CERTIFICATE #3478.01

TEST REPORT

EUT Description	**WLAN and BT, 2x2 PCIe M.2 1216 SD adapter card, LTE Coexistence**
Brand Name	**Intel® Wireless-AC 9560**
Model Name	**9560D2WL**
FCC ID ISED ID	**PD99560D2L** **1000M-9560D2L**
Date of Test Start/End	**2018-02-19 / 2018-03-09**
Features	**802.11ac, Dual Band, 2x2 Wi-Fi + Bluetooth® 5** (see section 5)

Applicant	**Intel Mobile Communications**
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Contact Person	**Steven Hackett**
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Reference Standards	**FCC CFR Title 47 Part 15 E** **RSS-247 issue 2, RSS-Gen issue 4** (see section 1)

Test Report identification	**180201-02.TR03**
Revision Control	**Rev. 00** **This test report revision replaces any previous test report revision** (see section 8)

The test results relate only to the samples tested.
The test report shall not be reproduced in full, without written approval of the laboratory.

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1. Standards, reference documents and applicable test methods

1. FCC 47 CFR part 15 – Subpart E – Unlicensed National Information Infrastructure Devices.
2. FCC 47 CFR part 15 - Subpart C – §15.209 Radiated emission limits; general requirements.
3. FCC OET KDB 789033 D02 General U-NII Test Procedures New Rules v02r01 – Guidelines for compliance testing of Unlicensed National Information Infrastructure (U-NII) Devices (Part 15, Subpart E)
4. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
5. RSS-247 Issue 2 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.
6. RSS-Gen Issue 4 - General Requirements for Compliance of Radio Apparatus.

2. General conditions, competences and guarantees

- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2005 testing laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED Assigned Code 1000Y.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

- ✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	20 ºC ±3 ºC
Humidity	35 % ± 15 %

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	180201-02.S01	Module	9560D2WL	WFM: 3413E87ED82B	2018-02-14	Used for conducted tests
	170524-02.S15	Extender Board	PCB00609_01	6092416-442	2017-05-30	
	170000-01.S01	Laptop	Latitude E5470	DPBLMC2	2017-03-28	
	170220-04.S04	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-04-10	
#02	180201-02.S03	Module	9560D2WL	WFM:3413E87ED853	2018-02-14	Used for Radiated Spurious Emission tests from 30 MHz to 1 GHz and AC power-line conducted emission tests
	170220-02.S03	Extender Board	PCB00609_01	6092416-446	2017-02-20	
	170000-01.S13	Laptop	Latitude E5470	FT6LMC2	2017-05-30	
	170727-02.S16	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-07-27	
#03	180201-02.S04	Module	9560D2WL	WFM:3413E87ED803	2018-02-14	Used for Radiated Spurious Emission tests from 1 GHz to 40 GHz
	170220-02.S04	Extender Board	PCB00609_01	6092416-493	2017-02-20	
	170000-01.S16	Laptop	Latitude E5470	C2HTPF2	2017-06-13	
	170727-02.S13	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-08-09	

5. EUT Features

Brand Name	Intel® Wireless-AC 9560
Model Name	9560D2WL
FCC ID	PD99560D2L
ISED ID	1000M-9560D2L
Software Version	11.1807.0-07027
Driver Version	99.0.28.6
Prototype / Production	Production
Supported Radios	802.11b/g/n 2.4GHz (2400.0 – 2483.5 MHz) 802.11a/n/ac 5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5850.0 MHz) Bluetooth 5 2.4GHz (2400.0 – 2483.5 MHz)
Antenna Information	CHAIN A: PIFA antenna. WiFi 2.4GHz & 5GHz and BT CHAIN B: PIFA antenna. WiFi 2.4GHz & 5GHz
Additional Information	

6. Remarks and comments

N/A

7. Test Verdicts summary

7.1. 802.11 a/n/ac – U-NII- 3

FCC part	RSS part	Test name	Verdict
15.407 (a) (3)	RSS-247 Clause 6.2.4.1	Power Limits. Maximum output power	P
15.407 (a) (3)	RSS-247 Clause 6.2.4.1	Peak power spectral density	P
15.407 (b) (3)	RSS-247 Clause 6.2.4.2	Undesirable emissions limits: Band Edge (conducted)	P
15.407 (b) (3) 15.209	RSS-247 Clause 6.2.4.2 RSS-GEN Clause 8.9	Undesirable emissions limits (radiated)	P
15.407 (6) 15.207	RSS-GEN Clause 8.8	AC power-line conducted emission measurements	P

8. Document Revision History

Revision #	Date	Modified by	Revision Details
Rev.00	2018-03-09	F. Nsengiyumva Z.Ouachicha	First Issue

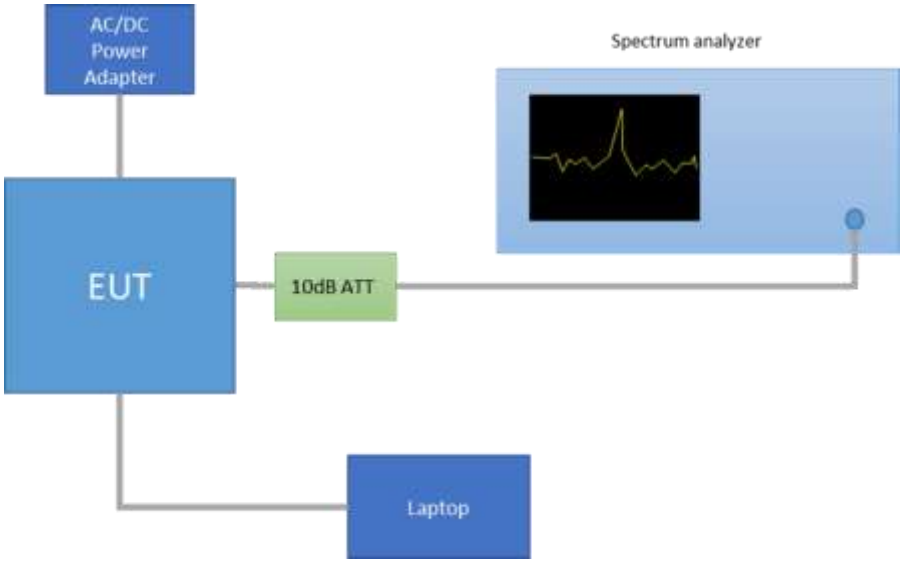
Annex A. Test & System Description

A.1 Measurement System

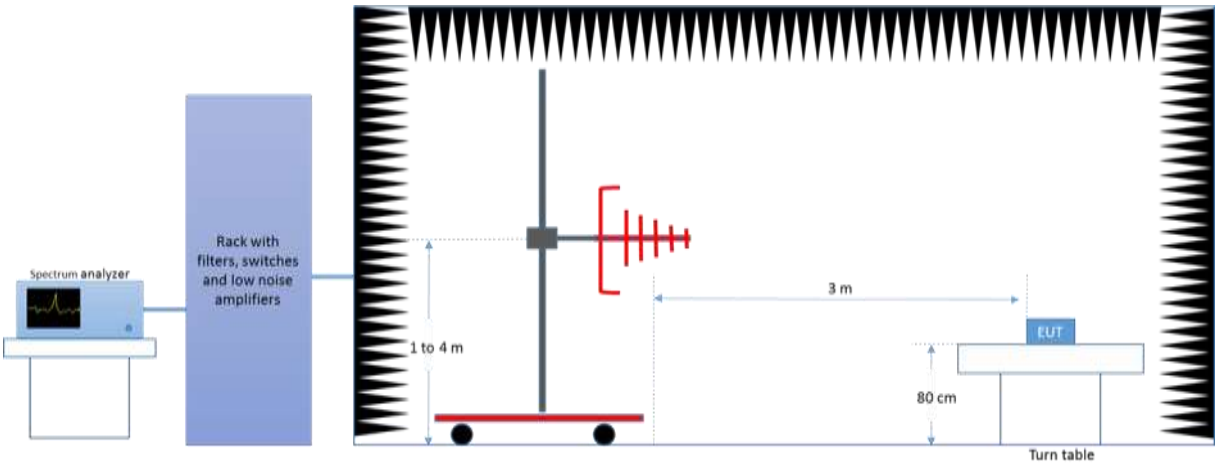
Measurements were performed using the following setups, made in accordance to the general provisions of FCC KDB 789033 D02 General UNII Test Procedures.

The DUT was installed in a test fixture and this test fixture is connected to a laptop computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes, using the Intel proprietary tool DRTU.

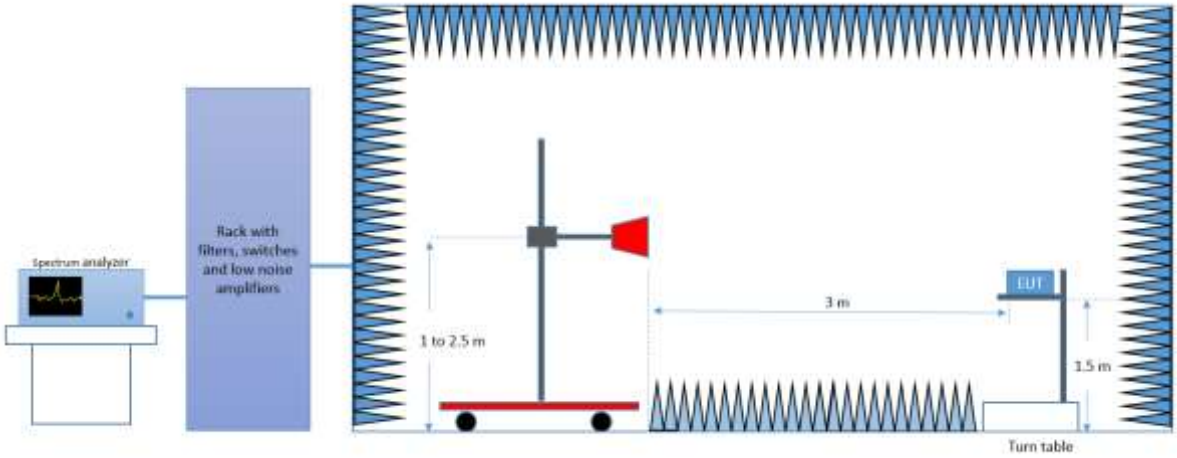
Conducted Setup



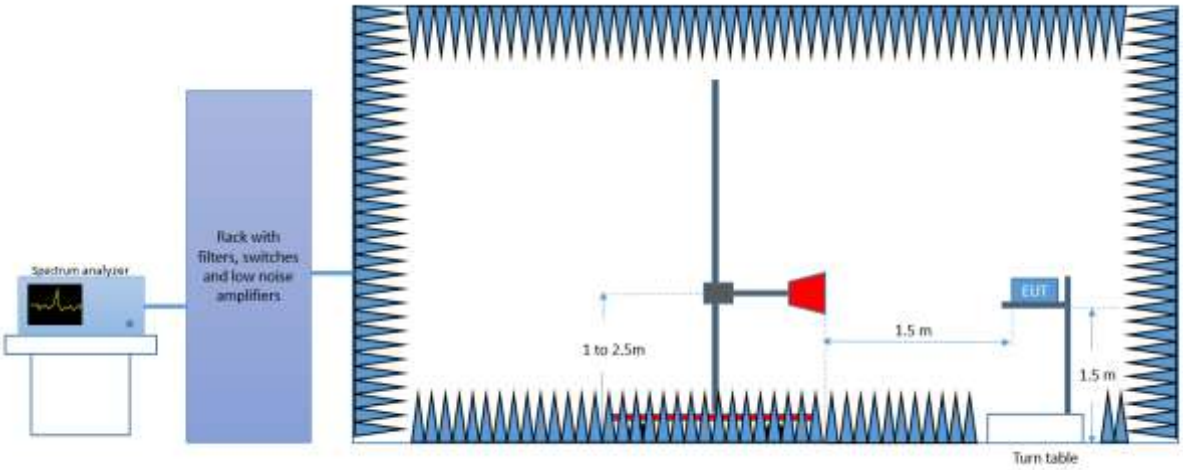
Radiated Setup 30 MHz – 1 GHz



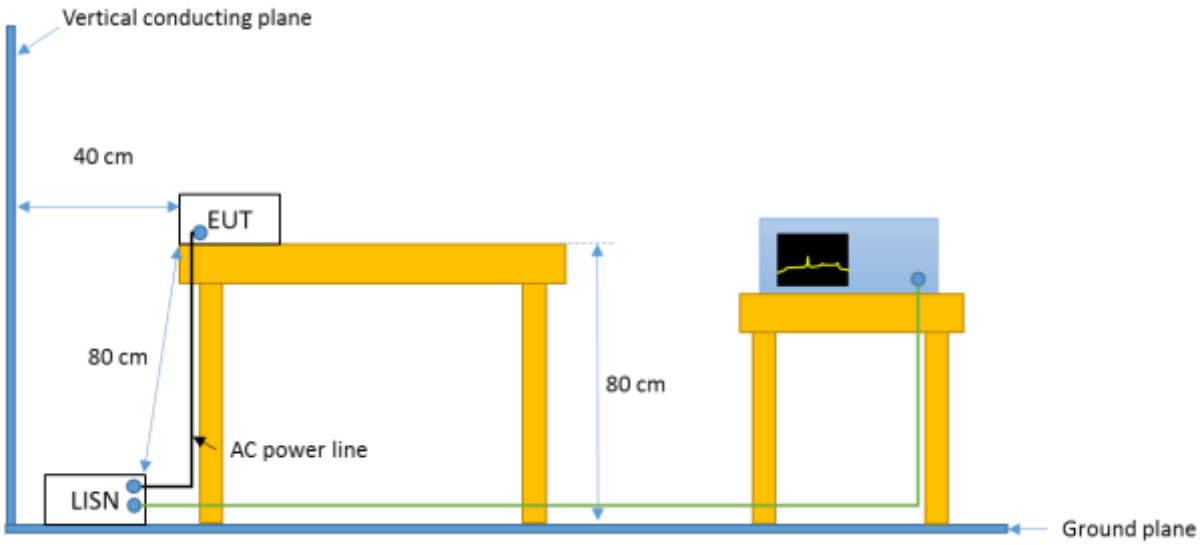
Radiated Setup 1 GHz – 18 GHz



Radiated Setup 18 GHz – 40 GHz



AC power-line conducted emission Setup 150 kHz – 30 MHz



A.2 Test Equipment List

Conducted Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0316	Spectrum analyzer	FSV30	103309	Rohde & Schwarz	2017-09-22	2019-09-22

Radiated Setup-1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0133	Spectrum analyzer	FSV40	101358	Rohde & Schwarz	2016-04-15	2018-04-15
0137	Log antenna 30 MHz – 1 GHz	3142E	00156946	ETS Lindgren	2017-12-19	2019-12-19
0135	Semi Anechoic chamber	FACT 3	5720	ETS Lindgren	2016-04-28	2018-04-28
0530	Measurement Software	EMC32	100623	Rohde & Schwarz	N/A	N/A

N/A: Not Applicable

Radiated Setup-2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0420	Spectrum analyzer	FSV40	101556	Rohde & Schwarz	2016-04-14	2018-04-14
0138	Horn antenna 1 GHz – 6.4 GHz	3117	00152266	ETS Lindgren	2016-03-14	2018-03-14
0141	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2016-04-13	2018-04-13
0334	Double Ridged Horn Antenna 18 GHz – 40 GHz	3116C-PA	00196308	ETS Lindgren	2017-08-22	2019-08-22
0337	Full Anechoic chamber	RFD_FA_100	5996	ETS Lindgren	2016-04-28	2018-04-28
0329	Measurement Software	EMC32	100401	Rohde & Schwarz	N/A	N/A

N/A: Not Applicable

Radiated Setup - shared equipments

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0617	Power Sensor 50MHz-18GHz	NRP-Z81	104386	Rohde & Schwarz	2017-05-24	2019-05-24
0618	Power Sensor 50MHz-18GHz	NRP-Z81	104382	Rohde & Schwarz	2017-05-24	2019-05-24

AC power-line conducted emission Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0027	Measurement software	EMC32	1300.7010.02	Rohde & Schwarz	NA	NA
0317	Spectrum Analyzer	FSV30	103308	Rohde & Schwarz	2017-08-05	2019-08-05
0532	LISN	ENV216	101321	Rohde & Schwarz	2016-09-13	2018-09-13
0607	LISN	ENV216	101342	Rohde & Schwarz	2017-09-06	2018-09-06
0538	Transformer	Monophase	TIMM3.15	Montelem	NA	NA
0095	Millivoltmeter	2000	4009301	KEITHLEY	2017-11-13	2019-11-13
0624	AC power source	61604	SM135546	CHROMA	NA	NA
0299	Multimeter	34401A	US36065790	HP	2017-11-14	2019-11-14

N/A: Not Applicable

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the below table:

Measurement type	Uncertainty [±dB]
Conducted Power	±1.0
Conducted Spurious Emission	±2.9
Radiated tests <1GHz	±3.8
Radiated tests 1GHz - 40 GHz	±4.7
AC power-line conducted emission	±1.45

Annex B. Test Results U-NII-3

B.1 Test Conditions

For 802.11a mode the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually, but not simultaneously.

For 802.11n20 (20 MHz channel bandwidth), 802.11n40 (40MHz channel bandwidth) and 802.11ac80 (80MHz channel bandwidth) modes the EUT can transmit at both CHAIN A and CHAIN B RF outputs individually, and also simultaneously.

The conducted RF output power at each chain was adjusted according to the client's supplied Target values (see following table) using the Intel DRTU tool and measuring the power by using a spectrum analyser with the channel integration method according to point II) E) 2) e) (Method SA-2 Alternative) of Guidance 789033 D02.
Measured values for adjustment were within +/- 0.25 dB from the declared Target values.

U-NII-3					Conducted Power, Target Value (dBm)		
Mode	BW (MHz)	Data Rate	CH #	Freq. (MHz)	SISO Chain A	SISO Chain B	MIMO at both ports A and B
802.11a	20	6Mbps	149	5745	21.5	21.5	-
			157	5785	21.5	21.5	-
			165	5825	21.5	21.5	-
802.11n	20	HT0 HT8*	149	5745	21.5	21.5	23.5
			157	5785	21.5	21.5	23.5
			165	5825	21.5	21.5	23.5
	40	HT0 HT8*	151F	5755	21.0	19.5	21.0
			159F	5795	21.0	22.0	24.0
802.11ac	80	VHT0	155ac80	5775	17.0	17.5	17.0

Overlapped channels between UNII-2C and UNII-3					Conducted Power, Target Value (dBm)		
Mode	BW (MHz)	Data Rate	CH #	Freq. (MHz)	SISO Chain A	SISO Chain B	MIMO at both ports A and B
802.11n	20	HT0 HT8*	144	5720	20.5	20.5	23.0
	40	HT0 HT8*	142F	5710	20.0	20.5	23.0
802.11ac	80	VHT0	138ac80	5690	19.5	20.0	23.0

The following data rates were selected based on preliminary testing that identified those rates as the worst cases for output power and spurious levels at the band edges:

802.11a → 6Mbps
802.11n20 and 802.11n40 (SISO) → HT0
802.11n20 and 802.11n40 (MIMO) → HT8
802.11ac80 (SISO) → VHT0
802.11ac80 (MIMO) → VHT0

Alternative channels to the lowest and highest channels per band have been also tested for Band Edge compliance.

