

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E REQUIREMENT

	OF		
Product Name:	Wireless Cable Gateway		
Brand Name:	Castlenet		
Model No.:	CBV3843ZU1M, CBW3843GU1M, CBV383ZU1M, CBW383GU1M		
Model Difference:	CBW3843GU1M: without VOIP CBV383ZU1M, CBW383GU1M: for marketing purpose used		
FCC ID:	RK9-CBV3843ZU1M		
Report No.:	E2/2016/60031		
Issue Date:	Jun. 30, 2016		
FCC Rule Part:	§15.407		
Prepared for:	CastleNet Technology Inc. No.64,Chung-Shan Rd., Tu-Cheng District, New Taipei City, 23680 Taiwan		
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyua City, Taiwan 333		
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Testing Laboratory

0513

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revision section of the document.

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# VERIFICATION OF COMPLIANCE

Applicant:	CastleNet Technology Inc. No.64,Chung-Shan Rd., Tu-Cheng District, New Taipei City, 23680 Taiwan
Product Name:	Wireless Cable Gateway
Brand Name:	Castlenet
Model No.:	CBV3843ZU1M, CBW3843GU1M, CBV383ZU1M, CBW383GU1M
Model Difference:	CBW3843GU1M: without VOIP CBV383ZU1M, CBW383GU1M: for marketing purpose used
FCC ID:	RK9-CBV3843ZU1M
File Number:	E2/2016/60031
Date of Test:	Jun. 04, 2016 ~ Jun. 24, 2016
Date of EUT Received:	Jun. 04, 2016

## We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Ton Lis	Date:	Jun. 30, 2016
Prepared By:	Tin LIn / Engineer Karen Huang	Date:	Jun. 30, 2016
- Approved By: -	Karen Huang / Clerk Jim Chang Jim Chang / Asst. Manager	Date:	Jun. 30, 2016

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# **Revision History**

Report Number	Revision	Description	Issue Date
E2/2016/60031	Rev.00	Initial creation of document	Jun. 30, 2016

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#### **GENERAL INFORMATION** 1.

## **1.1 Product Description**

General:

Product Name:	Wireless Cable Gateway		
Brand Name:	Castlenet		
Model No.:	CBV3843ZU1M, CBW3843GU1M, CBV383ZU1M, CBW383GU1M		
Model Difference:	CBW3843GU1M: without VOIP CBV383ZU1M, CBW383GU1M: for marketing purpose used		
Product SW/HW version:	N/A/ N/A		
Radio SW/HW version:	N/A/ N/A		
Test SW Version:	N/A		
RF power setting in TEST SW:	N/A		
RJ45 LAN CABLE:	Model No.: JY01-C066, Supplier: EKSON		
RJ11 PHONE CABLE:	Model No.: PF01-C097, Supplier: EKSON		
	12Vdc from Adapter		
Power Supply:	Adapter:	Model No.: ADS0306-W120250, Supplier: AOEM	

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### WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology	
110	5150~5250	4	14.87 dBm		
11a	5725-5850	5	0FDN 14.85 dBm		
11n /	HT20 / VHT20 5150~5250	4	HT: 14.96 dBm (Worst Case)	OFDM	
ac_20M	HT20 / VHT20 5725-5850	5	HT: 14.87 dBm (Worst Case)		
11n /	HT40 / VHT40 5150~5250	2	HT: 14.99 dBm (Worst Case)	OFDM	
ac_40M	HT40 / VHT40 5725-5850	2	HT: 14.98 dBm (Worst Case)		
11ac 80M	VHT80 5150~5250	1 14.98 dBm			
	VHT80 5725-5850	1	14.86 dBm	OFDM	
PIFA Antenna, Supplier: Taiwan Anjie Electronics Co. Ltd1. Main: Partl No.: AJDP1J-W0009, Gain: 4.38dBi (5150~5250MHz) 3.84dBi (5725~5850MHz)2. Aux 1: Partl No.: AJDP1J-W0007, Gain: 4.22dBi (5150~5250MHz) 5.50dBi (5725~5850MHz)3. Aux 2: Partl No.: AJDP1J-W0008, Gain: 5.53dBi (5150~5250MHz)			ronics Co. Ltd.		
Modulation type		4.51dBi (5725~5850MHz) 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transition	Rate:	802.11 a: 6 802.11 n_2 802.11 n_4 802.11 ac_ 802.11 ac_	/9/12/18/24/36/48/54 Mbps 20MHz: 6.5 – 216.7Mbps 20MHz: 13.5 – 450.0Mbps 20MHz: 6.5 –288.9Mbps 40MHz: 13.5 –600.0Mbps 80MHz: 29.3 – 1300.0Mbps		

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### 1.2 Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting, Wi-Fi 802.11a/b/g/n & ac features, and below is details of information.

Product Feature			
Product Name: Wireless Cable Gateway			
Brand Name: Castlenet			
Model No.:	CBV3843ZU1M, CBW3843GU1M, CBV383ZU1M, CBW383GU1M		
Model Difference: CBW3843GU1M: without VOIP CBV383ZU1M, CBW383GU1M: for marketing purpose used			
FCC ID:	RK9-CBV3843ZU1M		
Wi-Fi Specification	802.11a/b/g/n/ac		

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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#### 1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules

FCC KDB 662911 D01 Multiple Transmitter Output

FCC KDB 644545 D03 Guidance for IEEE 802.11ac v01

ANSI C63.10:2013

Note:

- All test items have been performed and record as per the above standards. 1.
- The composite system is compliance with FCC Subpart B is authorized under 2. the certification procedure.

### 1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333. (TAF code 0513)

FCC Registration Numbers are: 735305

Canada Registration Number: 4620A-5.

#### Special Accessories 1.5

There are no special accessories used while test was conducted.

#### **Equipment Modifications** 1.6

There was no modification incorporated into the EUT.

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#### SYSTEM TEST CONFIGURATION 2.

#### **EUT Configuration** 2.1

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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#### Measurement Results Explanation Example 2.4 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

### Note:

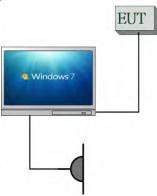
The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss 2.0dB, and 10dB attenuator.

SISO mode offset = RF cable loss (dB)+ attenuation factor(dB)+ 10 log(NANT) dB = 12.0(dB)MIMO mode offset = RF cable loss (dB)+ attenuation factor(dB)+ 10 log(NANT) dB = 16.8(dB)

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### 2.5 Configuration of Tested System



### Fig. 2-1 Radiated Emission

## Fig. 2-2 Conducted (Antenna Port) Configuration Emission

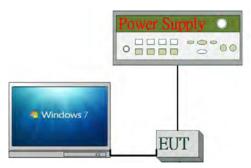
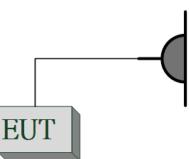


Fig. 2-3 Conduction Emission



**Table 2-1 Equipment Used in Tested System** 

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L420	LR-7HXZA	N/A	Un-shielded
3.	DC Power Supply	HP	E3640A	KR93300208	N/A	Un-shielded

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#### SUMMARY OF TEST RESULT 3.

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	Maximum Conducted Output Power	Compliant
§15.407(a)	Power Spectral Density	Compliant
§15.407(b)	Undesirable Radiated Emissions	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.203 §15.407(a)	Antenna Requirement	Compliant

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#### **DESCRIPTION OF TEST MODES** 4.

## 4.1 Operated in U-NII Bands

## Operated band in 5150 MHz ~5250 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode		
Channel	Frequency	
36	5180	
40	5200	
44	5220	
48	5240	

802.11 n HT40 Mode, 802.11ac VHT40 Mode				
channel Frequency				
38 5190				
46	5230			

802.11ac VHT80 Mode				
channel Frequency				
42 5210				

### Operated band in 5725 MHz ~5850 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode			
Channel	Frequency		
149	5745		
153	5765		
157	5785		
161	5805		
165	5825		

802.11 n HT40 Mode, 802.11ac VHT40 Mode			
channel Frequency			
151 5755			
159	5795		

802.11ac VHT80 Mode				
channel Frequency				
155 5775				

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### 4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.

2. Test program used to control the EUT for staying in continuous transmitting mode is programmed.

3. Investigation has been done on all the possible configurations for searching the worst case.

### **RADIATED EMISSION TEST:**

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	36,44,48	OFDM	6	Aux2
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
802.11a	5745~5825	149 to 165	149,157,165	OFDM	6	Aux2
802.11ac_VHT80	5775	155	155	OFDM	MCS0	MIMO
	RADI	ATED EMISS	ION TEST (A	BOVE 1 GHz)		
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	E100 E040	00 to 10	00 44 40	OFDM	6	Aux2
802.11n_HT20	5180~5240	36 10 48	36 to 48 36,44,48	OFDM	MCS16	MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS16	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
802.11a		140 += 105	140 157 105	OFDM	6	Aux2
802.11n_HT20	5745~5825	149 to 165	149,157,165	OFDM	MCS16	MIMO
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS16	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS0	MIMO

### Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

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#### ANTENNA PORT CONDUCTED MEASUREMENT:

	CONDUCTED TEST					
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a				OFDM	6	Aux2
802.11n_HT20 802.11ac_VHT20	5180~5240	36 to 48	36,44,48	OFDM	MCS16	MIMO
802.11n_HT40 802.11ac_VHT40	5190~5230	38 to 46	38,46	OFDM	MCS16	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
802.11a				OFDM	6	Aux2
802.11n_HT20 802.11ac_VHT20	5745~5825	149 to 165	149,157,165	OFDM	MCS16	MIMO
802.11n_HT40 802.11ac_VHT40	5755~5795	151 to 159	151,159	OFDM	MCS16	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS0	MIMO

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#### **MEASUREMENT UNCERTAINTY** 5.

Test Items	Uncertainty	
AC Power Line Conducted Emission	+/- 2.586 dB	
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz	
The Maximum Output Power Measurement	+/- 0.96 dB	
Peak Power Spectral Density Measurement	+/- 1.67 dB	
Frequency Stability	+/- 123.36 Hz	
Temperature	+/- 0.65 °C	
Humidity	+/- 4.6 %	
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%	

#### Radiated Spurious Emission:

	9kHz-30MHz: +/-2.87dB	
	30MHz - 180MHz: +/- 3.37dB	
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB	
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB	
	1GHz - 18GHz: +/- 4.04dB	
	18GHz - 40GHz: +/- 4.04dB	

	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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#### CONDUCTED EMISSION TEST 6.

### 6.1. Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range	Limits dB(uV)				
MHz	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				
Note					
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.					

### 6.2. Measurement Equipment Used

Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
EMI Test Receiver	R&S	ESCI 7	100950	12/12/2015	12/11/2016	
Coaxial Cables	N/A	N30N30-1042-1 50cm	N/A	02/07/2016	02/06/2017	
LISN	Schwarzbeck	NSLK 8127	8127-648	03/11/2016	03/10/2017	
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.	

### 6.3. EUT Setup

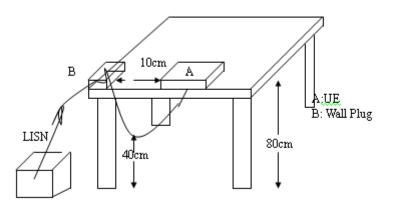
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- 3. The LISN was connected with 120Vac/60Hz power source.

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### 6.4. Test SET-UP



### 6.5. Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed.

### 6.6. Measurement Result

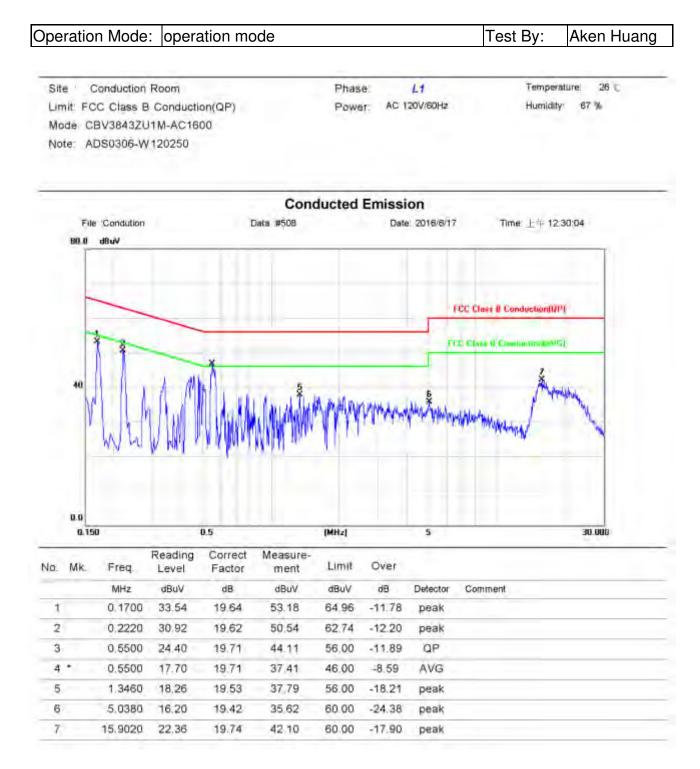
Note: Refer to next page for measurement data and plots. Note2: The \* reveals the worst-case results that closet to the limit

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## AC POWER LINE CONDUCTED EMISSION TEST DATA



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5 .

6

0.5580

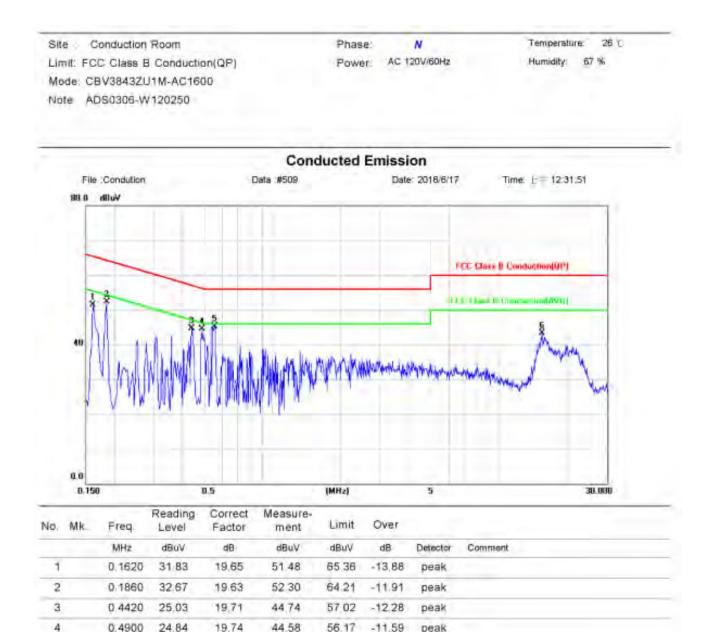
15.5180

25.64

23.41

1971

19.80



45.35

43 21

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-10.65

-16.79

peak

peak

56.00

60.00



## 7. DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

### Formula:

Duty Cycle = Ton / (Ton+Toff)

### **Measurement Procedure:**

- 1. Set span = Zero
- 2. RBW = 8MHz
- 3. VBW = 8MHz,
- 4. Detector = Peak

Duty Cycle:

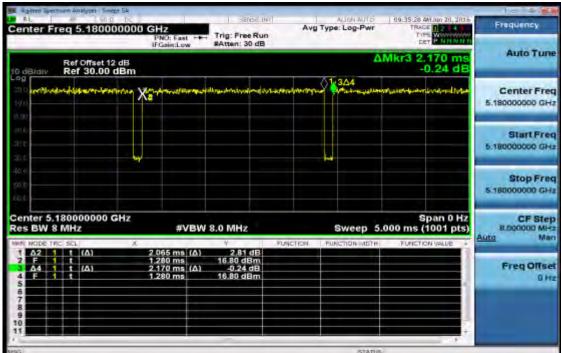
Mode	Duty Cycle (%)	Duty Factor (dB) =10*log ( 1/Duty Cycle
802.11a	95.16	0.22
802.11n_20	87.08	0.60
802.11n_40	78.22	1.07
802.11ac_80	92.45	0.34

Duty Cycle Factor:  $10 * \log(1/0.9516) = 0.22$ Duty Cycle Factor:  $10 * \log(1/0.8708) = 0.6$ Duty Cycle Factor:  $10 * \log(1/0.7822) = 1.07$ Duty Cycle Factor:  $10 * \log(1/0.9245) = 0.34$ 

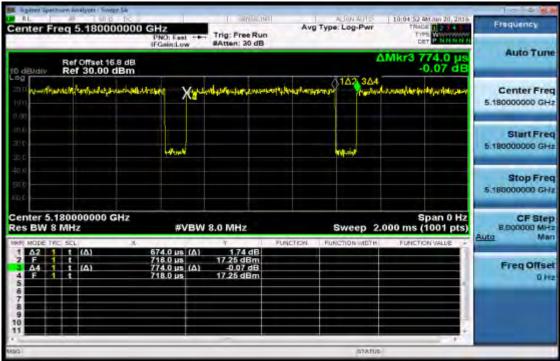
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### **DUTY CYCLE TEST SIGNAL Measurement Result** 802.11a



### 802.11n HT20



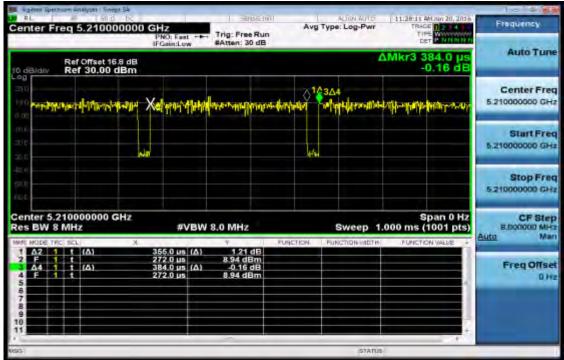
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## 802.11n HT 40

Agreen Spectrum An	alyzer i Sivept SA				the first of the second	1014/63
Center Freq 5	5.190000000 G	Hz	Trig: Free Run	Aug Type: Log-P		Frequency
10 dBidiv Ref		Gain:Low	#Atten: 30 dB		ΔMkr3 450.0 μs 0.13 dB	Auto Tune
20.0 19.0 19.0	complexitedation	X	ખ્ય <sub>મ</sub> ારીમ્લાનો∬વિવેત્સત્વેર	here as weakly just	304 aparter al Magaraten 149	Center Free 5.19000000 GH
30/0 30/0	- Lunius	alise from		(augus)	wij.	Start Free 5.190000000 GH
40.0 50(0 0.0						Stop Fre 5.19000000 GH
Center 5,1900 Res BW 8 MH2	1		8.0 MHz	Sweet	Span 0 Hz 5 1.000 ms (1001 pts)	CF Ste 8.000000 MH Auto Ma
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	(Δ) 3 4	52.0 μs (Δ) 48.0 μs 60.0 μs (Δ) 48.0 μs	5.01 dB 11.67 dBm 0.13 dB 11.67 dBm			Freq Offse 0 H
8 9 10 11 11					TATUS-	

### 802.11 ac VHT 80



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## 8. 26dB & 6dB & 99% EMISSION BANDWIDTH MEASUREMENT

### 8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C. The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

### 8.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
  - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
  - b. Mark the peak frequency and -26dB (upper and lower) frequency.
- 4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
- 5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
  - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Peak,

Sweep=auto

- b. Mark the peak frequency and -6dB (upper and lower) frequency.
- 6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all frequency of interest measured was complete.

