

FCC 47 CFR PART 15 SUBPART E

CERTIFICATION TEST REPORT

For

HYBRID DVB

MODEL No.: V1.5

FCC ID: 2AF9RHV15

Trade Mark: V1.5

REPORT NO: ES190402972W05

ISSUE DATE: June 12, 2019

Prepared for

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Prepared by

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1 TEST RESULT CERTIFICATION

Applicant : Wetek Electronics Limited.
Address : Level 10, Central building, 1-3 Pedder Street, Central, Hong Kong
Manufacturer : Wetek Electronics Limited.
Address : Level 10, Central building, 1-3 Pedder Street, Central, Hong Kong
EUT : HYBRID DVB
Model Name : V1.5
Trademark : V1.5

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart E	PASS

The above equipment was tested by EMTEK (SHENZHEN) CO., LTD. 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 the requirements of FCC Rules Part 2 and Part 15.407

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

Date of Test : April 25,2019 to June 10, 2019

Prepared by:


Sewen Guo /Editor

Reviewer:


Joe Xia /Supervisor

Approve & Authorized Signer :


Lisa Wang/Manager



TABLE OF CONTENTS

1	TEST RESULT CERTIFICATION	2
2	EUT TECHNICAL DESCRIPTION	4
3	SUMMARY OF TEST RESULT	6
4	TEST METHODOLOGY	7
4.1	GENERAL DESCRIPTION OF APPLIED STANDARDS	7
4.2	MEASUREMENT EQUIPMENT USED	7
4.3	DESCRIPTION OF TEST MODES	8
5	FACILITIES AND ACCREDITATIONS	12
5.1	FACILITIES.....	12
5.2	LABORATORY ACCREDITATIONS AND LISTINGS	12
6	TEST SYSTEM UNCERTAINTY	13
7	SETUP OF EQUIPMENT UNDER TEST	14
7.1	RADIO FREQUENCY TEST SETUP	14
7.2	RADIO FREQUENCY TEST SETUP	14
7.3	CONDUCTED EMISSION TEST SETUP	16
7.4	BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM.....	17
7.5	SUPPORT EQUIPMENT.....	17
8	TEST REQUIREMENTS	18
8.1	BANDWIDTH MEASUREMENT	18
8.2	MAXIMUM CONDUCTED OUTPUT POWER.....	59
8.3	MAXIMUM PEAK POWER DENSITY	64
8.4	FREQUENCY STABILITY	98
8.5	UNDESIRABLE RADIATED SPURIOUS EMISSION.....	107
8.6	POWER LINE CONDUCTED EMISSIONS.....	160
8.7	ANTENNA APPLICATION	163

2 EUT TECHNICAL DESCRIPTION

Characteristics	Description	
Product	HYBRID DVB	
Model Number	V1.5	
Wifi Type	☒ UNII-1: 5150MHz-5250MHz Band ☒ UNII-2A: with 5250MHz-5350MHz Band ☒ UNII-2C: with 5470MHz-5725MHz Band ☒ UNII-3 with 5725MHz-5850MHz Band	
WLAN Supported	☒ 802.11a ☒ 802.11n(20MHz channel bandwidth) ☒ 802.11n(40MHz channel bandwidth) ☒ 802.11ac(20MHz channel bandwidth) ☒ 802.11ac(40MHz channel bandwidth) ☒ 802.11ac(80MHz channel bandwidth)	
Data Rate	802.11a:54/48/36/24/18/12/9/6Mbps 802.11n:up to 600 Mbps 802.11ac:up to 1.733Gbps	
Modulation	☒ OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n; ☒ OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11ac;	
Frequency Range	☒ UNII-1: 5150MHz-5250MHz Band	
	☒ 5180-5240MHz for 802.11a; ☒ 5180-5240MHz for 802.11n(HT20); ☒ 5180-5240MHz for 802.11ac(HT20);	☒ 5190-5230MHz for 802.11n(HT40); ☒ 5190-5230MHz for 802.11ac(HT40); ☒ 5210MHz for 802.11ac(HT80);
	☒ UNII-2A: with 5250MHz-5350MHz Band	
	☒ 5260-5320MHz for 802.11a; ☒ 5260-5320MHz for 802.11n(HT20); ☒ 5260-5320MHz for 802.11ac(HT20);	☒ 5270-5310MHz for 802.11n(HT40); ☒ 5270-5310MHz for 802.11ac(HT40); ☒ 5290MHz for 802.11ac(HT80);
	☒ UNII-2C: with 5470MHz-5725MHz Band	
	☒ 5500-5700MHz for 802.11a; ☒ 5500-5700MHz for 802.11n(HT20); ☒ 5500-5700MHz for 802.11ac(HT20);	☒ 5510-5670MHz for 802.11n(HT40); ☒ 5510-5670MHz for 802.11ac(HT40); ☒ 5530-5610MHz for 802.11ac(HT80)
	☒ UNII-3 with 5725MHz-5850MHz Band	
	☒ 5745-5825MHz for 802.11a; ☒ 5745-5825MHz for 802.11n(HT20); ☒ 5745-5825MHz for 802.11ac(HT20);	☒ 5755-5795MHz for 802.11n(HT40); ☒ 5755-5795MHz for 802.11ac(HT40); ☒ 5775MHz for 802.11ac(HT80);
TCP Function	☐ Applicable	☒ Not Applicable
Antenna Type	Internal Antenna	
Antenna Gain	2 dBi	
Transmit Power	Output Power (Max.) for UNII-1 (1TX)	802.11a: 17.71dBm 802.11n(HT 20 MHz): 16.65dBm 802.11n(HT 40 MHz): 15.87dBm 802.11ac (HT 20 MHz): 16.65dBm

		802.11ac (HT 40 MHz): 15.30dBm 802.11ac (HT 80 MHz): 13.15dBm
	Output Power (Max.) for UNII-2A (1TX)	802.11a: 16.80dBm 802.11n(HT 20 MHz): 15.79dBm 802.11n(HT 40 MHz): 14.79dBm 802.11ac (HT 20 MHz): 15.73dBm 802.11ac (HT 40 MHz): 14.63dBm 802.11ac (HT 80 MHz): 11.82dBm
	Output Power (Max.) for UNII-2C (1TX)	802.11a: 17.93dBm 802.11n(HT 20 MHz): 17.50dBm 802.11n(HT 40 MHz): 17.85dBm 802.11ac (HT 20 MHz): 17.83dBm 802.11ac (HT 40 MHz): 17.14dBm 802.11ac (HT 80 MHz): 17.34dBm
	Output Power (Max.) for UNII-3 (1TX)	802.11a: 17.51dBm 802.11n(HT 20 MHz): 16.79dBm 802.11n(HT 40 MHz): 16.63dBm 802.11ac (HT 20 MHz): 16.91dBm 802.11ac (HT 40 MHz): 15.89dBm 802.11ac (HT 80 MHz): 13.80dBm
Power supply	☒ DC 12V for adapter	
	☒ Adapter : Model :KA1201A-1201000US Input : 100~240V;50/60Hz,0.4A Max Output: DC12V,1.0A	

Note: for more details, please refer to the User's manual of the EUT.

3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
15.407 (a) 15.407 (e)	99% , 6dB and 26dB Bandwidth	PASS	
15.407 (a)	Maximum Conducted Output Power	PASS	
15.407 (a)	Peak Power Spectral Density	PASS	
15.407 (b)	Radiated Spurious Emission	PASS	
15.407(g)	Frequency Stability	PASS	
15.407 (b)(6) 15.207	Power Line Conducted Emission	PASS	
15.407(a) 15.203	Antenna Application	PASS	
NOTE1: N/A (Not Applicable) NOTE2: According to FCC OET KDB 789033 D2 General UNII Test Procedures New Rules v02r01, In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.			

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2AF9RHV15 filing to comply with Section 15.247 of the FCC Part 15, Subpart E Rules.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2, Subpart J

FCC 47 CFR Part 15, Subpart E

FCC KDB 789033 D2 General UNII Test Procedures New Rules v02r01

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	May 20, 2019
L.I.S.N.	Rohde & Schwarz	ENV216	101161	May 20, 2019
50Ω Coaxial Switch	Anritsu	MP59B	6100175589	May 21, 2019
Voltage Probe	Rohde & Schwarz	ESH2-Z3	100122	May 21, 2019
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	May 20, 2019
I.S.N	Teseq GmbH	ISN T800	30327	May 21, 2019

4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 21, 2019
Pre-Amplifier	HP	8447F	2944A07999	May 20, 2019
Bilog Antenna	Schwarzbeck	VULB9163	142	May 20, 2019
Loop Antenna	ARA	PLA-1030/B	1029	May 20, 2019
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 21, 2019
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 20, 2019
Cable	Schwarzbeck	AK9513	ACRX1	May 21, 2019
Cable	Rosenberger	N/A	FP2RX2	May 21, 2019
Cable	Schwarzbeck	AK9513	CRPX1	May 21, 2019
Cable	Schwarzbeck	AK9513	CRRX2	May 21, 2019

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	May 21, 2019
Signal Analyzer	Agilent	N9010A	My53470879	May 21, 2019
Power meter	Anritsu	ML2495A	0824006	May 21, 2019
Power sensor	Anritsu	MA2411B	0738172	May 21, 2019
Spectrum Analyzer	Agilent	E4407B	88156318	May 21, 2019
Temperature & Humidity Chamber	YINHE	SDH0525F	2003003	May 19, 2018

Remark: Each piece of equipment is scheduled for calibration once a year.

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

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.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

☒ Wifi 5G with U-NII - 1

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220		
40	5200	48	5240		

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190				
46	5230				

Frequency and Channel list for 802.11ac Wave2 (HT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	5210				

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	40	5200	48	5240

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	N/A	N/A	46	5230

Test Frequency and channel for 802.11ac Wave2 (HT80):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	5210	N/A	N/A	N/A	N/A

☒ Wifi 5G with U-NII -2A

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	60	5300		
56	5280	64	5320		

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270				
62	5310				

Frequency and Channel list for 802.11ac (HT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
58	5290				

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
52	5260	56	5280	64	5320

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
54	5270	N/A	N/A	62	5310

Test Frequency and channel for 802.11ac (HT80):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
58	5290				

☒ Wifi 5G with U-NII -2C

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	116	5580	132	5660
104	5520	120	5600	136	5680
108	5540	124	5620	140	5700
112	5560	128	5640		

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
102	5510	118	5590	134	5670
110	5550	126	5630		

Frequency and Channel list for 802.11ac (HT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
106	5530	122	5610		

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	116	5580	140	5700

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
102	5510			134	5670

Test Frequency and channel for 802.11ac (HT80):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
106	5530				

☒ Wifi 5G with U-NII -3

Frequency and Channel list for 802.11a/n (HT20)/802.11ac (HT20):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785	165	5825
153	5765	161	5805		

Frequency and Channel list for 802.11n (HT40)/ 802.11ac (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755				
159	5795				

Frequency and Channel list for 802.11ac (HT80):

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
155	5775				

Test Frequency and Channel for 802.11a/n (HT20)/802.11ac (HT20):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	157	5785	165	5825

Test Frequency and channel for 802.11n (HT40)/ 802.11ac (HT40):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	N/A	N/A	159	5795

Test Frequency and channel for 802.11ac (HT80):

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
155	5775				

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab.

: Accredited by CNAS, 2018.11.30

The certificate is valid until 2022.10.28

The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2017)

The Certificate Registration Number is L2291.

Accredited by TUV Rheinland Shenzhen 2018.03.30

The Laboratory has been assessed according to the requirements ISO/IEC 17025.

Accredited by FCC, August 08, 2018

Designation Number: CN1204

Test Firm Registration Number: 882943

Accredited by A2LA, August 31, 2020

The Certificate Registration Number is 4321.01.

Accredited by Industry Canada, November 09, 2018

The Conformity Assessment Body Identifier is CN0008.

Name of Firm

: EMTEK(SHENZHEN) CO., LTD.

Site Location

: Bldg 69, Majialong Industry Zone,
Nanshan District, Shenzhen, Guangdong, China

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

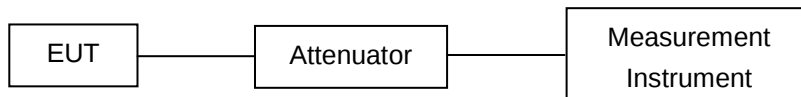
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Power Density	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP

The WLAN component's antenna ports(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT.

Above 30MHz:

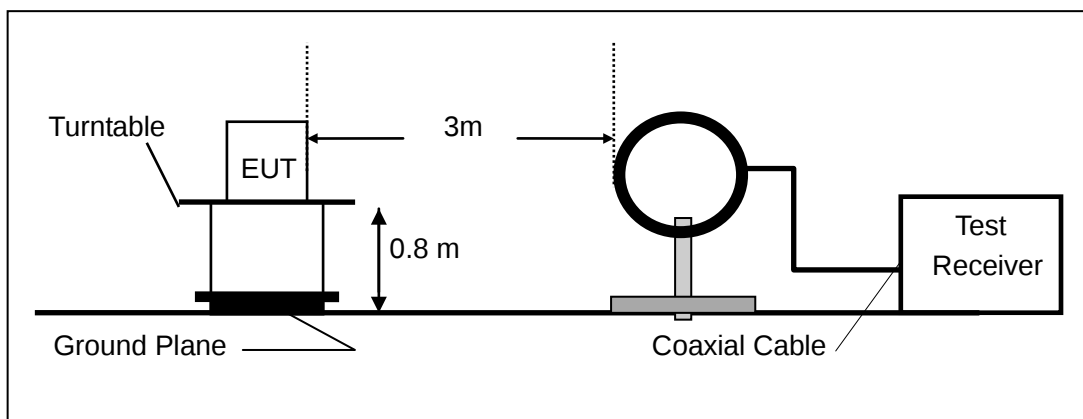
The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

Above 1GHz:

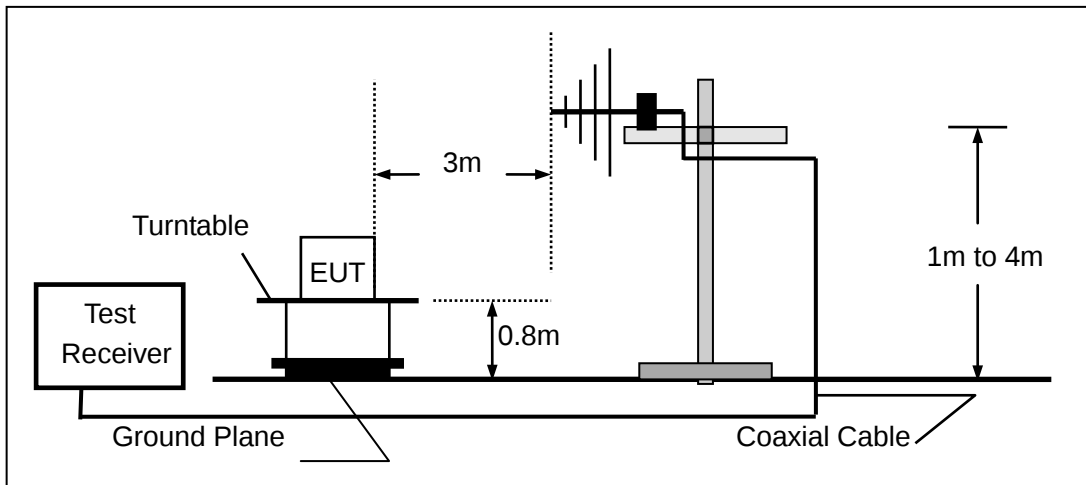
(Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.)

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

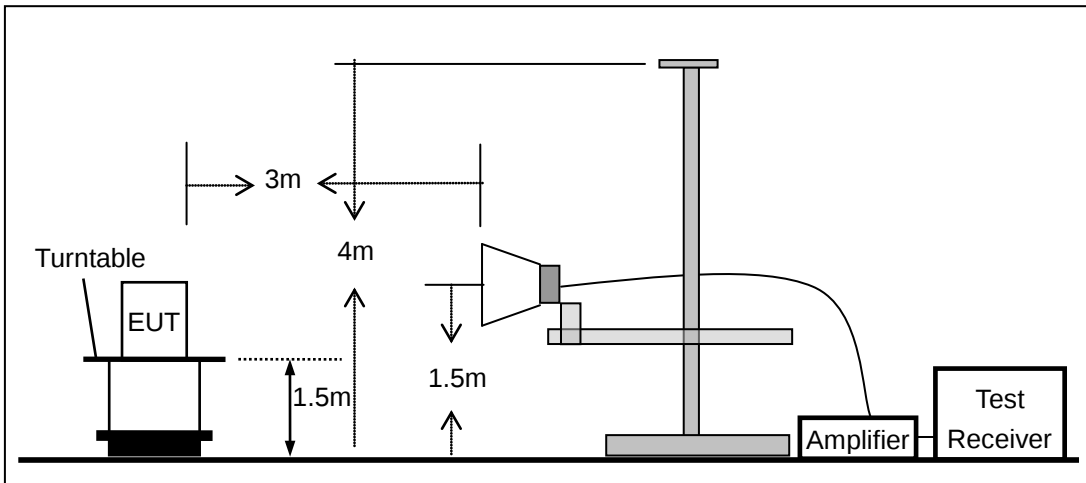
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

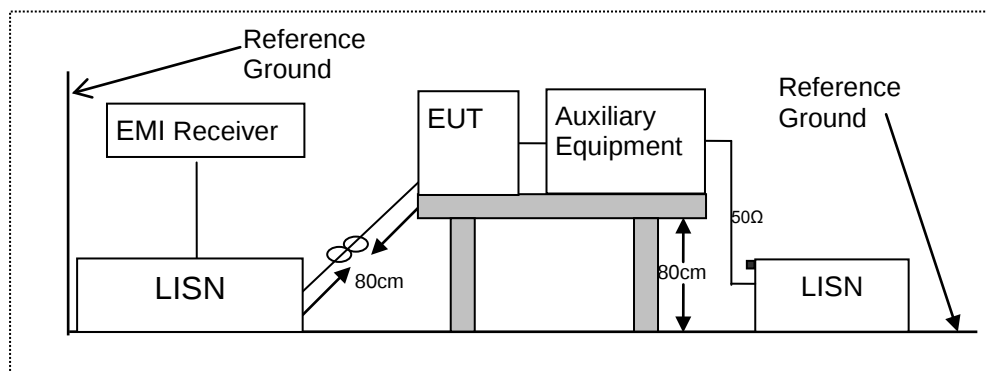


7.3 CONDUCTED EMISSION TEST SETUP

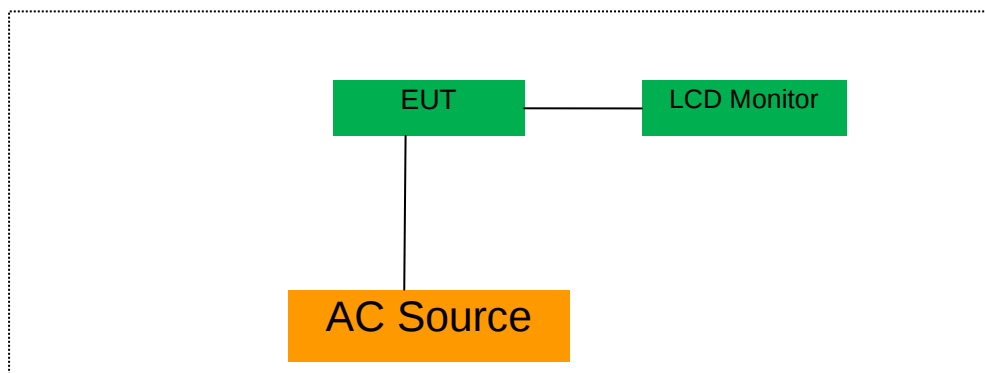
The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



7.4 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM



7.5 SUPPORT EQUIPMENT

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
Adapter cable	1.5	Unshielded	Without Ferrite

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
HDMI cable	1.5	Shielded	With Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	acer	ZR1	LXTECOCO76643158 372500
LCD Monitor	SONY	SDM-S53/B T8UC7	P-17465811-F

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

8 TEST REQUIREMENTS

8.1 BANDWIDTH MEASUREMENT

8.1.1 Applicable Standard

According to FCC Part 15.407(a)(1) for UNII Band I
According to FCC Part 15.407(a)(2) for UNII Band II-A and UNII Band II-C
According to FCC Part 15.407(a)(3) for UNII Band III
According to FCC Part 15.407(e) for UNII Band III
According to 789033 D02 Section II(C)
According to 789033 D02 Section II(D)

8.1.2 Conformance Limit

(1) For the band 5.15-5.25 GHz.