B.2 Test Results Tables

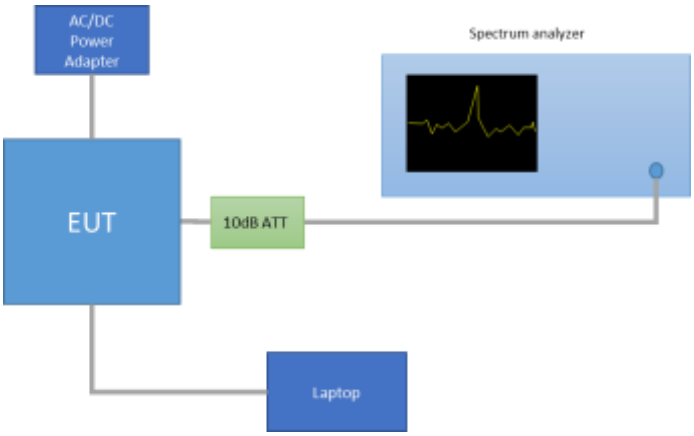
B.2.1 6dB & 99% Bandwidth

Test limits

FCC part	RSS part	Limits
15.407 (e)	RSS-247 Clause 6.2.4.1	For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

The setup below was used to measure the 6dB & 99% Bandwidth. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



For the overlapped channels between U-NII-2C and U-NII-3 bands, and according to FCC KDB 789033 D02 v02r01 , the boundary frequency between the bands is used as one edge for defining the portion of the 6dB bandwidth that falls within a particular U-NII band. This rule is only applicable for the 6dB bandwidth and for those channels marked as overlapped.

Results tables

U-NII-3 channels

Mode	Rate	Antenna	Channel	Freq. [MHz]	6dB BW [MHz]	99% BW [MHz]
802.11a	6Mbps	SISO CHAIN A	149	5745	**16.34**	16.92
			157	5785	16.33	16.88
			165	5825	16.33	16.92
		SISO CHAIN B	149	5745	16.33	16.88
			157	5785	16.32	16.88
			165	5825	16.34	**16.96**
802.11n20	HT0	SISO CHAIN A	149	5745	**17.58**	17.92
			157	5785	17.56	17.92
			165	5825	17.57	**18.00**
		SISO CHAIN B	149	5745	17.58	17.96
			157	5785	17.58	17.96
			165	5825	17.58	18.00
	HT8	MIMO CHAIN A	149	5745	17.57	17.92
			157	5785	17.58	17.96
			165	5825	17.57	**18.00**
		MIMO CHAIN B	149	5745	**17.59**	17.84
			157	5785	17.59	17.96
			165	5825	17.59	18.00
802.11n40	HT0	SISO CHAIN A	151F	5755	36.33	36.64
			159F	5795	36.33	**36.72**
		SISO CHAIN B	151F	5755	36.33	36.64
			159F	5795	**36.34**	36.72
	HT8	MIMO CHAIN A	151F	5755	36.33	36.56
			159F	5795	36.33	**36.72**
		MIMO CHAIN B	151F	5755	**36.35**	36.40
			159F	5795	36.35	36.40
802.11ac80	VHT0	SISO CHAIN A	155ac80	5775	**71.46**	**75.12**
		SISO CHAIN B		5775	72.72	75.12
		MIMO CHAIN A		5775	**71.42**	**75.12**
		MIMO CHAIN B		5775	71.42	75.00

Max Value

Overlapped channels between U-NII-2C and U-NII-3

Mode	Rate	Antenna	Channel	Frequency	6dB BW [MHz]	26dB BW UNII-3
802.11n20	HT0	SISO CHAIN A	144	5720	3.64	**7.13**
		SISO CHAIN B			**3.65**	6.93
	HT8	MIMO CHAIN A			3.82	6.87
		MIMO CHAIN B			**3.86**	**7.08**
802.11n40	HT0	SISO CHAIN A	142F	5710	**3.19**	**7.19**
		SISO CHAIN B			3.17	6.92
	HT8	MIMO CHAIN A			**3.25**	**6.92**
		MIMO CHAIN B			3.24	6.83
802.11ac80	VHT0	SISO CHAIN A	138ac80	5690	**3.19**	6.90
		SISO CHAIN B			3.18	**8.42**
		MIMO CHAIN A			**3.22**	**7.85**
		MIMO CHAIN B			3.22	7.85

Max Value

Note, the 26dB bandwidth of the overlapped channels falling in U-NII-3 band is shown in the above table. These values were used to measure the maximum output power in the U-NII-3 band as specified in chapter B.2.2.

See Section B.3.1, B.3.2, B.3.3, and Section B.3.4 for the screenshot results.

B.2.2 Power Limits. Maximum output power & Peak power spectral Density

Test limits

FCC part	RSS part	Limits
15.407 (a) (3)	RSS-247 Clause 6.2.4.1	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

Test procedure

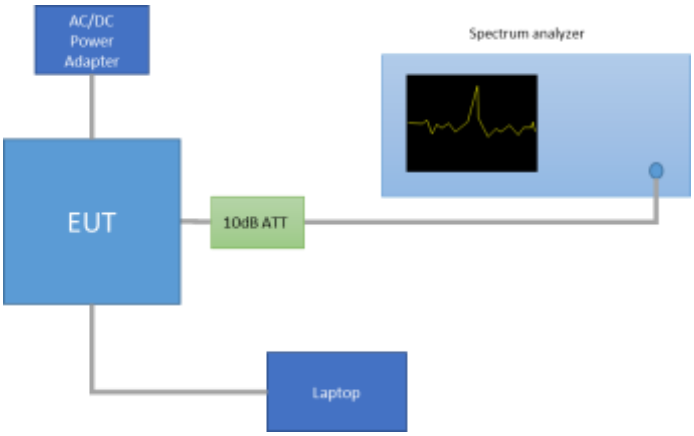
The Maximum Conducted Output Power was measured using the channel integration method according to point E) 2) e) (Method SA-2 Alternative) of KDB 789033 D02.
The maximum power spectral density (PSD) was measured using the method according to point F) (Method SA-2 Alternative) of KDB 789033 D02.

In the measure-and-sum approach for MIMO mode, the conducted emission level (e.g., transmit power or power in specified bandwidth) is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically in linear power units to determine the total emission level from the device.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power.

The setup below was used to measure the maximum conducted output power and power spectral density. The antenna terminal of the EUT is connected to the spectrum analyser through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

The declared maximum antenna gain is 5dBi.



For the overlapped channels between U-NII-2C and U-NII-3, and according to FCC KDB 789033 D02 v02r01 , the power is computed based on the portion of the emission bandwidth (26dB) contained within that band. This rule is only applicable for those channels marked as overlapped.

Results tables

Duty cycle

Mode	Rate	Antenna	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
802.11a	6Mbps	SISO-A	2.03	2.07	98.30%
		SISO-B	2.03	2.07	98.30%
802.11n20	HT0	SISO-A	1.89	1.93	98.12%
		SISO-B	1.89	1.93	98.12%
	HT8	MIMO-A	0.97	1.01	95.99%
		MIMO-B	0.97	1.01	95.99%
802.11n40	HT0	SISO-A	0.93	0.96	96.40%
		SISO-B	0.93	0.96	96.40%
	HT8	MIMO-A	0.49	0.53	92.32%
		MIMO-B	0.49	0.53	92.32%
802.11ac80	VHT0	SISO-A	0.46	0.49	93.22%
		SISO-B	0.46	0.49	93.22%
		MIMO-A	0.26	0.30	86.31%
		MIMO-B	0.26	0.30	86.31%

Maximum output power – U-NII-3 Channels

Mode	Rate	Channel	Frequency (MHz)	Antenna	Average Cond. Output Power [dBm]	Max.* Cond. Output Power [dBm]	Max.* Cond. Output Power [mW]	Max.* EIRP [dBm]
802.11a	6Mbps	149	5745	SISO CHAIN A	21.35	21.35	136.46	26.35
				SISO CHAIN B	21.36	21.36	136.77	26.36
		157	5785	SISO CHAIN A	21.34	21.34	136.14	26.34
				SISO CHAIN B	21.33	21.33	135.83	26.33
		165	5825	SISO CHAIN A	21.32	21.32	**135.52**	26.32
				SISO CHAIN B	21.40	21.40	**138.04**	26.40
802.11n20	HT0	149	5745	SISO CHAIN A	21.26	21.26	133.66	26.26
				SISO CHAIN B	21.20	21.20	**131.83**	26.20
		157	5785	SISO CHAIN A	21.28	21.28	134.28	26.28
				SISO CHAIN B	21.31	21.31	**135.21**	26.31
		165	5825	SISO CHAIN A	21.31	21.31	135.21	26.31
				SISO CHAIN B	21.27	21.27	133.97	26.27
	HT8	149	5745	MIMO CHAIN A	17.75	17.93	62.05	22.93
				MIMO CHAIN B	17.78	17.96	62.48	22.96
				Combined A+B	20.78	20.95	**124.54**	25.95
		157	5785	MIMO CHAIN A	20.37	20.55	113.44	25.55
				MIMO CHAIN B	20.45	20.63	115.55	25.63
				Combined A+B	23.42	23.60	228.99	28.60
		165	5825	MIMO CHAIN A	20.47	20.65	116.08	25.65
				MIMO CHAIN B	20.37	20.55	113.44	25.55
				Combined A+B	23.43	23.61	**229.52**	28.61
802.11n40	HT0	151F	5755	SISO CHAIN A	18.98	19.14	**82.02**	24.14
				SISO CHAIN B	19.15	19.31	85.30	24.31
		159F	5795	SISO CHAIN A	21.41	21.57	**143.53**	26.57
				SISO CHAIN B	21.29	21.45	139.62	26.45
	HT8	151F	5755	MIMO CHAIN A	16.62	16.97	49.74	21.97
				MIMO CHAIN B	16.82	17.17	52.08	22.17
				Combined A+B	19.73	20.08	**101.82**	25.08
		159F	5795	MIMO CHAIN A	20.39	20.74	118.49	25.74
				MIMO CHAIN B	20.32	20.67	116.60	25.67
				Combined A+B	23.37	23.71	**235.09**	28.71
802.11ac80	VHT0	155ac80	5775	SISO CHAIN A	16.80	17.10	**51.34**	22.10
				SISO CHAIN B	17.10	17.40	**55.02**	22.40
				MIMO CHAIN A	13.04	13.68	23.33	18.68
				MIMO CHAIN B	11.90	12.54	17.95	17.54
				Combined A+B	15.52	16.16	**41.28**	21.16

* Maximum values are the duty cycle compensated values calculated from the average (measured)

Max Value

Min Value

Maximum output power – Overlapped channels between U-NII-2C and U-NII-3

Mode	Rate	Channel	Freq.	Antenna	Average Cond. Output Power UNII-3 [dBm]	Max.* Cond. Output Power UNII-3 [dBm]	Max.* Cond. Output Power UNII-3 [mW]	Max.* EIRP UNII-3 [dBm]
802.11n20	HT0	144	5720	SISO CHAIN A	14.08	14.16	**26.08**	19.16
				SISO CHAIN B	14.36	14.44	**27.81**	19.44
	HT8			MIMO CHAIN A	12.88	13.06	20.22	18.06
				MIMO CHAIN B	13.15	13.33	21.52	18.33
				Combined A+B	16.03	16.20	**41.73**	21.20
802.11n40	HT0	142F	5710	SISO CHAIN A	10.16	10.32	**10.76**	15.32
				SISO CHAIN B	10.26	10.42	**11.01**	15.42
	HT8			MIMO CHAIN A	9.59	9.94	9.86	14.94
				MIMO CHAIN B	9.77	10.12	10.27	15.12
				Combined A+B	12.69	13.04	**20.13**	18.04
802.11ac80	VHT0	138ac80	5690	SISO CHAIN A	4.32	4.62	**2.90**	9.62
				SISO CHAIN B	4.26	4.56	**2.86**	9.56
				MIMO CHAIN A	3.81	4.45	2.79	9.45
				MIMO CHAIN B	3.84	4.48	2.81	9.48
				Combined A+B	6.84	7.47	**5.59**	12.47

* Maximum values are the duty cycle compensated values calculated from the measured average values

Max Value

Min Value

Maximum Power Spectral Density (PSD) – U-NII-3 channels

Mode	Rate	Channel	Freq. [MHz]	Antenna	Average conducted PSD [dBm/500kHz]	Max.* conducted PSD [dBm/500kHz]
802.11a	6Mbps	149	5745	SISO CHAIN A	6.65	6.65
				SISO CHAIN B	6.66	6.66
		157	5785	SISO CHAIN A	6.74	**6.74**
				SISO CHAIN B	6.71	6.71
		165	5825	SISO CHAIN A	6.64	6.64
				SISO CHAIN B	6.73	6.73
802.11n20	HT0	149	5745	SISO CHAIN A	6.30	6.30
				SISO CHAIN B	6.24	6.24
		157	5785	SISO CHAIN A	6.39	6.39
				SISO CHAIN B	6.39	6.39
		165	5825	SISO CHAIN A	6.44	**6.44**
				SISO CHAIN B	6.30	6.30
	HT8	149	5745	MIMO CHAIN A	2.82	3.00
				MIMO CHAIN B	2.96	3.14
				Combined A+B	5.90	6.08
		157	5785	MIMO CHAIN A	5.66	5.84
				MIMO CHAIN B	5.57	5.75
				Combined A+B	8.63	8.80
		165	5825	MIMO CHAIN A	5.61	5.79
				MIMO CHAIN B	5.50	5.68
				Combined A+B	8.57	**8.74**
802.11n40	HT0	151F	5755	SISO CHAIN A	1.04	1.20
				SISO CHAIN B	1.11	1.27
		159F	5795	SISO CHAIN A	3.38	**3.54**
				SISO CHAIN B	3.26	3.42
	HT8	151F	5755	MIMO CHAIN A	-1.23	-0.88
				MIMO CHAIN B	-1.09	2.86
				Combined A+B	1.85	2.20
		159F	5795	MIMO CHAIN A	2.51	-0.74
				MIMO CHAIN B	2.48	2.83
				Combined A+B	5.51	**5.85**
802.11ac80	VHT0	155ac80	5775	SISO CHAIN A	-3.40	-3.10
				SISO CHAIN B	-3.10	**-2.80**
				MIMO CHAIN A	-6.67	-6.03
				MIMO CHAIN B	-8.02	-7.38
				Combined A+B	-4.28	**-3.64**

* Maximum values are the duty cycle compensated values calculated from the average (measured)
Max Value

Maximum Power Spectral Density (PSD) – Overlapped channels between U-NII-2C and U-NII-3

Mode	Rate	Channel	Freq. [MHz]	Antenna	Average conducted PSD UNII-2C [dBm/MHz]	Maximum* conducted PSD UNII-2C [dBm/MHz]
802.11n20	HT0	144	5720	SISO CHAIN A	5.57	5.65
				SISO CHAIN B	5.86	**5.94**
	HT8			MIMO CHAIN A	4.52	4.70
				MIMO CHAIN B	4.62	4.80
				Combined A+B	7.58	**7.76**
802.11n40	HT0	142F	5710	SISO CHAIN A	2.49	2.65
				SISO CHAIN B	2.50	**2.66**
	HT8			MIMO CHAIN A	1.84	2.19
				MIMO CHAIN B	2.09	2.44
				Combined A+B	4.98	**5.32**
802.11ac80	VHT0	138ac80	5690	SISO CHAIN A	-3.33	**-3.03**
				SISO CHAIN B	-3.43	-3.13
				MIMO CHAIN A	-3.74	-3.10
				MIMO CHAIN B	-3.64	-3.00
				Combined A+B	-0.68	**-0.04**

* Maximum values are the duty cycle compensated values calculated from the average (measured) values

Max Value

See Section B.3.5, B.3.6, B.3.7, and Section B.3.8 for the screenshot results

B.2.3 Undesirable emission limits : Band Edge (Conducted)

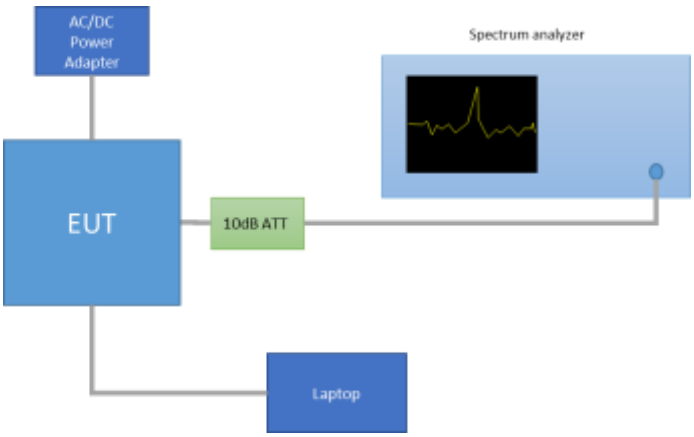
Test limits

FCC part	RSS part	Limits
15.407 (b) (4)	RSS-247 Clause 6.2.4.2	For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Test procedure

The setup below was used to measure undesirable emissions on the Band Edge domain. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss and the declared Antenna Gain.

The declared maximum antenna gain is 5dBi.



See Section B.3.9 for the screenshot results.

B.2.4 Radiated spurious emission

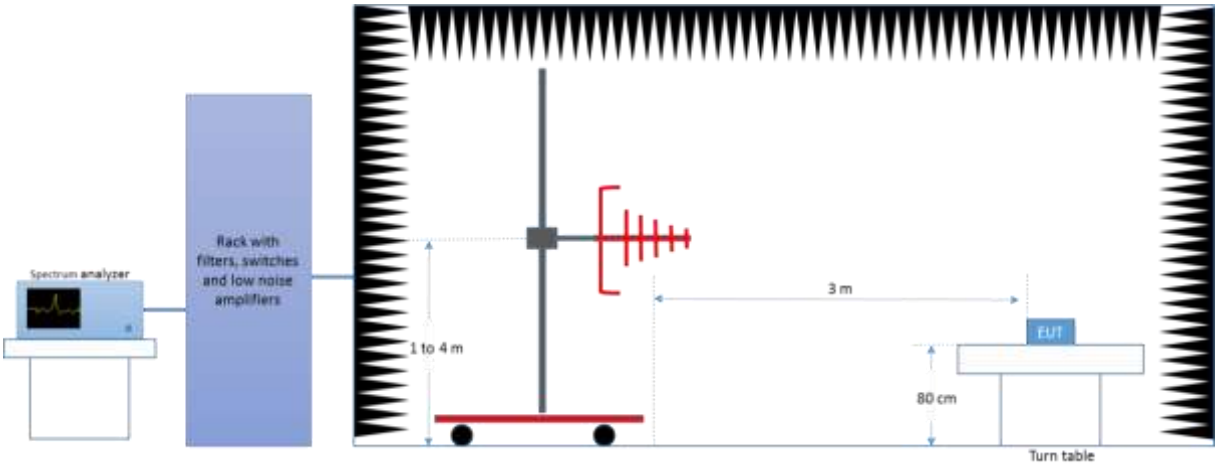
Standard references

<table>
<tr><th>FCC part</th><th>RSS part</th><th>Limits</th></tr>
<tr><td>15.407 (b) (4)</td><td>RSS-247 Clause 6.2.4.2</td><td>For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.</td></tr>
<tr><td>15.209</td><td>RSS-GEN, Clause 8.9</td><td>Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Strength (µV/m)</th><th>Field Strength (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

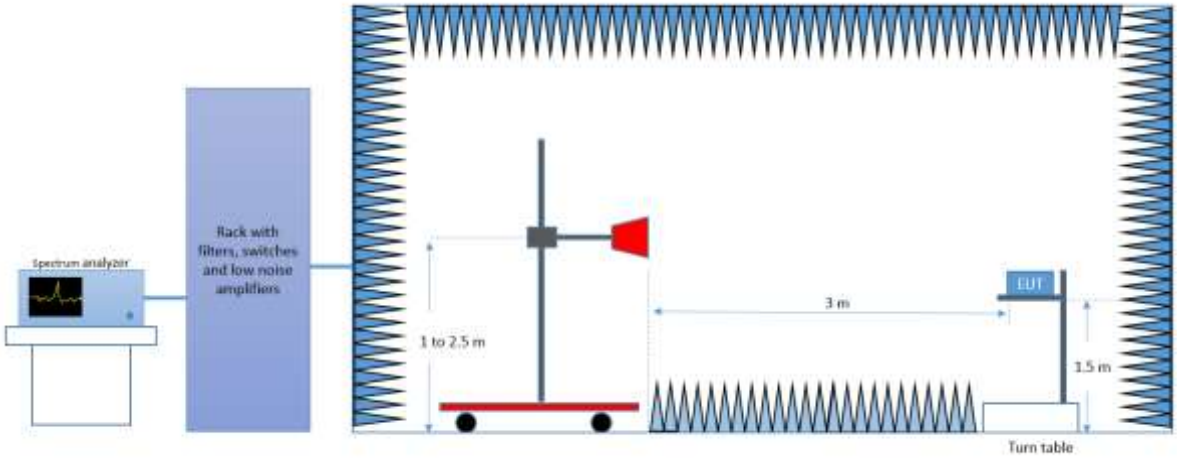
Test procedure

The setup below was used to measure the radiated spurious emissions.
Depending of the frequency range and bands being tested, different antennas and filters were used.
The final measurement is done by varying the antenna height, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The radiated spurious emission was measured on the worst case configuration selected from the chapter B.2.2 and using the low, middle and high channel.
For technologies 802.11n20, 802.11n40 and 802.11ac80 the worst case in terms of spurious emissions found among the low, mid and high channels when tested on chain A and B separately is used to perform the test in MIMO mode (Chain A+B).

