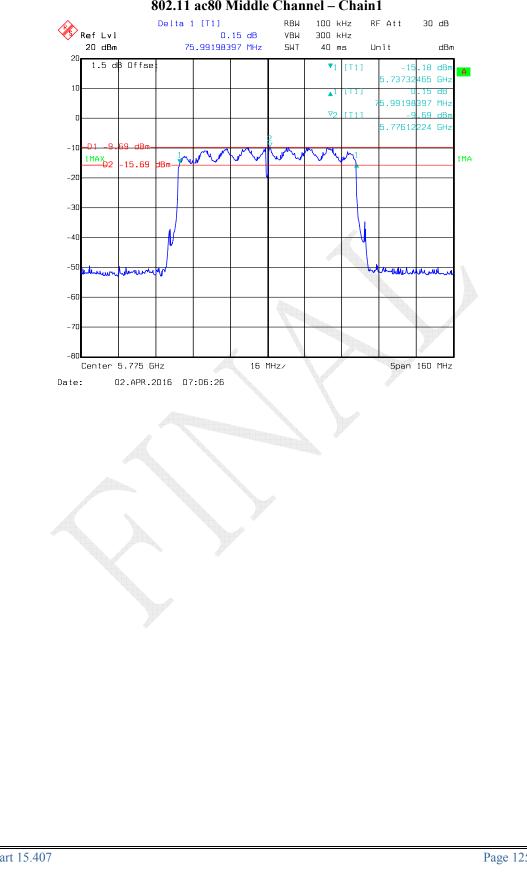
802.11n ht20 Middle Channel – Chain1

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802.11 ac80 Middle Channel – Chain1

## FCC §15.407(a) –MAXIMUM CONDUCTED OUTPUT POWER

### **Applicable Standard**

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(4) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2015-11-03	2016-11-03
Agilent	Wideband Power Sensor	N1921A	MY54170013	2015-11-03	2016-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2015-11-03	2016-11-03
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06

#### **Test Equipment List and Details**

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## **Test Procedure**

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r01

## **Test Data**

#### **Environmental Conditions**

Temperature:	24.6 °C
<b>Relative Humidity:</b>	50 %
<b>ATM Pressure:</b>	100.9 kPa

The testing was performed by Dean Liu on 2016-04-02.

### Test Mode: Transmitting

#### 5150-5250 MHz band

Mode	Channel	Frequency	Maximum	Result			
	Channel	MHz	Chain 0	Chain 1	Total	Limits	Kesuit
	Low	5180	12.94	12.39	15.68	24	PASS
802.11a	Middle	5200	12.57	12.73	15.66	24	PASS
	High	5240	12.84	13.27	16.07	24	PASS
	Low	5180	11.59	11.19	14.4	24	PASS
802.11n20	Middle	5200	11.47	11.56	14.53	24	PASS
	High	5240	11.31	12.37	14.88	24	PASS
802.11n40	Low	5190	11.22	11.62	14.43	24	PASS
802.111140	High	5230	11.17	11.92	14.57	24	PASS
802.11ac80	Middle	5210	9.9	10.35	13.14	24	PASS

### 5725-5850 MHz band

Mode	Channel	Frequency	Maximum	Result			
wide	Channel	MHz	Chain 0	Chain 1	Total	Limits	Kesult
	Low	5745	13.12	13.11	16.13	30	PASS
802.11a	Middle	5785	13.05	12.96	16.02	30	PASS
	High	5825	12.93	12.66	15.81	30	PASS
	Low	5745	11.51	11.24	14.39	30	PASS
802.11n20	Middle	5785	11.22	11.1	14.17	30	PASS
	High	5825	11.46	11.82	14.65	30	PASS
80 <b>2</b> 11m40	Low	5755	11.98	11.51	14.76	30	PASS
802.11n40	High	5795	11.31	11.97	14.66	30	PASS
802.11ac80	Middle	5775	9.98	9.82	12.91	30	PASS

Note: the device is a client device. both antenna maximum atenna gain are 5dBi, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for NANT  $\leq$  4;

So:

Directional gain = GANT + Array Gain = 5dBi

The power limit no need reduce.