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

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

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

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

8.1.3 Test Configuration

Test according to clause 6.1 radio frequency test setup

8.1.4 Test Procedure

According to 789033 D02 v02r01 section C&D, the following is the measurement procedure.

1. Emission Bandwidth (EBW)

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. Minimum Emission Bandwidth for the band 5.725-5.85 GHz

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

D. 99 Percent Occupied Bandwidth

The 99-percent occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission. Measurement of the 99-percent occupied bandwidth is required only as a condition for using the optional band-edge measurement techniques described in section II.G.3.d). Measurements of 99-percent occupied bandwidth may also optionally be used in lieu of the EBW to 789033 D02 v01r02 General UNII Test Procedures New Rules v01 define the minimum frequency range over which the spectrum is integrated when measuring maximum conducted output power as described in section II.E. However, the EBW must be measured to determine bandwidth dependent limits on maximum conducted output power in accordance with 15.407(a).

The following procedure shall be used for measuring (99 %) power bandwidth:

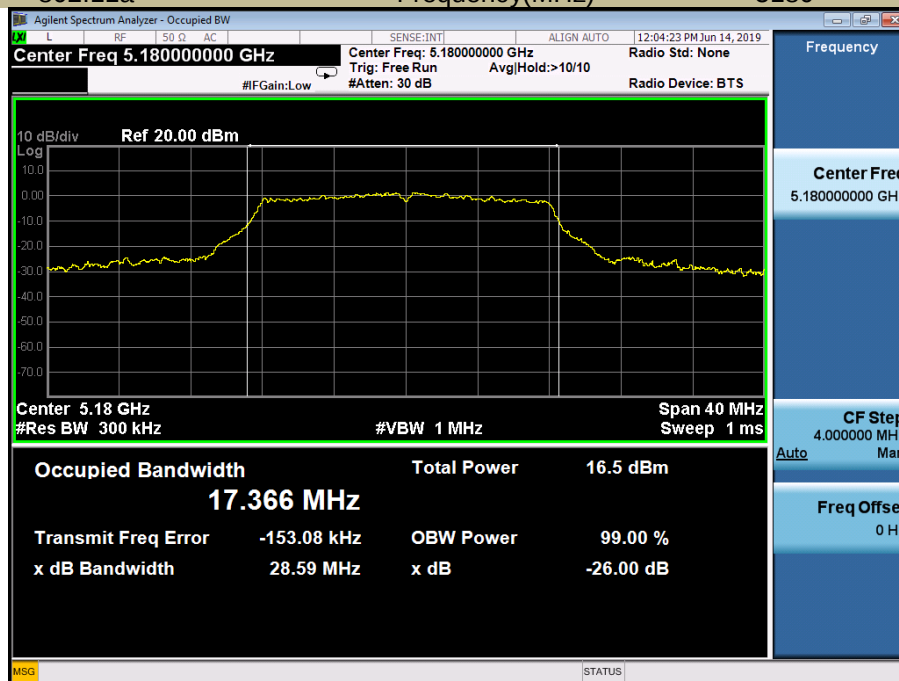
1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 \cdot \text{RBW}$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

8.1.5 Test Results

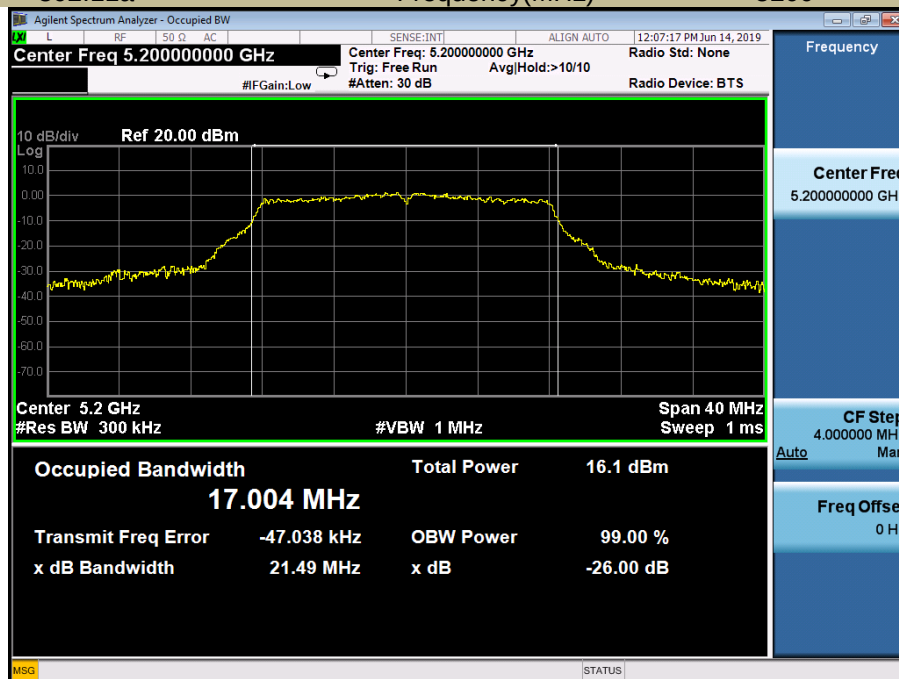
5150-5250MHz

Test Mode	Test Channel MHz		26 dB Bandwidth MHz	99% Bandwidth MHz	Verdict
802.11a	CH36	5180	28.59	17.366	Pass
	CH40	5200	21.49	17.004	Pass
	CH48	5240	21.42	16.967	Pass
802.11n-HT20	CH36	5180	28.69	18.261	Pass
	CH40	5200	22.29	18.249	Pass
	CH48	5240	21.57	18.039	Pass
802.11ac(HT20)	CH36	5180	24.36	18.170	Pass
	CH40	5200	22.38	18.113	Pass
	CH48	5240	22.04	18.104	Pass
802.11n-HT40	CH38	5190	75.95	37.074	Pass
	CH46	5230	48.80	36.497	Pass
802.11ac(HT40)	CH38	5190	42.09	36.498	Pass
	CH46	5230	40.31	36.371	Pass
802.11ac(HT80)	CH42	5210	96.11	76.00	Pass

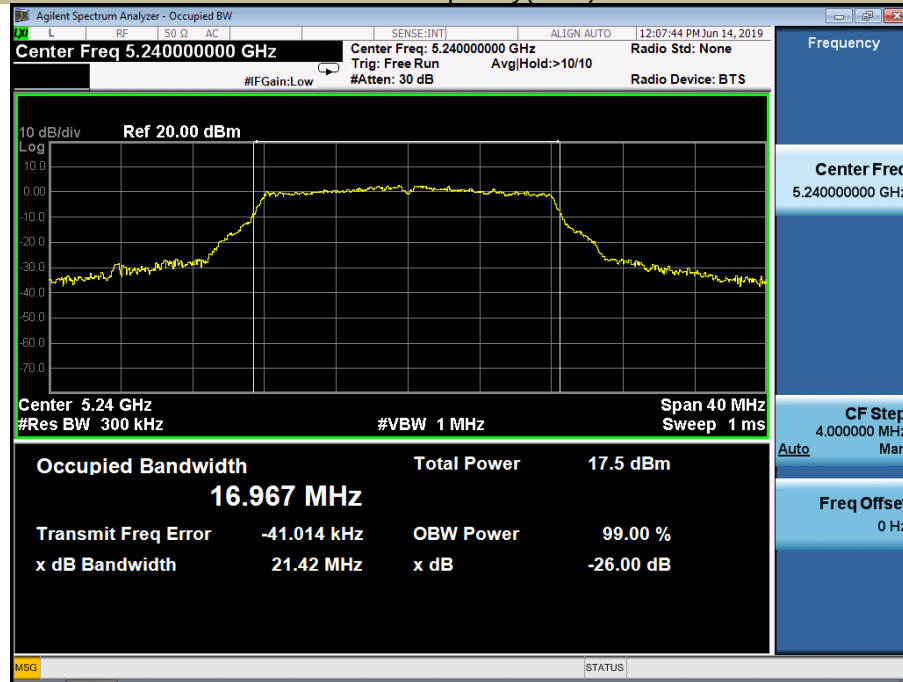
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11a Frequency(MHz) 5180



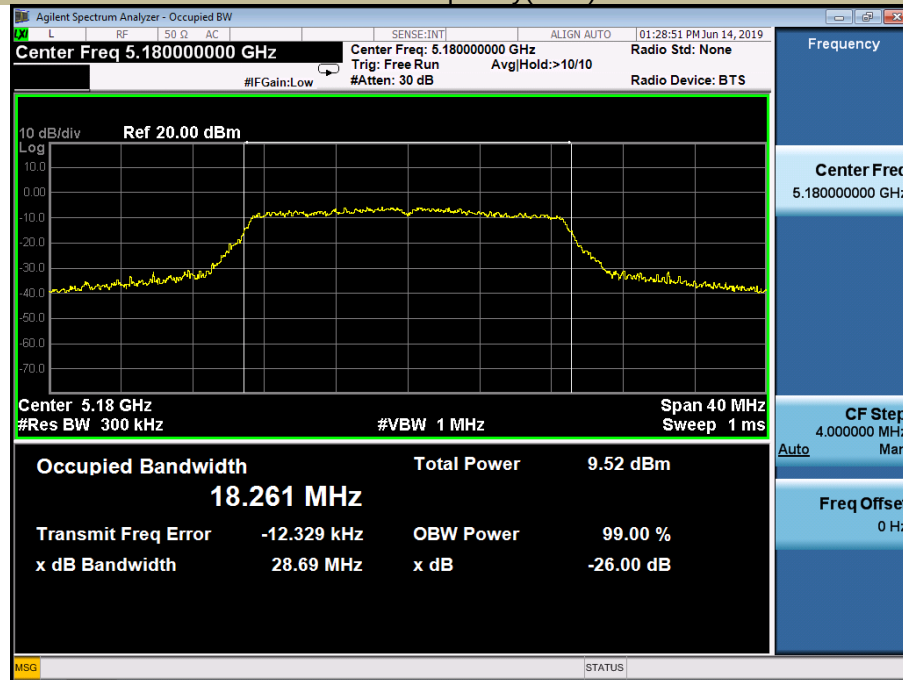
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11a Frequency(MHz) 5200



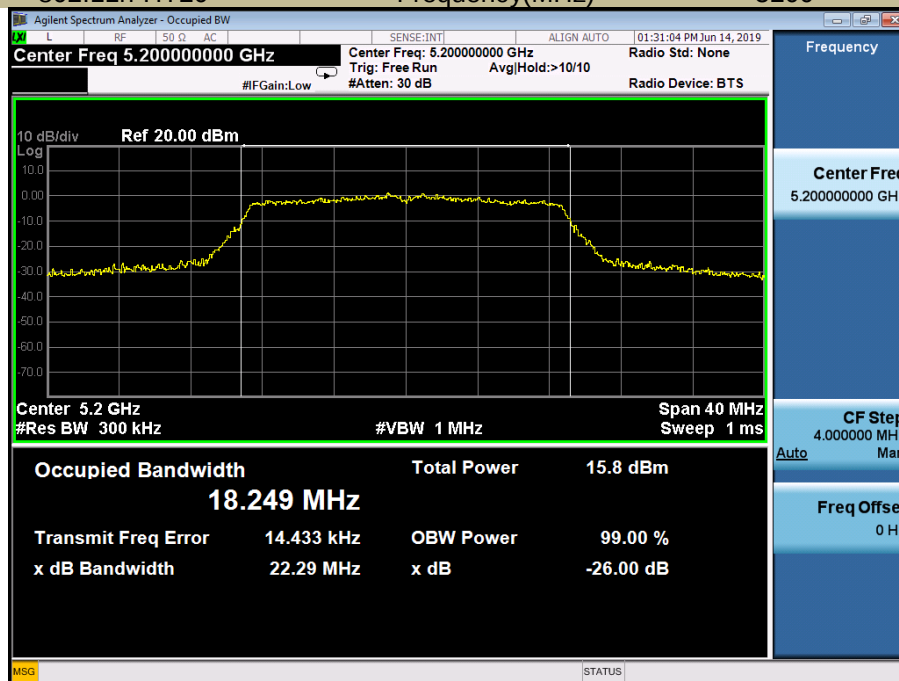
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11a Frequency(MHz) 5240



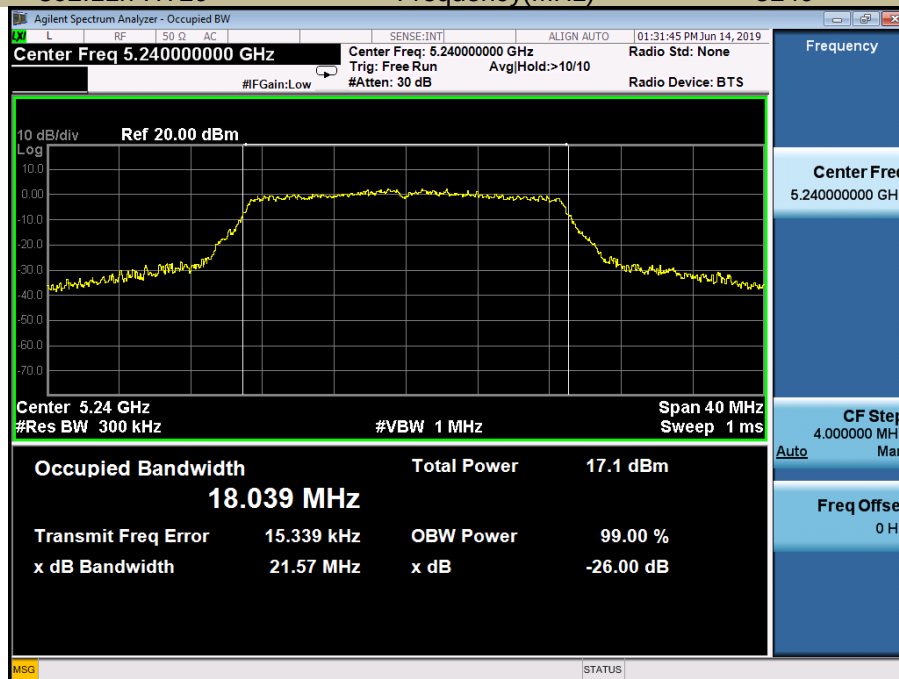
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5180



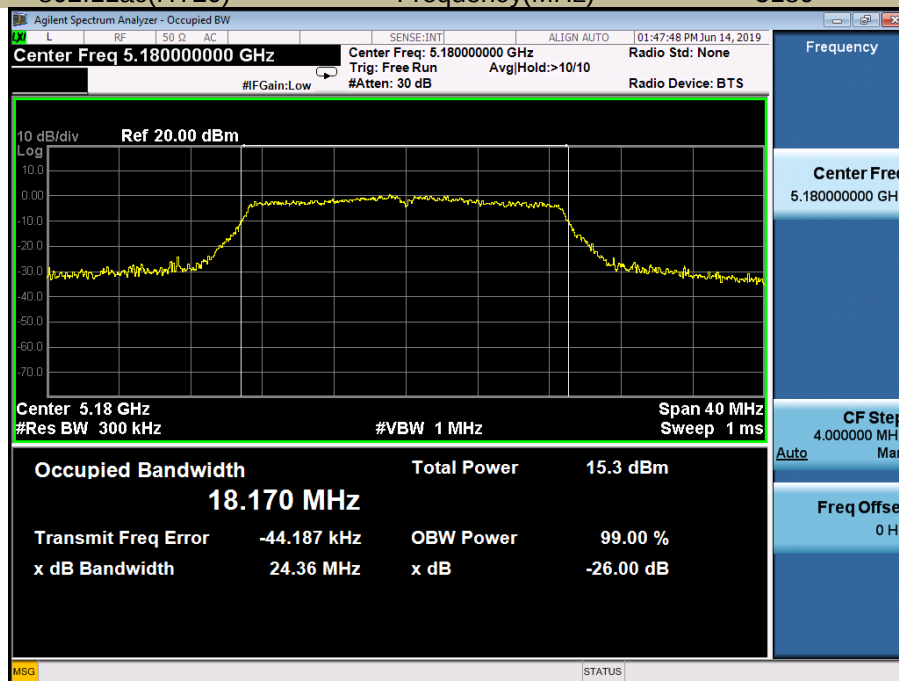
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Test Model 802.11n-HT20 Frequency(MHz) 5200



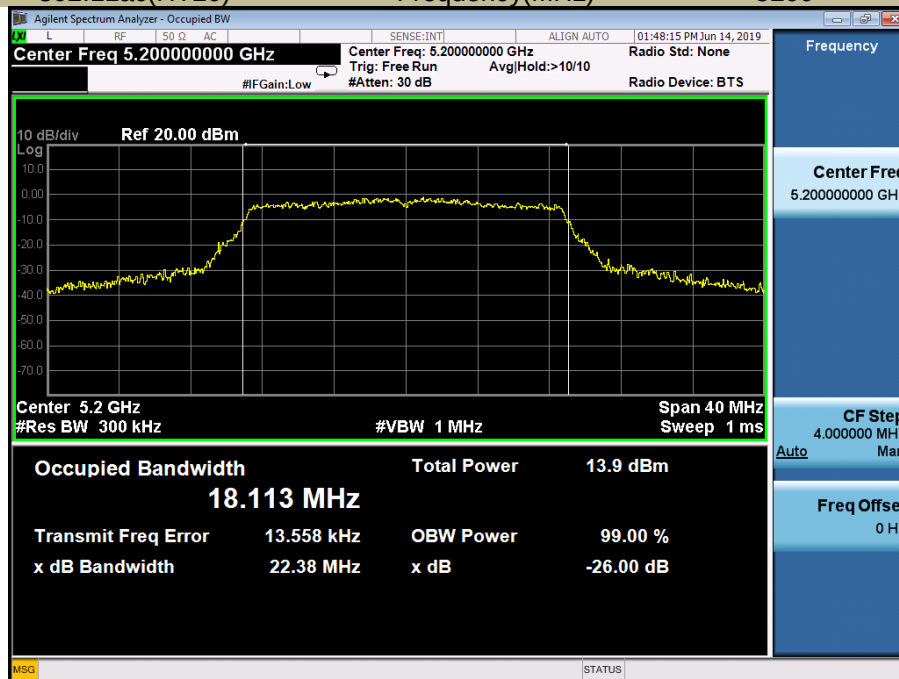
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11n-HT20 Frequency(MHz) 5240



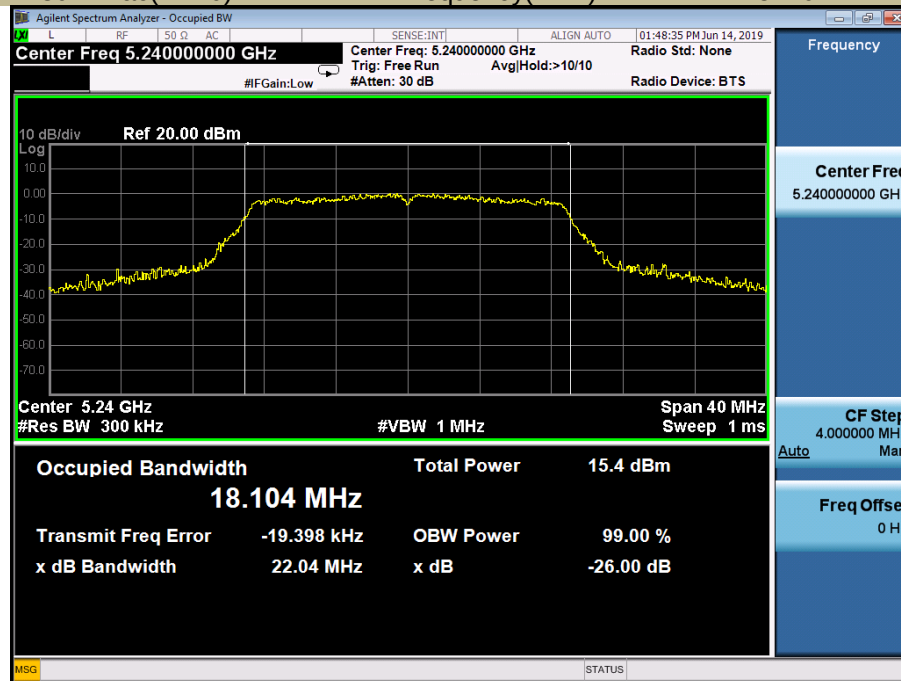
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5180



