FCC 47 CFR PART 15 SUBPART E: 2013 AND ANSI C63.10: 2009 TEST REPORT

For

Product name	Model
Enterprise Access Point	EAP706; EAP705
Wireless Hotspot Gateway	HSG326; HSG325
Cluster Access Point	CAP326; CAP325

Brand Name : 4ipnet

Issued for

4IPNET, INC.
5F, No. 367, Fusing N. Rd., Songshan Dist., Taipei 105, Taiwan(R.O.C.)

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)
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Issued Date: May 15, 2015

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
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1. TEST REPORT CERTIFICATION

Applicant	:	**4IPNET, INC.** 5F, No. 367, Fusing N. Rd., Songshan Dist., Taipei 105, Taiwan(R.O.C.)
Manufacturer	:	**Advance Multimedia Internet Technology Inc.** No.28, Lane 31 , Sec. 1 , Huandong Rd. , Sinshih District , Tainan City 74146 , Taiwan
Equipment Under Test	:	
Model	:	

Product name	Model
Enterprise Access Point	EAP706; EAP705
Wireless Hotspot Gateway	HSG326; HSG325
Cluster Access Point	CAP326; CAP325

Brand	:	4ipnet
Date of Test	:	March 25, 2015 ~ May 07, 2015

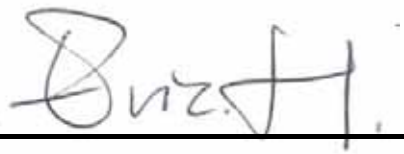
APPLICABLE STANDARD	
Standard	**Test Result**
FCC Part 15 Subpart E: 2013 AND ANSI C63.10: 2009	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Jeter Wu
Assistant Manager

Reviewed by:



Eric Huang
Assistant Section Manager

2. EUT DESCRIPTION

Product Name / **Model Number**	**Product name** / **Model** Enterprise Access Point / EAP706; EAP705 Wireless Hotspot Gateway / HSG326; HSG325 Cluster Access Point / CAP326; CAP325
Brand Name	4ipnet
Identify Number	T150225N03
Received Date	February 25, 2015
Frequency Range	IEEE 802.11a, 802.11n HT20 : 5180MHz ~ 5240MHz; 5745 ~ 5825MHz IEEE 802.11n HT40 : 5190MHz ~ 5230MHz; 5755 ~ 5795MHz IEEE 802.11ac VHT80 : 5210MHz; 5775MHz
Transmit Power	IEEE 802.11a : 17.05dBm IEEE 802.11n HT20 : 18.28dBm IEEE 802.11n HT40 : 15.22dBm IEEE 802.11ac VHT80 : 16.15dBm
Channel Spacing	IEEE 802.11a, 802.11n HT20 : 20MHz IEEE 802.11n HT40, 11ac VHT80 : 20MHz
Channel Number	IEEE 802.11a, 802.11n HT20 : 5180MHz ~ 5825MHz : 9 Channels IEEE 802.11n HT40 : 5190MHz ~ 5795MHz : 4 Channels IEEE 802.11ac VHT80 : 5210MHz ~ 5775MHz : 2 Channels
Transmit Data Rate	IEEE 802.11a : 54, 48 ,36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n(HT20) : 130, 117, 104, 78, 52, 39, 26 13Mbps IEEE 802.11n(HT40) :300, 243, 216, 162, 108, 81, 54, 27 Mbps **IEEE 801.11ac** (HT20):156, 130, 117, 104, 78, 52, 39, 26, 13 Mbps (HT40):360, 270, 243, 216, 162, 108, 81, 54, 27 Mbps (HT80):866.7, 702, 585, 526.5, 468, 351, 234, 175.5, 117, 58.5 Mbps
Type of Modulation	IEEE 802. 11n HT20/11n HT40: BPSK, QPSK, 16QAM, 64QAM, and OFDM IEEE 802.11n HT20/40 : OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11 ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM

Antenna Type	**5GHz Antenna (2TX2RX)** **For model: EAP706** Manufacture: Cortec Technology Inc. Type: Dipole (SMA Male Reverse) Model: AN2450-3901BRS Gain: 3.2dBi **For model: EAP705** Manufacture: GainForce Technology Co., Ltd. Type: Chip Model: AN3216-B5R5HAAT/LF Gain: 2dBi Manufacture: WHA YU INDUSTRIAL CO., LTD. Type: PIFA Model: NE3-14133 Gain: 2.57dBi
Power Rating	12Vdc; 2.5A(Powered from Adapter)
Test Voltage	120Vac, 60Hz

Power Adapter :

No.	Manufacturer	Model No.	Power Input	Power Output
1	APD	WA-30B12	100-240Vac, 50-60Hz, 0.8A	12Vdc, 2.5A

Remark :

1. *Client consigns only one model sample to test (Model Number: EAP706).*
2. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
3. *For more details, please refer to the User's manual of the EUT.*
4. *This submittal(s) (test report) is intended for FCC ID: **VZ9150001** filing to comply with Section 15.407, of the FCC Part 15, Subpart E Rules.*
5. *The different of the each model is shown as bellows:*

Model	EAP706	EAP705	HSG326	HSG325	CAP326	CAP325
Antenna	Dipole*4	Chip*3, PIFA*1	Dipole*4	Chip*3, PIFA*1	Dipole*4	Chip*3, PIFA*1
External Case	Case 1 (Dipole antenna)	Case 2 (Build-in antenna)	Case 1 (Dipole antenna)	Case 2 (Build-in antenna)	Case 1 (Dipole antenna)	Case 2 (Build-in antenna)

Operation Frequency:
IEEE 802.11a, 802.11n HT20

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)			
CHANNEL	**MHz**	**CHANNEL**	**MHz**
36	5180	44	5220
40	5200	48	5240
149	5745	153	5765
157	5785	161	5805
165	5825		

IEEE 802.11n HT40

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)			
CHANNEL	**MHz**	**CHANNEL**	**MHz**
38	5190	46	5230
151	5755	159	5795

IEEE 802.11ac VHT80

UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII)			
CHANNEL	**MHz**	**CHANNEL**	**MHz**
42	5210	155	5775

3. DESCRIPTION OF TEST MODES

Conducted Emission / Radiated Emission Test (Below 1 GHz)

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	TX Mode

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	TX Mode
	Conducted Emission	TX Mode

Remark : *Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.*

Conducted / Radiated Emission Test (Above 1 GHz)

IEEE 802.11a, 802.11n HT20 mode / 5180MHz ~ 5240MHz; 5745MHz ~ 5825MHz

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5180
Middle	5200
High	5240

Channel	Frequency (MHz)
Low	5745
Middle	5785
High	5825

IEEE 802.11a mode : 6Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT20 mode : 13Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11n HT40 mode / 5190MHz ~ 5230MHz; 5755MHz ~ 5795MHz

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	5190
High	5230

Channel	Frequency (MHz)
Low	5755
High	5795

IEEE 802.11n HT40 mode : 27Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11ac VHT80 mode / 5210MHz; 5775MHz

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Middle	5210

Channel	Frequency (MHz)
Middle	5775

IEEE 802.11n HT40 mode : 117Mbps data rate (worst case) were chosen for full testing.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2009 and FCC CFR 47, 15.207, 15.209 and 15.407.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

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

No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF 1109

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC TW1037

Copies of granted accreditation certificates are available for downloading from our web site, http:///www.ccsrf.com

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz Test Site : OATS-6	±3.38dB
Radiated Emission, 200 to 1000 MHz Test Site : OATS-6	±3.04dB
Radiated Emission, 1 to 26.5 GHz	± 3.20dB
Power Line Conducted Emission	± 2.01dB

Uncertainty figures are valid to a confidence level of 95%, K=2

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

For RF test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1.	Note Book	Acer	AS 3830TG	DOC	Power cable, unshd, 1.6m

No.	Signal cable description	
A	DC Power	Unshielded, 1.5m, 1pcs
B	LAN	Unshielded, 10m, 1pcs.

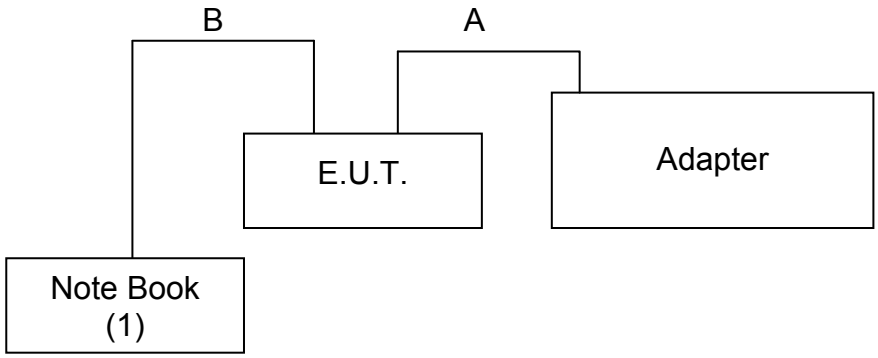
For EMI test

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	Notebook	IBM	T43	DOC	Power cable, unshd, 1.6m
2	Notebook	MSI	MS-1452	DOC	Power cable, unshd, 1.6m
3	Flash Disk	Kingston	DTIG3/8GB	DOC	N/A
4	HUB	BARRICAD	SMC7008BR	DOC	Power cable, unshd, 1.6m
5	POE Injector	Gigabit	PSE301GA	N/A	Power cable, unshd, 1.4m

No.	Signal cable description	
A	DC Output	Unshielded, 1.8m, 1pcs.
B	RJ 45	Unshielded, 10m, 1pcs.
C	RJ 45	Unshielded, 10m, 1pcs.
D	RJ 45	Unshielded, 1.0m, 1pcs.
E	RJ 45	Unshielded, 1.6m, 2pcs.
F	USB	Unshielded, 0.2m, 1pcs.

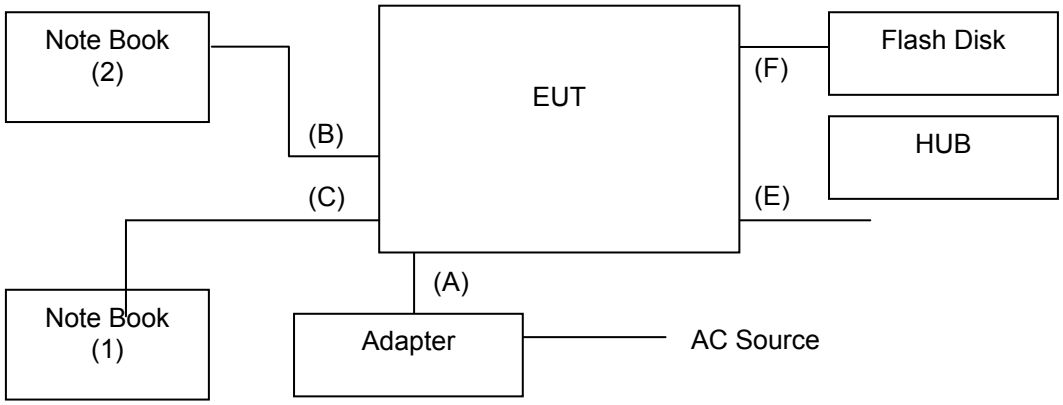
SETUP DIAGRAM FOR TESTS

For RF test

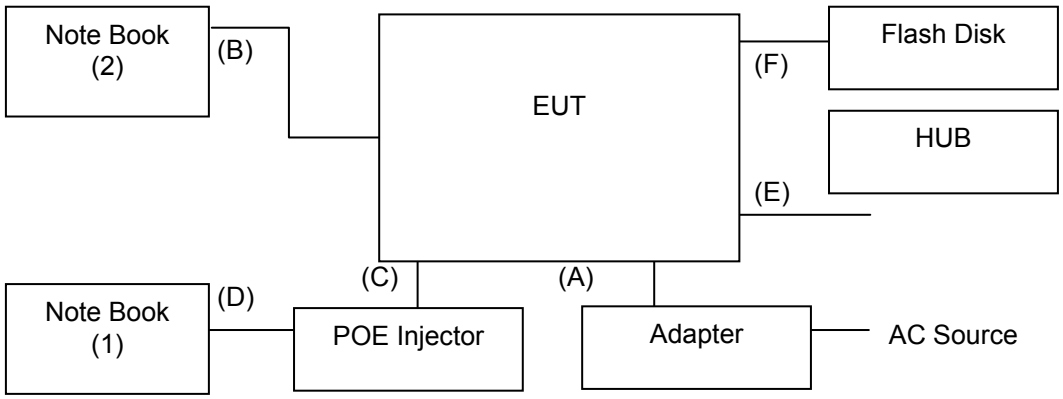


For EMI test

Test mode: Normal Operation



Test mode: POE Mode



EUT OPERATING CONDITION

RF Setup_Band 1

1. Set up all computers like the setup diagram.
2. The Test Program "**MT76xxE_AP**" software was used for testing

TX Mode:

- ⇨ **Tx Mode:**
- ⇨ **OFDM、HT MixMode** (Bandwidth: 20、40)、**VHT Mode** (Bandwidth: 80)
- ⇨ **Tx Data Rate: 6Mbps** (IEEE 802.11a mode ,chain 0 TX)
  13Mbps (IEEE 802.11n HT20 mode , chain 0 & chain 1 TX)
  27Mbps (IEEE 802.11n HT40 mode, chain 0 & chain 1 TX)
  117Mbps (IEEE 802.11ac VHT80 mode, chain 0 & chain 1 TX)

Power control mode
Target Power:
IEEE 802.11a Lower Sub-Band Channel Low (5180MHz) = 26 **(Chain 0)**
IEEE 802.11a Lower Sub-Band Channel Middle (5200MHz) = 27 **(Chain 0)**
IEEE 802.11a Lower Sub-Band Channel High (5240MHz) = 28 **(Chain 0)**

Target Power:
IEEE 802.11n HT20 Lower Sub-Band Channel Low (5180MHz) = 23 **(Chain 0)**
IEEE 802.11n HT20 Lower Sub-Band Channel Middle (5200MHz) = 24 **(Chain 0)**
IEEE 802.11n HT20 Lower Sub-Band Channel High (5240MHz) = 25 **(Chain 0)**
IEEE 802.11n HT20 Lower Sub-Band Channel Low (5180MHz) = 23 **(Chain 1)**
IEEE 802.11n HT20 Lower Sub-Band Channel Middle (5200MHz) = 24 **(Chain 1)**
IEEE 802.11n HT20 Lower Sub-Band Channel High (5240MHz) = 25 **(Chain 1)**

Target Power:
IEEE 802.11n HT40 Lower Sub-Band Channel Low (5190MHz) = 18 **(Chain 0)**
IEEE 802.11n HT40 Lower Sub-Band Channel Middle (5210MHz) = 19 **(Chain 0)**
IEEE 802.11n HT40 Lower Sub-Band Channel High (5230MHz) = 1A **(Chain 0)**
IEEE 802.11n HT40 Lower Sub-Band Channel Low (5190MHz) = 18 **(Chain 1)**
IEEE 802.11n HT40 Lower Sub-Band Channel Middle (5210MHz) = 19 **(Chain 1)**
IEEE 802.11n HT40 Lower Sub-Band Channel High (5230MHz) = 1A **(Chain 1)**

Target Power:
IEEE 802.11n HT80 Lower Sub-Band Channel Middle (5210MHz) = 15 **(Chain 0)**
IEEE 802.11n HT80 Lower Sub-Band Channel Middle (5210MHz) = 15 **(Chain 1)**

RF Setup_Band 4

1. Set up all computers like the setup diagram.
2. The Test Program " **MT76xxE_AP**" software was used for testing.

TX Mode:

- ⇨ **Tx Mode:**
- ⇨ **OFDM、HT MixMode** (Bandwidth: 20、40)、**VHT Mode** (Bandwidth: 80)
- ⇨ **Tx Data Rate: 6Mbps** (IEEE 802.11a mode ,chain 0 & chain 1 TX)
  13Mbps (IEEE 802.11n HT20 mode , chain 0 & chain 1 TX)
  27Mbps (IEEE 802.11n HT40 mode, chain 0 & chain 1 TX)
  117Mbps (IEEE 802.11ac VHT80 mode, chain 0 & chain 1 TX)

Power control mode
Target Power:
IEEE 802.11a Higher Sub-Band Channel Low (5745MHz) = 1F **(Chain 0)**
IEEE 802.11a Higher Sub-Band Channel Middle (5785MHz) = 20 **(Chain 0)**
IEEE 802.11a Higher Sub-Band Channel High (5825MHz) = 21 **(Chain 0)**
Target Power:
IEEE 802.11n HT20 Higher Sub-Band Channel Low (5745MHz) = 22 **(Chain 0)**
IEEE 802.11n HT20 Higher Sub-Band Channel Middle (5785MHz) = 23 **(Chain 0)**
IEEE 802.11n HT20 Higher Sub-Band Channel High (5825MHz) = 24 **(Chain 0)**
IEEE 802.11n HT20 Higher Sub-Band Channel Low (5745MHz) = 22 **(Chain 1)**
IEEE 802.11n HT20 Higher Sub-Band Channel Middle (5785MHz) = 23 **(Chain 1)**
IEEE 802.11n HT20 Higher Sub-Band Channel High (5825MHz) = 24 **(Chain 1)**
Target Power:
IEEE 802.11n HT40 Higher Sub-Band Channel Low (5755MHz) = 1B **(Chain 0)**
IEEE 802.11n HT40 Higher Sub-Band Channel High (5795MHz) = 1C **(Chain 0)**
IEEE 802.11n HT40 Higher Sub-Band Channel Low (5755MHz) = 1B **(Chain 1)**
IEEE 802.11n HT40 Higher Sub-Band Channel High (5795MHz) = 1C **(Chain 1)**
Target Power:
IEEE 802.11ac HT80 Higher Sub-Band Channel Middle (5775MHz) = 18 **(Chain 0)**
IEEE 802.11ac HT80 Higher Sub-Band Channel Middle (5775MHz) = 18 **(Chain 1)**

RX Mode：

MAC Address: FFFFFFFFFFFF

Start RX

3. All of the function are under run.
4. Start test.

Normal Link Setup

1. Setup a whole system for test as shown on setup diagram.
2. Turn on power and check function.
3. Start to test.

7. FCC PART 15.407 REQUIREMENTS

7.1 26dB BANDWIDTH

LIMITS

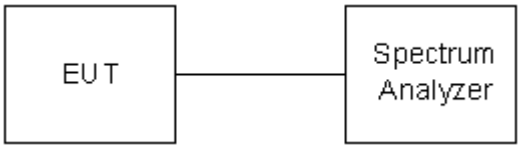
§ 15.303 (c) (2), For purposes of this subpart, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	JAN. 23, 2016

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

TEST SETUP



TEST PROCEDURE

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. 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%.

TEST RESULTS

IEEE 802.11a Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Pass / Fail
Low	5180	27.81	PASS
Middle	5200	28.10	PASS
High	5240	30.13	PASS

IEEE 802.11a Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)	Pass / Fail
Low	5745	21.09	PASS
Middle	5785	22.66	PASS
High	5825	24.19	PASS

IEEE 802.11n HT20 Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
Low	5180	20.84	19.94	PASS
Middle	5200	21.26	20.22	PASS
High	5240	21.75	20.10	PASS

IEEE 802.11n HT20 Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
Low	5745	23.65	21.86	PASS
Middle	5785	24.64	23.34	PASS
High	5825	27.70	27.90	PASS

IEEE 802.11n HT40 Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
Low	5190	40.43	39.66	PASS
Middle	5210	40.14	39.70	PASS
High	5230	40.40	39.85	PASS

IEEE 802.11n HT40 Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
Low	5755	39.97	39.80	PASS
High	5795	39.97	39.84	PASS

IEEE 802.11ac VHT80 Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
Middle	5210	80.92	81.30	PASS

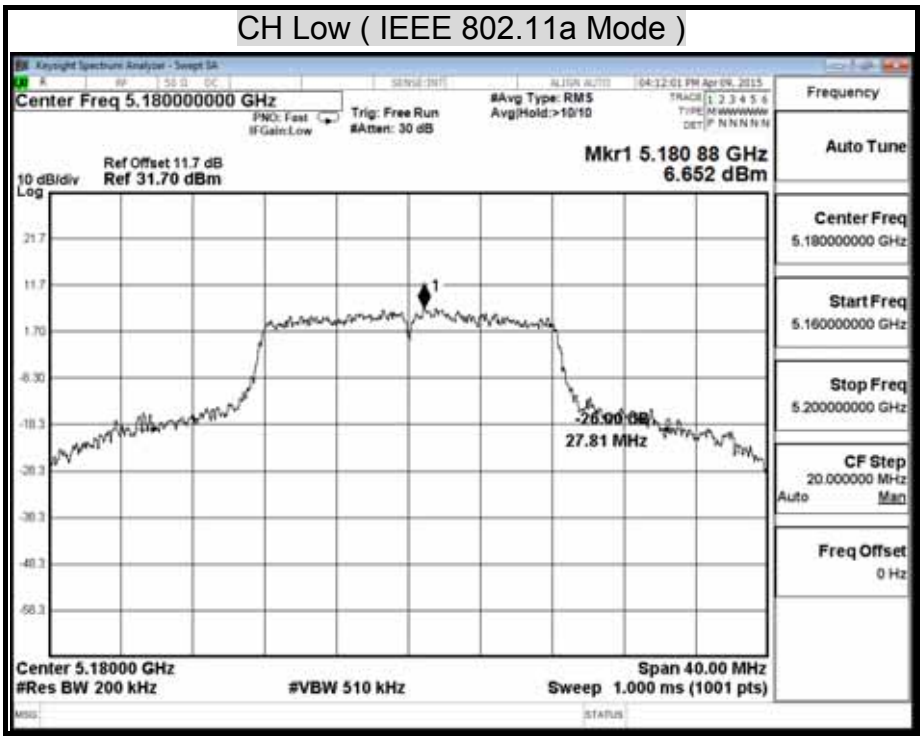
IEEE 802.11ac VHT80 Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	26dB Bandwidth (MHz)		Pass / Fail
		Chain 0	Chain 1	
Middle	5775	83.00	81.32	PASS

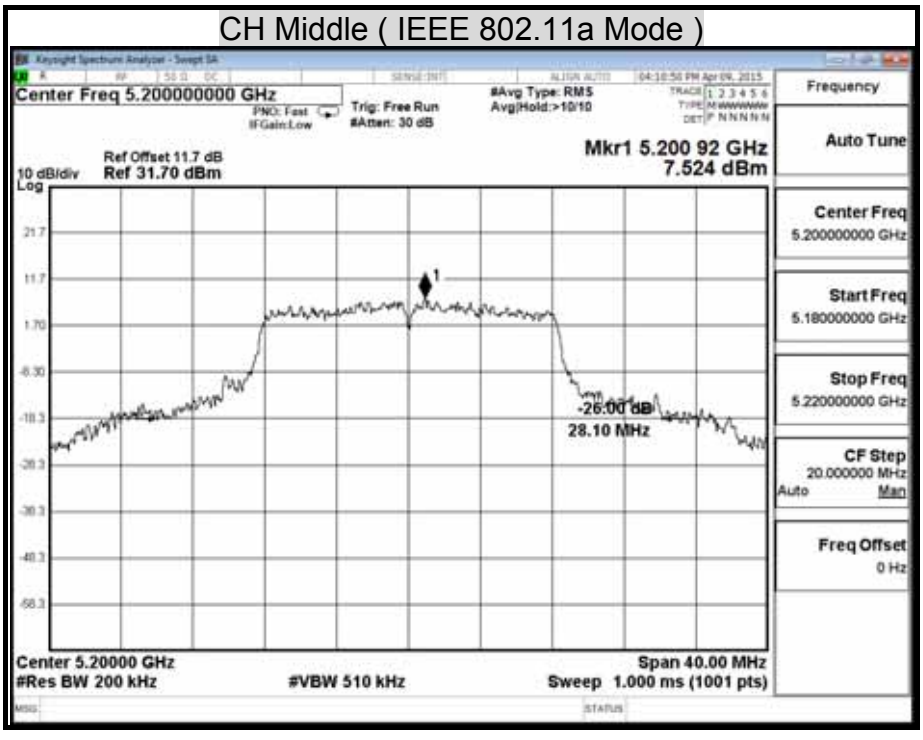
26dB BANDWIDTH

Test Mode: IEEE 802.11a mode / 5150 ~ 5250MHz

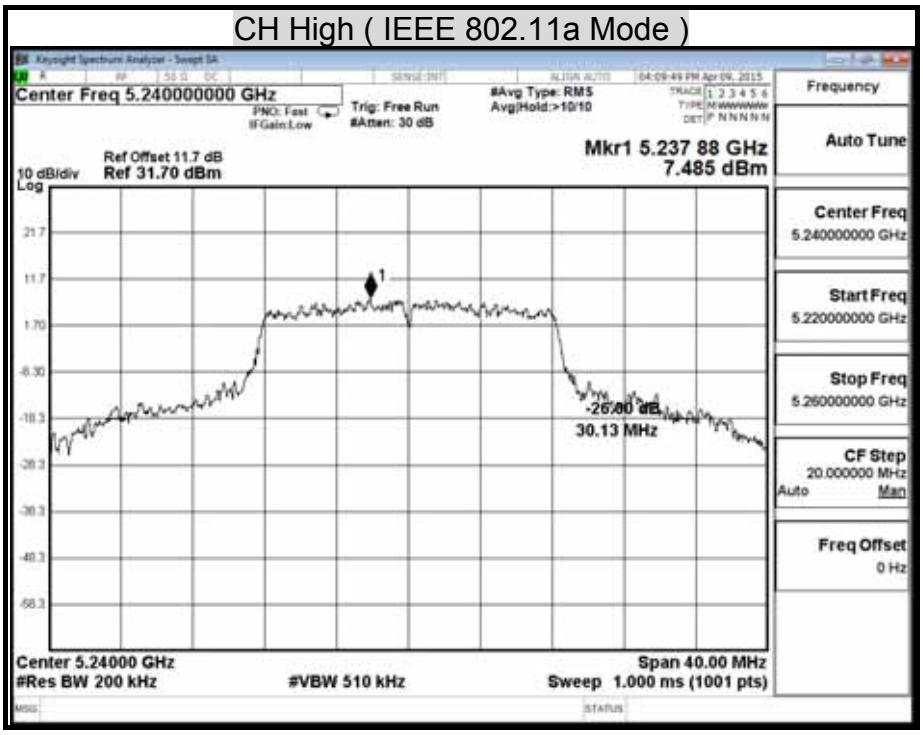
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

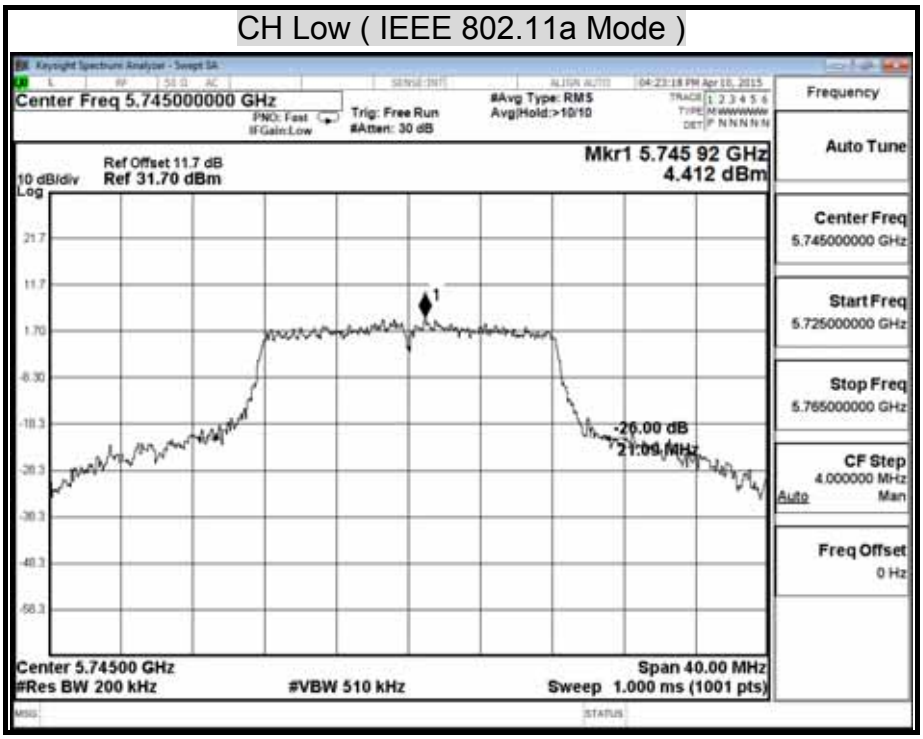


CH High (IEEE 802.11a Mode)

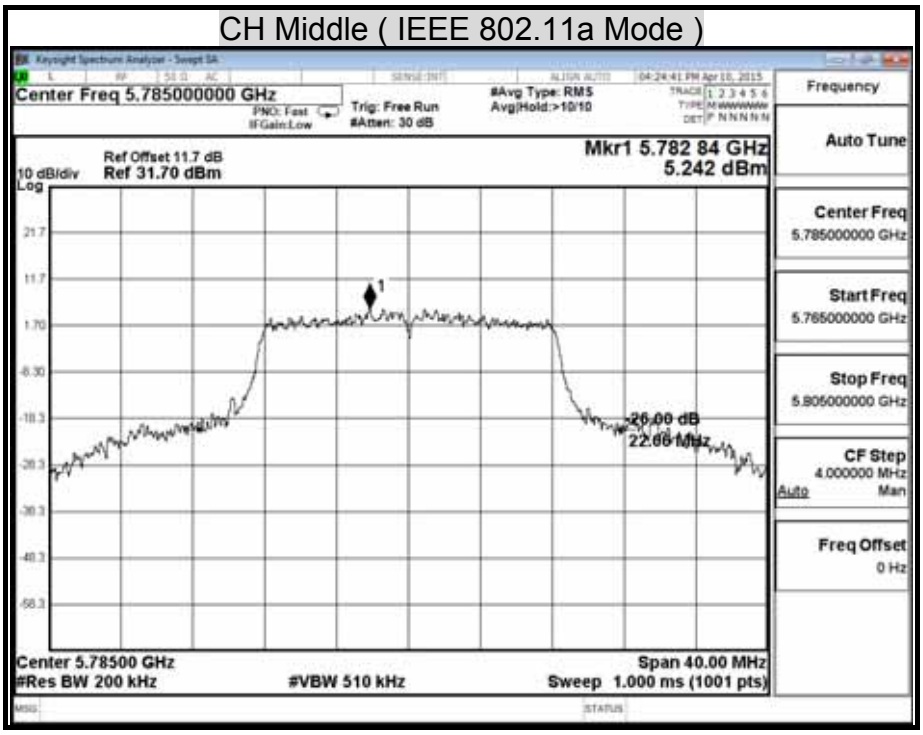


Test Mode: IEEE 802.11a mode / 5725 ~ 5850MHz

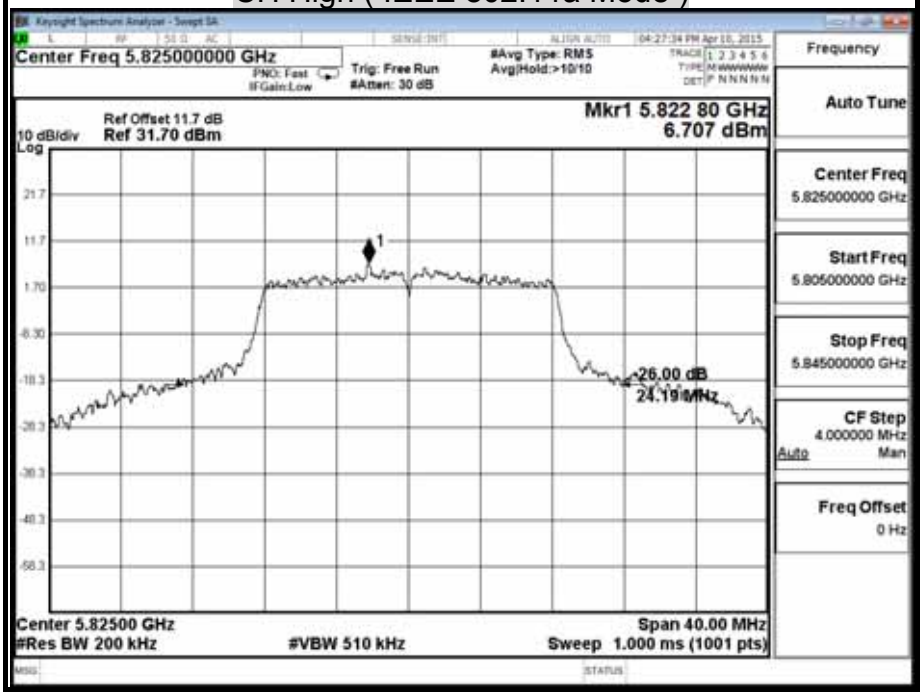
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

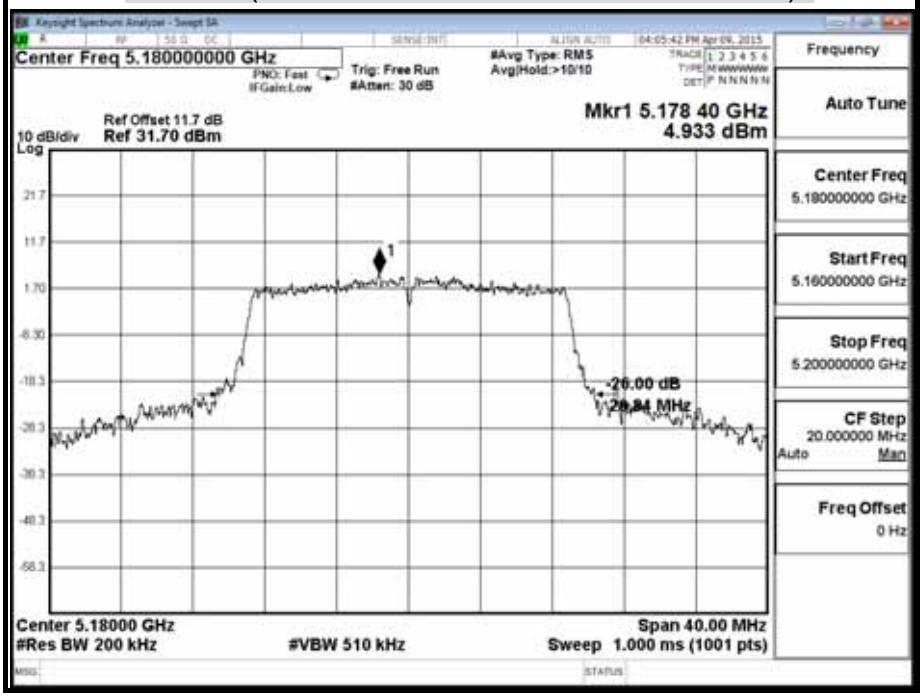


CH High (IEEE 802.11a Mode)

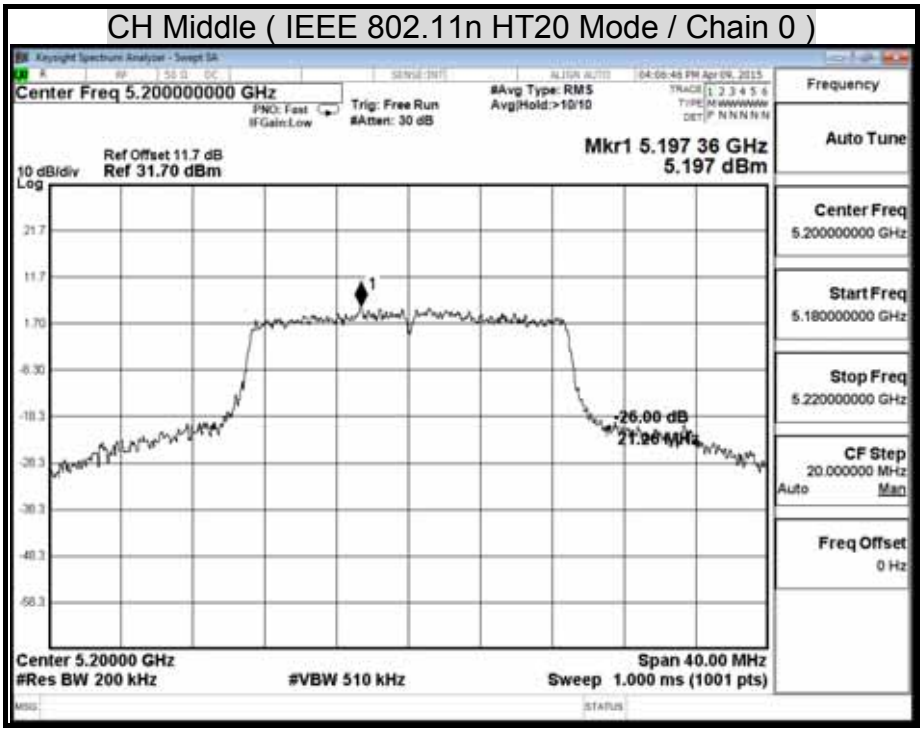


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

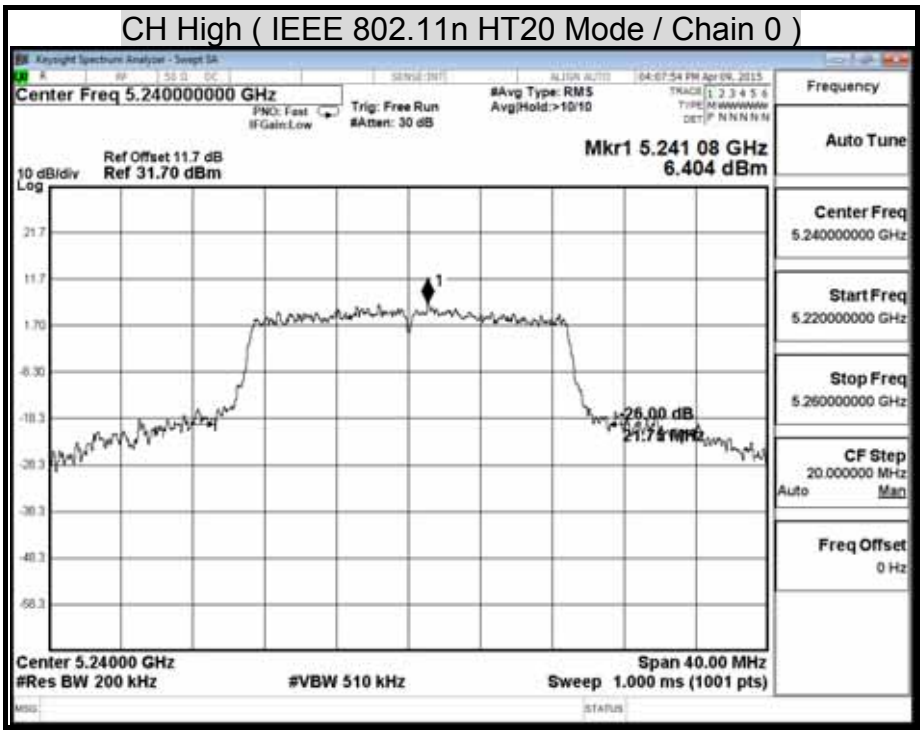
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

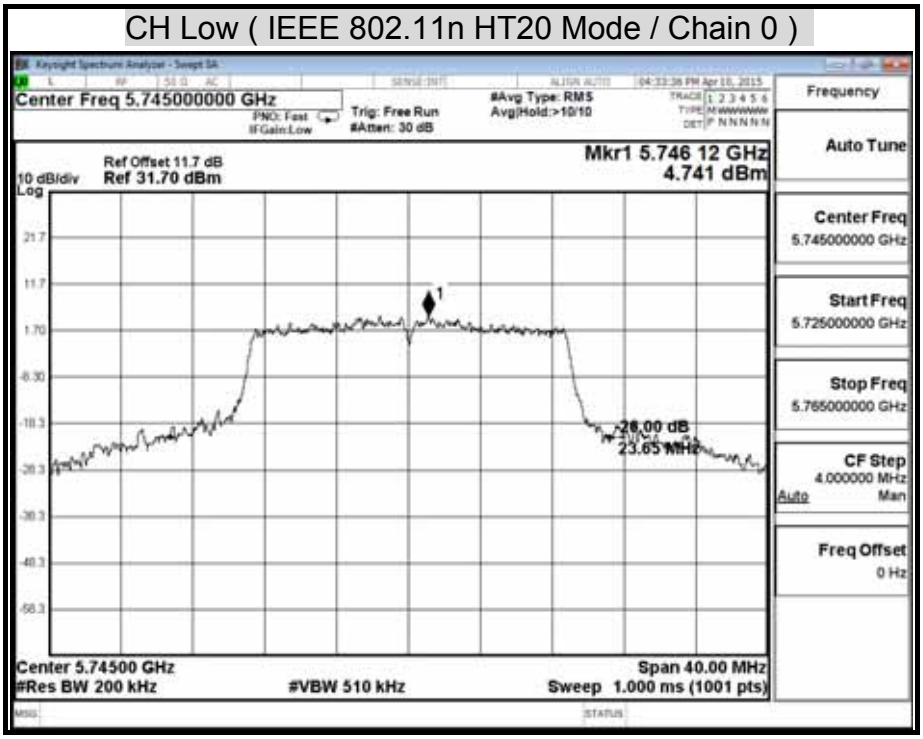


CH High (IEEE 802.11n HT20 Mode / Chain 0)