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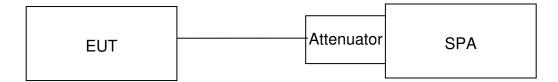
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#### **Measurement Equipment Used** 8.3

	SGS Conducted Room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1326001	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315048	06/23/2015	06/22/2016
Spectrum Ana- lyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
DC Power Sup- ply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/23/2015	06/22/2016

#### Test Set-up 8.4



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#### 8.5 Measurement Result 26dB Bandwidth

#### 802.11a Aux2

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.04	13.019
5220	19.95	12.999
5240	19.98	13.006

### 802.11n HT20 Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.14	13.041
5220	20.23	13.061
5240	20.12	13.036

### 802.11n HT20 Aux1

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.08	13.028
5220	20.38	13.091
5240	20.32	13.079

### 802.11n HT20 Aux2

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5180	20.23	13.060
5220	20.24	13.061
5240	20.16	13.045

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#### 802.11n HT40 Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	39.63	15.980
5230	39.88	16.008

#### 802.11n HT40 Aux1

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	38.81	15.890
5230	39.23	15.936

### 802.11n HT40 Aux2

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5190	39.16	15.928
5230	39.37	15.952

#### 802.11ac VHT80 Main

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5210	82.35	19.157

### 802.11ac VHT80 Aux1

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5210	80.79	19.074

### 802.11ac VHT80 Aux2

Frequency (MHz)	26dB Bandwidth (MHz)	10 Log (B) (dB)
5210	80.97	19.083

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### 6dB Bandwidth (5725 MHz~ 5850 MHz) measure with Peak detector for FCC

#### 802.11a Aux2

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	16.36	12.138
5785	16.37	12.139
5825	16.37	12.140

#### 802.11n HT20 Main

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.59	12.453
5785	17.60	12.455
5825	17.59	12.451

#### 802.11n HT20 Aux1

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.62	12.459
5785	17.62	12.461
5825	17.63	12.464

#### 802.11n HT20 Aux2

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5745	17.60	12.455
5785	17.58	12.450
5825	17.62	12.459

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#### 802.11n HT40 Main

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	35.57	15.511
5795	36.34	15.604

#### 802.11n HT40 Aux1

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	36.28	15.597
5795	36.38	15.608

#### 802.11n HT40 Aux2

Frequency (MHz)	6dB Bandwidth (MHz)	10 Log (B) (dB)
5755	36.31	15.600
5795	35.56	15.509

#### 802.11ac VHT80 Main

Frequency	6dB Bandwidth	10 Log (B)
(MHz)	(MHz)	(dB)
5775	75.35	18.771

#### 802.11ac \_VHT80\_Aux1

Frequency	6dB Bandwidth	10 Log (B)
(MHz)	(MHz)	(dB)
5775	75.91	18.803

### 802.11ac VHT80 Aux2

Frequency	6dB Bandwidth	10 Log (B)
(MHz)	(MHz)	(dB)
5775	75.32	18.769

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### 99% Bandwidth

### (5150~5250 MHz)

#### 802.11a

Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.28	< 5250

### 802.11n HT20

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.79	< 5250

#### Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.79	< 5250

#### Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5240	5248.82	< 5250

### 802.11n HT40

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.10	< 5250

#### Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.15	< 5250

#### Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5230	5248.10	< 5250

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### 802.11ac VHT80

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.90	< 5250

#### Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.90	< 5250

#### Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5210	5247.90	< 5250

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### 5725~5850MHz

### 802.11a

#### Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5745	5736.66	> 5725

### 802.11n HT20

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5745	5736.09	> 5725

#### Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5745	5736.09	> 5725

#### Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5745	5736.12	> 5725

### 802.11n HT40

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5755	5736.85	> 5725

#### Aux1

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5755	5736.70	> 5725

#### Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5755	5736.80	> 5725

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### 802.11ac VHT80

Main

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5775	5737.10	> 5725

Aux1

-	uency Hz)	Measured Frequency (MHz)	Limit (MHz)
57	75	5737.20	> 5725

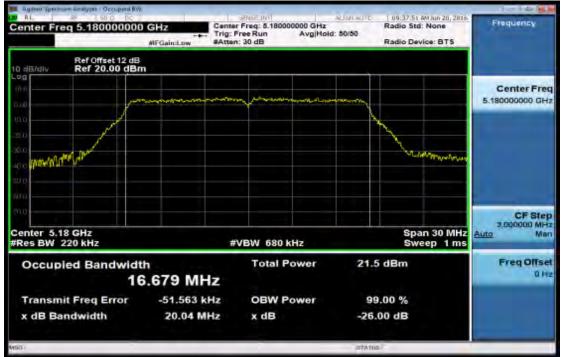
Aux2

Frequency (MHz)	Measured Frequency (MHz)	Limit (MHz)
5775	5737.10	> 5725

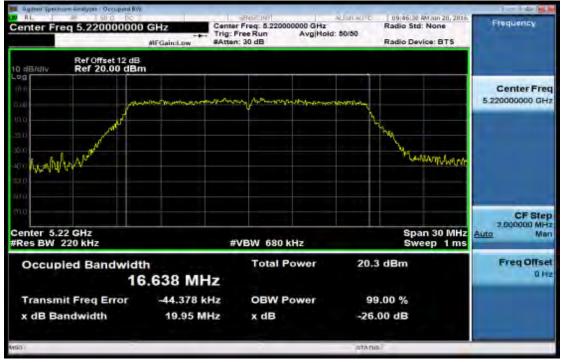
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## 26dB & 99% Bandwidth 802.11a, 5150~5250 MHz (Aux2) Test Data CH-Low (5180MHz)



## Test Data CH-Mid (5220MHz)



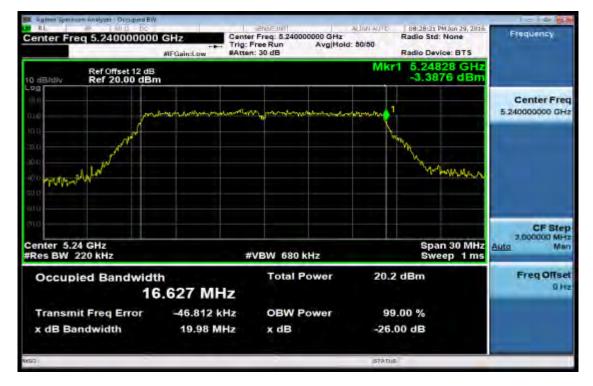
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## Test Data CH-High (5240MHz)



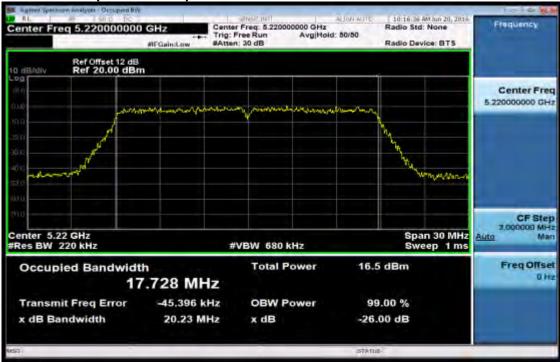
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### 802.11n HT20, 5150~5250 MHz (Main) Test Data CH-Low (5180 MHz)

DI ALIGH AUT 10:11:30 AM Jun 20, 2018 Radio Std: None Center Freq: 5.180000000 GHz Trig: Freq Run Avg|Hold: 50/50 #Atten: 30 dB Frequency Center Freq 5.180000000 GHz **MFGain:Low** Radio Device: BTS Ref Offset 12 dB Ref 20.00 dBm Center Freq 5.18000000 GHz mark CF Step 3.00 Center 5.18 GHz #Res BW 220 kHz Span 30 MHz Auto Ma #VBW 680 kHz Sweep 1 ms 16.4 dBm Freq Offse Occupied Bandwidth Total Power OH 17.747 MHz Transmit Freq Error -57.259 kHz **OBW Power** 99.00 % 20.14 MHz -26.00 dB x dB Bandwidth x dB

# Test Data CH-Mid (5220 MHz)

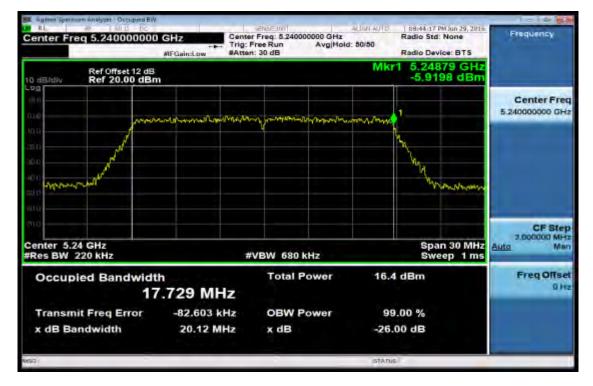


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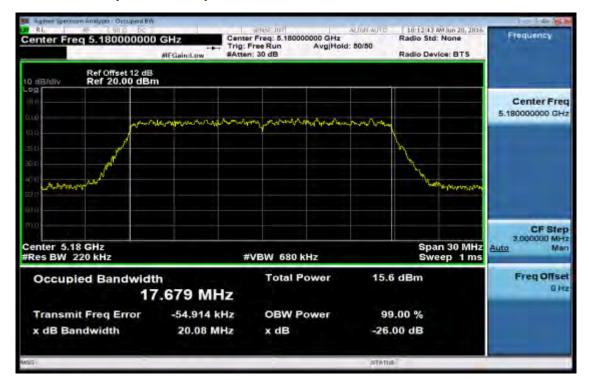
## Test Data CH-High (5240 MHz)



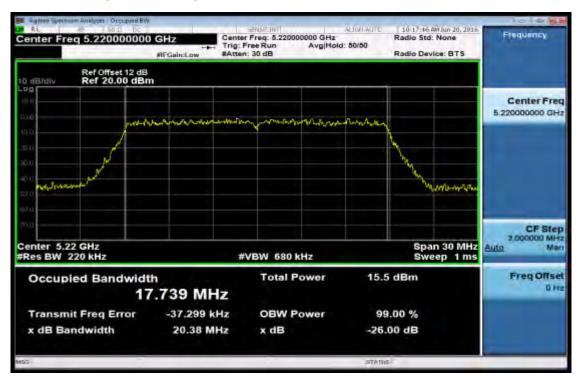
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#### 802.11n HT20, 5150~5250 MHz (Aux1) Test Data CH-Low (5180 MHz)

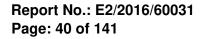


## Test Data CH-Mid (5220 MHz)



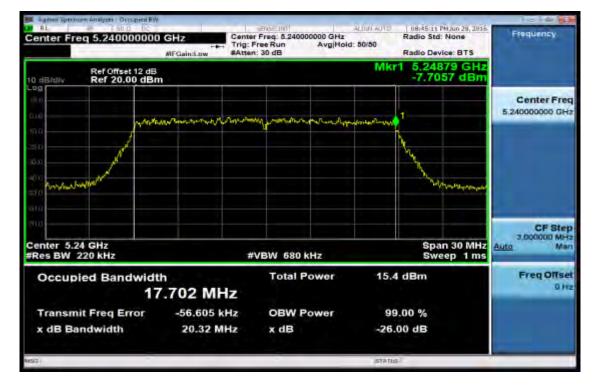
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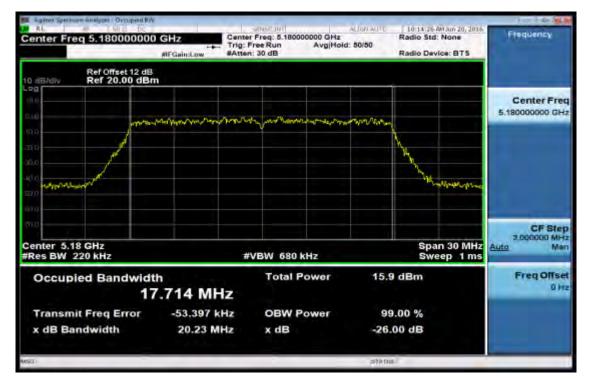
## Test Data CH-High (5240 MHz)



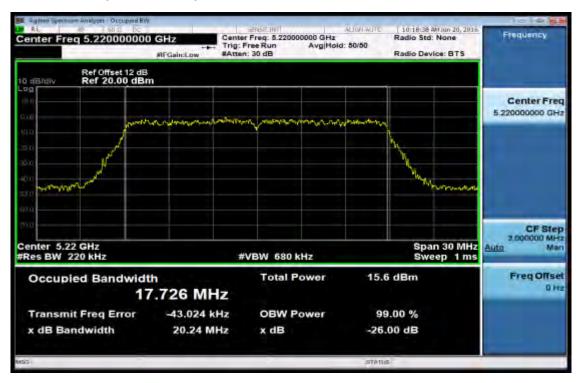
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#### 802.11n HT20, 5150~5250 MHz (Aux2) Test Data CH-Low (5180 MHz)



## Test Data CH-Mid (5220 MHz)



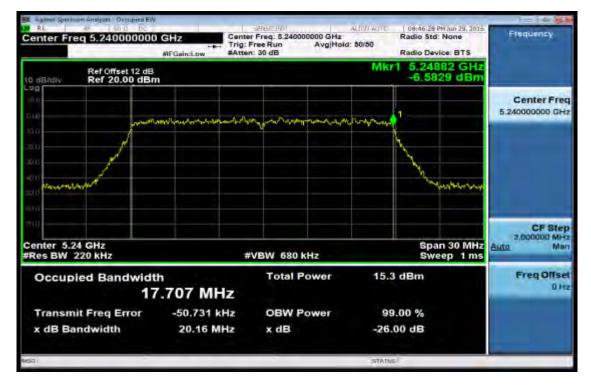
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## Test Data CH-High (5240 MHz)



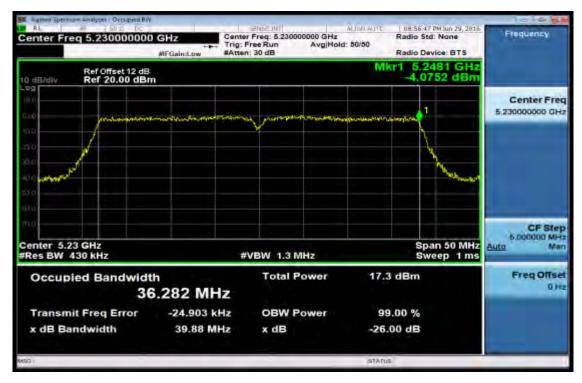
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## 802.11n HT40, 5150~5250 MHz (Main) Test Data CH-Low (5190 MHz)

RL	MANAYER   Occupied BW # 150.0 Dc q 5.190000000	GHz Cen	senseum ter Freq: 5.19000000 :: Free Run A ten: 30 dB	0 GHz vg Hold: 50/50	11:02:21 AM Jun 20, 2015 Radio Std: None Radio Device: BTS	Frequency
10 dB/div	Ref Offset 12 dB Ref 20.00 dBn	n				
10.0 20.0 20.0 20.0 20.0 40.0 Autoreter	Juin	1	- Junio	1)+9-12-0-14-13-bec	themes	Center Free 5.190000000 GH
Center 5.19 #Res BW 4			#VBW 1.2 MHz		Span 50 MHz Sweep 1 ms	CF Ster 5.00000 MH Auto Mar
Occupi	ed Bandwidt 36	<sup>h</sup> 5.281 MHz	Total Pow	ver 17	4 dBm	Freq Offse 0 H
	Transmit Freq Error -32.944 kl x dB Bandwidth 39.63 Ml		OBW Pow x dB		9.00 % 5.00 dB	
55)			-	IATO	us-	

## Test Data CH-High (5230 MHz)



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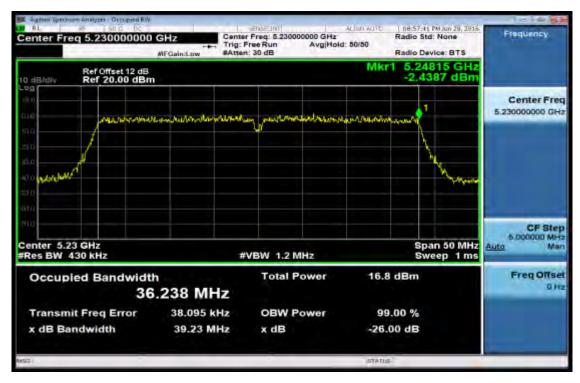
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## 802.11n HT40, 5150~5250 MHz (Aux1) Test Data CH-Low (5190 MHz)

RI	en Analysen Decupied BW 50.0 DC eq 5.190000000	Her ing.	Freq: 5.190000000 GHz Free Run Avg Hol n: 30 dB	Radio Sto		Frequency							
to dB/div	Ref Offset 12 dB Ref 20.00 dBm	Ref Offset 12 dB Ref 20.00 dBm											
	nennula	and an	h y window Andrewski sta	Kalenti Magazila		Center Fred 5.15000000 GHz							
250	/				mon								
010 010 Center 5.1	9 GHz			Spi	an 50 MHz A	CF Step 5.000000 MH							
Res BW 4	130 kHz ied Bandwidt		VBW 1.2 MHz Total Power		eep 1 ms								
		.284 MHz				0.00							
Transm	it Freq Error	1.913 kHz	OBW Power	99.00 %									
x dB Ba	x dB Bandwidth 38.8		ndwidth 38.81 MHz		x dB	-26.00 dB							
45G				STATUS									

## Test Data CH-High (5230 MHz)



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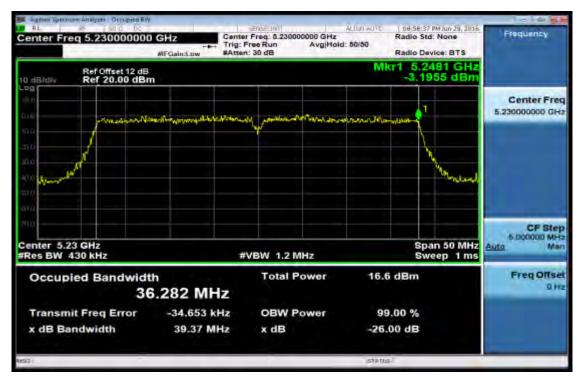
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## 802.11n HT40, 5150~5250 MHz (Aux2) Test Data CH-Low (5190 MHz)

Frequency		11.06-03 Radio Sto Radio De		Center Freq: 6.190000000 GHz Trig: Free Run AvgiHold: 50/50 #Atten: 30 dB				Autent Spectrum Analyzer Occupied BW RL 80 1902 DC enter Freq 5.190000000 GHz MFGaincLew					
									Ref Offset Ref 20.0	0 dB/div			
Center Free 5.19000000 GH		maniq	witht	ng takang	property	minutary	w.a.nakinki	otherwood	yenin				
	the wards								1	niu iu.a iu.a iu.a iu.a iu.a iu.a iu.a iu			
СF Ste 5.000000 МН <u>Auto</u> Ма	an 50 MHz eep 1 ms			Hz	W 1.3 M	#VE				Center 5.1			
Freq Offse 0 H		.5 dBm 99.00 % 6.00 dB		Total Power		łz	Occupied Bandwidth 36.273 MHz						
				ower			Transmit Freq Error-18.753 kx dB Bandwidth39.16 M						
		2	status							951			

## Test Data CH-High (5230 MHz)



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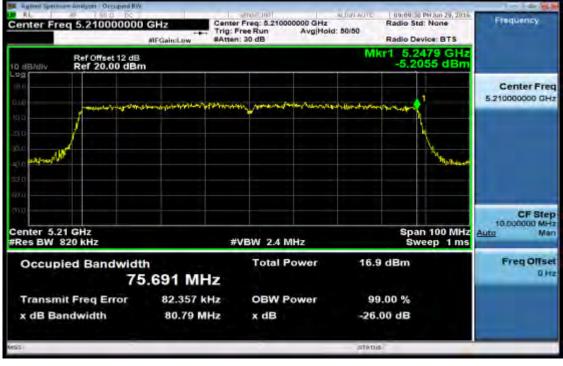
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### 802.11ac VHT80, 5150~5250 MHz (Main) Test Data CH-Mid (5210 MHz)