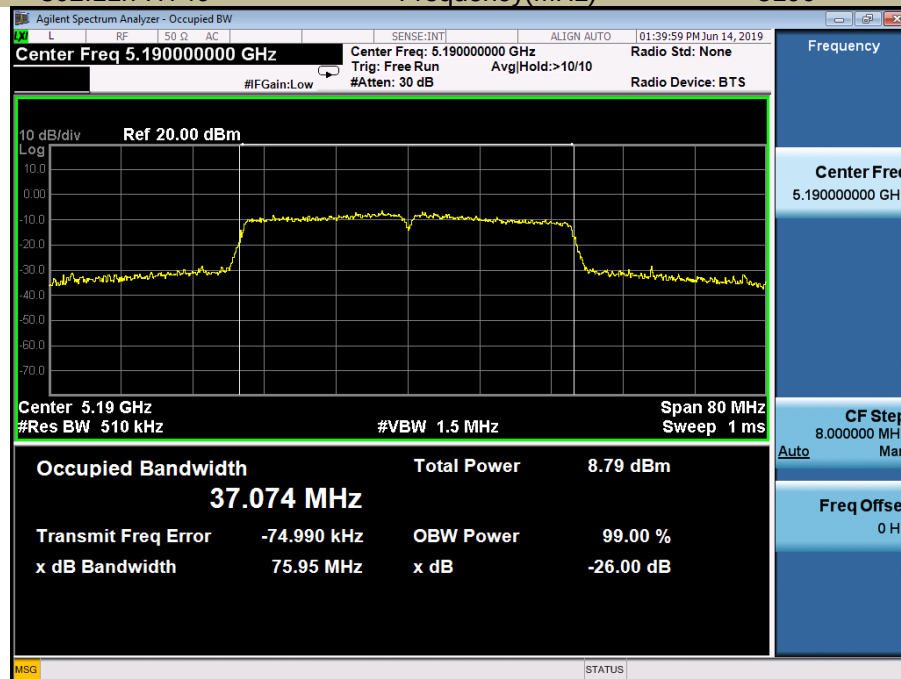
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11ac(HT20) Frequency(MHz) 5200



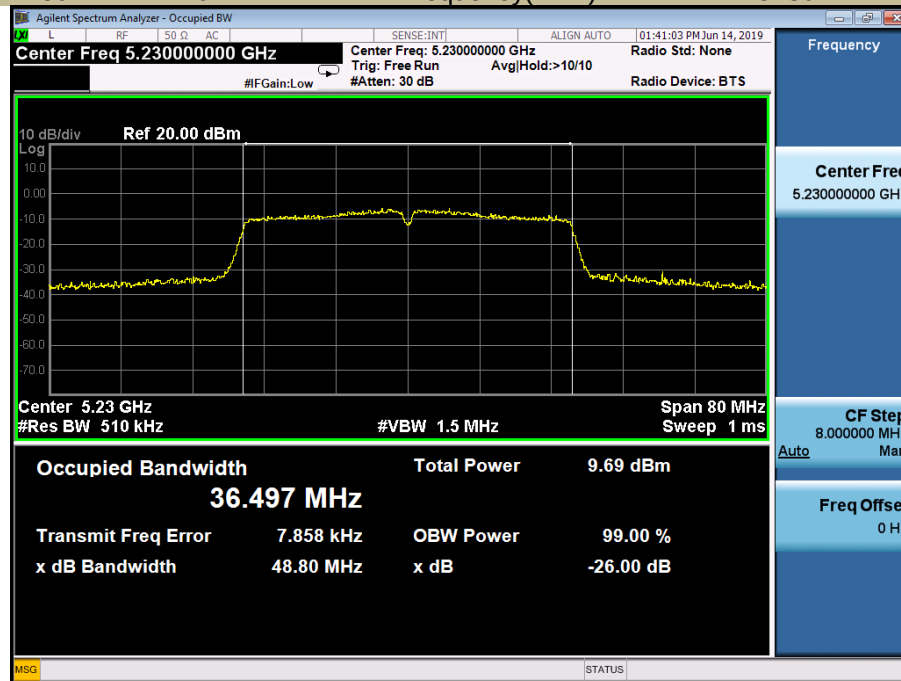
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Test Model 802.11ac(HT20) Frequency(MHz) 5240



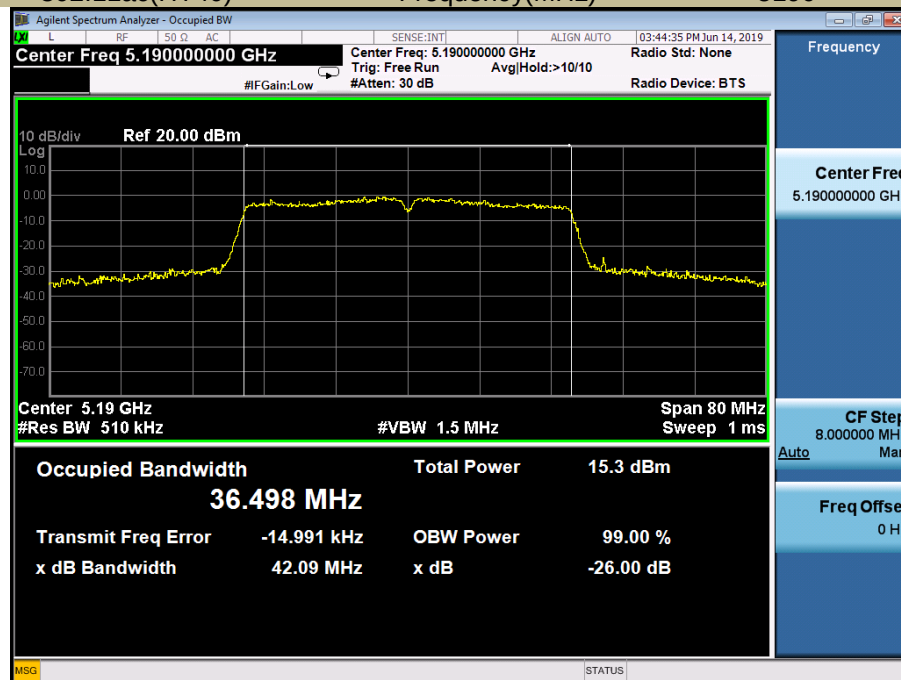
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11n-HT40 Frequency(MHz) 5190



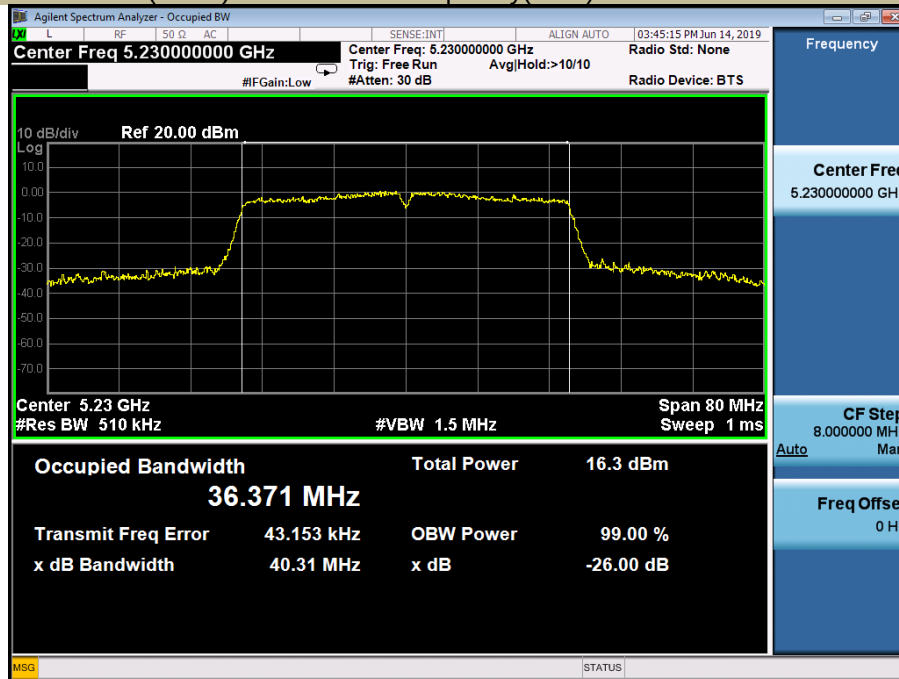
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11n-HT40 Frequency(MHz) 5230



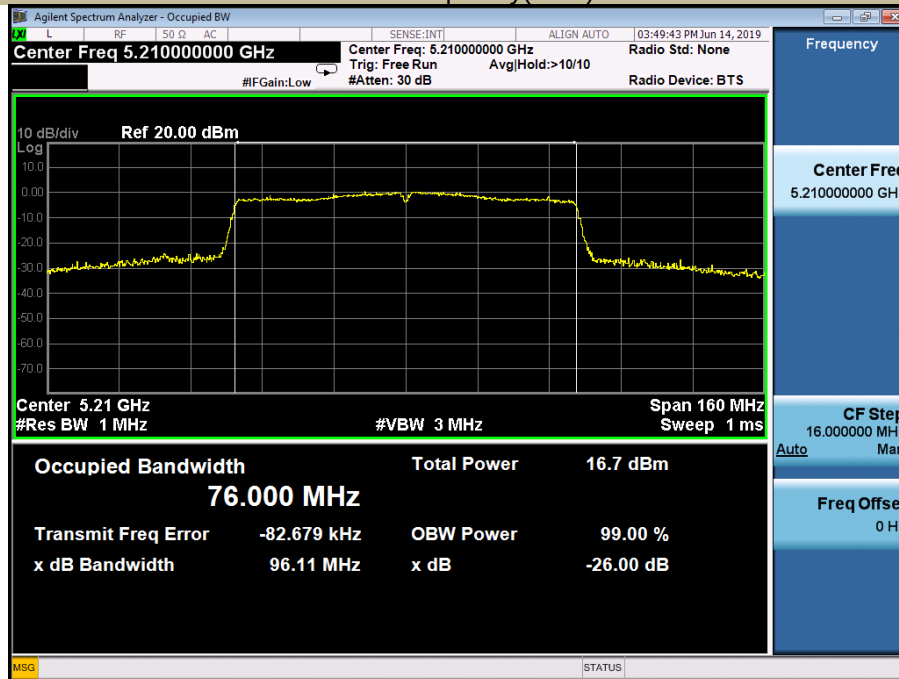
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11ac(HT40) Frequency(MHz) 5190



Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11ac(HT40) Frequency(MHz) 5230



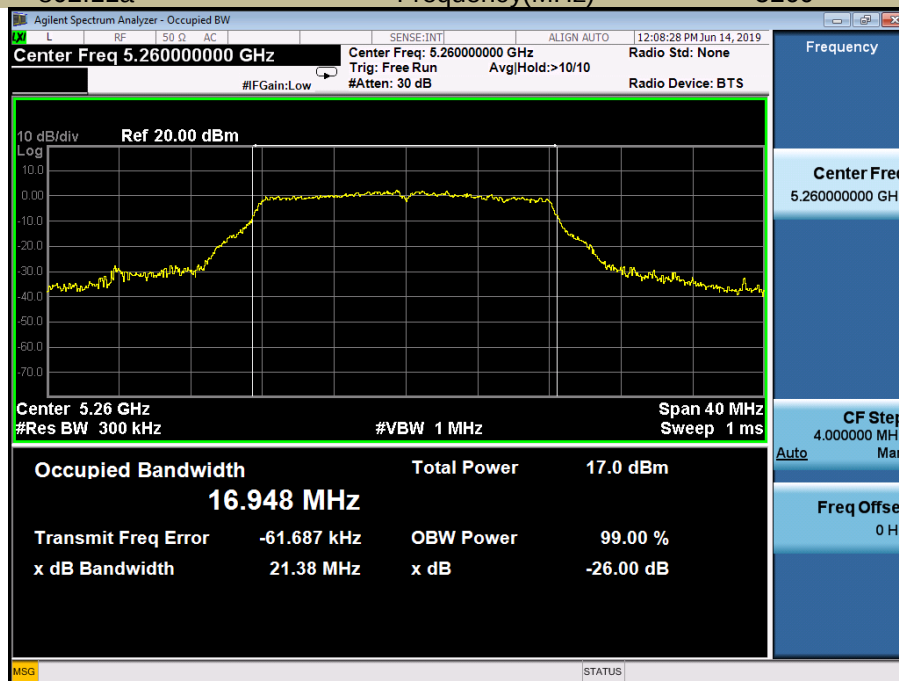
Emission Bandwidth&99% Occupied Bandwidth U-NII - 1
Test Model 802.11ac 80 Frequency(MHz) 5210



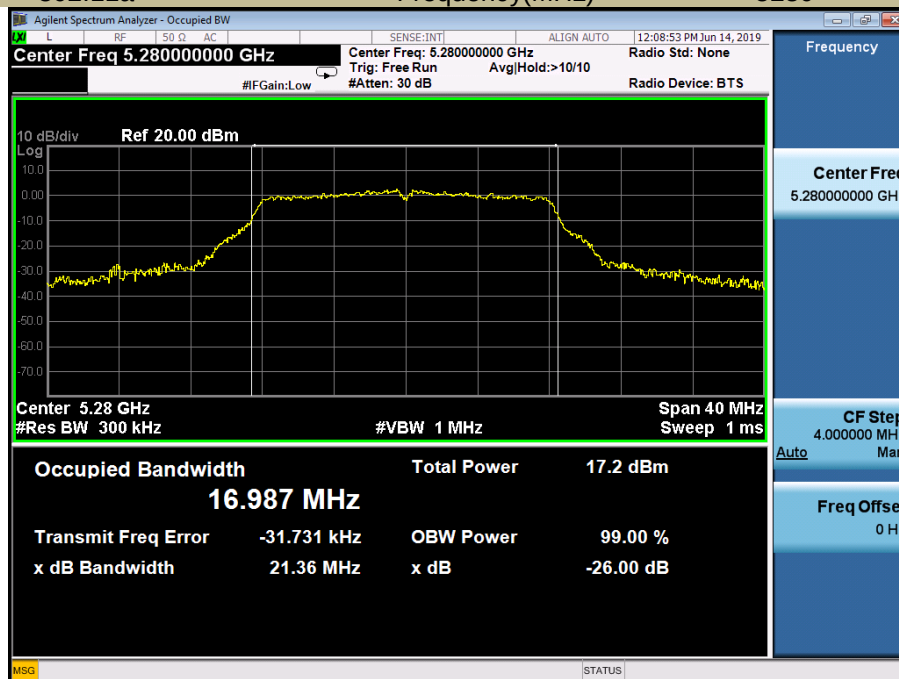
5250-5350MHz

Test Mode	Test Channel MHz		26 dB Bandwidth MHz	99% Bandwidth MHz	Verdict
802.11a	CH52	5260	21.38	16.948	Pass
	CH56	5280	21.36	16.987	Pass
	CH64	5320	21.44	16.947	Pass
802.11n-HT20	CH52	5260	21.78	18.034	Pass
	CH56	5280	21.82	18.085	Pass
	CH64	5320	21.59	18.010	Pass
802.11ac(HT20)	CH52	5260	21.51	18.046	Pass
	CH56	5280	22.18	18.062	Pass
	CH64	5320	21.77	18.043	Pass
802.11n-HT40	CH54	5270	40.82	36.612	Pass
	CH62	5310	45.82	36.475	Pass
802.11ac(HT40)	CH54	5270	40.18	36.438	Pass
	CH62	5310	40.08	36.336	Pass
802.11ac(HT80)	CH58	5290	82.46	75.939	Pass

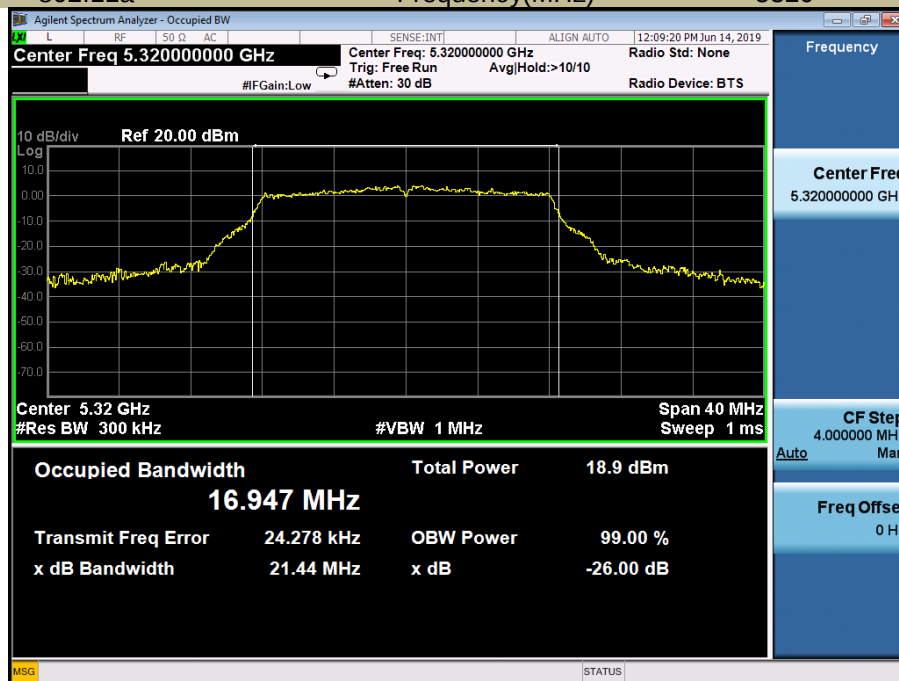
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11a Frequency(MHz) 5260



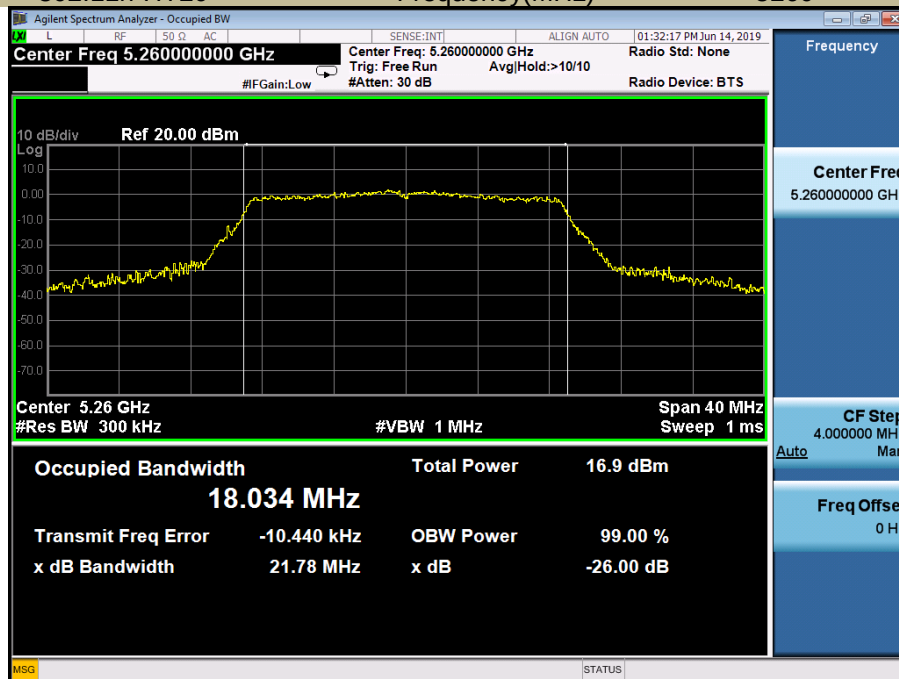
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11a Frequency(MHz) 5280



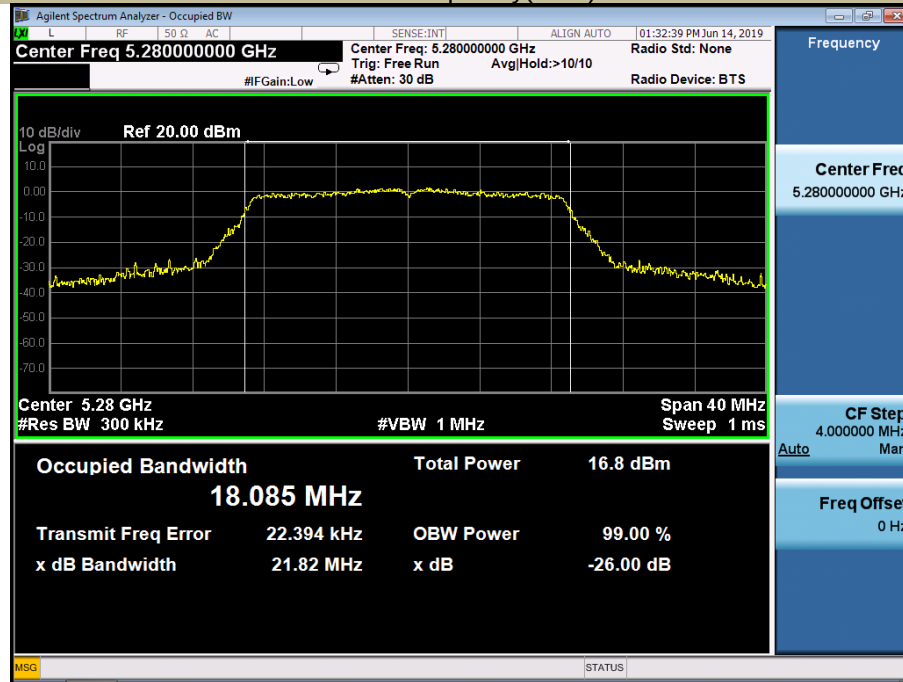
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11a Frequency(MHz) 5320