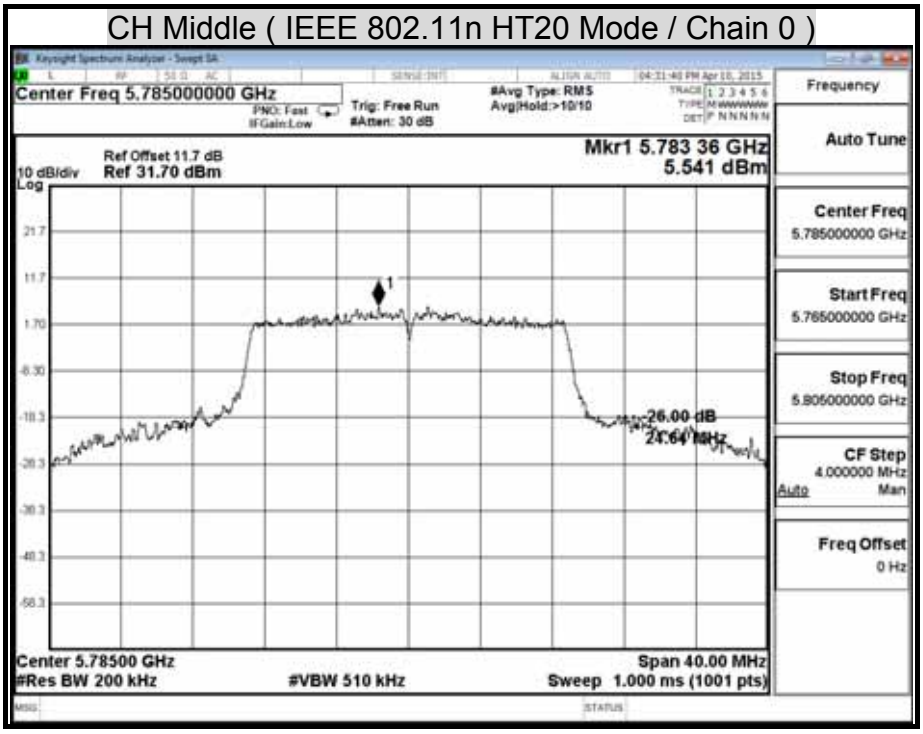


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

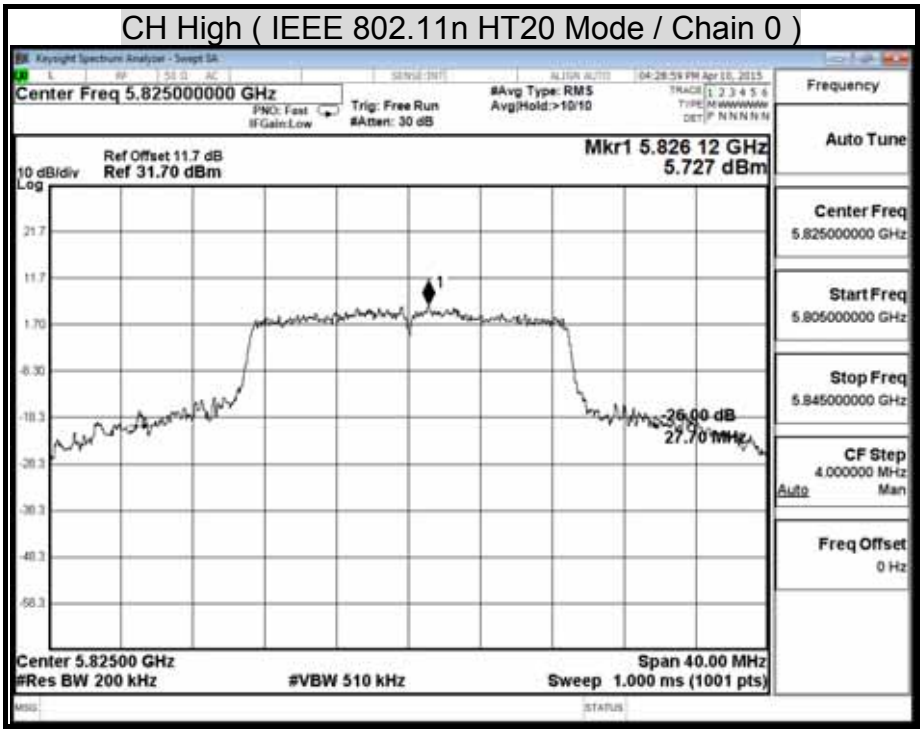
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

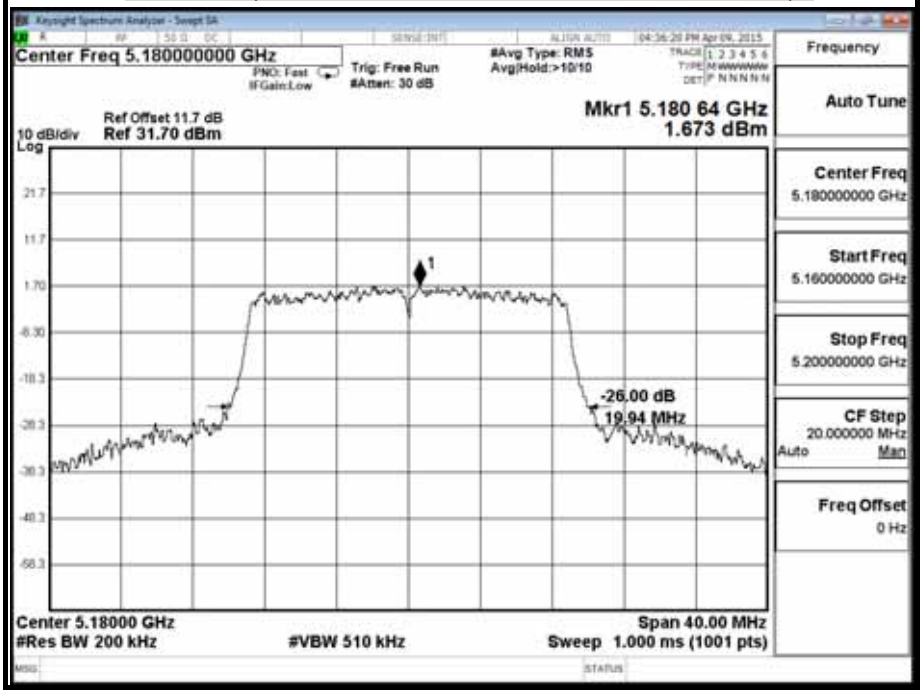


CH High (IEEE 802.11n HT20 Mode / Chain 0)

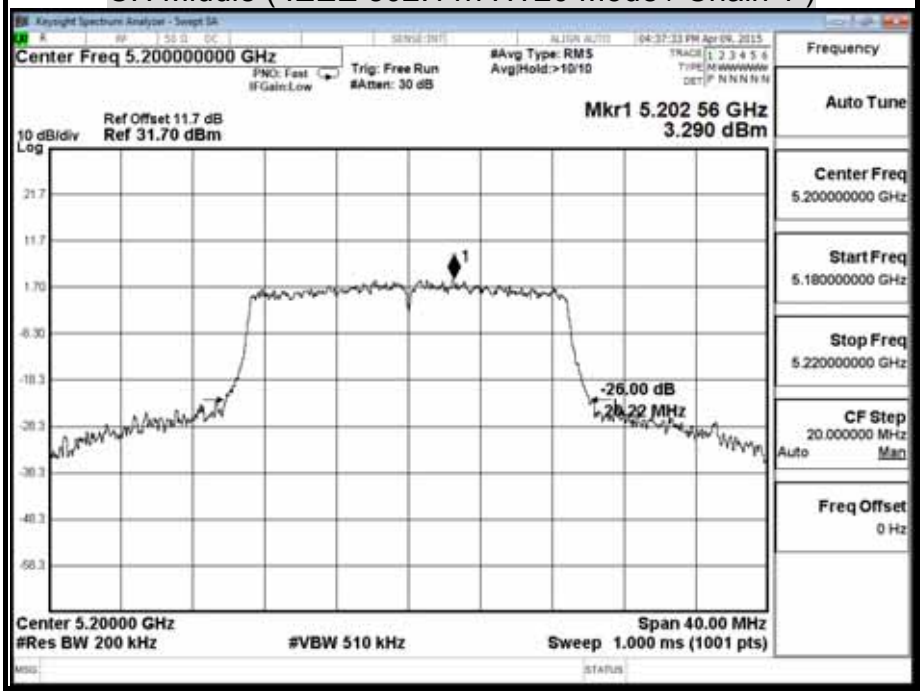


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

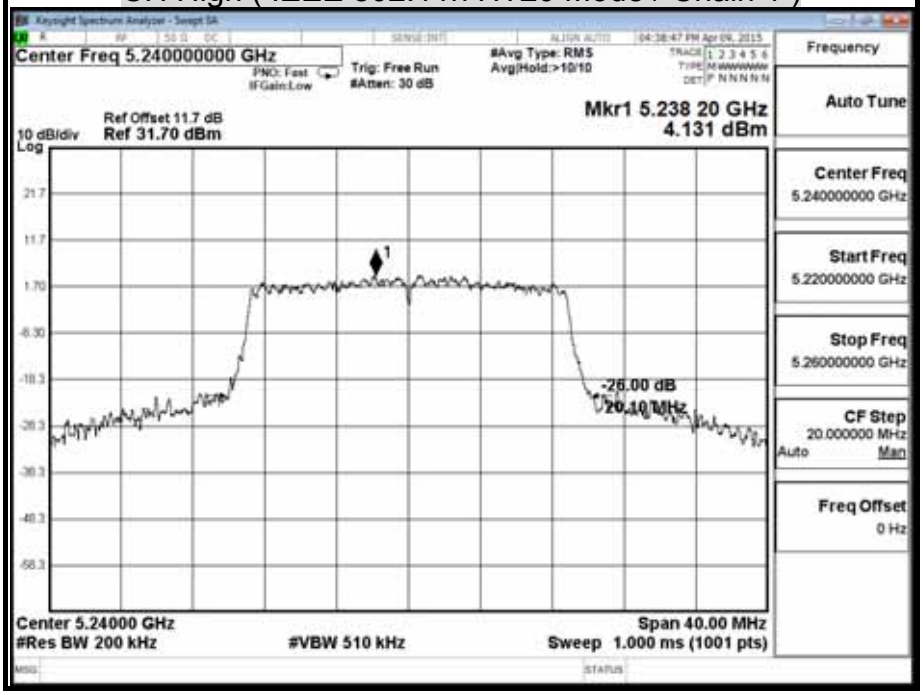
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

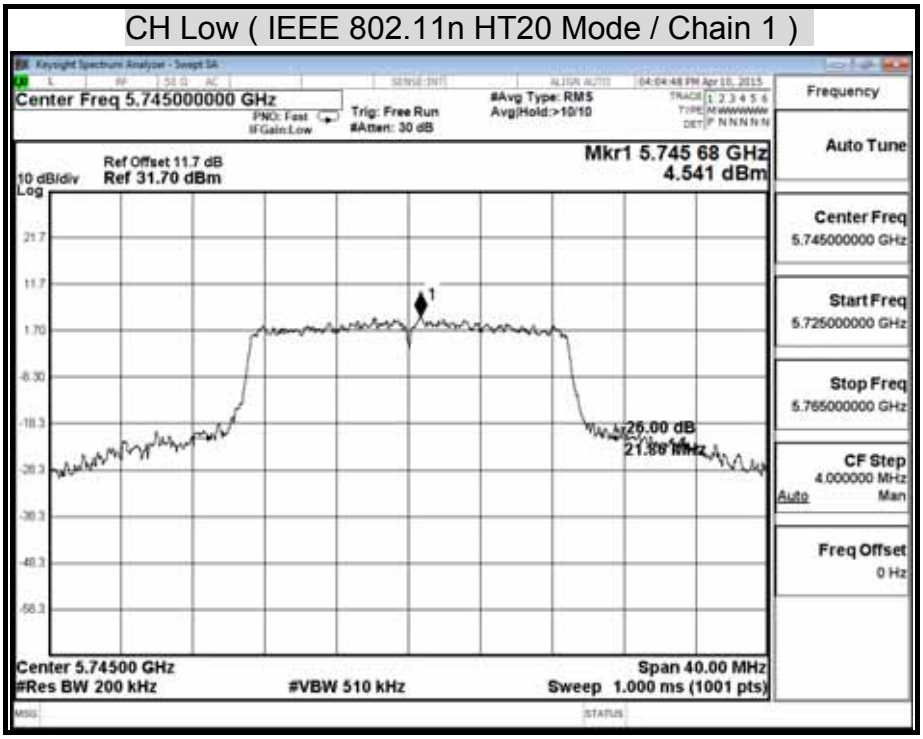


CH High (IEEE 802.11n HT20 Mode / Chain 1)

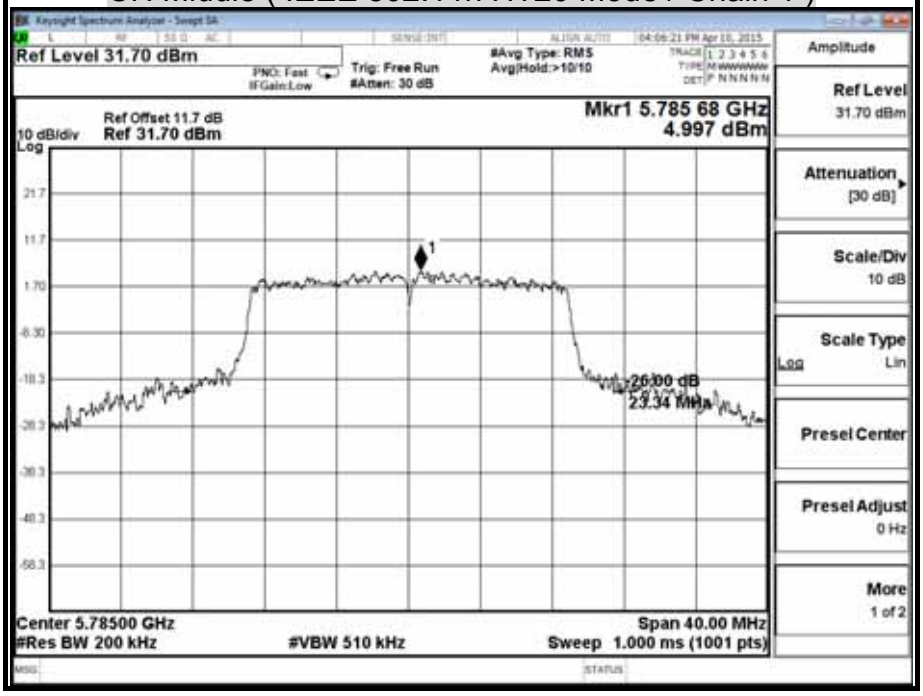


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

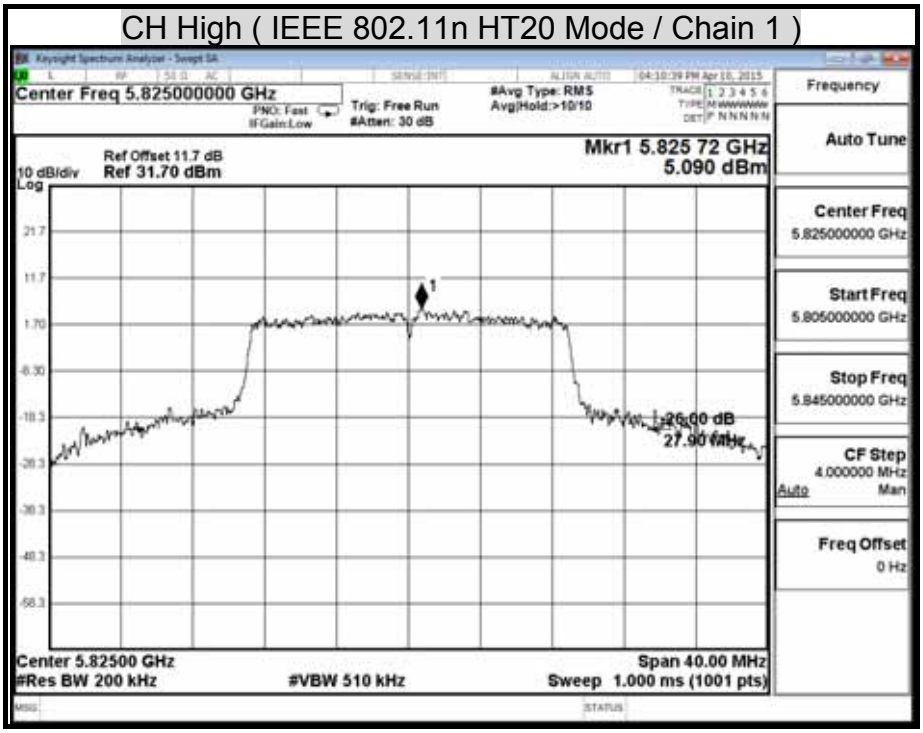
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

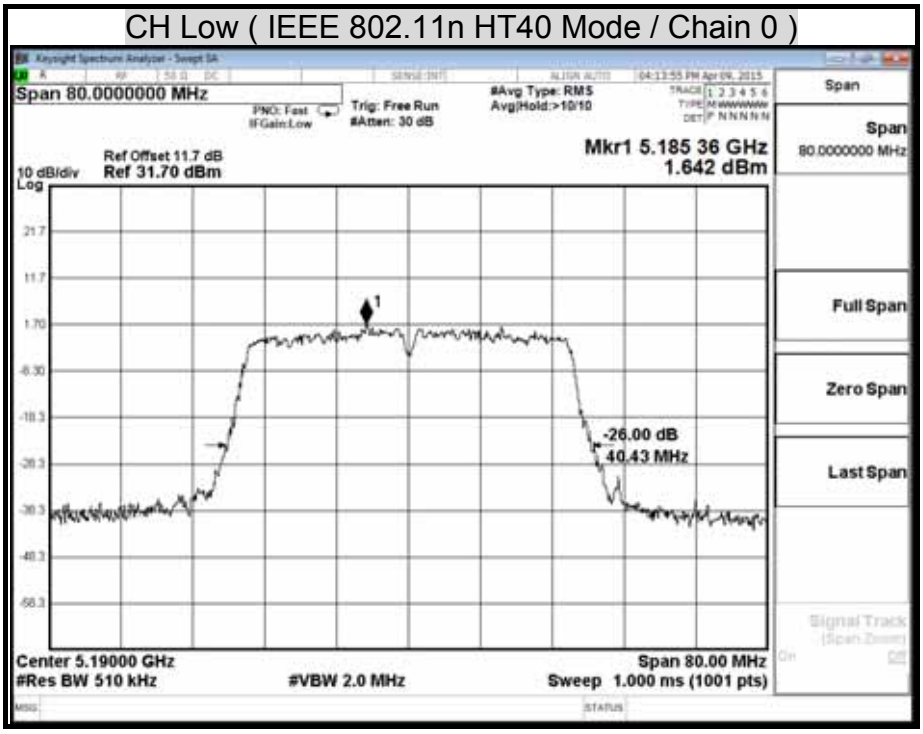


CH High (IEEE 802.11n HT20 Mode / Chain 1)

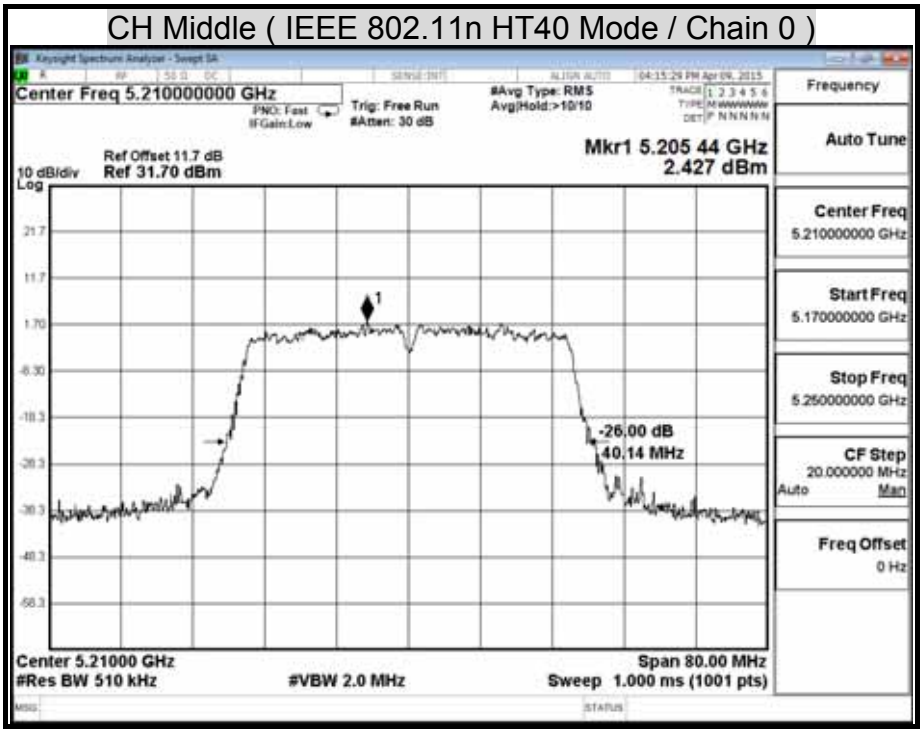


Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

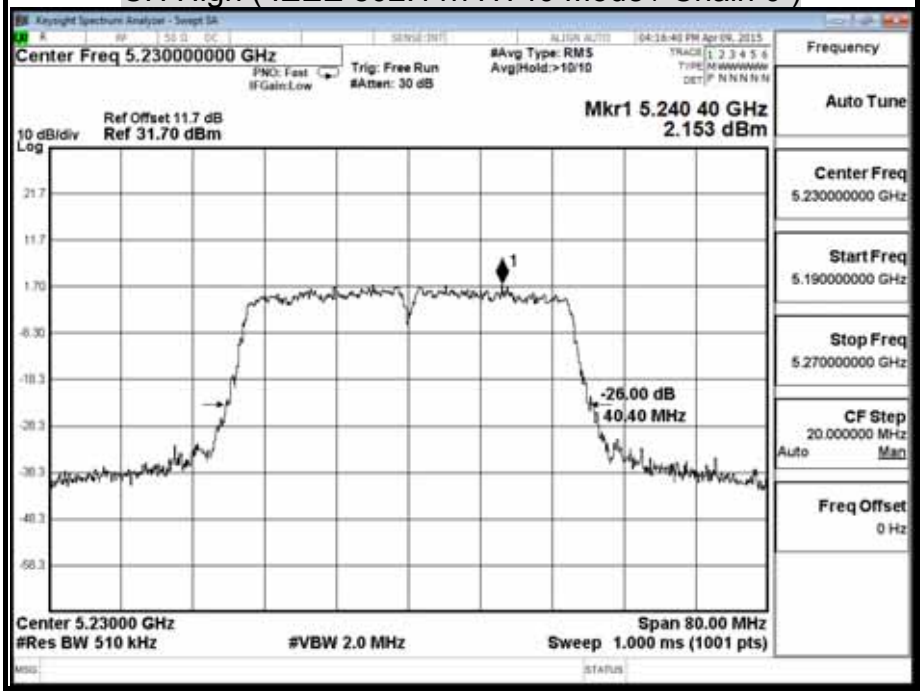
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

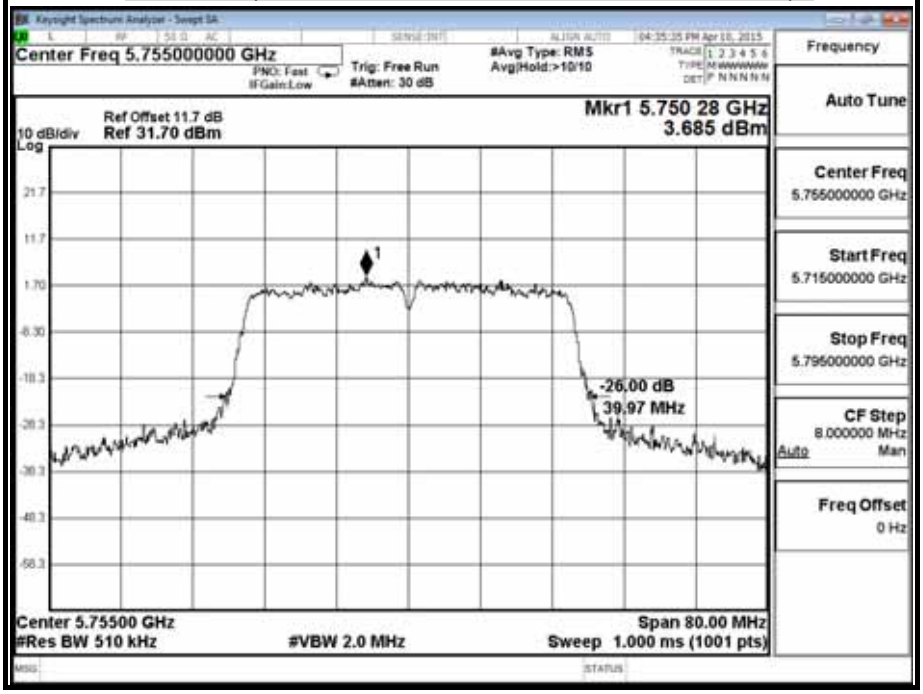


CH High (IEEE 802.11n HT40 Mode / Chain 0)

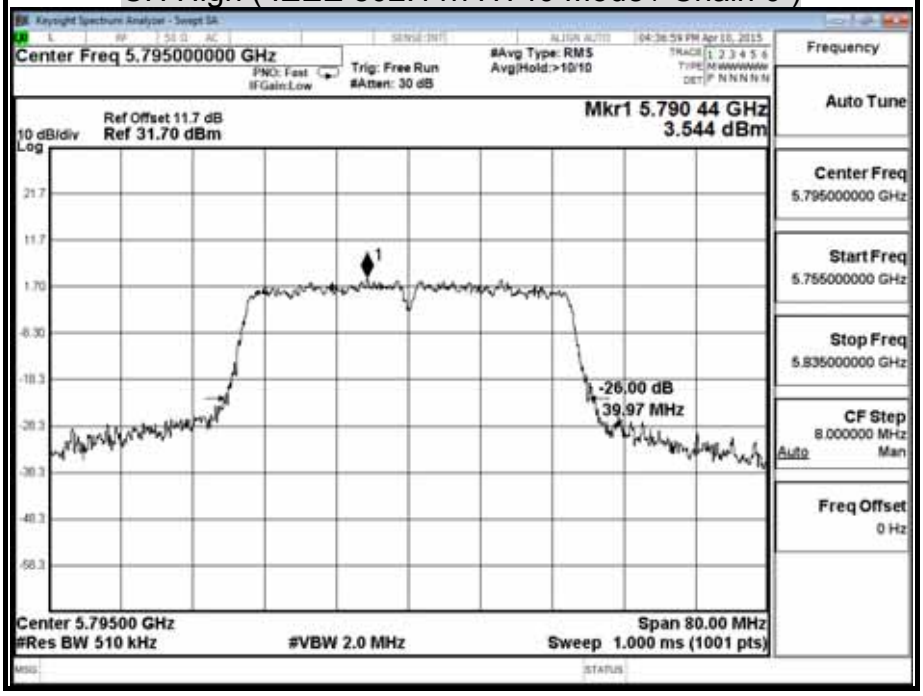


Test Mode: IEEE 802.11n HT 40 MHz mode / 5720 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 0)

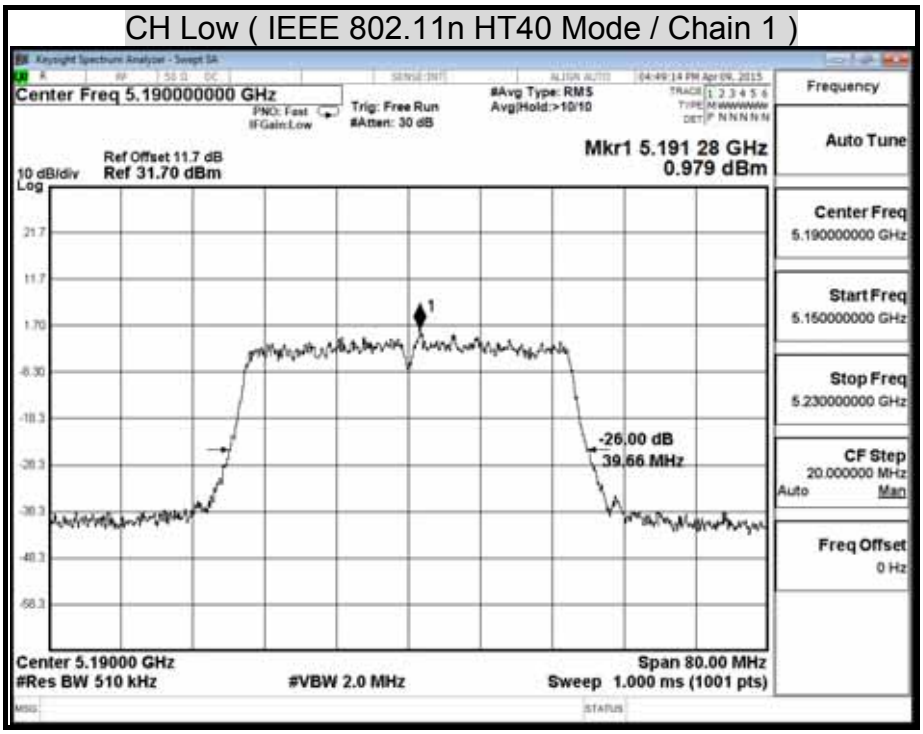


CH High (IEEE 802.11n HT40 Mode / Chain 0)

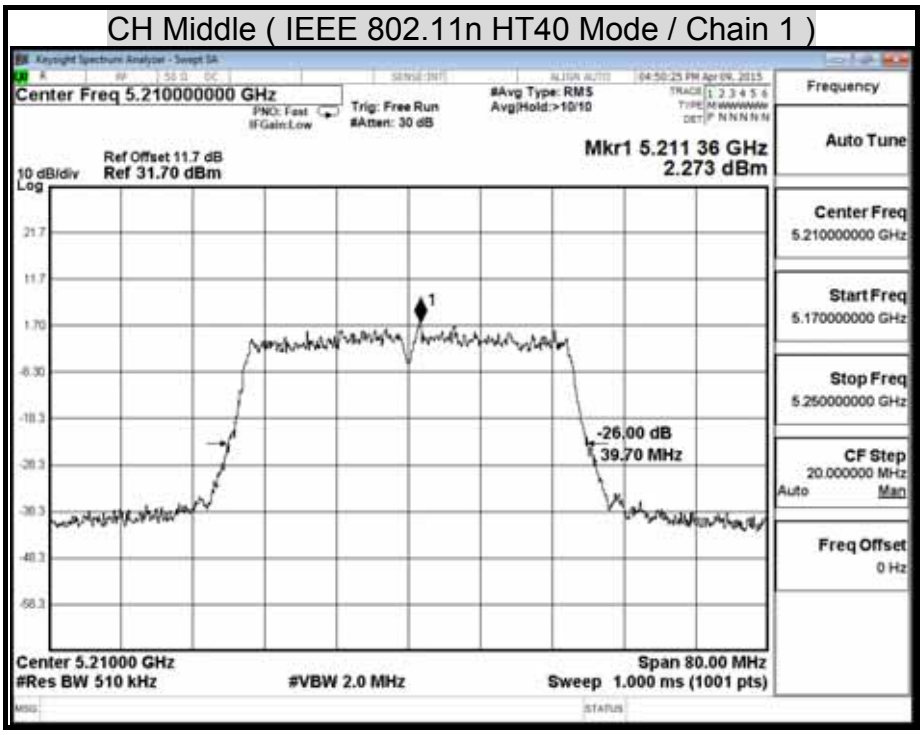


Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

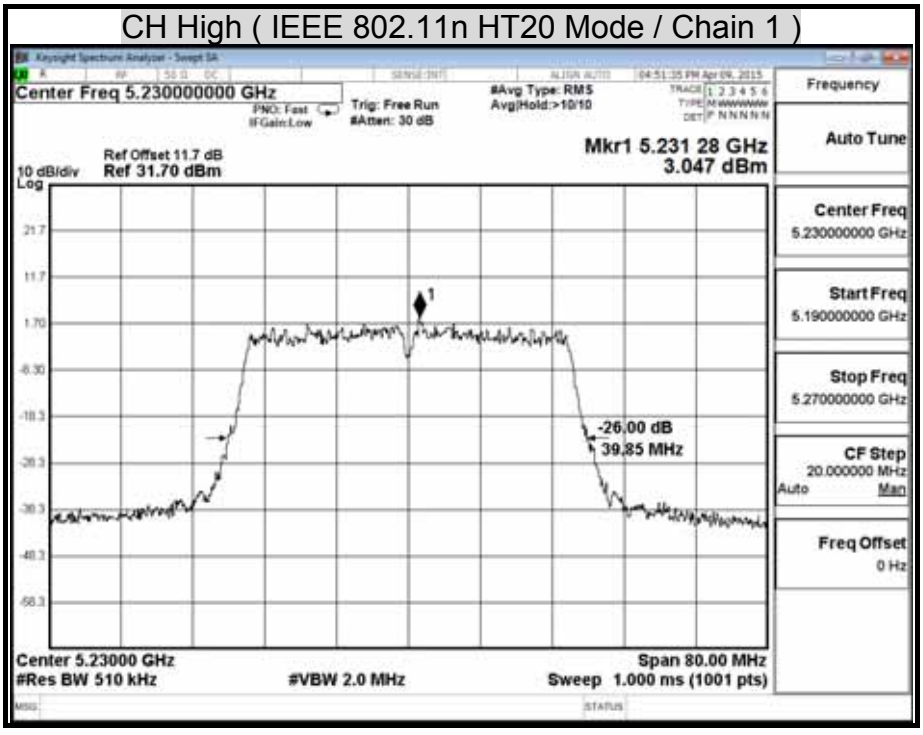
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

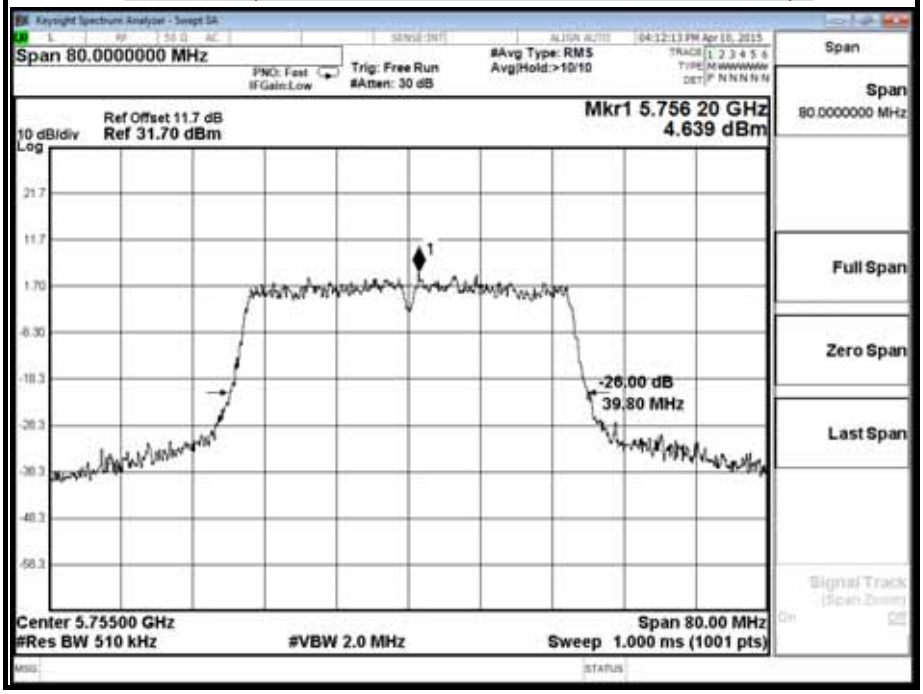


CH High (IEEE 802.11n HT20 Mode / Chain 1)

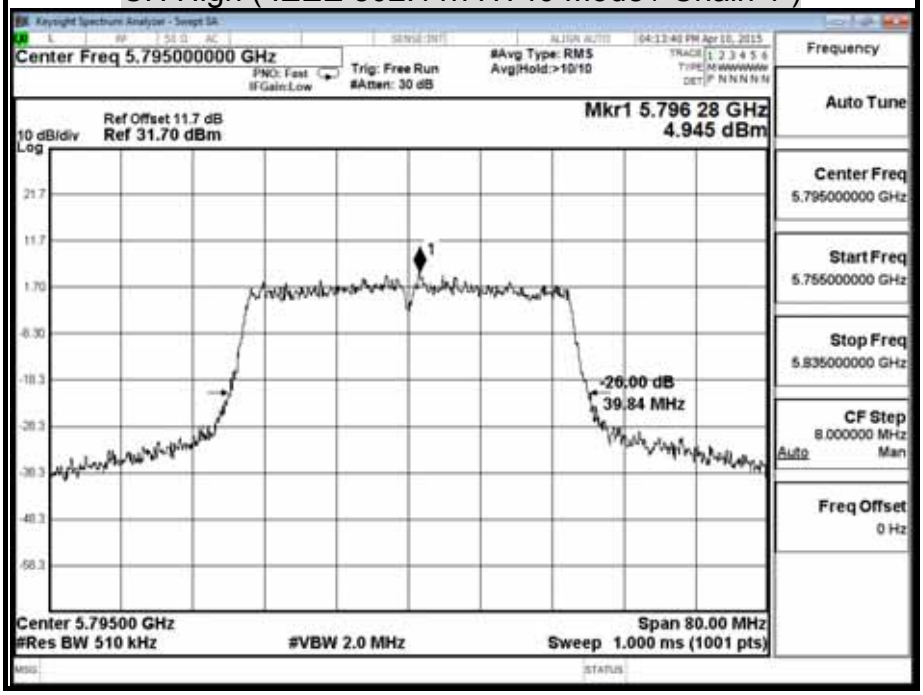


Test Mode: IEEE 802.11n HT 40 MHz mode / 5720 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 1)

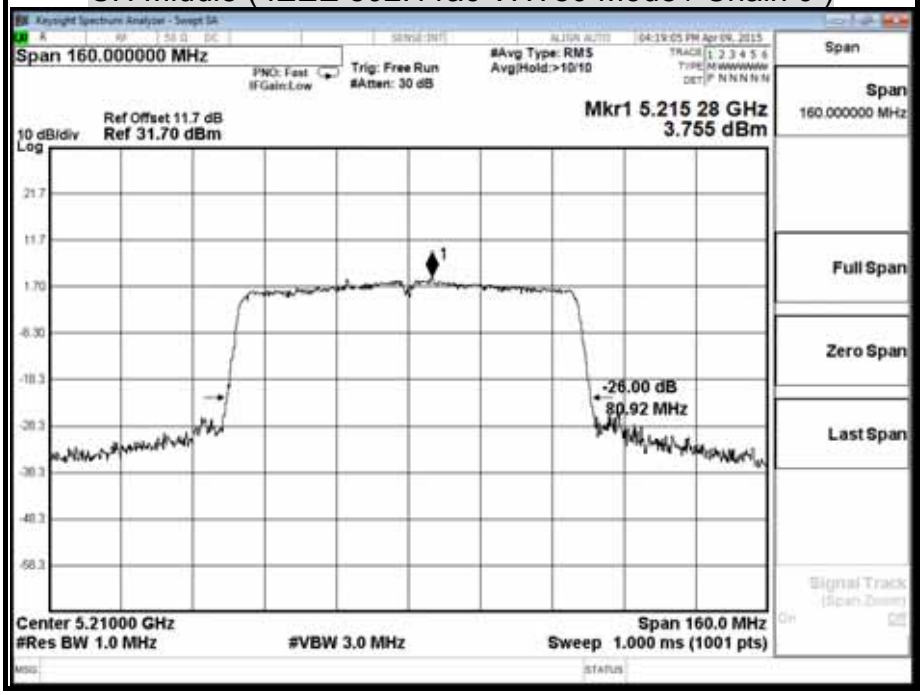


CH High (IEEE 802.11n HT40 Mode / Chain 1)