# FCC §15.407(a) - POWER SPECTRAL DENSITY

## **Applicable Standard**

(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

### **Test Procedure**

According to KDB 789033 D02 General UNII Test Procedures New Rules v01r01

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2014-05-09	2015-05-09
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06

### **Test Equipment List and Details**

\* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## **Test Data**

#### **Environmental Conditions**

Temperature:	22.9 °C
<b>Relative Humidity:</b>	54 %
ATM Pressure:	101 kPa

The testing was performed by Dean Liu on 2015-04-12.

Test Mode: Transmitting

Test Result: Compliance. Please refer to the following table and plot.

5150MHz-5250MHz	:
-----------------	---

Mode	Channel	Frequency MHz	(	PSD dBm/MHz)	Limit	Result	
		MHZ	Chain0	Chain1	Total	(dBm/MHz)	
	Low	5180	2.31	1.72	5.04	15	PASS
802.11a	Middle	5200	2.11	2.64	5.39	15	PASS
	High	5240	2.47	3.06	5.79	15	PASS
	Low	5180	0.72	0.58	3.66	15	PASS
802.11n20	Middle	5200	0.89	1.48	4.21	15	PASS
	High	5240	1.3	1.97	4.66	15	PASS
802.11n40	Low	5190	-2.78	-1.32	1.02	15	PASS
	High	5230	-2.72	-0.82	1.34	15	PASS
802.11ac80	Middle	5210	-6.19	-5.49	-2.82	15	PASS

Note: the device is a client device. Both antenna maximum atenna gain are 5dBi, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices: Array Gain = 10 log(NANT/NSS) dB.

So:

Directional gain = GANT + Array Gain = 5+10\*log(2) = 8 dBiThe Power density Limits was reduce 2dB

5725MHz-5850MHz:

Mode	Channel	Frequency	Power Spectral Density (dBm/300kHz)		Power Spectral Density (dBm/500kHz)			Limits
Mode	Channel	MHz	Chain 0	Chain 1	Chain0 Integrated Value	Chain 1 Integrated Value	Total	(dBm/500kHz)
	Low	5745	-1.32	-1.11	0.9	1.11	4.02	28
802.11a	Middle	5785	-1.58	-1.31	0.64	0.91	3.79	28
	High	5825	-1.29	-1.59	0.93	0.63	3.79	28
	Low	5745	-2.98	-2.57	-0.76	-0.35	2.46	28
802.11n20	Middle	5785	-2.96	-3.05	-0.74	-0.83	2.23	28
	High	5825	-3.31	-2.58	-1.09	-0.36	2.3	28
902 11-40	Low	5755	-5.85	-4.99	-3.63	-2.77	-0.17	28
802.11n40	High	5795	-5.81	-4.7	-3.59	-2.48	0.01	28
802.11n40	Middle	5775 🥒	-8.67	-9.97	-6.45	-7.75	-4.04	28

Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500kHz/RBW)$  to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

Note: the device is a client device. Both antenna maximum atenna gain are 5dBi, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

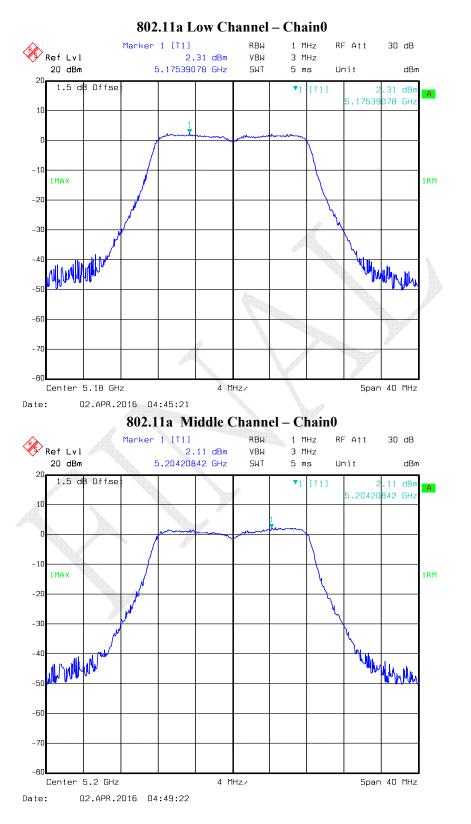
Array Gain =  $10 \log(NANT/NSS) dB$ .