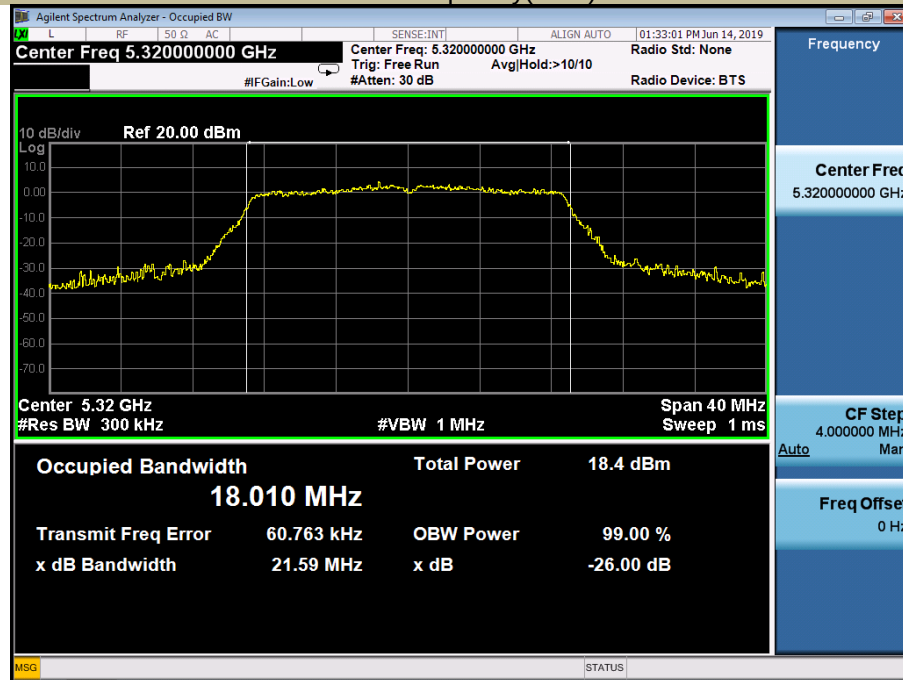
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5260



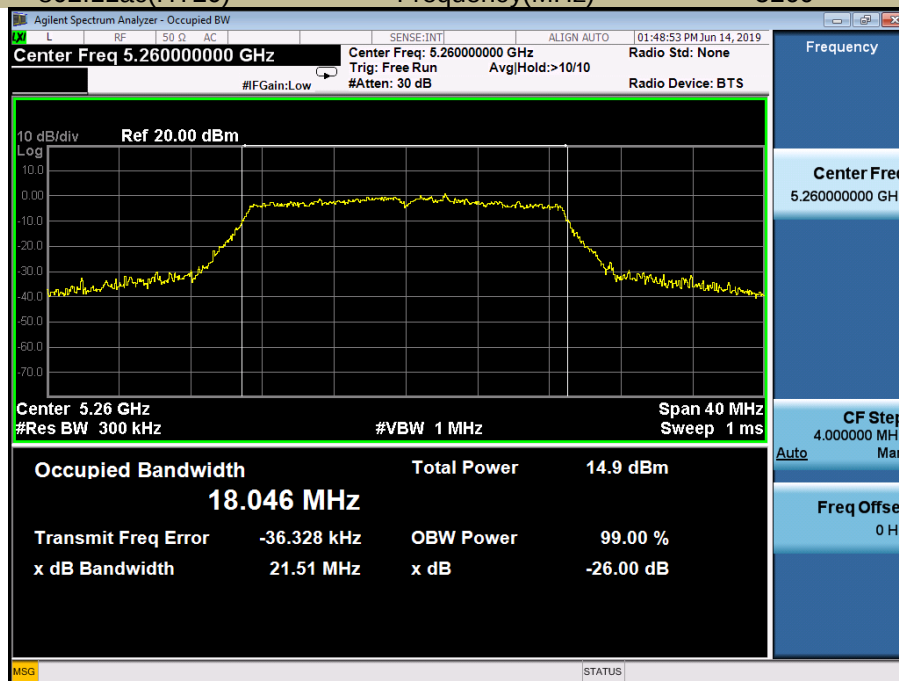
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5280



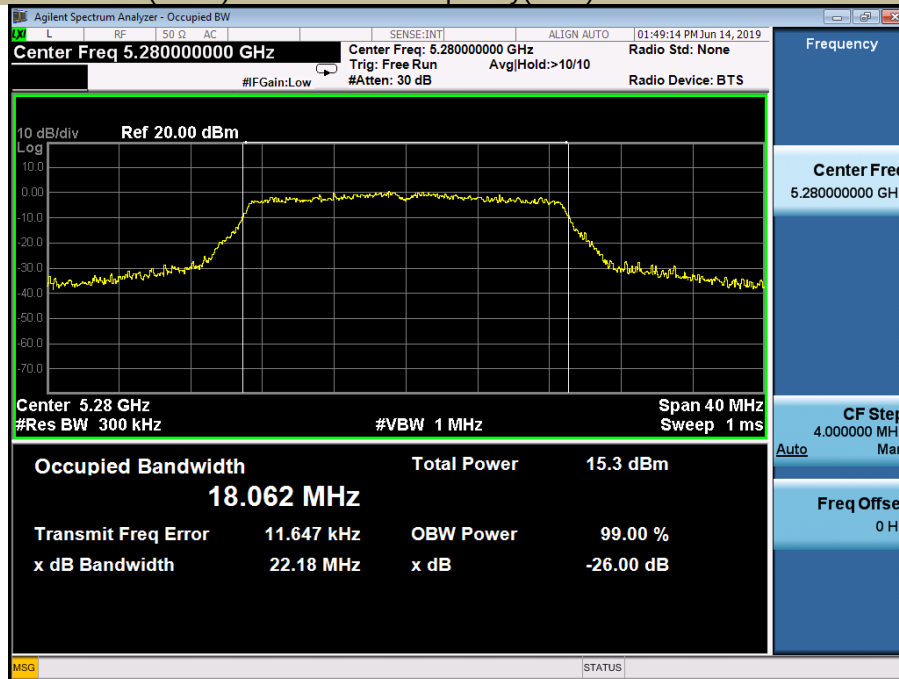
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11n-HT20 Frequency(MHz) 5320



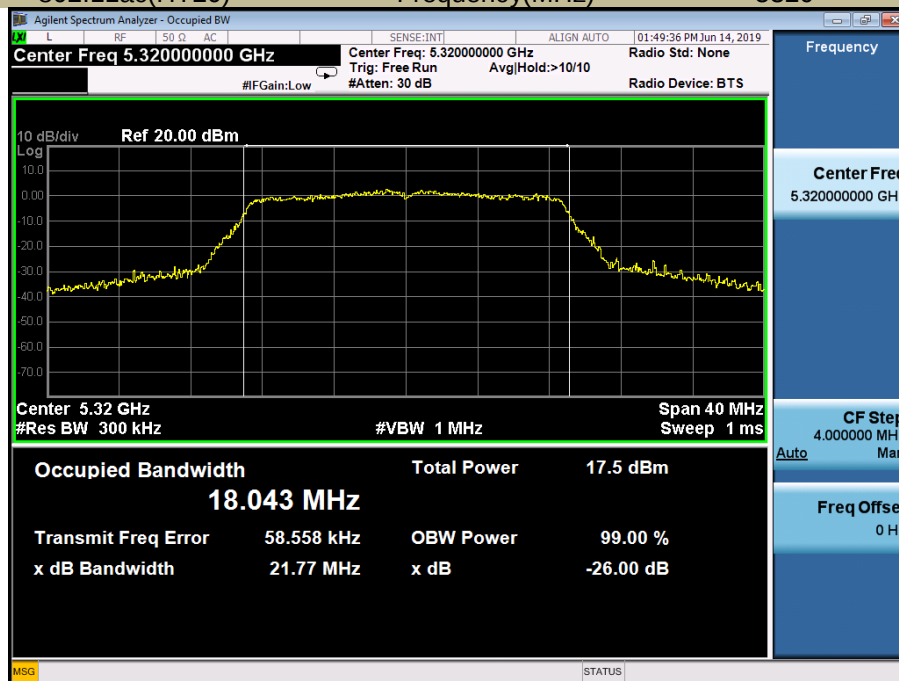
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5260



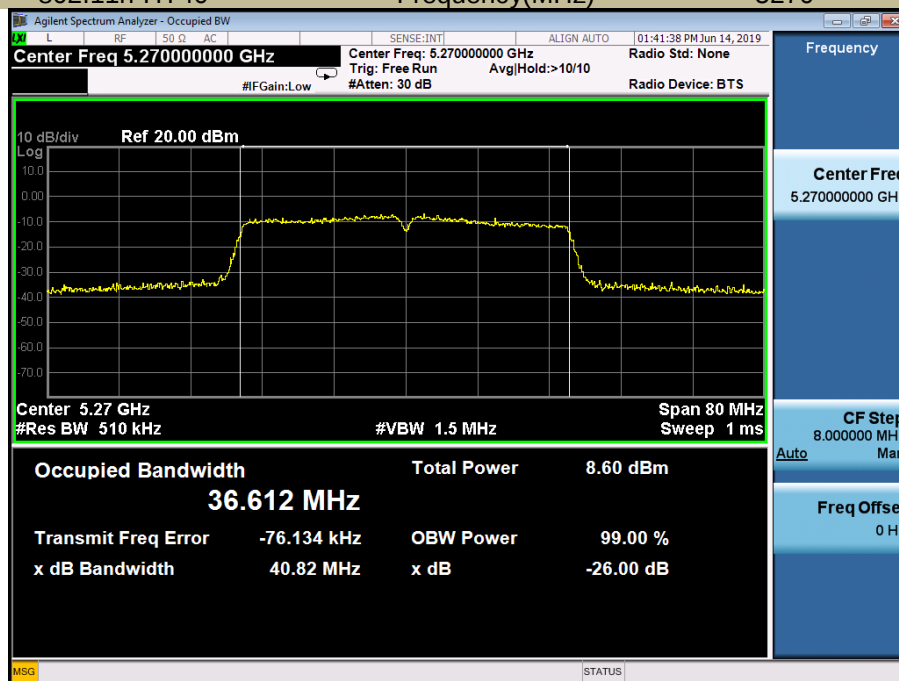
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11ac(HT20) Frequency(MHz) 5280



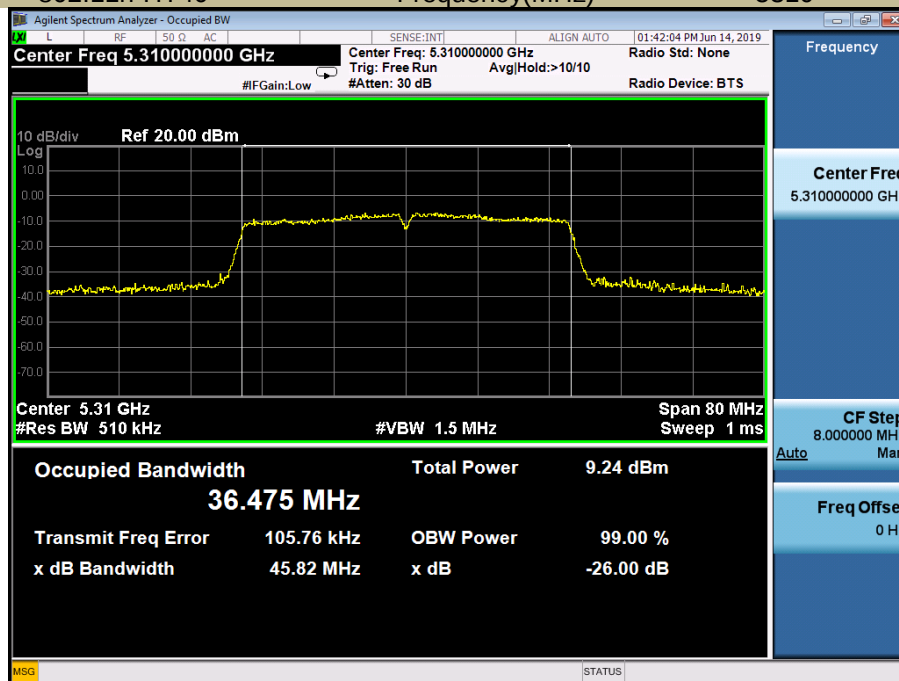
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Test Model 802.11ac(HT20) Frequency(MHz) 5320



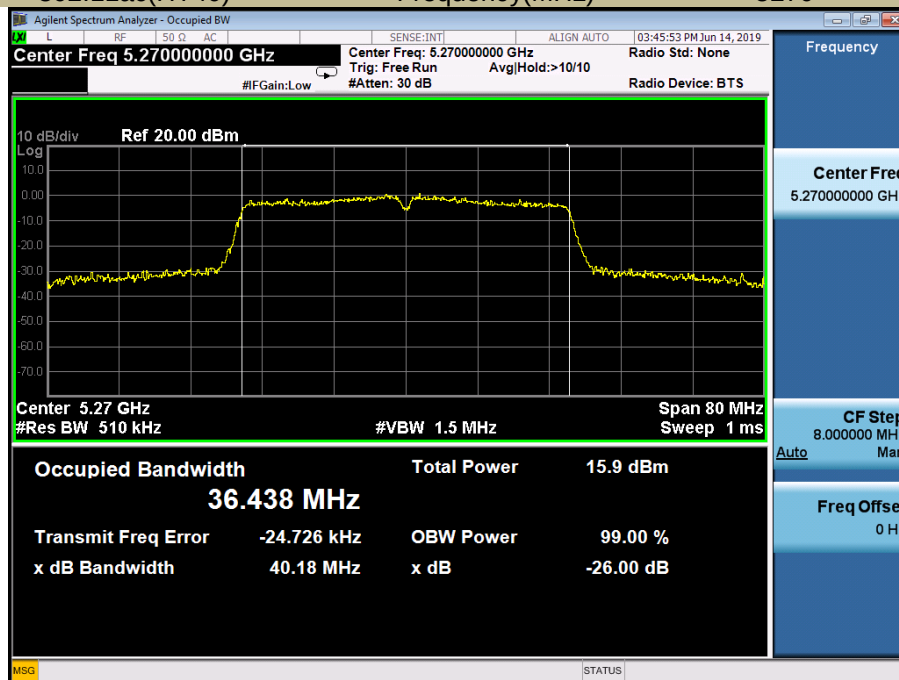
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11n-HT40 Frequency(MHz) 5270



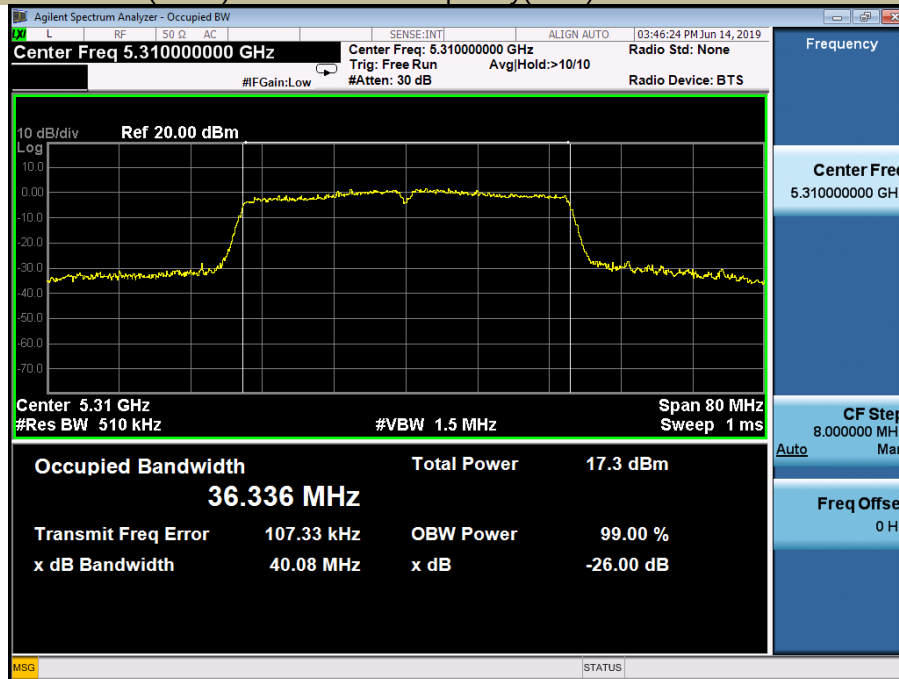
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11n-HT40 Frequency(MHz) 5310



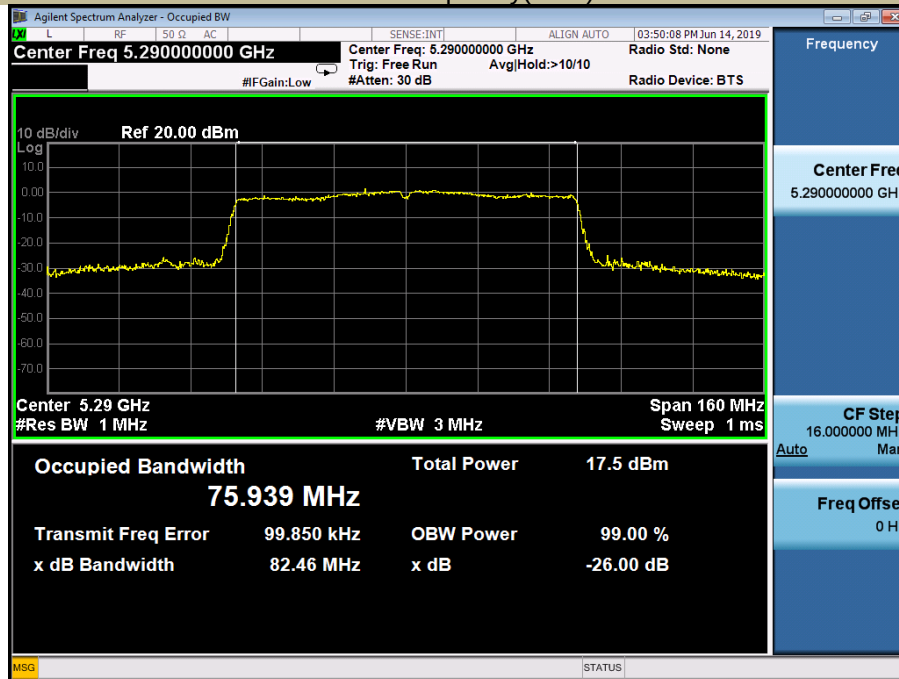
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11ac(HT40) Frequency(MHz) 5270



Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11ac(HT40) Frequency(MHz) 5310



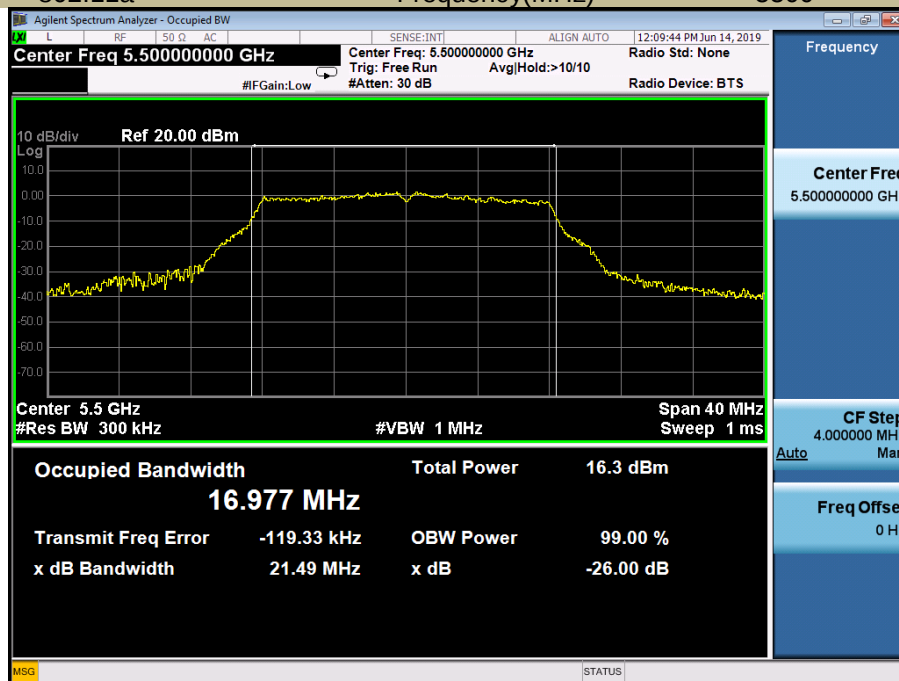
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2A
Test Model 802.11ac 80 Frequency(MHz) 5290