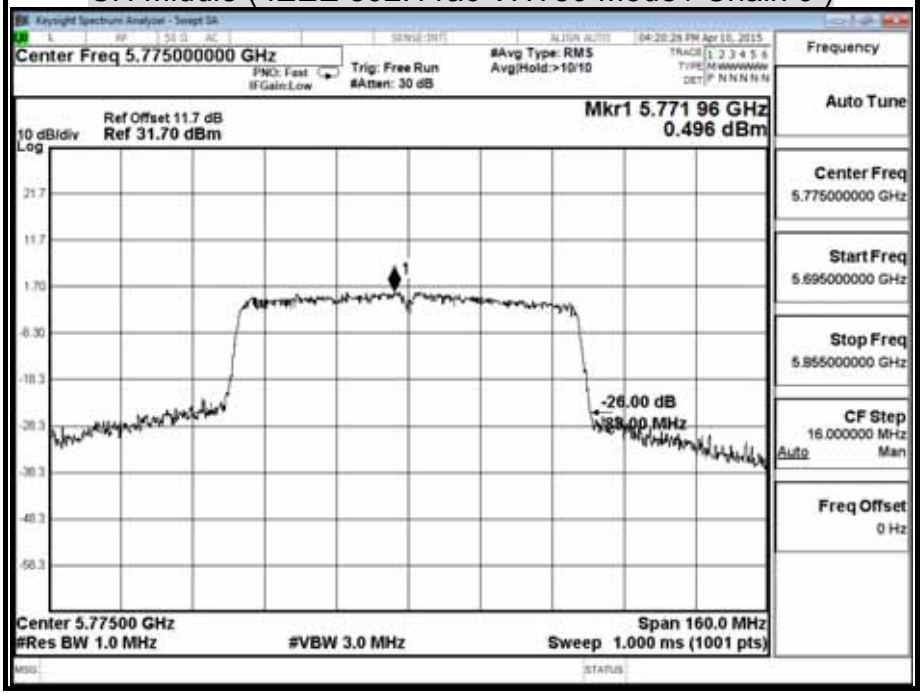
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



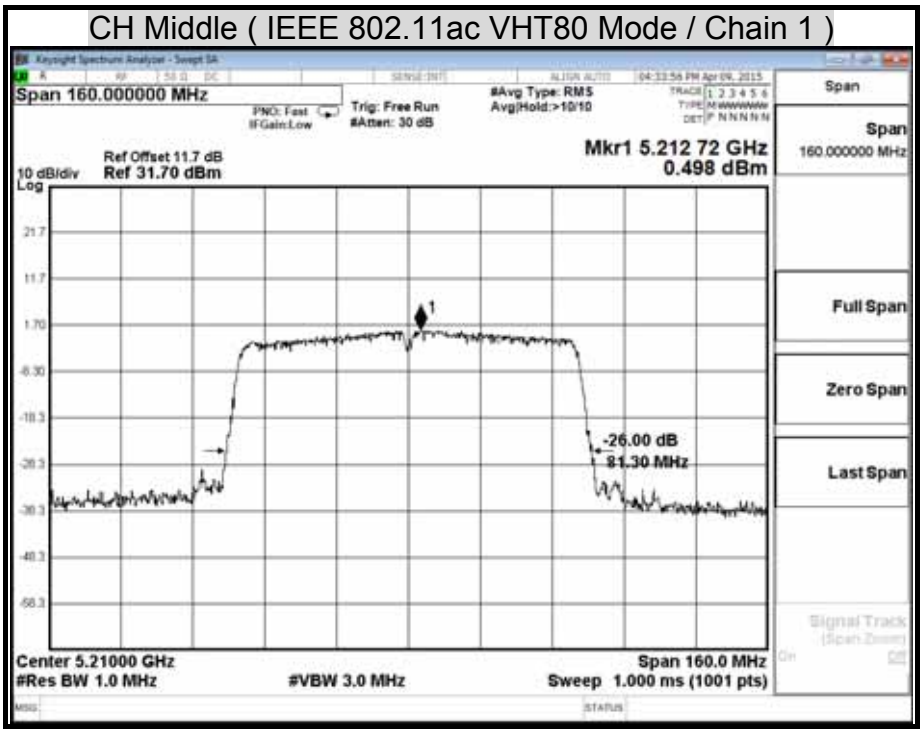
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



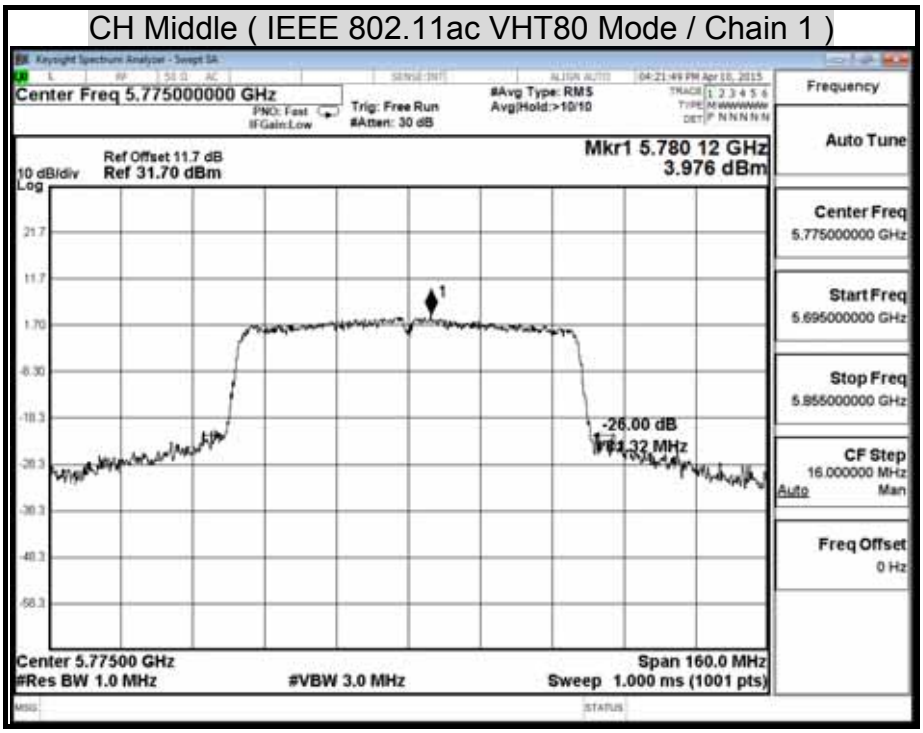
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



7.2 6DB BANDWIDTH

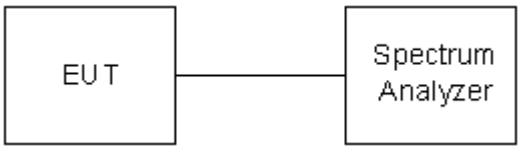
LIMIT

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

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	JAN. 23, 2016

TEST SETUP



TEST PROCEDURE

1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.

TEST RESULTS

IEEE 802.11a Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (kHz)	Pass / Fail
Low	5745	16.48	>500	PASS
Middle	5785	16.49	>500	PASS
High	5825	16.47	>500	PASS

IEEE 802.11n HT20 Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	5745	17.70	17.65	>500	PASS
Middle	5785	17.66	17.64	>500	PASS
High	5825	17.67	17.67	>500	PASS

IEEE 802.11n HT40 Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Low	5755	36.36	36.08	>500	PASS
High	5795	36.32	35.98	>500	PASS

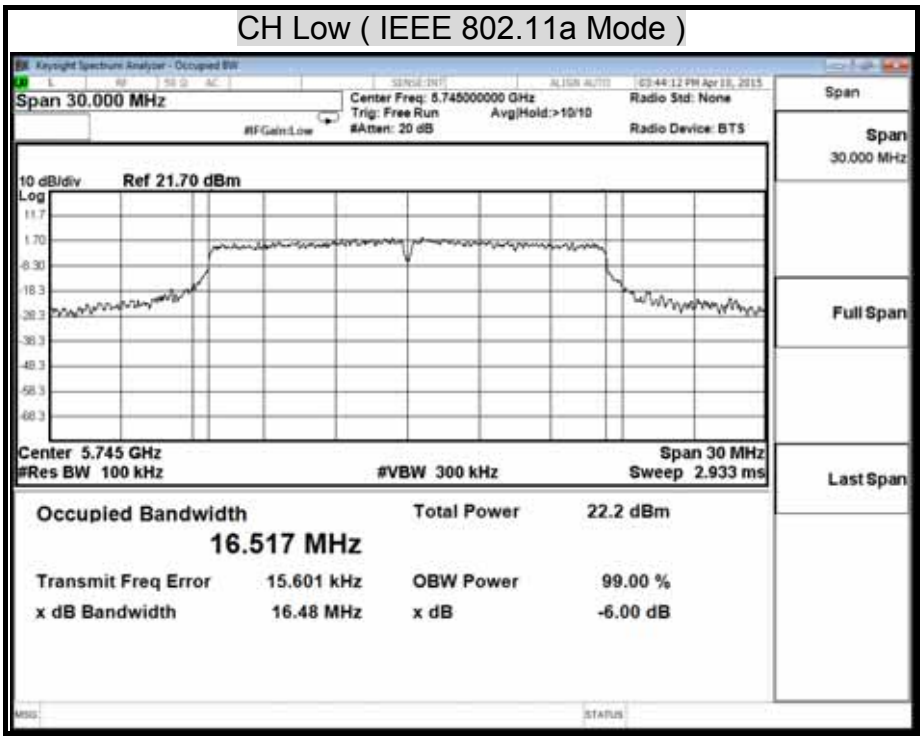
IEEE 802.11ac VHT80 Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (kHz)	Pass / Fail
		Chain 0	Chain1		
Middle	5775	75.76	75.68	>500	PASS

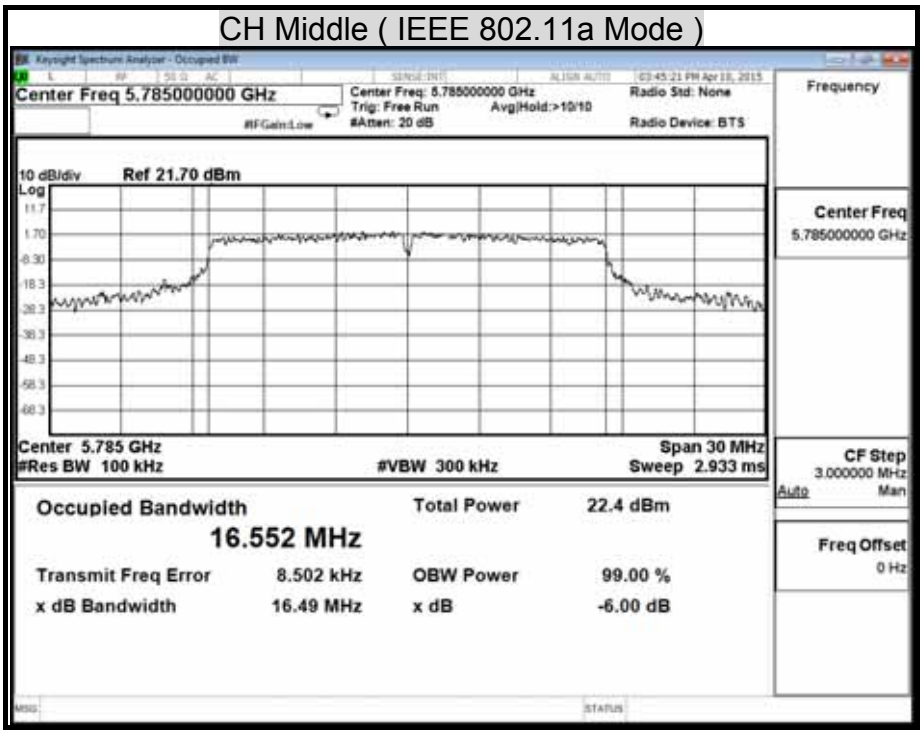
6dB BANDWIDTH

Test Mode: IEEE 802.11a mode / 5725 ~ 5850MHz

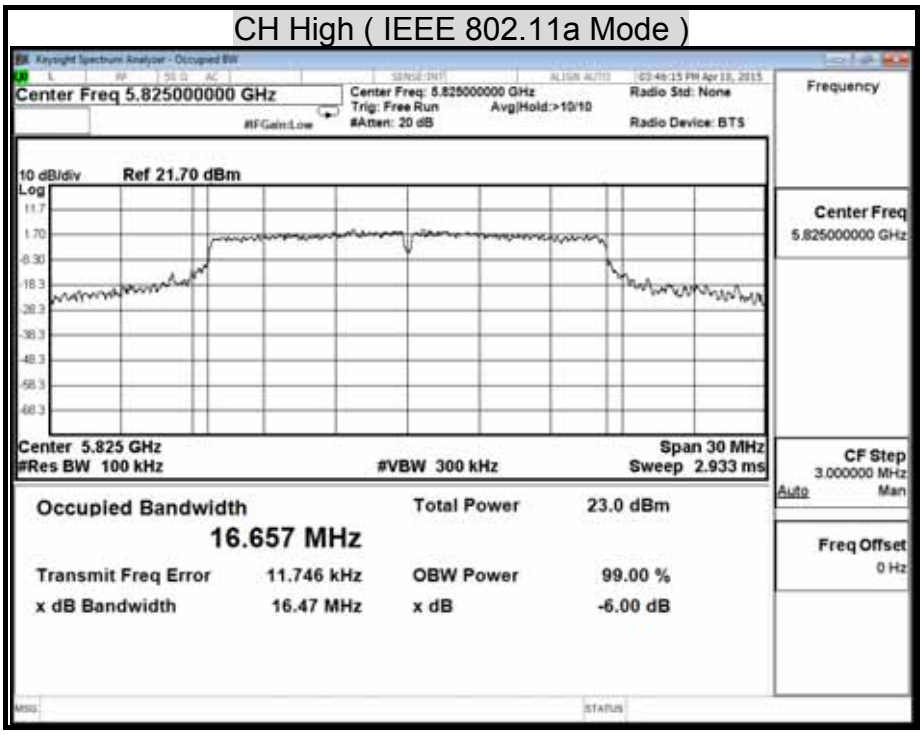
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

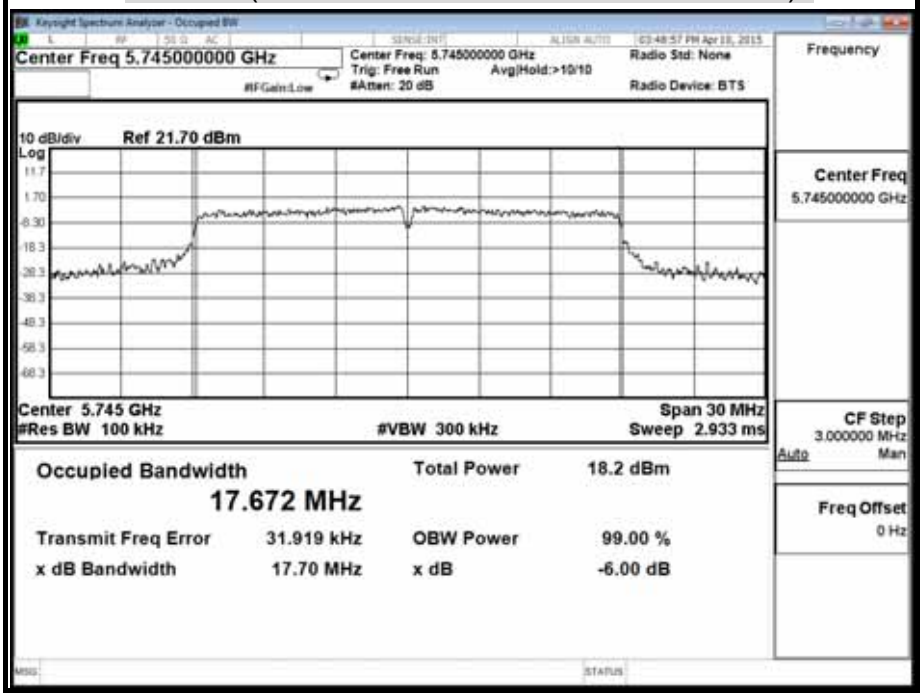


CH High (IEEE 802.11a Mode)

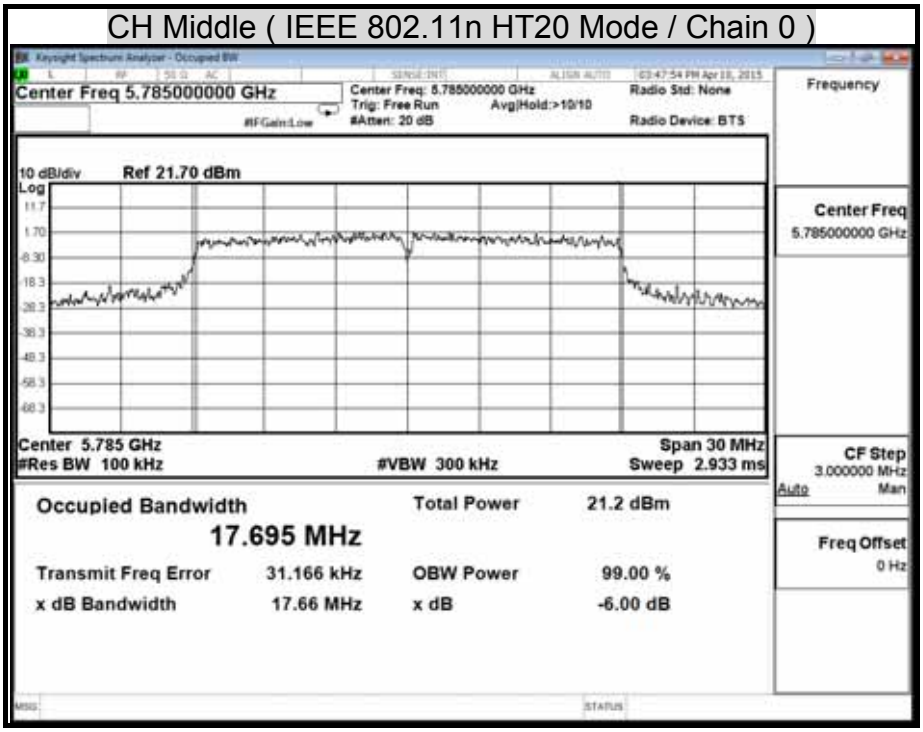


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

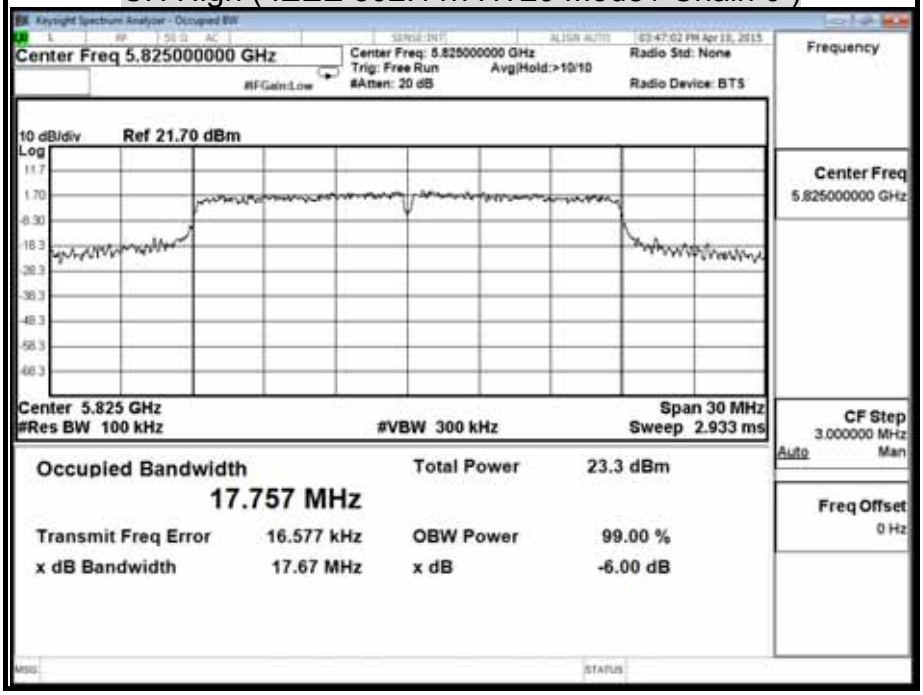
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

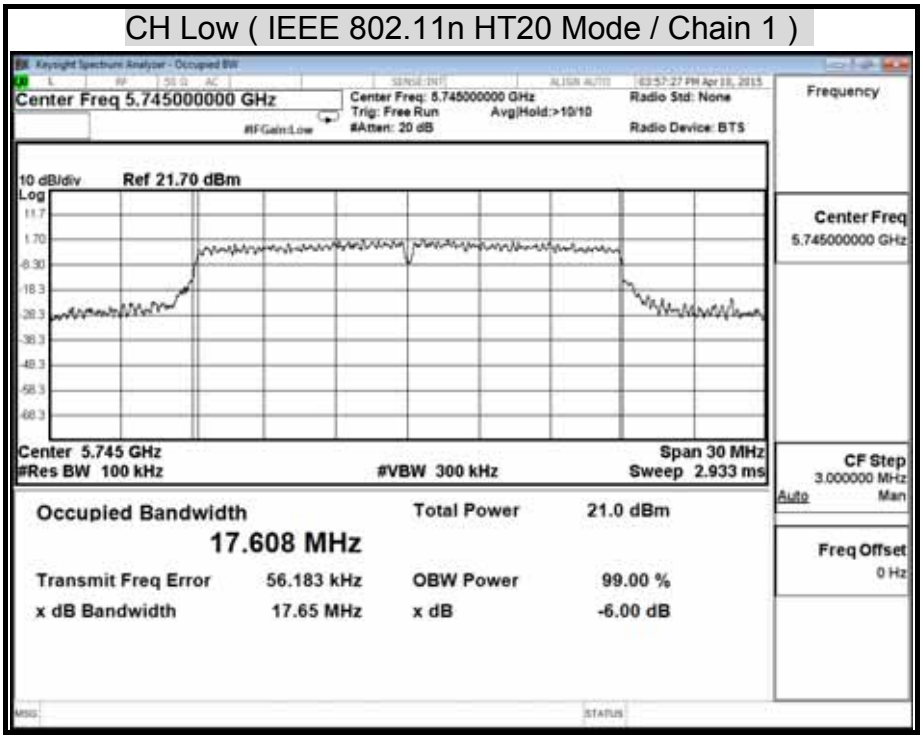


CH High (IEEE 802.11n HT20 Mode / Chain 0)

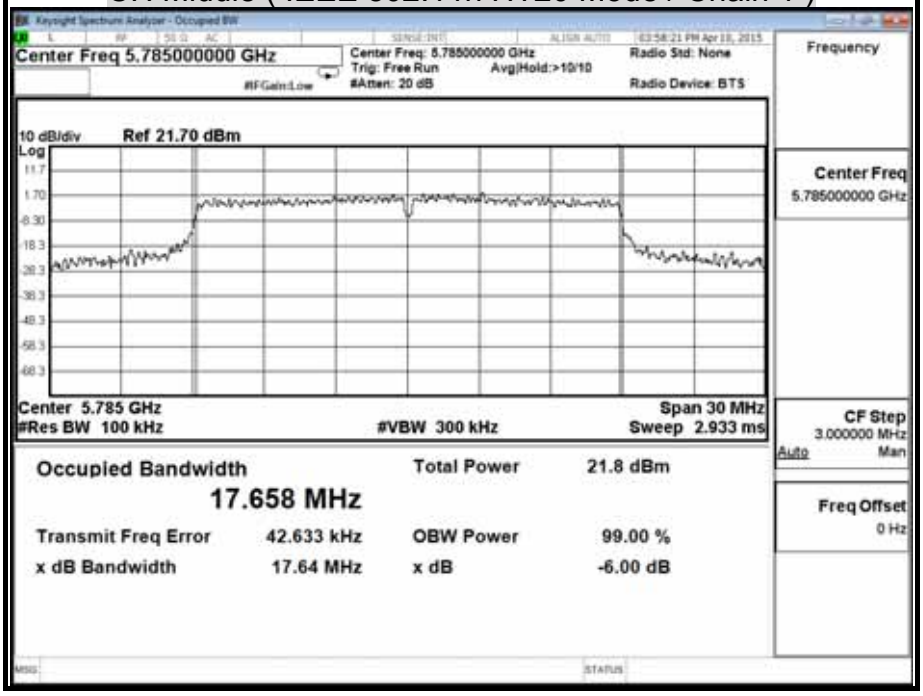


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

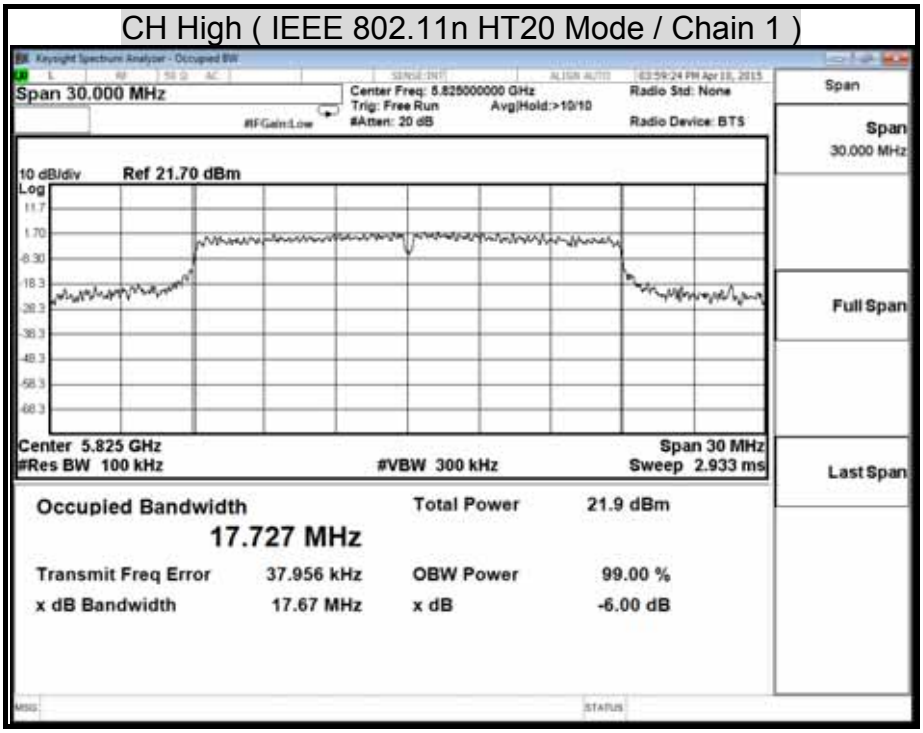
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

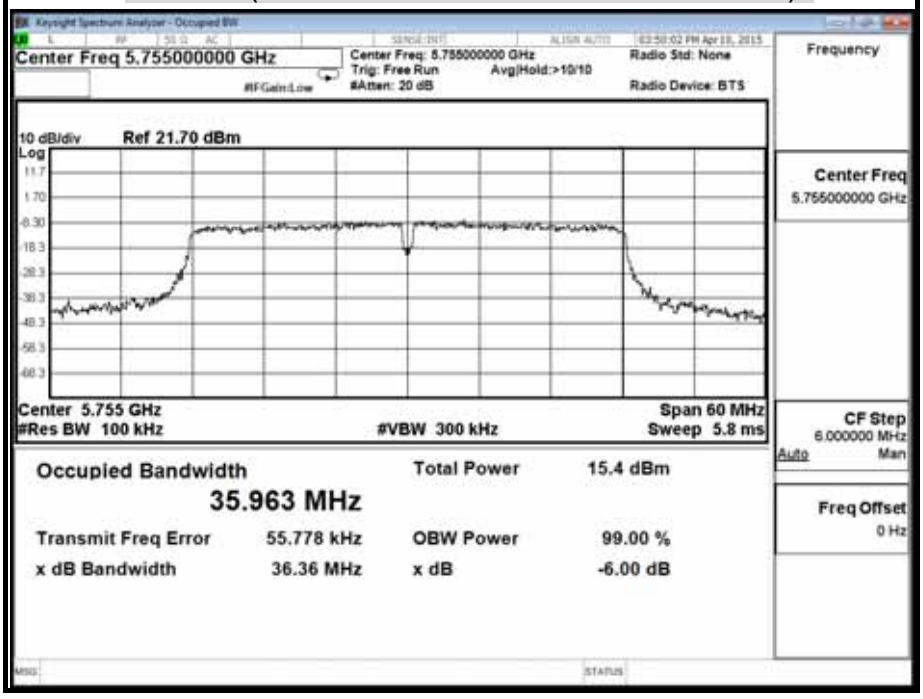


CH High (IEEE 802.11n HT20 Mode / Chain 1)

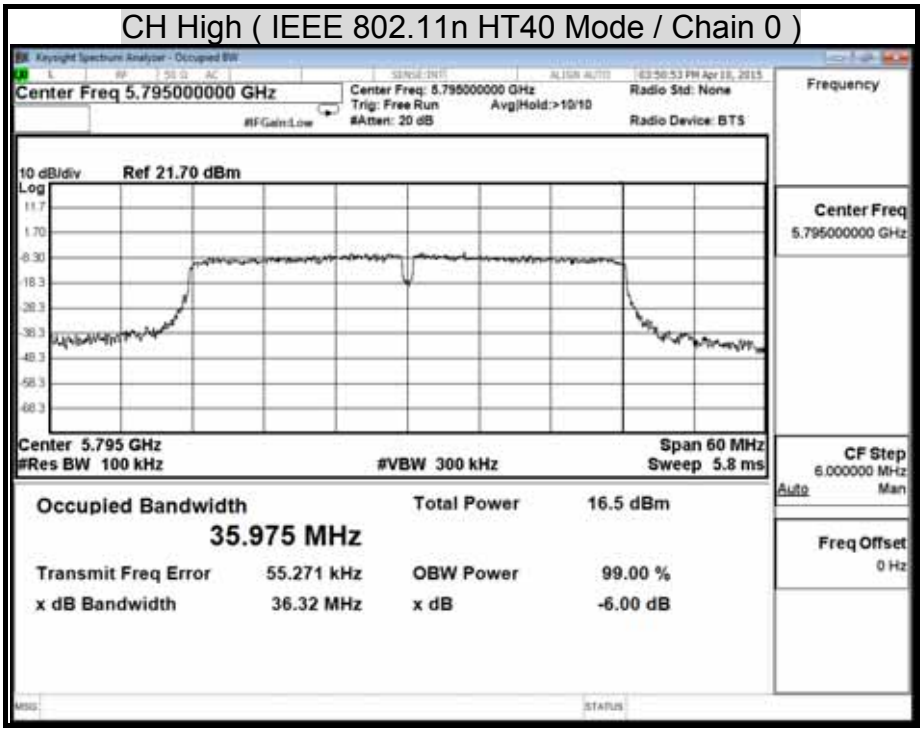


Test Mode: IEEE 802.11n HT 40 MHz mode / 5720 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 0)

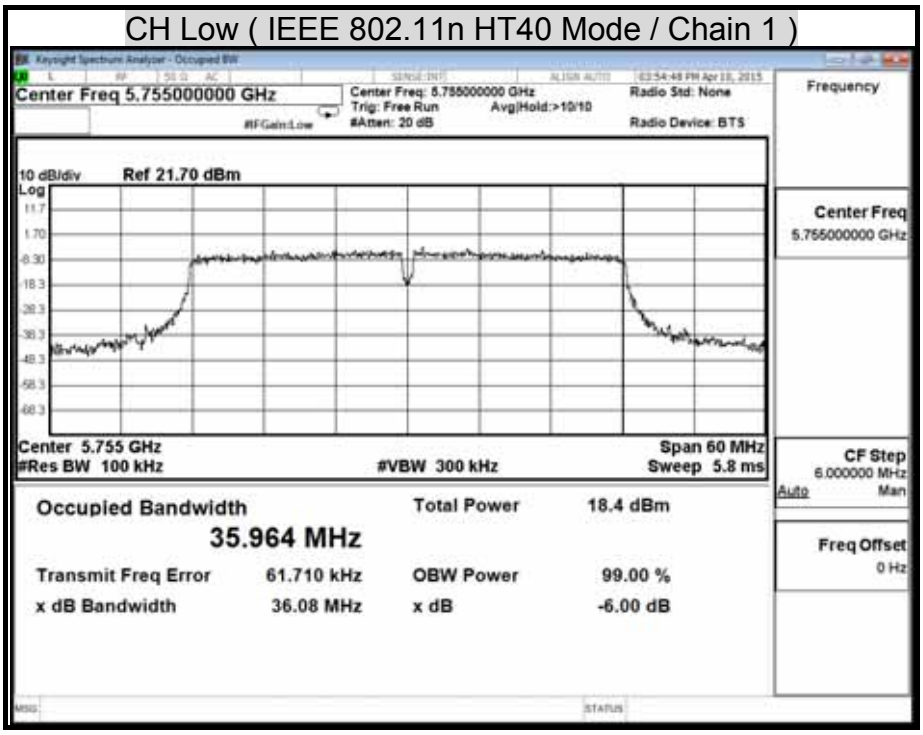


CH High (IEEE 802.11n HT40 Mode / Chain 0)

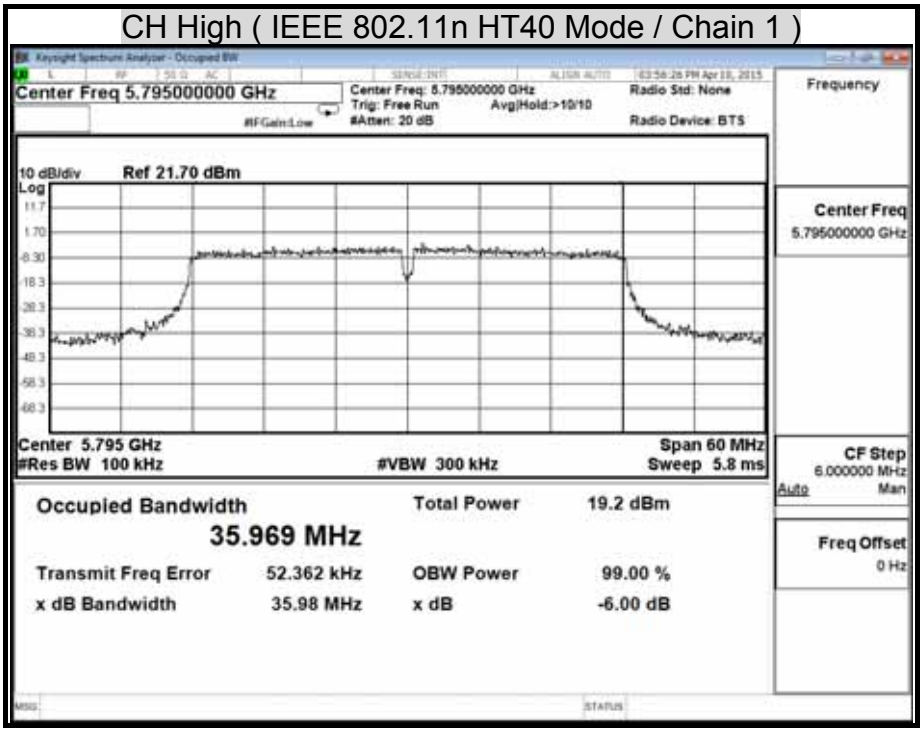


Test Mode: IEEE 802.11n HT 40 MHz mode / 5720 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 1)

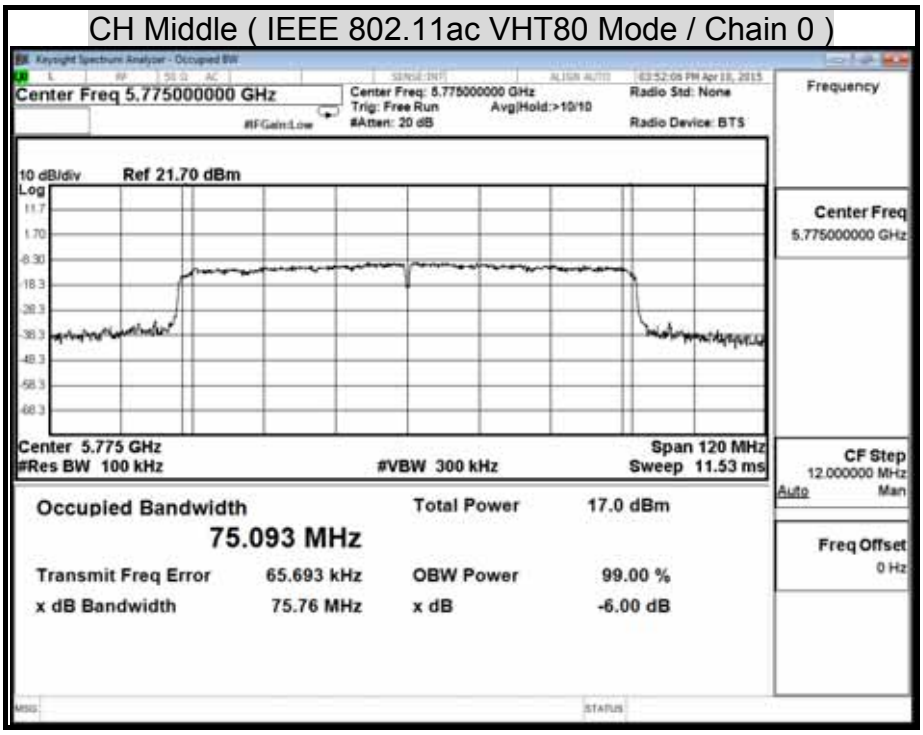


CH High (IEEE 802.11n HT40 Mode / Chain 1)



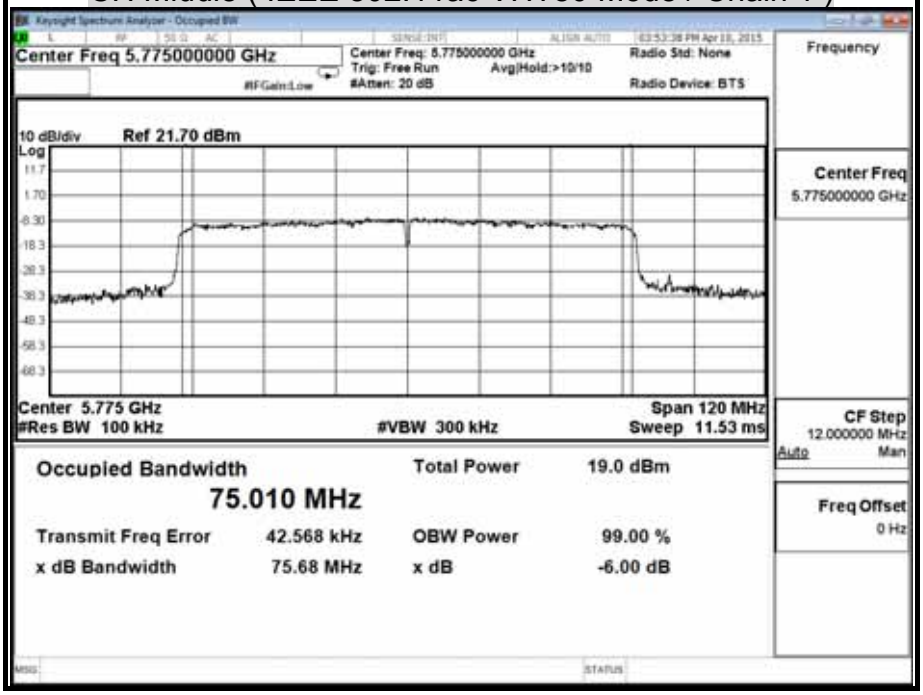
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



7.3 MAXIMUM CONDUCTED OUTPUT POWER

LIMITS

§ 15.407(a)

(1) For the band 5.15-5.25 GHz.

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

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

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

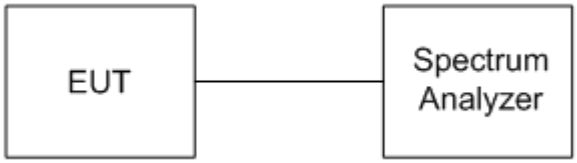
(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the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

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	JAN. 23, 2016

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

TEST SETUP



TEST PROCEDURE

1. Set span to encompass the entire 26-dB emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.
4. Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Sweep time = auto.
6. Detector = RMS (*i.e.*, power averaging), if available. Otherwise, use sample detector mode.
7. If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (*i.e.,* with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
8. Trace average at least 100 traces in power averaging (*i.e.,* RMS) mode.
9. Compute power by integrating the spectrum across the 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW (or, alternatively, the entire 99% occupied bandwidth) of the spectrum.