## 802.11ac VHT80, 5150~5250 MHz (Aux1) Test Data CH-Mid (5210 MHz)



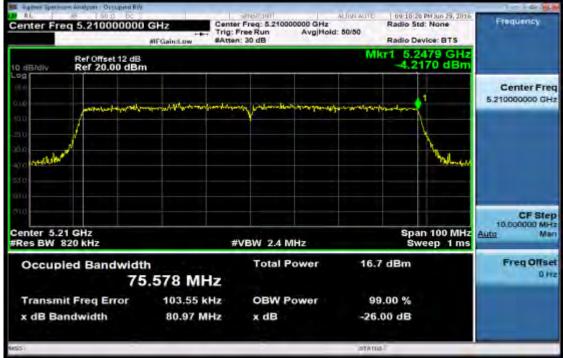
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## 802.11ac VHT80, 5150~5250 MHz (Aux2) Test Data CH-Mid (5210 MHz)



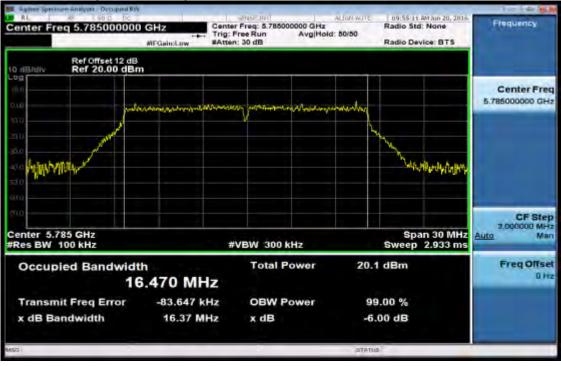
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## 6dB & 99% Bandwidth 802.11a, 5725~5850 MHz (Aux2) Test Data CH-Low (5745 MHz)



## Test Data CH-Mid (5785 MHz)

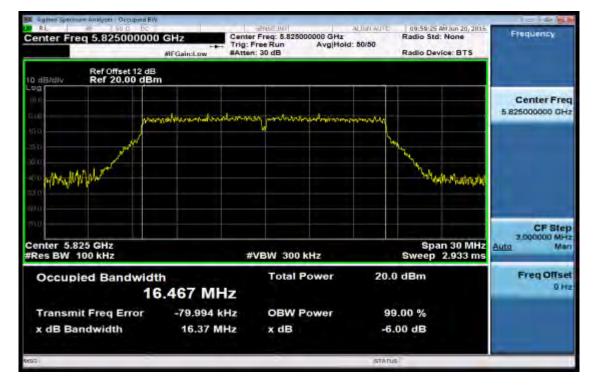


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## Test Data CH-High (5825 MHz)



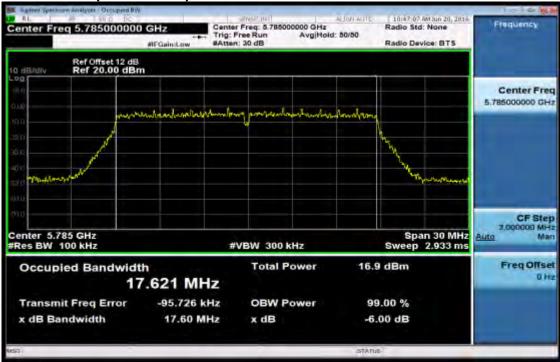
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## 802.11n HT20, 5725~5850 MHz (Main) Test Data CH-Low (5745 MHz)

PI 08:51:53 PM Jun 29, 2018 Radio Std: None ALTON ALTO Center Freq. 5.745000000 GHz Trig: Free Run Avg|Hold: 50/50 #Atten: 30 dB Frequency Center Freq 5.745000000 GHz Radio Device: BTS **MFGain:Low** 5.73609 GH -8.2584 dBn Mkr Ref Offset 12 dB Ref 20.00 dBm Center Freq 5.745000000 GHz Amarta Name CF Step 3.00 Center 5.745 GHz #Res BW 100 kHz Span 30 MHz Sweep 2.933 ms Auto Ma #VBW 300 kHz Freq Offse Occupied Bandwidth Total Power 17.2 dBm OH 17.634 MHz Transmit Freq Error -84.916 kHz **OBW** Power 99.00 % 17.59 MHz -6.00 dB x dB Bandwidth x dB

# Test Data CH-Mid (5785 MHz)

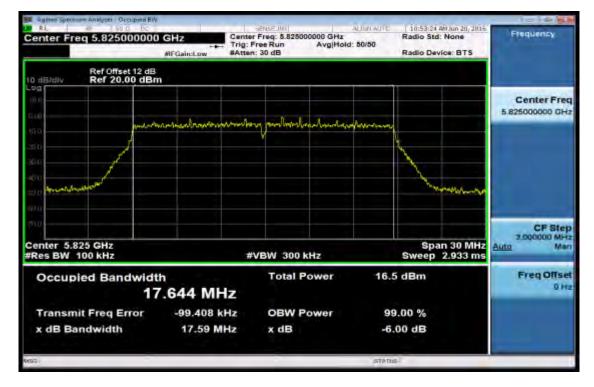


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## Test Data CH-High (5825 MHz)



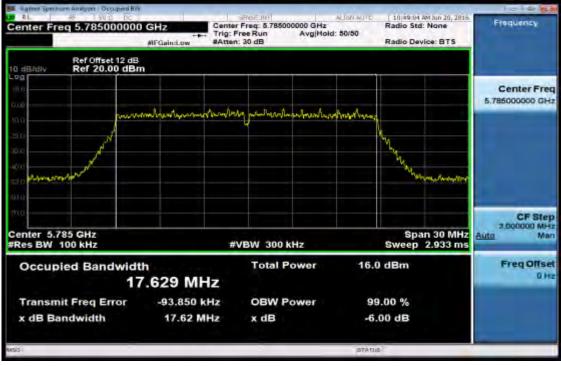
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#### 802.11n\_HT20, 5725~5850 MHz (Aux1) Test Data CH-Low (5745 MHz)

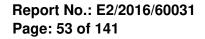
Frequency	Radio Std: None Radio Device: BTS	ALIM WITC Hz Hold: 50/50	rFreq: 5.745000000 GF FreeRun Avg 1 1: 30 dB	ing:	eq 5.745000000	RL							
	1 5.73609 GHz -9.7391 dBm	Mkr			Ref Offset 12 dB Ref 20.00 dBm	10 dB/div							
Center Freq 5.745000000 GHz		Joursander	n marturalization	mandershammental	- Parte								
	Werning and a super				wat	200 300 400 530 <b>754/454</b>							
CF Step 3.000000 MH3 Auto Mar	Span 30 MHz Sweep 2.933 ms		VBW 300 kHz			Center 5.7							
Freq Offset 0 Hz	dBm	15.4	Total Power	Occupied Bandwidth 17.630 MHz									
	.00 % 00 dB		OBW Power x dB	-75.930 kHz 17.62 MHz									
-	2	statu	-			155							

## Test Data CH-Mid (5785 MHz)



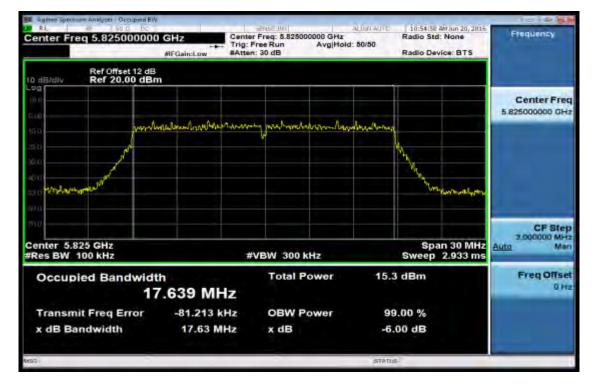
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## Test Data CH-High (5825 MHz)



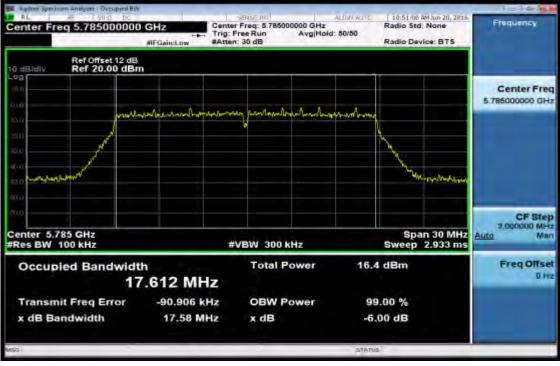
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#### 802.11n HT20, 5725~5850 MHz (Aux2) Test Data CH-Low (5745 MHz)

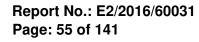


## Test Data CH-Mid (5785 MHz)



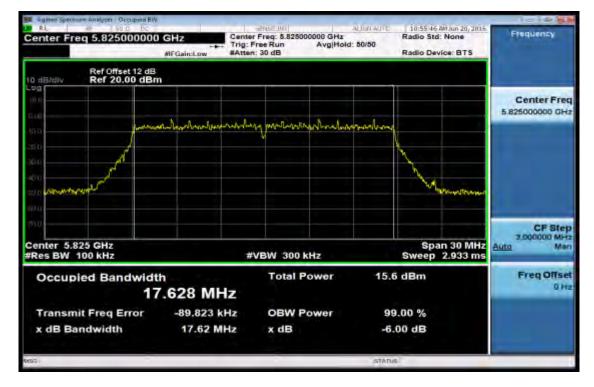
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## Test Data CH-High (5825 MHz)



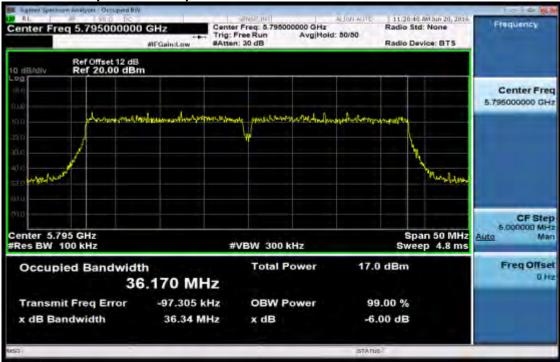
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## 802.11n HT40, 5725~5850 MHz (Main) Test Data CH-Low (5755 MHz)

DI 08:59:54 PM Jun 29, 2018 Radio Std: None Center Freq. 5.755000000 GHz Trig: Free Run Avg|Hole #Atten: 30 dB Frequency Center Freq 5.755000000 GHz Avg|Hold: 50/50 Radio Device: BTS **MFGain:Low** 5.73685 GH -9.8246 dBn Mkr Ref Offset 12 dB Ref 20.00 dBm 0 Center Freq 5.755000000 GHz 1 CF Step 5.00 Center 5.755 GHz #Res BW 100 kHz Span 50 MHz Auto Ma #VBW 300 kHz Sweep 4.8 ms Freq Offse Total Power 17.5 dBm **Occupied Bandwidth** OH 36.146 MHz **OBW** Power Transmit Freq Error -88.177 kHz 99.00 % 35.57 MHz -6.00 dB x dB Bandwidth x dB

## Test Data CH-Mid (5795 MHz)



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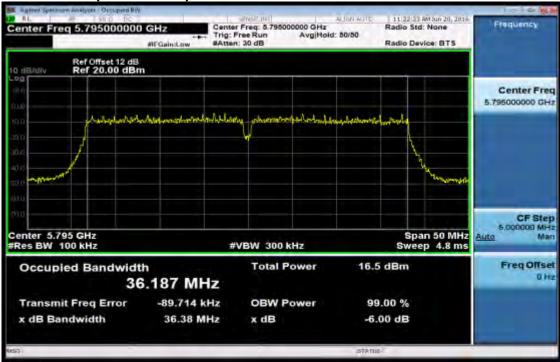
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## 802.11n HT40, 5725~5850 MHz (Aux1) Test Data CH-Low (5755 MHz)

DI Radio Std: None ALIGH AUTO Center Freq. 5.755000000 GHz Trig: Free Run Avg/Hold #Atten: 30 dB Frequency Center Freq 5.755000000 GHz Avg|Hold: 50/50 **MFGain:Low** Radio Device: BTS 5.7367 GH 12.948 dBn Million of the Ref Offset 12 dB Ref 20.00 dBm ō Center Freq 5.755000000 GHz A sale CF Step 5.00 Center 5.755 GHz #Res BW 100 kHz Span 50 MHz Auto Ma #VBW 300 kHz Sweep 4.8 ms 16.4 dBm Freq Offse Occupied Bandwidth Total Power OH 36.111 MHz Transmit Freq Error -94.181 kHz **OBW Power** 99.00 % 36.28 MHz -6.00 dB x dB Bandwidth x dB

## Test Data CH-Mid (5795 MHz)



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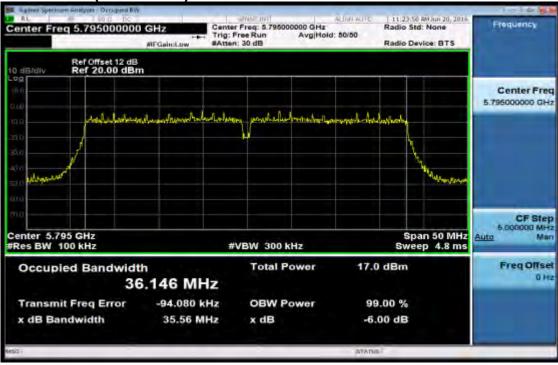
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### 802.11n HT40, 5725~5850 MHz (Aux2) Test Data CH-Low (5755 MHz)

ALIGH ALITS 69:60:58 PM Jun 29, 2018 Center Freq: 5.755000000 GHz Trig: Free Run Avg|Hol #Atten: 30 dB Frequency Center Freq 5.755000000 GHz Radio Std: None Avg|Hold: 50/50 **MFGaincLow** Radio Device: BTS 5.7368 GHz -8.6639 dBm Mker1 Ref Offset 12 dB Ref 20.00 dBm 0 #8 Center Fred 5 755000000 GHz CF Step 5.000000 MH Center 5.755 GHz #Res BW 100 kHz Span 50 MHz Sweep 4.8 ms Auto Ma #VBW 300 kHz Total Power 16.7 dBm Freq Offse **Occupied Bandwidth** OPE 36.152 MHz -77.269 kHz **OBW Power Transmit Freg Error** 99.00 % x dB Bandwidth 36.31 MHz x dB -6.00 dB

## Test Data CH-Mid (5795 MHz)



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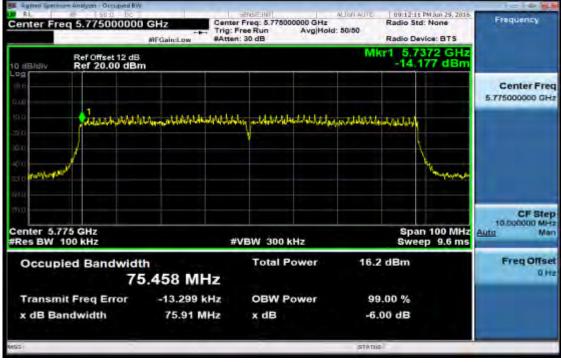
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#### 802.11ac VHT80, 5725~5850 MHz (Main) Test Data CH-Low (5775 MHz)



## 802.11ac VHT80, 5725~5850 MHz (Aux1) Test Data CH-Low (5775 MHz)



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#### 802.11ac VHT80, 5725~5850 MHz (Aux2) Test Data CH-Low (5775 MHz)

Aglest Spectrum	Analyzes   Octoped By	4	CONTRACTOR OF A DESCRIPTION OF A DESCRIP	Sector Sector		10 4 33
Center Freq	5.77500000		ter Freq: 5.775000000 GHz Free Run AvgiHolo ten: 30 dB	Radi	17:12 PMJun 29, 2016 io Std: None io Device: BTS	Frequency
10 dB/div	Ref Offset 12 dB Ref 20.00 dB				5.7371 GHz 13.406 dBm	
010 (0.0						Center Free 5.775000000 GH:
100	- Label and termined and	hild never haldel of here and had	hole pridition with the		ш	
30.0 40.0	/					
sala tehalaparat					malandarper	
pu)						CF Step 10.000000 MHz
Center 5.775 #Res BW 10			#VBW 300 kHz		Span 100 MHz Sweep 9.6 ms	Auto Man
Occupie	d Bandwid 7	<sup>th</sup> 5.387 MHz	Total Power	17.2 dBr	m	Freq Offset 0 Hz
Transmit x dB Band	Freq Error dwidth	-78.524 kHz 75.32 MHz	OBW Power x dB	99.00 9 -6.00 d		
wsig i				STATUS		

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#### MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT 9.

#### **Standard Applicable** 9.1

OPERZTION Band	EUT CATEGORY	LIMIT
U-NII-1	Access Point (Mater device)	1 Watt(30dBm)
	Fixed point-to-point Acess Ponit	1 Watt(30dBm)
	 Mobile and portable clinet device	250mW(23.98dBm)
U-NII-2A		250mW(23.98dBm) or 11dBm+10 log B
U-NII-2C		250mW(23.98dBm) or 11dBm+10 log B
U-NII-3		1 Watt(30dBm)

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the direction-al gain of the antenna exceeds 6 dBi.

#### Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit				
UNII-1	5.53+4.77=10.3dBi	23.98dBm – (10.3 – 6 dBi) = 19.68dBm				
U-NII-3	5.50+4.77=10.27dBi	30 dBm – (10.27 – 6 dBi) = 25.73dBm				

Therefore the limit needs to reduce for the UNII-1 and U-NII-3 band.

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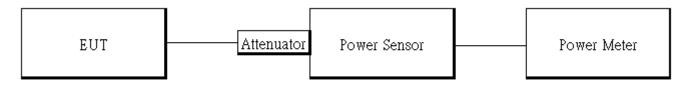
#### 9.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
- 4. Power Meter is used as the auxiliary test equipment to conduct the output power measurement.
- 5. Record the max. reading and add 10 log(1/duty cycle).
- 6. Repeat above procedures until all frequency (low, middle, and high channel) measured were complete.