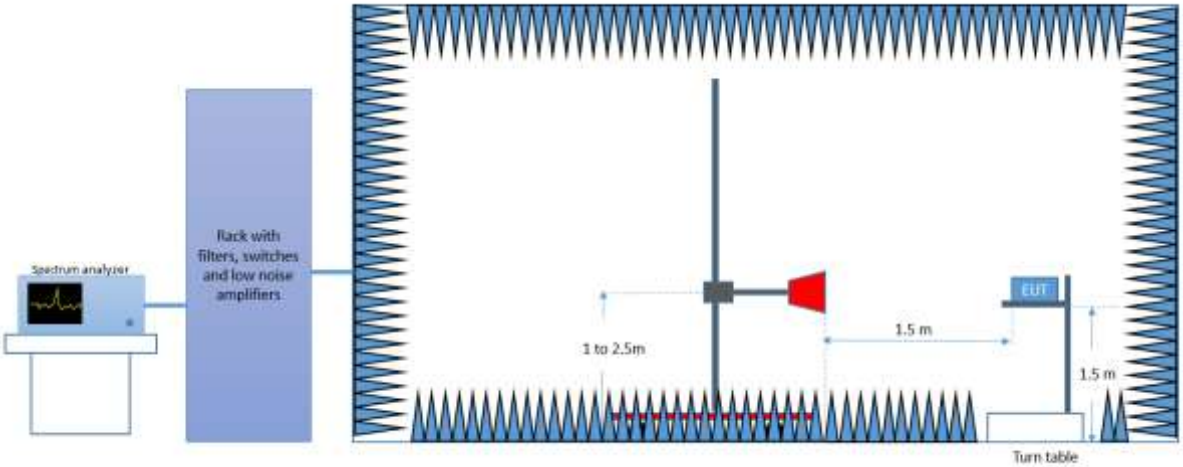
Radiated Setup 30 MHz- 1 GHz



Radiated Setup 1 GHz - 18 GHz



Radiated Setup 18 GHz - 40 GHz



Sample Calculation

The field strength is deduced from the radiated measurement using the following equation:

$$E = 126.8 - 20\log(\lambda) + P - G$$

where

E is the field strength of the emission at the measurement distance, in dBµV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/f_{MHz}], in m

G is the gain of the test antenna, in dBi

NOTE – The measured power P includes all applicable instrument correction factors up to the connection to the test

Antenna e.g. cable losses, amplifier gains.

For field strength measurements made at other than the distance at which the applicable limit is specified, the field strength of the emission at the distance specified by the limit is deduced as follows:

$$E_{SpecLimit} = E_{Meas} + 20\log(D_{Meas}/D_{SpecLimit})$$

where

$E_{SpecLimit}$ *is the field strength of the emission at the distance specified by the limit, in dBµV/m*

E_{Meas} *is the field strength of the emission at the measurement distance, in dBµV/m*

D_{Meas} *is the measurement distance, in m*

$D_{SpecLimit}$ *is the distance specified by the limit, in m*

Test Results

30 MHz – 40 GHz, 802.11a, 6Mbps, Chain A

Radiated Spurious – CH149

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.8	---	43.6	12.8
216.0	31.1	---	46.0	14.9
576.0	37.5	---	46.0	**8.5**
640.0	35.3	---	46.0	10.7
1124.9	44.7	---	74.0	29.3
1124.9	---	36.9	54.0	17.1
1190.2	---	39.0	54.0	15.0
1190.5	44.5	---	74.0	29.5
11488.4	53.3	---	74.0	20.7
11488.8	---	41.9	54.0	12.1
39671.4	---	41.3	54.0	12.7
39866.7	51.2	---	74.0	22.8

Radiated Spurious – CH157

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.7	---	43.6	12.9
216.0	28.4	---	46.0	17.6
312.0	30.7	---	46.0	15.3
576.0	37.2	---	46.0	8.8
1124.9	---	37.2	54.0	16.8
1125.2	45.3	---	74.0	28.7
1190.0	44.9	---	74.0	29.1
1190.2	---	38.6	54.0	15.4
11566.5	---	41.1	54.0	12.9
11574.5	51.7	---	74.0	22.3
23142.5	50.9	---	74.0	23.1
23144.4	---	41.1	54.0	12.9

Radiated Spurious – CH165

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.5	---	43.6	13.1
576.0	36.5	---	46.0	9.5
640.0	35.9	---	46.0	10.1
1113.6	---	35.1	54.0	18.9
1114.1	42.7	---	74.0	31.3
1151.9	---	34.7	54.0	19.3
1190.2	45.7	---	74.0	28.3
1190.2	---	39.7	54.0	14.3
11638.7	50.3	---	74.0	23.7
11649.0	---	39.2	54.0	14.8
23297.6	50.9	---	74.0	23.1
23298.4	---	41.5	54.0	12.5

30 MHz – 40 GHz, 802.11a, 6Mbps, Chain B

Radiated Spurious – CH149

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.6	---	43.6	13.0
216.0	31.7	---	43.6	11.9
264.0	33.5	---	46.0	12.5
576.0	37.0	---	46.0	9.0
1113.4	43.5	---	74.0	30.5
1113.6	---	36.1	54.0	17.9
1190.2	46.3	---	74.0	27.7
1190.2	---	39.3	54.0	14.7
16654.4	56.7	---	74.0	17.3
16662.4	---	45.5	54.0	8.5
39666.3	---	42.6	54.0	11.4
39869.6	53.7	---	74.0	20.3

Radiated Spurious – CH157

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	31.0	---	43.6	12.6
576.0	36.9	---	46.0	9.1
640.0	35.4	---	46.0	10.6
1113.2	43.1	---	74.0	30.9
1113.4	---	36.2	54.0	17.8
1190.2	45.4	---	74.0	28.6
1190.2	---	39.3	54.0	14.7
15943.2	---	44.3	54.0	9.7
15945.0	55.1	---	74.0	18.9
39796.2	---	42.8	54.0	11.2
39838.0	53.1	---	74.0	20.9

Radiated Spurious – CH165

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	31.0	---	43.6	12.4
216.0	30.6	---	46.0	15.4
576.0	37.2	---	46.0	8.8
1113.4	43.0	---	74.0	31.0
1113.6	---	36.2	54.0	17.8
1190.5	---	39.1	54.0	14.9
1190.7	45.0	---	74.0	29.0
15945.5	---	43.7	54.0	10.3
15948.1	55.7	---	74.0	18.3
39789.5	53.3	---	74.0	20.7
39814.0	---	43.1	54.0	10.9

30 MHz – 40 GHz, 802.11n20, HT0, Chain A

Radiated Spurious – CH149

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.5	---	43.6	13.1
168.8	34.6	---	43.6	9.0
264.0	39.6	---	46.0	6.4
576.0	36.5	---	46.0	9.5
1113.4	43.0	---	74.0	31.0
1113.6	---	34.8	54.0	19.2
1190.5	44.4	---	74.0	29.6
1190.5	---	38.7	54.0	15.3
11490.2	52.0	---	74.0	22.0
11490.2	---	42.2	54.0	11.8
39794.1	---	43.0	54.0	11.0
39811.8	53.7	---	74.0	20.3

Radiated Spurious – CH157

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
264.0	34.1	---	46.0	11.9
576.0	36.6	---	46.0	9.4
1113.4	---	35.5	54.0	18.5
1113.6	43.5	---	74.0	30.5
1190.2	---	39.4	54.0	14.6
1190.5	46.3	---	74.0	27.7
11566.9	---	41.2	54.0	12.8
11570.0	51.6	---	74.0	22.4
23286.2	53.7	---	74.0	20.3
23301.6	---	42.5	54.0	11.5

Radiated Spurious – CH165

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	29.2	---	43.6	14.4
216.0	32.2	---	46.0	13.8
264.0	36.7	---	46.0	9.3
576.0	37.0	---	46.0	9.0
1113.4	---	34.6	54.0	19.4
1113.6	42.6	---	74.0	31.4
1190.2	45.9	---	74.0	28.1
1190.2	---	39.2	54.0	14.8
17466.0	57.8	---	74.0	16.2
17475.3	---	46.3	54.0	7.7
23301.6	---	42.5	54.0	11.5
23286.2	53.7	---	74.0	20.3

30 MHz – 40 GHz, 802.11n20, HT0, Chain B

Radiated Spurious – CH149

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.6	---	43.6	13.0
216.0	33.4	---	46.0	12.6
264.0	41.6	---	46.0	**4.4**
1113.4	---	36.5	54.0	17.5
1113.6	43.0	---	74.0	31.0
1190.2	45.5	---	74.0	28.5
1190.2	---	39.4	54.0	14.6
16616.9	---	45.2	54.0	8.8
16617.8	56.7	---	74.0	17.3
39683.6	53.5	---	74.0	20.5
39816.9	---	42.7	54.0	11.3

Radiated Spurious – CH157

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
209.3	33.4	---	43.6	10.2
576.0	36.9	---	46.0	9.1
902.5	39.1	---	46.0	6.9
1113.4	---	36.7	54.0	17.3
1113.6	43.3	---	74.0	30.7
1190.2	44.5	---	74.0	29.5
1190.2	---	39.0	54.0	15.0
13406.8	---	40.2	54.0	13.8
13410.0	53.5	---	74.0	20.5
39794.1	53.7	---	74.0	20.3
39819.4	---	42.8	54.0	11.2

Radiated Spurious – CH165

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	26.9	---	43.6	16.7
576.0	36.4	---	46.0	9.6
640.0	36.7	---	46.0	9.3
1113.4	44.1	---	74.0	29.9
1113.4	---	36.4	54.0	17.6
1190.0	44.5	---	74.0	29.5
1190.5	---	39.7	54.0	14.3
15972.7	54.6	---	74.0	19.4
15973.6	---	44.0	54.0	10.0
39834.6	---	42.8	54.0	11.2
39774.7	53.0	---	74.0	21.0

30 MHz – 40 GHz, 802.11n20, HT8, Chain A+B

Radiated Spurious – CH157

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	26.5	---	43.6	17.1
178.9	26.8	---	43.6	16.8
640.0	40.9	---	46.0	5.1
1113.6	42.8	---	74.0	31.2
1113.6	---	33.9	54.0	20.1
1190.2	---	38.5	54.0	15.5
1190.5	44.8	---	74.0	29.2
11566.0	52.4	---	74.0	21.6
11566.9	---	42.0	54.0	12.0
17348.2	55.1	---	74.0	18.9
17354.9	---	44.4	54.0	9.6
23141.2	52.3	---	74.0	21.7
23141.7	---	41.5	54.0	12.5

30 MHz – 40 GHz, 802.11n40, HT0, Chain A

Radiated Spurious – CH151F

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	26.4	---	43.6	17.2
576.0	36.5	---	46.0	9.5
1113.4	42.6	---	74.0	31.4
1113.6	---	35.2	54.0	18.8
1190.5	45.8	---	74.0	28.2
1190.5	---	39.5	54.0	14.5
11514.3	51.3	---	74.0	22.7
11514.3	---	40.9	54.0	13.1
39709.8	---	42.9	54.0	11.1
39957.8	53.6	---	74.0	20.4

Radiated Spurious – CH159F

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	29.6	---	43.6	14.0
216.0	28.7	---	46.0	17.3
576.0	36.4	---	46.0	9.6
640.0	36.4	---	46.0	9.6
1113.6	---	34.7	54.0	19.3
1113.6	43.0	---	74.0	31.0
1190.2	---	39.4	54.0	14.6
1190.7	44.9	---	74.0	29.1
16625.0	55.9	---	74.0	18.1
16626.3	---	44.8	54.0	9.2
39836.3	---	43.9	54.0	10.1
39841.0	54.7	---	74.0	19.3

30 MHz – 40 GHz, 802.11n40, HT0, Chain B

Radiated Spurious – CH151F

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	29.1	---	43.6	14.5
216.0	29.1	---	46.0	16.9
576.0	35.8	---	46.0	10.2
640.0	36.8	---	46.0	9.2
1113.4	---	36.5	54.0	17.5
1113.6	43.0	---	74.0	31.0
1190.2	45.0	---	74.0	29.0
1190.2	---	39.5	54.0	14.5
15970.0	---	43.7	54.0	10.3
15984.7	55.3	---	74.0	18.7
39636.3	---	42.9	54.0	11.1
39968.8	53.8	---	74.0	20.2

Radiated Spurious – CH159F

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	29.5	---	43.6	14.1
216.0	28.3	---	43.6	15.3
576.0	36.5	---	46.0	9.5
640.0	36.3	---	46.0	9.7
1113.4	42.9	---	74.0	31.1
1113.6	---	36.5	54.0	17.5
1190.2	---	38.9	54.0	15.1
1190.5	45.3	---	74.0	28.7
16621.4	---	44.8	54.0	9.2
16629.9	56.7	---	74.0	17.3
39797.1	---	44.1	54.0	9.9
39994.1	54.2	---	74.0	19.8

30 MHz – 40 GHz, 802.11n40, HT8, Chain A+B

Radiated Spurious – CH159F

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	27.0	---	43.6	16.6
178.9	25.9	---	43.6	17.7
640.0	41.2	---	46.0	**4.8**
1113.4	41.6	---	74.0	32.4
1113.6	---	33.3	54.0	20.7
1189.5	44.3	---	74.0	29.7
1190.2	---	39.0	54.0	15.0
16651.3	57.1	---	74.0	16.9
16653.5	---	45.0	54.0	9.0
23182.9	---	39.1	54.0	14.9
23189.5	49.9	---	74.0	24.1

30 MHz – 40 GHz, 802.11ac80, VHT0, Chain A

Radiated Spurious – CH155ac80

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	29.3	---	43.6	14.3
216.0	27.7	---	46.0	18.3
576.0	37.2	---	46.0	8.8
640.0	36.7	---	46.0	9.3
1113.4	---	34.2	54.0	19.8
1113.6	42.5	---	74.0	31.5
1190.2	---	38.6	54.0	15.4
1190.5	44.9	---	74.0	29.1
16637.4	---	45.0	54.0	9.0
16644.6	56.6	---	74.0	17.4
23139.8	47.3	---	74.0	26.7
23139.8	---	39.9	54.0	14.1

30 MHz – 40 GHz, 802.11ac80, VHT0, Chain B

Radiated Spurious – CH155ac80

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	30.2	---	43.6	13.4
216.0	30.1	---	46.0	15.9
576.0	36.5	---	46.0	9.5
640.0	36.3	---	46.0	9.7
1113.2	42.7	---	74.0	31.3
1113.4	---	36.7	54.0	17.3
1190.0	45.9	---	74.0	28.1
1190.2	---	38.9	54.0	15.1
16617.8	57.0	---	74.0	17.0
16623.6	---	44.6	54.0	9.4
39849.4	53.6	---	74.0	20.4
39850.2	---	43.0	54.0	11.0

30 MHz – 40 GHz, 802.11ac80, VHT0, Chain A+B

Radiated Spurious – CH155ac80

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
115.2	27.1	---	43.6	16.5
170.6	25.2	---	43.6	18.4
320.0	32.1	---	46.0	13.9
640.0	42.0	---	46.0	**4.0**
1113.2	42.7	---	74.0	31.3
1113.4	---	33.2	54.0	20.8
1190.2	44.5	---	74.0	29.5
1190.5	---	38.1	54.0	15.9
16597.3	56.3	---	74.0	17.7
16620.0	---	45.0	54.0	9.0
23150.5	---	38.8	54.0	15.2
23160.0	48.3	---	74.0	25.7

B.2.5 AC power-line conducted emission

Standard references:

<table>
<tr><th>FCC part</th><th>Limits</th></tr>
<tr><td>15.407 (6)
15.207</td><td>Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

<table>
<tr><th rowspan="2">Frequency of emission (MHz)</th><th colspan="2">Conducted limit (dBµV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
*Decreases with the logarithm of the frequency.</td></tr>
</table>

Test procedure:

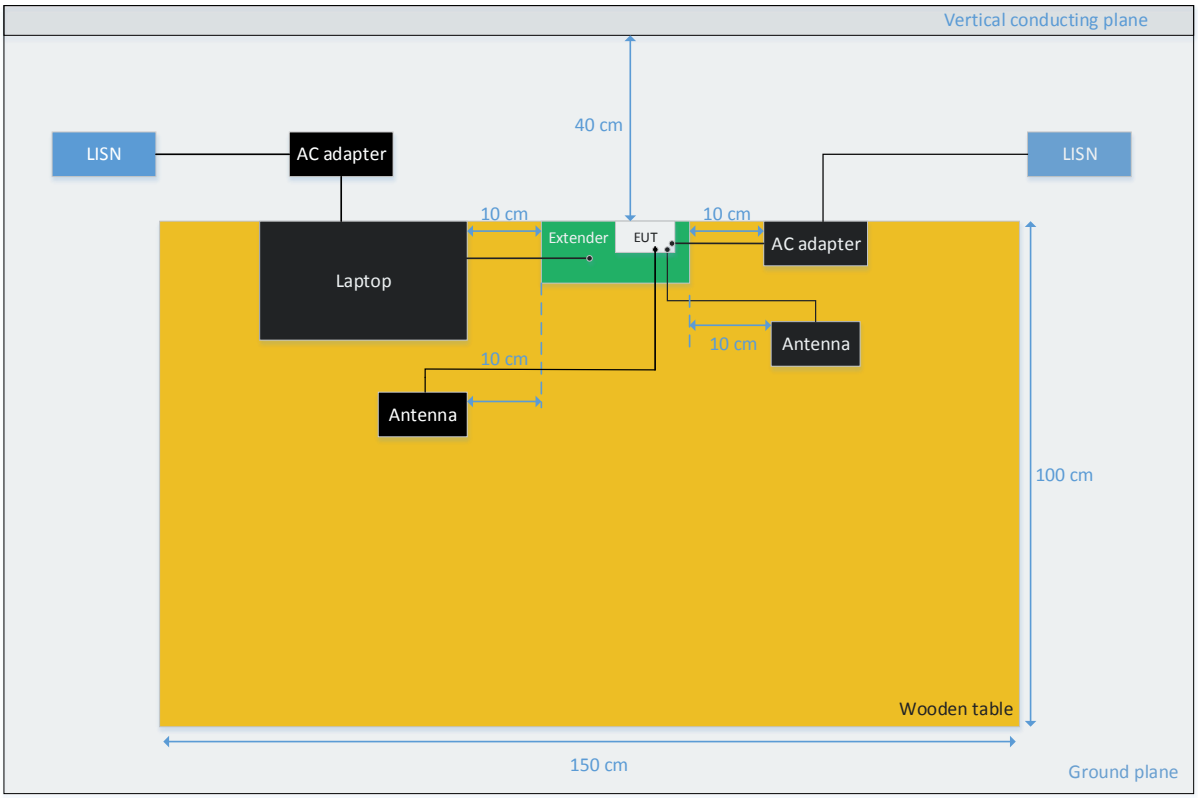
The EUT and peripherals are placed on a wooden table with a nominal size of 1.0 m by 1.5 m, raised 80 cm above the reference ground plane. The EUT is connected to AC-Power line through a Line Impedance Stabilization Network (LISN) to accommodate a 50 Ω/50 µH coupling impedance for the measurement system. The EUT control PC is considered as a peripheric and therefore is connected to a second LISN which has the measurement port connected to a 50 ohms impedance.