TEST RESULTS

IEEE 802.11a Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5180	16.14	30.00	PASS
Middle	5200	16.92	30.00	PASS
High	5240	17.05	30.00	PASS

IEEE 802.11a Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	5745	15.02	30.00	PASS
Middle	5785	15.60	30.00	PASS
High	5825	16.23	30.00	PASS

Remark:

1. *At finial test to get the worst-case emission at 6Mbps.*
2. *The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT20 Mode / 5150 ~ 5250MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	5180	14.07	10.64	15.70	29.79	PASS
Middle	5200	14.46	11.20	16.14	29.79	PASS
High	5240	16.03	11.98	17.47	29.79	PASS

IEEE 802.11n HT20 Mode / 5725 ~ 5850MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	5745	15.63	12.58	17.38	29.79	PASS
Middle	5785	16.35	13.82	18.28	29.79	PASS
High	5825	16.18	13.76	18.15	29.79	PASS

Remark:

1. *At finial test to get the worst-case emission at 13Mbps.*
2. *The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11n HT40 Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	5190	9.49	5.90	11.07	29.79	PASS
Middle	5210	10.33	6.16	11.74	29.79	PASS
High	5230	11.66	6.64	12.85	29.79	PASS

IEEE 802.11n HT40 Mode / 5725 ~ 5850 MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Low	5755	13.21	10.33	15.01	29.79	PASS
High	5795	13.20	10.92	15.22	29.79	PASS

Remark:

1. *At finial test to get the worst-case emission at 27Mbps.*
2. *The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

IEEE 802.11ac VHT80 Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Middle	5210	11.39	6.99	12.74	29.79	PASS

IEEE 802.11ac VHT80 Mode / 5725 ~ 5850 MHz

Channel	Channel Frequency (MHz)	Peak Power (dBm)			Peak Power Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Total		
Middle	5775	13.87	12.27	16.15	29.79	PASS

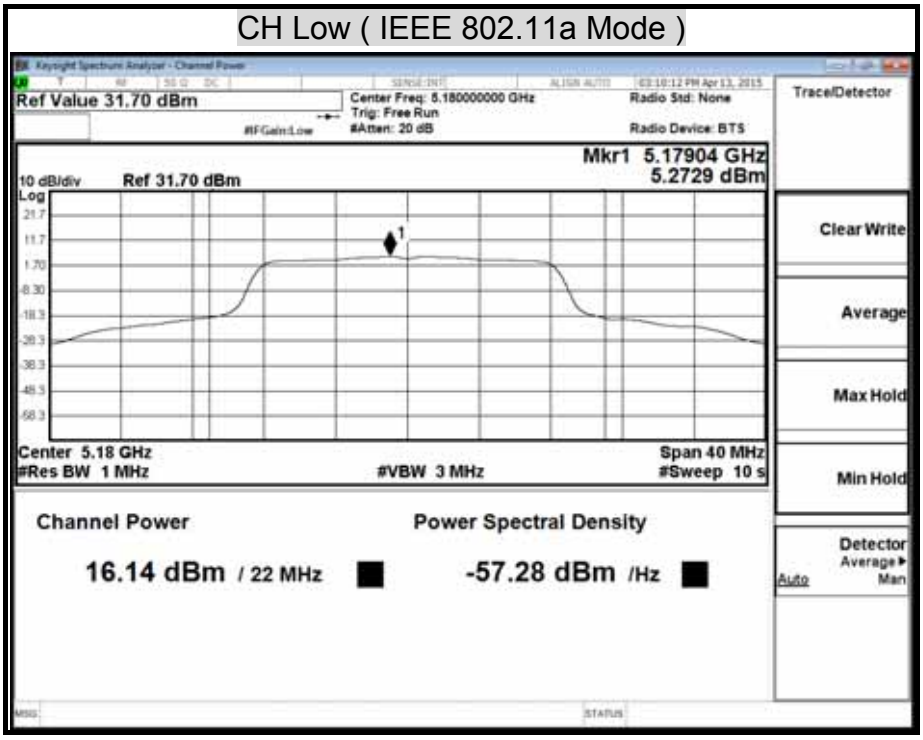
Remark:

1. *At finial test to get the worst-case emission at 117Mbps.*
2. *The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.*

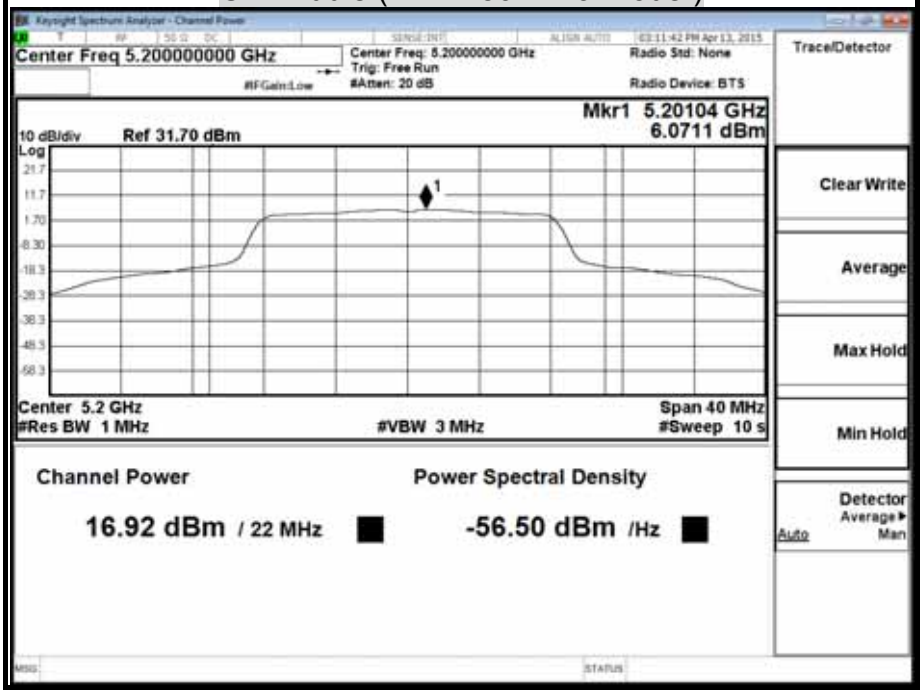
MAXIMUM CONDUCTED OUTPUT POWER

Test Mode: IEEE 802.11a mode / 5150 ~ 5250MHz

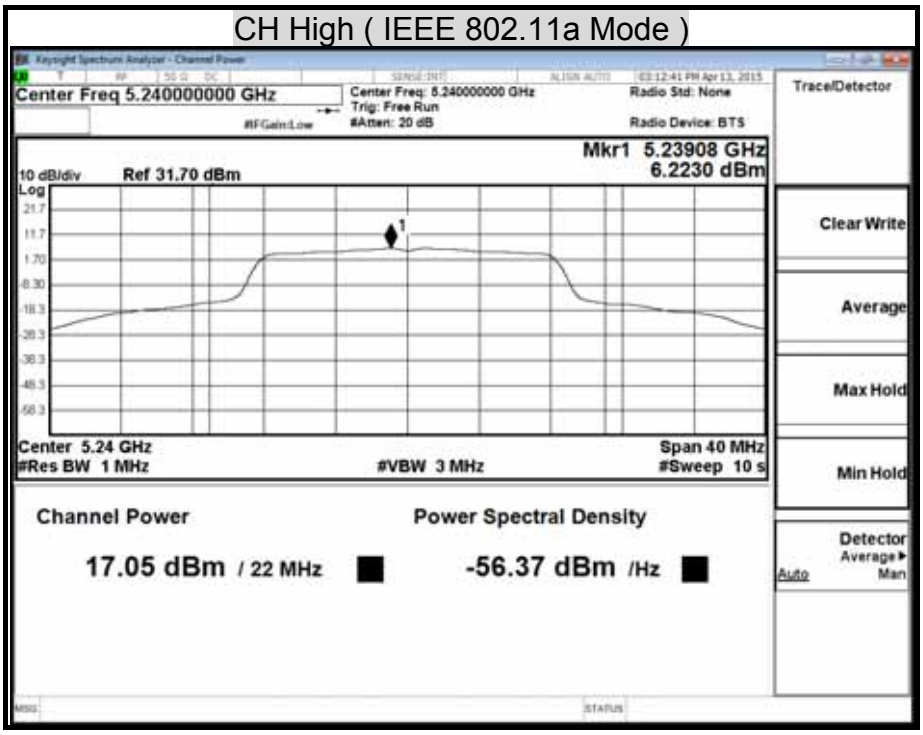
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

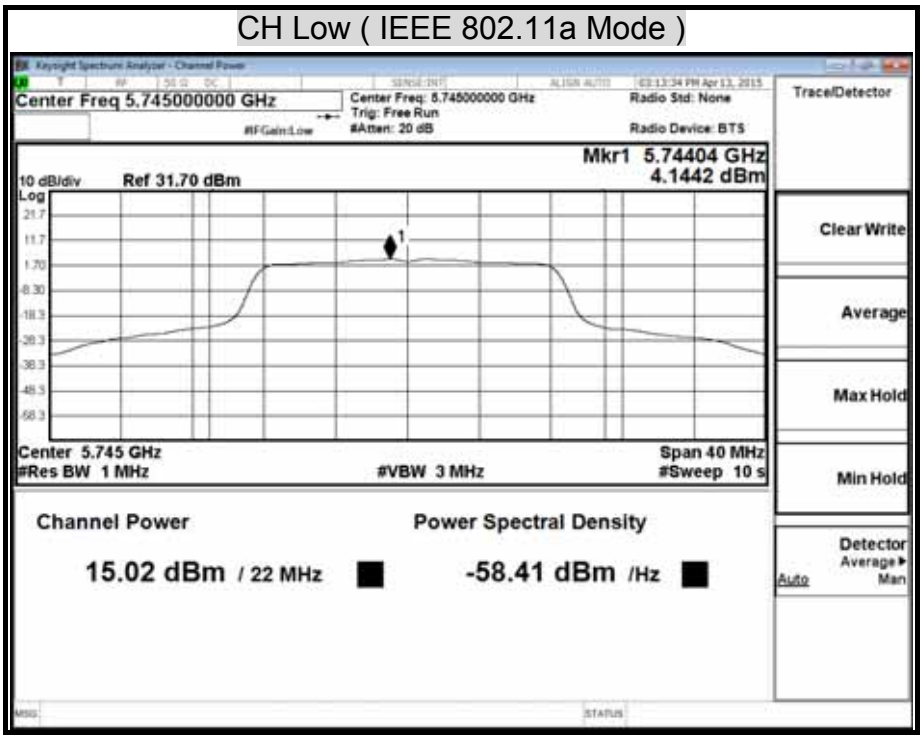


CH High (IEEE 802.11a Mode)

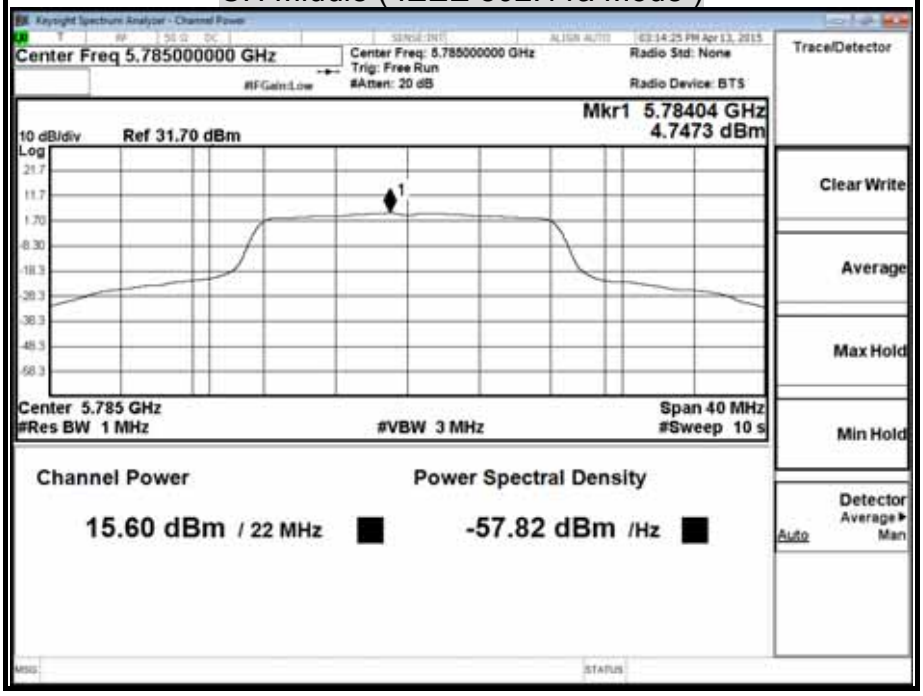


Test Mode: IEEE 802.11a mode / 5725 ~ 5850MHz

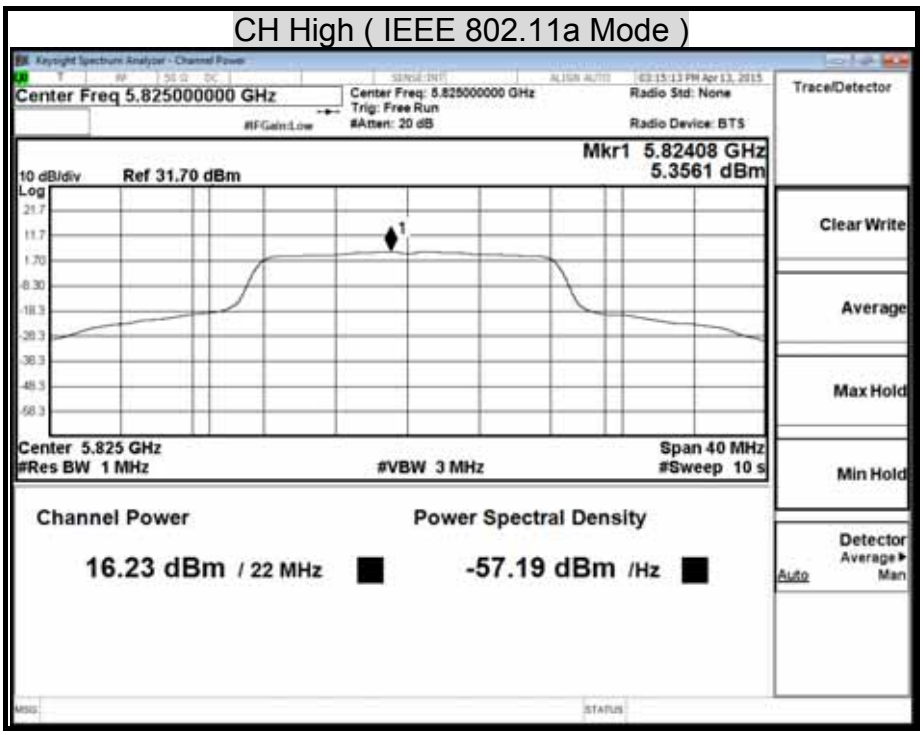
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

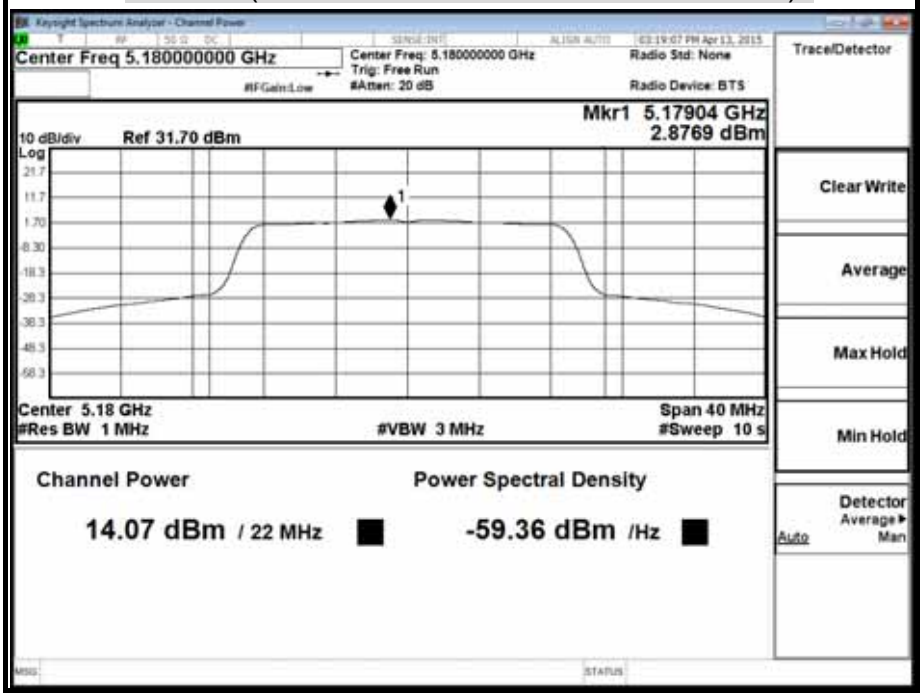


CH High (IEEE 802.11a Mode)

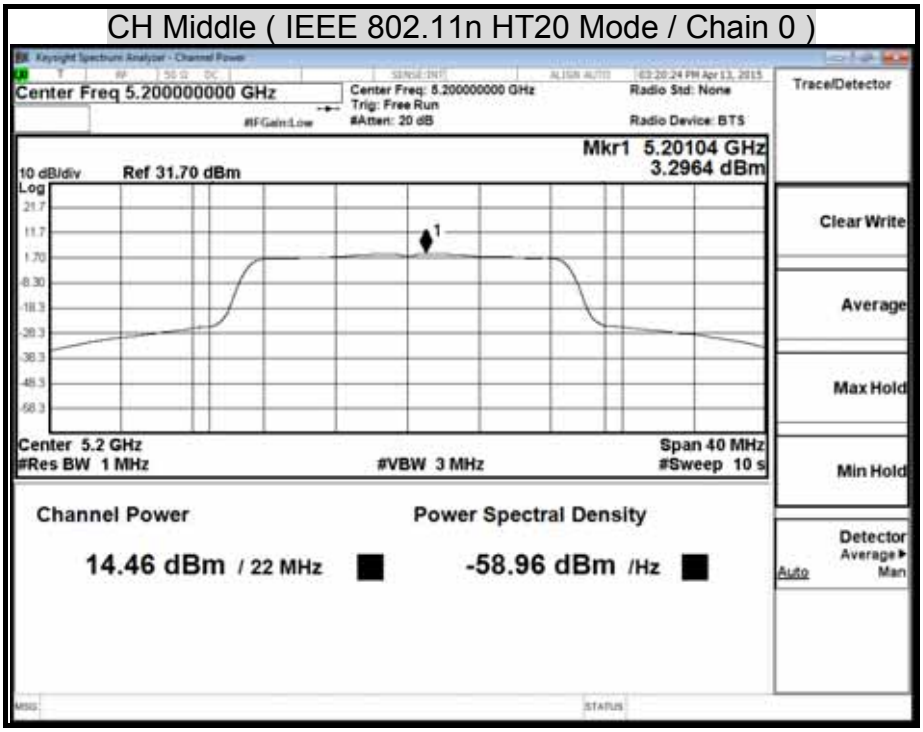


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

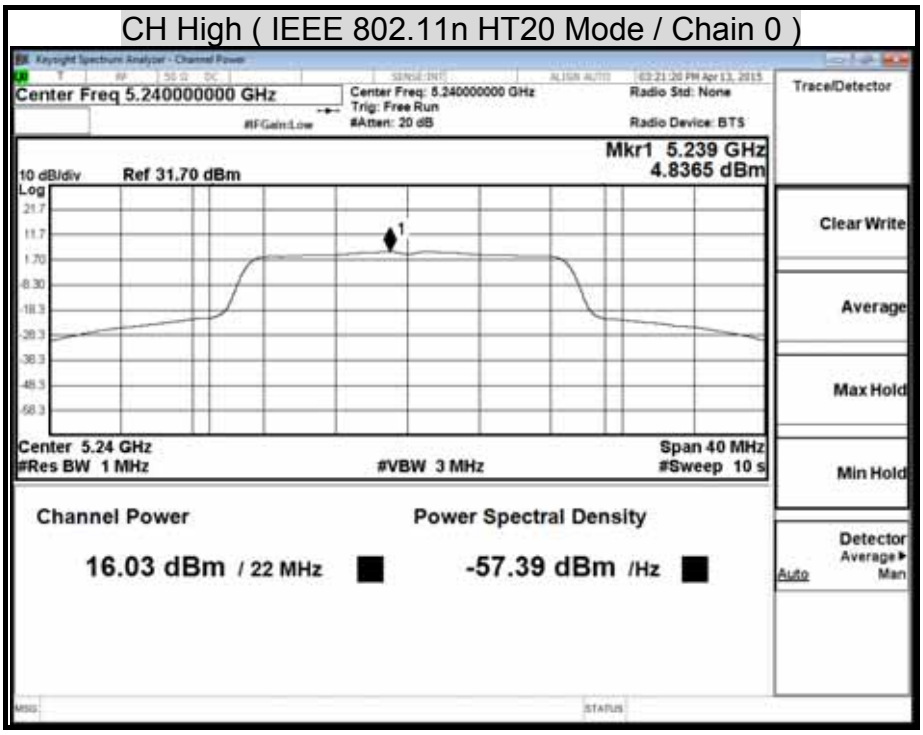
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

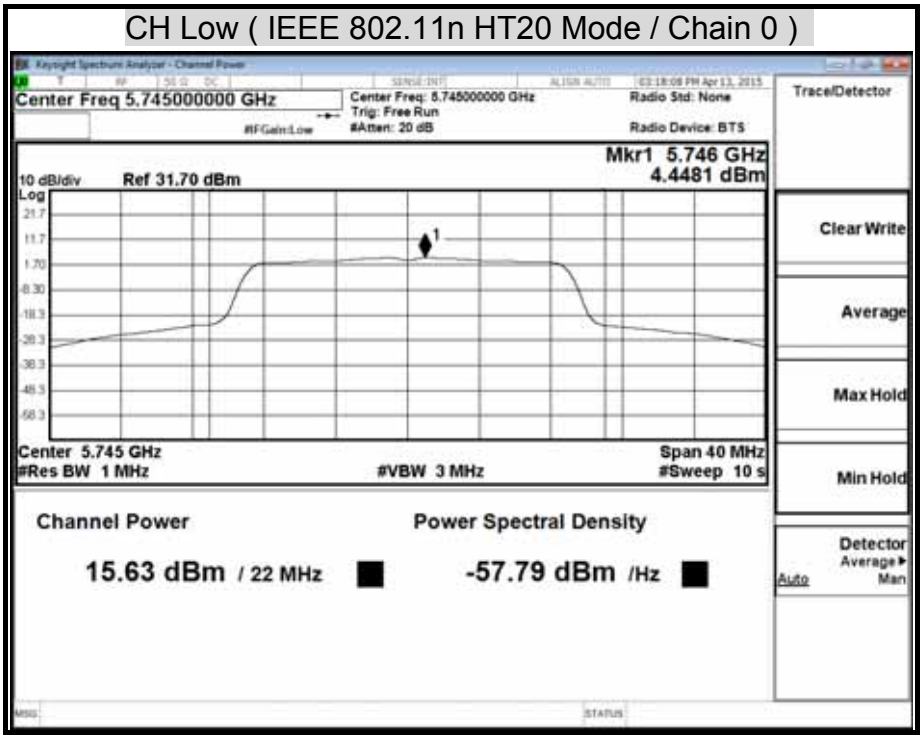


CH High (IEEE 802.11n HT20 Mode / Chain 0)

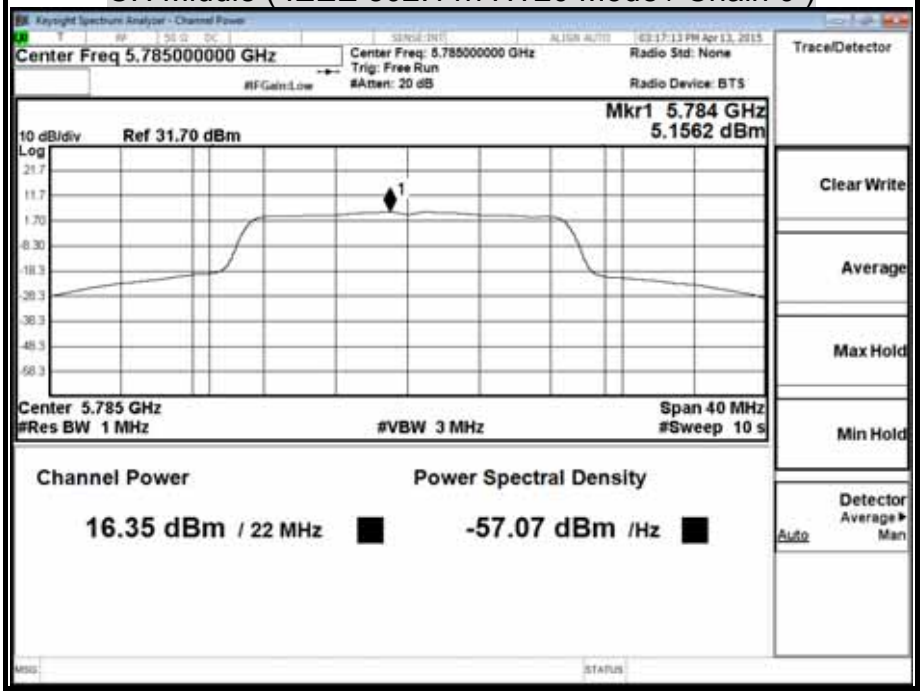


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

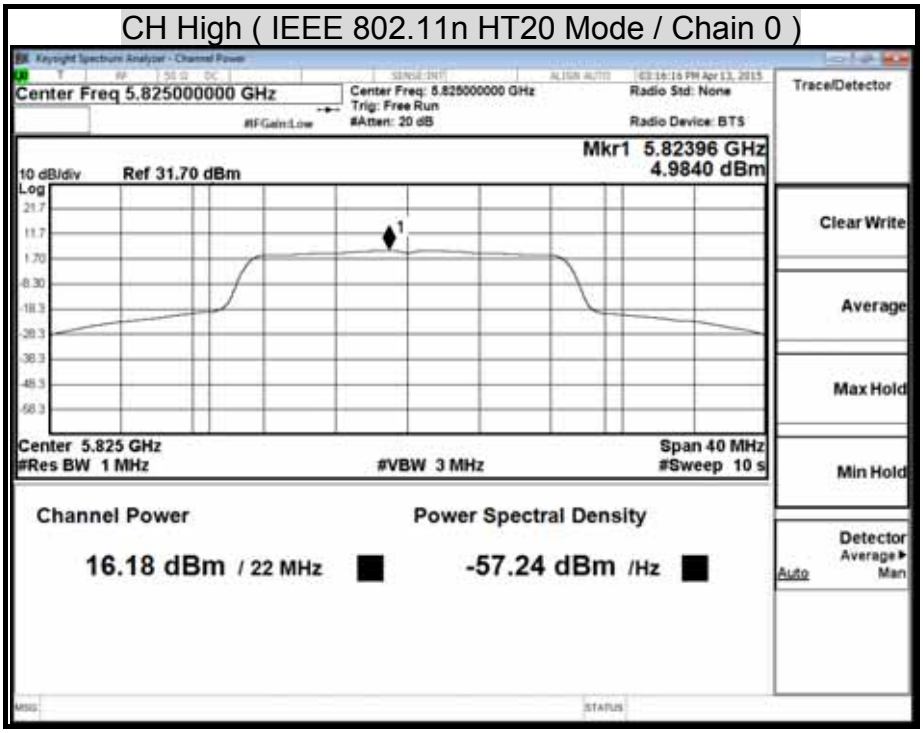
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

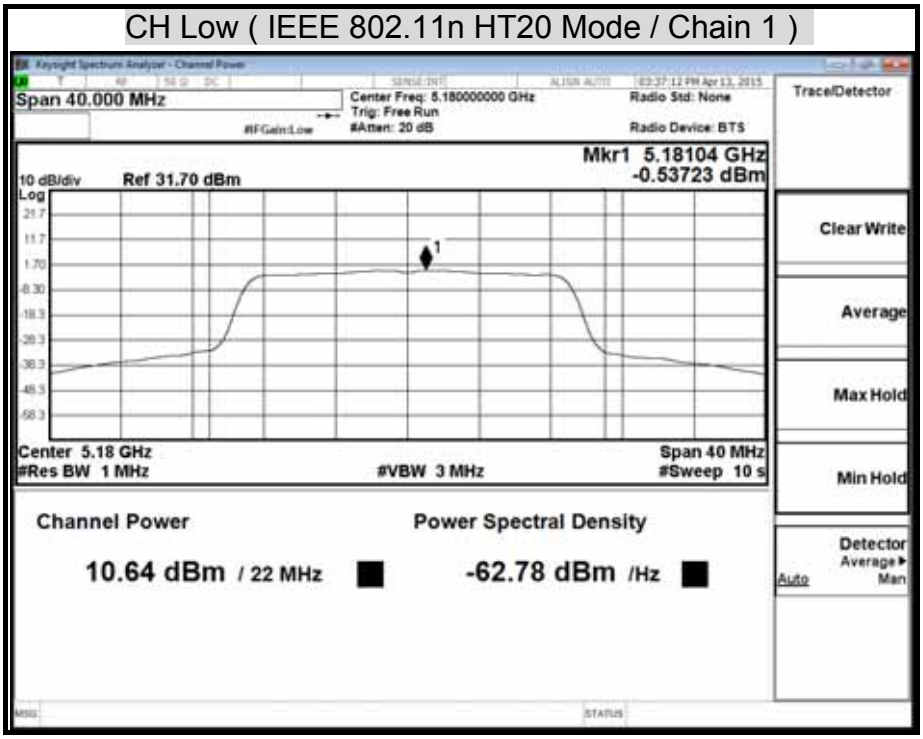


CH High (IEEE 802.11n HT20 Mode / Chain 0)

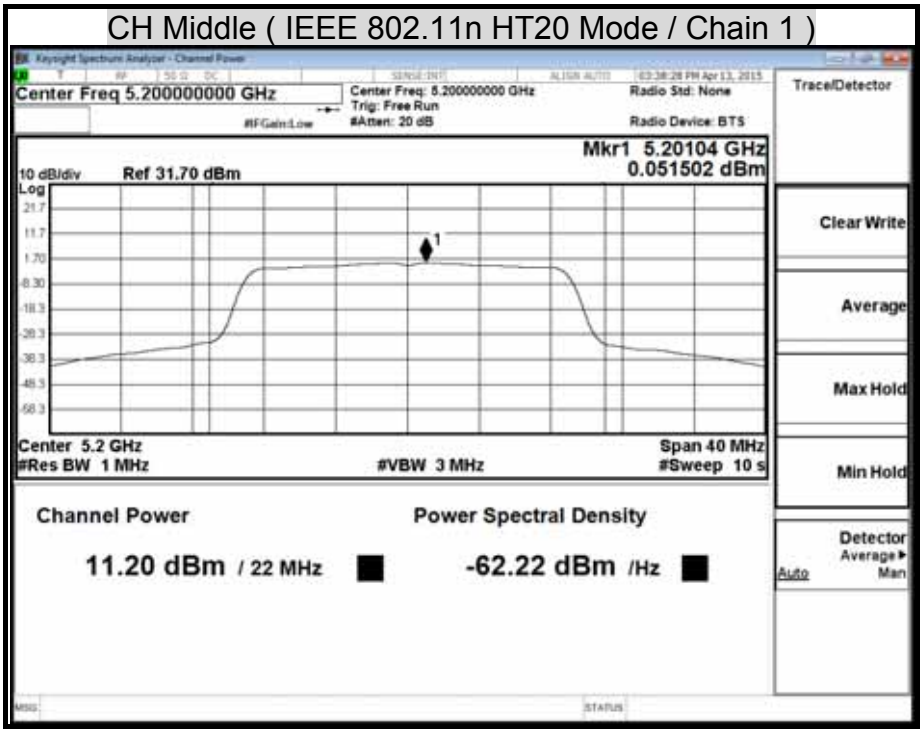


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

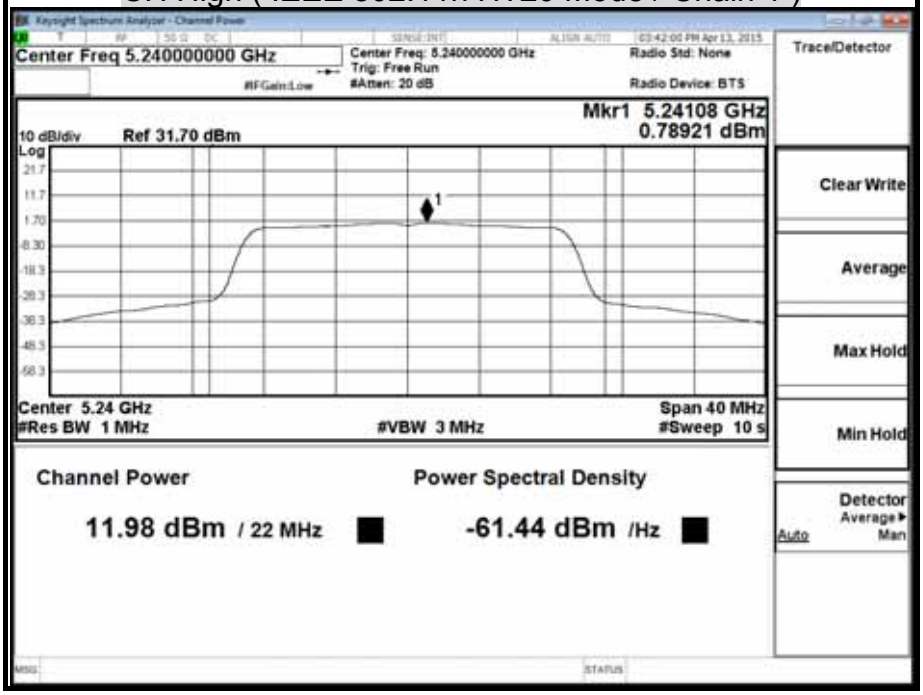
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

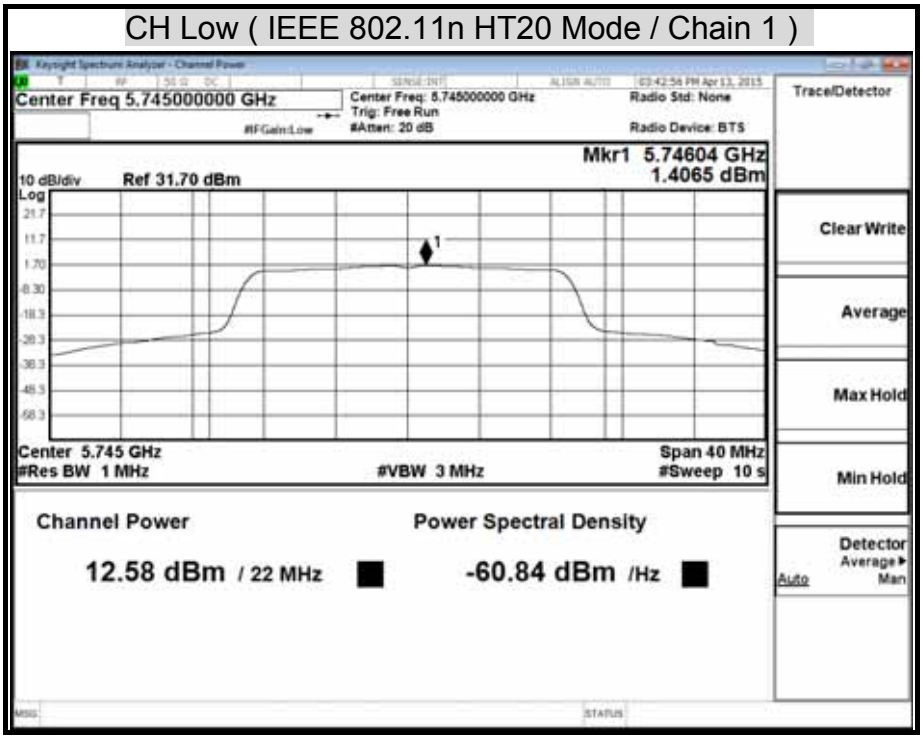


CH High (IEEE 802.11n HT20 Mode / Chain 1)

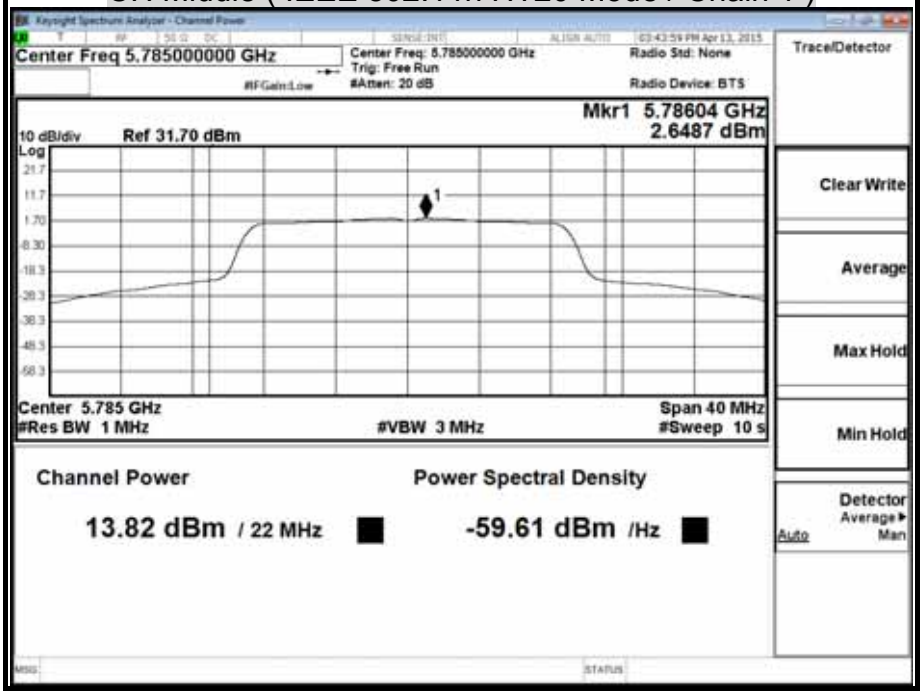


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

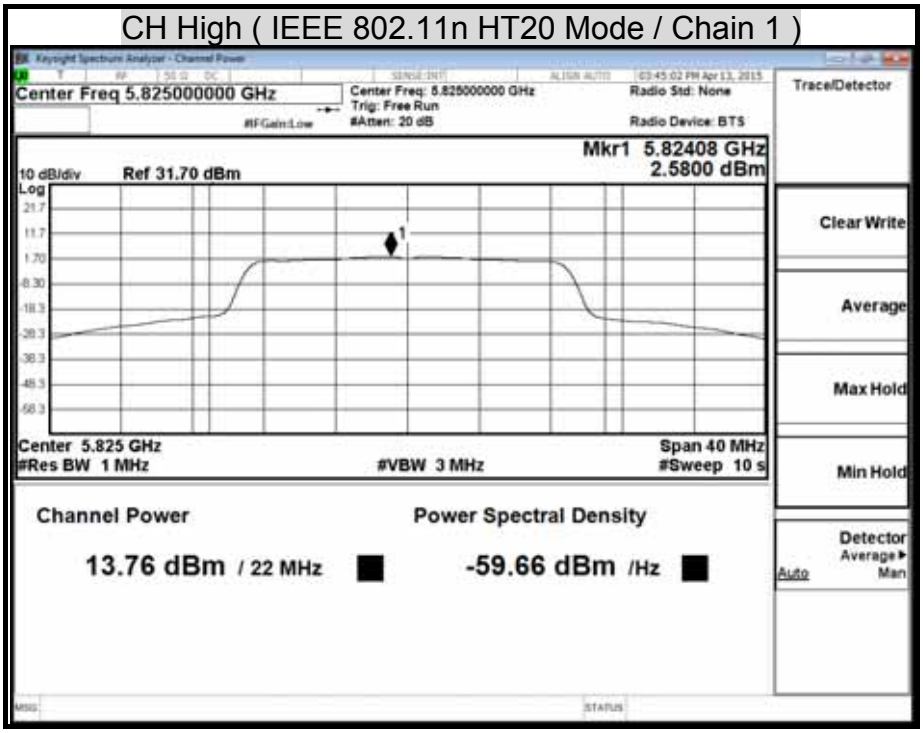
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

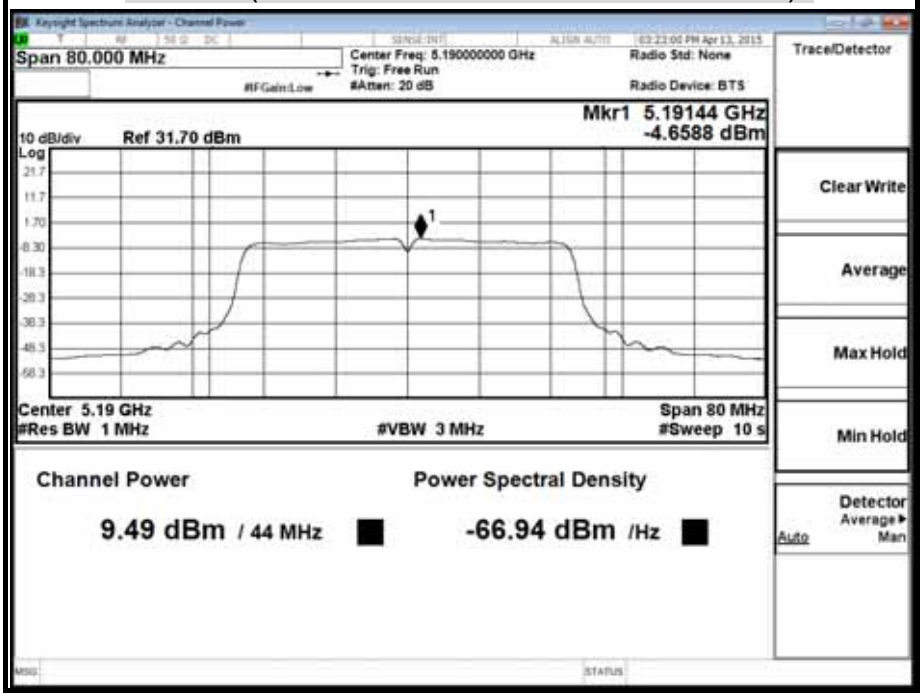


CH High (IEEE 802.11n HT20 Mode / Chain 1)