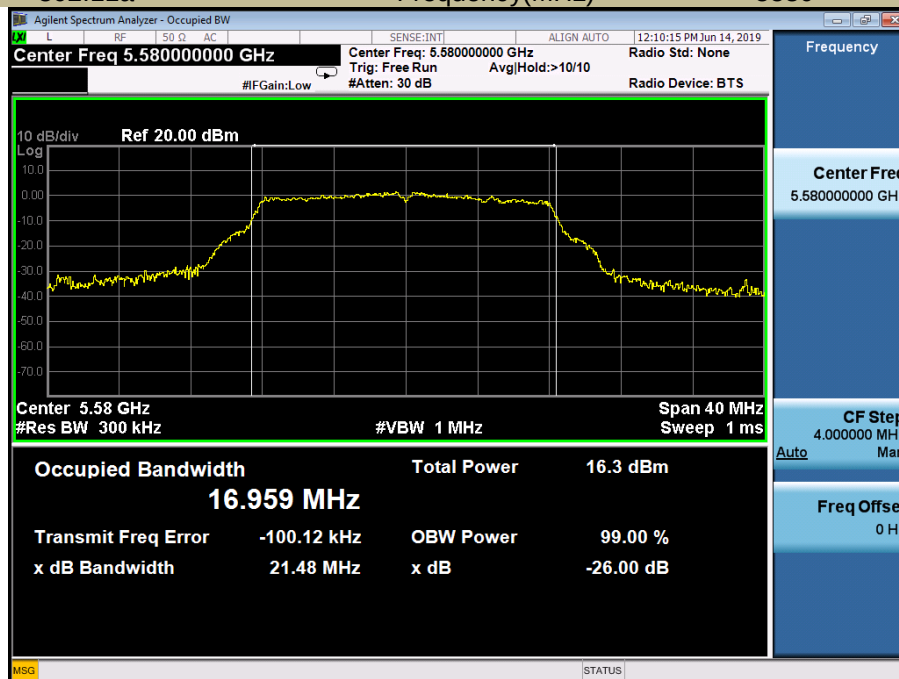
5470-5725MHz

Test Mode	Test Channel MHz		99% Bandwidth MHz	26dB Bandwidth MHz	Verdict
802.11a	CH100	5500	16.977	21.49	Pass
	CH116	5580	16.959	21.48	Pass
	CH140	5700	17.080	21.96	Pass
802.11n-HT20	CH100	5500	17.992	21.62	Pass
	CH116	5580	18.003	21.55	Pass
	CH140	5700	18.103	22.19	Pass
802.11ac(HT20)	CH100	5500	18.070	21.69	Pass
	CH116	5580	17.996	21.69	Pass
	CH140	5700	18.116	21.74	Pass
802.11n-HT40	CH102	5510	36.252	40.11	Pass
	CH134	5670	36.349	40.06	Pass
802.11ac(HT40)	CH102	5510	36.421	39.87	Pass
	CH134	5670	36.322	39.86	Pass
802.11ac(HT80)	CH106	5530	75.875	81.86	Pass

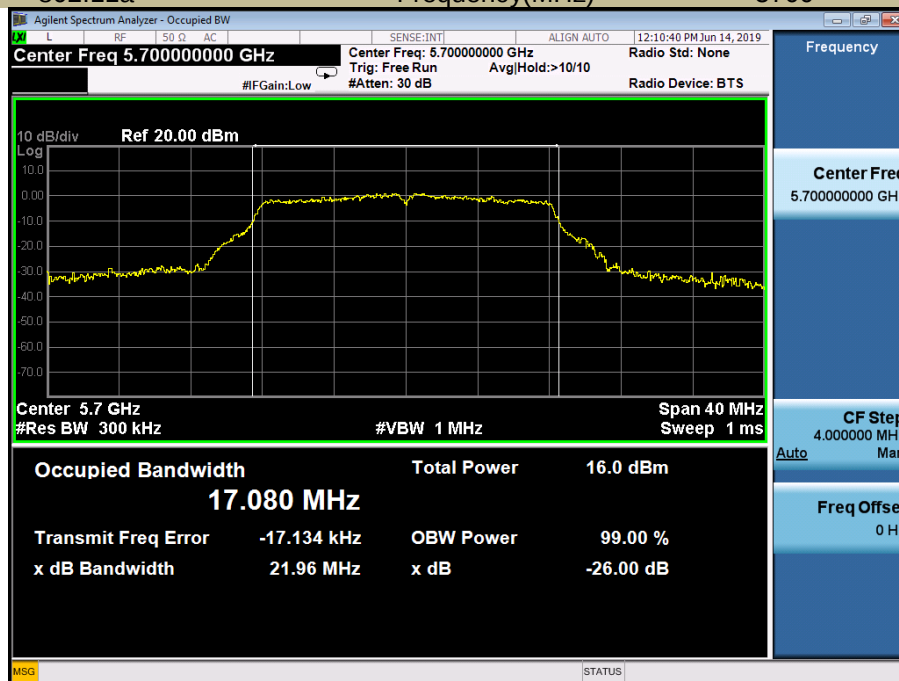
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11a Frequency(MHz) 5500



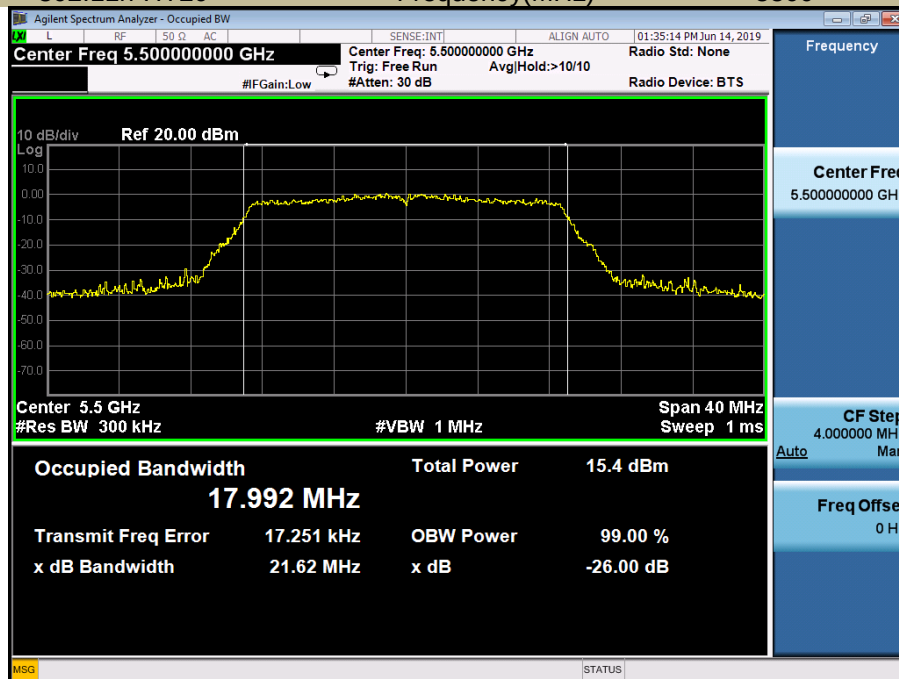
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11a Frequency(MHz) 5580



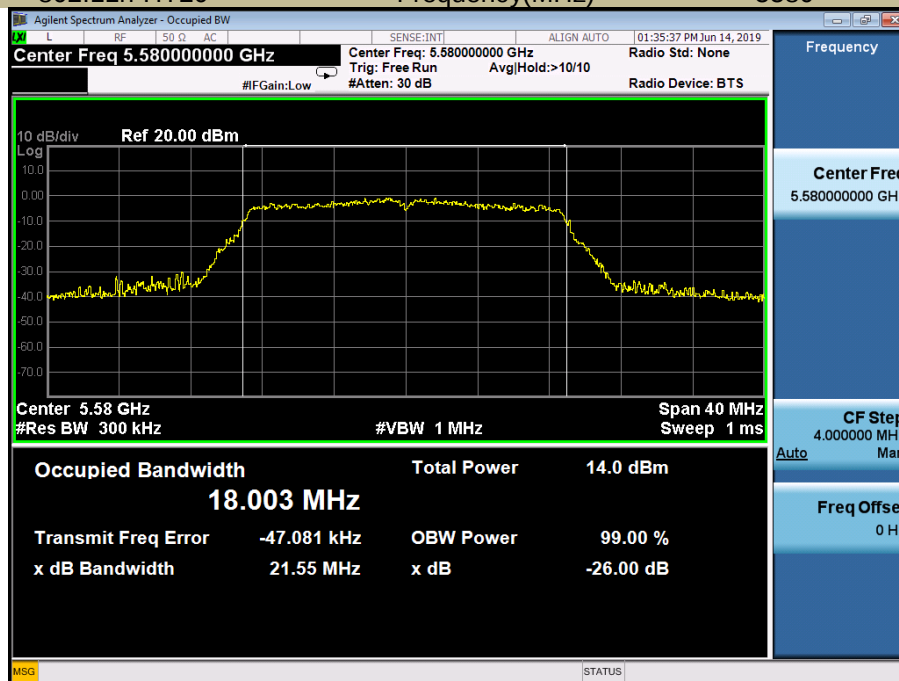
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11a Frequency(MHz) 5700



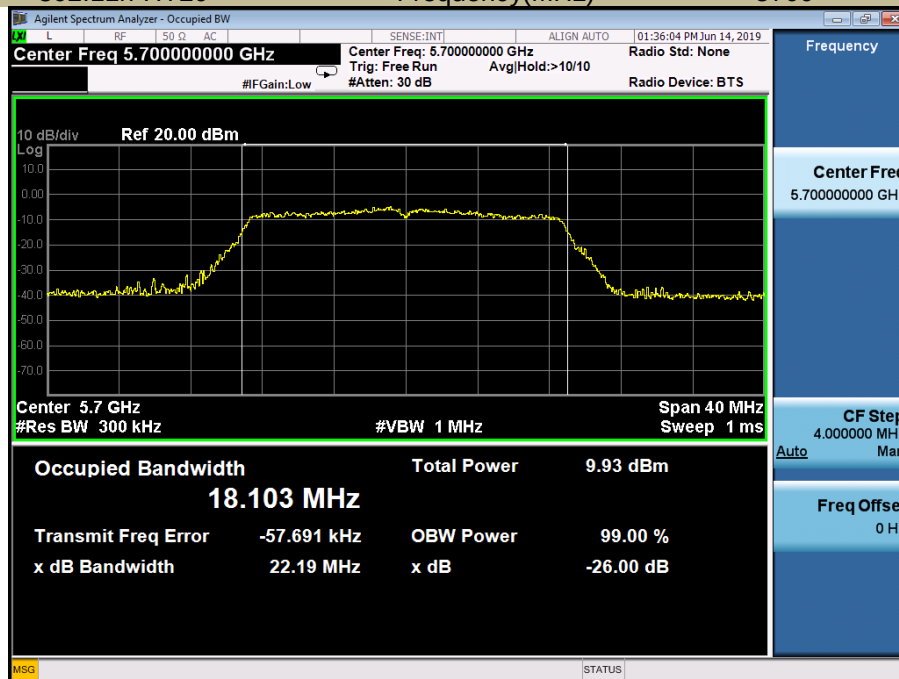
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11n-HT20 Frequency(MHz) 5500



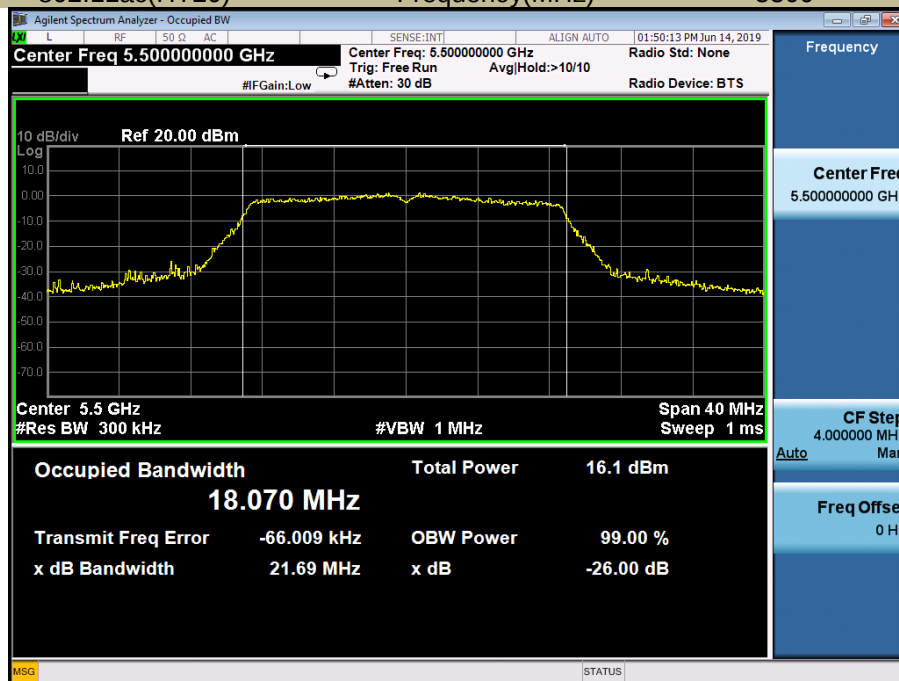
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11n-HT20 Frequency(MHz) 5580



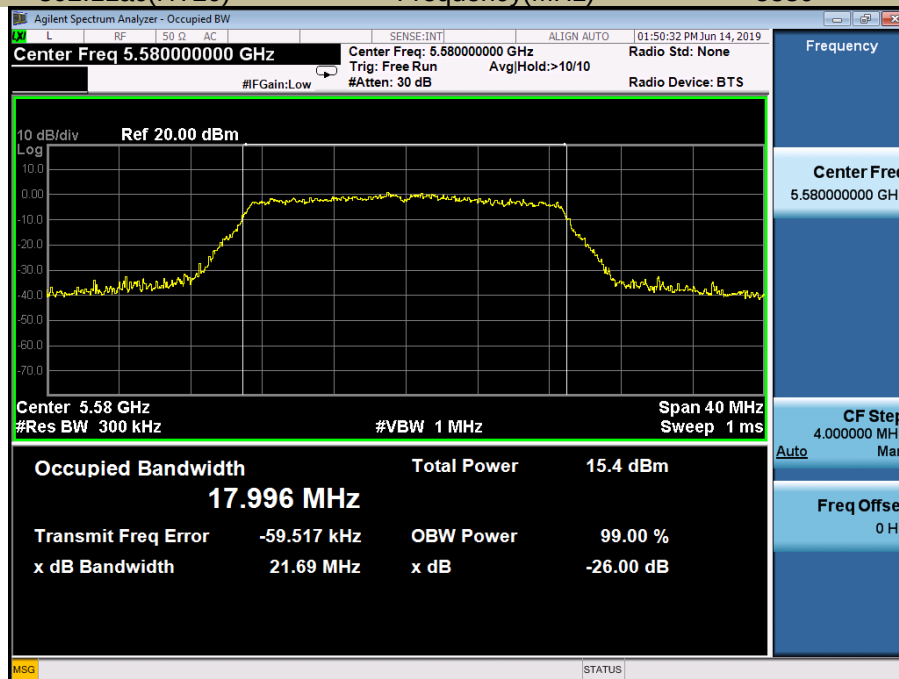
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11n-HT20 Frequency(MHz) 5700



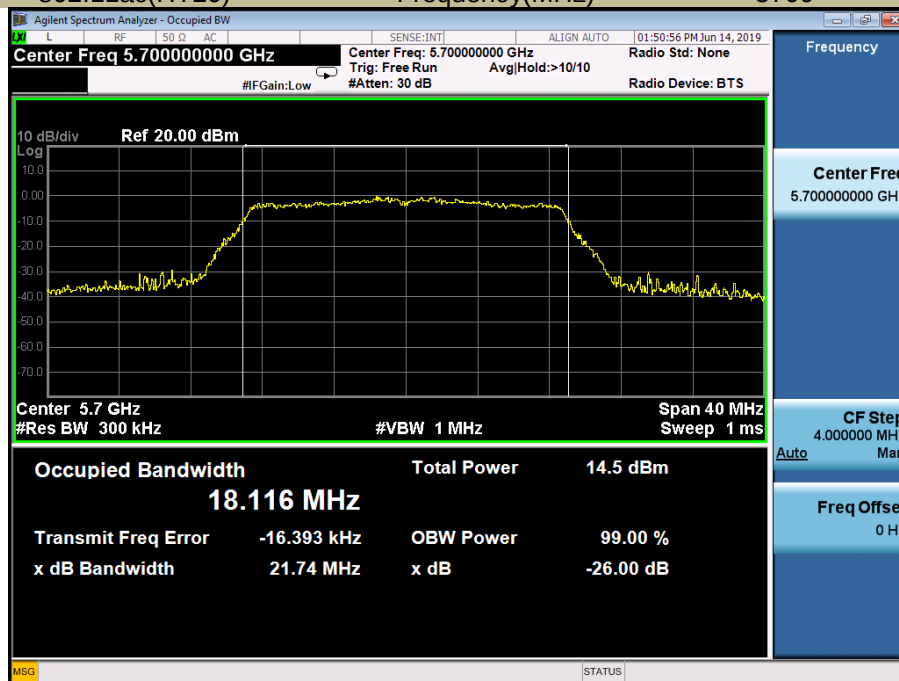
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11ac(HT20) Frequency(MHz) 5500



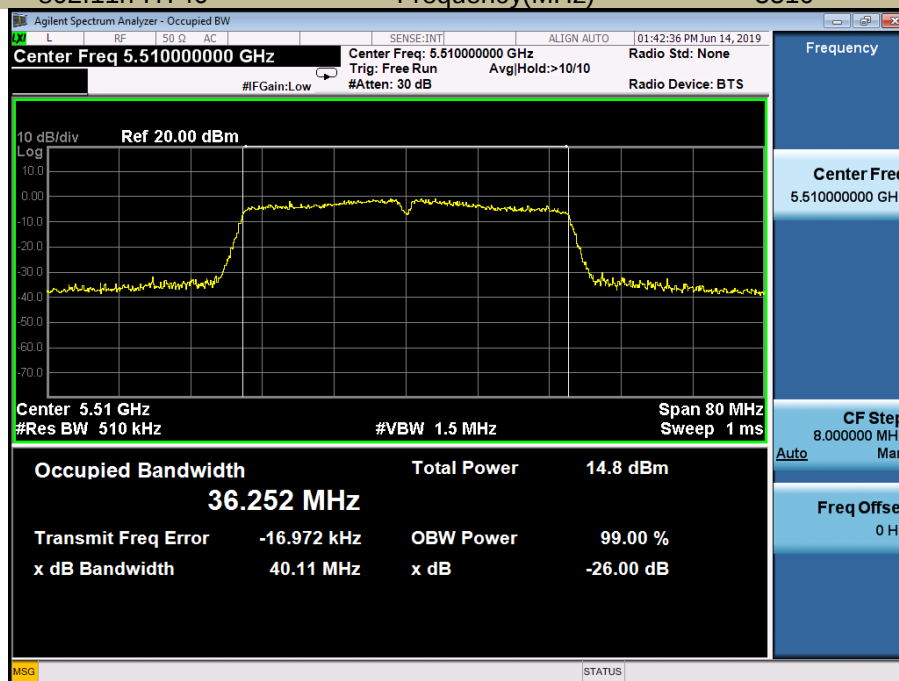
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11ac(HT20) Frequency(MHz) 5580