So:

Directional gain = GANT + Array Gain = 5+10\*log(2) = 8 dBiThe Power density Limits was reduce 2dB

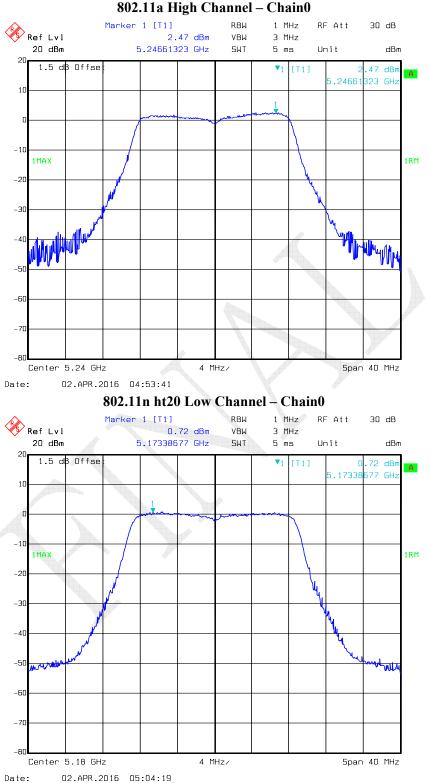
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## 5150MHz-5250MHz:



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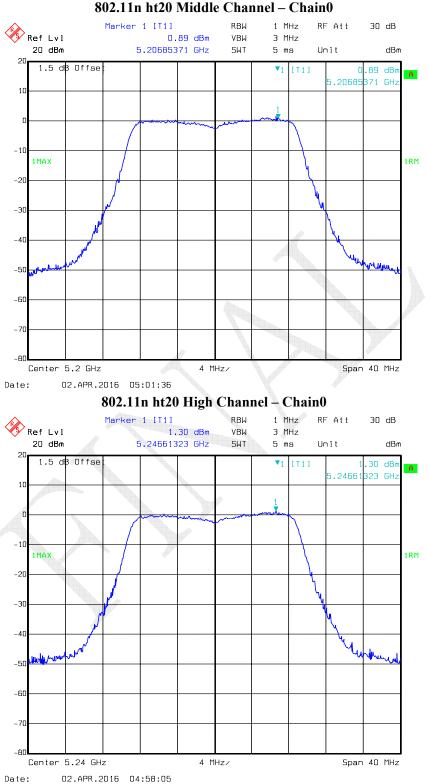
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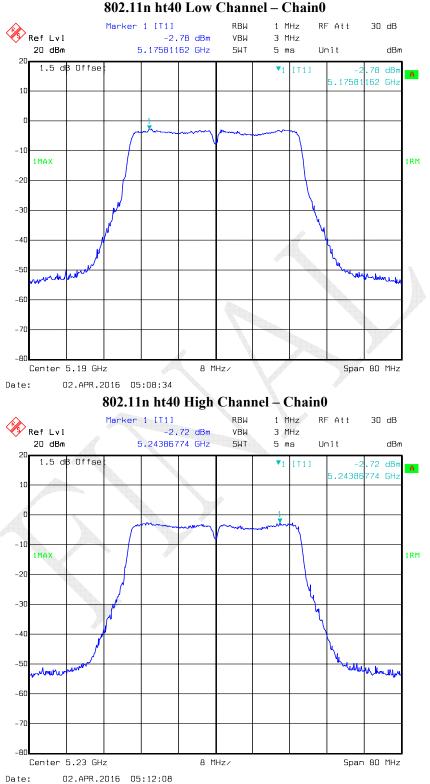