Each measurement is done for each current-carrying conductor (Line and Neutral) at the end plug of the EUT power cord. The EUT is tested for several transmission modes (frequency channel, modulation, etc.) and the result providing the maximum measured emission is reported.

The exploratory measurement is done over the frequency range from 150 kHz to 30 MHz, while the measurement receiver is recording the Peak and Average signal at 10 kHz steps in Max Hold mode. The cables manipulation is performed within the range of likely configurations to determine the maximum emission. Once the EUT cable configuration, arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is found the six highest AC power-line conducted emissions relative to 20 dB of the limit are reported as the final measurement. If fewer than six emission frequencies are within 20 dB of the limit, the noise level is reported. For the final measurement, the measurement receiver records the Quasi Peak values with 9 kHz resolution bandwidth and the average values with 10 kHz resolution bandwidth.

The reported results correspond to the configuration of the worst case spurious level detected among all modes.

EUT arrangement for AC power-line conducted emission tests



Sample Calculation:

The measured level at the spectrum analyzer in dBuV is corrected by a transducer factor taking into account the losses of the RF cable and the LISN as follows:

Conducted Emission level (dBuV) = SA_{Level} + $RFCable_{Losses}$ + $LISN_{Losses}$

Where:
SA_{Level} is the voltage level displayed on the measurement receiver, in dBuV.
$RFCable_{Losses}$ is the value of the cable losses between the LISN and the measurement receiver, in dB.
$LISN_{Losses}$ is the value of the insertion losses of the LISN, in dB.

Test Results:

150kHz – 30MHz, all modes

AC power-line conducted – Phase L1

Frequency	Max Peak	Avg	Limit	Margin
MHz	dBµV	dBµV	dBµV	dB
0.16	53.5	---	65.7	12.2
0.16	---	30.2	55.7	25.5
0.38	43.3	---	59.5	16.2
0.37	---	27.7	49.7	22.0
3.76	40.7	---	56.0	15.3
3.75	---	28.8	46.0	17.2
8.62	43.4	---	60.0	16.6
8.55	---	30.4	50.0	19.6
13.56	54.8	---	60.0	5.2
13.56	---	40.5	50.0	9.5
17.47	36.1	---	60.0	23.9
17.67	---	26.4	50.0	23.6

Note: The emissions found do not change with the modulation and/or frequency.

AC power-line conducted – Neutral N

Frequency	Max Peak	Avg	Limit	Margin
MHz	dBµV	dBµV	dBµV	dB
0.16	53.4	---	65.7	12.3
0.16	---	28.9	55.7	26.8
0.38	45.1	---	59.5	14.4
0.37	---	28.1	49.7	21.6
4.06	40.8	---	56.0	15.2
4.01	---	26.1	46.0	19.9
9.37	43.7	---	60.0	16.3
9.42	---	29.1	50.0	20.9
13.56	54.2	---	60.0	5.8
13.56	---	40.7	50.0	9.3
19.56	37.1	---	60.0	22.9
19.53	---	24.8	50.0	25.2

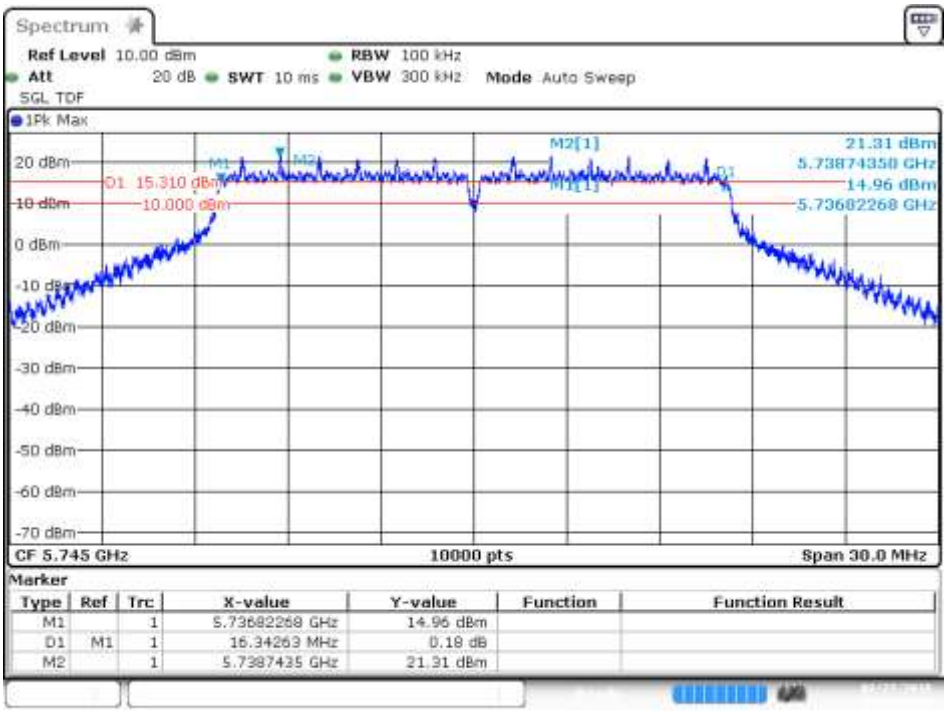
Note: The emissions found do not change with the modulation and/or frequency.