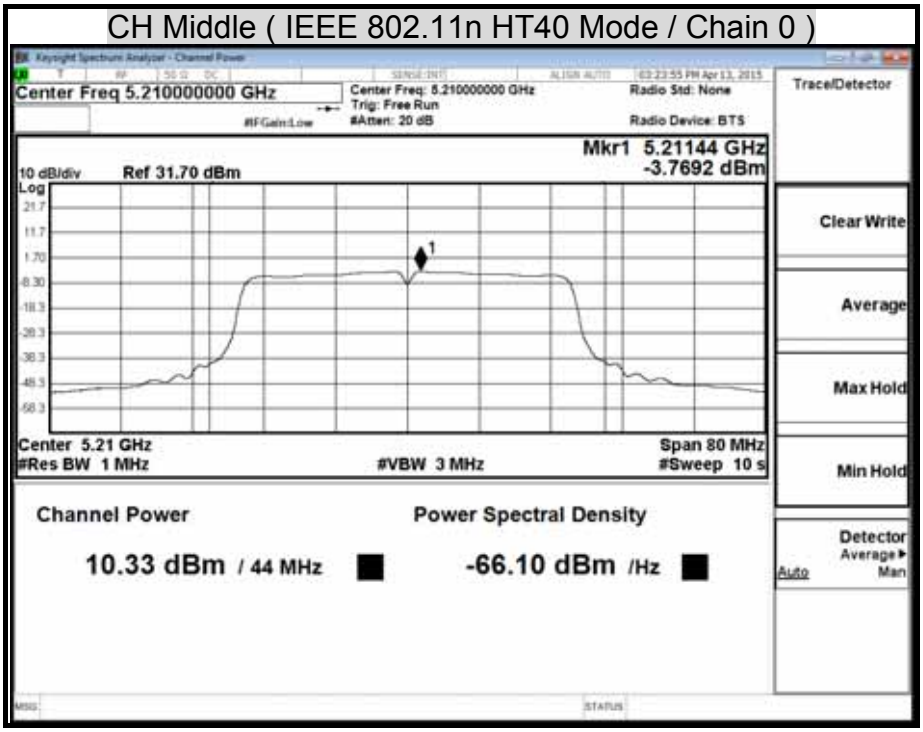


Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

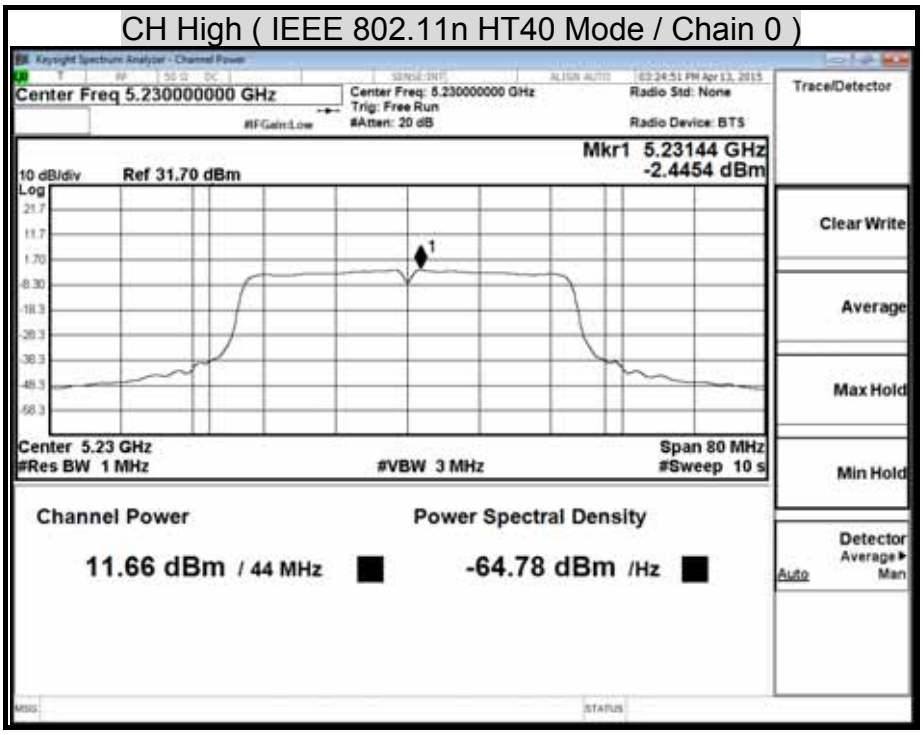
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

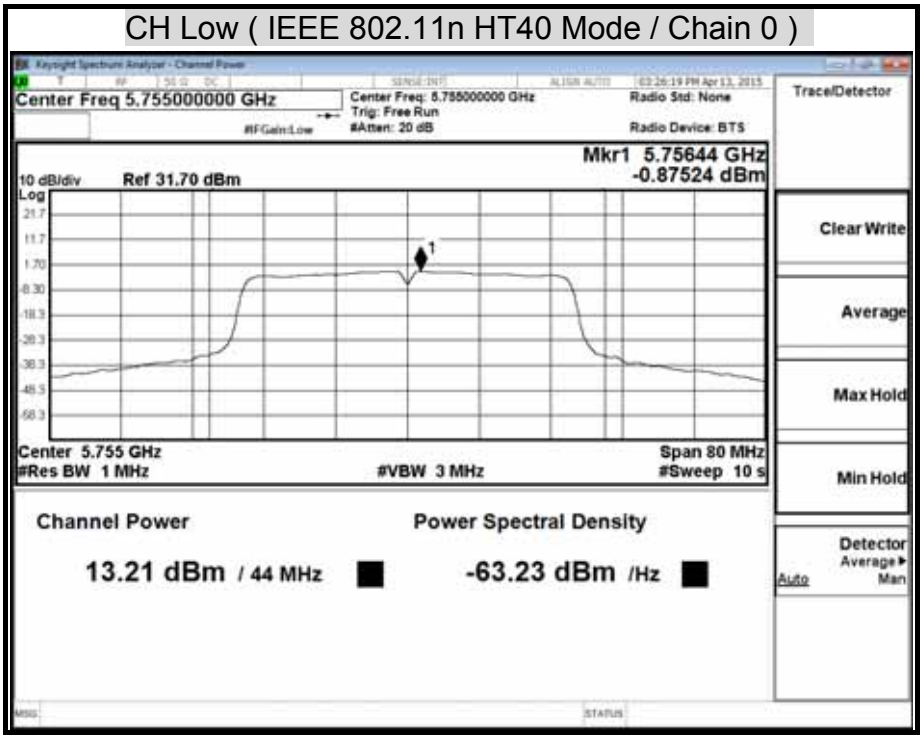


CH High (IEEE 802.11n HT40 Mode / Chain 0)

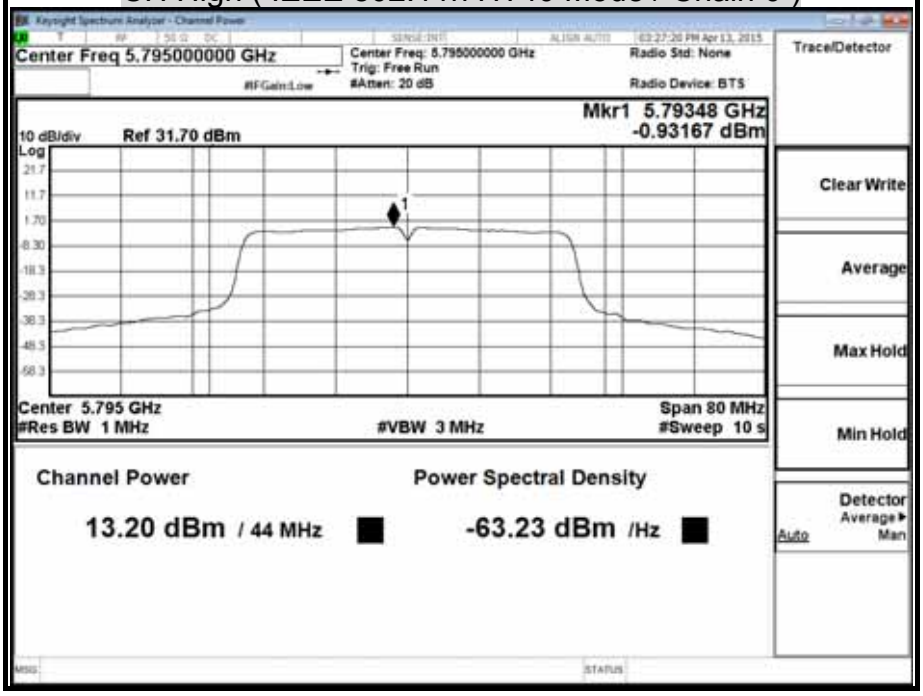


Test Mode: IEEE 802.11n HT 40 MHz mode / 5725 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 0)



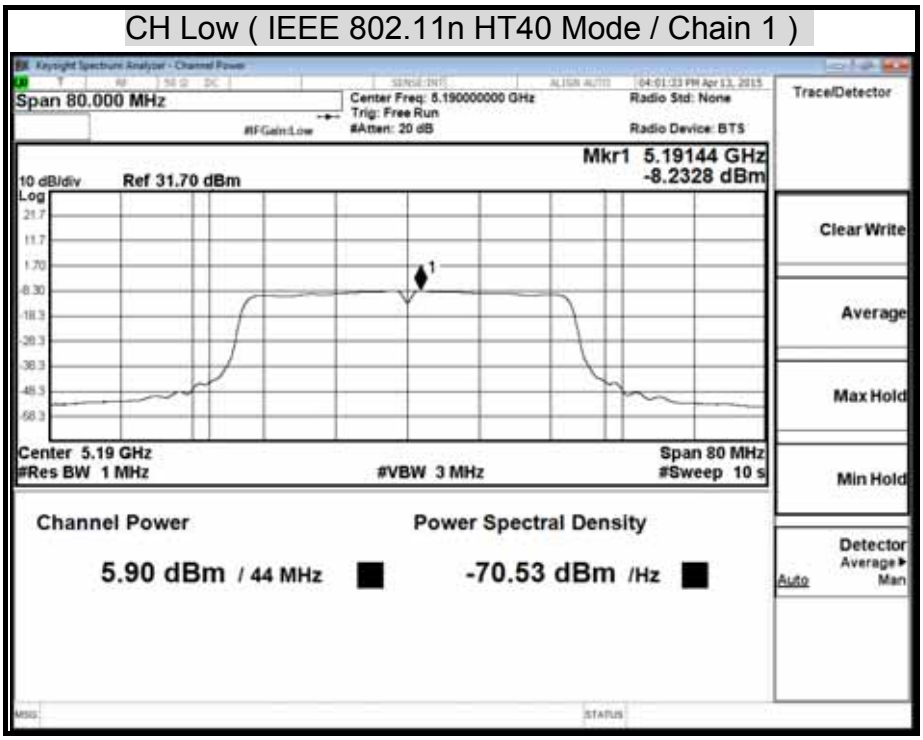
CH High (IEEE 802.11n HT40 Mode / Chain 0)



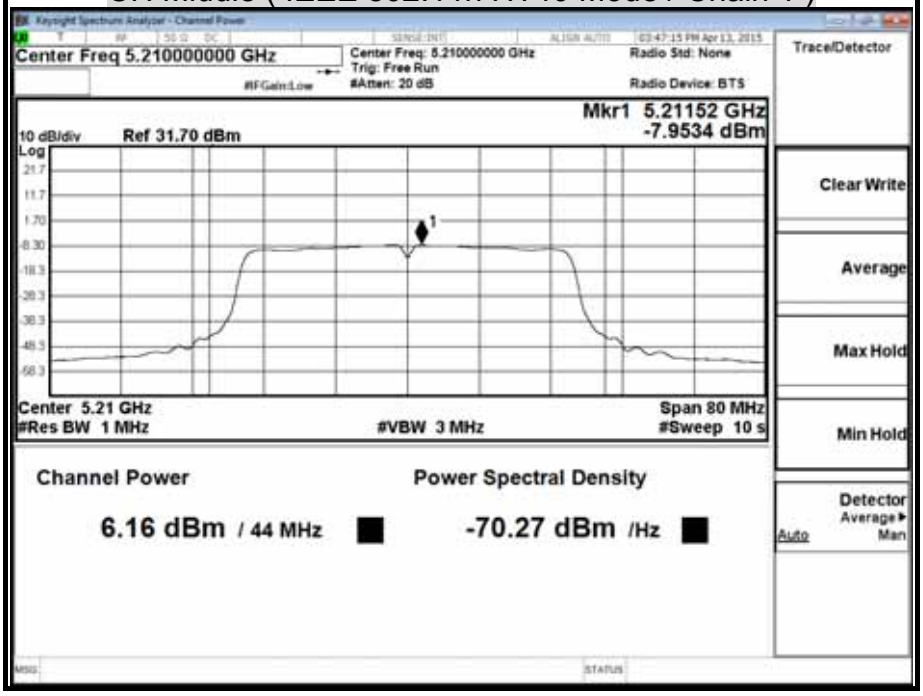
‘

Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

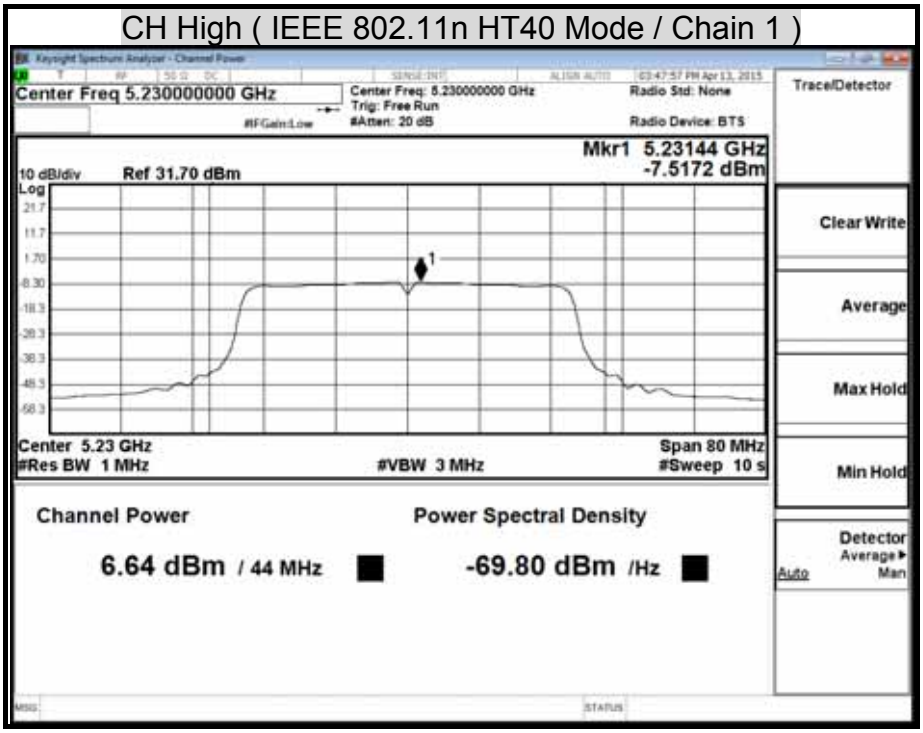
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

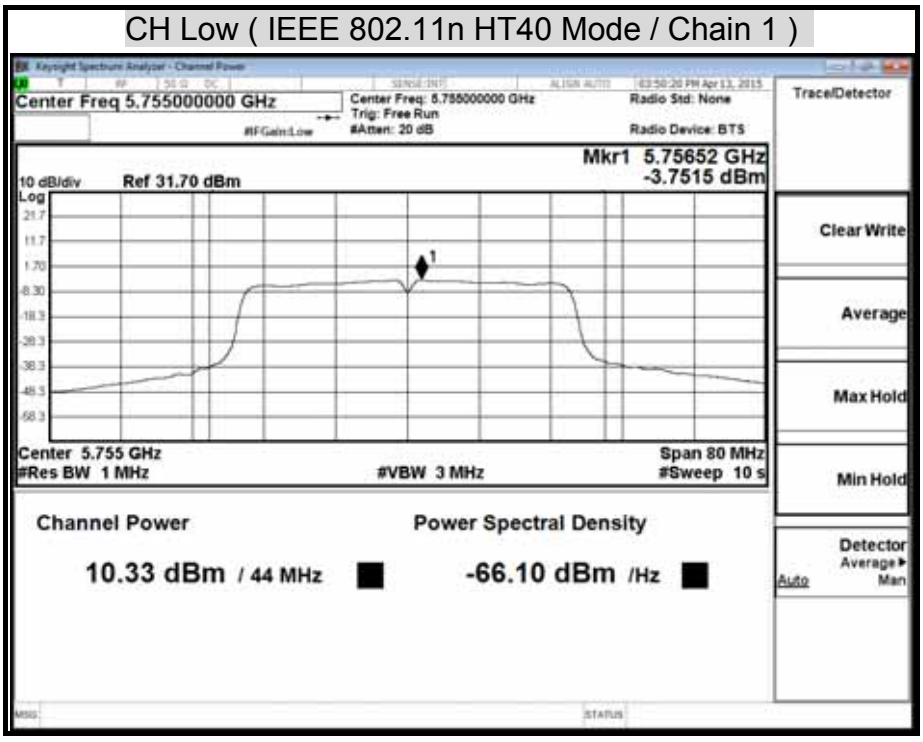


CH High (IEEE 802.11n HT40 Mode / Chain 1)

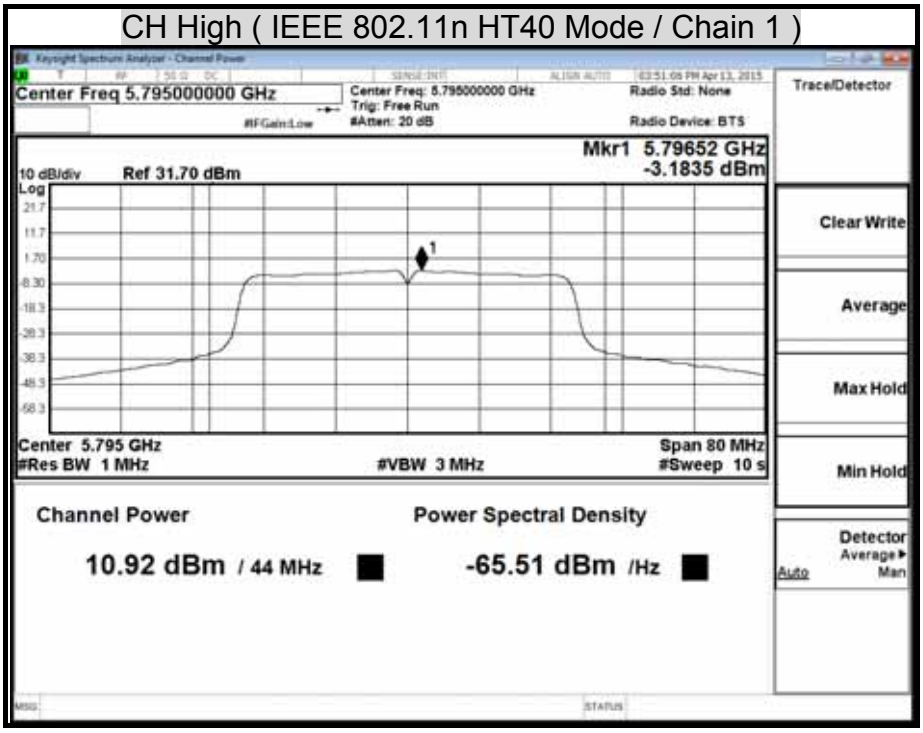


Test Mode: IEEE 802.11n HT 40 MHz mode / 5725 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 1)

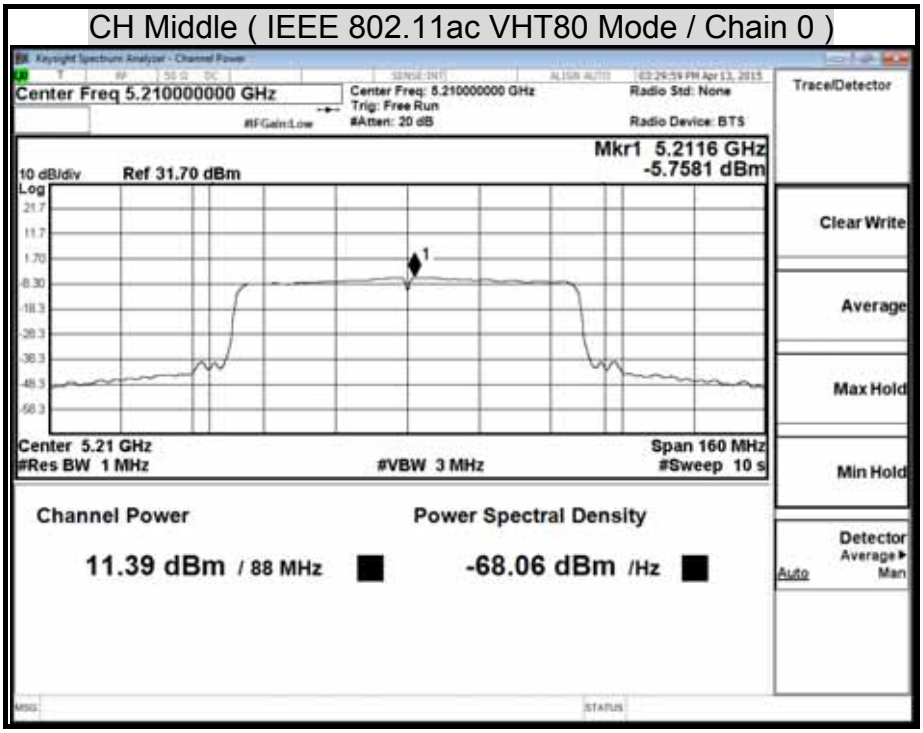


CH High (IEEE 802.11n HT40 Mode / Chain 1)



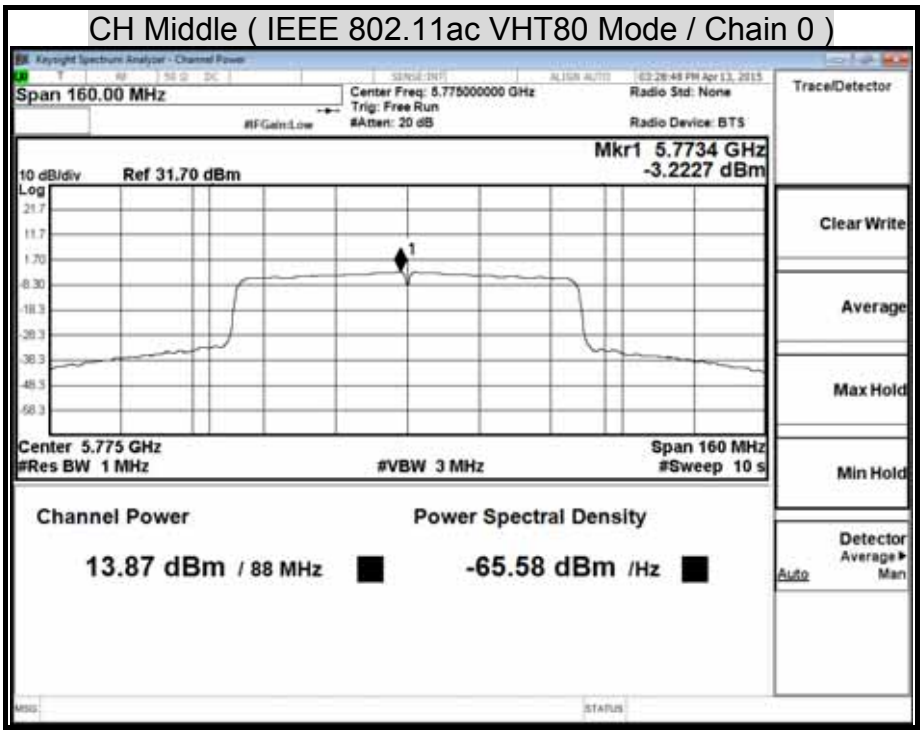
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



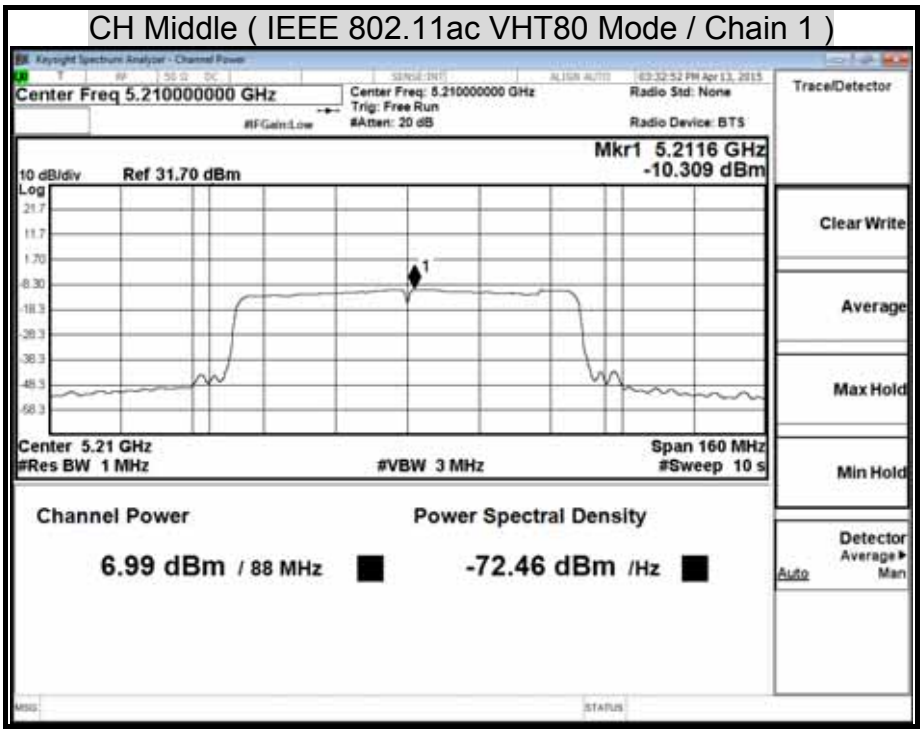
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



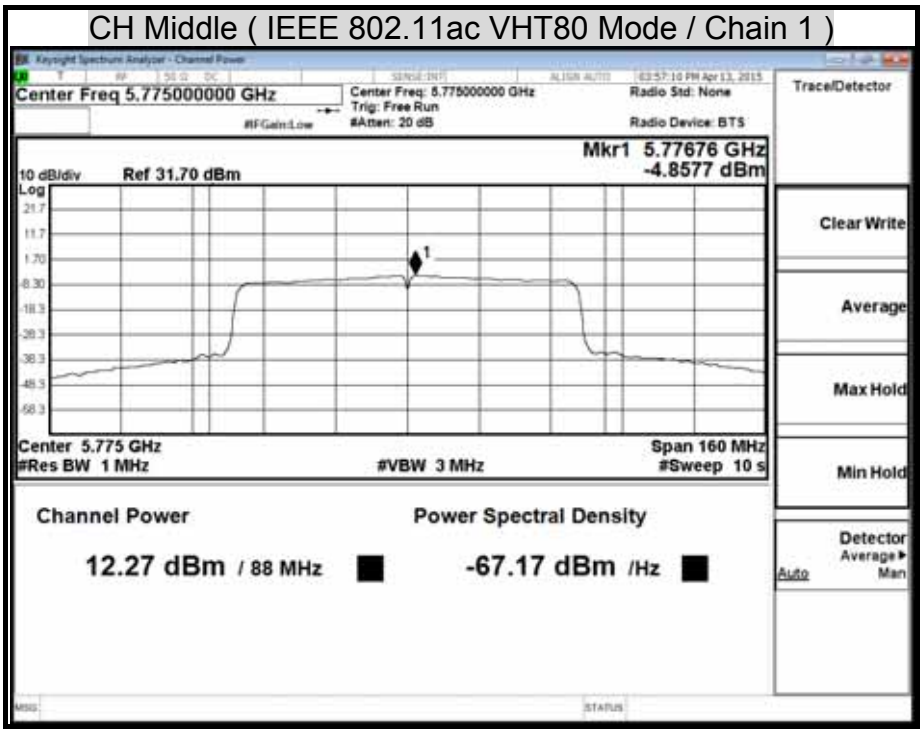
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



7.4 PEAK POWER SPECTRAL DENSITY

LIMITS

§ 15.407 (a)

(1) For the band 5.15-5.25 GHz.

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

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

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

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

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	JAN. 23, 2016

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

TEST SETUP

TEST PROCEDURE

1. Set span to encompass the entire 26-dB emission bandwidth (EBW) (or, alternatively, the entire 99% occupied bandwidth) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.
4. Number of points in sweep ≥ 2 Span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
5. Sweep time = auto.
6. Detector = RMS (*i.e.*, power averaging), if available. Otherwise, use sample detector mode.
7. If transmit duty cycle < 98 percent, use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (*i.e.,* with no off intervals) or at duty cycle ≥ 98 percent, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
8. Trace average at least 100 traces in power averaging (*i.e.,* RMS) mode.
9. Use the peak search function on the instrument to find the peak of the spectrum.

TEST RESULTS

IEEE 802.11a Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5180	5.18	17.00	-11.82	PASS
Middle	5200	5.20		-11.80	PASS
High	5240	5.24		-11.76	PASS

IEEE 802.11a Mode / 5725 ~ 5850 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)	PPSD Total (dBm)	BWCF	Limit (dBm)	Margin (dB)	Pass / Fail
Low	5745	4.14	1.13	-3.01	30.00	-28.87	PASS
Middle	5785	4.75	1.74	-3.01		-28.26	PASS
High	5825	5.36	2.35	-3.01		-27.65	PASS

Remark:

1. At finial test to get the worst-case emission at 6Mbps.

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT20 Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Margin (dB)	Pass / Fail
		Chain 0	Chain 1	Total			
Low	5180	2.88	-0.54	4.51	17.00	-12.49	PASS
Middle	5200	3.30	0.05	4.98		-12.02	PASS
High	5240	4.84	0.79	6.28		-10.72	PASS

IEEE 802.11n HT20 Mode / 5725 ~ 5850 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)			BWCF	Limit (dBm)	Margin (dB)	Pass / Fail
		Chain 0	Chain 1	Total				
Low	5745	4.45	1.41	3.19	-3.01	30.00	-26.81	PASS
Middle	5785	5.16	2.65	4.08	-3.01		-25.92	PASS
High	5825	4.98	2.58	3.95	-3.01		-26.05	PASS

Remark:

1. At finial test to get the worst-case emission at 13Mbps

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11n HT40 Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Margin (dB)	Pass / Fail
		Chain 0	Chain 1	Total			
Low	5190	-4.66	-8.23	-3.08	17.00	-20.08	PASS
Middle	5210	-3.77	-7.95	-2.37		-19.37	PASS
High	5230	-2.45	-7.52	-1.27		-18.27	PASS

IEEE 802.11n HT40 Mode / 5725 ~ 5850 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)			BWCF	Limit (dBm)	Margin (dB)	Pass / Fail
		Chain 0	Chain 1	Total				
Low	5755	-0.88	-3.75	-2.08	-3.01	30.00	-32.08	PASS
High	5795	-0.93	-3.18	-1.91	-3.01		-31.91	PASS

Remark:

1. At finial test to get the worst-case emission at 27Mbps

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

IEEE 802.11ac VHT80 Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Margin (dB)	Pass / Fail
		Chain 0	Chain 1	Total			
Middle	5210	-5.76	-10.31	-4.45	17.00	-20.08	PASS

IEEE 802.11ac VHT80 Mode / 5150 ~ 5250 MHz

Channel	Channel Frequency (MHz)	PPSD (dBm)			BWCF	Limit (dBm)	Margin (dB)	Pass / Fail
		Chain 0	Chain 1	Total				
Middle	5775	-3.22	-4.86	-3.96	-3.01	30.00	-33.96	PASS

Remark:

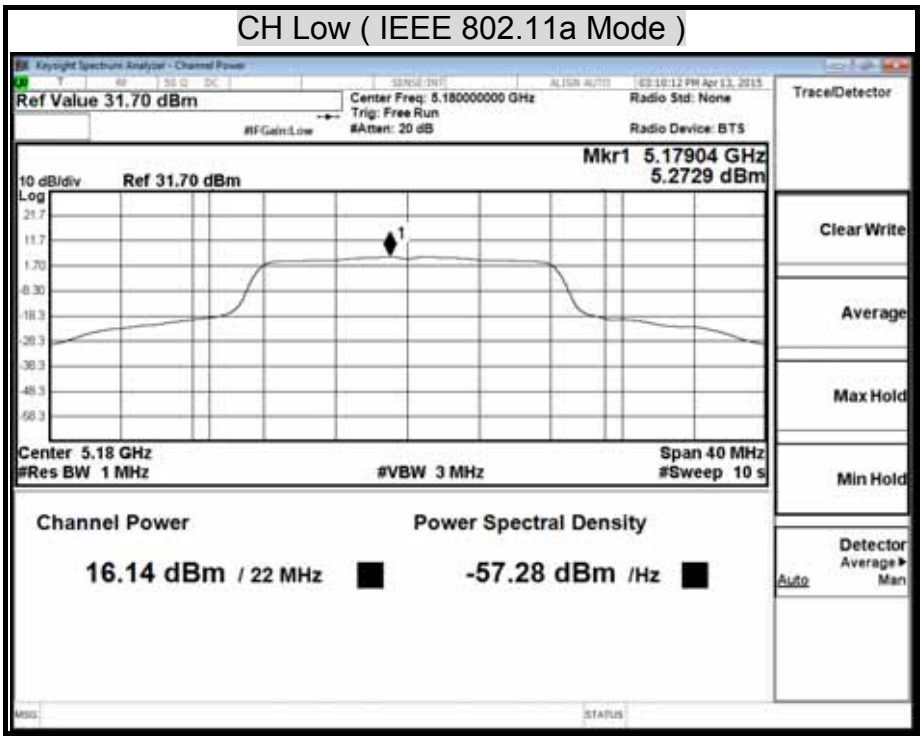
1. At finial test to get the worst-case emission at 117Mbps

2. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

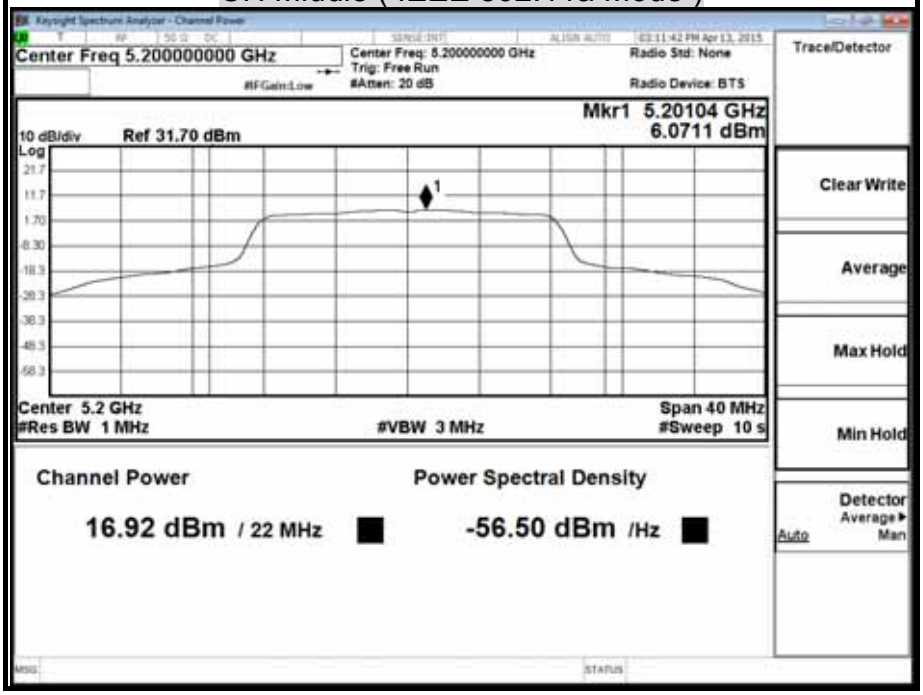
PEAK POWER SPECTRAL DENSITY

Test Mode: IEEE 802.11a mode / 5150 ~ 5250MHz

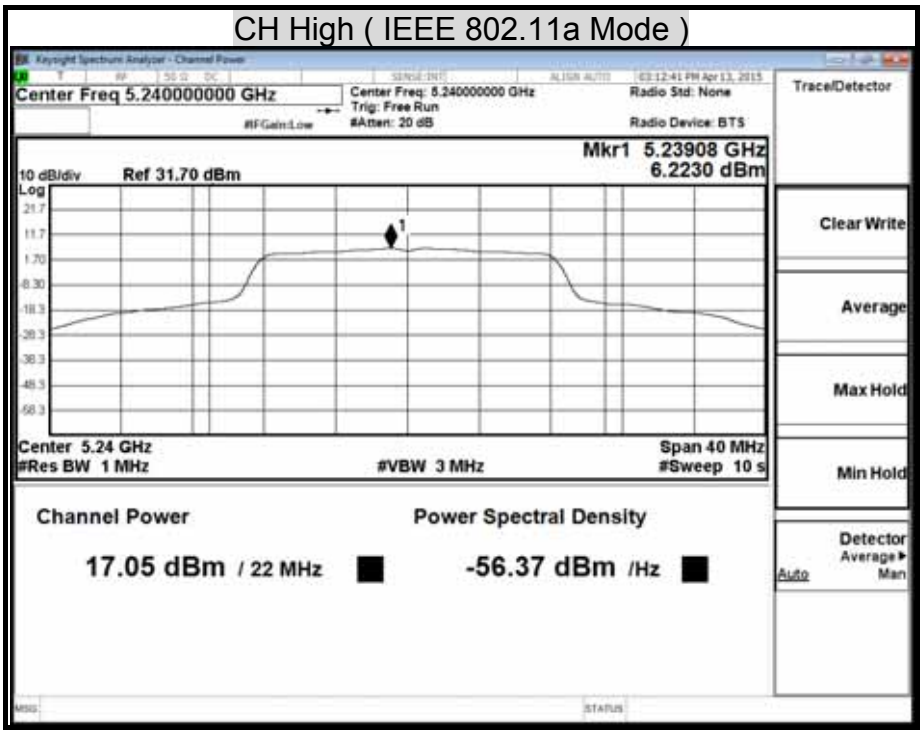
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

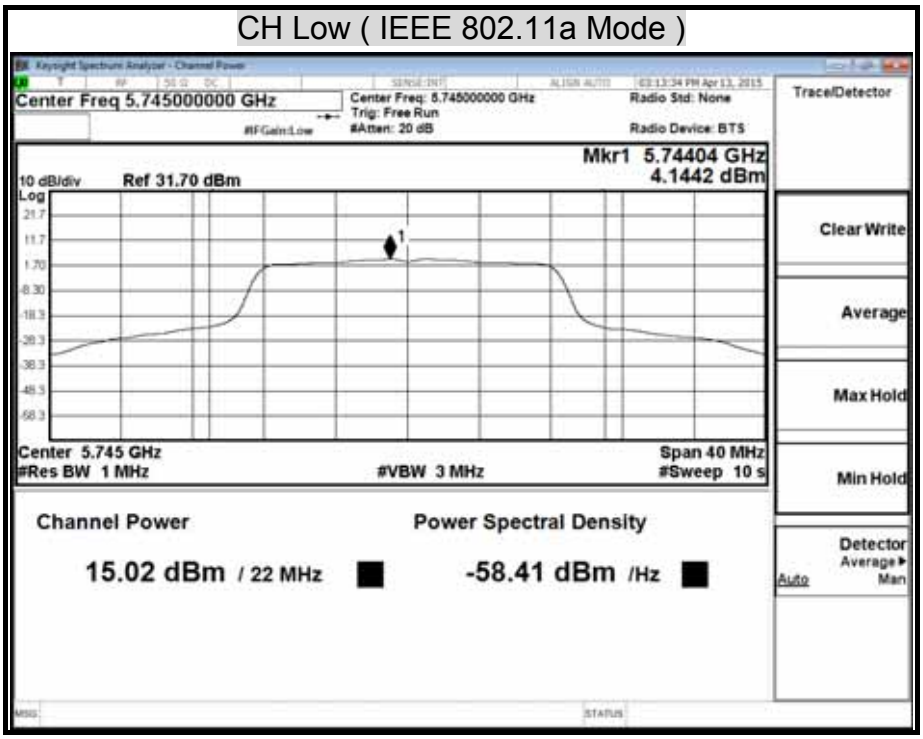


CH High (IEEE 802.11a Mode)