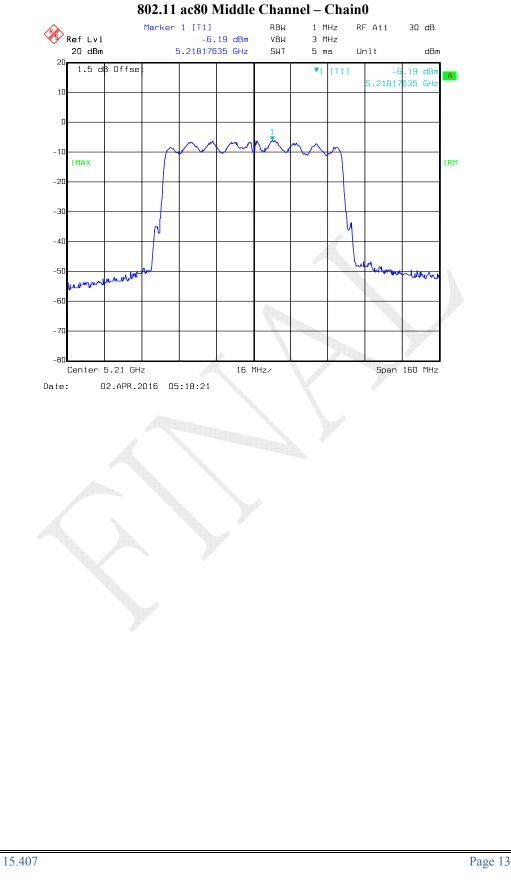
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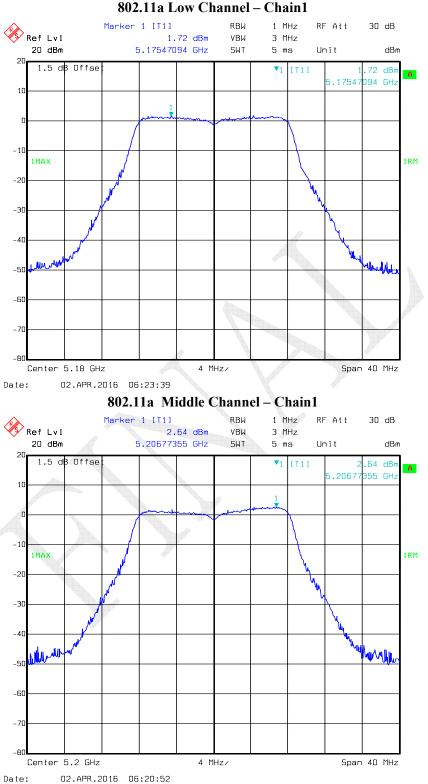