B.3 Test Results Screenshot

B.3.1 6dB Bandwidth

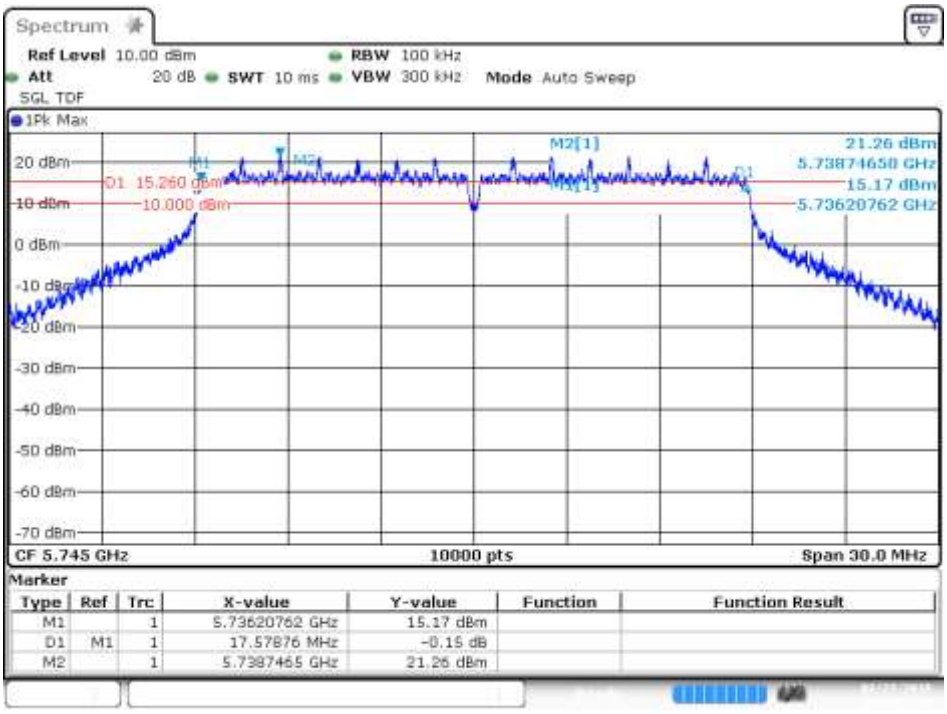
SISO-A, 802.11a, 6Mbps

Channel 149



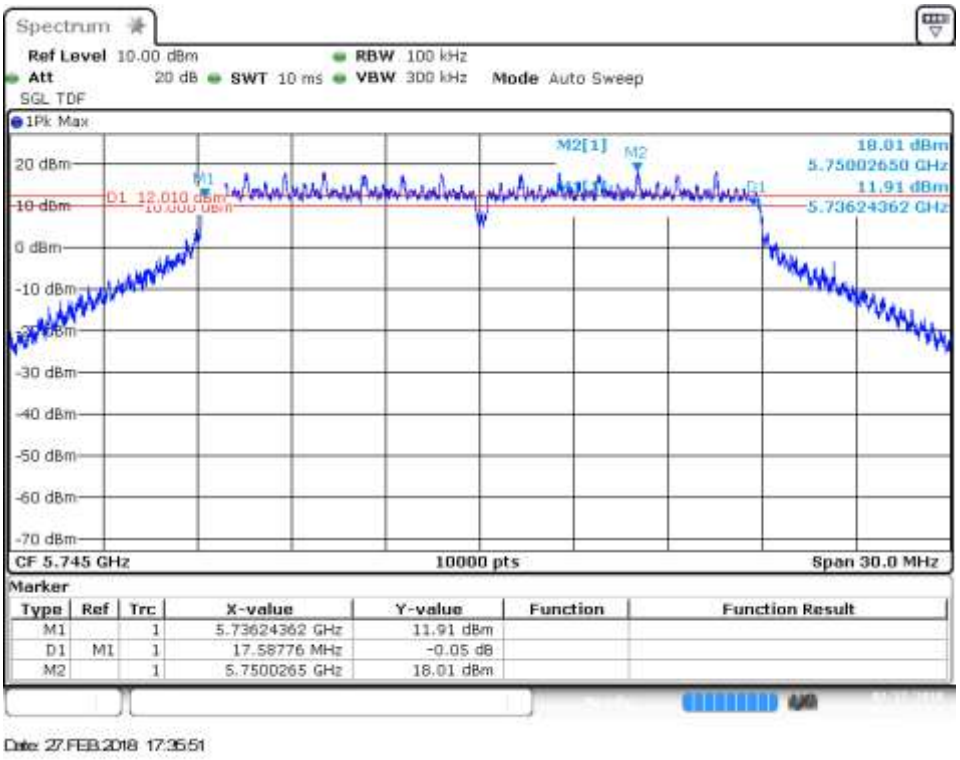
SISO-A, 802.11n20, HT0

Channel 149



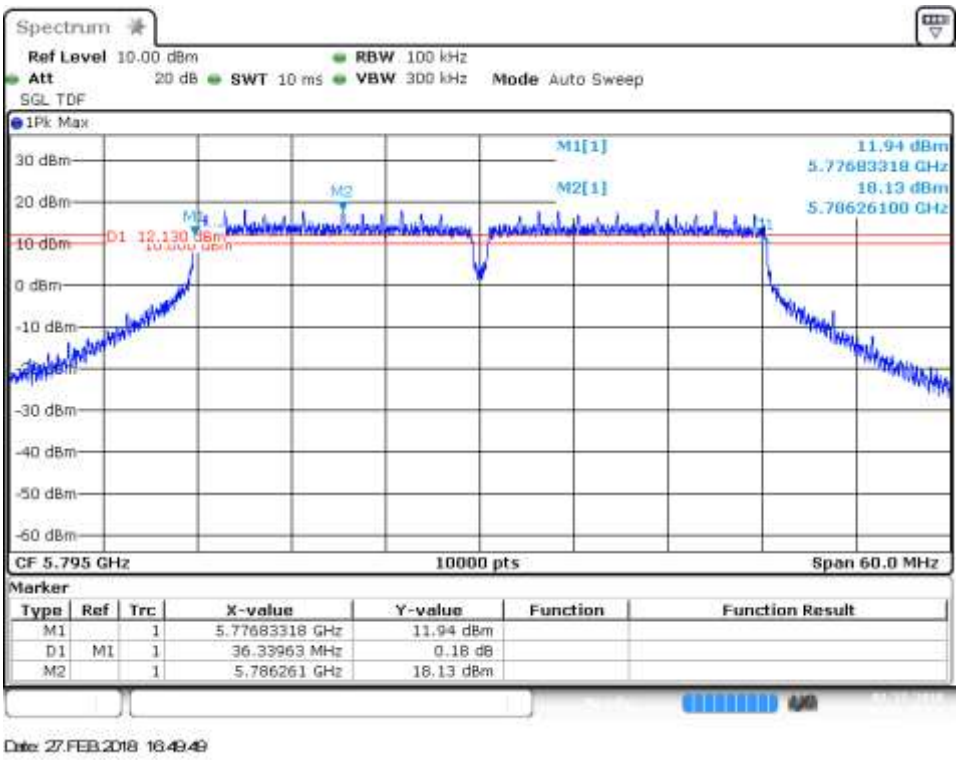
MIMO-B, 802.11n20, HT8

Channel 149



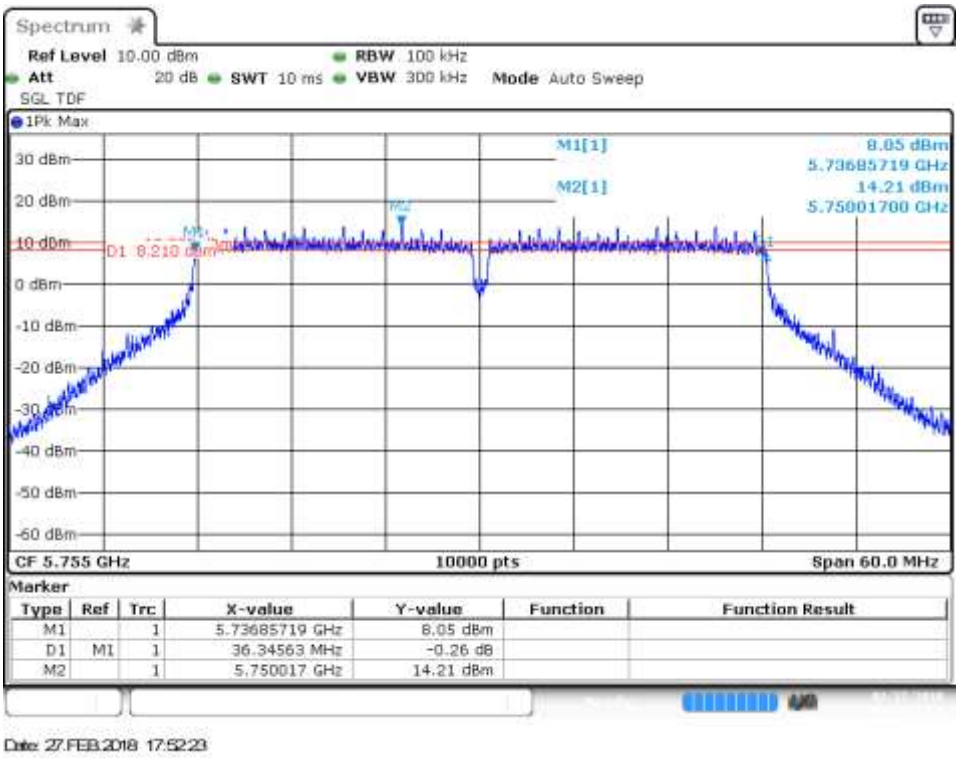
SISO-B, 802.11n40, HT0

Channel 159F



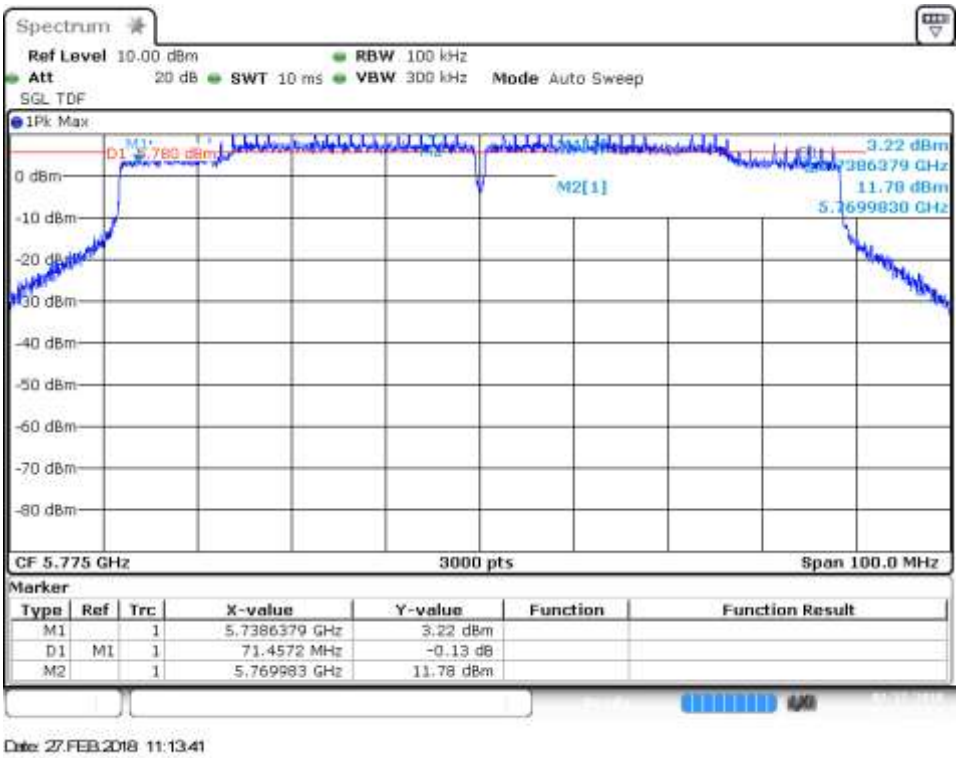
MIMO-B, 802.11n40, HT8

Channel 151F



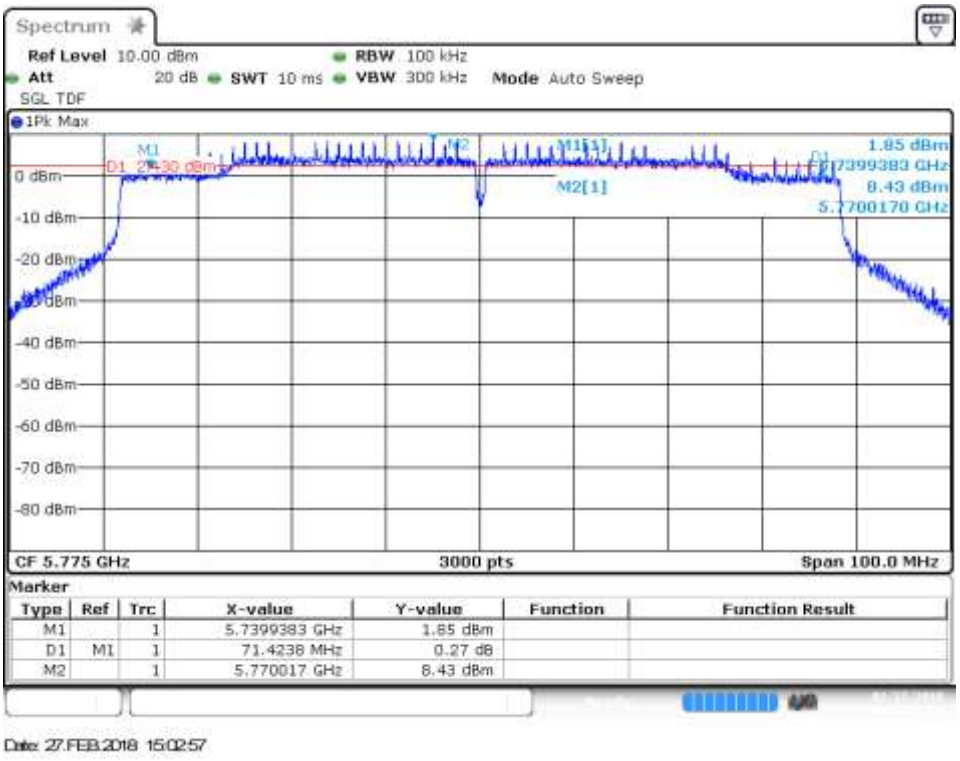
SISO-A, 802.11ac80, VHT0

Channel 155ac80



MIMO-A, 802.11ac80, VHT0

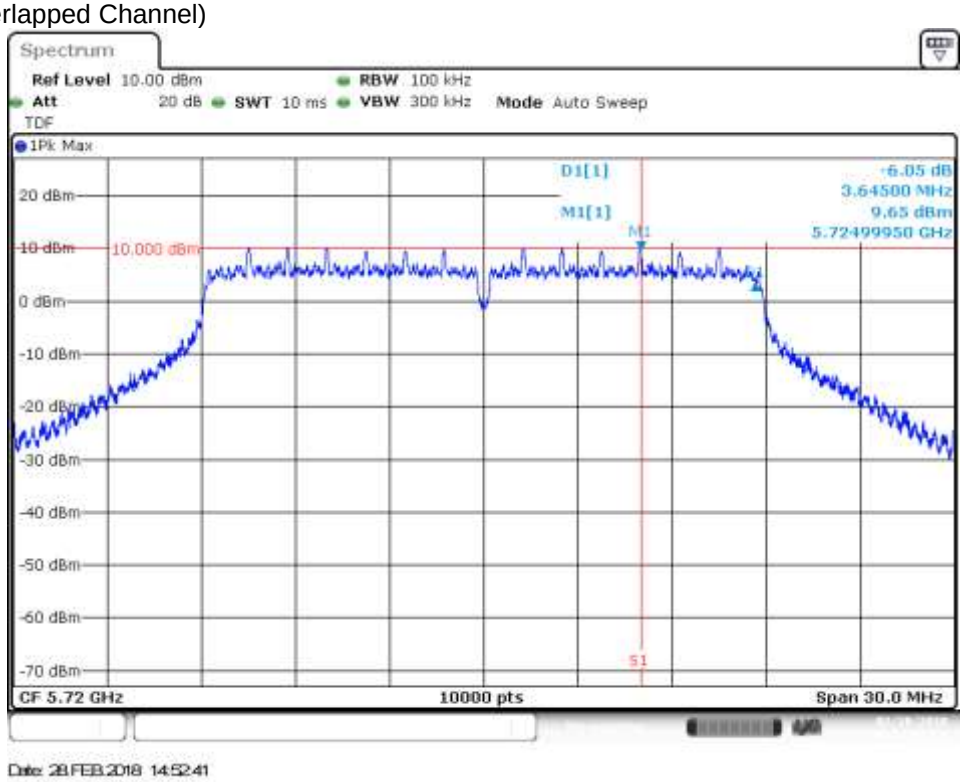
Channel 155ac80



B.3.2 6dB Bandwidth (Overlapped Channel)

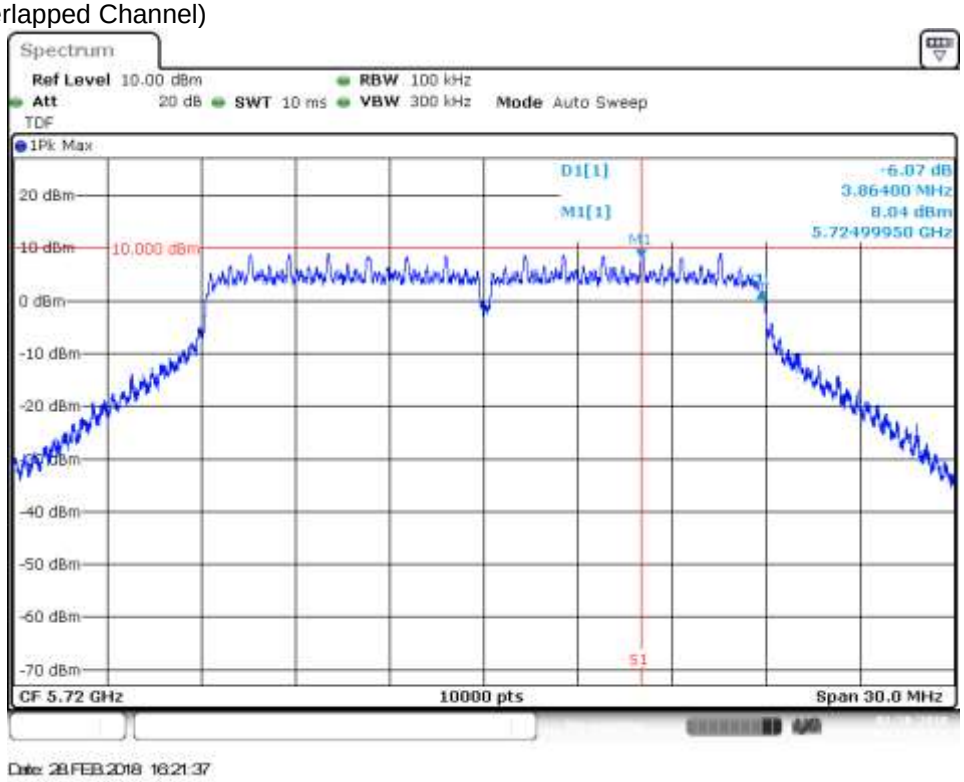
SISO-B, 802.11n20, HT8

Channel 144 (Overlapped Channel)



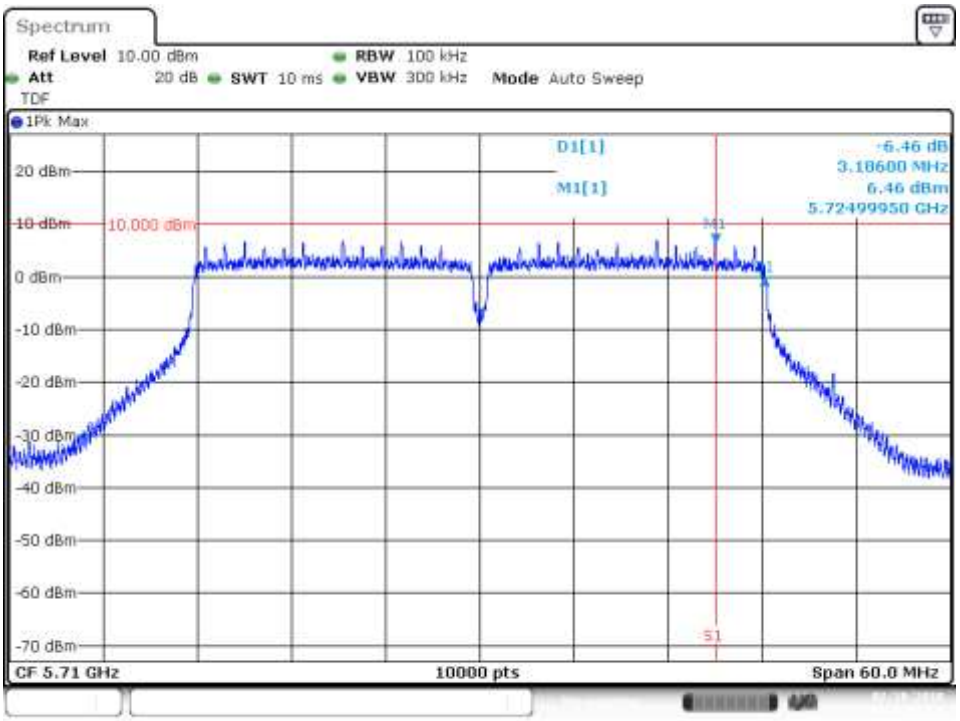
MIMO-B, 802.11n20, HT8

Channel 144 (Overlapped Channel)



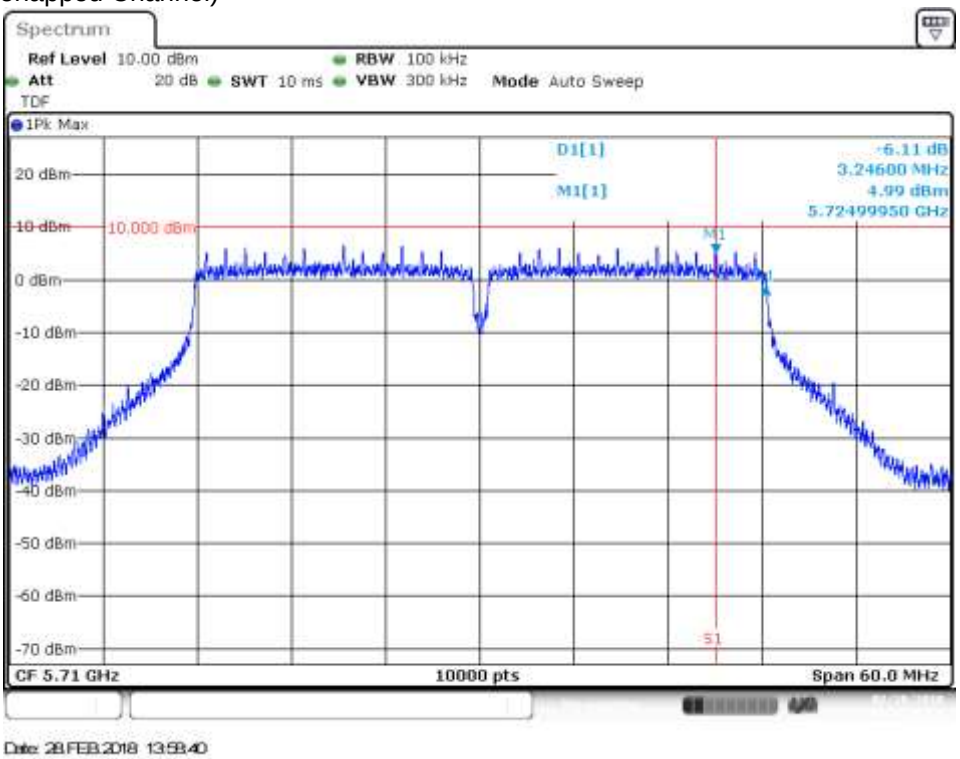
SISO-A, 802.11n40, HT8

Channel 142F (Overlapped Channel)



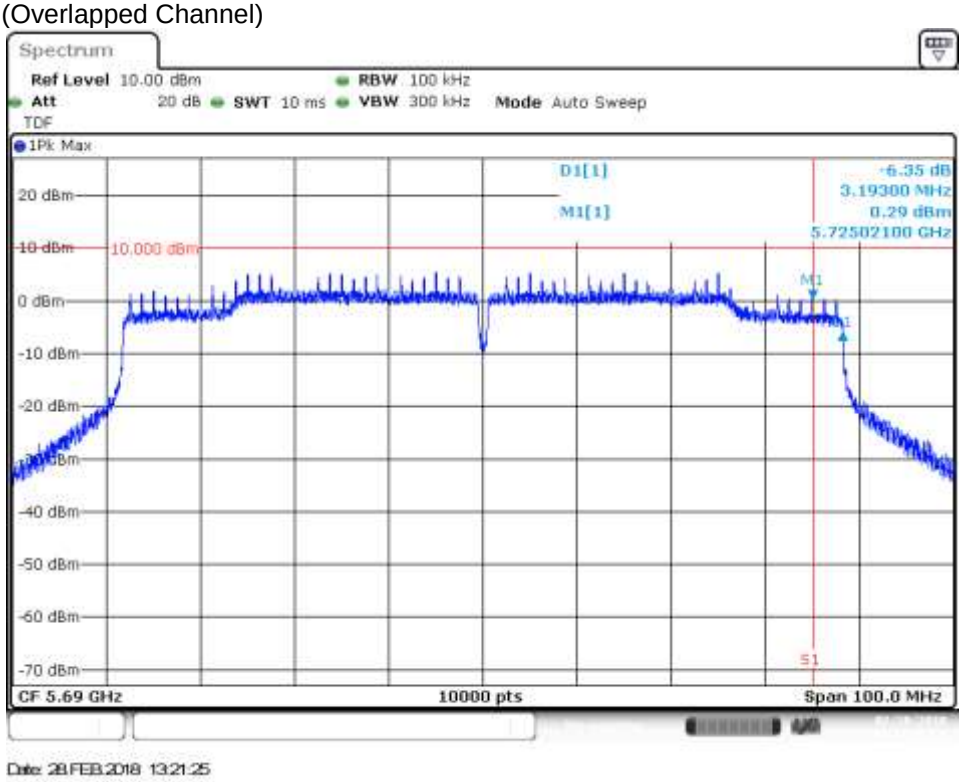
MIMO-A, 802.11n40, HT8

Channel 142F (Overlapped Channel)



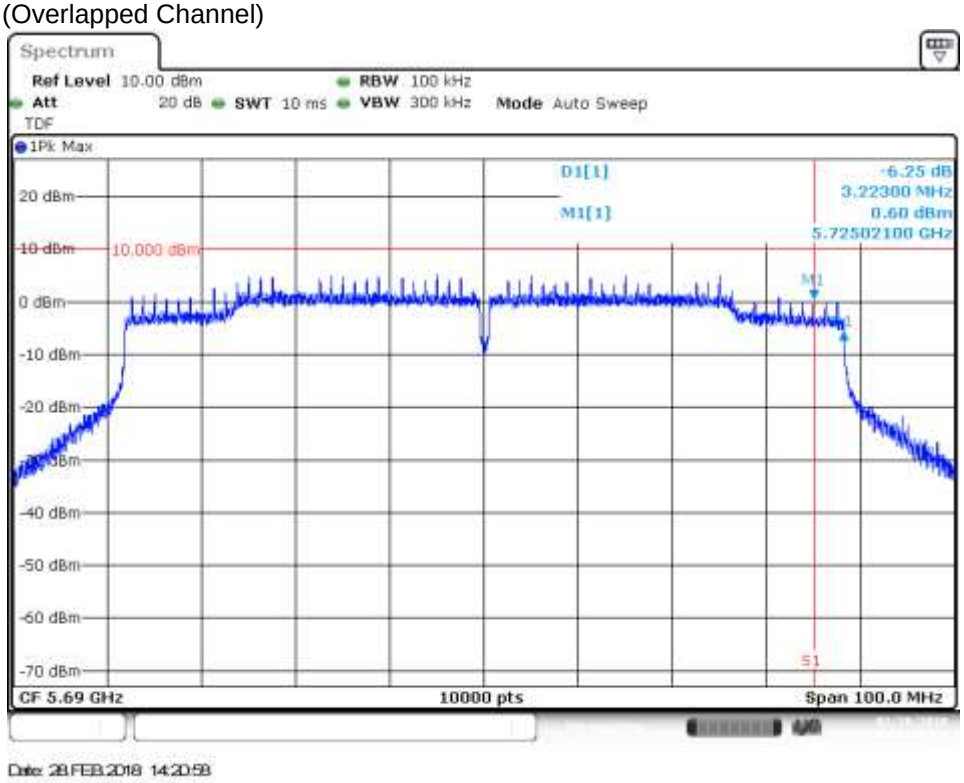
SISO-A, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



MIMO-A, 802.11ac80, VHT0

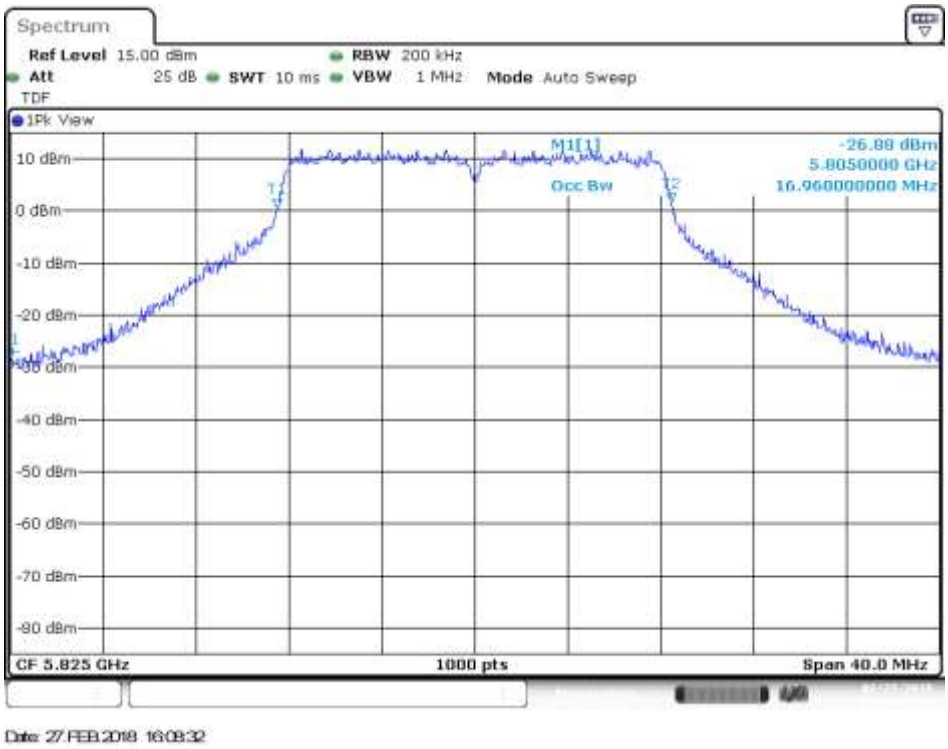
Channel 138ac80 (Overlapped Channel)