#### 9.3 Measurement Equipment Used

	S	GS Conducted	Room		
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2496A	1326001	06/23/2015	06/22/2016
Power Sensor	Anritsu	MA2411B	1315048	06/23/2015	06/22/2016
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/23/2015	06/22/2016

#### 9.4 Test Set-up



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#### 9.5 Measurement Result

#### Conducted output power

#### 802.11a Main

СН	Frequency (MHz)	Data Rate	TOTAL POWER (dBm)	TOTAL POWER (mW)	REQUIRED LIMIT (dBm)	RESULT
36	5180	MCS0	14.81	30.269	23.98	PASS
44	5220	MCS0	14.87	30.690	23.98	PASS
48	5240	MCS0	14.80	30.200	23.98	PASS
149	5745	MCS0	14.84	30.479	30	PASS
157	5785	MCS0	14.81	30.269	30	PASS
165	5825	MCS0	14.85	30.549	30	PASS

#### 802.11n\_HT20\_MIMO

CH		Data	AVERAGE POWER (dBm)			TOTAL	REQUIRED		
СП	(MHz)	Rate	CH 0	CH 1	CH 2	POWER (dBm)		LIMIT (dBm)	RESULT
36	5180	MCS16	10.44	9.81	10.09	14.89	30.848	19.68	PASS
44	5220	MCS16	10.49	9.94	10.13	14.96	31.361	19.68	PASS
48	5240	MCS16	10.44	9.9	10.14	14.94	31.166	19.68	PASS
149	5745	MCS16	10.93	9.36	9.84	14.87	30.656	25.73	PASS
157	5785	MCS16	10.76	9.26	9.82	14.76	29.940	25.73	PASS
165	5825	MCS16	10.79	9.27	9.9	14.80	30.220	25.73	PASS

#### 802.11n HT40 MIMO

CH	CH Frequency		AVERAGE POWER (dBm)		TOTAL POWER	TOTAL POWER	REQUIRED LIMIT	RESULT	
СП	(MHz)	Rate	CH 0	CH 1	CH 2	(dBm)	(mW)	(dBm)	RESULT
38	5190	MCS16	10.11	9.51	10.59	14.86	30.645	19.68	PASS
46	5230	MCS16	10.31	9.69	10.6	14.99	31.533	19.68	PASS
151	5755	MCS16	10.65	9.61	10.31	14.98	31.496	25.73	PASS
159	5795	MCS16	10.58	9.37	10.32	14.89	30.843	25.73	PASS

#### 802.11ac VHT80 MIMO

СН	Frequency (MHz)	Data	AVERAG	E POWE	R (dBm)	TOTAL POWER	TOTAL POWER	REQUIRED LIMIT	RESULT
Ch		IHz) Rate	CH 0	CH 1	CH 2	(dBm)	(mW)	(dBm)	HEODE I
42	5210	MCS0	10.63	9.57	10.35	14.98	31.458	19.68	PASS
155	5775	MCS0	10.45	9.38	10.37	14.86	30.651	25.73	PASS

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### **10. PEAK POWER SPECTRAL DENSITY**

#### **10.1 Standard Applicable**

OPERZTION Band	EUT CATEGORY	LIMIT
U-NII-1	Access Point (Mater device)	17dBm/ MHz
	Fixed point-to-point Acess Ponit	
	 Mobile and portable clinet device	11dBm/ MHz
U-NII-2A		11dBm/ MHz
U-NII-2C		11dBm/ MHz
U-NII-3		30dBm/ 500kHz

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### Note:

The antenna gain is granter than 6 dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

	Effective Legacy Gain (dBi)	Limit
UNII-1	5.53+4.77=10.30dBi	17dBm – (10.3 – 6 dBi) = 12.70dBm
U-NII-3	5.50+4.77=10.27dBi	30dBm – (10.27 – 6 dBi) = 25.73dBm

Therefore the limit needs to reduce for the UNII-1 and U-NII-3 band.

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#### **10.2 Measurement Procedure**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
- 4. For U-NII1, U-NII-2A, U-NII-2C Band: Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth) For U-NII-3 Band: Set RBW=500 kHz, VBW≥ 3RBW, where span is enough to capture the entire bandwidth.

Set RBW=500 kHz, VBW  $\geq$  3RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

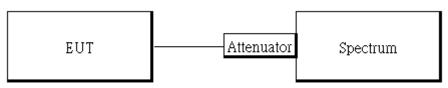
- 5. User the cursor on spectrum to peak search the highest level of trace
- 6. Record the max. reading and add 10 log(1/duty cycle).
- 7. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

#### 10.3 Measurement Equipment Used

SGS Conducted Room						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due	
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017	
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016	
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016	

#### 10.4 Test Set-up



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#### **10.5 Measurement Result**

POWER DENSITY 802.11a MODE						
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)			
5180	1.38	17	-15.62			
5220	1.56	17	-15.44			
5240	1.66	17	-15.34			
5745	8.16	30	-21.84			
5785	8.17	30	-21.83			
5825	7.63	30	-22.37			
POWER DENSITY 802.11n HT20 MODE						
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)			
5180	-0.57	12.7	-13.27			
5220	0.50	12.7	-12.20			
5240	-1.06	12.7	-13.76			
5745	9.10	25.73	-16.63			
5785	8.61	25.73	-17.12			
5825	8.87	25.73	-16.86			
POWER DENSITY 802.11n HT40 MODE						
Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)			
5190	-2.96	12.7	-15.66			
5230	-7.04	12.7	-19.74			
5755	7.02	25.73	-18.71			
5795	6.76	25.73	-18.97			
POWER DENSITY 802.11ac VHT80 MODE						

PPSD (dBm)

-4.74

3.12

Frequency (MHz)

5210

5775

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Limit (dBm)

12.7

25.73

Margin (dB)

-17.44

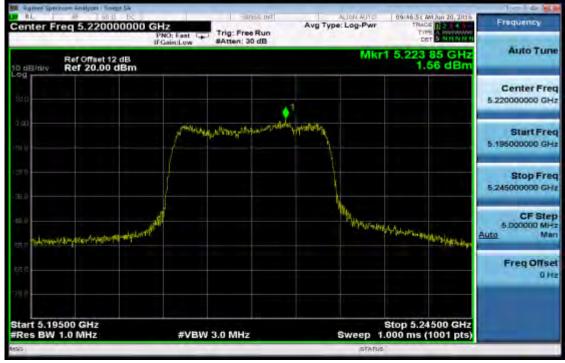
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### 802.11a 5150~5250 MHz Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



### Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)

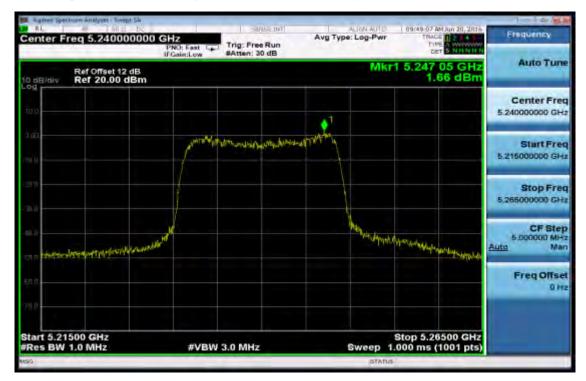


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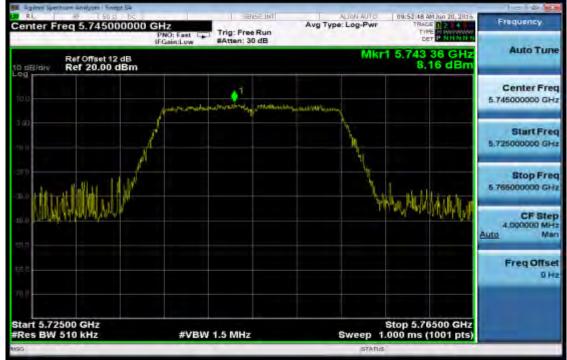
## Peak Power Spectral Density Data Plot (CH High 5240 MHz)



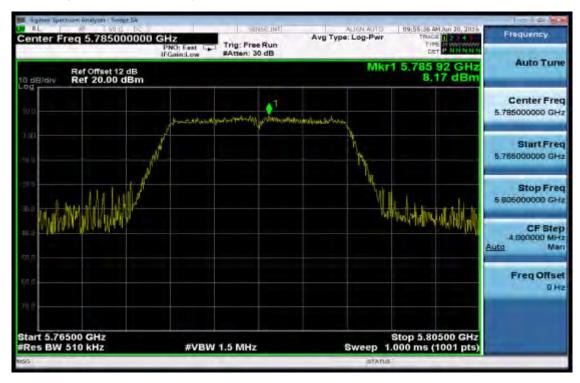
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#### 802.11a 5725~5850 MHz Peak Power Spectral Density Data Plot (CH Low 5745 MHz)



#### Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)

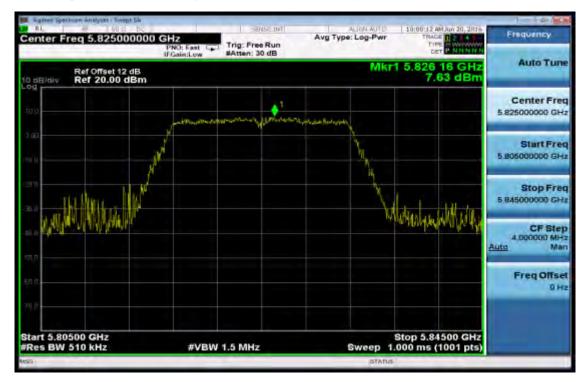


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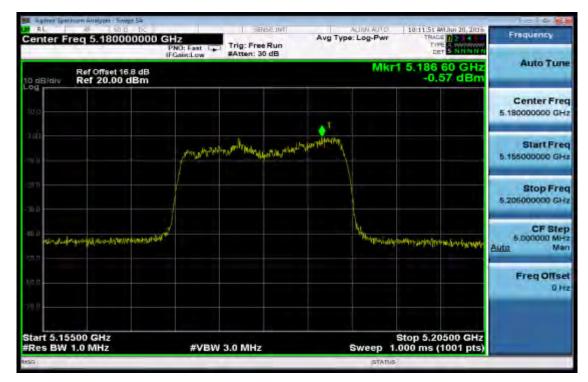
# Peak Power Spectral Density Data Plot (CH High 5825 MHz)



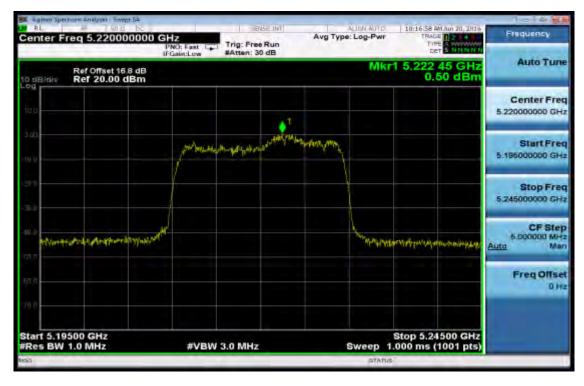
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## 802.11n HT20, 5150~5250 MHz Peak Power Spectral Density Data Plot (CH Low 5180 MHz)



## Peak Power Spectral Density Data Plot (CH Mid 5220 MHz)



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## Peak Power Spectral Density Data Plot (CH High 5240 MHz)

Austenn Spectrum Analyzes / Swept Sk				10 4 10
Center Freq 5.240000000 GHz	ant La Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	18/20/48 AM Jun 20, 2016 TRADE 1 2 3 4 1 TIPE DET S DH MON	Frequency
10 dB/dry Ref 20.00 dBm	LOW MATCHIN: 30 CD	Mkr	1 5.243 45 GHz -1.06 dBm	Auto Tuni
100				Center Free 5.240000000 GH
1¢1	water procession	up Tangta		Start Fre 5.215000000 GH
2010				Stop Fre 5.265000000 GH
20.0 agupmanistrations al agraphic international states		hereit	blervit North-Apple-arapplith-managed	CF Ste 5.000000 Mit Auto Mit
er it				Freq Offs 0)
70 0 Start 5.21500 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz		Stop 5.26500 GHz .000 ms (1001 pts)	
NSG	V BV 5.0 MILE	STATUS		

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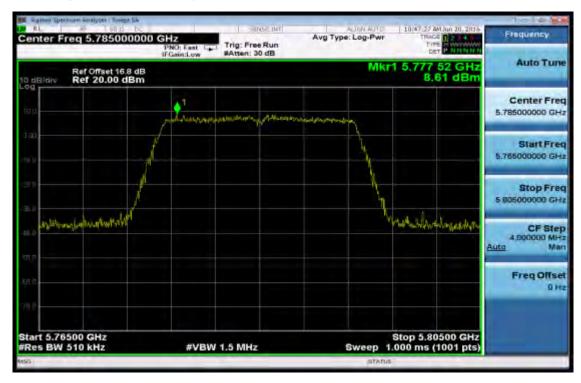
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# 802.11n HT20, 5725~5850 MHz Peak Power Spectral Density Data Plot (CH Low 5745 MHz)



## Peak Power Spectral Density Data Plot (CH Mid 5785 MHz)



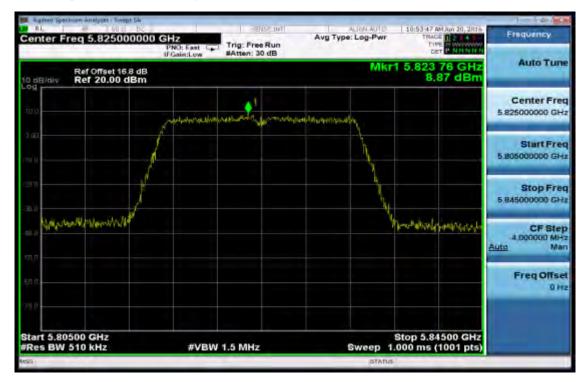
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# Peak Power Spectral Density Data Plot (CH High 5825 MHz)

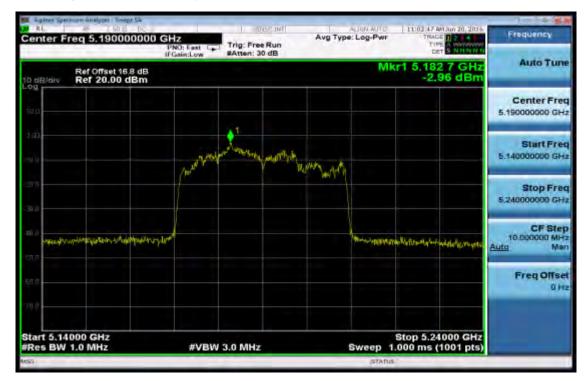


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# 802.11n HT40, 5150~5250 MHz Peak Power Spectral Density Data Plot (CH Low 5190 MHz)



# Peak Power Spectral Density Data Plot (CH High 5230 MHz)

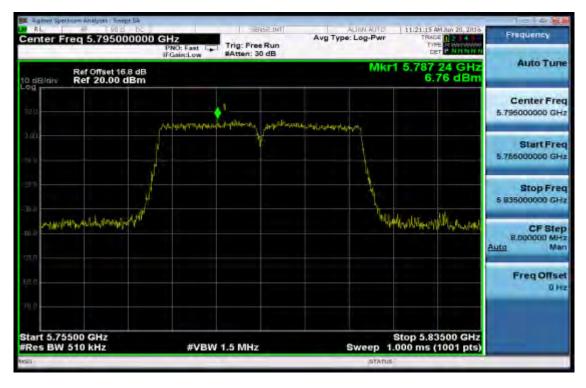




# 802.11n HT40, 5725~5850 MHz Peak Power Spectral Density Data Plot (CH Low 5755 MHz)



# Peak Power Spectral Density Data Plot (CH High 5795 MHz)



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## 802.11ac VHT80, 5150~5250 MHz Peak Power Spectral Density Data Plot (CH Mid 5210 MHz)



# 802.11ac VHT80, 5725~5850 MHz Peak Power Spectral Density Data Plot (CH Mid 5775 MHz)



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# 11. UNDESIRABLE RADIATED EMISSION MEASUREMENT1

#### 11.1 **Standard Applicable**

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- 1. For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- 2. For transmitters operating in the 5.725-5.85 GHz band: 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.

APPLICABLE TO	LIMIT					
FCC KDB 789033 D02 General UNII Test Procedures New Rules	FIELD STRE	NGTH AT 3m				
	PK: 74 (dBμV/m)	AV 54 (dBμV/m)				
APPLICABLE TO	EIRP LIMIT	FIELD STRENGTH AT 3m				
15.407(b)(1)						
15.407(b)(2)	PK: -27 (dBm/MHz)	PK: 68.3 (dBµV/m)				
15.407(b)(3)						
15.407(b)(4)(i)	PK:-27 (dBm/MHz) *1 PK:10 (dBm/MHz) *2 PK:15.6 (dBm/MHz) *3 PK:27 (dBm/MHz) *4	PK: 68.2(dBµV/m) *1 PK:105.2 (dBµV/m) *2 PK: 110.8(dBµV/m) *3 PK:122.2 (dBµV/m) *4				
*1 beyond 75 MHz or more above o						
	*2 below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above.					
*3 below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz abo						
*4 from 5 MHz above or below the band edge increasing linearly to a level of 27						
dBm/MHz at the band edge.						

EIRP =  $((E^*d)^2) / 30$ , where E is the field in V/m, d is the measurement distance (3m), EIRP is the equivalent isotropically radiated power in Watts.

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Unwanted spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(KHz)	300
0.490-1.705	24000/F(KHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

#### Note:

- 1. The lower limit shall apply at the transition frequencies.
- Emission level (dBµV/m) = 20 log Emission level (dBµV/m)

#### **Measurement Equipment Used** 11.2

SGS SAC-III										
Name of Equip- ment			rer Model Serial Num- ( ber		Calibration Due					
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017					
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2015	12/22/2016					
Broadband Anten- na	TESEQ	CBL 6112D	35240	10/28/2015	10/27/2016					
Horn Antenna	ETS-Lindgren	3117	00143272	12/16/2015	12/15/2016					
Horn Antenna	Schwarzbeck	BBHA9170	185	07/24/2015	07/23/2016					
Pre Amplifier	EMC Instru- ments	EMC330	980096	12/12/2015	12/11/2016					
Pre Amplifier	EMC Instru- ments	EMC0011830	980199	12/12/2015	12/11/2016					
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016					
Pre Amplifier	EMC Instru- ments	EMC184045B	980135	12/12/2015	12/11/2016					
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016					
Coaxial Cable	Coaxial Cable Huber+Suhner		966Rx 30M-3G	12/12/2015	12/11/2016					

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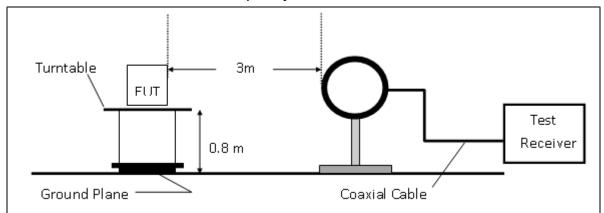
Name of Equip- ment	Manufacturer	Model	Serial Num- ber	Calibration Date	Calibration Due
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017
Controller	MF	MF-7802	MF-7802 N/A		N.C.R.
Antenna Master	Antenna Master MF		N/A N/A		N.C.R.
Turn Table MF		N/A	N/A	N.C.R.	N.C.R.
Test Software World-Pallas		Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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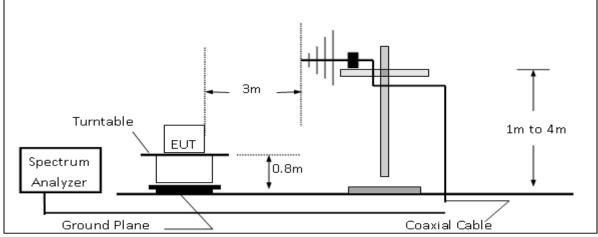


## 11.3 Test SET-UP

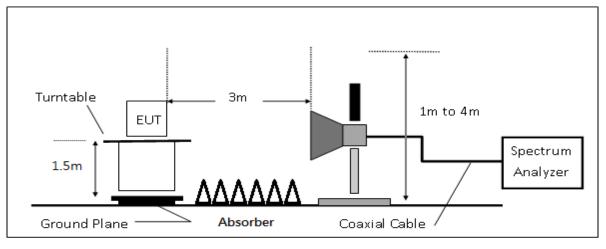
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



## (B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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## 11.4 Measurement Procedure

- The EUT was placed on a turn table which is 0.8m above ground plane. 1.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules.
- The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequen-3. cy> 1GHz above ground plane.
- The turn table shall rotate 360 degrees to determine the position of maximum emission 4. level.
- 5. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) 6. and Quasi-peak (QP) at frequency below 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency 7. above 1 GHz.
- Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 8. 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 11. Repeat above procedures until all frequency measured were complete.