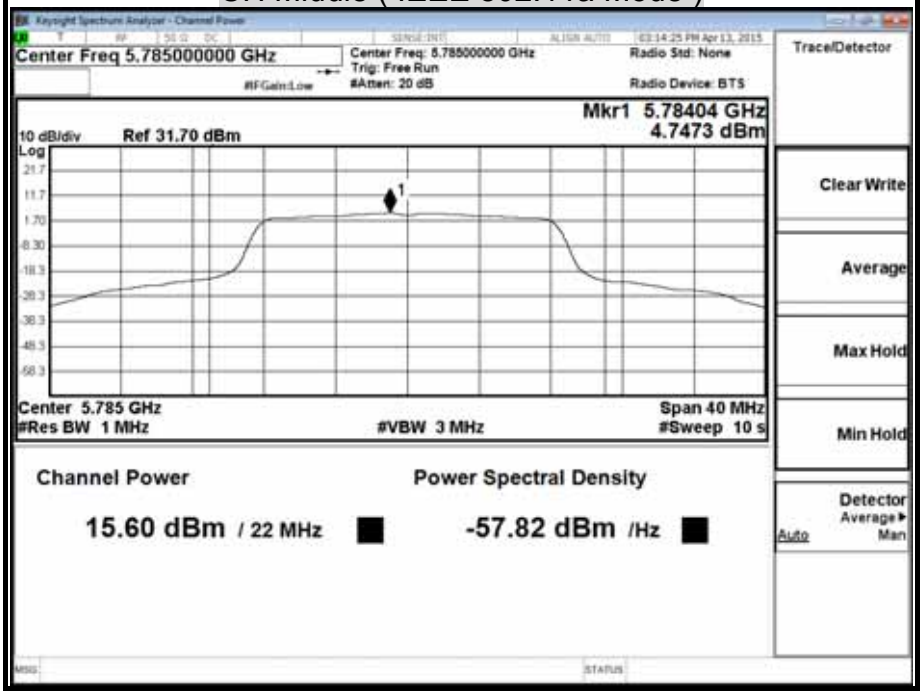


Test Mode: IEEE 802.11a mode / 5725 ~ 5850MHz

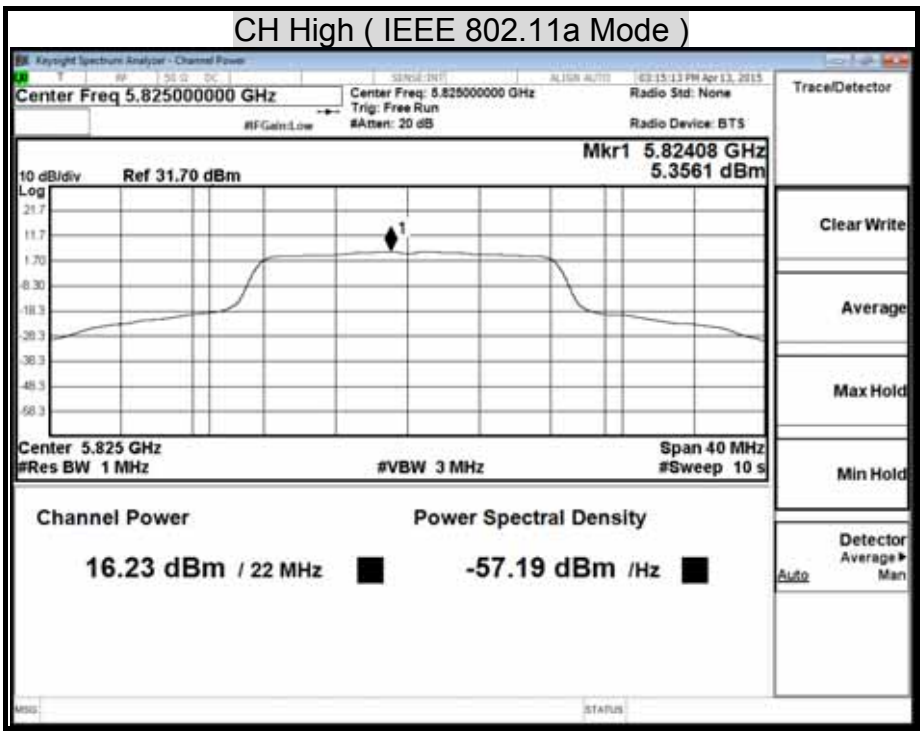
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

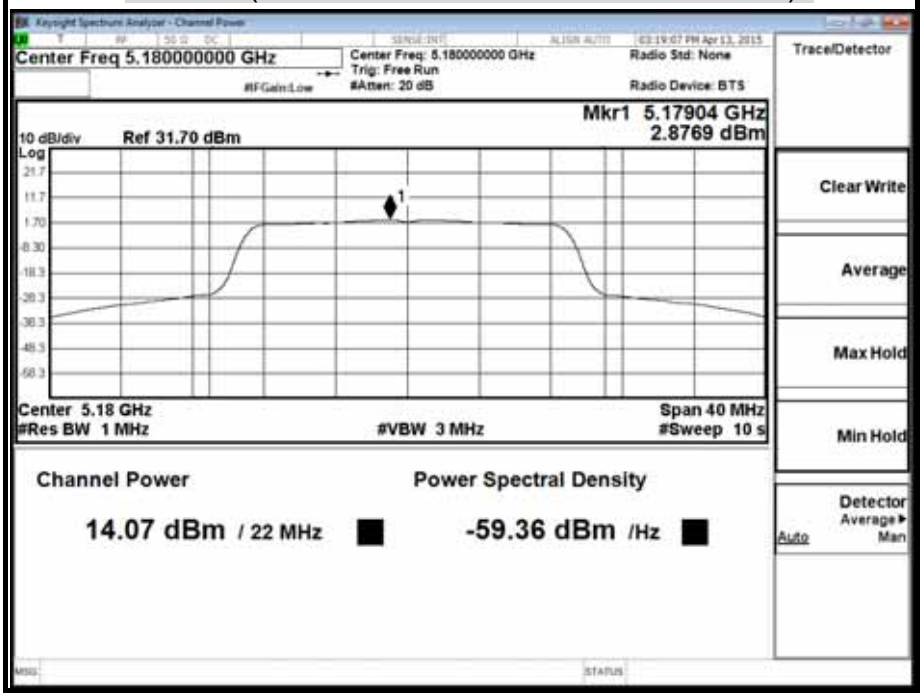


CH High (IEEE 802.11a Mode)

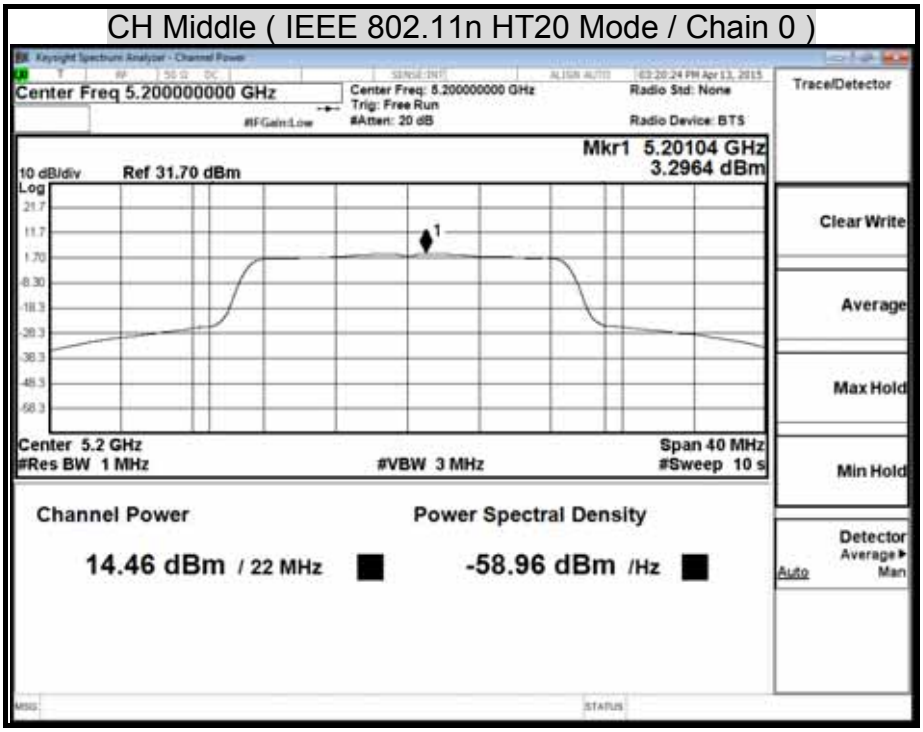


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

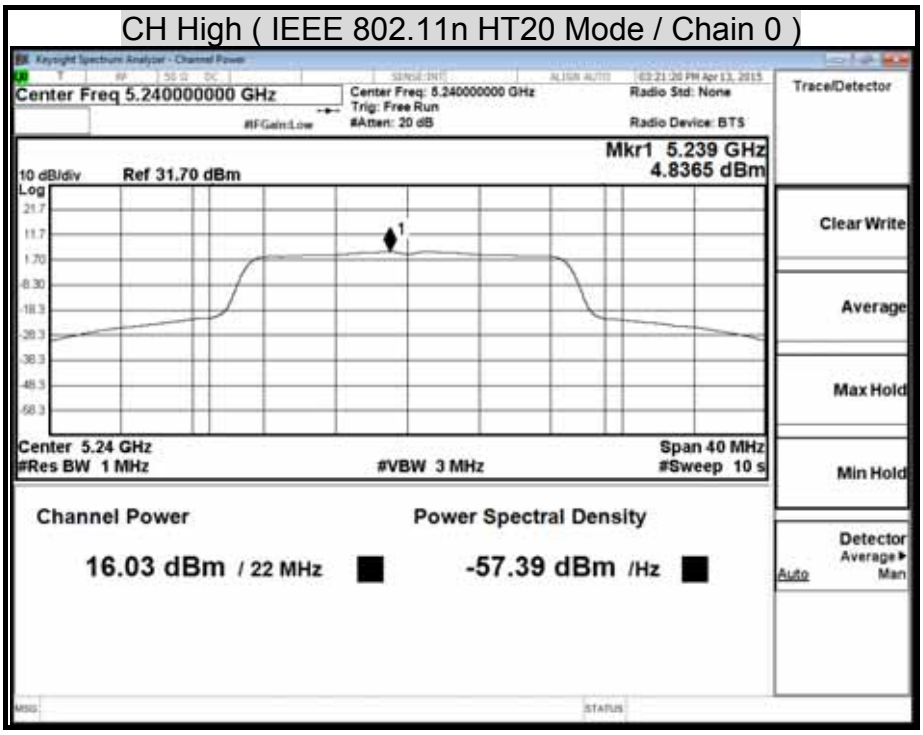
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

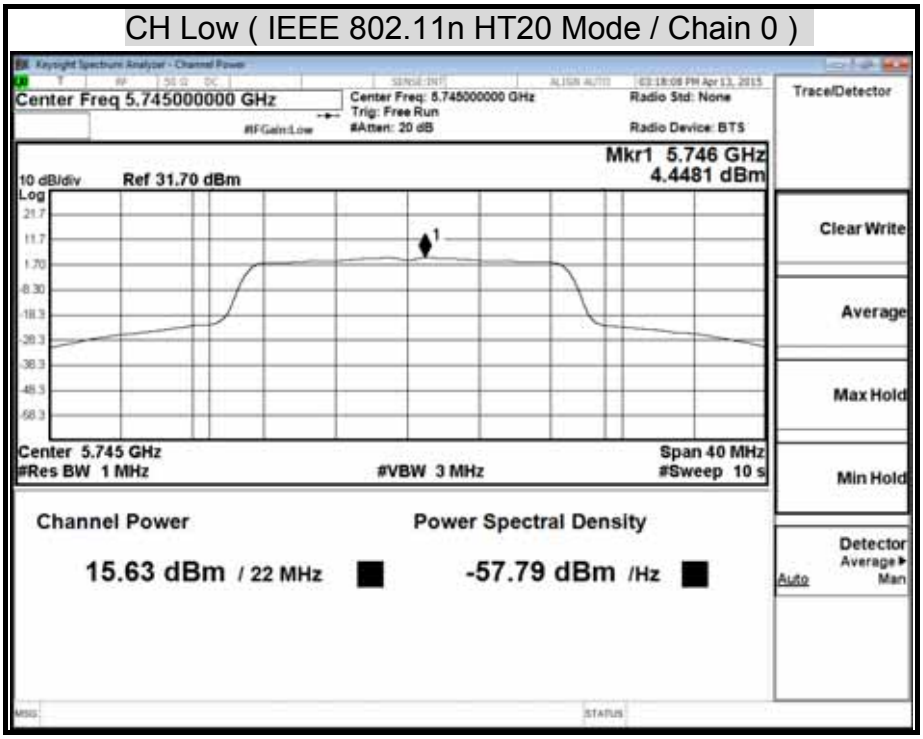


CH High (IEEE 802.11n HT20 Mode / Chain 0)

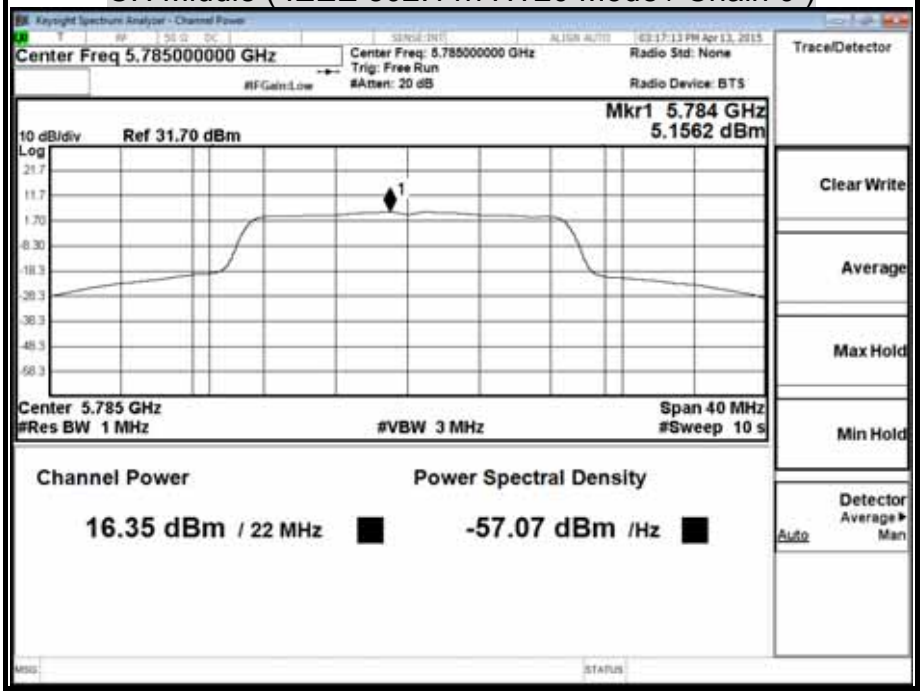


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

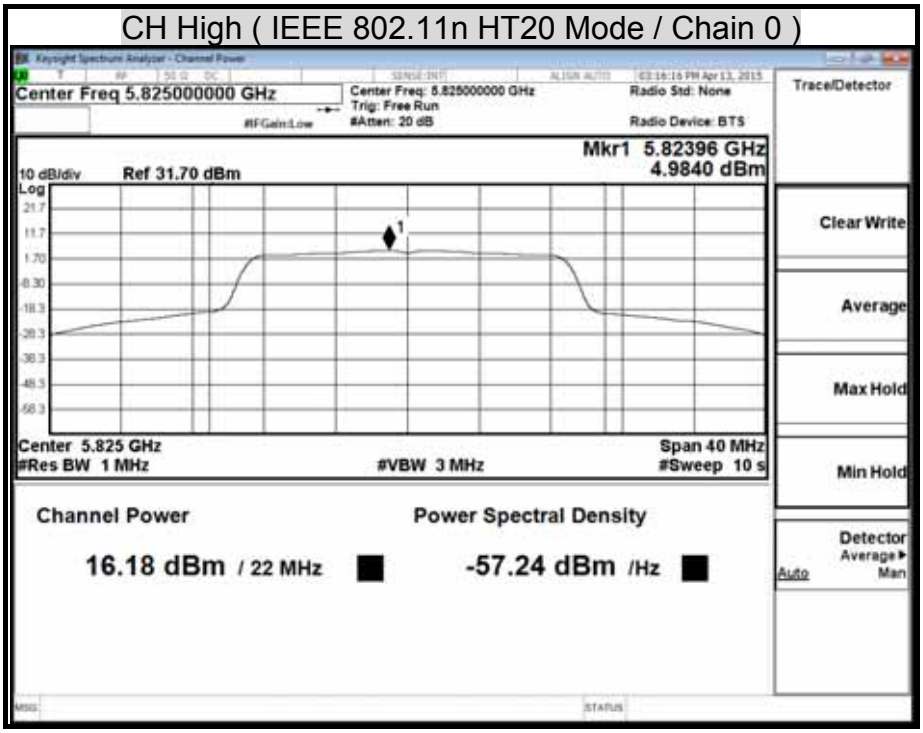
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

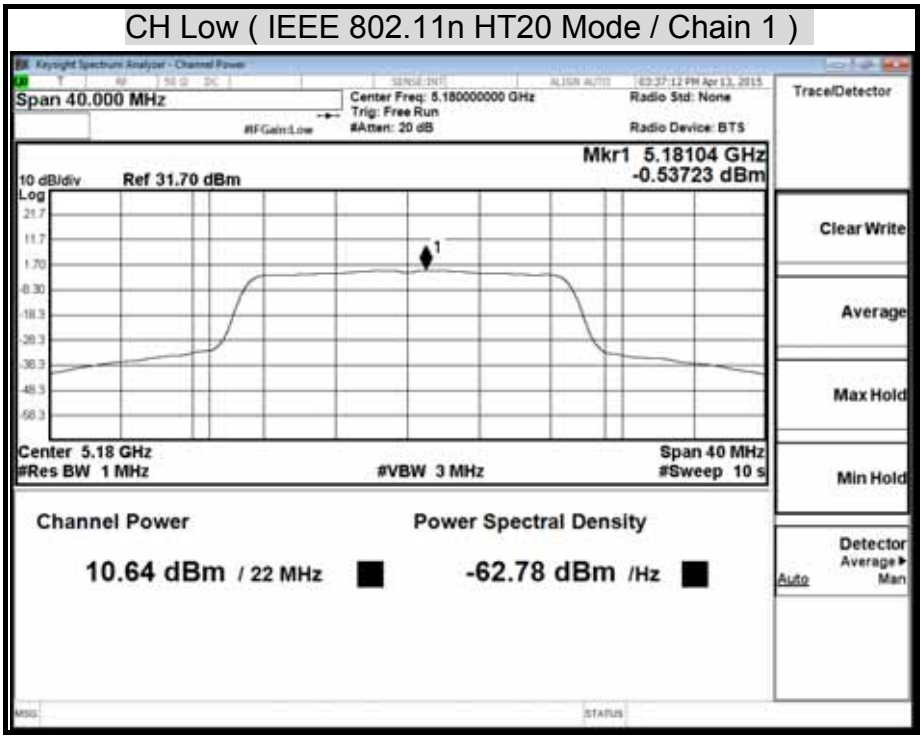


CH High (IEEE 802.11n HT20 Mode / Chain 0)

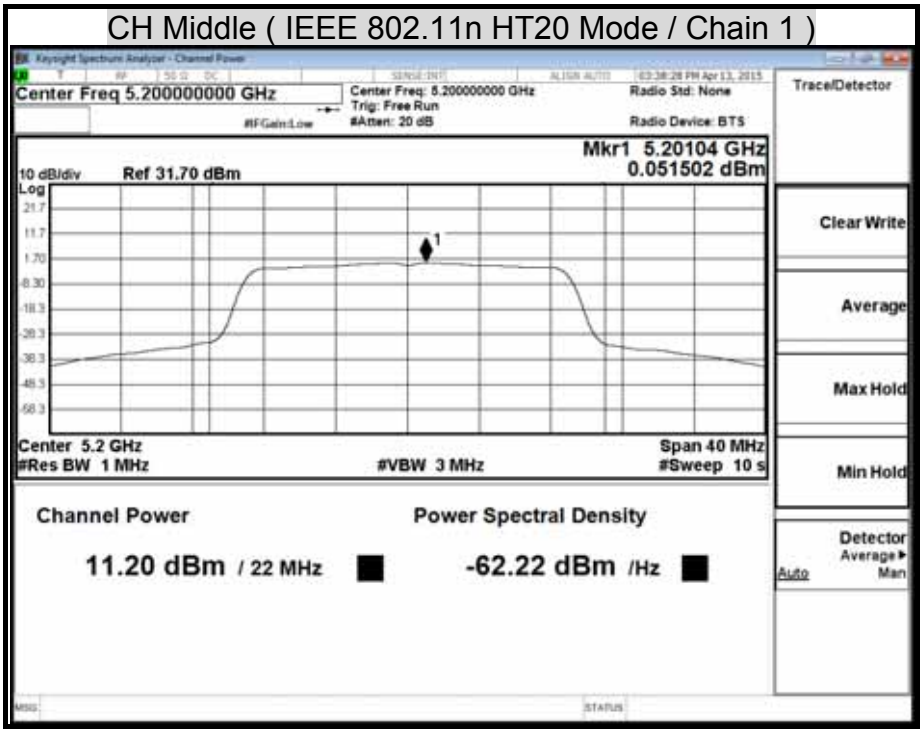


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

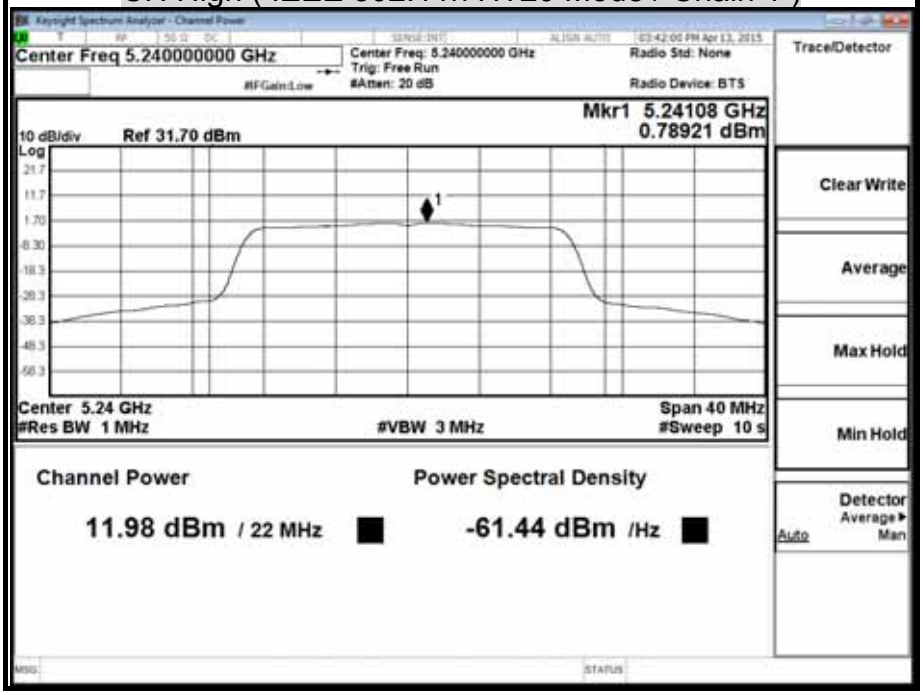
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

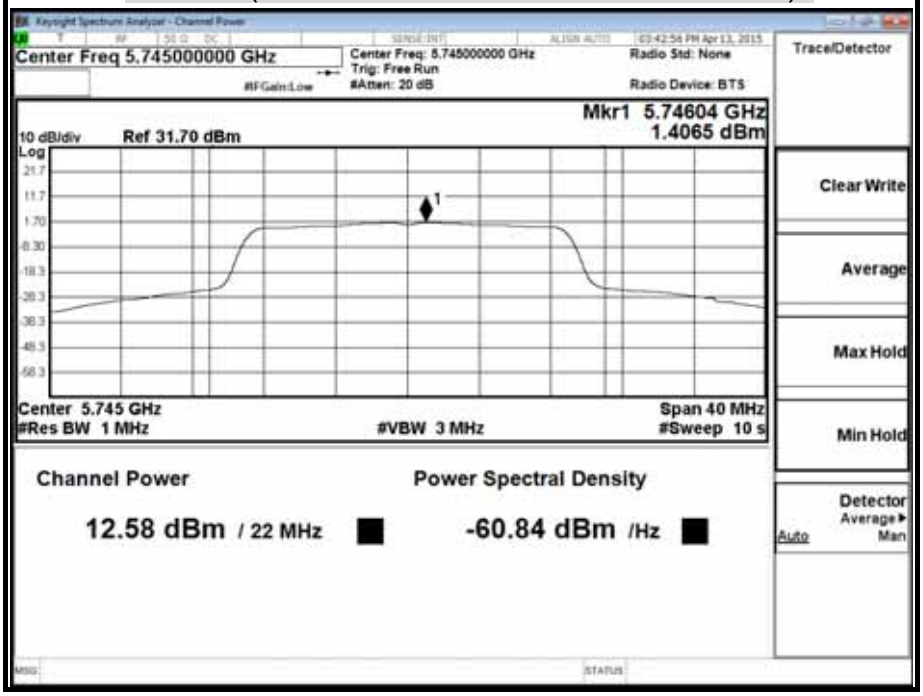


CH High (IEEE 802.11n HT20 Mode / Chain 1)

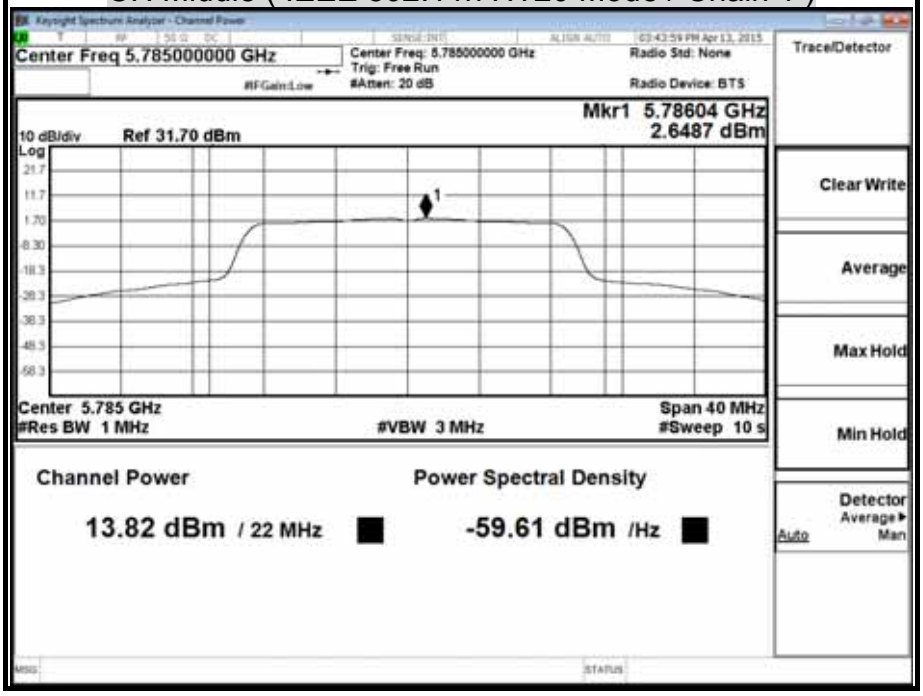


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

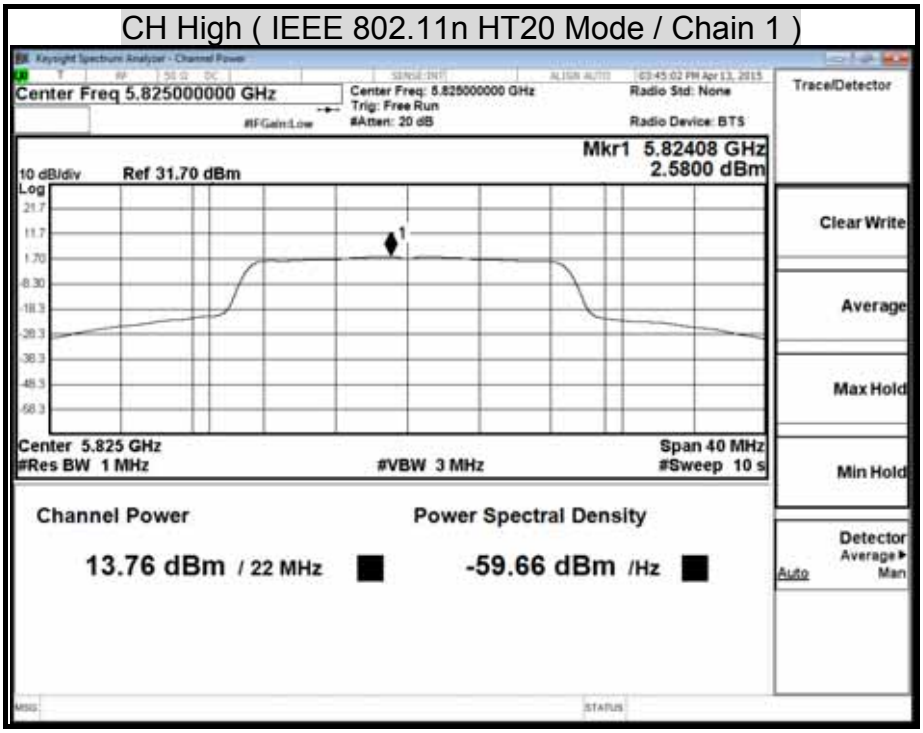
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

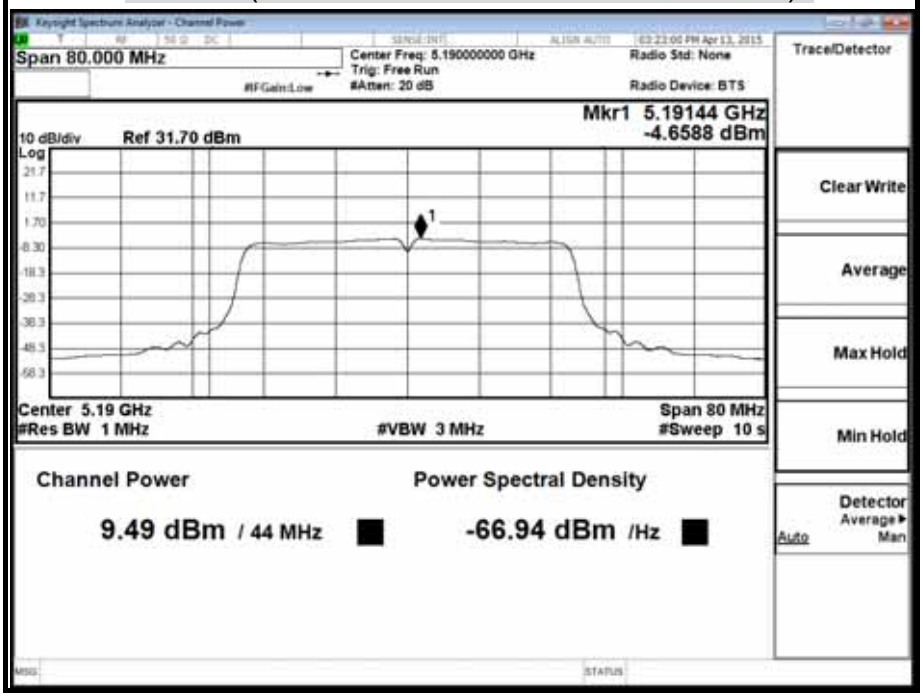


CH High (IEEE 802.11n HT20 Mode / Chain 1)

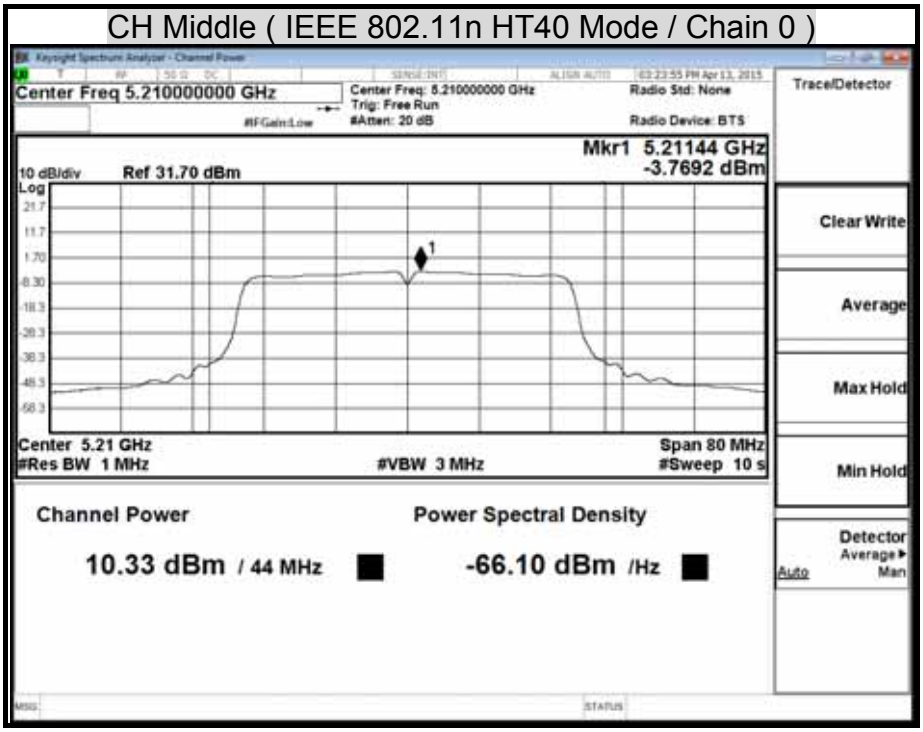


Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

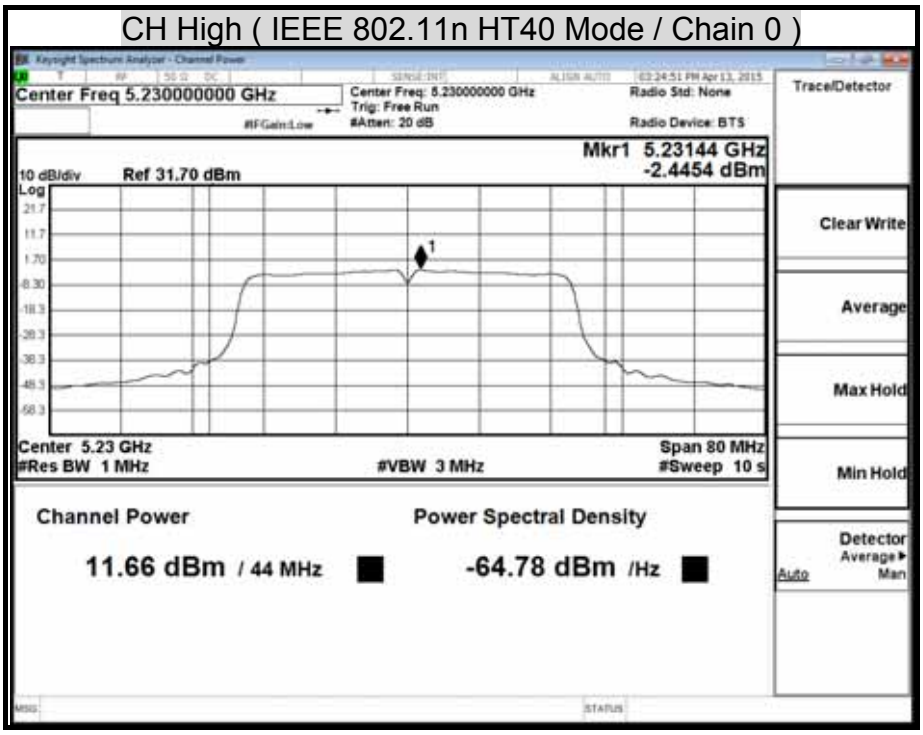
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

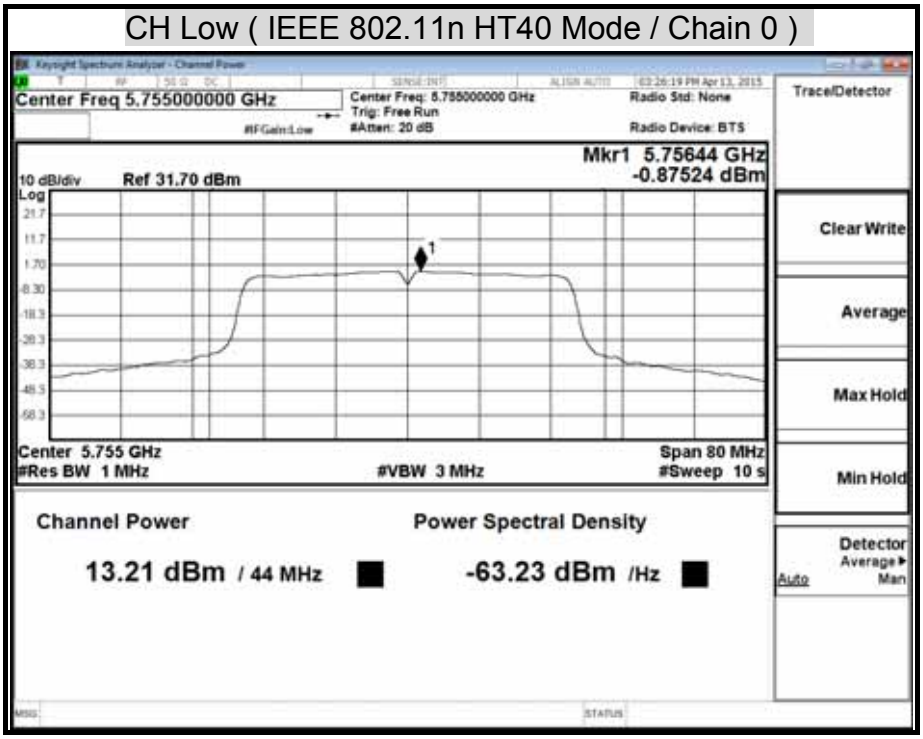


CH High (IEEE 802.11n HT40 Mode / Chain 0)

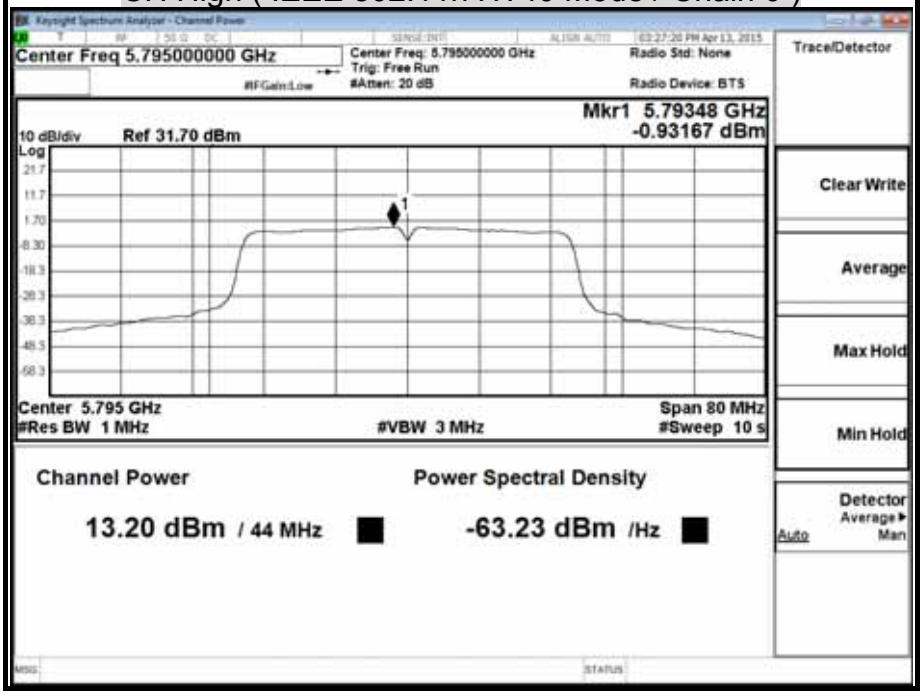


Test Mode: IEEE 802.11n HT 40 MHz mode / 5725 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 0)