B.3.3 99% Bandwidth

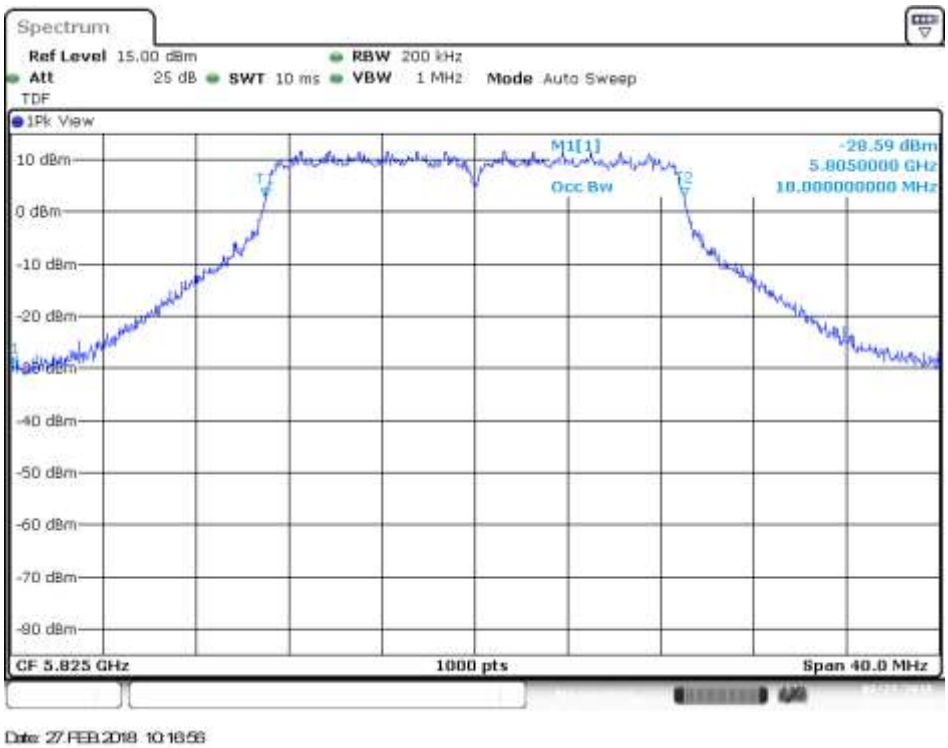
SISO-B, 802.11a, 6Mbps

Channel 165



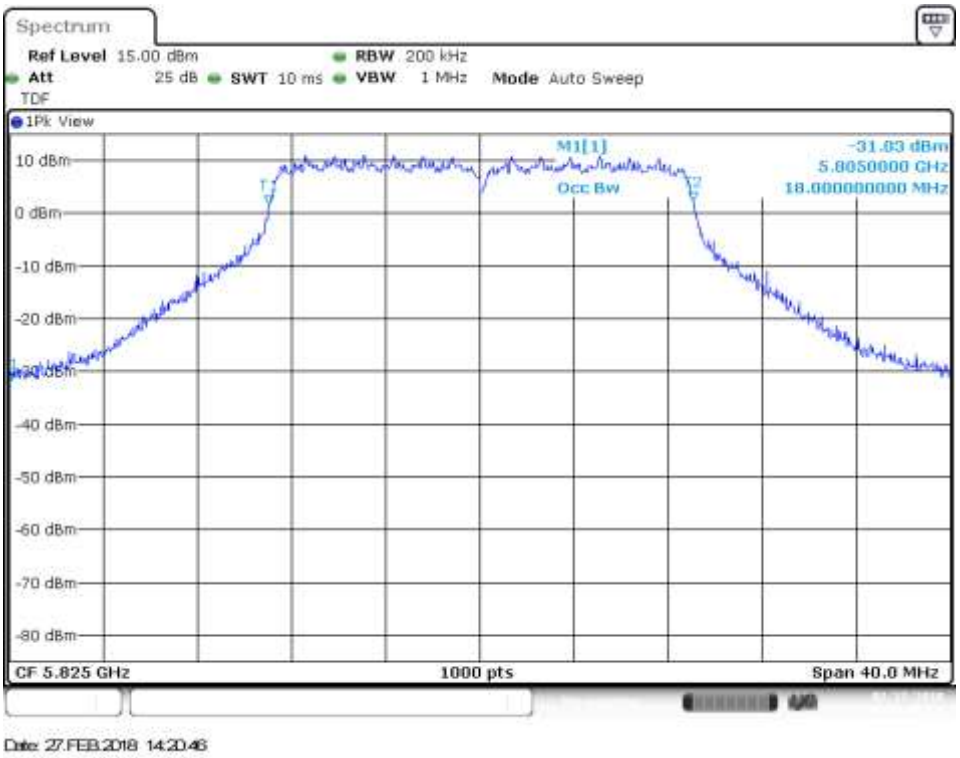
SISO-A, 802.11n20, HT0

Channel 165



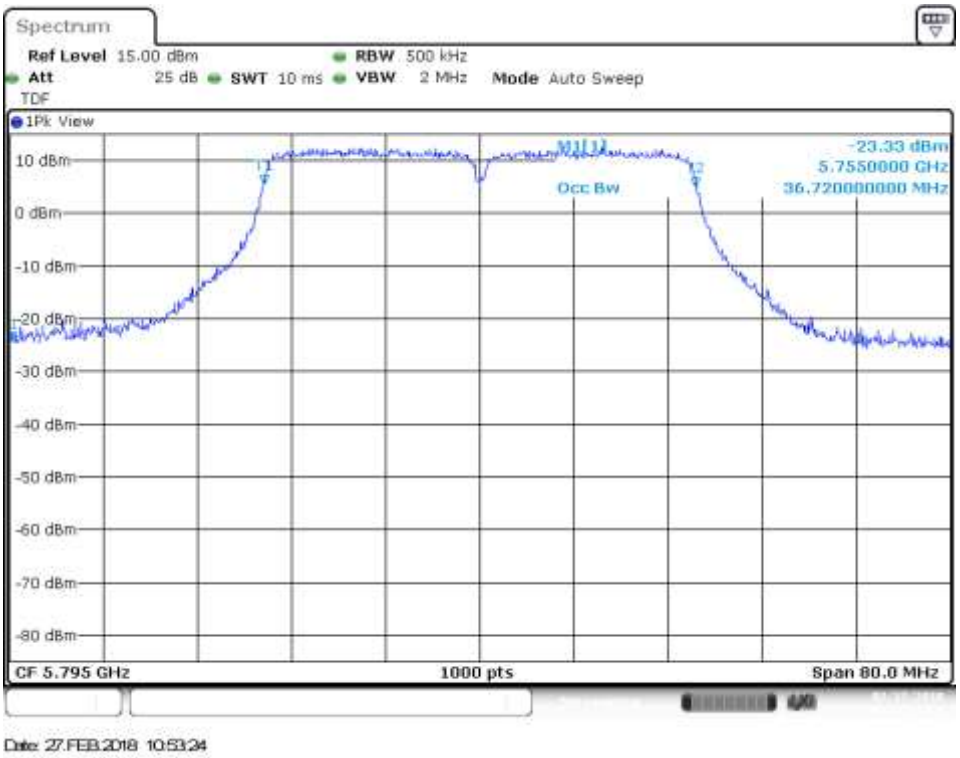
MIMO-A, 802.11n20, HT8

Channel 165



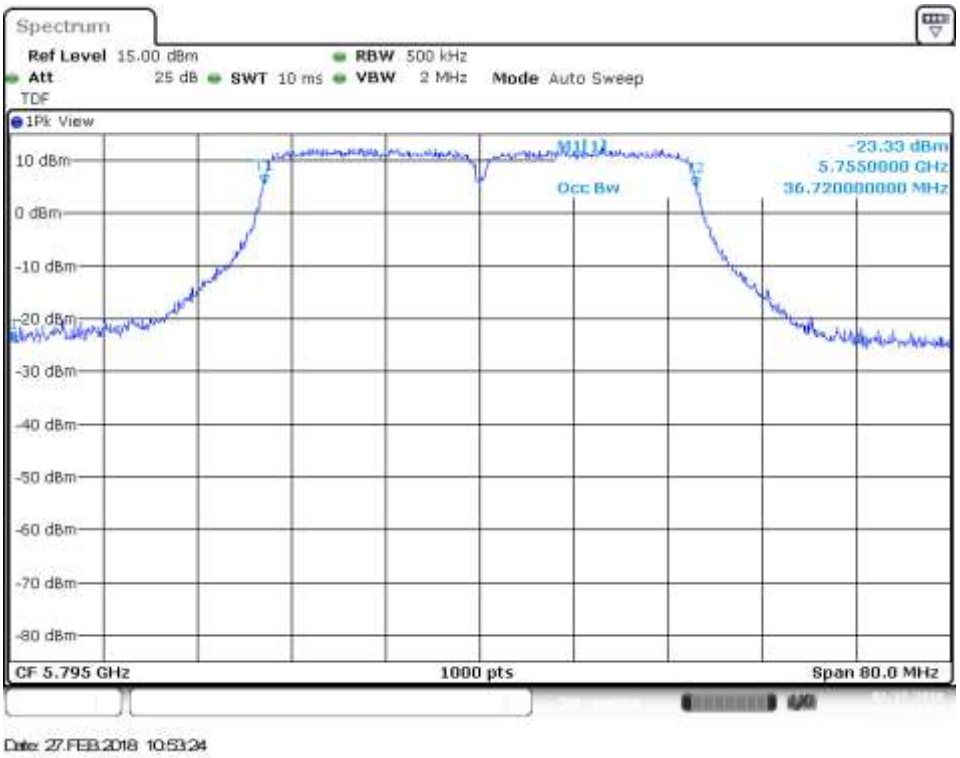
SISO-A, 802.11n40, HT0

Channel 159F



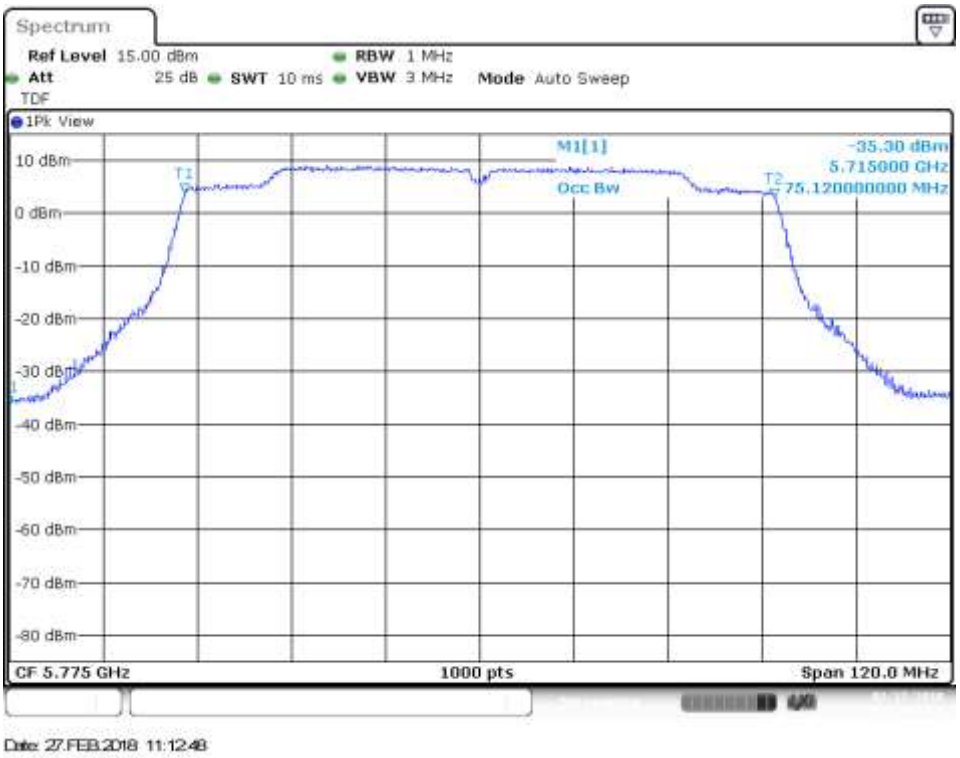
MIMO-A, 802.11n40, HT8

Channel 159F



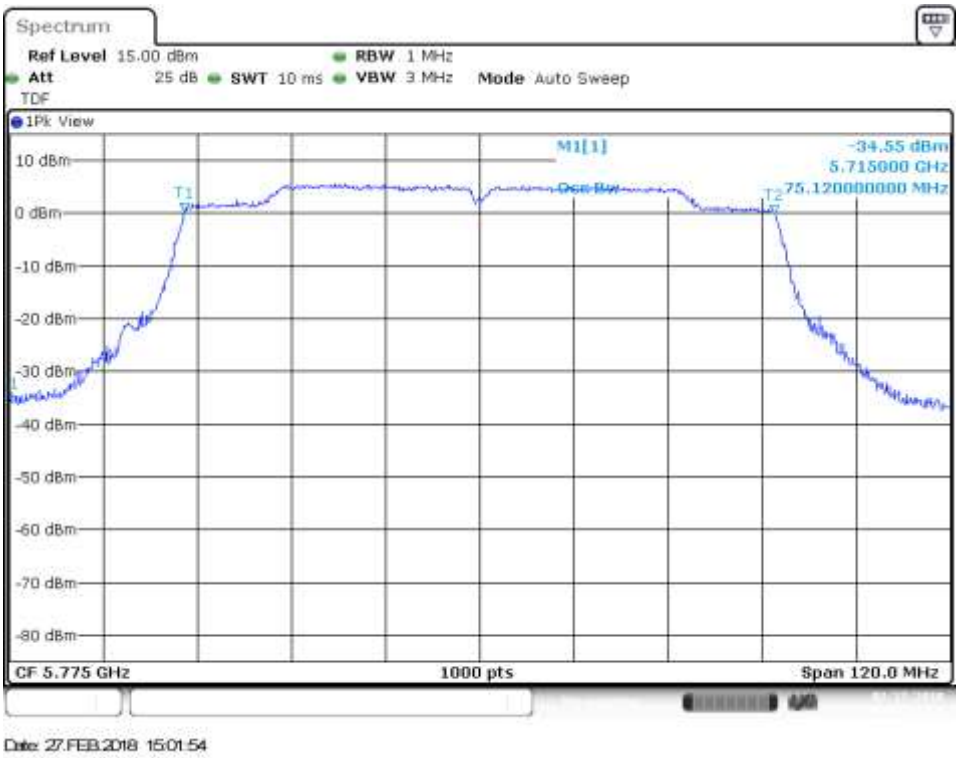
SISO-A, 802.11ac80, VHT0

Channel 155ac80



MIMO-A, 802.11ac80, VHT0

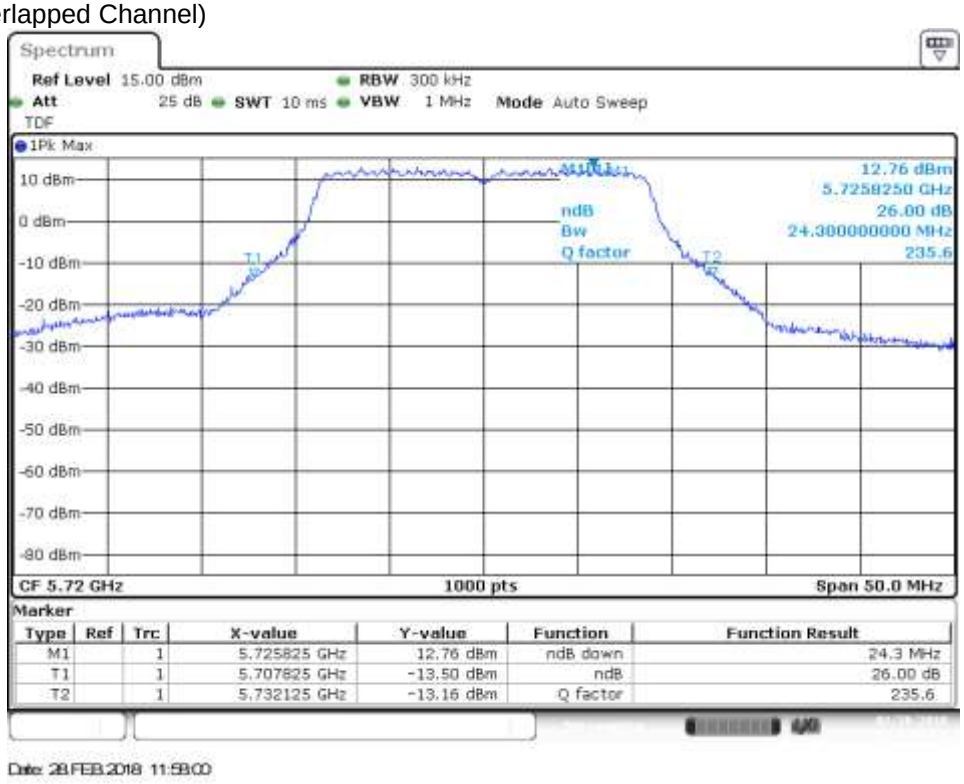
Channel 155ac80



B.3.4 26dB Bandwidth (Overlapped Channel)

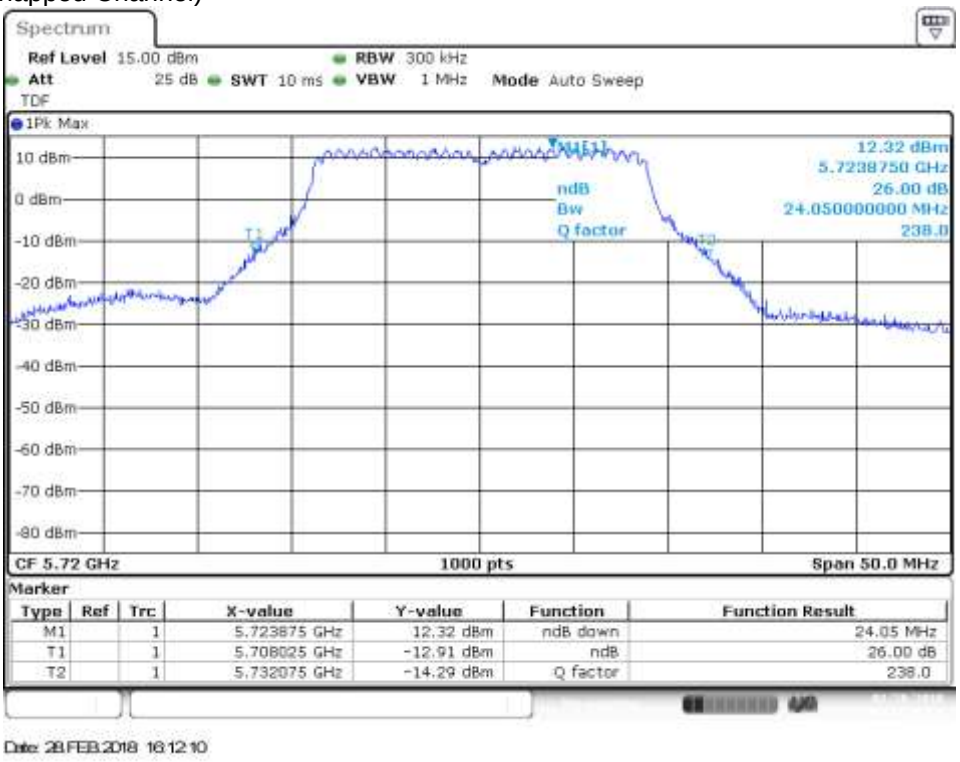
SISO-A, 802.11n20, HT0

Channel 144 (Overlapped Channel)