## 11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

## FS = RA + AF + CL - AG

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

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## Note :

"F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency."E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

# 11.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

## 11.7 Measurement Result

Refer to attach tabular data sheets.

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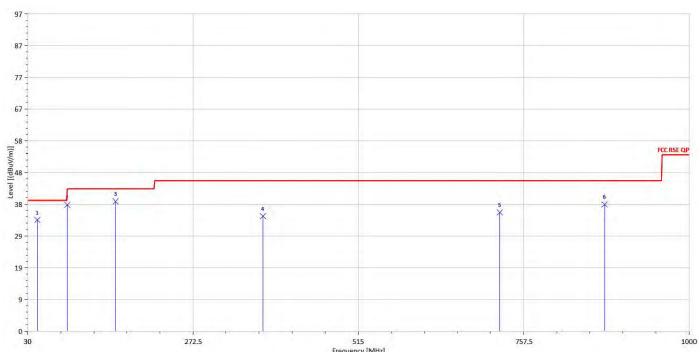
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## **Radiated Spurious Emission Measurement Result Below 1GHz Worst-Case Data:** 802.11a 5150~5250 MHz

Operation Mode :	802.11a	Test Date :	2016/6/15
Fundamental Frequency :	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Pony
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical

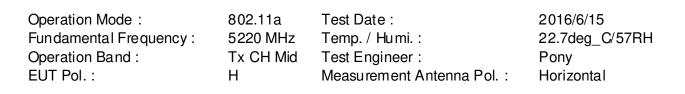


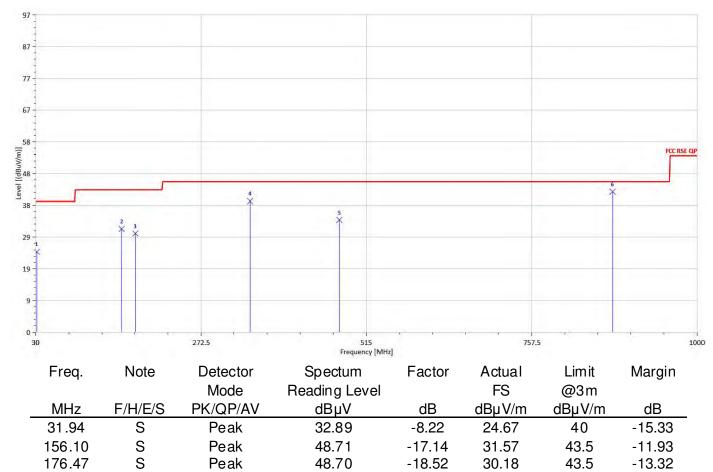
				Frequency [MHz]	Frequency [MHz]						
	Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin			
			Mode	Reading Level		FS	@3m				
	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
	44.55	S	QP	50.10	-16.05	34.05	40	-5.95			
	88.20	S	Peak	58.44	-19.77	38.67	43.5	-4.83			
	159.01	S	Peak	57.22	-17.50	39.72	43.5	-3.78			
	375.32	S	Peak	45.72	-10.53	35.20	46	-10.80			
	722.58	S	Peak	41.53	-5.16	36.37	46	-9.63			
	875.84	S	Peak	41.61	-2.80	38.81	46	-7.19			

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42.41

45.71

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Peak

Peak

Peak

S

S

S

344.28

475.23

875.84

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-11.50

-8.05

-2.80

40.04

34.36

42.91

46

46

46

-5.96

-11.64

-3.09



#### 802.11a, 5725~5850 MHz

683.78

875.84

S

S

F C	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		Fundamental Frequency: 5785 MHz Temp. / H Operation Band: Tx CH Mid Test Engir				lumi. :	na Pol. :	2016/6/15 22.7deg_C Pony Vertical	/57RH
97										
87 -										
77 -										
]										
67 -										
58									FCC RSE OP	
Level [(dBuV/m)]										
level 38								6		
30	× ×	3 *	4 *				5 *	<u> </u>		
29 -										
19 -										
9										
0										
0 <del>-</del> 30	, <u> </u>		272.5	, 5: Frequen		аста т 1	757,5	ал. — <u>т</u> . — І	1000	
	Freq.	Note	Detector	Sp	pectum	Factor	Actual	Limit	Margin	
			Mode		ding Level		FS	@3m		
	MHz	F/H/E/S	PK/QP/AV		dBµV	dB	dBµV/m	dBµV/m	dB	
	44.55	S	QP		49.70	-16.05	33.65	40	-6.35	
	88.20	S	Peak		57.56	-19.77	37.79	43.5	-5.71	
	158.04	S	QP		52.73	-17.40	35.33	43.5	-8.17	
	375.32	S	Peak	4	45.28	-10.53	34.75	46	-11.25	

Peak

Peak

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38.87

41.63

-5.55

-2.80

33.32

38.83

46

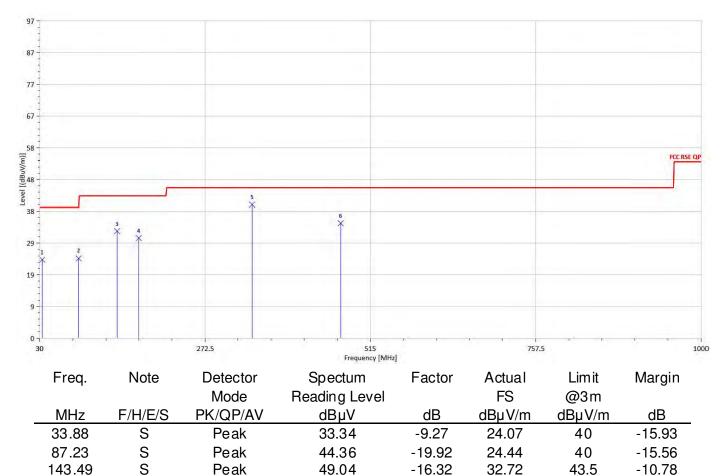
46

-12.68

-7.17



Operation Mode:	802.11a	Test Date :	2016/6/15
Fundamental Frequency:	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



52.47

42.96

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Peak

Peak

Peak

S

S

S

175.50

341.37

471.35

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-18.51

-11.66

-7.81

30.62

40.81

35.15

43.5

46

46

-12.88

-5.19

-10.85



683.78

S

S

#### 802.11ac VHT80, 5150~5250 MHz

F (	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		y: 52	02.11ac80 210 MHz k CH Low	Test Dat Temp. / I Test Eng Measure	Humi. :	nna Pol. :	2016/6/15 22.7deg_( Pony Vertical		
97 -	1									
87 -	-									
	1									
77 -										
67 -										
	1									
28 18 18 18 18 18 18 18 18 18 18 18 18 18									FCC RSE QP	
ngp)]  a		f								
38 -		3 X								
	×		*		5 ¥		6 *			
29 -										
19 -										
9 -										
- 0 E	30	r	272.5		515 Frequency [MHz	1	757,5	т. т. т.	1000	)
	Freq.	Note	Detect		pectum	Factor	Actual	Limit	Margin	
			Mode		ding Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/		dBµV	dB	dBµV/m	dBµV/m	dB	
	44.55	S	QP		49.80 -16.05 33.75		40	-6.25		
	88.20	S	Peak		58.41	-19.77	38.64	43.5	-4.86	
	159.98	S	QP		55.83	-17.52	38.31	43.5	-5.19	
	323.91	S	Peak		45.30	5.30 -11.87 33.4		46 -12.57		

40.29

39.10

Peak

Peak

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-8.09

-5.55

32.20

33.55

46

46

-13.80

-12.45



473.29

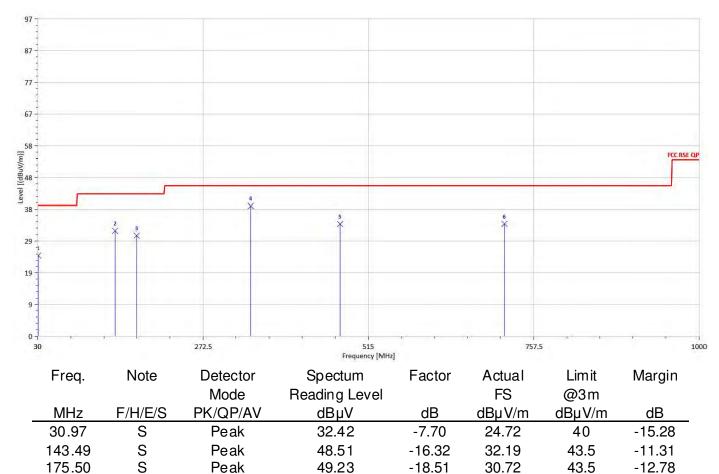
714.82

S

S

S

Operation Mode:	802.11ac80	Test Date :	2016/6/15
Fundamental Frequency:	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



51.42

42.30

39.79

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Peak

Peak

Peak

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-11.62

-7.99

-5.42

39.80

34.31

34.36

46

46

46

-6.20

-11.69

-11.64



### 802.11ac VHT80, 5725~5850 MHz

S

S

474.26

625.58

Func Oper	Operation Mode : Fundamental Frequency : Operation Band : EUT Pol. :		802.11 y : 5775 N Tx CH H	/Hz	Test Date Temp. / H Test Eng Measure	Humi. :	nna Pol. :	2016/6/15 22.7deg_( Pony Vertical	
97									
87 -									
77 =									
67 -									
58 58 48 48 48									FCC RSE OP
ngp48									
38	_	3 X	4			6			
29-1	2 ×		×		* *	6 ×			
1									
19 -									
9 -									
0								. г.	
30			272.5		515 Frequency [MHz]		757,5	5	1000
F	req.	Note	Detector	•	ectum	Factor	Actual	Limit	Margin
N	/Hz	F/H/E/S	Mode		ng Level	٩D	FS dBu\//m	@3m dBu\//m	dD
			PK/QP/AV		<u>3μV</u>	dB	dBµV/m	dBµV/m	dB
	4.55SQP49.507.23SQP50.75			-16.05	33.45	40 -6.55			
	7.23	S S	QP Book		).75 7.39	-19.92 -17.52	30.83	40 43.5	-9.17
	9.98 5.32			5.39 5.35	-17.52 -10.53	39.87	43.5 46	-3.63	
37	5.32	3	Peak	4:	0.00	-10.53	34.82	40	-11.18

Peak

Peak

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41.39

41.04

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-8.09

-6.10

33.31

34.94

46

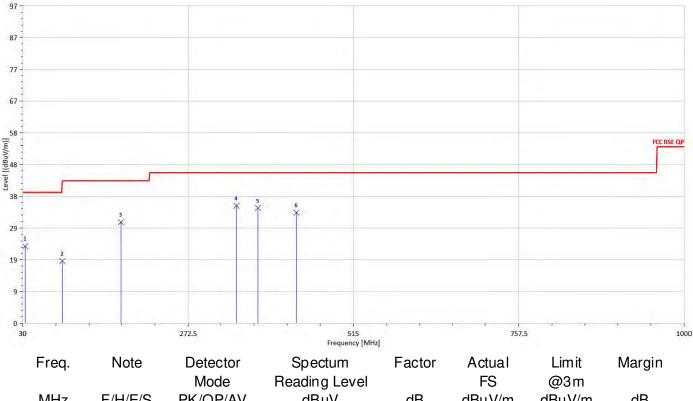
46

-12.69

-11.06



Operation Mode:	802.11ac80	Test Date :	2016/6/15
Fundamental Frequency:	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Pony
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



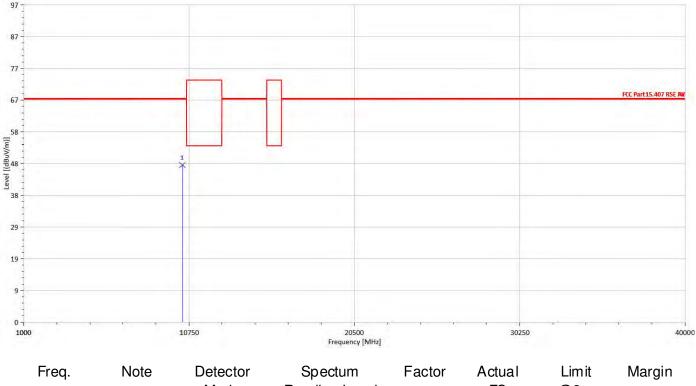
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	32.83	-9.27	23.56	40	-16.44
88.20	S	Peak	38.78	-19.77	19.02	43.5	-24.48
174.53	S	Peak	49.30	-18.42	30.88	43.5	-12.62
343.31	S	Peak	47.55	-11.61	35.94	46	-10.06
375.32	S	Peak	45.80	-10.53	35.27	46	-10.73
431.58	S	Peak	43.20	-9.39	33.81	46	-12.19



### Above 1GHz Worst-Case Data:

### Radiated Spurious Emission Measurement Result 802.11a, 5150~5250 MHz

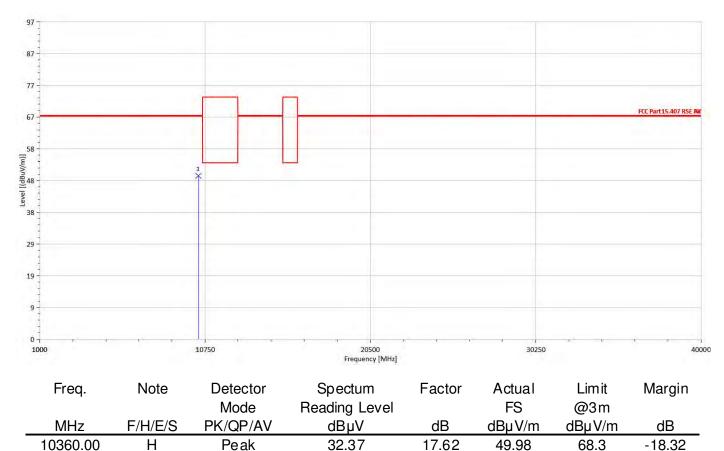
802.11a	Test Date :	2016/6/15
5180 MHz	Temp. / Humi. :	22.7deg_C/57RH
Tx CH Low	Test Engineer :	Ashton
Н	Measurement Antenna Pol. :	Vertical
	5180 MHz Tx CH Low	5180 MHz Temp. / Humi. : Tx CH Low Test Engineer :



	⊢req.	Note	Detector	Spectum	Factor	Actual	Limit	Margin	
			Mode	Reading Level		FS	@3m		
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
	10360.00	Н	Peak	30.45	17.62	48.07	68.3	-20.23	

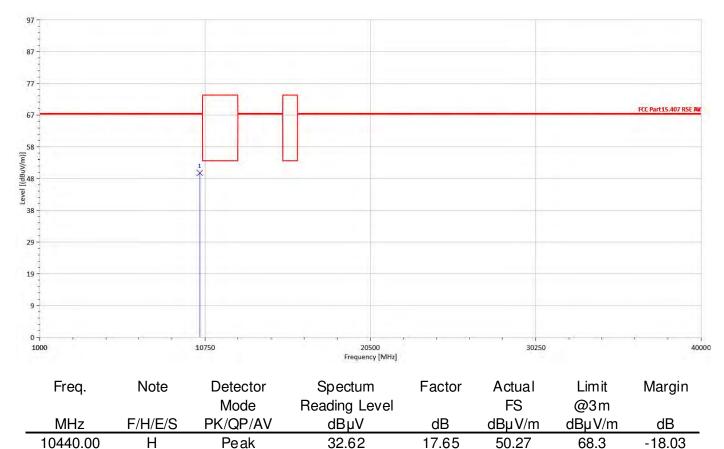


Operation Mode :	802.11a	Test Date :	2016/6/15
Fundamental Frequency :	5180 MHz	Temp. / Humi. :	22.7deg C/57RH
Operation Band : EUT Pol. :	Tx CH Low H	Test Engineer : Measurement Antenna Pol. :	Ashton Horizontal



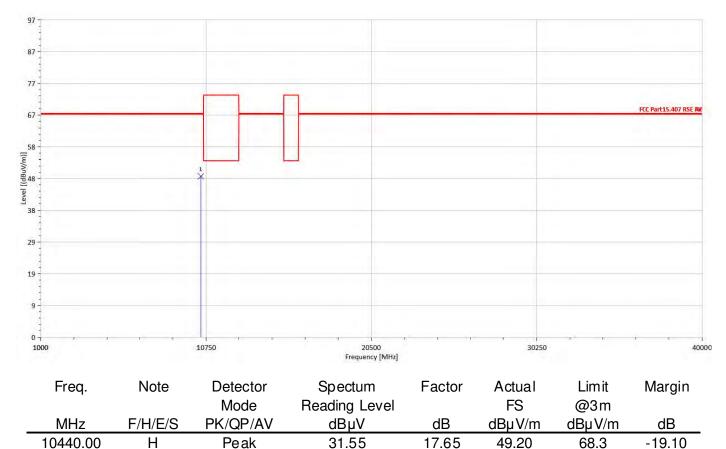


Operation Mode:	802.11a	Test Date :	2016/6/15
Fundamental Frequency:	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band:	Tx CH Mid	Test Engineer :	Ashton
EUT Pol.:	H	Measurement Antenna Pol. :	Vertical





Operation Mode:	802.11a	Test Date :	2016/6/15
Fundamental Frequency:	5220 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band:	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

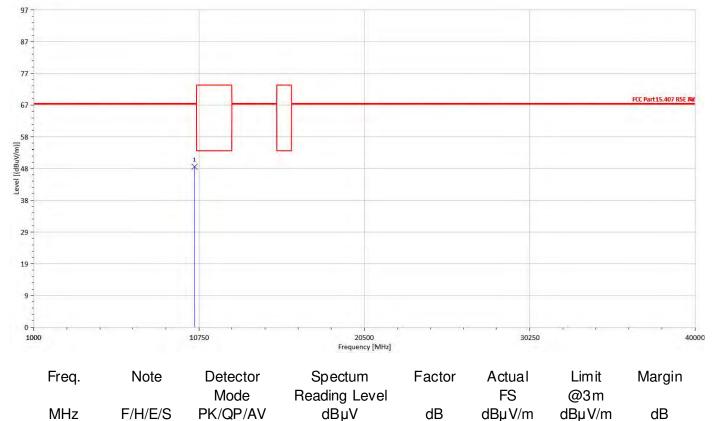




Н

Peak

Operation Mode :	802.11a	Test Date :	2016/6/15
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



31.07

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18.00

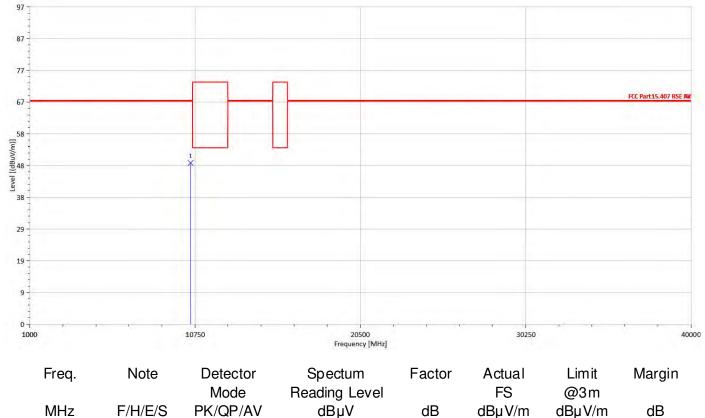
49.07

68.3

-19.23



Н



31.33

Peak

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18.00

49.33

68.3

-18.97



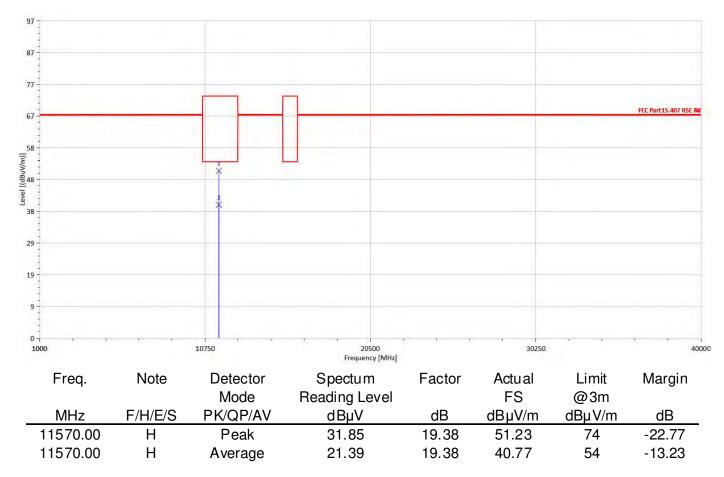
### Radiated Spurious Emission Measurement Result 802.11a, 5725~5850 MHz