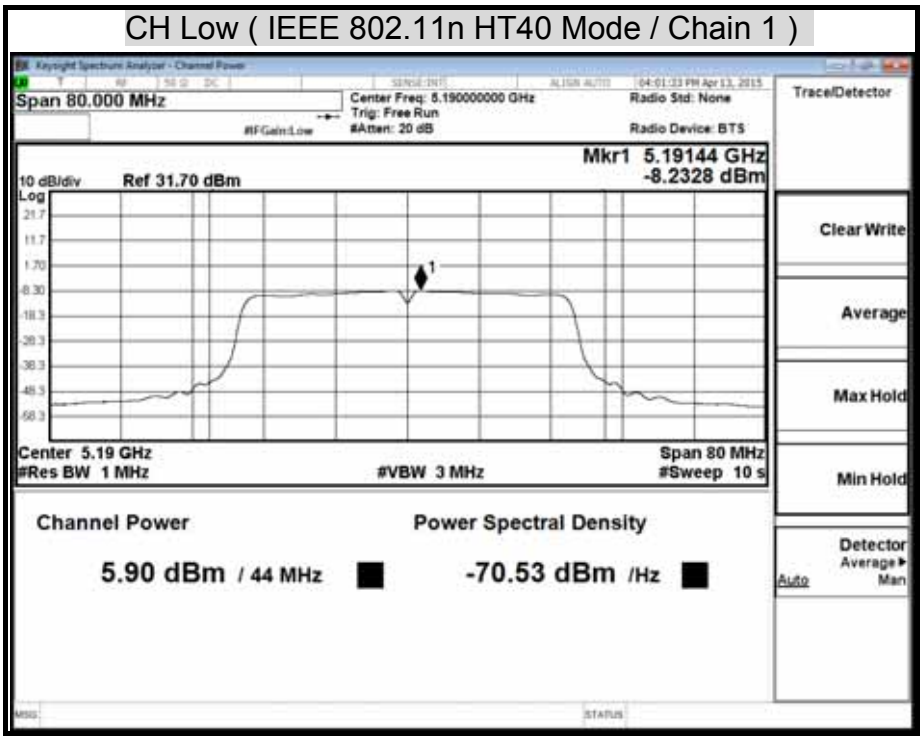
CH High (IEEE 802.11n HT40 Mode / Chain 0)



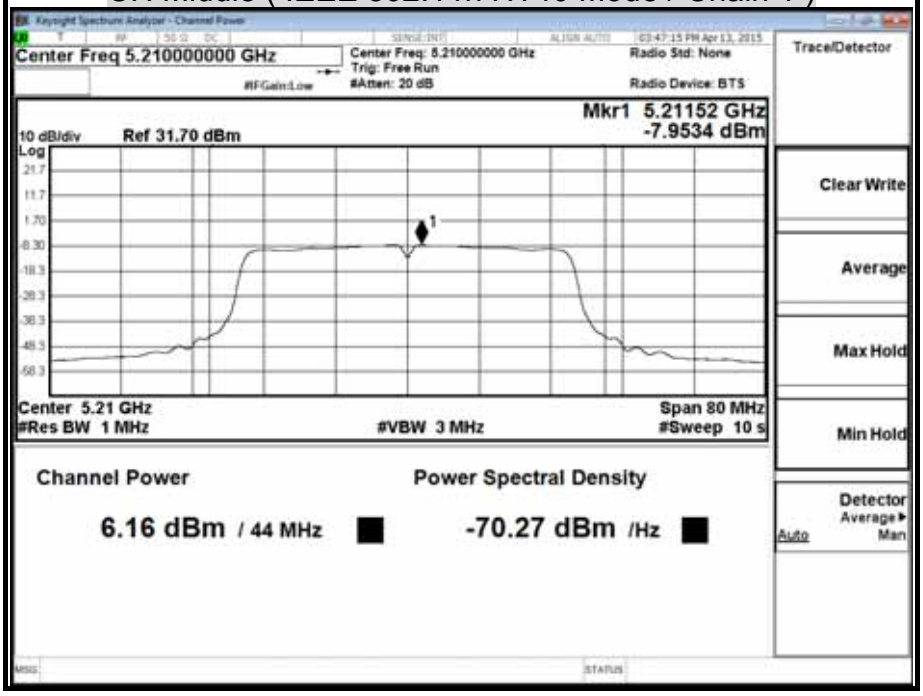
‘

Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

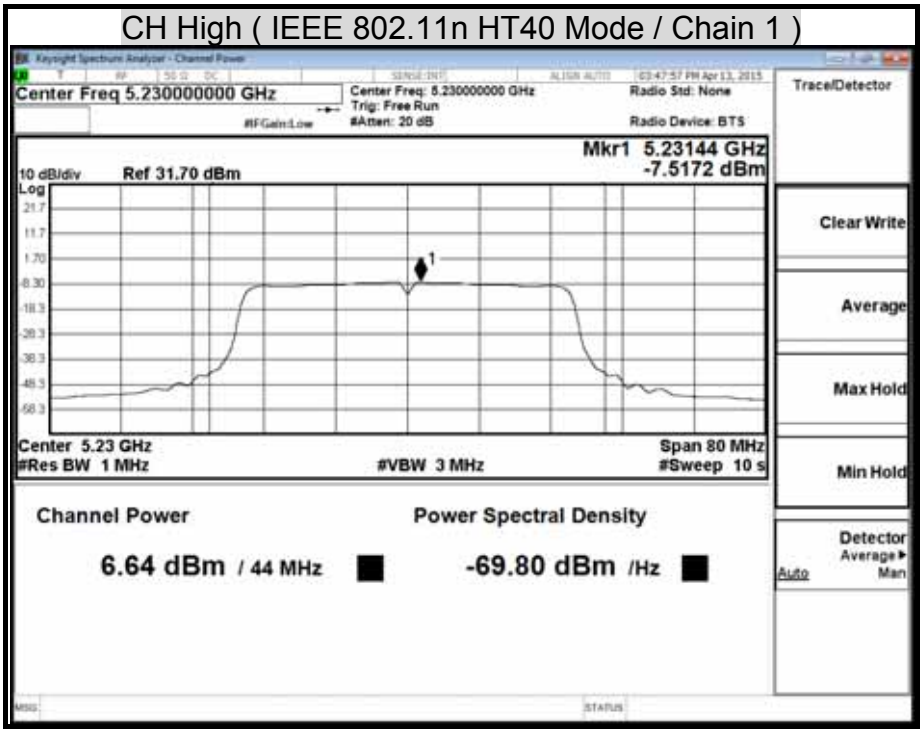
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

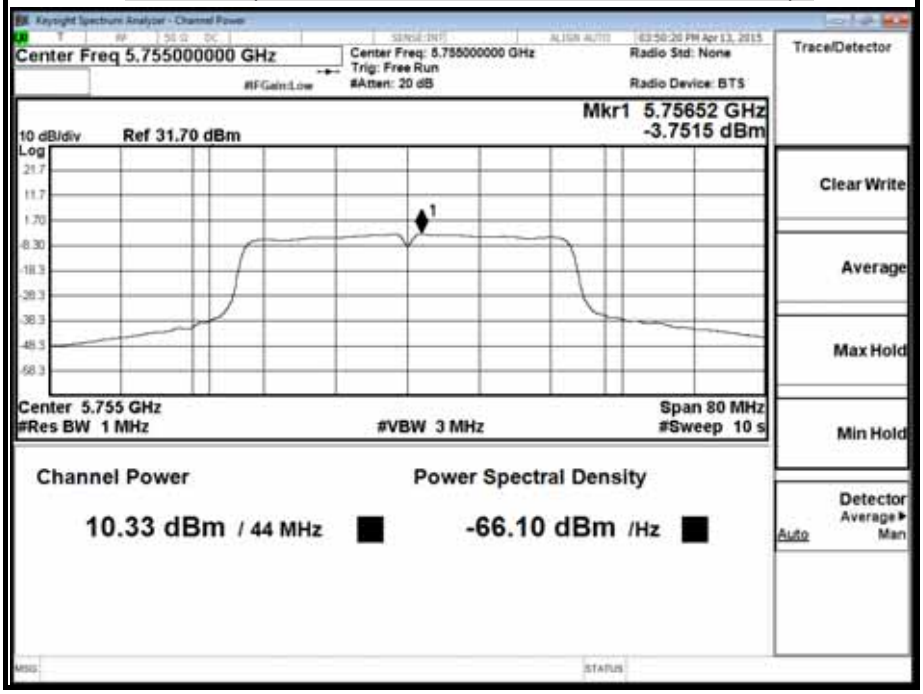


CH High (IEEE 802.11n HT40 Mode / Chain 1)

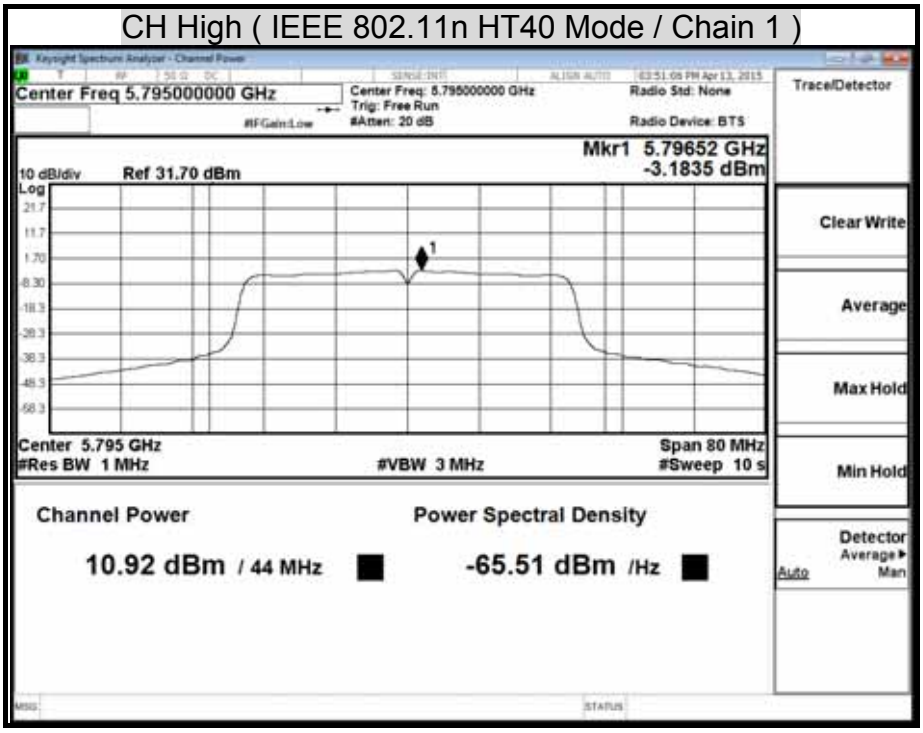


Test Mode: IEEE 802.11n HT 40 MHz mode / 5725 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 1)

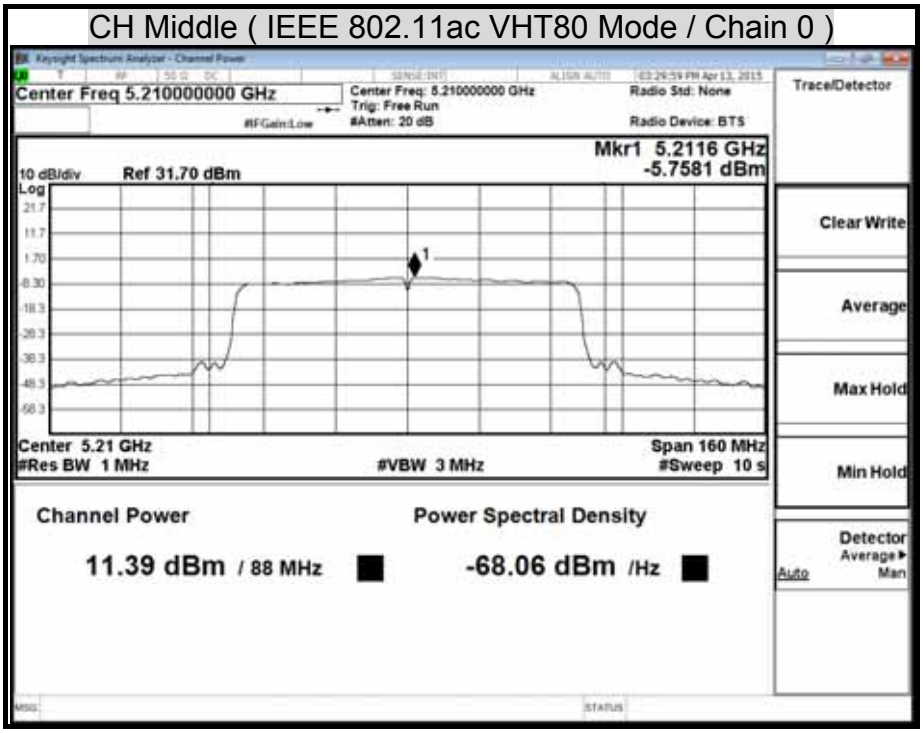


CH High (IEEE 802.11n HT40 Mode / Chain 1)



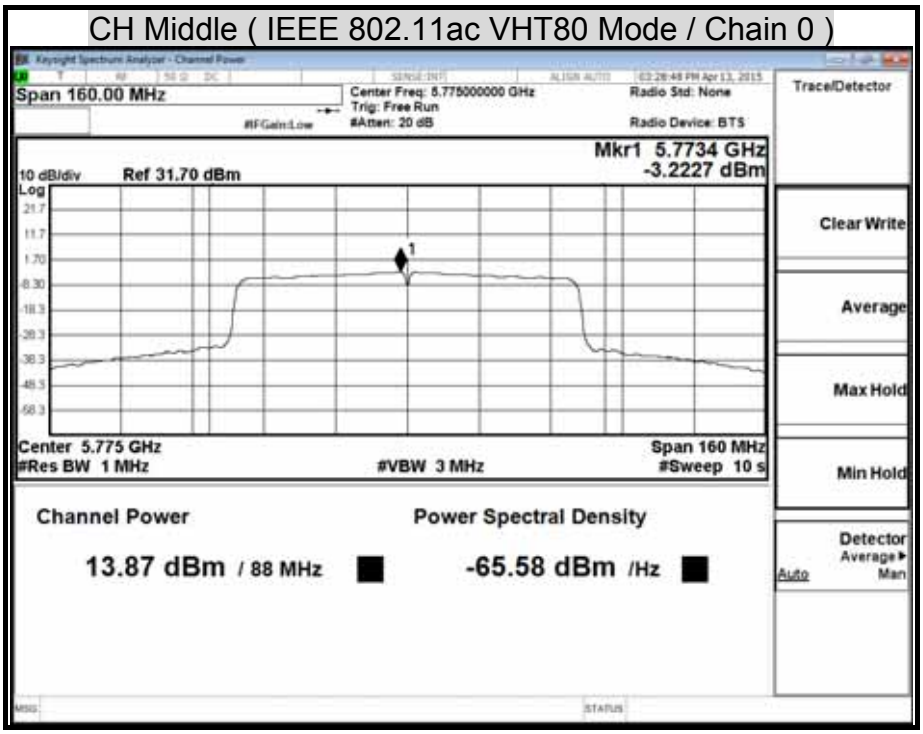
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



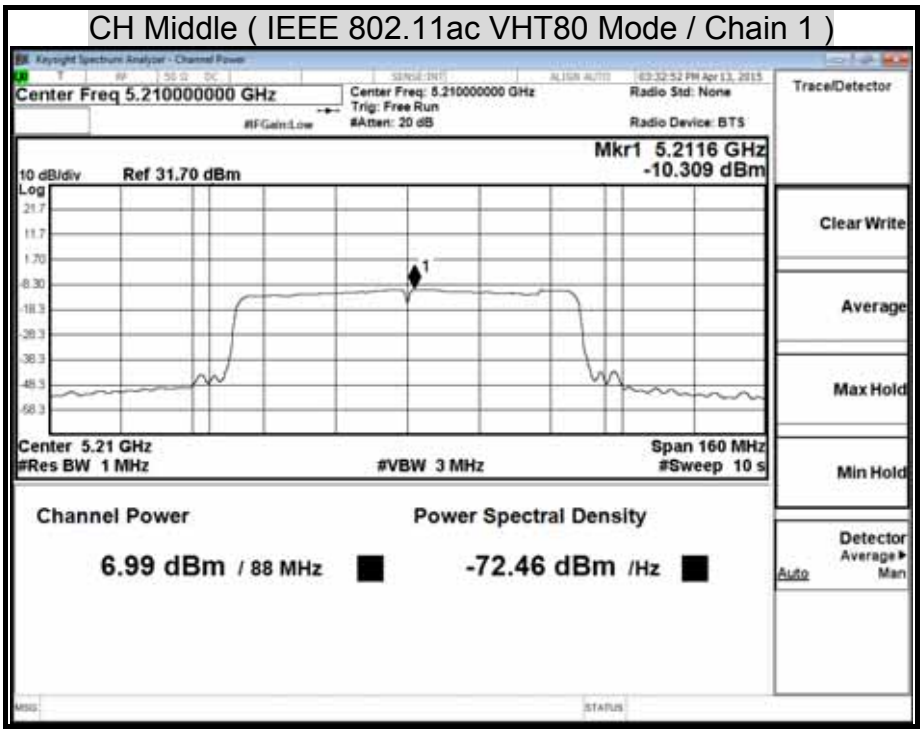
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



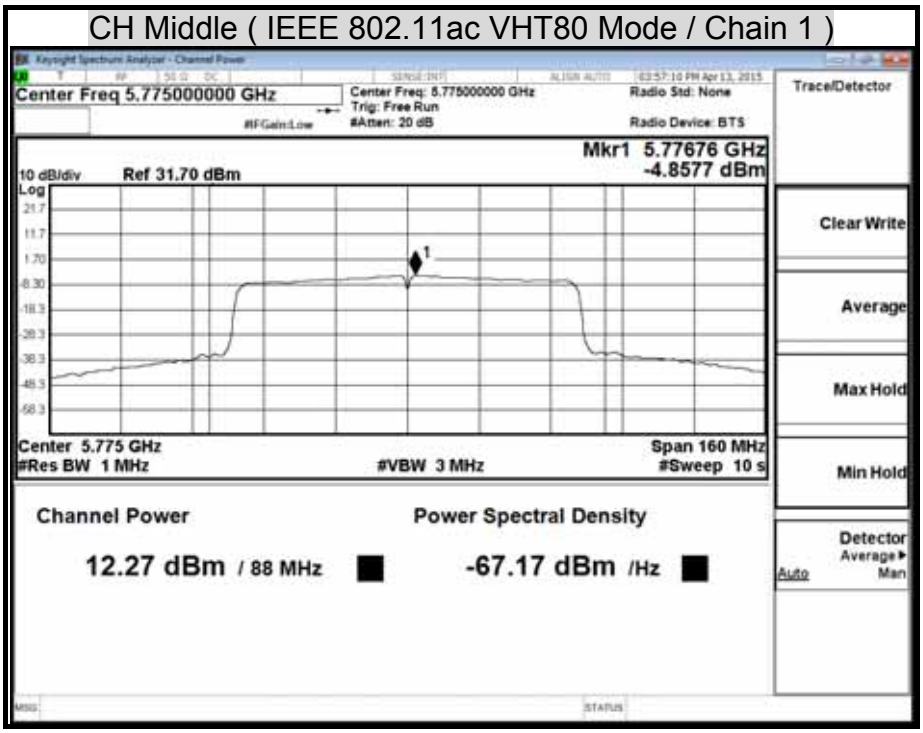
Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 1)



7.5 DUTY CYCLE

LIMIT

Nil (No dedicated limit specified in the Rules)

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY54430216	JAN. 23, 2016

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

TEST SETUP

TEST PROCEDURE

a) Place the EUT on the table and set it in transmitting mode.

b) Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

c) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

TEST RESULTS

No non-compliance noted.

TEST DATA

	us	Times	Ton	Total Ton time(ms)
Ton1	100000.000	1	100000.000	100.000
Ton2		0	0.000	
Ton3		0	0.000	
Tp				100.000

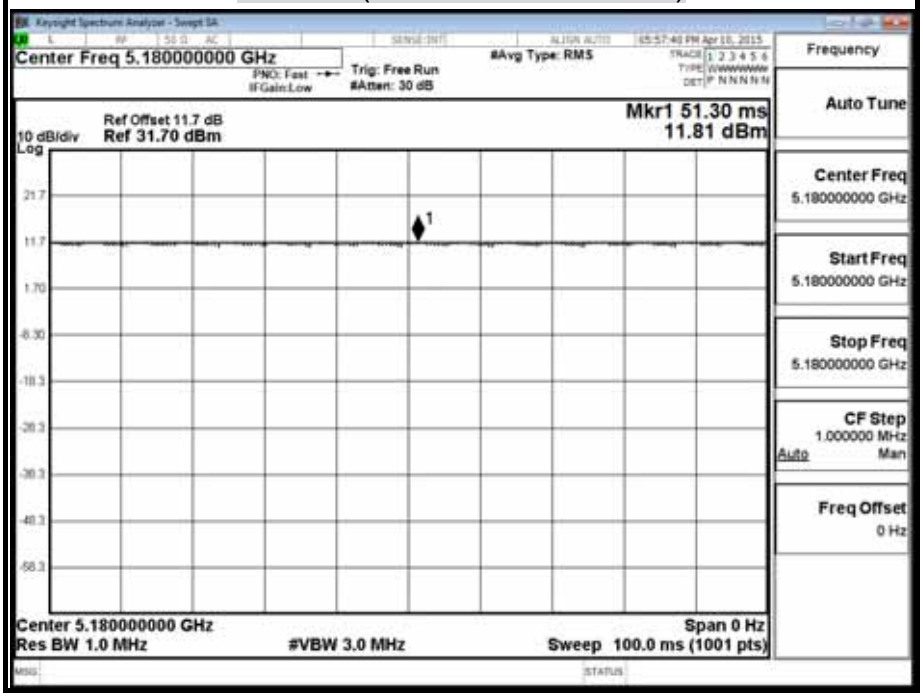
Ton	100.000		
Tp(Ton+Toff)	100.000		
Duty Cycle	1.000	100	%
Duty Factor	0.000		

TEST PLOT

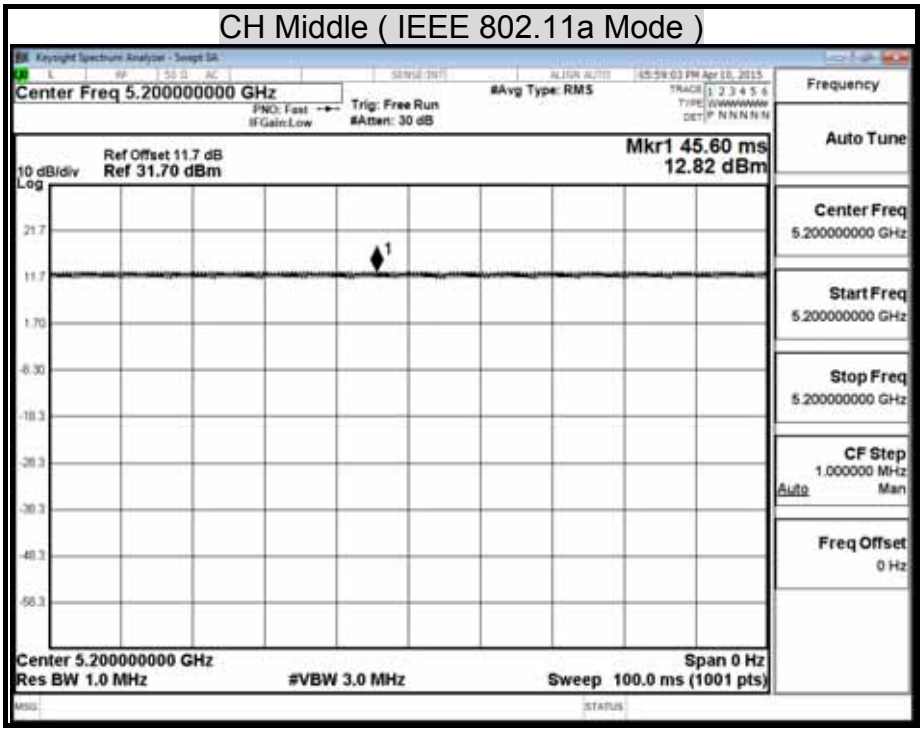
Duty Cycle

Test Mode: IEEE 802.11a mode / 5150 ~ 5250MHz

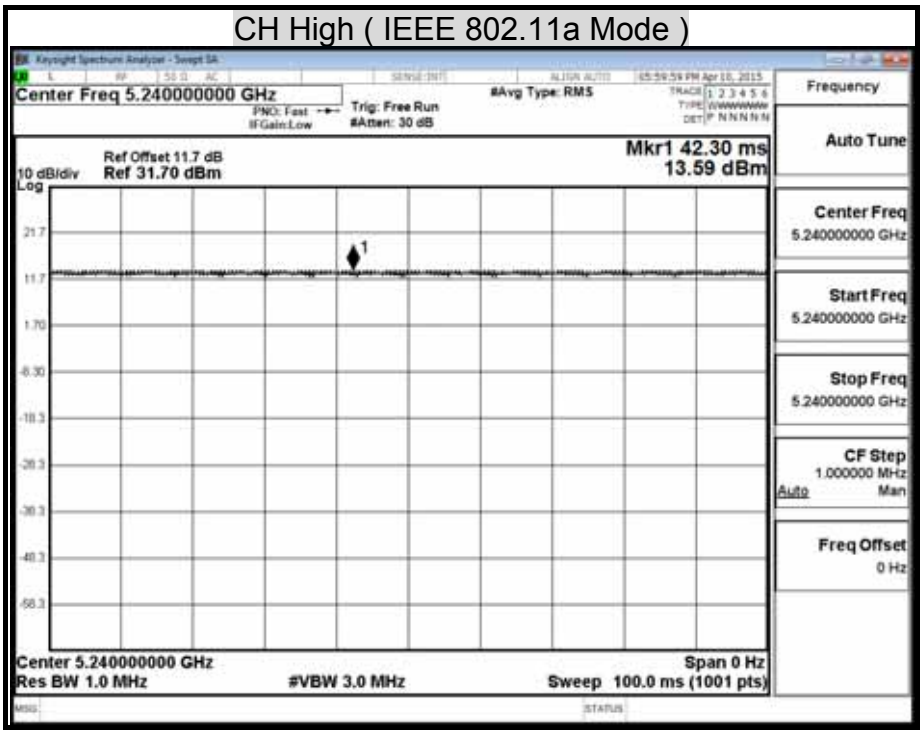
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

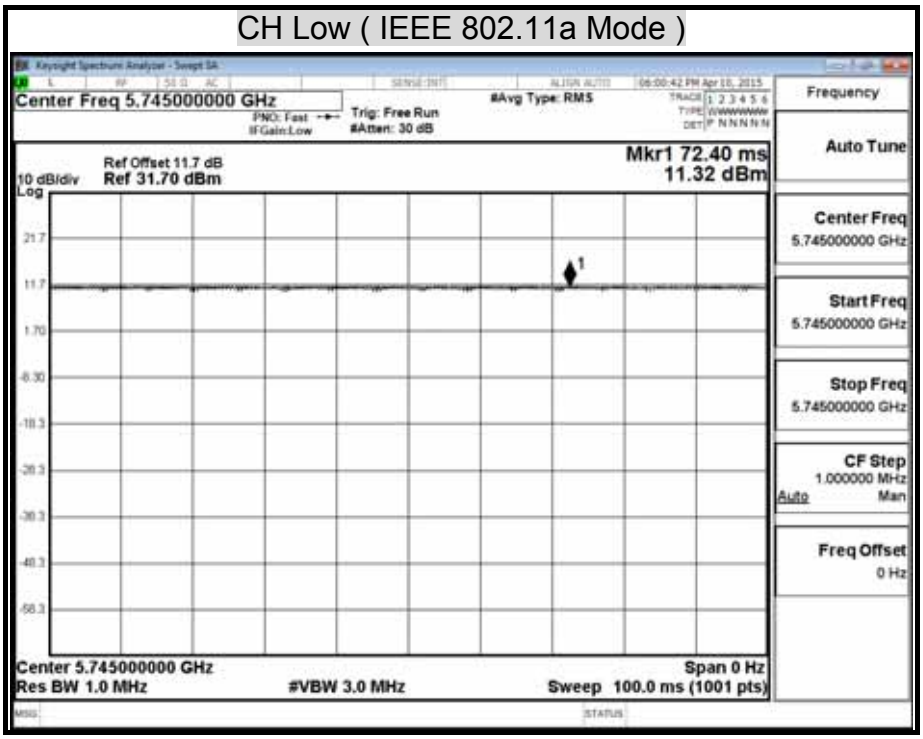


CH High (IEEE 802.11a Mode)

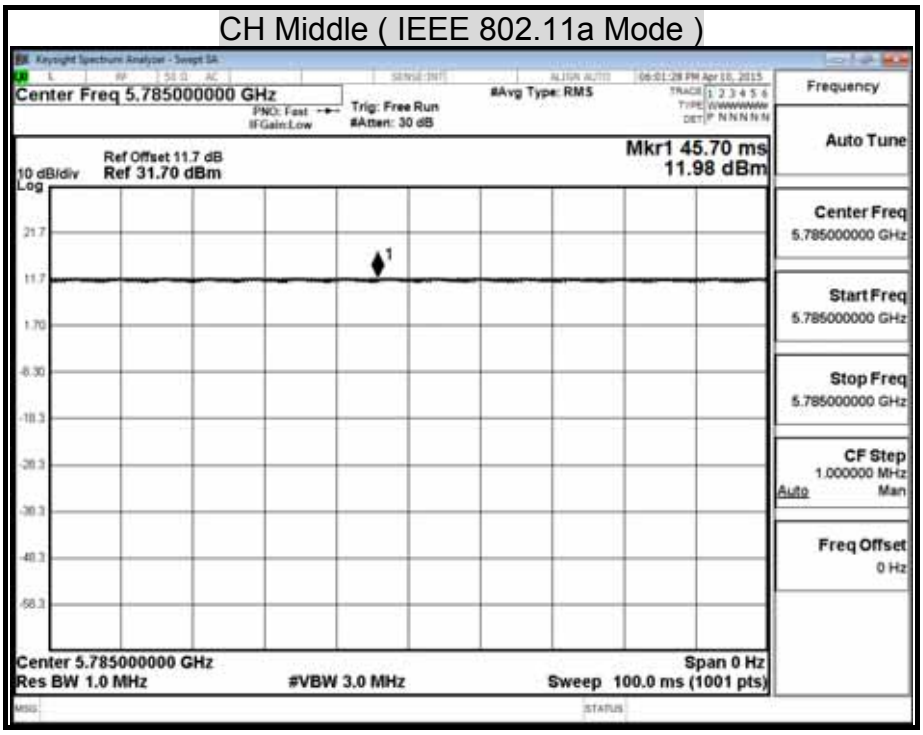


Test Mode: IEEE 802.11a mode / 5725 ~ 5850MHz

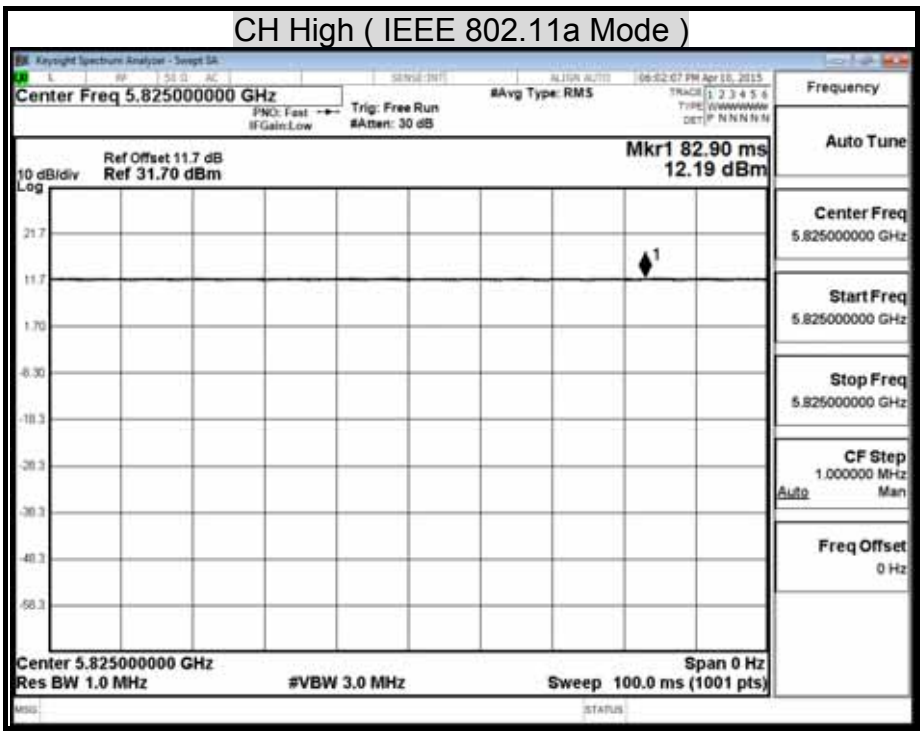
CH Low (IEEE 802.11a Mode)



CH Middle (IEEE 802.11a Mode)

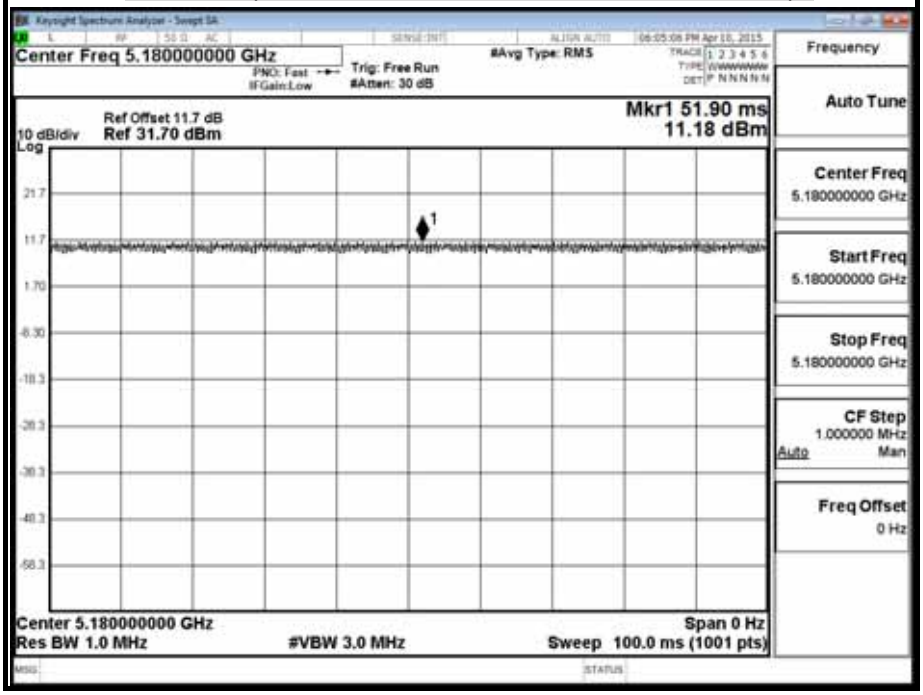


CH High (IEEE 802.11a Mode)

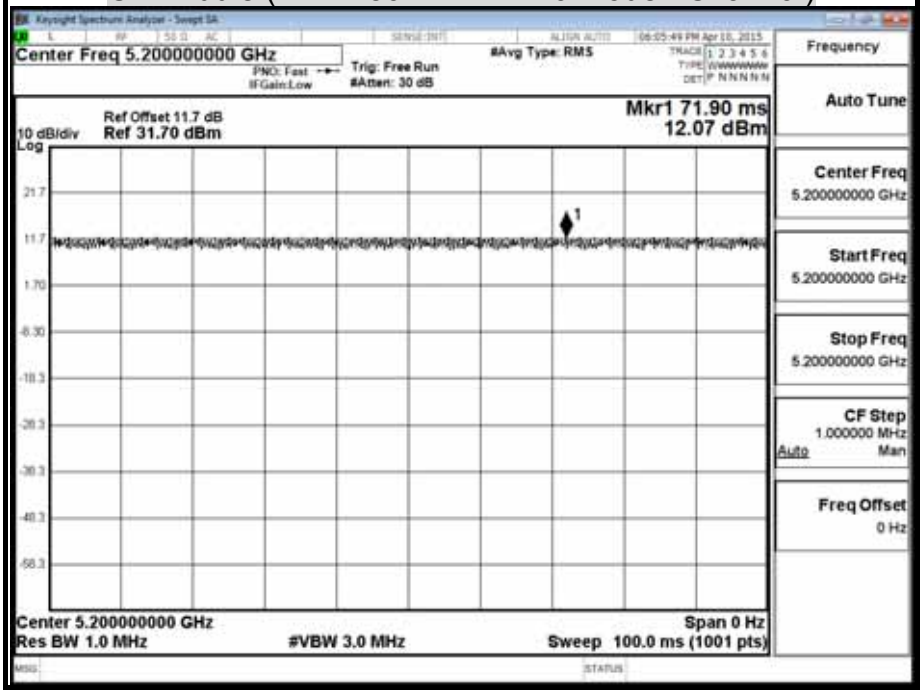


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

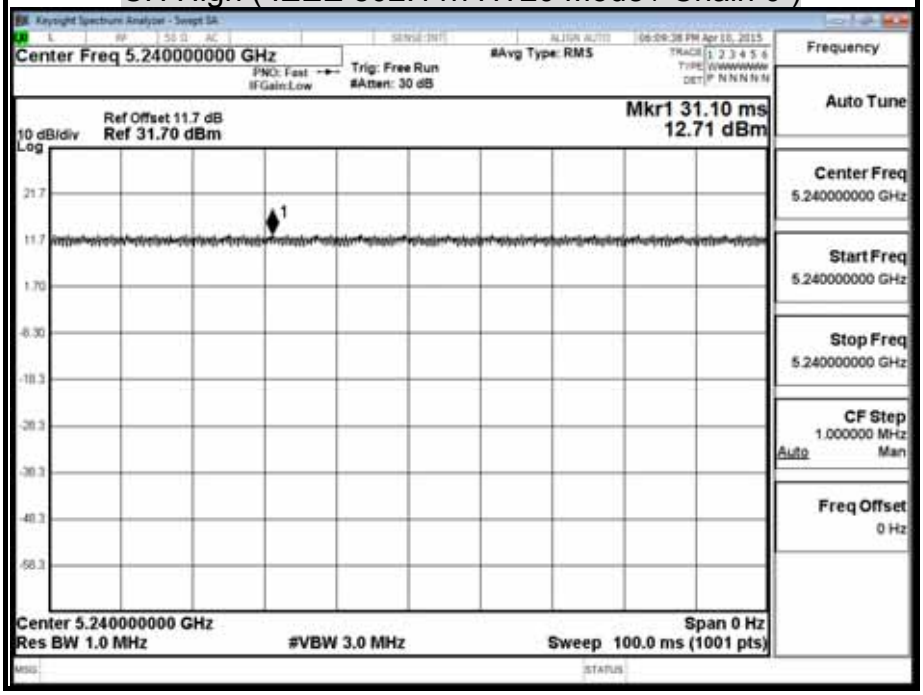
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

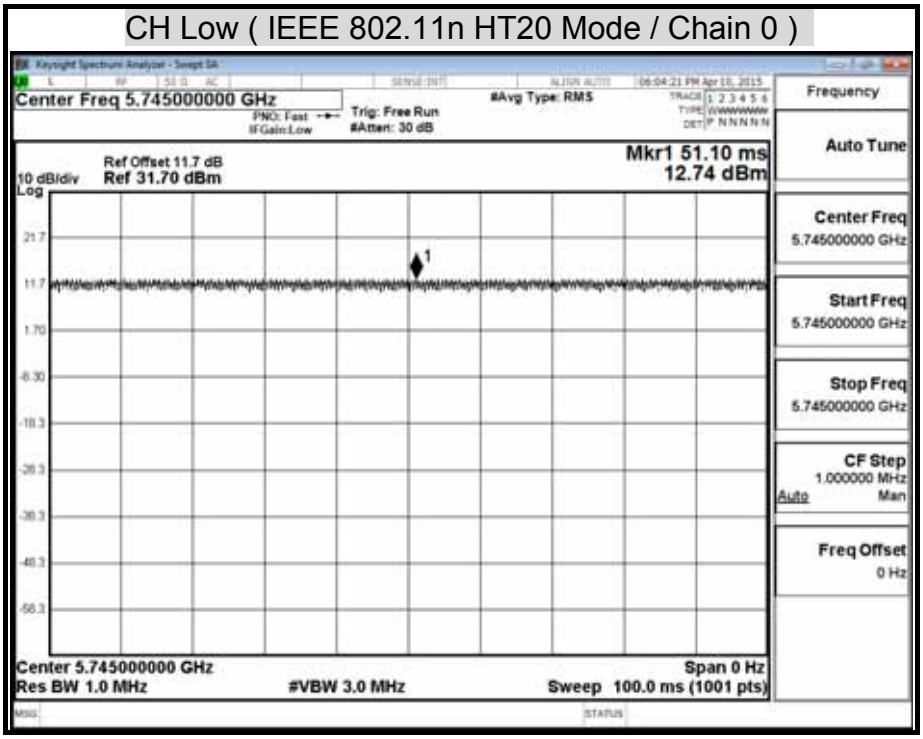


CH High (IEEE 802.11n HT20 Mode / Chain 0)