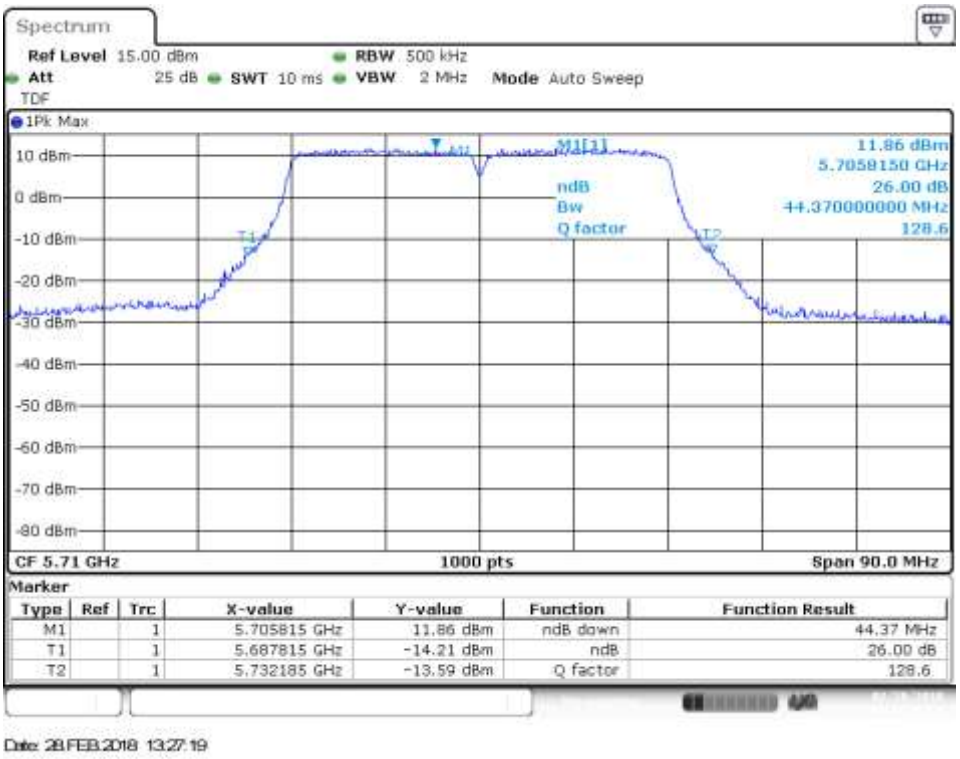
MIMO-B, 802.11n20, HT8

Channel 144 (Overlapped Channel)



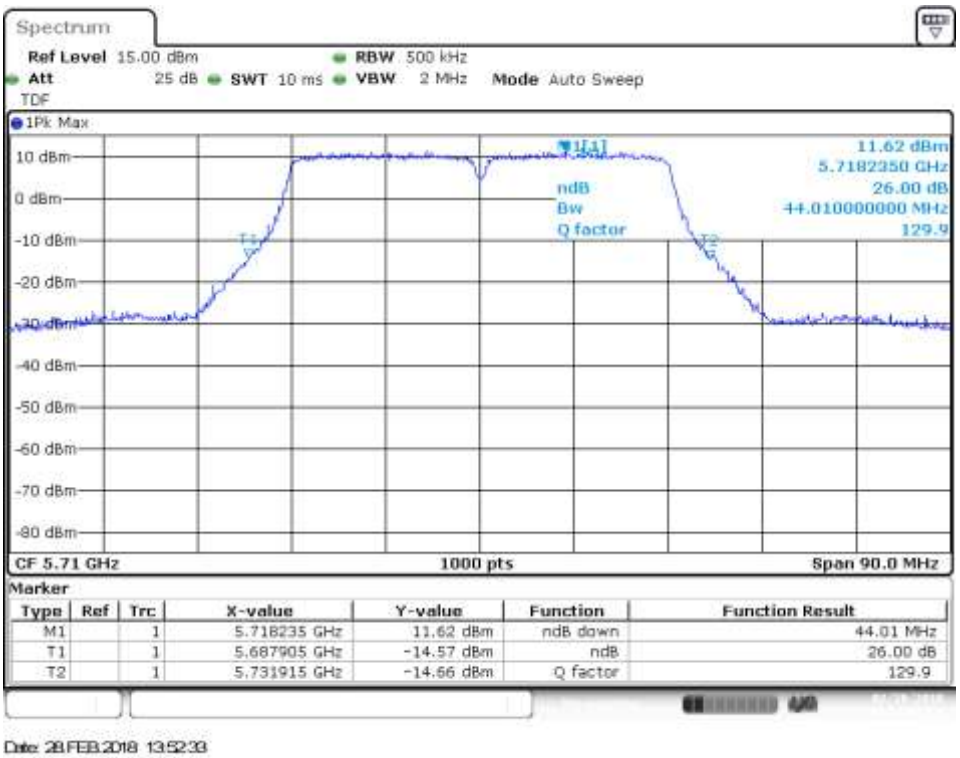
SISO-A, 802.11n40, HT0

Channel 142F (Overlapped Channel)



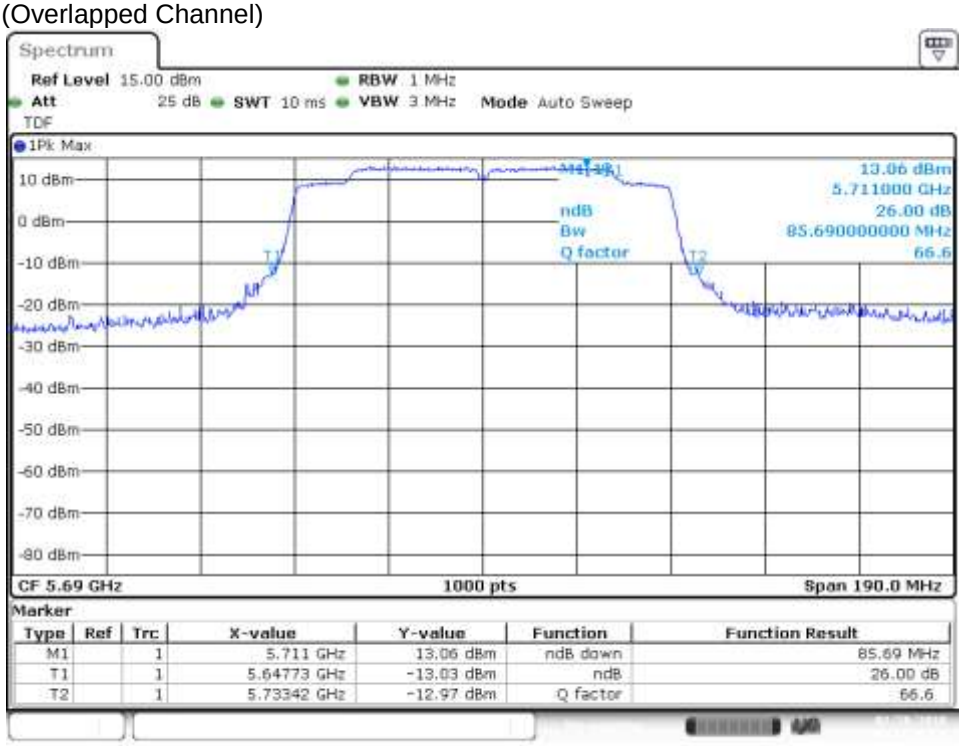
MIMO-A, 802.11n40, HT8

Channel 142F (Overlapped Channel)



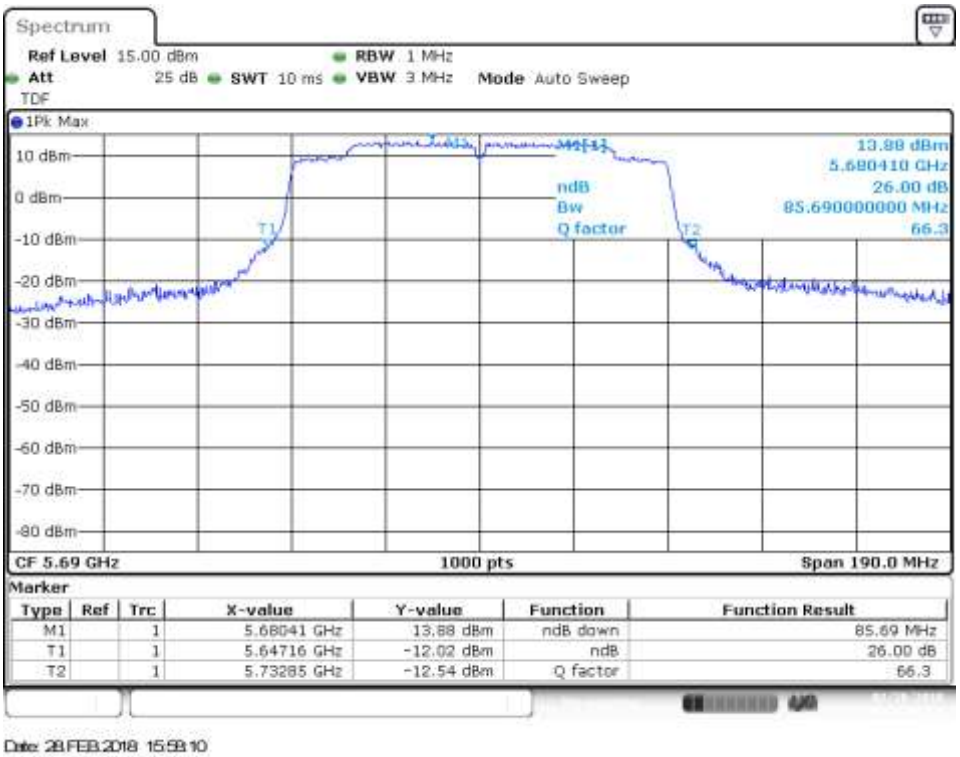
SISO-B, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



MIMO-A, 802.11ac80, VHT0

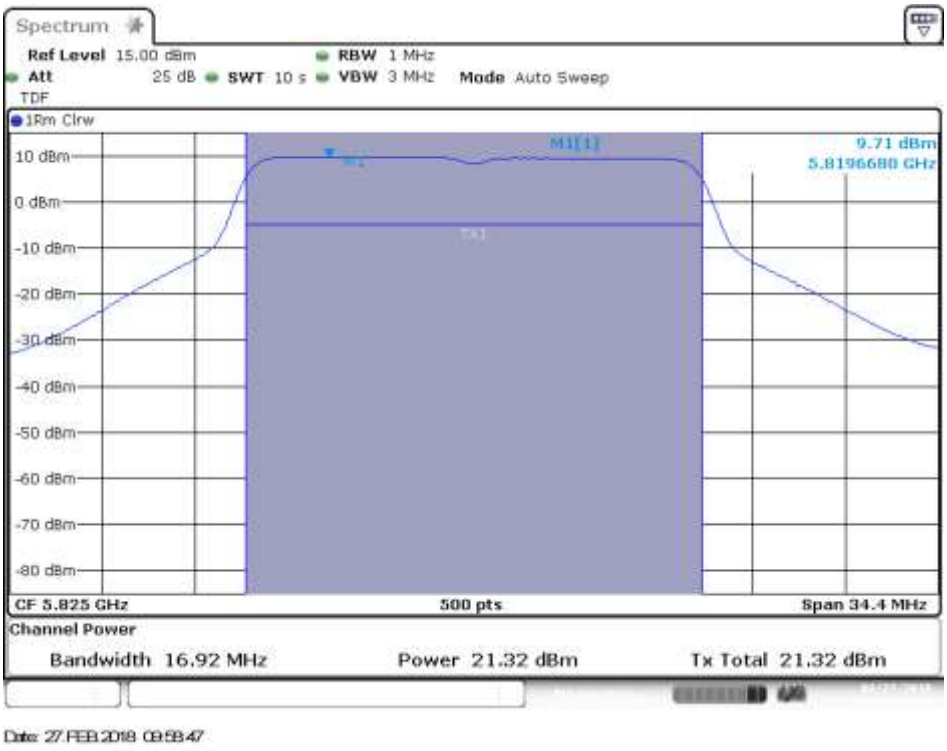
Channel 138ac80 (Overlapped Channel)