Operation E EUT Pol. :	al Frequenc	802.11 cy : 5785 M Tx CH H	1Hz Temp. Mid Test E	ate : / Humi. : ngineer : rement Antenn		2016/6/15 22.7deg_C/ Ashton Vertical	57RH
97 							
77							
67							FCC Part15.407 RSE AM
58 2							
58 58 48 48		×					
38		2 X					
29 -							
19							
19							
9							
0	т <del></del>	10750	2050 Frequency		30250	т. т. т.	40000
Freq.	Note	Detector	Spectum Deading Lev	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode PK/QP/AV	Reading Le <sup>.</sup> dBµV	dB	FS dBµV/m	@3m dBµV/m	dB
11490.00 11490.00	H H	Peak Average	32.06 21.39	18.39 18.39	50.45 39.78	74 54	-23.55 -14.22

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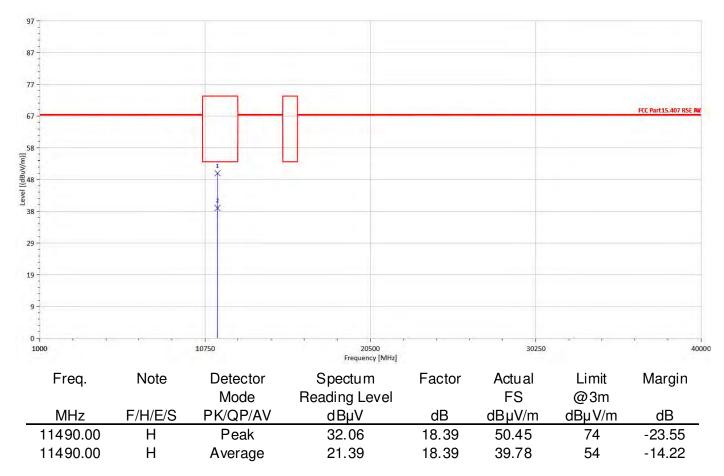
Operation Mode :	802.11a	Test Date :	2016/6/15
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg C/57RH
Operation Band :	Tx CH Mid	Test Engineer:	Ashton
EUT Pol. :	H	Measurement Antenna Pol.:	Horizontal



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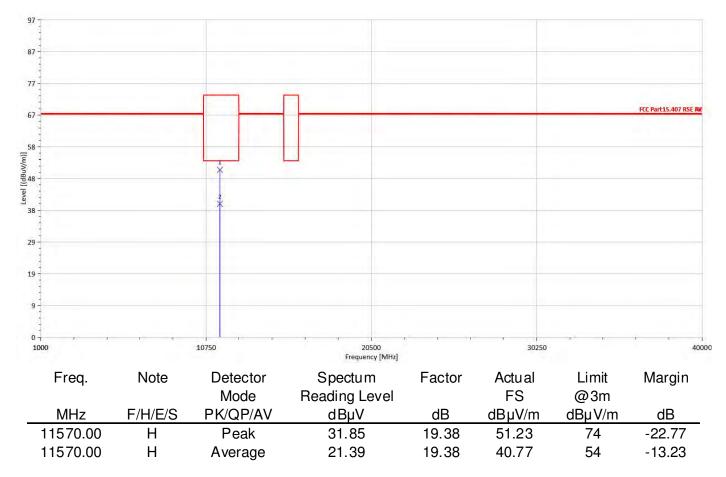


Operation Mode:	802.11a	Test Date :	2016/6/15
Fundamental Frequency:	5785 MHz	Temp. / Humi. :	22.7deg C/57RH
Operation Band : EUT Pol. :	Tx CH Mid H	Test Engineer : Measurement Antenna Pol. :	Ashton Vertical





Operation Mode:	802.11a	Test Date :	2016/6/15
Fundamental Frequency:	5785 MHz	Temp. / Humi. :	22.7deg C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal





Operation Mode :	802.11a	Test Date :	2016/6/15
Fundamental Frequency :	5825 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical

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87							
67							FCC Part 15,407 RSE AM
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38							
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0 <del> </del> 1000		10750	20500 Frequency [MHz]		30250	Б. Б.	4000
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµ V/m	dB
11570.00	Н	Peak	31.33	19.38	50.71	74	-23.29
11570.00	Н	Average	21.41	19.38	40.79	54	-13.21



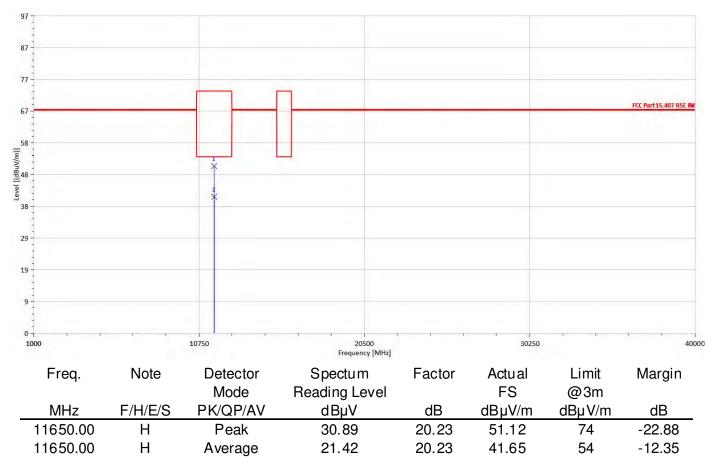
Operation Mode :	802.11a	Test Date :	2016/6/15
Fundamental Frequency :	5825 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

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0	· · ·	10750	20500 Frequency [MHz]	, <u> </u>	30250	x. r.	4000
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11650.00	Н	Peak	31.08	20.23	51.31	74	-22.69
11650.00	Н	Average	21.35	20.23	41.58	54	-12.42



#### Radiated Spurious Emission Measurement Result 802.11n HT20, 5150~5250 MHz

Operation Mode :	802.11n20	Test Date:	2016/6/15
Fundamental Frequency :	5180 MHz	Temp. / Humi.:	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



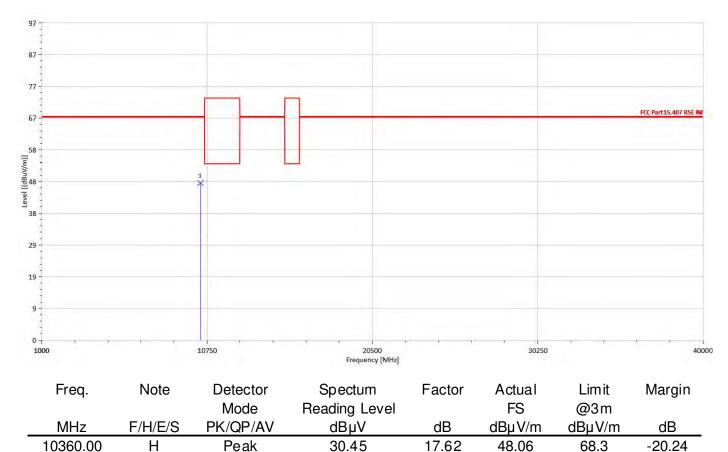
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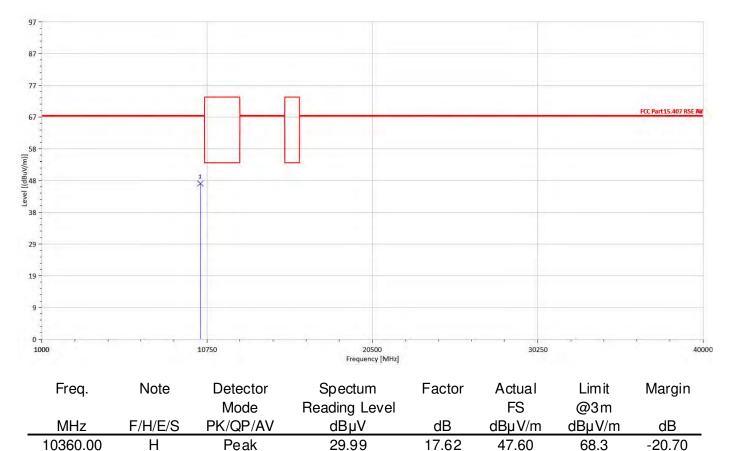


Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency : Operation Band :	5180 MHz Tx CH Low	Temp. / Humi. : Test Engineer :	22.7deg_C/57RH Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



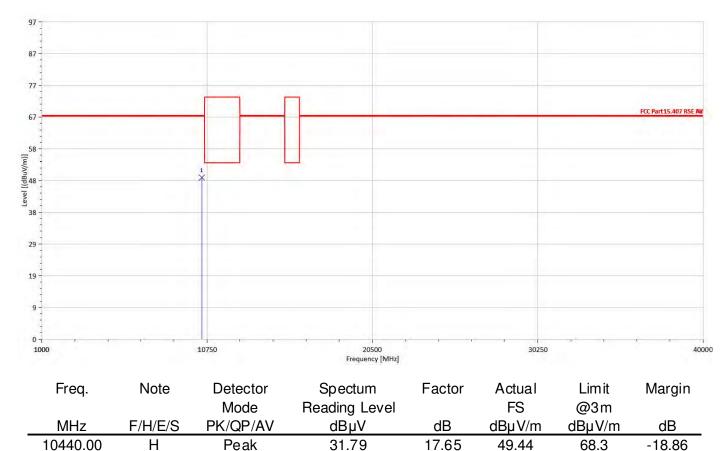


Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency : Operation Band :	5220 MHz Tx CH Mid	Temp. / Humi. : Test Engineer :	22.7deg_C/57RH Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical



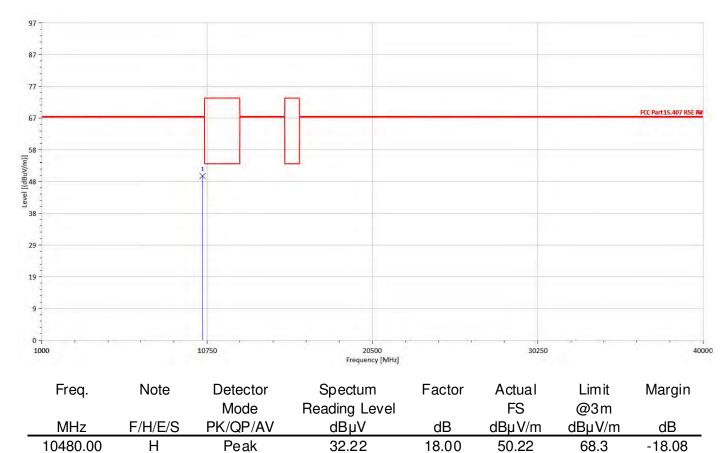


Operation Mode:	802.11n20	Test Date:	2016/6/15
Fundamental Frequency:	5220 MHz	Temp. / Humi.:	22.7deg C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal



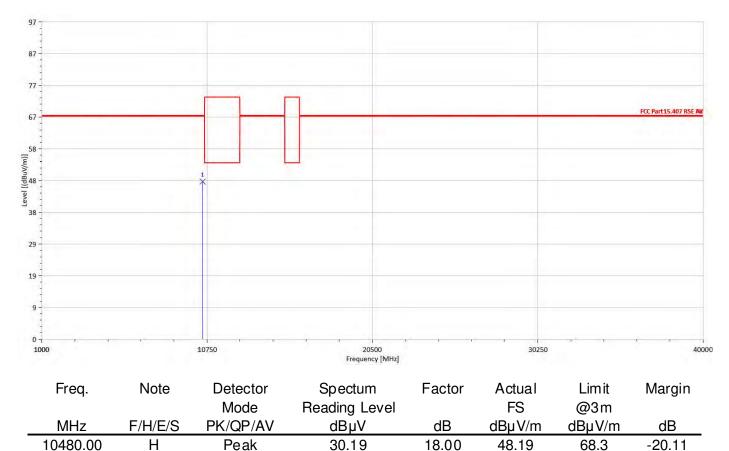


Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical





Operation Mode :	802.11n20	Test Date:	2016/6/15
Fundamental Frequency :	5240 MHz	Temp. / Humi. :	22.7 deg_C/57 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal

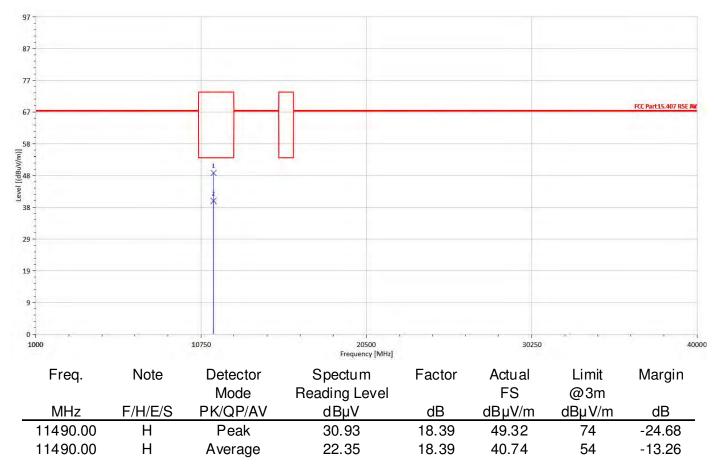


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## Radiated Spurious Emission Measurement Result 802.11n HT20, 5725~5850 MHz

Operation Mode :	802.11n20	Test Date:	2016/6/15
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7 deg_C/57 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical



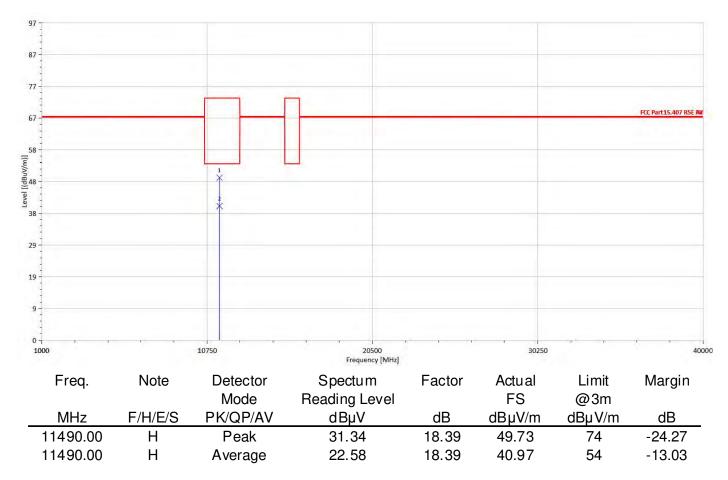
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Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency :	5745 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal

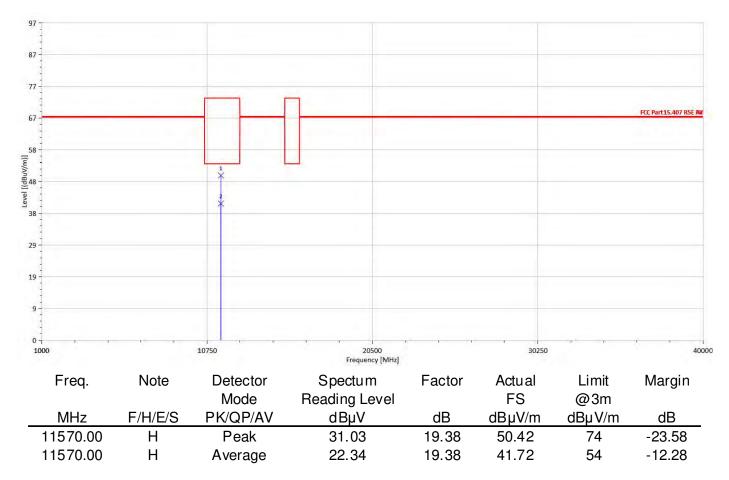


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Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical

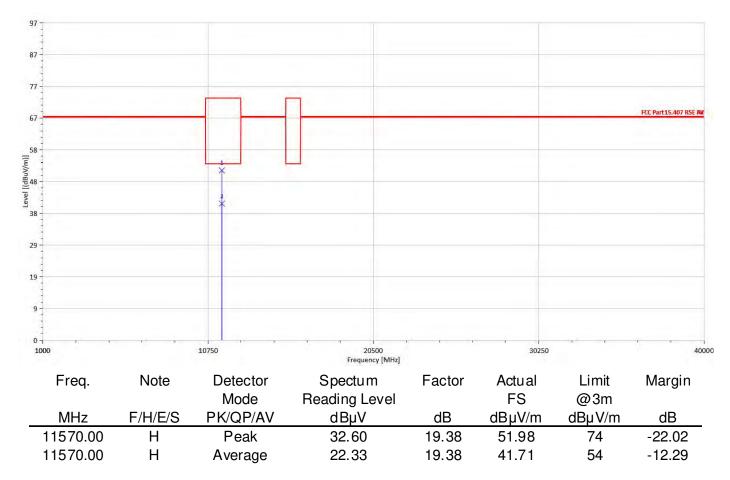


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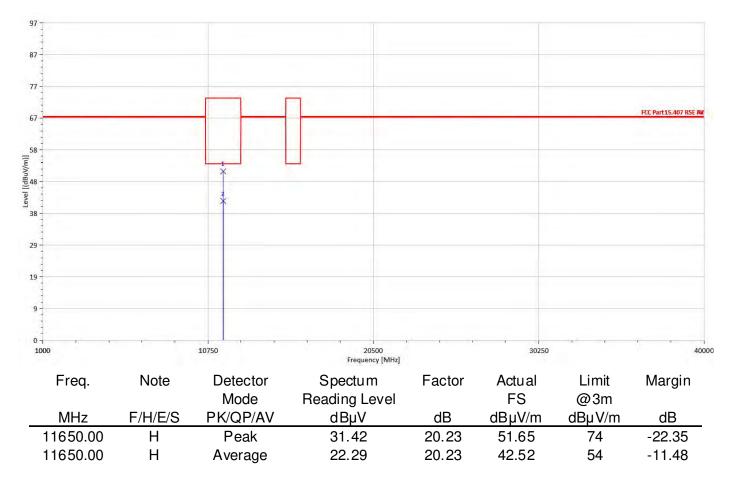
Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency :	5785 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Mid	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal