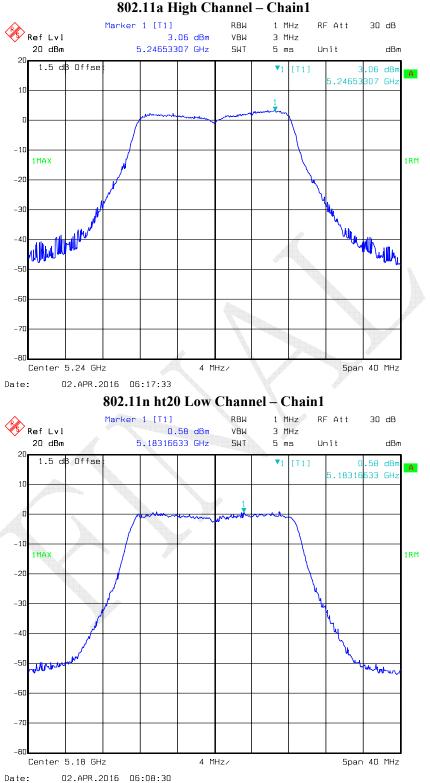
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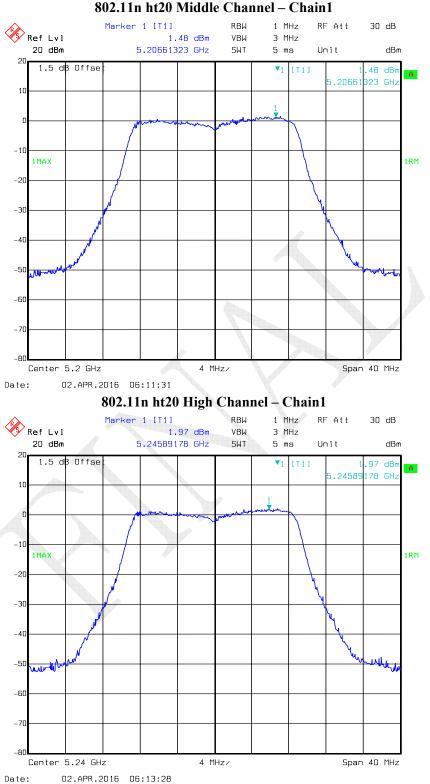