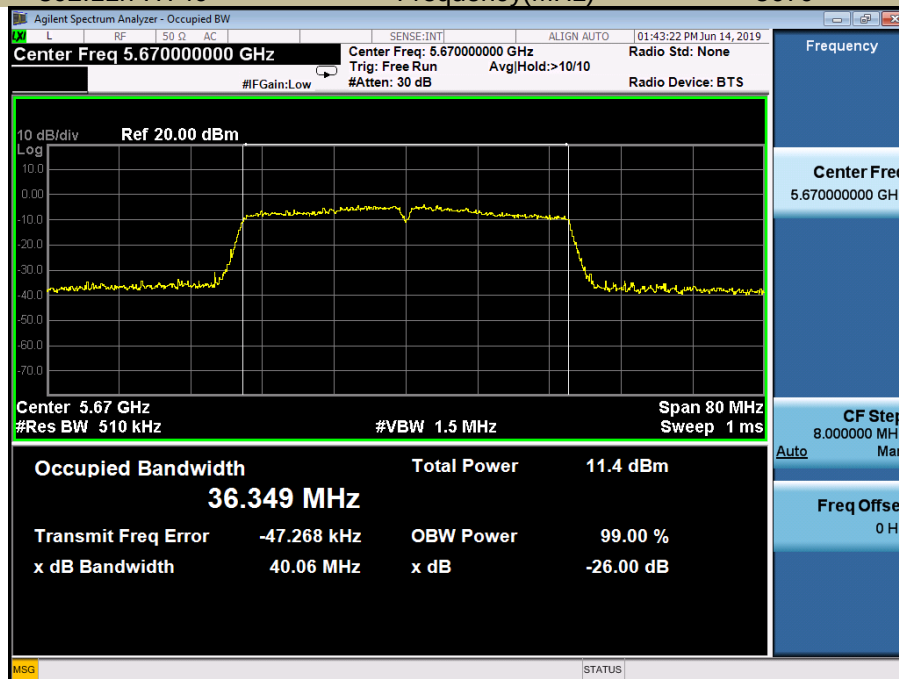
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11ac(HT20) Frequency(MHz) 5700



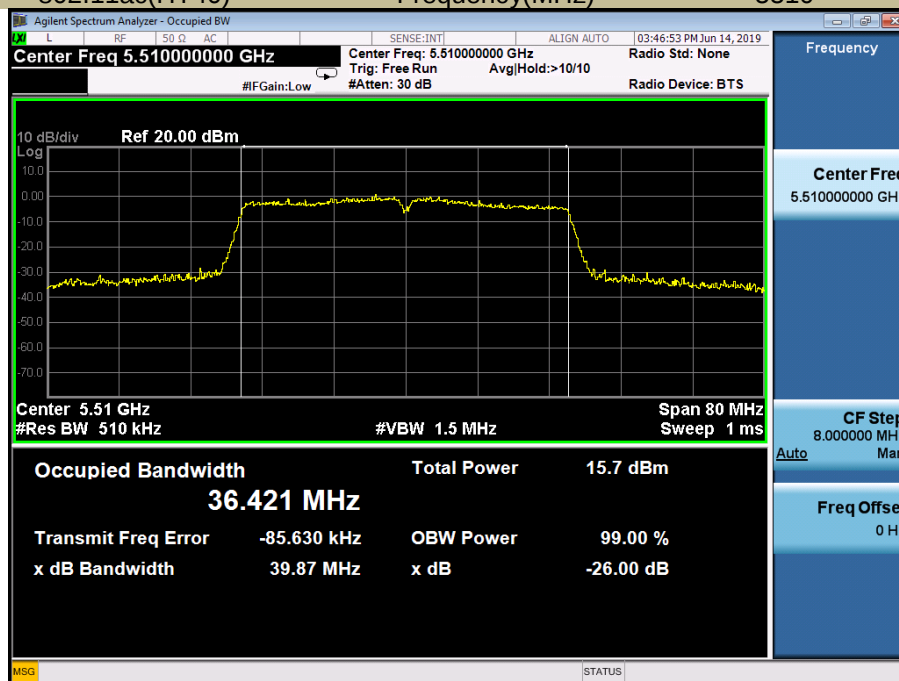
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11n-HT40 Frequency(MHz) 5510



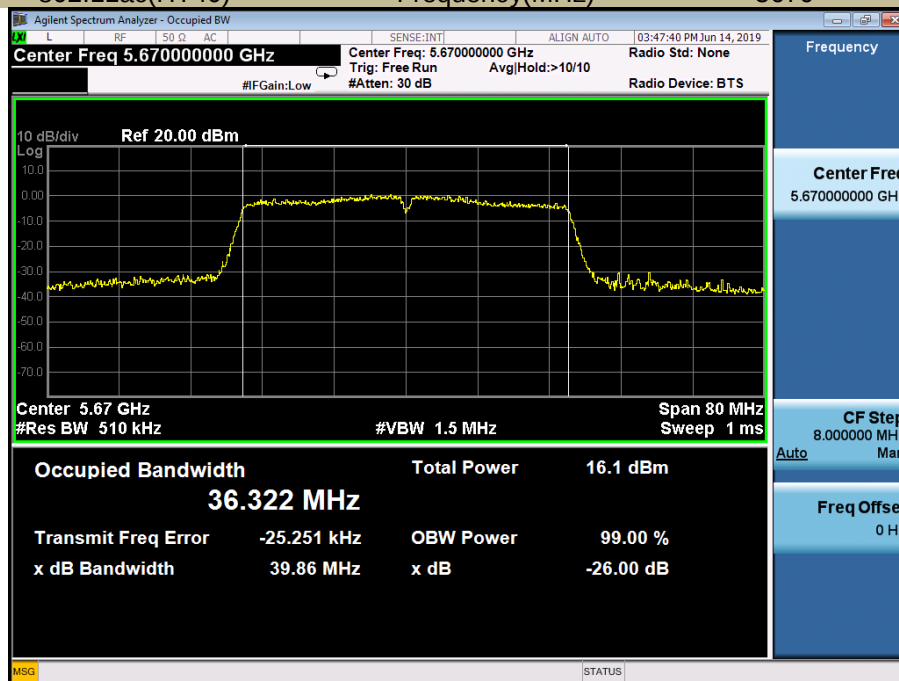
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11n-HT40 Frequency(MHz) 5670



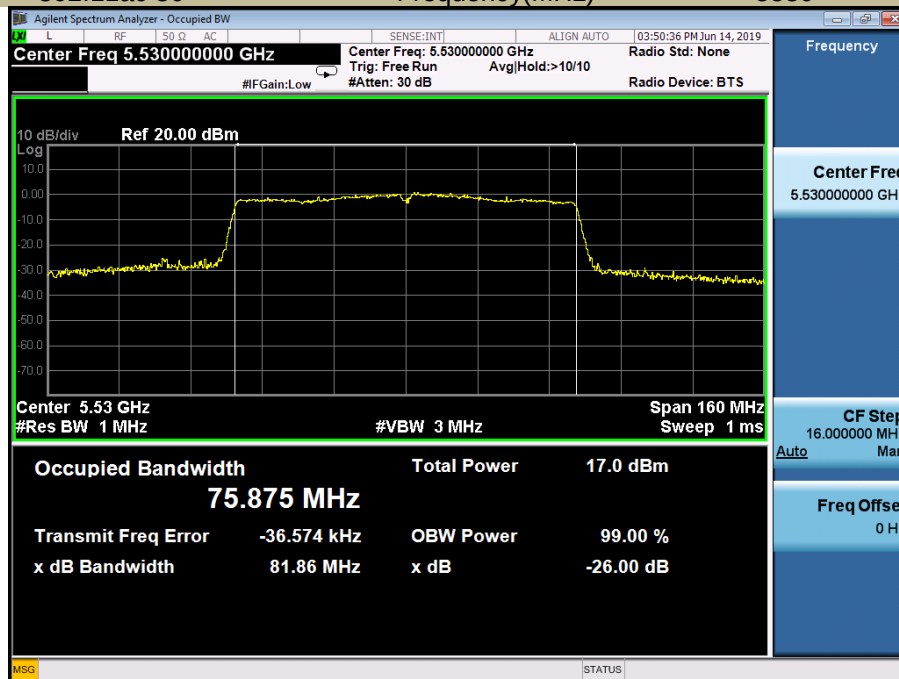
Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11ac(HT40) Frequency(MHz) 5510



Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11ac(HT40) Frequency(MHz) 5670



Emission Bandwidth&99% Occupied Bandwidth U-NII – 2C
Test Model 802.11ac 80 Frequency(MHz) 5530

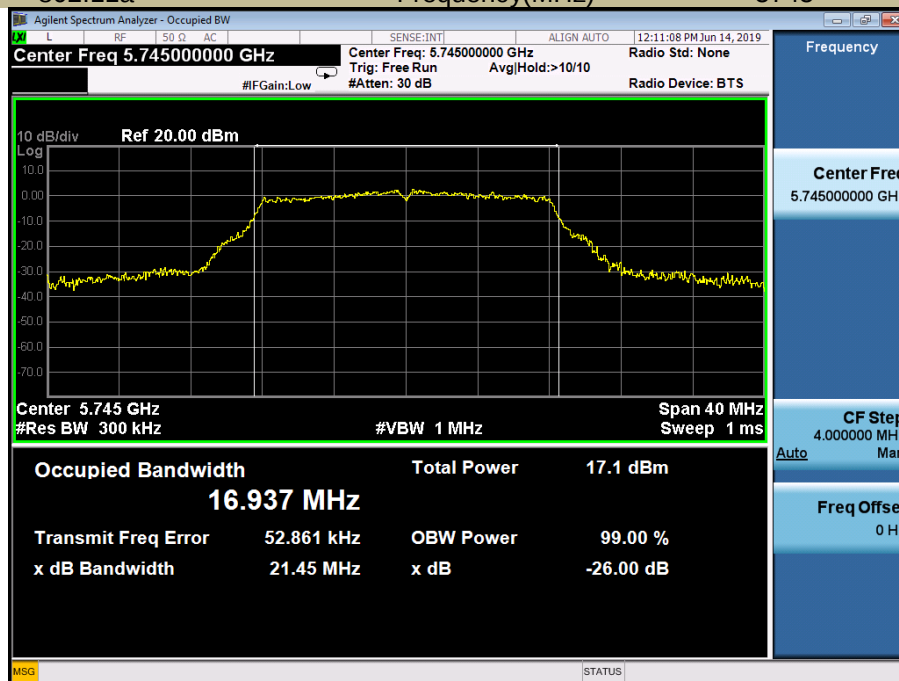


5725-5850MHz

Test Mode	Test Channel MHz		6 dB Bandwidth MHz	99% Bandwidth MHz	26dB Bandwidth MHz	Limit kHz
802.11a	CH149	5745	16.266	16.937	21.45	≥500
	CH157	5785	16.266	16.955	21.47	≥500
	CH165	5825	16.266	16.960	21.68	≥500
802.11n-HT20	CH149	5745	17.540	18.060	21.63	≥500
	CH157	5785	17.540	18.131	21.90	≥500
	CH165	5825	17.540	18.167	21.84	≥500
802.11ac(HT20)	CH149	5745	17.540	18.021	21.56	≥500
	CH157	5785	17.540	18.027	21.69	≥500
	CH165	5825	17.540	18.041	21.48	≥500
802.11n-HT40	CH151	5755	36.240	36.340	40.00	≥500
	CH159	5795	36.240	36.513	40.58	≥500
802.11ac(HT40)	CH151	5755	36.240	36.290	40.18	≥500
	CH159	5795	36.010	36.438	40.16	≥500
802.11ac(HT80)	CH155	5775	75.480	75.628	81.74	≥500

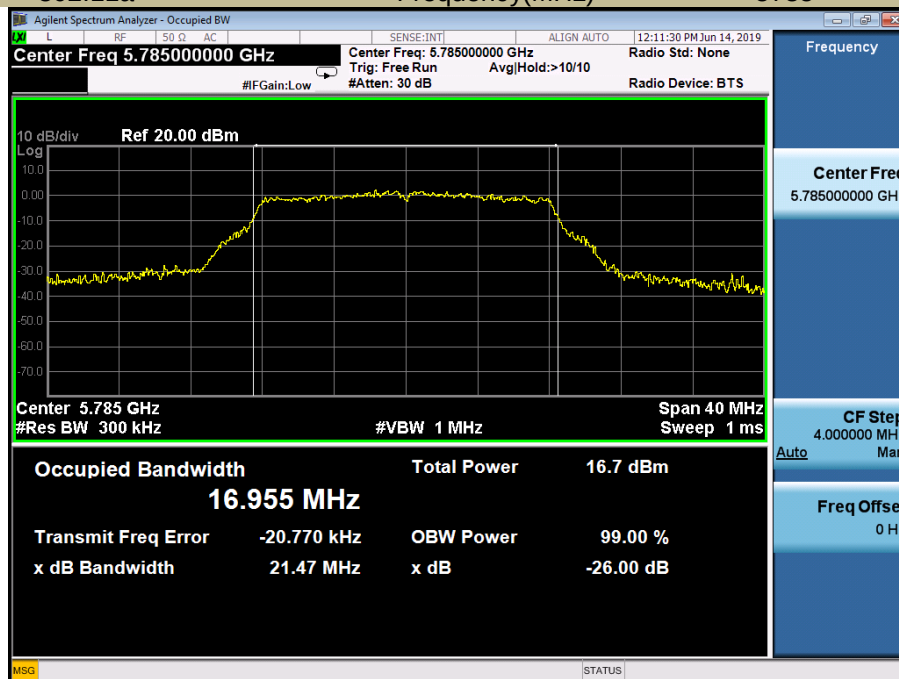
99% Occupied Bandwidth
Test Model 802.11a

U-NII - 3
Frequency(MHz) 5745



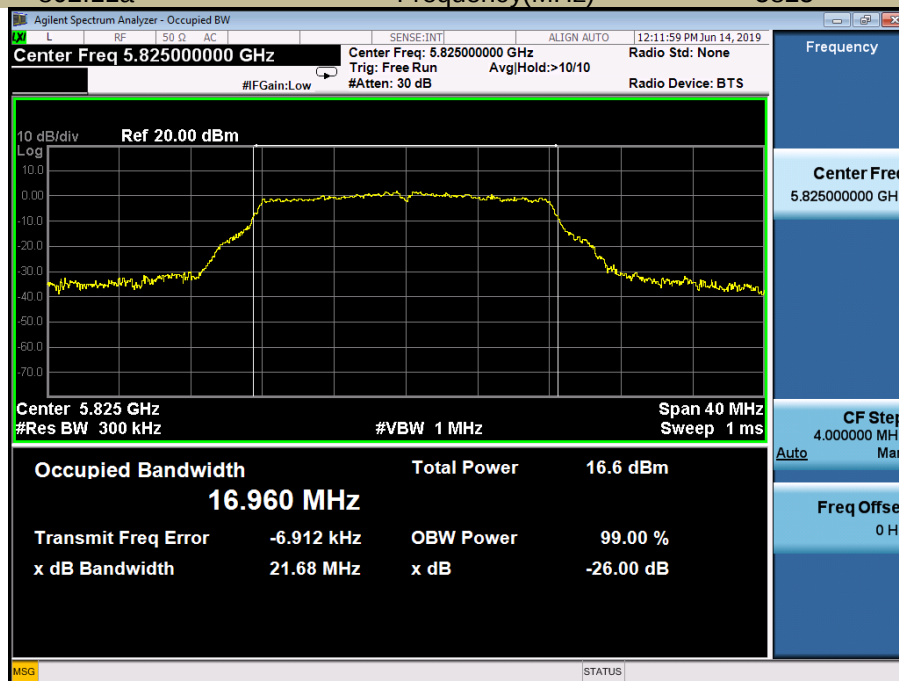
99% Occupied Bandwidth
Test Model 802.11a

U-NII - 3
Frequency(MHz) 5785



99% Occupied Bandwidth
Test Model 802.11a

U-NII - 3
Frequency(MHz) 5825



99% Occupied Bandwidth
Test Model 802.11n-HT20

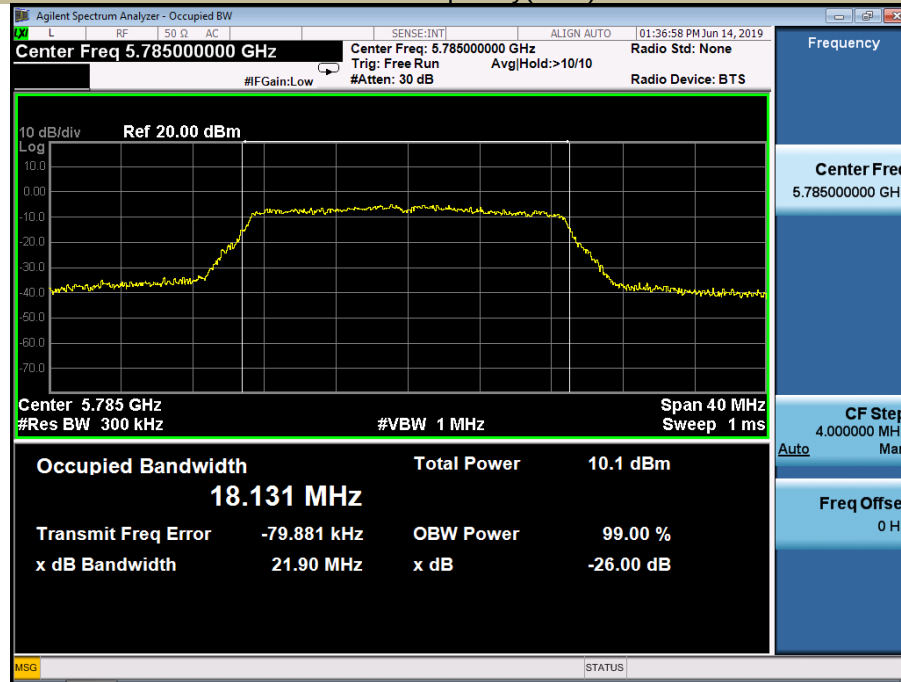
U-NII - 3
Frequency(MHz) 5745



99% Occupied Bandwidth
Test Model 802.11n-HT20

U-NII - 3
Frequency(MHz)

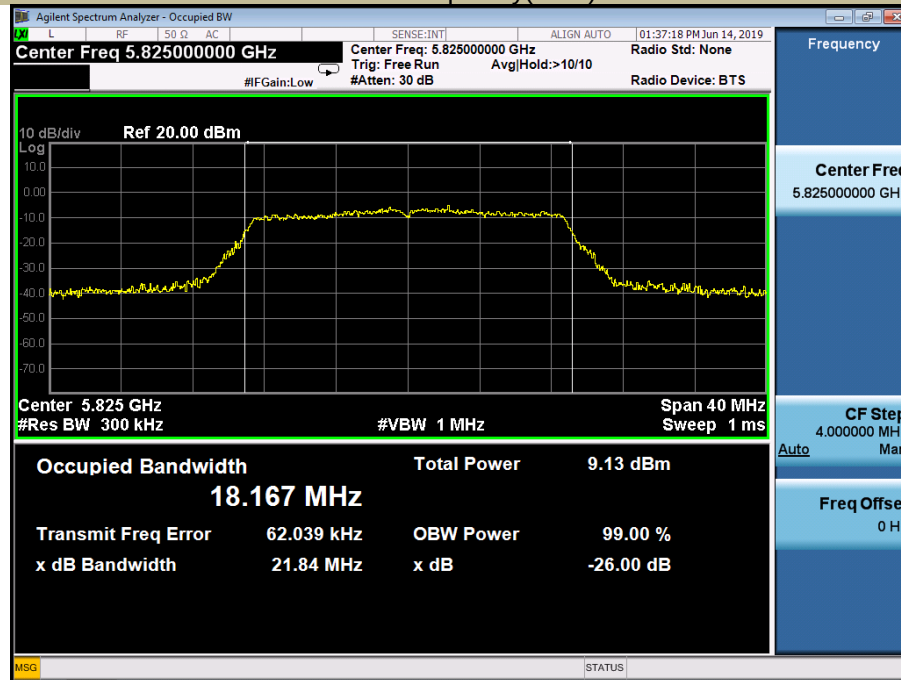
5785



99% Occupied Bandwidth
Test Model 802.11n-HT20

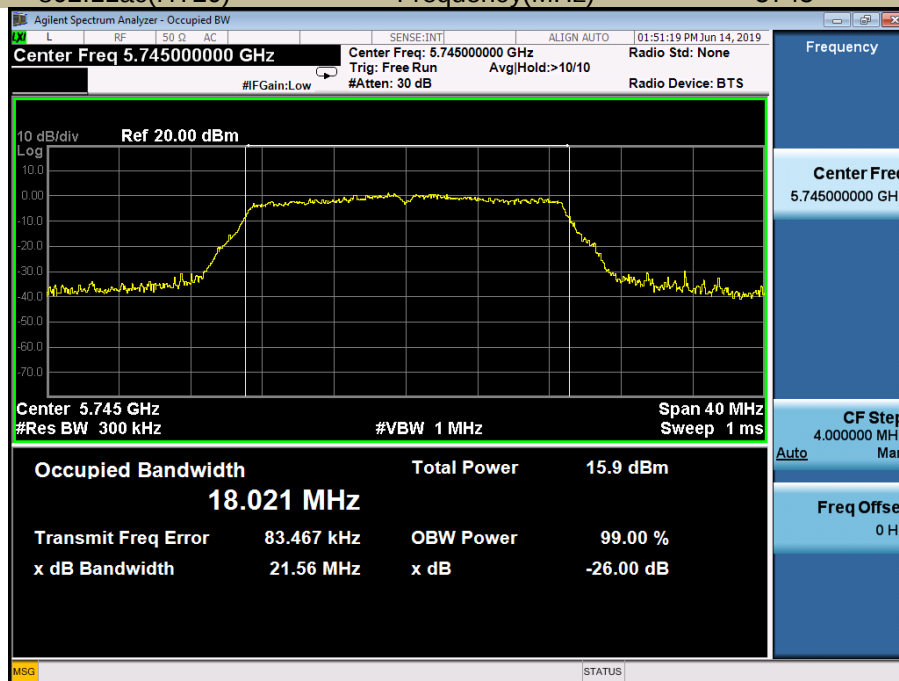
U-NII - 3
Frequency(MHz)