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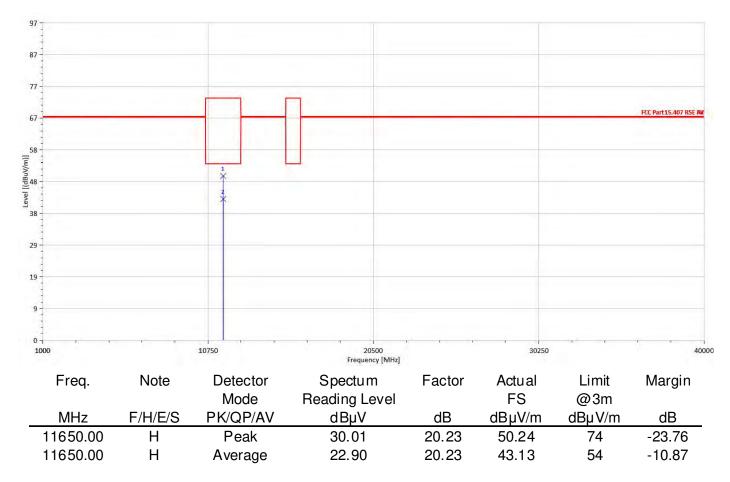
Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency :	5825 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical



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Operation Mode :	802.11n20	Test Date :	2016/6/15
Fundamental Frequency :	5825 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal



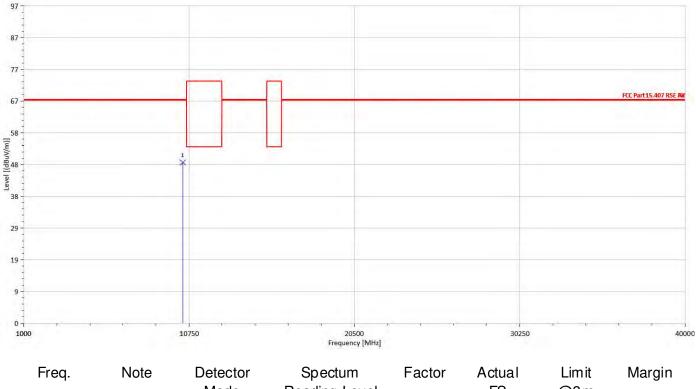
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## Radiated Spurious Emission Measurement Result 802.11n HT40, 5150~5250 MHz

Operation Mode:	802.11n40	Test Date:	2016/6/15
Fundamental Frequency:	5190 MHz	Temp. / Humi.:	22.7deg C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Vertical



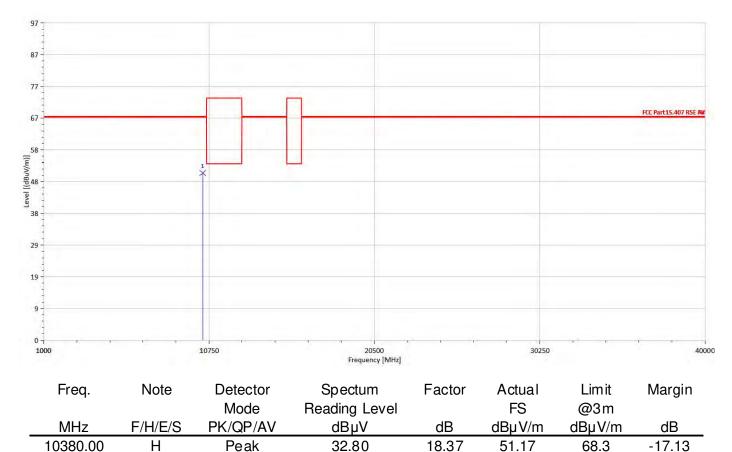
rieq.	NOLE	Delector	Specium	i aciui	Actual		Maryin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµ V/m	dBµV/m	dB
10380.00	Н	Peak	30.78	18.37	49.15	68.3	-19.15

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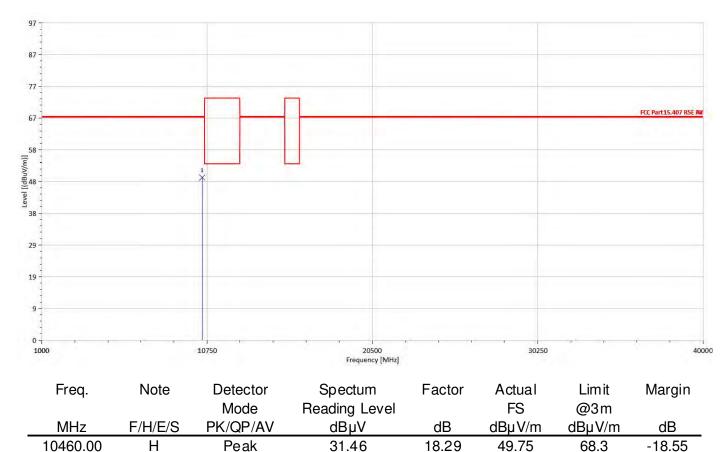
Operation Mode :	802.11n40	Test Date :	2016/6/15
Fundamental Frequency :	5190 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal



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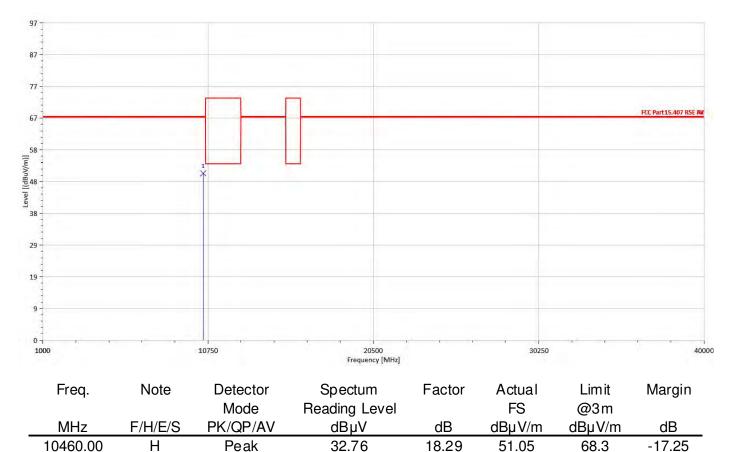
Operation Mode :	802.11n40	Test Date:	2016/6/15
Fundamental Frequency :	5230 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical



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Operation Mode :	802.11n40	Test Date :	2016/6/15
Fundamental Frequency :	5230 MHz	Temp. / Humi. :	22.7 deg_C/57 RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal

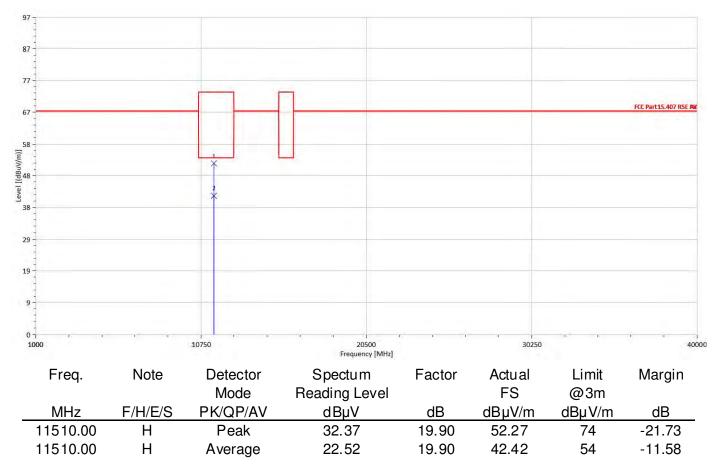


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#### Radiated Spurious Emission Measurement Result 802.11n HT40, 5725~5850 MHz

Operation Mode :	802.11n40	Test Date:	2016/6/15
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	22.7 deg_C/57 RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical



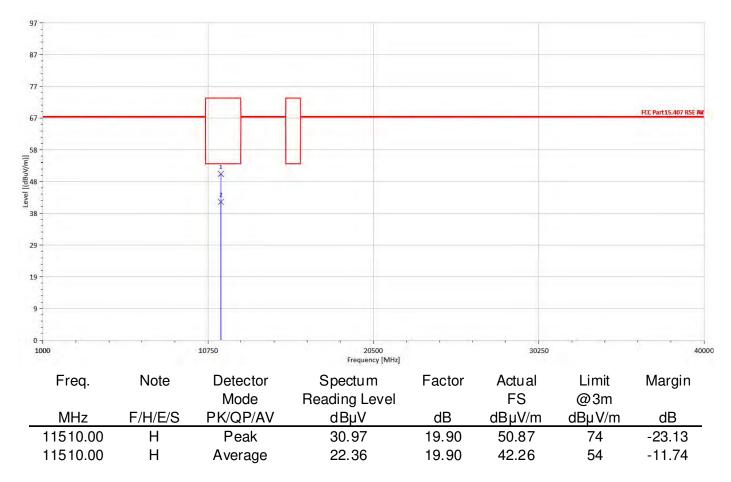
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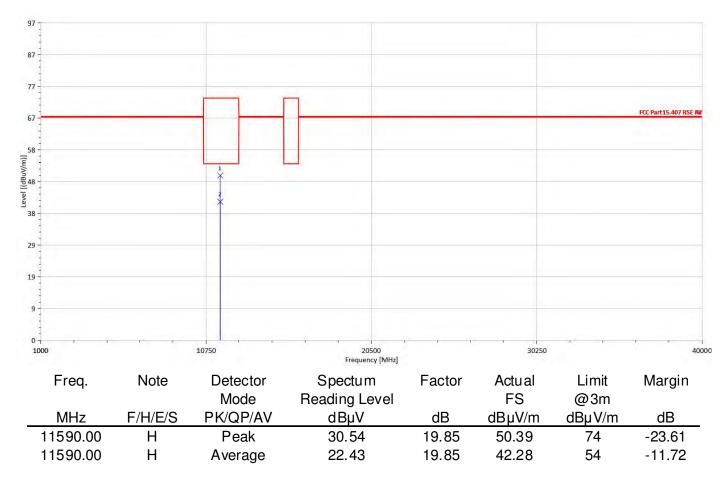
Operation Mode :	802.11n40	Test Date :	2016/6/15
Fundamental Frequency :	5755 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal



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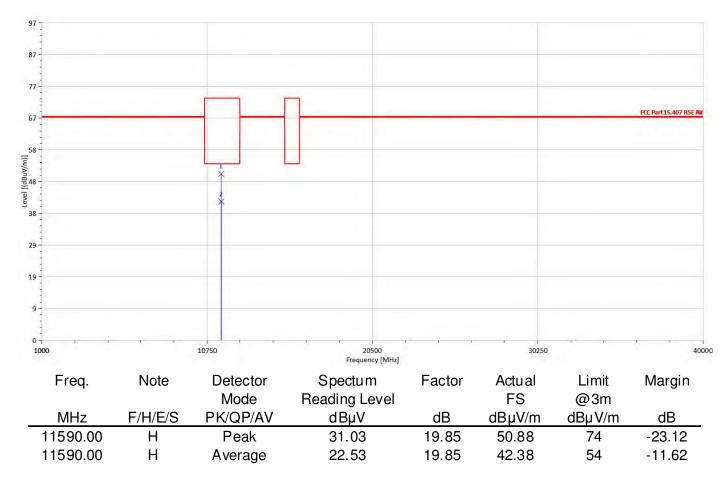
Operation Mode :	802.11n40	Test Date :	2016/6/15
Fundamental Frequency :	5795 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical



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Operation Mode :	802.11n40	Test Date :	2016/6/15
Fundamental Frequency :	5795 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Horizontal

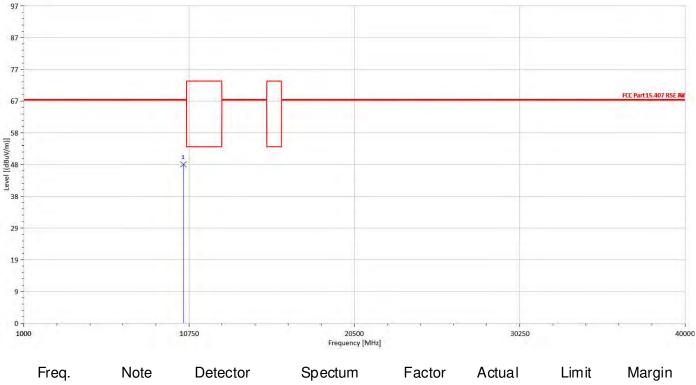


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## Radiated Spurious Emission Measurement Result 802.11ac VHT80, 5150~5250 MHz

Operation Mode :	802.11ac80	Test Date :	2016/6/15
Fundamental Frequency :	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	Н	Measurement Antenna Pol. :	Vertical

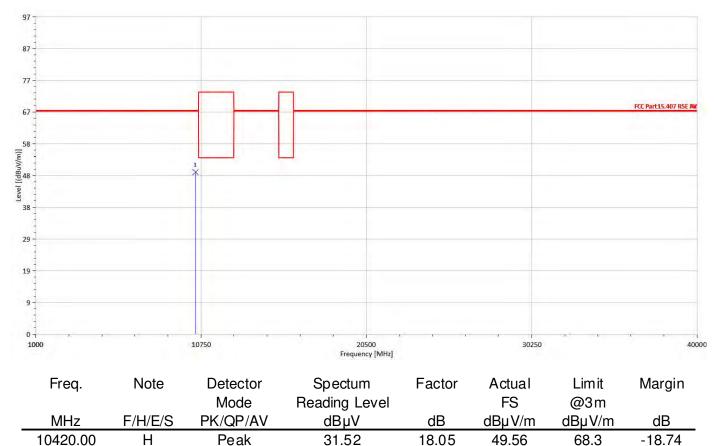


⊢req.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµ V/m	dBµV/m	dB
10420.00	Н	Peak	30.54	18.05	48.59	68.3	-19.71

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Operation Mode:	802.11ac80	Test Date :	2016/6/15
Fundamental Frequency:	5210 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band:	Tx CH Low	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal

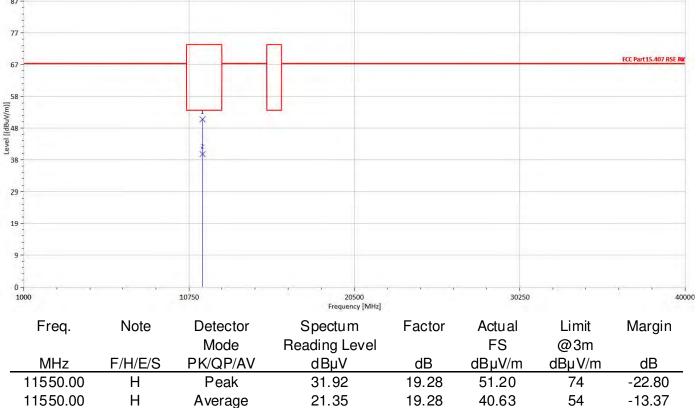


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#### Radiated Spurious Emission Measurement Result 802.11ac VHT80, 5725~5850 MHz

Operation Mode:	802.11ac80	Test Date :	2016/6/15
Fundamental Frequency:	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band:	Tx CH High	Test Engineer :	Ashton
EUT Pol.:	H	Measurement Antenna Pol. :	Vertical
97			



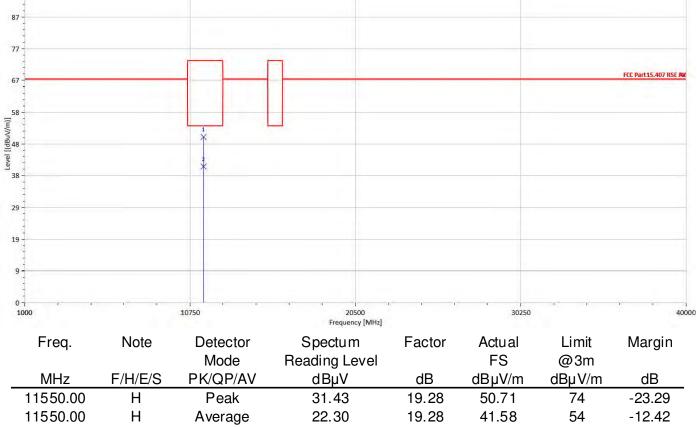
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Fundamental Frequency :	5775 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx CH High	Test Engineer :	Ashton
EUT Pol. :	H	Measurement Antenna Pol. :	Horizontal
Operation Mode :	802.11ac80	Test Date :	2016/6/15



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## Band edge falling to restricted band

#### 802.11a mode

•	<i>I</i> ode : al Frequenc Band :	802.11a y : 5180 MH BE CH L H	ow Test Engi	lumi. :	ına Pol. :	2016/6/14 22.7deg_C Pony Vertical	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5149.36	S	Peak	51.42	8.19	59.61	74	-14.39
5149.36	S	Average	32.24	8.19	40.43	54	-13.57
5150.00	E	Peak	49.33	8.19	57.52	74	-16.48
5150.00	E	Average	32.25	8.19	40.44	54	-13.56
Operation N	Node :	802.11a	Test Date	:		2016/6/14	
•	al Frequenc					22.7deg_C	/57RH
Operation E		, BE CH L				Pony 0_	
EUT Pol. :		Н	0	nent Anter	ina Pol. :	Horizontal	
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5148.28	S	PK/QP/AV Peak	dBμV 43.57	8.18	dBµV/m 51.75	dBµV/m 74	-22.25
5148.28 5148.28	S S	PK/QP/AV Peak Average	dBµV 43.57 31.44	8.18 8.18	dBµV/m 51.75 39.62	dBμV/m 74 54	-22.25 -14.38
5148.28 5148.28 5150.00	S S E	PK/QP/AV Peak Average Peak	dBµV 43.57 31.44 41.73	8.18 8.18 8.19	dBµV/m 51.75 39.62 49.92	dBμV/m 74 54 74	-22.25 -14.38 -24.08
5148.28 5148.28	S S	PK/QP/AV Peak Average	dBµV 43.57 31.44	8.18 8.18	dBµV/m 51.75 39.62	dBμV/m 74 54	-22.25 -14.38
5148.28 5148.28 5150.00 5150.00 Operation M	S S E Ande : al Frequenc	PK/QP/AV Peak Average Peak Average 802.11a	<u>dBµV</u> 43.57 31.44 41.73 31.41 Test Date Iz Temp. / H ow Test Engi	8.18 8.18 8.19 8.19 8.19	dBµV/m 51.75 39.62 49.92 39.60	dBμV/m 74 54 74	-22.25 -14.38 -24.08 -14.40
5148.28 5148.28 5150.00 5150.00 Operation M Fundament Operation E	S S E Ande : al Frequenc	PK/QP/AV Peak Average Peak Average 802.11a y : 5745 MH BE CH L	<u>dBµV</u> 43.57 31.44 41.73 31.41 Test Date Iz Temp. / H ow Test Engi	8.18 8.19 8.19 8.19	dBµV/m 51.75 39.62 49.92 39.60	dBµV/m 74 54 74 54 2016/6/15 22.7deg_C Pony	-22.25 -14.38 -24.08 -14.40
5148.28 5148.28 5150.00 5150.00 Operation M Fundament Operation E EUT Pol. :	S E E Aode : al Frequenc 3and :	PK/QP/AV Peak Average Peak Average 802.11a sy : 5745 MH BE CH L H Detector	dBµV 43.57 31.44 41.73 31.41 Test Date Iz Temp. / H ow Test Engi Measurer	8.18 8.19 8.19 8.19 Iumi. : neer : neer :	dBµV/m 51.75 39.62 49.92 39.60	dBμV/m 74 54 74 54 2016/6/15 22.7deg_C Pony Vertical	-22.25 -14.38 -24.08 -14.40 /57RH
5148.28 5148.28 5150.00 5150.00 Operation M Fundament Operation E EUT Pol. :	S E E Aode : al Frequenc 3and :	PK/QP/AV Peak Average Peak Average 802.11a sy : 5745 MH BE CH L H Detector	dBµV 43.57 31.44 41.73 31.41 Iz Test Date Iz Temp. / H ow Test Engi Measurer Spectum	8.18 8.19 8.19 8.19 Iumi. : neer : neer :	dBµV/m 51.75 39.62 49.92 39.60	dBµV/m 74 54 74 54 2016/6/15 22.7deg_C Pony Vertical Limit	-22.25 -14.38 -24.08 -14.40 /57RH
5148.28 5148.28 5150.00 5150.00 Operation M Fundament Operation E EUT Pol. : Freq.	S S E E Aode : al Frequenc 3and : Note	PK/QP/AV Peak Average Peak Average 802.11a sy : 5745 MH BE CH L H Detector Mode	dBµV 43.57 31.44 41.73 31.41 Iz Test Date Iz Temp. / H ow Test Engi Measurer Spectum Reading Level	8.18 8.19 8.19 1000 8.19 8.19 8.19 8.19 8.19 8.19 8.18 8.18	dBµV/m 51.75 39.62 49.92 39.60 ma Pol. : Actual FS	dBµV/m 74 54 74 54 2016/6/15 22.7deg_C Pony Vertical Limit @3m	-22.25 -14.38 -24.08 -14.40 /57RH