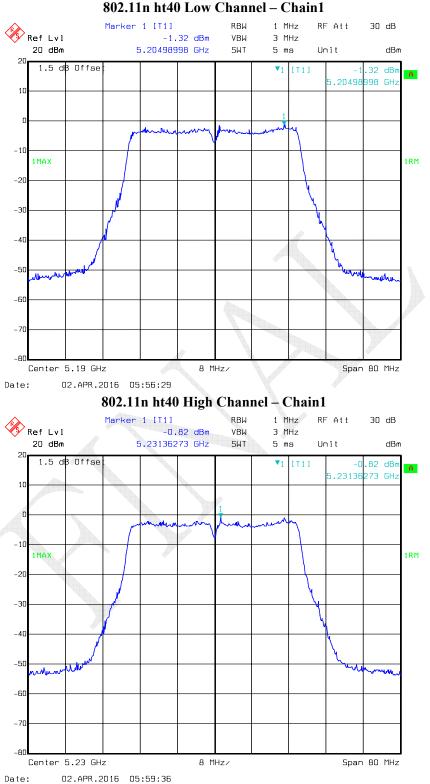


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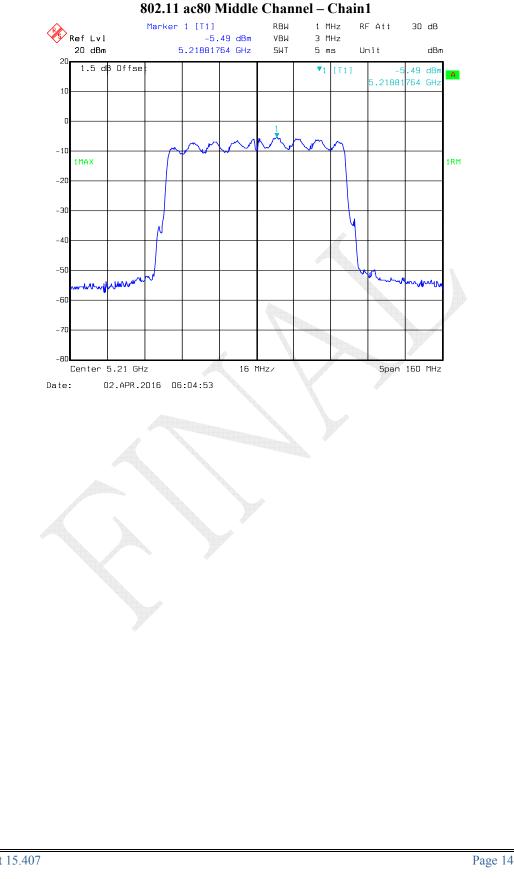
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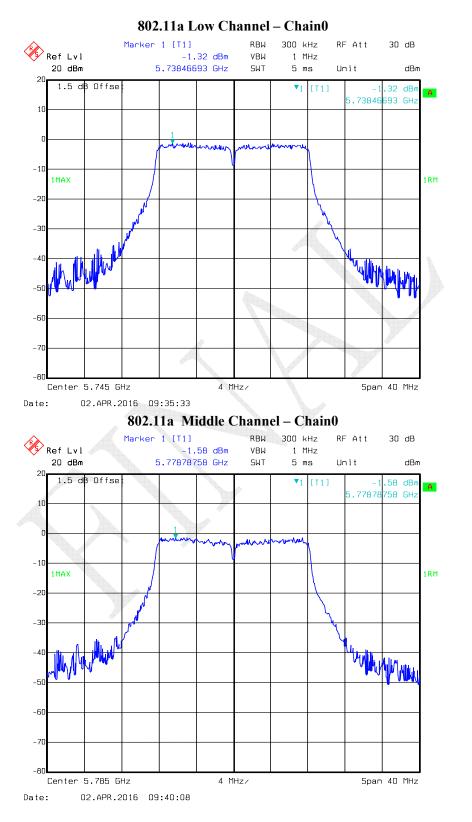
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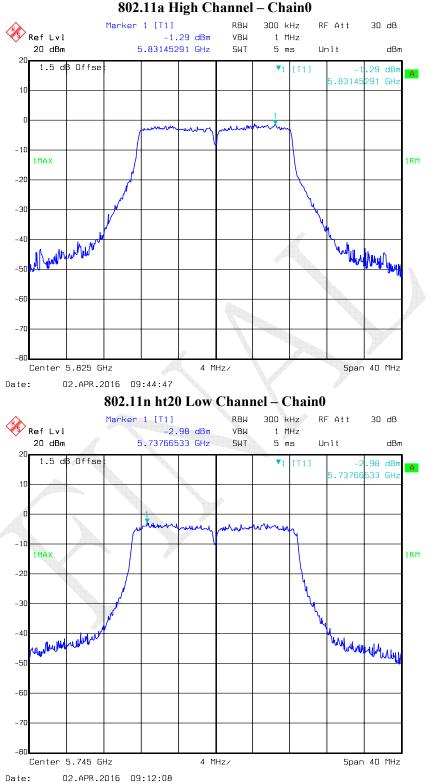