5825



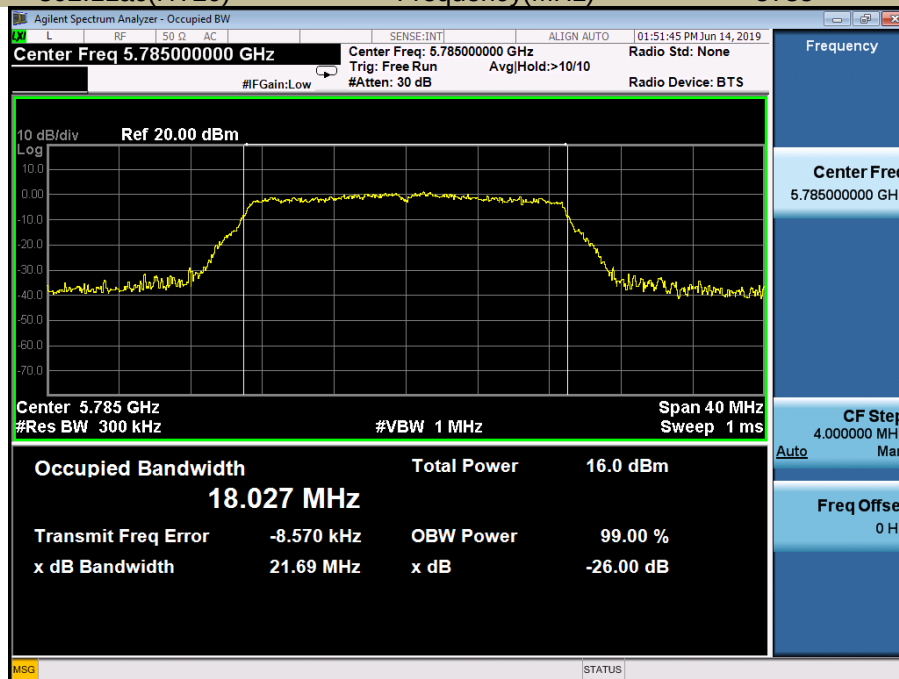
99% Occupied Bandwidth
Test Model 802.11ac(HT20)

U-NII - 3
Frequency(MHz) 5745



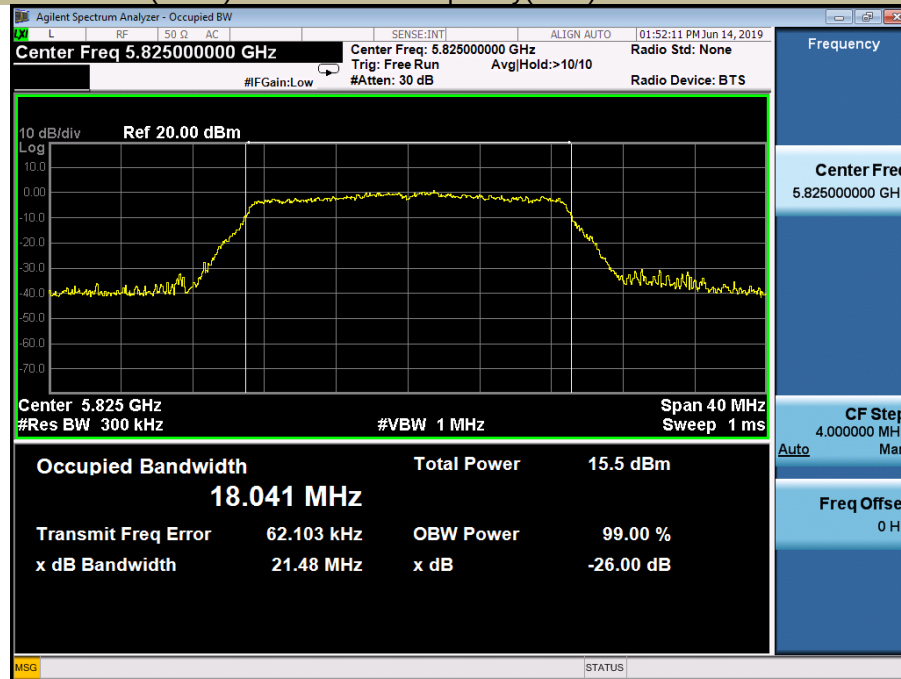
99% Occupied Bandwidth
Test Model 802.11ac(HT20)

U-NII - 3
Frequency(MHz) 5785



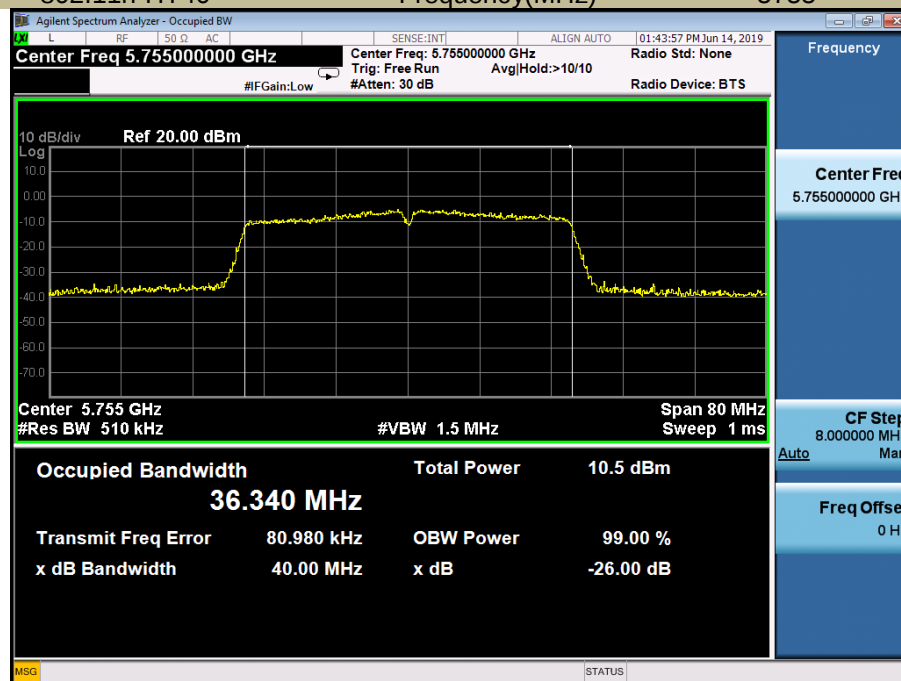
99% Occupied Bandwidth
Test Model 802.11ac(HT20)

U-NII - 3
Frequency(MHz) 5825



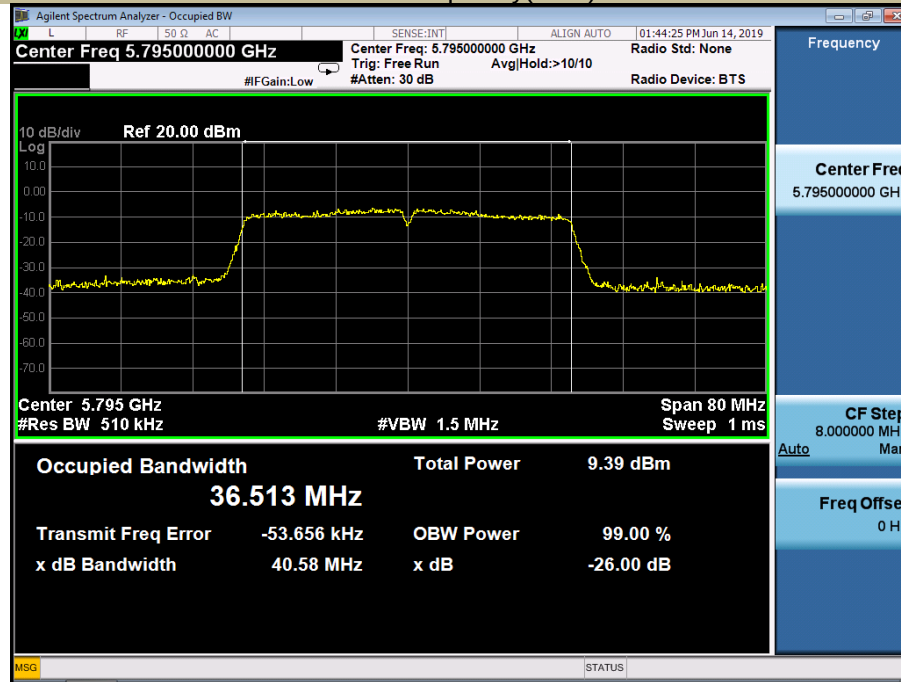
99% Occupied Bandwidth
Test Model 802.11n-HT40

U-NII - 3
Frequency(MHz) 5755



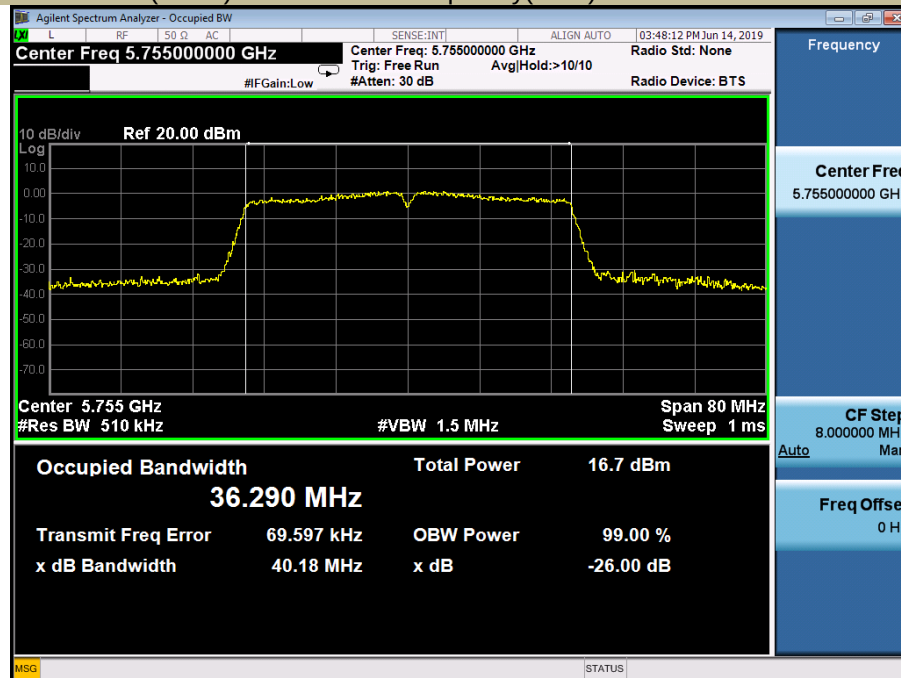
99% Occupied Bandwidth
Test Model 802.11n-HT40

U-NII - 3
Frequency(MHz) 5795



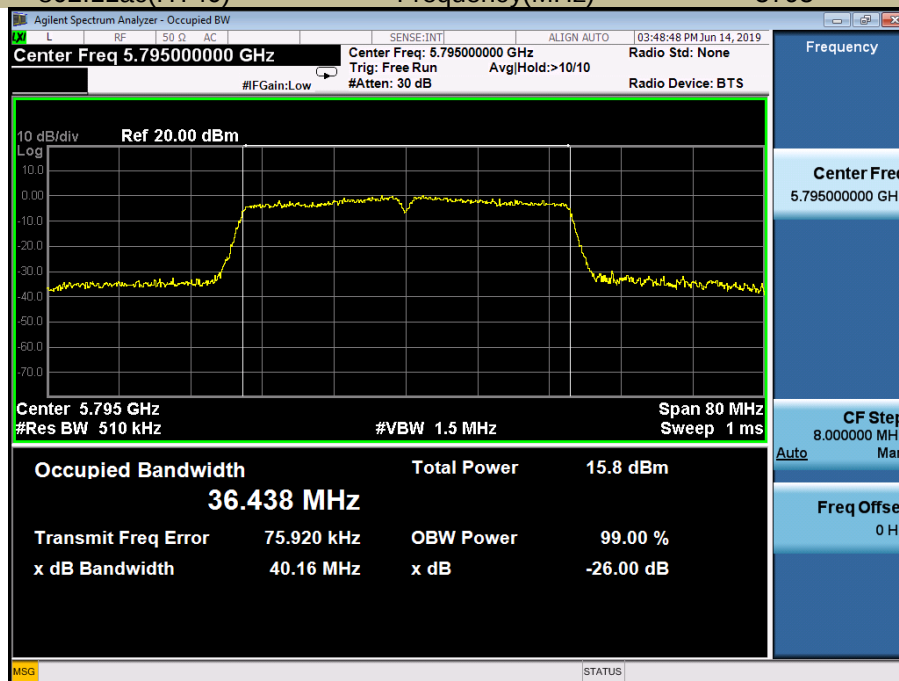
99% Occupied Bandwidth
Test Model 802.11ac(HT40)

U-NII - 3
Frequency(MHz) 5755



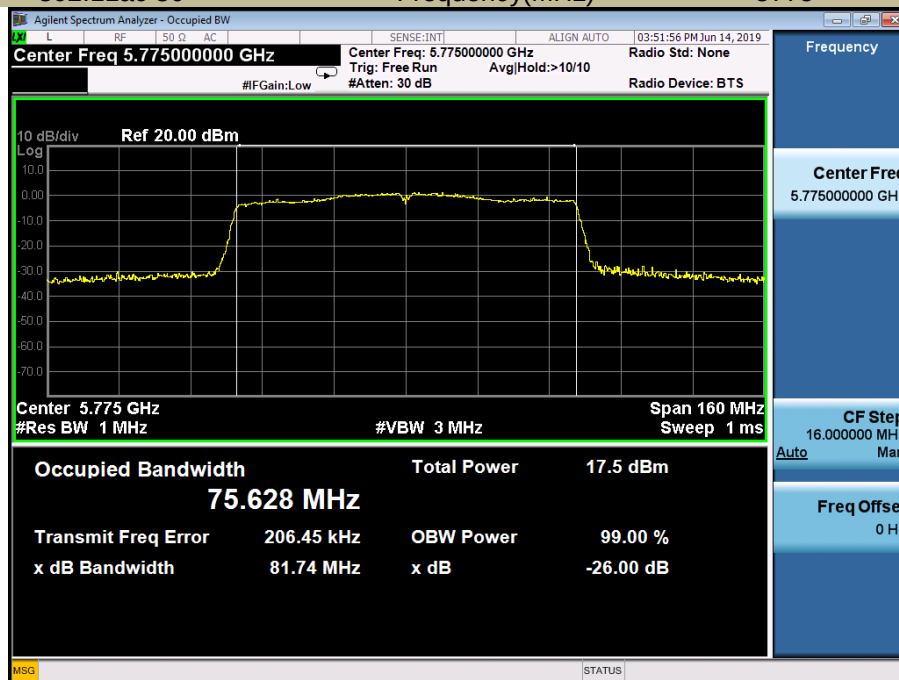
99% Occupied Bandwidth
Test Model 802.11ac(HT40)

U-NII - 3
Frequency(MHz) 5795



99% Occupied Bandwidth
Test Model 802.11ac 80

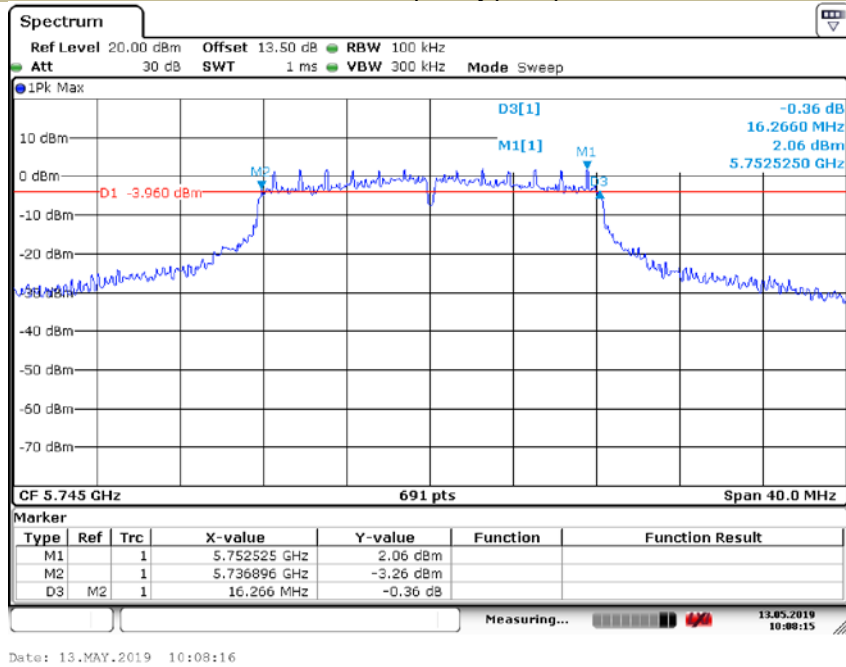
U-NII - 3
Frequency(MHz) 5775



6db Emission Bandwidth
Test Model 802.11a

U-NII - 3
Frequency(MHz)

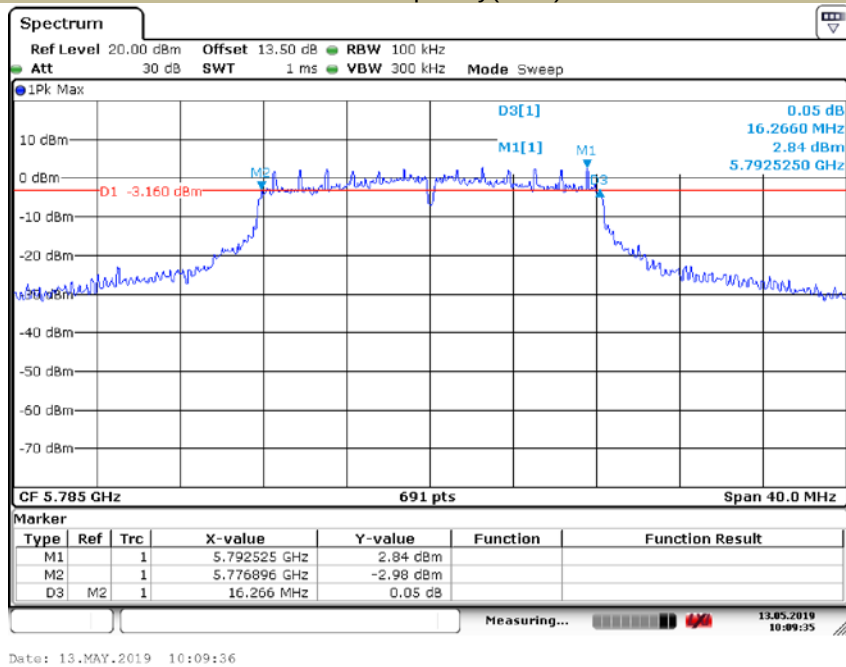
5745



6db Emission Bandwidth
Test Model 802.11a

U-NII - 3
Frequency(MHz)