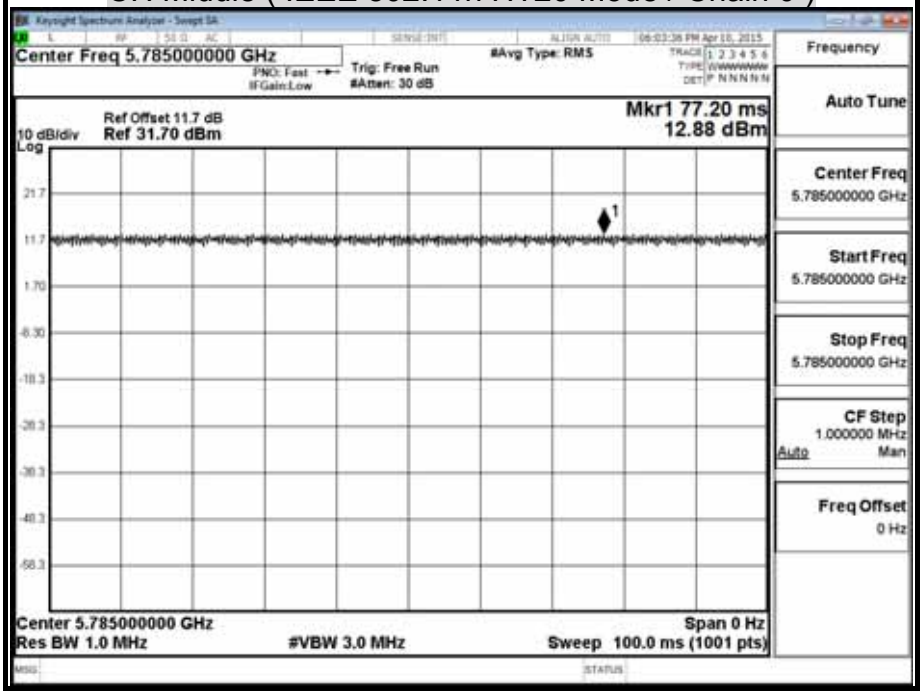


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

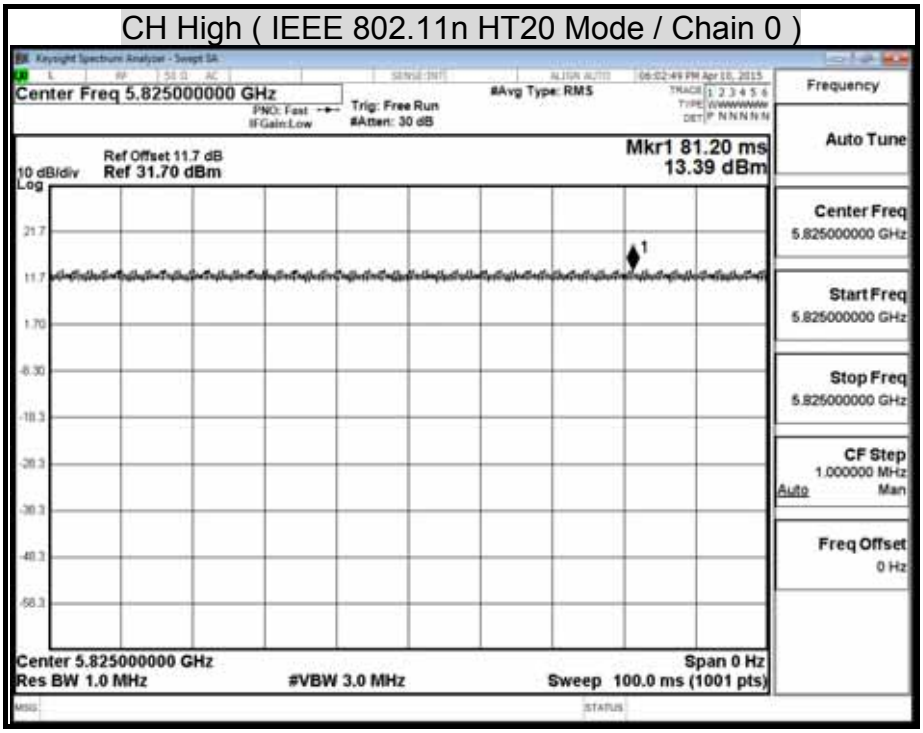
CH Low (IEEE 802.11n HT20 Mode / Chain 0)



CH Middle (IEEE 802.11n HT20 Mode / Chain 0)

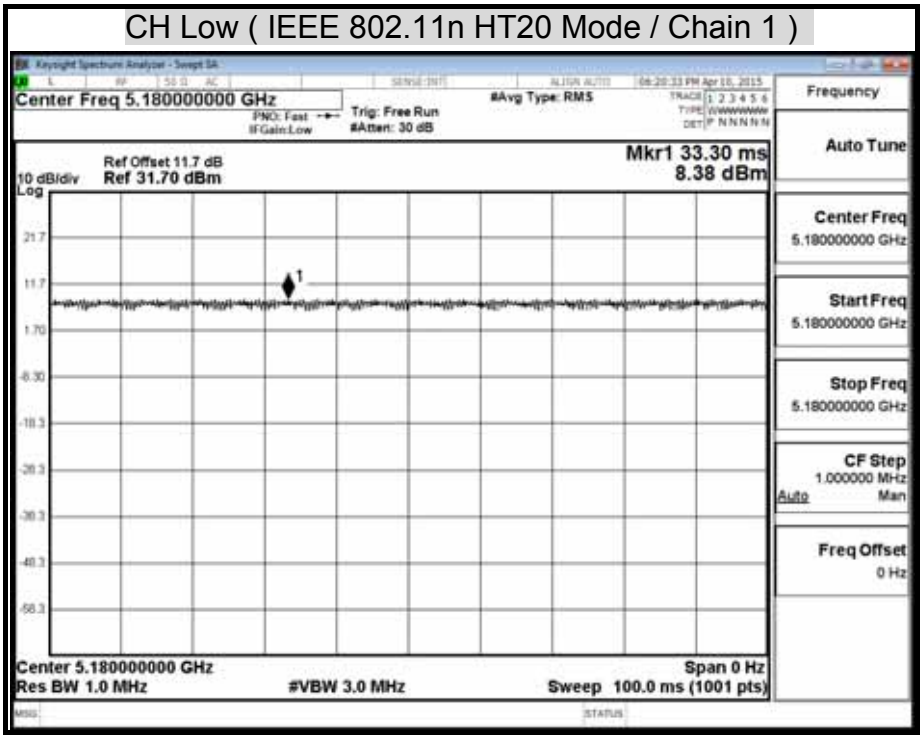


CH High (IEEE 802.11n HT20 Mode / Chain 0)

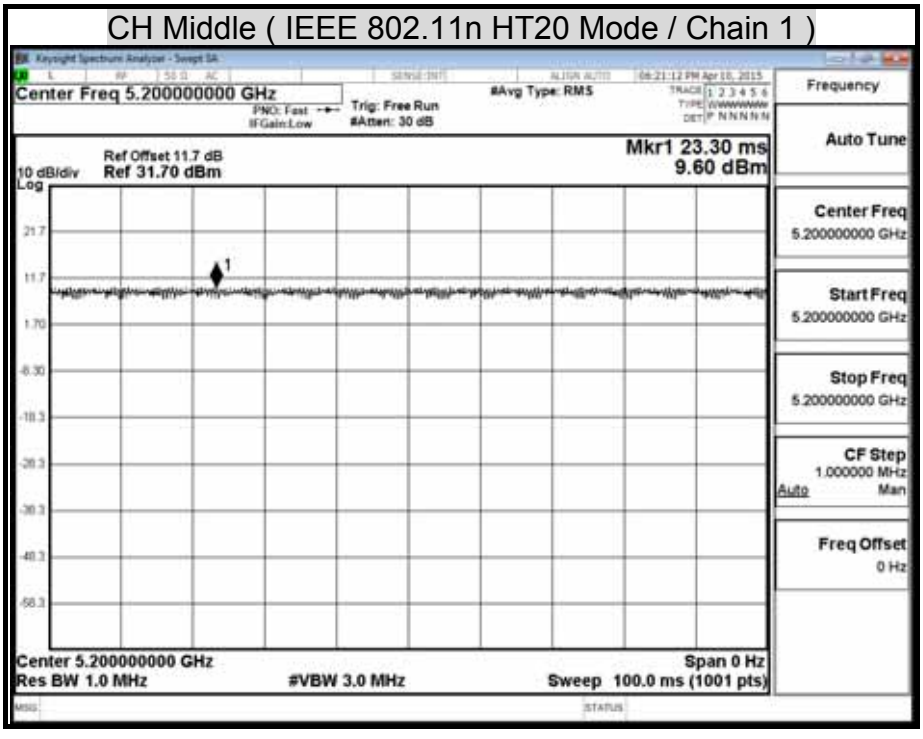


Test Mode: IEEE 802.11n HT 20 MHz mode / 5150 ~ 5250MHz

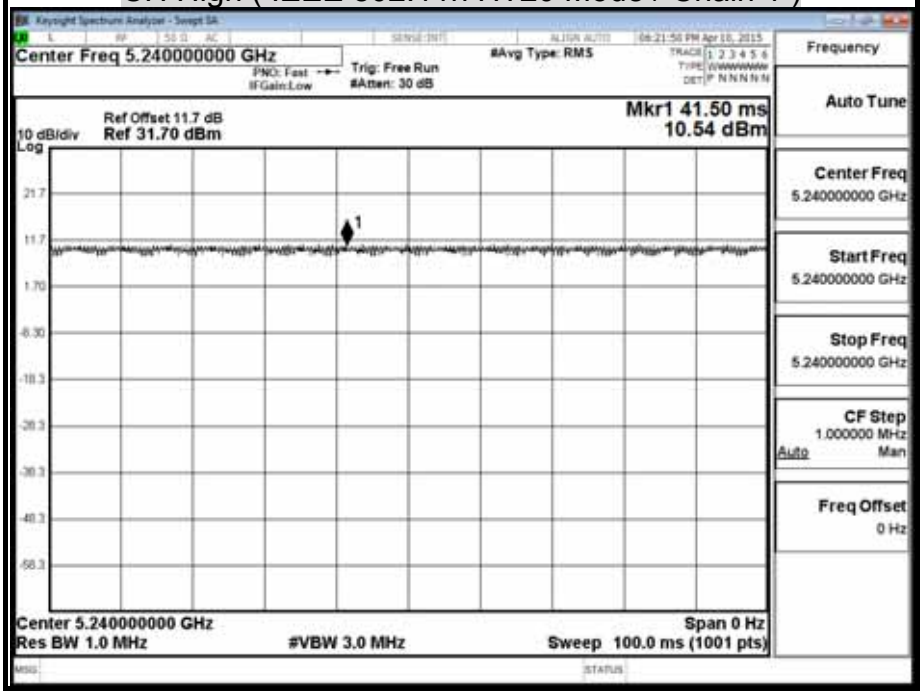
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

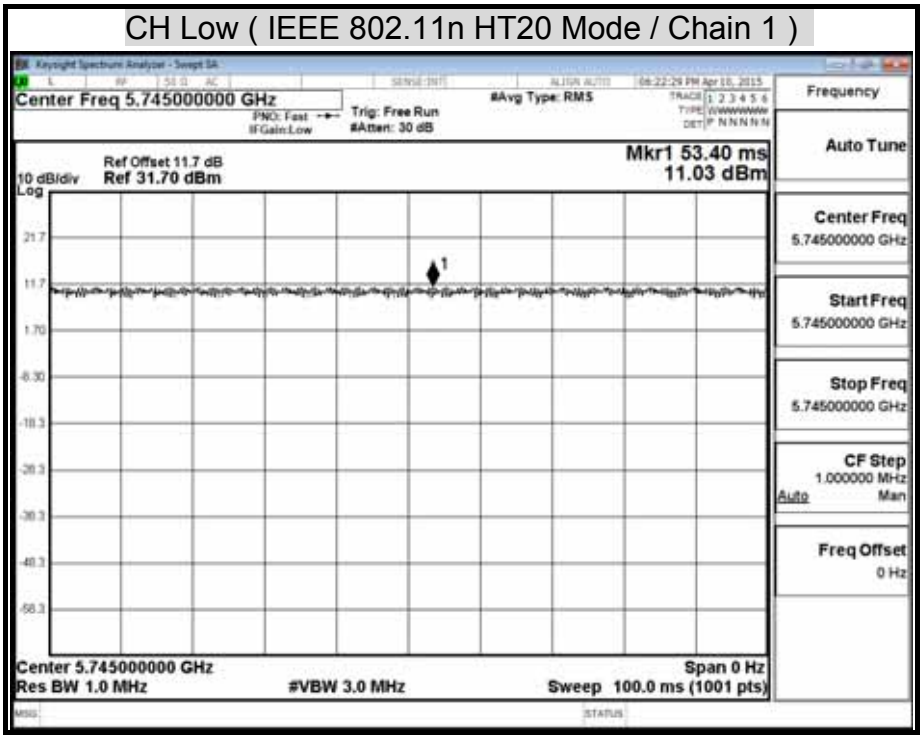


CH High (IEEE 802.11n HT20 Mode / Chain 1)

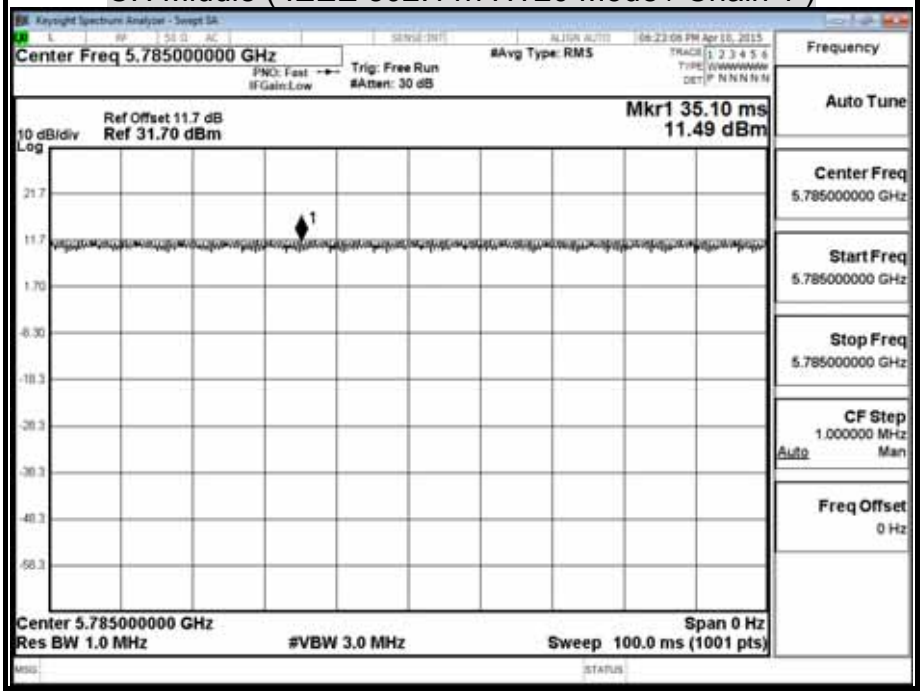


Test Mode: IEEE 802.11n HT 20 MHz mode / 5725 ~ 5850MHz

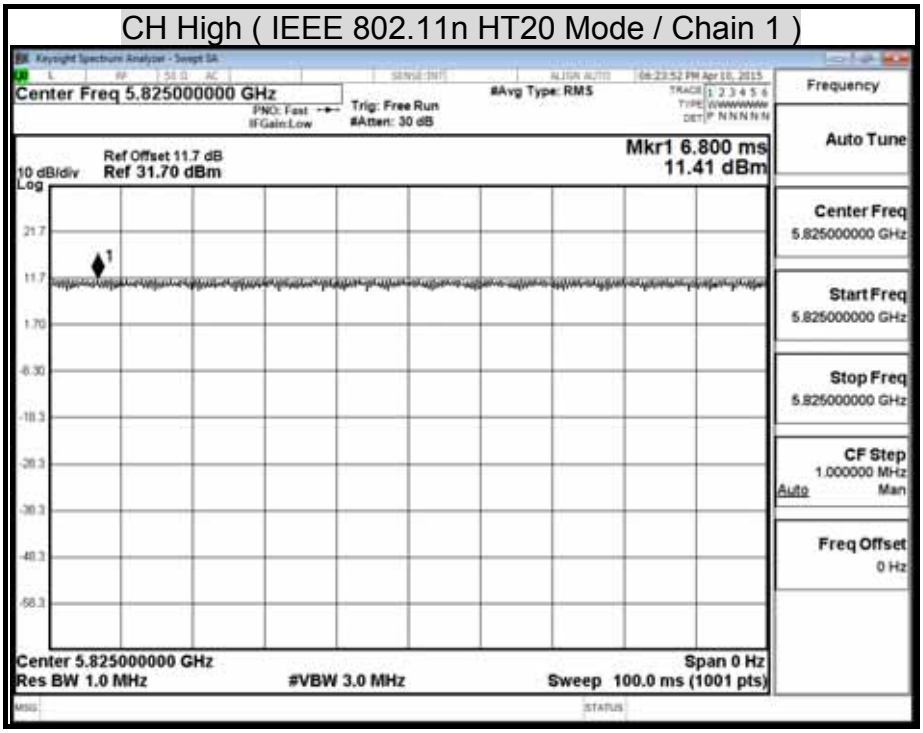
CH Low (IEEE 802.11n HT20 Mode / Chain 1)



CH Middle (IEEE 802.11n HT20 Mode / Chain 1)

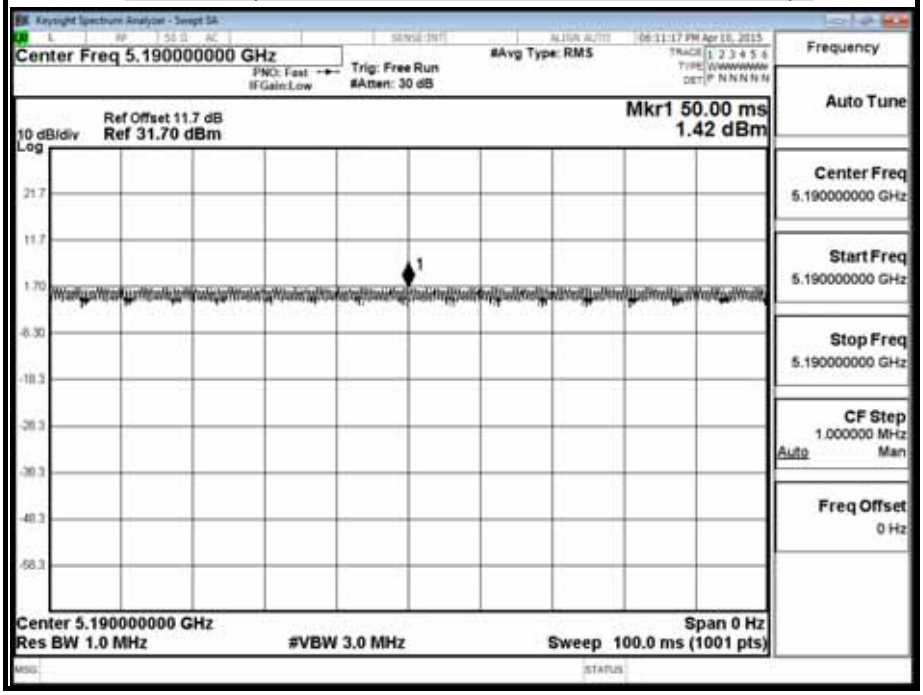


CH High (IEEE 802.11n HT20 Mode / Chain 1)

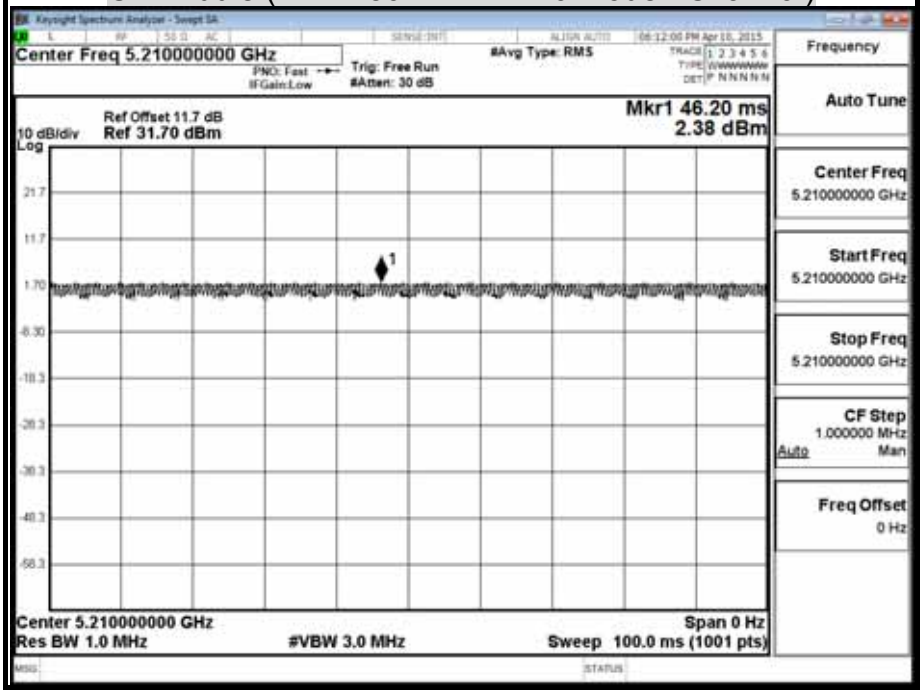


Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

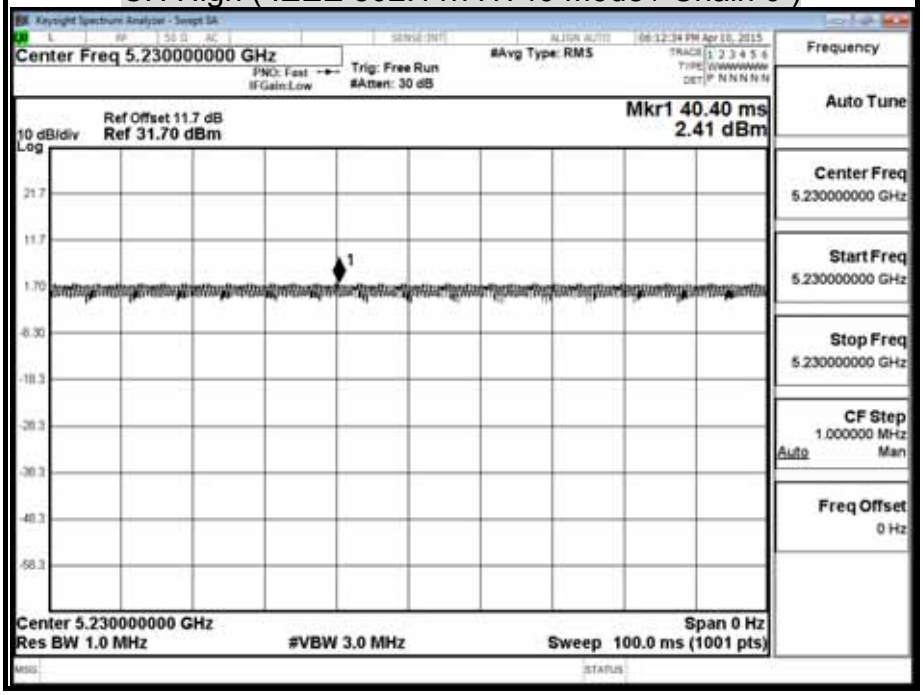
CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH Middle (IEEE 802.11n HT40 Mode / Chain 0)

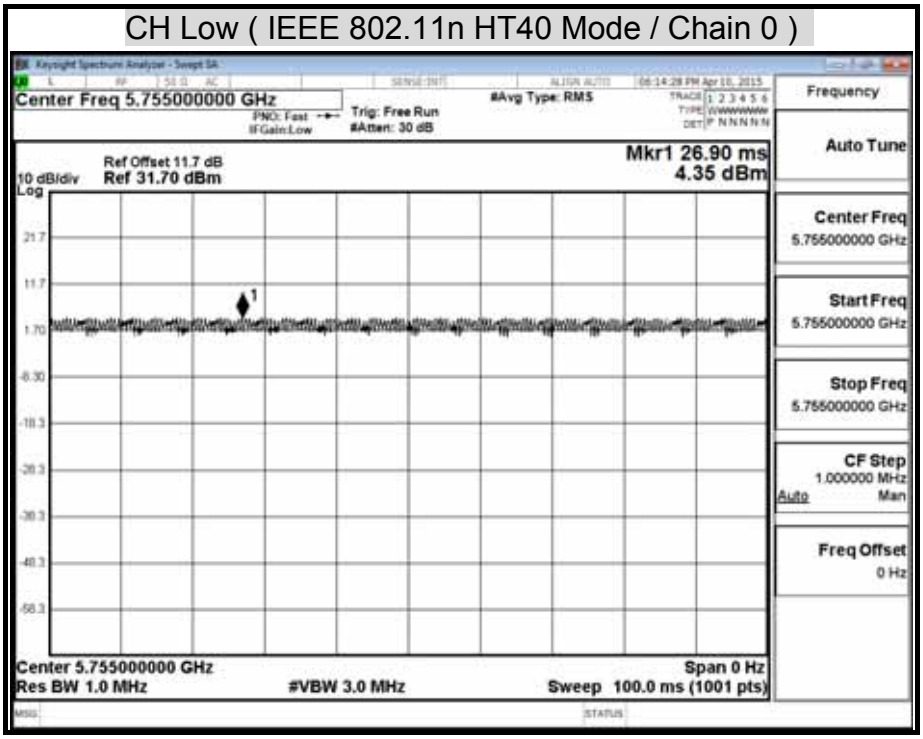


CH High (IEEE 802.11n HT40 Mode / Chain 0)

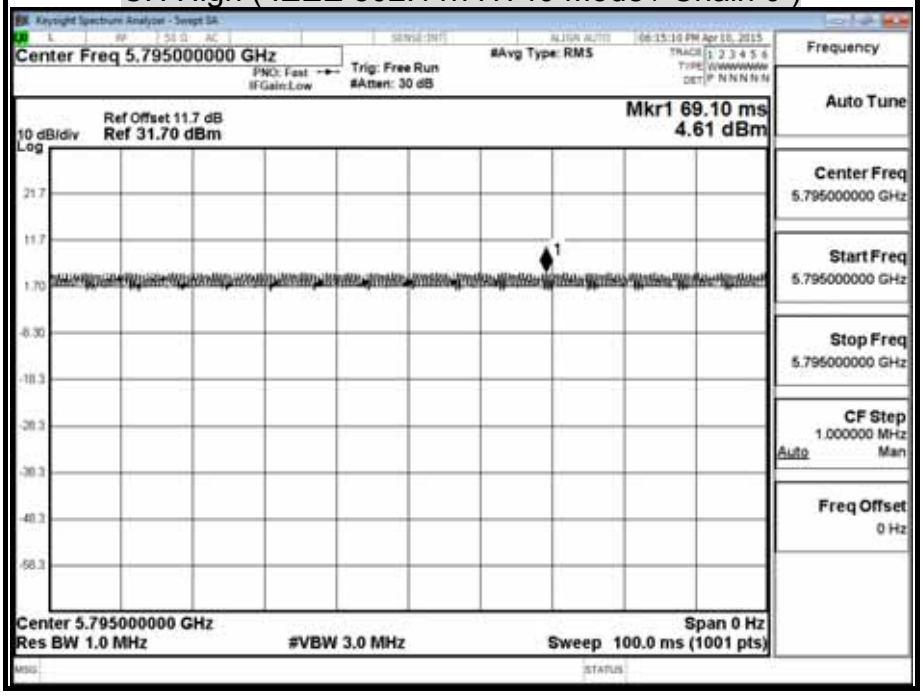


Test Mode: IEEE 802.11n HT 40 MHz mode / 5725 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 0)



CH High (IEEE 802.11n HT40 Mode / Chain 0)



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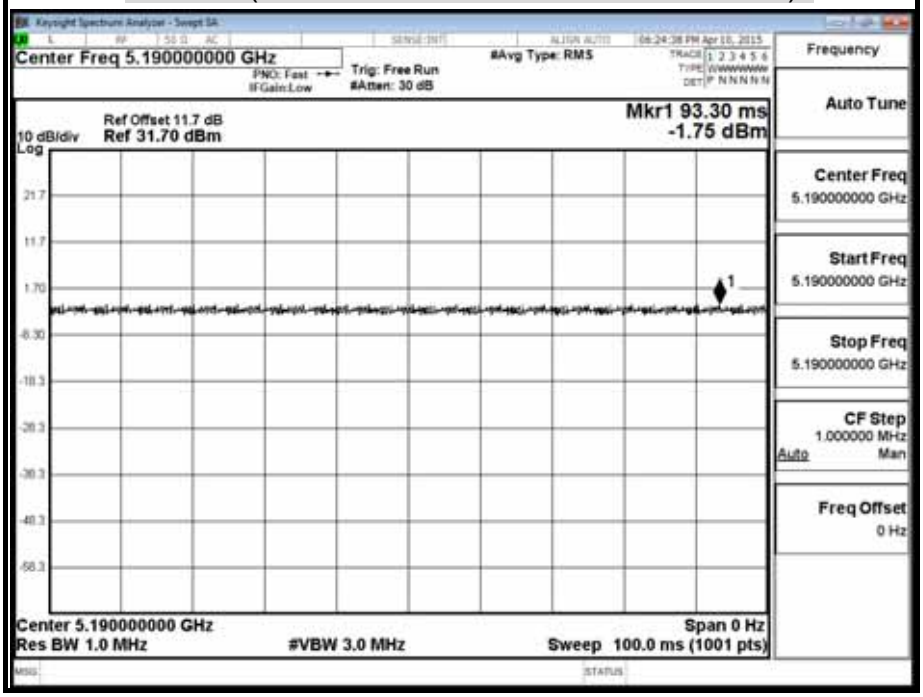
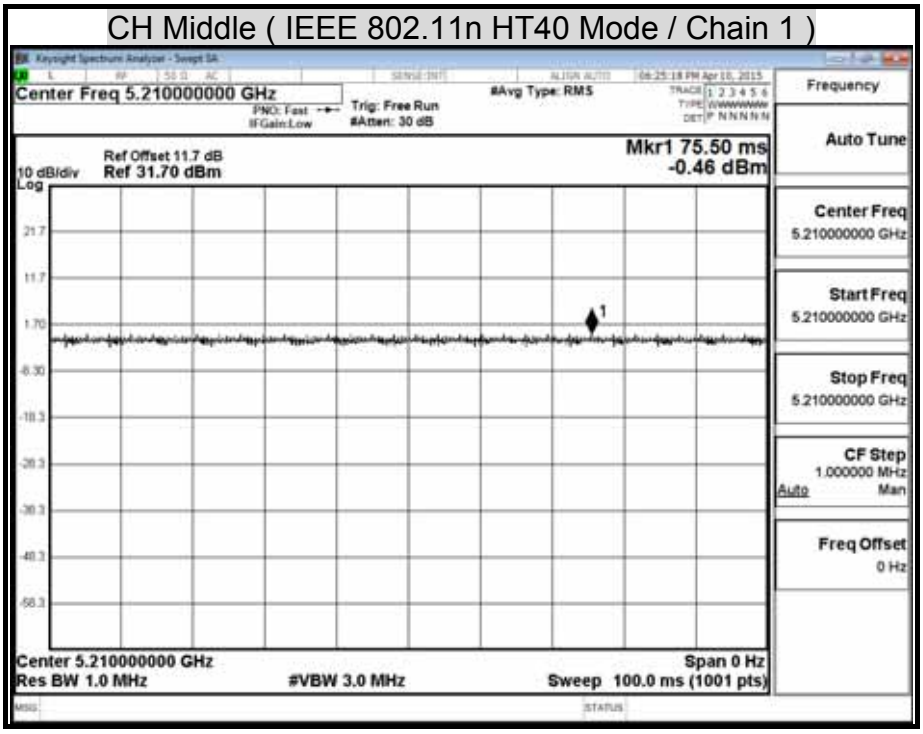
Test Mode: IEEE 802.11n HT 40 MHz mode / 5150 ~ 5250MHz

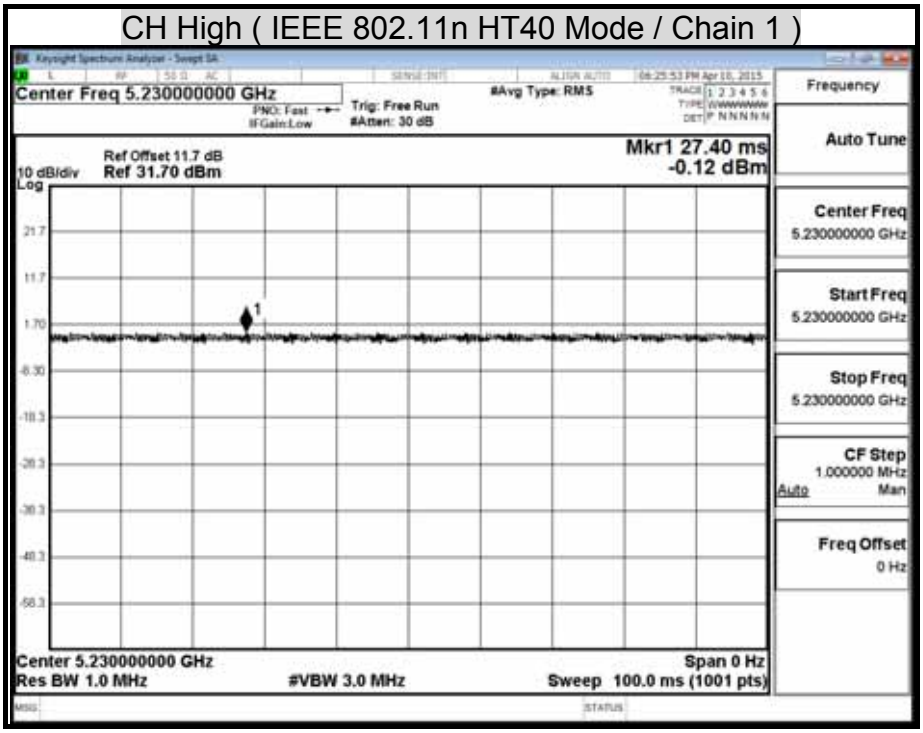
CH Low (IEEE 802.11n HT40 Mode / Chain 1)



CH Middle (IEEE 802.11n HT40 Mode / Chain 1)

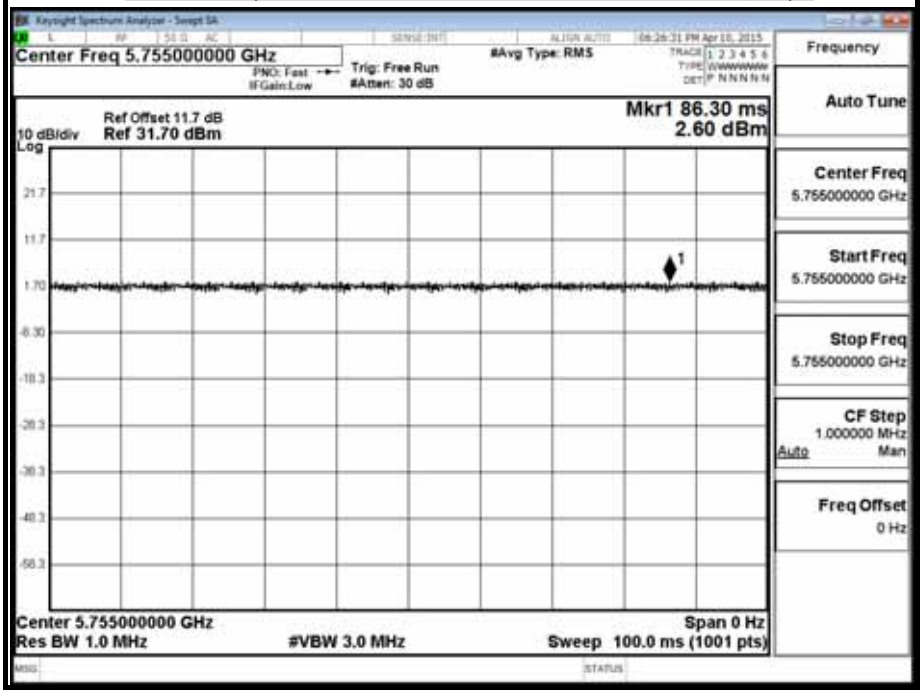


CH High (IEEE 802.11n HT40 Mode / Chain 1)

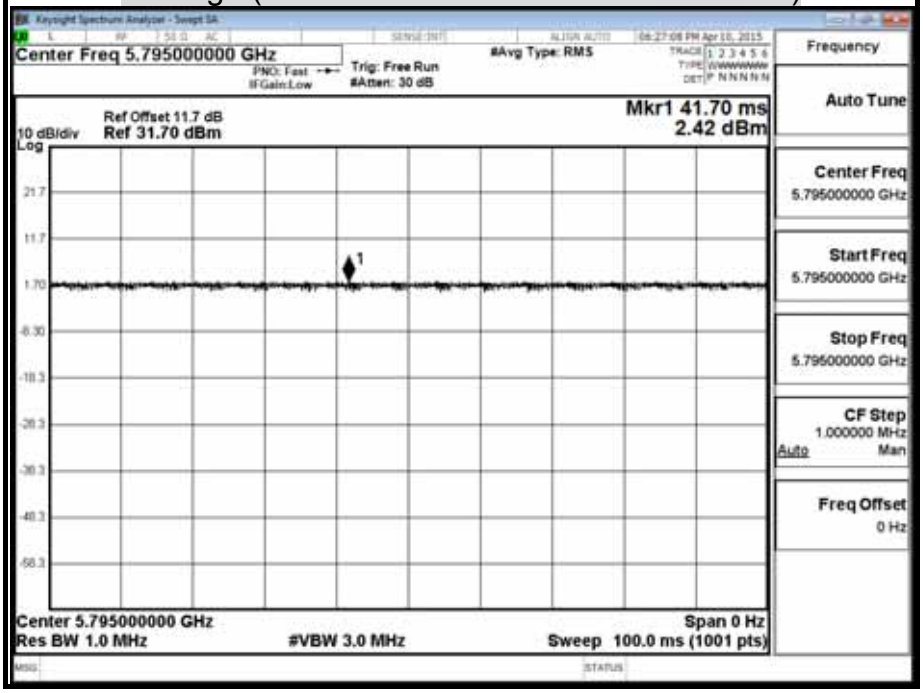


Test Mode: IEEE 802.11n HT 40 MHz mode / 5725 ~ 5850 MHz

CH Low (IEEE 802.11n HT40 Mode / Chain 1)

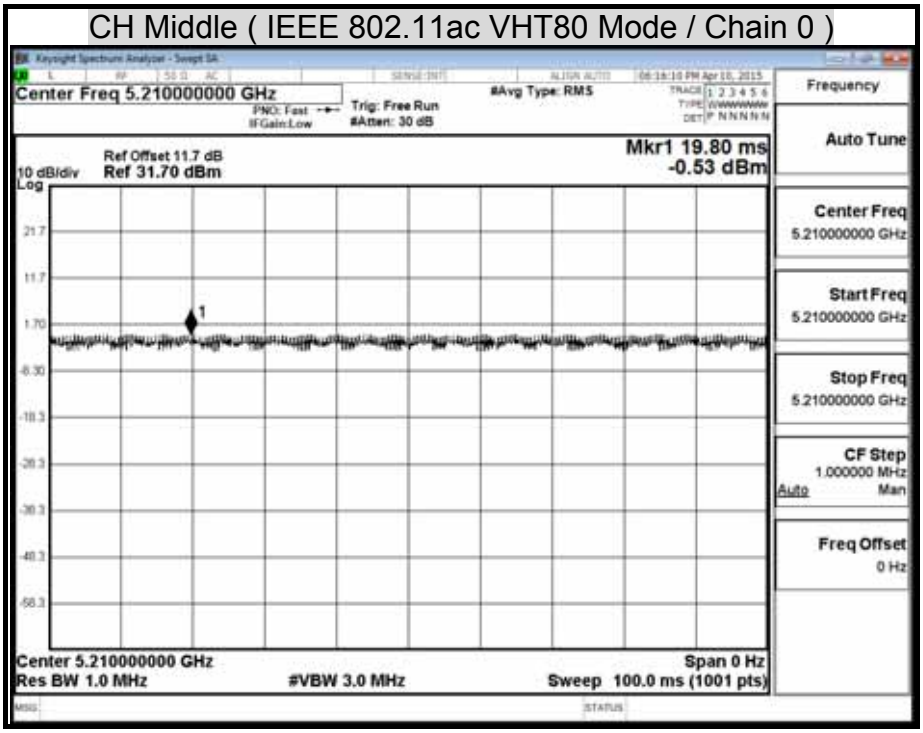


CH High (IEEE 802.11n HT40 Mode / Chain 1)



Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5150 ~ 5250MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)



Test Mode: IEEE 802.11ac VHT 80 MHz mode / 5725 ~ 5850MHz

CH Middle (IEEE 802.11ac VHT80 Mode / Chain 0)