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Operation Fundamen Operation EUT Pol. :	tal Frequenc Band :	802.11a y : 5745 Mł BE CH I H	Hz Temp. / ⊦ ₋ow Test Eng	lumi. :	nna Pol. :	2016/6/15 22.7deg_C/ Pony Horizontal	′57RH
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5663.40	S	Peak	46.49	9.20	55.69	78.14593	-22.45
5725.00	Е	Peak	52.99	9.30	62.29	122.23	-59.94
Operation	Mada	802.11a	Test Date			2016/6/15	
Operation I							
Operation I	tal Frequenc	9. 5625 MF BECHE	•			22.7deg_C Pony	'Э/ КП
EUT Pol. :	banu.	H	0 0	ment Anter	nna Dal	Vertical	
EUT FUL.		п	Measure	ment Anter	111a FUI	ventical	
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	-
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5850.00	E	Peak	57.31	9.49	66.80	122.23	-55.43
5903.20	S	Peak	53.98	9.76	63.75	84.36186	-20.62
Operation	Mada	802.11a	Test Date			2016/6/15	
Operation I						2016/6/15 22.7deg C/	
				lumai i			
	tal Frequenc		•			0_	0/111
Operation I		BECHH	High Test Eng	ineer :	ana Dal	Pony	0/111
			High Test Eng		nna Pol. :	0_	07111
Operation I		BECHH	High Test Eng	ineer :	nna Pol. : Actual	Pony	Margin
Operation I EUT Pol. :	Band :	BE CH F H	ligh Test Eng Measure	ineer : ment Anter		Pony Horizontal	
Operation I EUT Pol. :	Band :	BE CH H H Detector	High Test Eng Measure Spectum	ineer : ment Anter	Actual	Pony Horizontal Limit	
Operation I EUT Pol. : Freq.	Band : Note	BE CH H H Detector Mode	High Test Eng Measure Spectum Reading Level	ineer : ment Anter Factor	Actual FS	Pony Horizontal Limit @3m	Margin

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## 802.11n20 HT mode

Operation N Fundament Operation E EUT Pol. :	al Frequency	802.11n/ y : 5180 MH BE CH L H	lz Temp. / H .ow Test Engi	lumi. :	na Pol. :	2016/6/15 22.7deg_C Pony Vertical	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5101.48	S	Peak	51.60	7.97	59.57	74	-14.43
5101.48	S	Average	37.31	7.97	45.28	54	-8.72
5150.00	E	Peak	42.89	8.19	51.08	74	-22.92
5150.00	E	Average	31.85	8.19	40.04	54	-13.96
Orantian		000 11.4				004 0/0/4 5	
Operation N		802.11n				2016/6/15	
	al Frequency	•				22.7deg_C	/57RH
Operation E EUT Pol. :	and:	BECHL	0		na Dal I	Pony	
EUT POL:		Н	Measuren	nent Anten	na Pol. :	Horizontal	
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5101.84	S	Peak	47.31	7.98	55.29	74	-18.71
5101.84	S	Average	34.54	7.98	42.52	54	-11.48
5150.00	Ĕ	Average	31.41	8.19	39.60	54	-14.40
5150.00	Е	Peak	41.94	8.19	50.13	74	-23.87
Operation N	lode :	802.11n	20 Test Date	•		2016/6/15	
	al Frequenc					22.7deg_C	/57BH
Operation E	• •	BE CH L				Pony	
EUT Pol. :		Н	0	nent Anten	na Pol. :	Vertical	
	NU -						
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5664.00	S	Peak	53.54	9.20	62.73	78.59	-15.86
5725.00	E	Peak	49.53	9.30	58.83	122.23	-63.40

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Operation I Fundamen Operation I EUT Pol. :	tal Frequenc	802.11n2 y : 5745 MH BE CH L H	lz Temp. / H .ow Test Eng	lumi. :	ına Pol. :	2016/6/15 22.7deg_C, Pony Horizontal	/57RH
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5657.30	S	Peak	49.06	9.25	58.31	73.63186	-15.32
5725.00	E	Peak	48.78	9.30	58.08	122.23	-64.15
Operation I		802.11n2				2016/6/15	
	tal Frequency					22.7deg_C	/57RH
Operation I	Band :	BE CH H	• •			Pony	
EUT Pol. :		Н	Measure	ment Anter	nna Pol. :	Vertical	
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5850.00	E	Peak	46.72	9.49	56.20	122.23	-66.03
5903.00	S	Peak	52.94	9.76	62.70	84.51	-21.81
Operation I	Mode :	802.11n2	20 Test Date	ə :		2016/6/15	
Fundament	tal Frequency	y: 5825 MH	lz Temp./H	Humi. :		22.7deg_C	/5/RH
Operation E		y : 5825 MH BE CH H	•			22.7deg_C Pony	/5/RH
			ligh Test <sup>'</sup> Eng		nna Pol. :		/5/RH
Operation I		BECHH	ligh Test <sup>'</sup> Eng	ineer :	na Pol. : Actual	Pony	/57RH Margin
Operation E EUT Pol. :	Band :	BE CH H H Detector	ligh Test Eng Measure	ineer : ment Anter		Pony Horizontal	
Operation E EUT Pol. :	Band :	BE CH H H Detector	ligh Test <sup>'</sup> Eng Measure Spectum	ineer : ment Anter	Actual	Pony Horizontal Limit	
Operation E EUT Pol. : Freq.	Band : Note	BE CH H H Detector Mode	ligh Test <sup>'</sup> Eng Measure Spectum Reading Level	ineer : ment Anter Factor	Actual FS	Pony Horizontal Limit @3m	Margin

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## 802.11n40 HT mode

Operation N Fund ament Operation E EUT Pol. :	al Frequenc	802.11n y : 5190 MH BE CH L H	lz Temp. / H .ow Test Engi	lumi. :	ina Pol. :	2016/6/15 22.7deg_C Pony Vertical	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5147.20	S	Peak	49.66	8.17	57.84	74	-16.16
5147.20	S	Average	33.21	8.17	41.38	54	-12.62
5150.00	Е	Peak	46.20	8.19	54.39	74	-19.61
5150.00	Е	Average	33.76	8.19	41.95	54	-12.05
Operation M Fundament Operation B EUT Pol. :	al Frequenc	802.11n sy : 5190 MF BE CH L H	lz Temp. / H .ow Test Engi	lumi. :	ına Pol. :	2016/6/15 22.7deg_C Pony Horizontal	/57RH
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5100.88	S	Peak	45.66	7.97	53.63	74	-20.37
5100.88	S E	Average	32.87	7.97	40.84	54	-13.16
5150.00		Peak	42.57	8.19	50.76	74	-23.24
5150.00	E	Average	31.70	8.19	39.89	54	-14.11
Operation N Fundament Operation E EUT Pol. :	al Frequenc	802.11n sy : 5745 MF BE CH L H	Iz Temp. / H .ow Test Engi	lumi. :	ına Pol. :	2016/6/15 22.7deg_C Pony Vertical	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
·		Mode	Reading Level		FS	@3m	-
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5657.31	S	Peak	50.40	9.25	59.65	73.63945	-13.98
5725.00	Е	Peak	53.79	9.30	63.09	122.23	-59.14

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Operation I Fundament Operation I EUT Pol. :	tal Frequenc	802.11n y : 5745 MH BE CH L H	lz Temp. / ł .ow Test Eng	Humi. :	nna Pol. :	2016/6/15 22.7deg_C/ Pony Horizontal	57RH
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5657.20	S	Peak	46.12	9.25	55.37	73.55815	-18.19
5725.00	E	Peak	53.39	9.30	62.69	122.23	-59.54
Operation N	Mode :	802.11n4	40 Test Date	e :		2016/6/15	
	al Frequenc					22.7deg_C/	57RH
Operation E	Band :	BE CH F				Pony	
EUT Pol. :		Н	Measure	ment Anter	nna Pol. :	Vertical	
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5850.00	E	Peak	48.21	9.49	57.70	122.23	-64.53
5883.00	S	Peak	51.05	9.63	60.67	99.31001	-38.64
Operation N	Mode :	802.11n	40 Test Dat	o ·		2016/6/15	
•	al Frequenc					22.7deg C/	57RH
Operation E	•	BE CH H	•			Pony	0/1111
EUT Pol. :	Sana .	H	•	ment Anter	nna Pol. :	Horizontal	
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level	٩D	FS dBul//m	@3m	dD
<u>MHz</u> 5850.00	F/H/E/S E	PK/QP/AV Peak	dBµV 43.07	dB 9.49	dBµV/m 52.56	<u>dBµV/m</u> 122.23	dB -69.67
5880.80 5880.80	S	Peak	43.07 45.47	9.49 9.62	52.56 55.08	100.93810	-69.67 -45.85
5000.00	0	I Can	40.47	3.02	55.00	100.30010	-40.00

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## 802.11ac80 VHT mode

Operation N Fundament Operation E EUT Pol. :	al Frequenc	802.11a sy : 5210 MH BE CH L H	Hz Temp. / ⊦ ₋ow Test Engi	łumi. :	ina Pol. :	2016/6/15 22.7deg_C Pony Vertical	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5150.00	E	Peak	53.84	8.19	62.03	74	-11.97
5150.00	E	Average	34.65	8.19	42.84	54	-11.16
Operation M Fundament Operation B EUT Pol. :	al Frequenc	802.11a sy : 5210 MH BE CH L H	Hz Temp. / H ₋ow Test Engi	łumi. :	na Pol. :	2016/6/15 22.7deg_C Pony Horizontal	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5147.10	S	Peak	47.96	8.17	56.14	74	-17.86
5147.10	S	Average	32.67	8.17	40.84	54	-13.16
5150.00	E	Peak	44.46	8.19	52.65	74	-21.35
5150.00	E	Average	32.60	8.19	40.79	54	-13.21
Operation I Fundament Operation I EUT Pol. :	al Frequenc	802.11a sy : 5775 Mł BE CH L H	Hz Temp. / H ₋ow Test Engi	łumi. :	ina Pol. :	2016/6/15 22.7deg_C Pony Vertical	/57RH
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
-		Mode	Reading Level		FS	@3m	-
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5688.10	S	Peak	50.96	9.50	60.46	96.42407	-35.96
5725.00	Е	Peak	57.11	9.30	66.41	122.23	-55.82

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Operation Fundamen Operation EUT Pol. :	tal Frequenc	802.11a y : 5775 M BE CH H	Hz Temp. / H Low Test Eng	lumi. :	nna Pol. :	2016/6/15 22.7deg_C/ Pony Horizontal	′57RH
Freq.	Note	Detector Mode	Spectum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5687.60	S	Peak	53.66	9.49	63.15	96.05408	-32.91
5725.00	Е	Peak	54.47	9.30	63.77	122.23	-58.46
Operation	Mada	900 11	200 Test Det			2016/6/15	
Operation		802.11a v : 5775 M				2016/6/15	
Operation	tal Frequenc	BECH				22.7deg_C/ Pony	3/NH
EUT Pol. :	banu .	H	0 0	meet . ment Anter	na Pol	Vertical	
LOT 1 01			Measurer		ina i u	Ventical	
Freq.	Note	Detector	Spectum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
5850.00	E	Peak	49.66	9.49	59.15	122.23	-63.08
5891.28	S	Peak	47.24	9.66	56.90	93.18296	-36.28
Operation	Mode ·	80211:	ac80 Test Date	Z .		2016/6/15	
Operation		802.11a				2016/6/15 22.7deg C/	(57BH
Fundamen	tal Frequenc	y: 5775 M	Hz Temp. / H	łumi. :		22.7deg_C/	′57RH
Fundamen Operation	tal Frequenc	y : 5775 M BE CH	Hz Temp. / H High Test Eng	lumi. : ineer :	nna Pol	22.7deg_C/ Pony	′57RH
Fundamen	tal Frequenc Band :	y: 5775 M	Hz Temp. / H High Test Eng Measurer	lumi. : ineer : ment Anter		22.7deg_C/ Pony Horizontal	
Fundamen Operation	tal Frequenc	y : 5775 M BE CH H Detector	Hz Temp. / H High Test Eng Measure Spectum	lumi. : ineer :	Actual	22.7deg_C/ Pony Horizontal Limit	'57RH Margin
Fundamen Operation EUT Pol. : Freq.	tal Frequenc Band : Note	y : 5775 M BE CH H Detector Mode	Hz Temp. / H High Test Eng Measurer Spectum Reading Level	lumi. : ineer : ment Anter Fa <i>c</i> tor	Actual FS	22.7deg_C/ Pony Horizontal Limit @3m	Margin
Fundamen Operation EUT Pol. : Freq. MHz	tal Frequenc Band : Note F/H/E/S	y : 5775 M BE CH H Detector Mode PK/QP/AV	Hz Temp. / H High Test Eng Measure Spectum Reading Level dBµV	Humi. : ineer : ment Anter Factor dB	Actual FS dBµV/m	22.7deg_C/ Pony Horizontal Limit @3m dBµV/m	Margin dB
Fundamen Operation EUT Pol. : Freq.	tal Frequenc Band : Note	y : 5775 M BE CH H Detector Mode	Hz Temp. / H High Test Eng Measurer Spectum Reading Level	lumi. : ineer : ment Anter Fa <i>c</i> tor	Actual FS	22.7deg_C/ Pony Horizontal Limit @3m	Margin

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# 12. TRANSMISSION IN THE ABSENCE OF DATA

## 12.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

## 12.2 Result

No non-compliance noted: Refer to the theory of operation.

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# **13. FREQUENCY STABILITY**

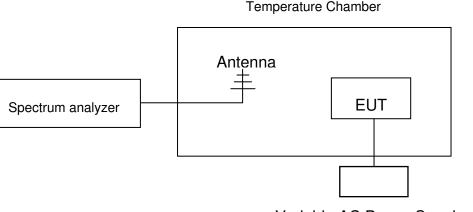
# 13.1 Standard Applicable

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

## **13.2 Measurement Procedure**

- 1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
- 2. Set EUT as normal operation.
- 3. Turn the EUT on and couple its output to spectrum.
- 4. Turn the EUT off and set the chamber to the highest temperature specified.
- 5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
- 6. Repeat step with the temperature chamber set to the lowest temperature.

# 13.3 Test SET-UP



Variable AC Power Supply

## 13.4 Measurement Equipment Used:

	SGS Conducted Room								
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due				
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017				
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016				
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/23/2015	06/22/2016				

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#### 13.5 **Measurement Result**

Operation Mode	802.11 a	Test Date	2016.06.20
Temperature	:25 ℃	Test By	Enzo
Humidity	:60 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
		36	5180	5,179.90641	0.00001807
		44	5220	5,219.90618	0.00001797
	13.8V	48	5240	5,239.90643	0.00001786
	13.6 V	149	5745	5,744.89788	0.00001778
		157	5785	5,784.89546	0.00001807
		165	5825	5,824.89480	0.00001806
<b>0</b> °C		36	5180	5,179.90783	0.00001779
		44	5220	5,219.90713	0.00001779
	10.01/	48	5240	5,239.90556	0.00001802
	10.2V	149	5745	5,744.89764	0.00001782
		157	5785	5,784.89686	0.00001783
		165	5825	5,824.89610	0.00001784

		36	5180	5,179.90605	0.00001814
<b>25</b> ℃		44	5220	5,219.90565	0.00001807
	12V	48	48 5240 5	5,239.90521	0.00001809
	I Z V	149	5745	5,744.89608	0.00001809
		157	5785	5,784.89518	0.00001812
		165	5825	5,824.89458	0.00001810

		36	5180	5,179.90460	0.00001842
		44	5220	5,219.90489	0.00001822
	13.8V	48	5240	5,239.90333	0.00001845
	13.0 V	149	5745	5,744.89534	0.00001822
		157	5785	5,784.89368	0.00001838
<b>10</b> °C		165	5825	5,824.89406	0.00001819
<b>40</b> °C		36	5180	5,179.90417	0.00001850
		44	5220	5,219.90466	0.00001826
	10.2V	48	5240	5,239.90487	0.00001815
	10.2 v	149	5745	5,744.89452	0.00001836
		157	5785	5,784.89412	0.00001830
		165	5825	5,824.89390	0.00001821

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**40** °C

Operation Mode	802.11 n_HT40	Test Date	2016.06.20
Temperature	:25 ℃	Test By	Enzo
Humidity	:60 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
		38	5190	5,189.96482	0.0000678
	13.8V	46	5230	5,230.00864	-0.00000165
	13.0 V	151	5755	5,754.96923	0.0000535
<b>0</b> °C		159	5795	5,795.00876	-0.00000151
UC		38	5190	5,189.96399	0.0000694
	10.2V	46	5230	5,230.00883	-0.00000169
	10.2 V	151	5755	5,754.96886	0.00000541
		159	5795	5,795.01017	-0.00000175
_					
		38	5190	5,189.96312	0.00000711
<b>0F</b> °C	12V	46	5230	5,230.00712	-0.00000136
<b>25</b> ℃	1 Z V	151	5755	5,754.96580	0.00000594
		159	5795	5,795.00845	-0.00000146
		38	5190	5,189.96294	0.00000714
	12.0\/	46	5230	5,230.00592	-0.00000113
	13.8V	151	5755	5,754.96864	0.00000545

159

38

46

151

159

10.2V

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5795

5190

5230

5755

5795

5,795.00679

5,189.96188

5,230.00528

5,754.96744

5,795.00679

-0.00000117

0.0000734

-0.00000101

0.0000566

-0.00000117



Operation Mode	802.11 ac_VHT80	Test Date	2016.06.20
Temperature	:25 °C	Test By	Enzo
Humidity	:60 %		

Test Temp.	Test Voltage	Channel	Measured Frequency (MHz)	Spectrum Frequency (MHz)	ΔFrequency (MHz)
<b>0</b> °C	13.8V	42	5210	5,209.96104	0.0000748
		155	5775	5,774.98779	0.00000211
	10.2V	42	5210	5,209.96113	0.00000746
		155	5775	5,774.98733	0.00000219
<b>25</b> °C	3.3V	42	5210	5,209.96059	0.0000756
		155	5775	5,774.98725	0.00000221
<b>40</b> ℃	13.8V	42	5210	5,209.95950	0.00000777
		155	5775	5,774.98710	0.00000223
	10.2V	42	5210	5,209.96026	0.00000763
		155	5775	5,774.98609	0.00000241

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# **14. ANTENNA REQUIREMENT**

# 14.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device. According to §15.407, 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.

# 14.2 Antenna Connected Construction

PCB antenna designs are used.

The antenna is designed with permanent attached and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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