## 5725MHz-5850MHz:

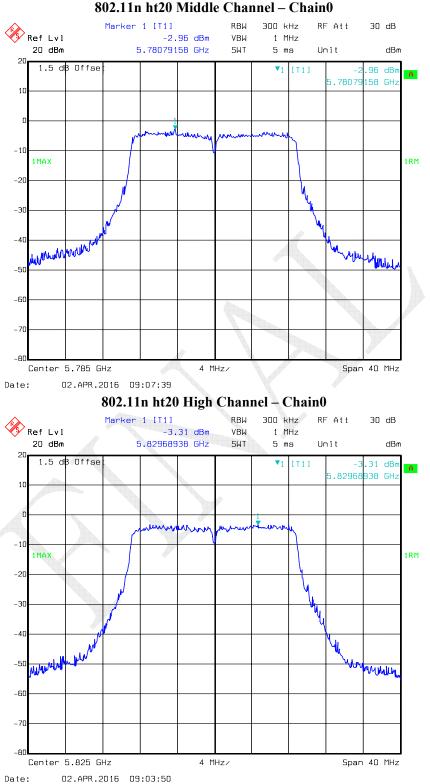


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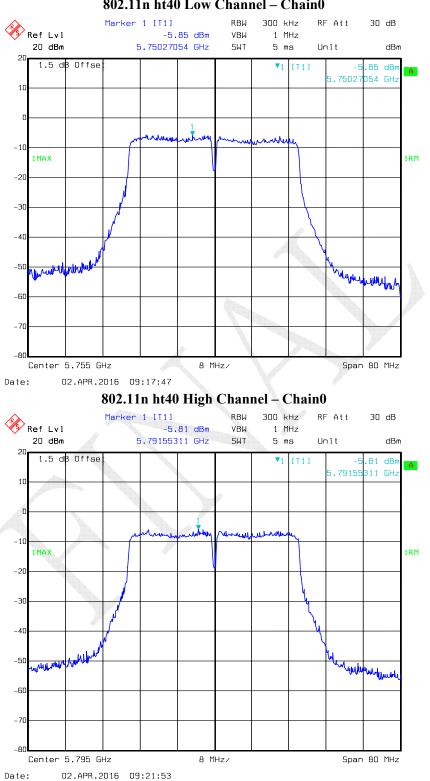
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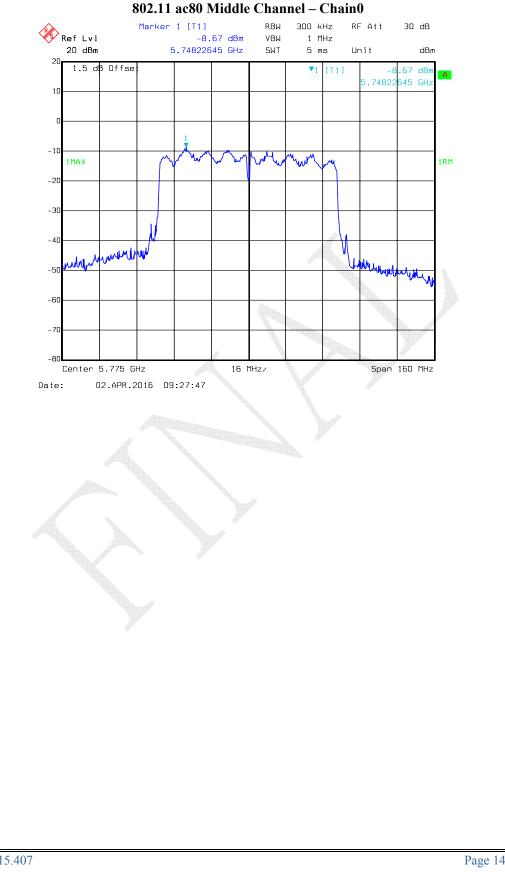
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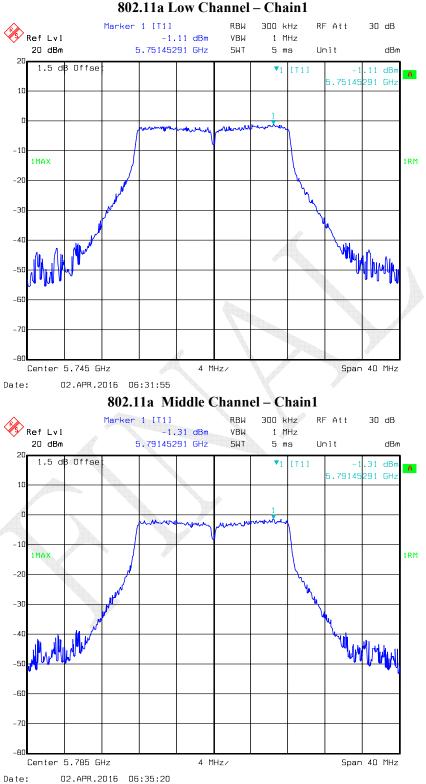