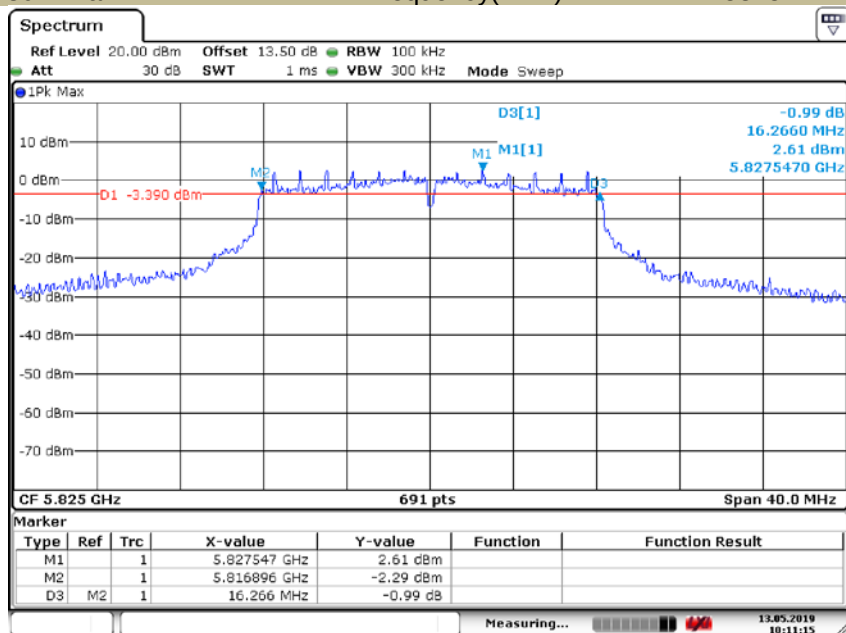
5785



6db Emission Bandwidth
Test Model 802.11a

U-NII - 3
Frequency(MHz)

5825

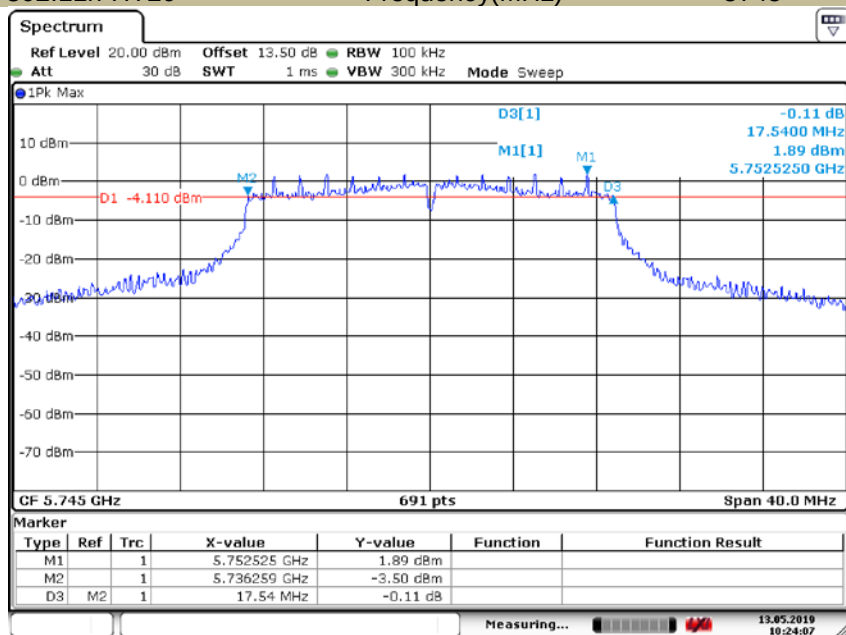


Date: 13.MAY.2019 10:11:15

6db Emission Bandwidth
Test Model 802.11n-HT20

U-NII - 3
Frequency(MHz)

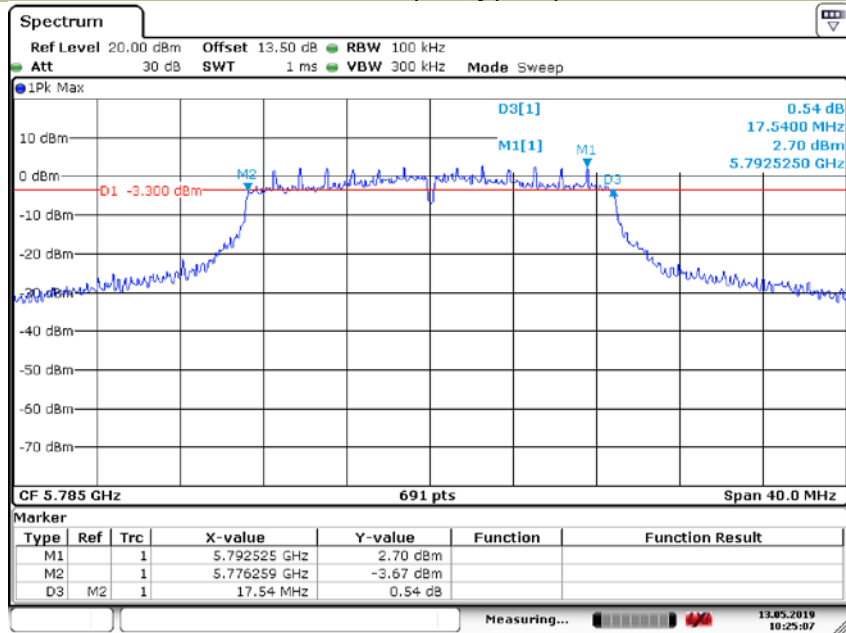
5745



Date: 13.MAY.2019 10:24:08

6db Emission Bandwidth
Test Model 802.11n-HT20

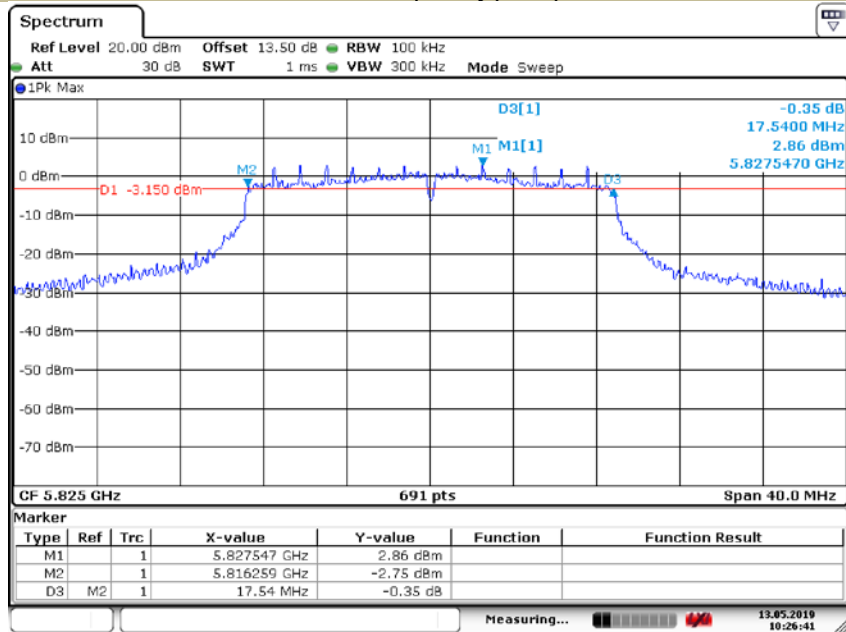
U-NII - 3
Frequency(MHz) 5785



Date: 13.MAY.2019 10:25:07

6db Emission Bandwidth
Test Model 802.11n-HT20

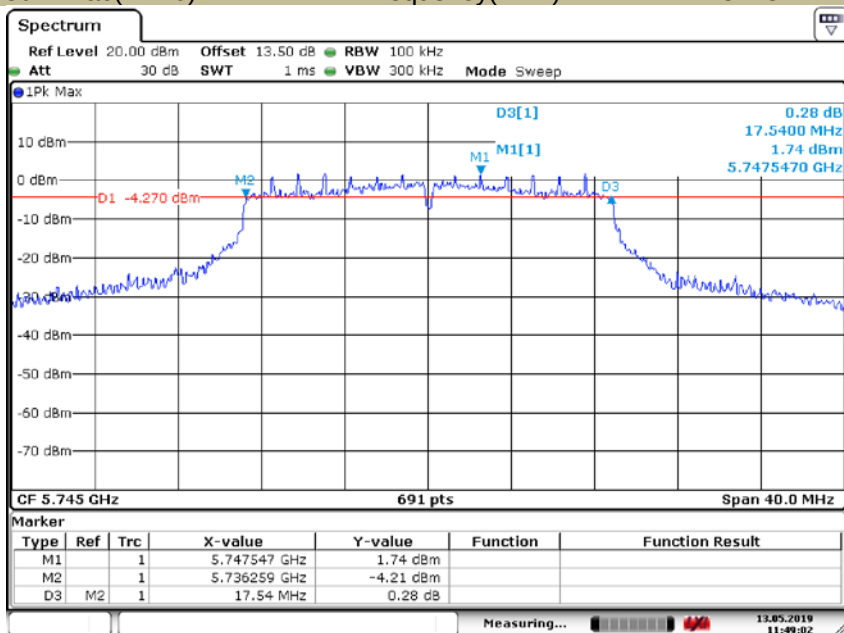
U-NII - 3
Frequency(MHz) 5825



Date: 13.MAY.2019 10:26:42

6db Emission Bandwidth
Test Model 802.11ac(HT20)

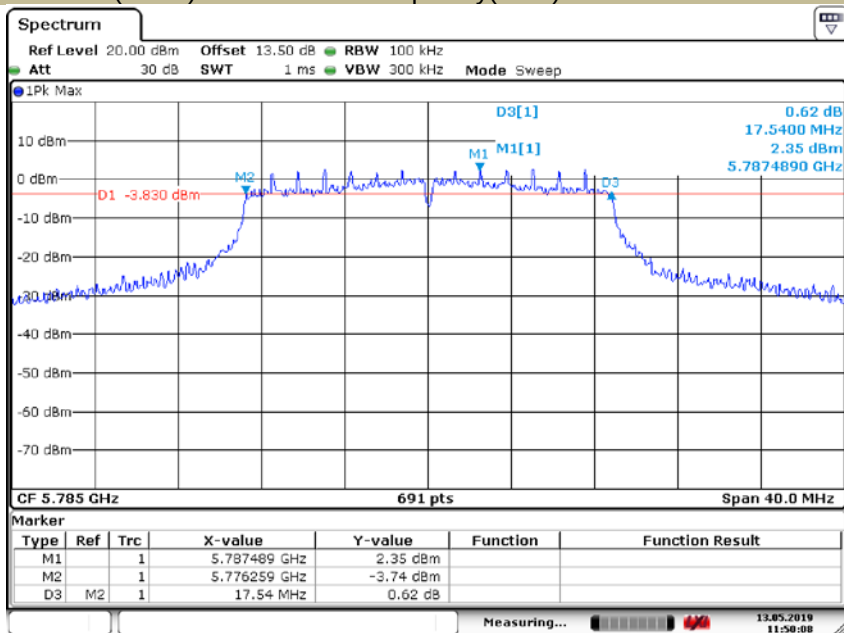
U-NII - 3
Frequency(MHz) 5745



Date: 13.MAY.2019 11:49:02

6db Emission Bandwidth
Test Model 802.11ac(HT20)

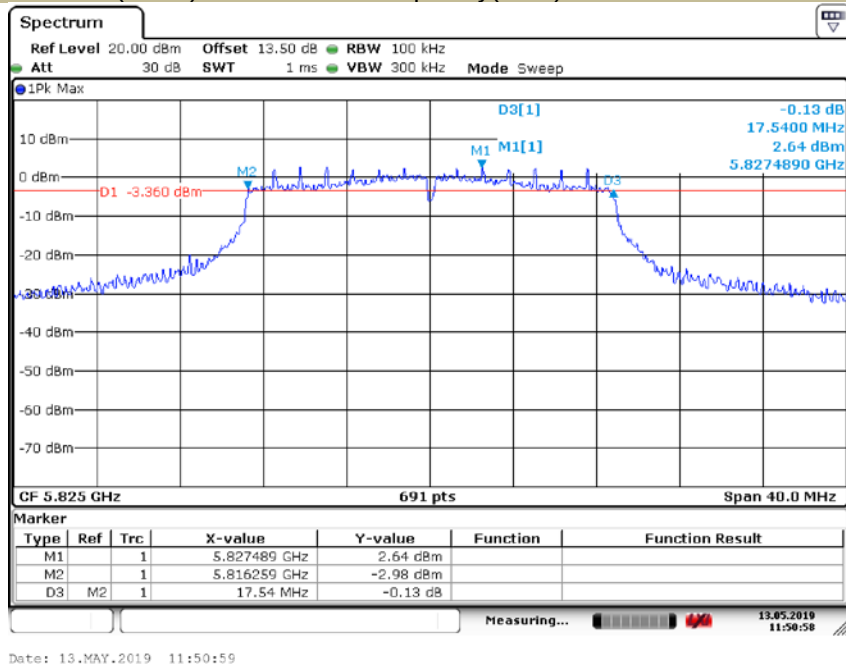
U-NII - 3
Frequency(MHz) 5785



Date: 13.MAY.2019 11:50:09

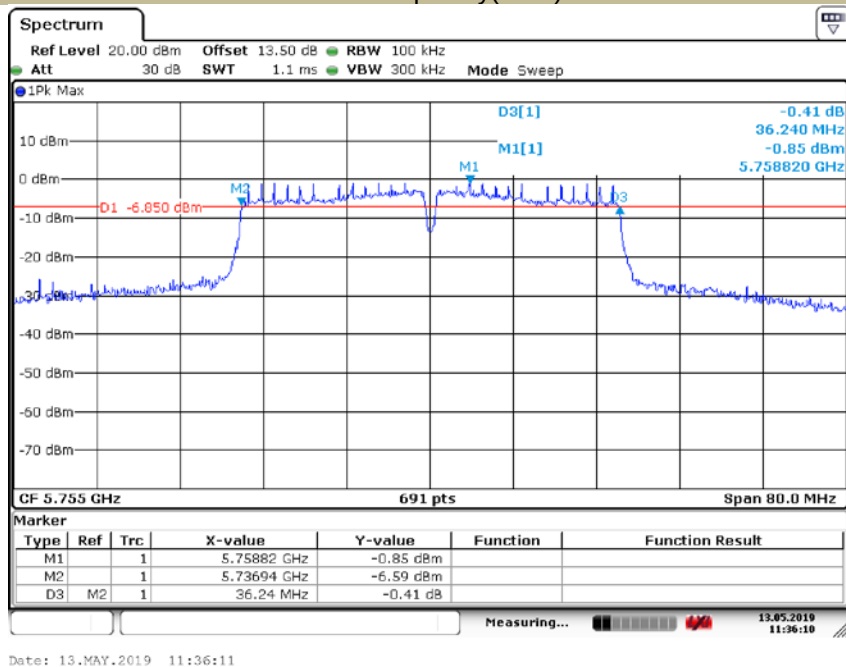
6db Emission Bandwidth
Test Model 802.11ac(HT20)

U-NII - 3
Frequency(MHz) 5825



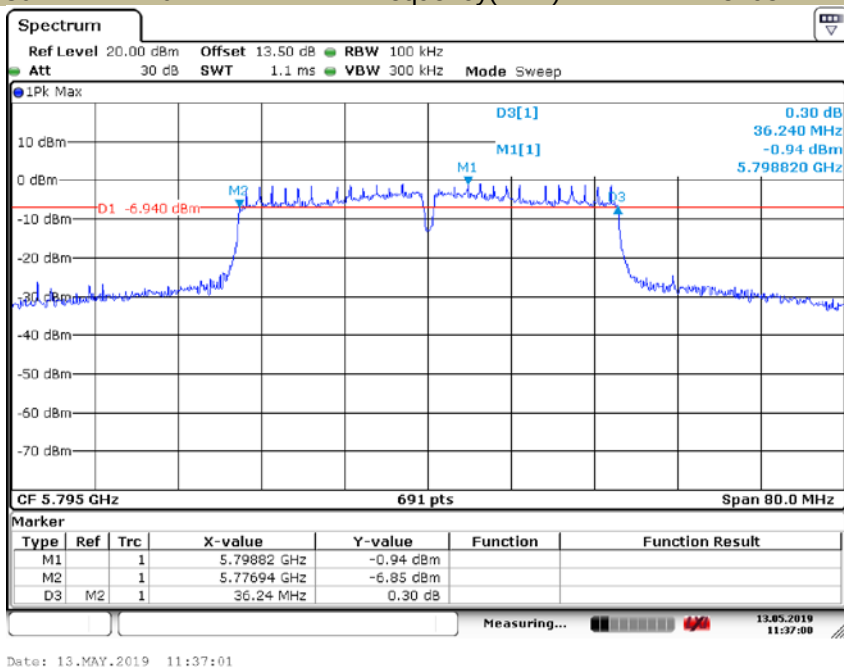
6db Emission Bandwidth
Test Model 802.11n-HT40

U-NII - 3
Frequency(MHz) 5755



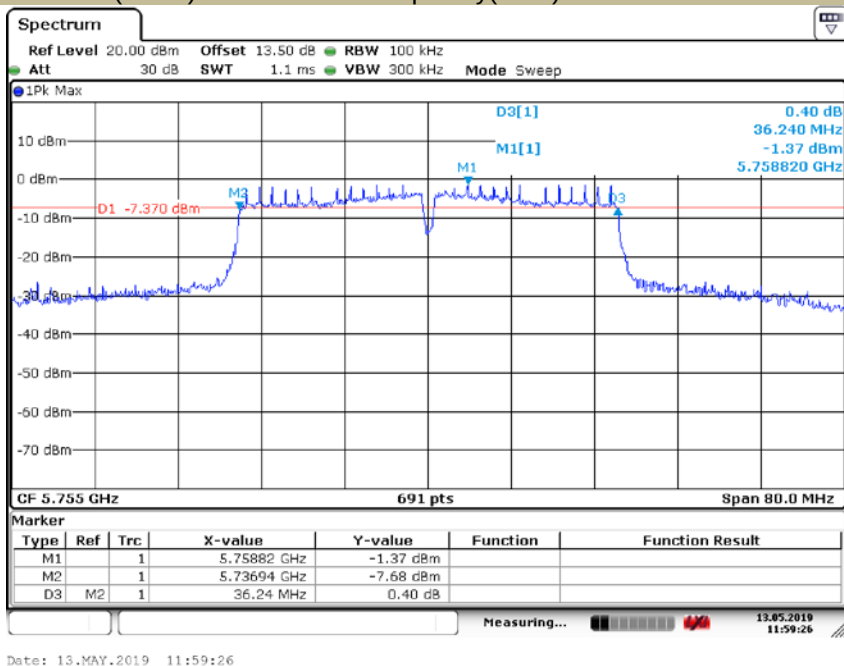
6db Emission Bandwidth
Test Model 802.11n-HT40

U-NII - 3
Frequency(MHz) 5795



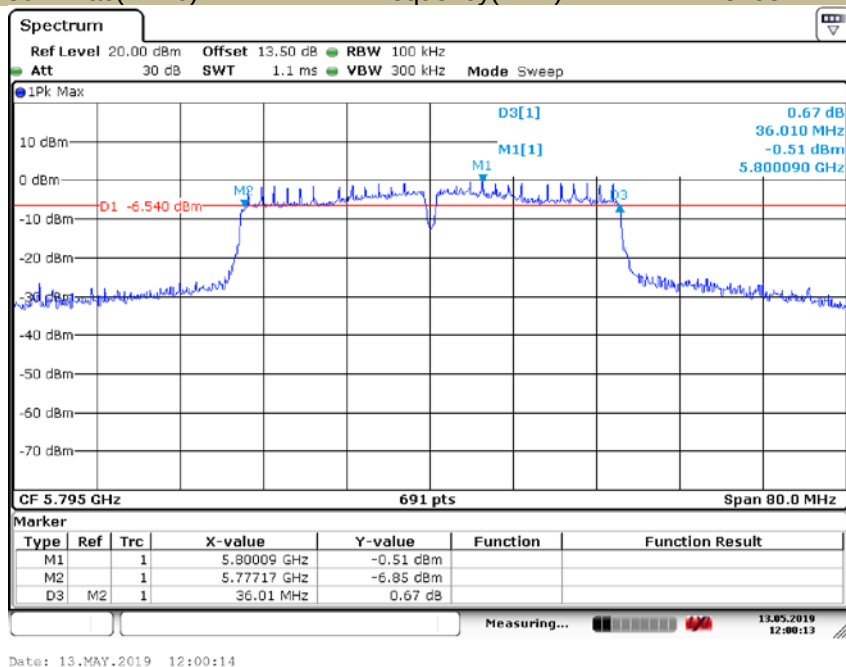
6db Emission Bandwidth
Test Model 802.11ac(HT40)

U-NII - 3
Frequency(MHz) 5755



6db Emission Bandwidth
Test Model 802.11ac(HT40)

U-NII - 3
Frequency(MHz) 5795



6db Emission Bandwidth
Test Model 802.11ac 80

U-NII - 3
Frequency(MHz) 5775