802.11n ht40 Low Channel - Chain0

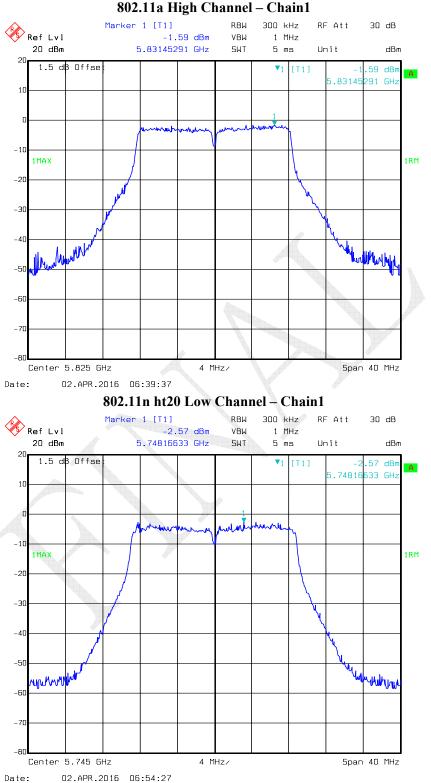
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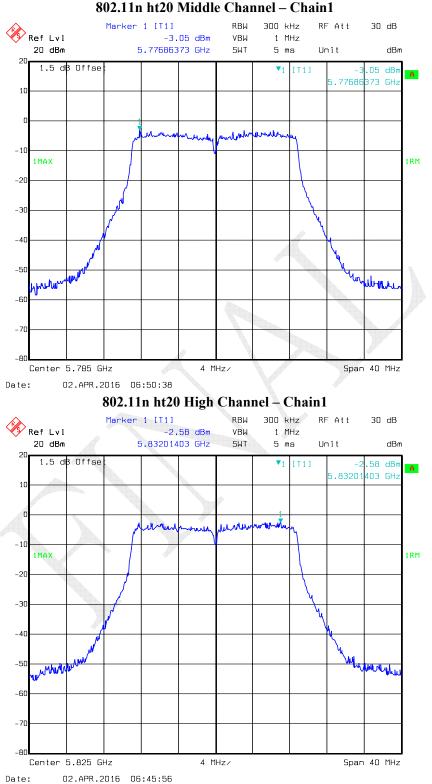
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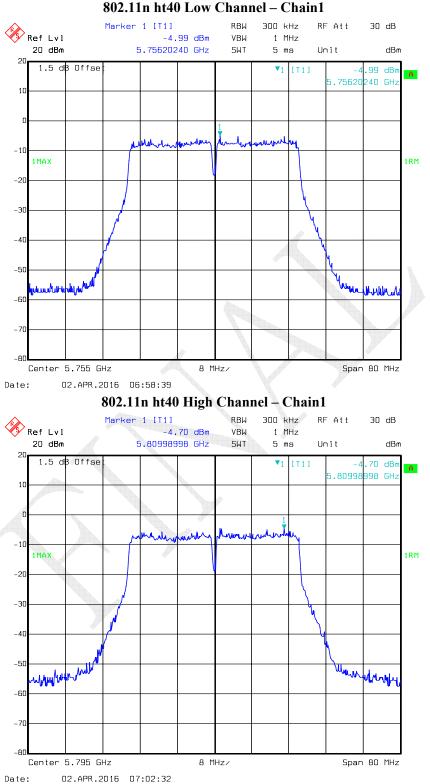
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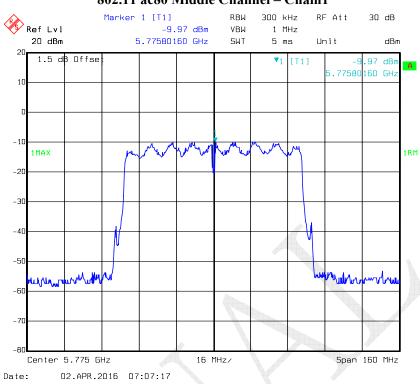
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Bay Area Compliance Laboratories Corp. (Dongguan)



802.11 ac80 Middle Channel – Chain1

\*\*\*\*\* END OF REPORT \*\*\*\*\*

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