B.3.5 Maximum output power

SISO-A, 802.11a, 6Mbps

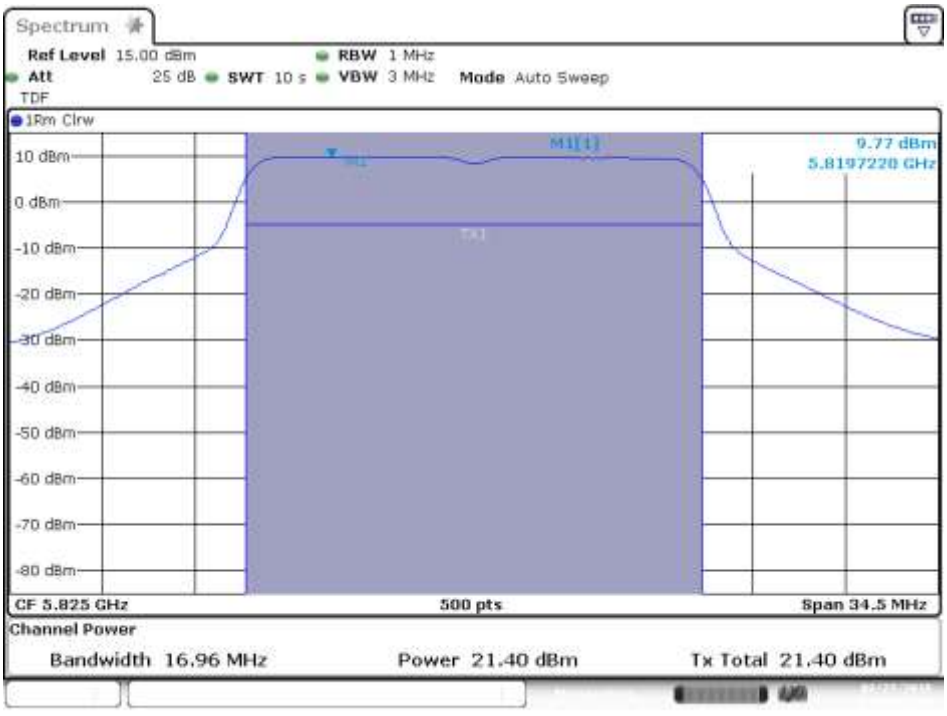
Channel 165



Date: 27.FEB.2018 09:58:47

SISO-B, 802.11a, 6Mbps

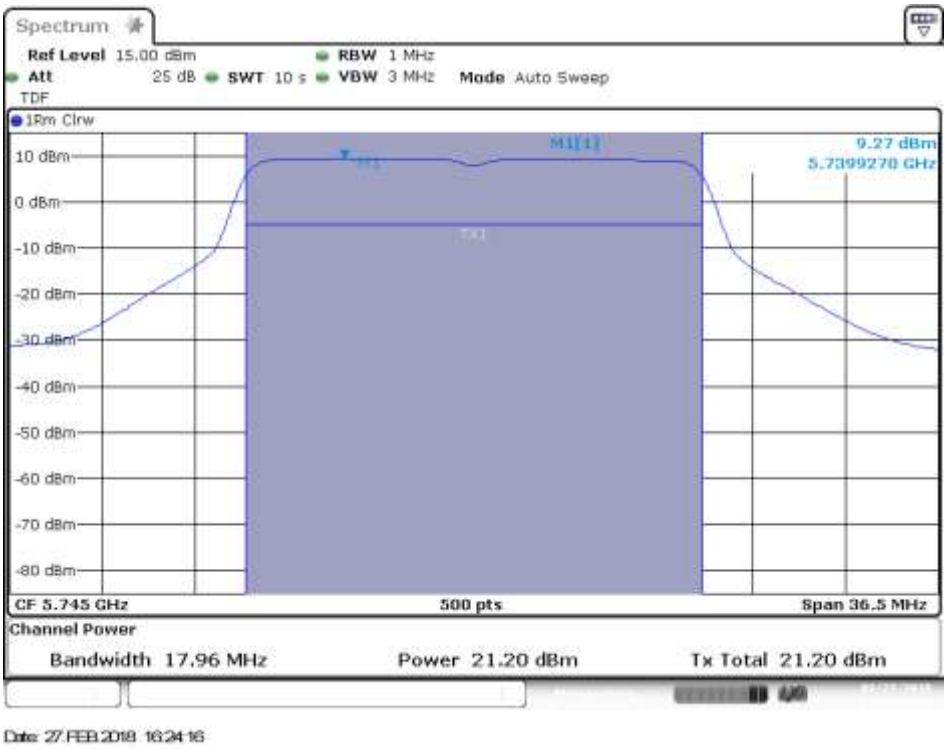
Channel 165



Date: 27.FEB.2018 16:09:57

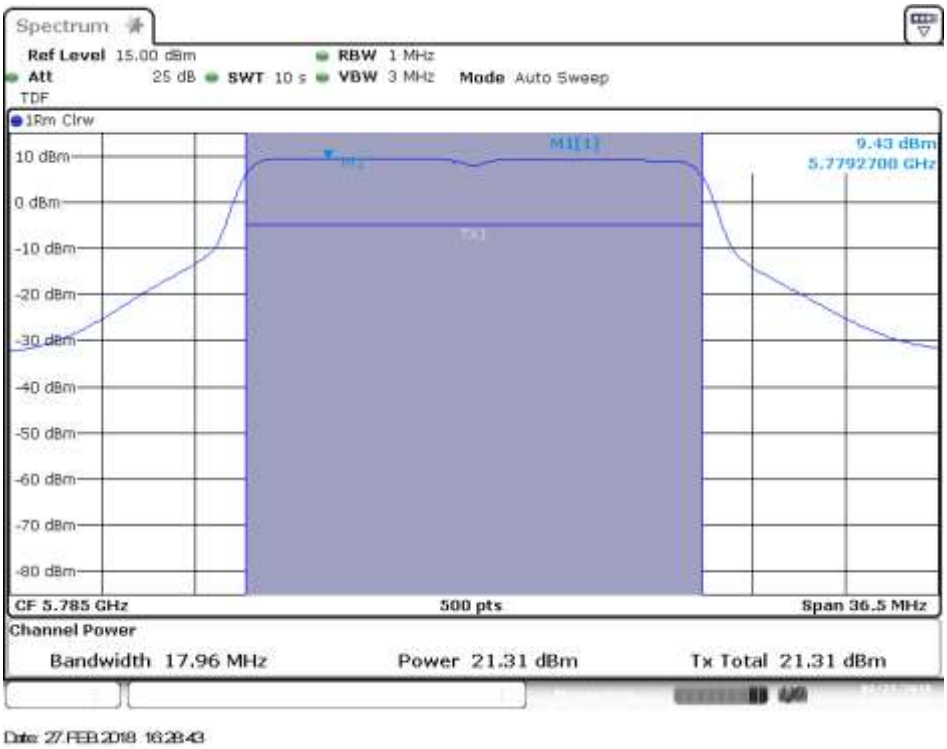
SISO-B, 802.11n20, HT0

Channel 149



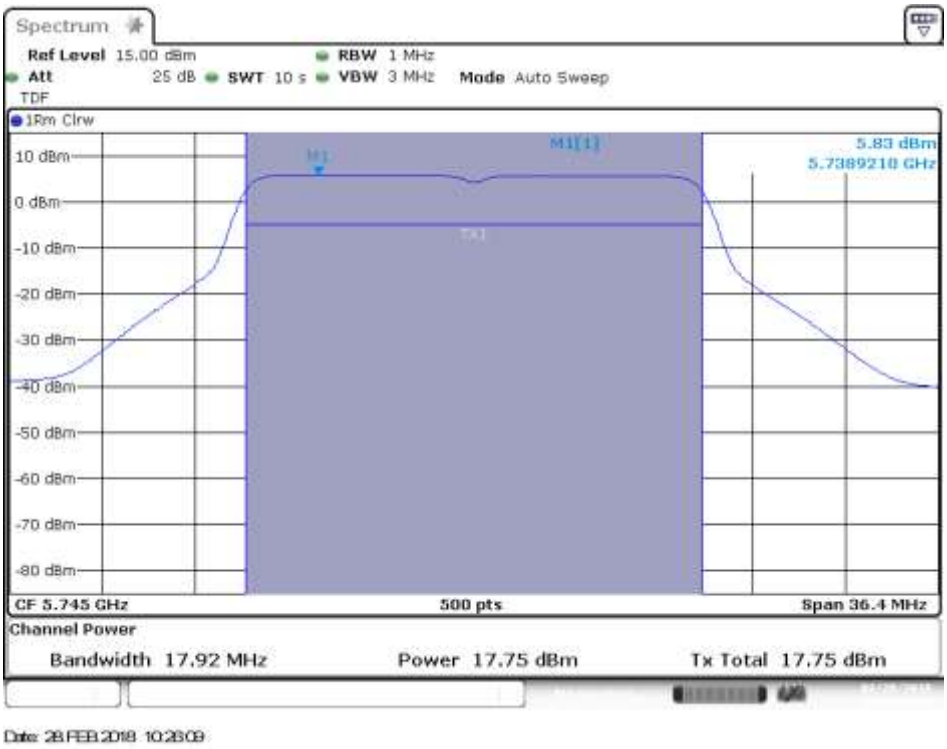
SISO-B, 802.11n20, HT0

Channel 157



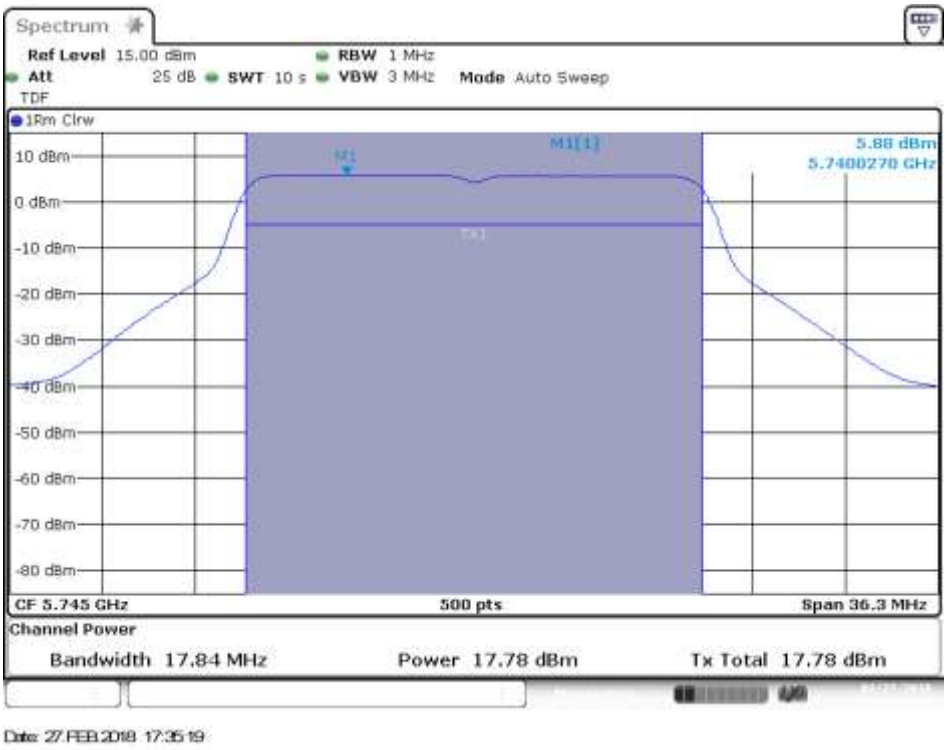
MIMO-A, 802.11n20, HT8

Channel 149



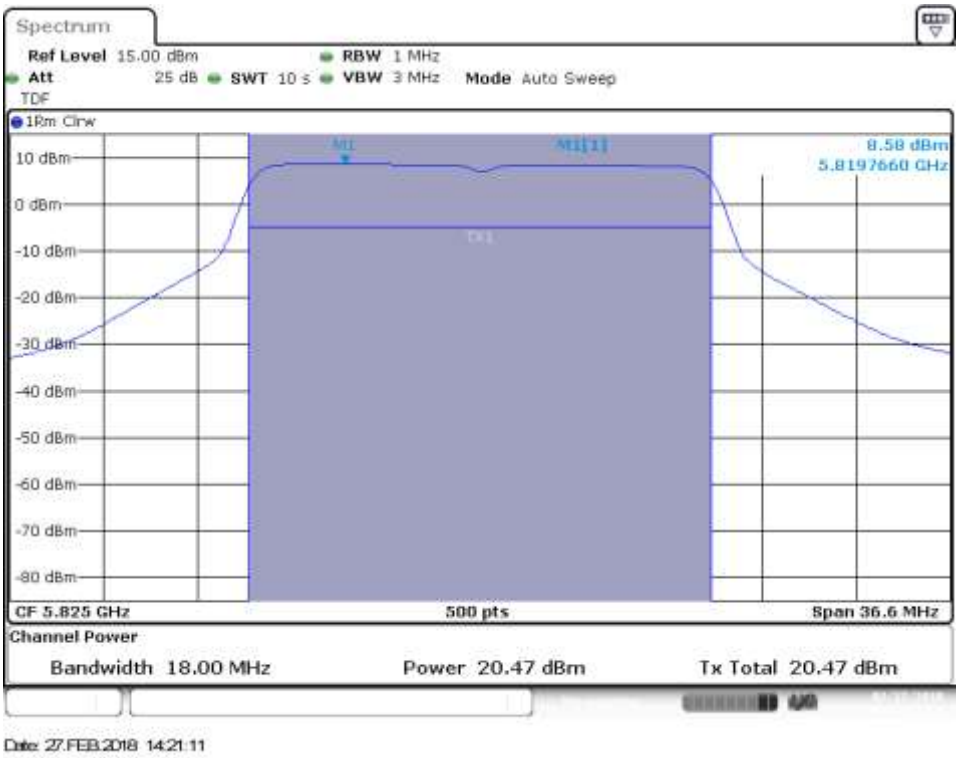
MIMO-B, 802.11n20, HT8

Channel 149



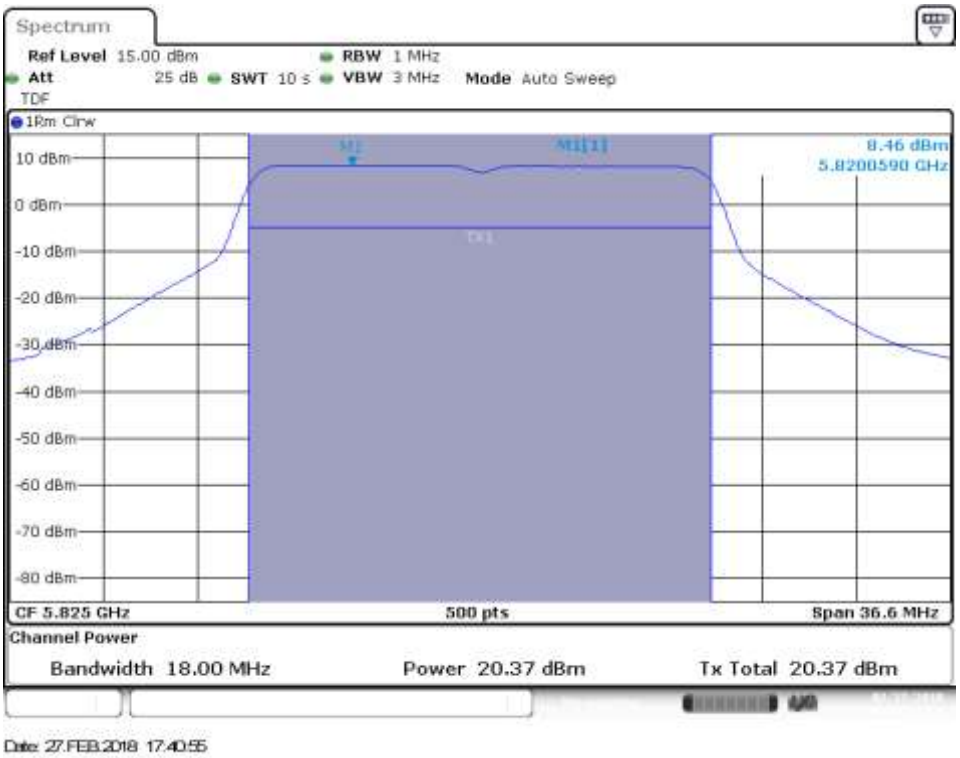
MIMO-A, 802.11n20, HT8

Channel 165



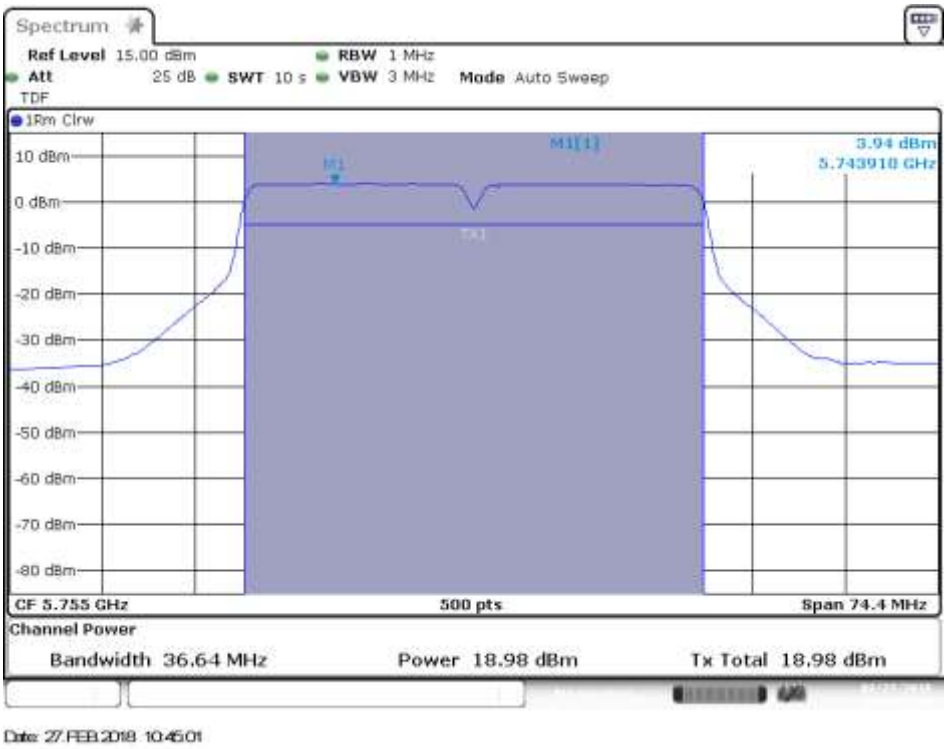
MIMO-B, 802.11n20, HT8

Channel 165



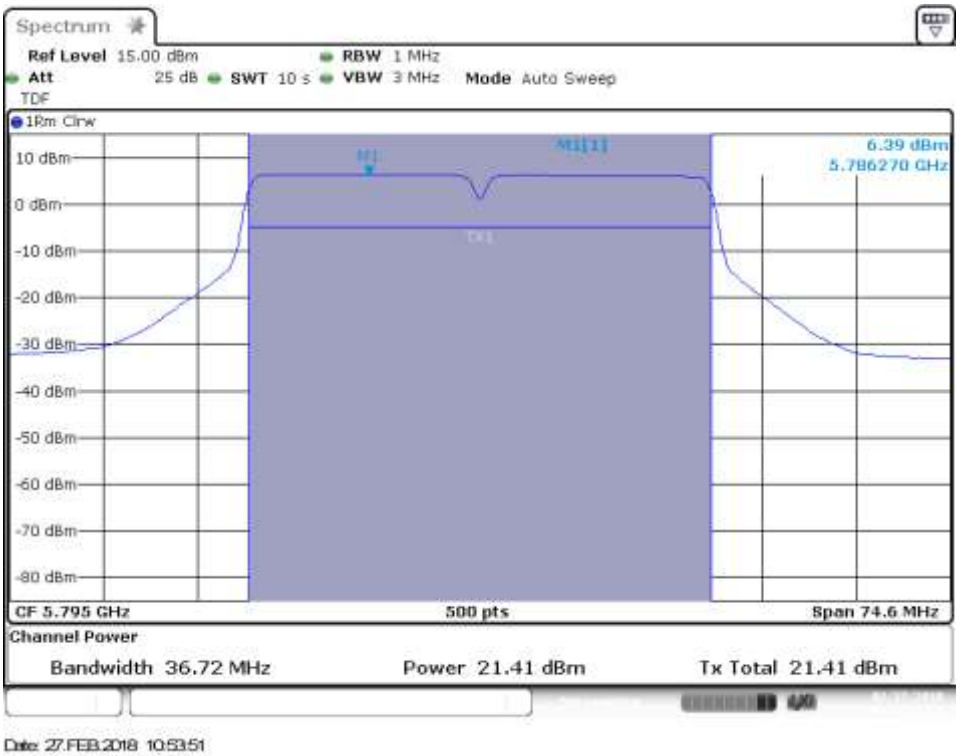
SISO-A, 802.11n40, HT0

Channel 151F



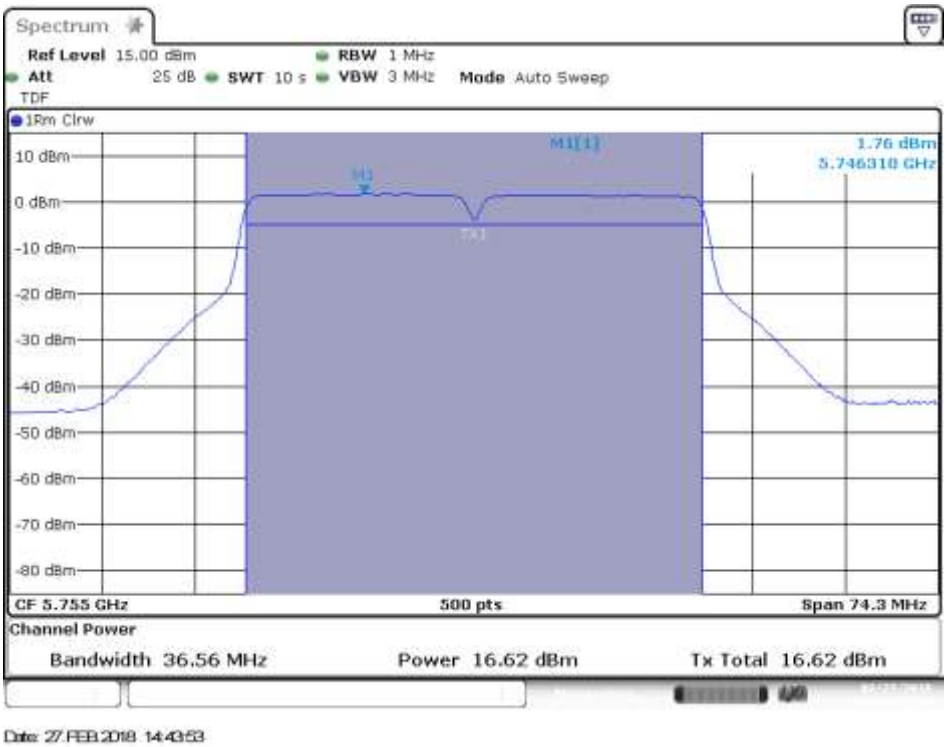
SISO-A, 802.11n40, HT0

Channel 159F



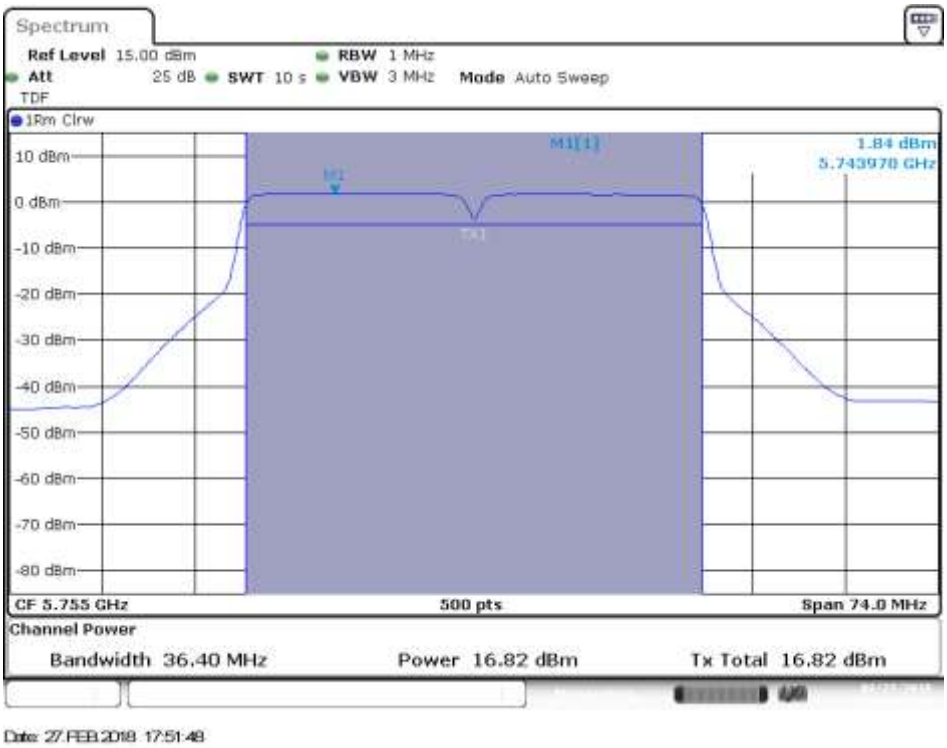
MIMO-A, 802.11n40, HT8

Channel 151F



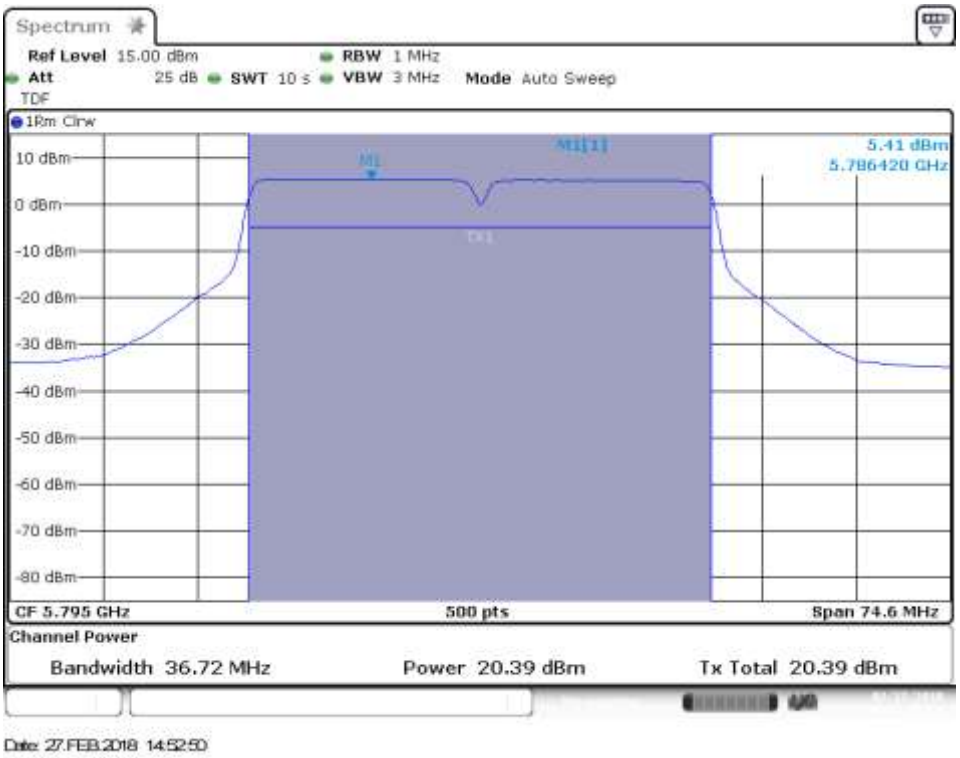
MIMO-B, 802.11n40, HT8

Channel 151F



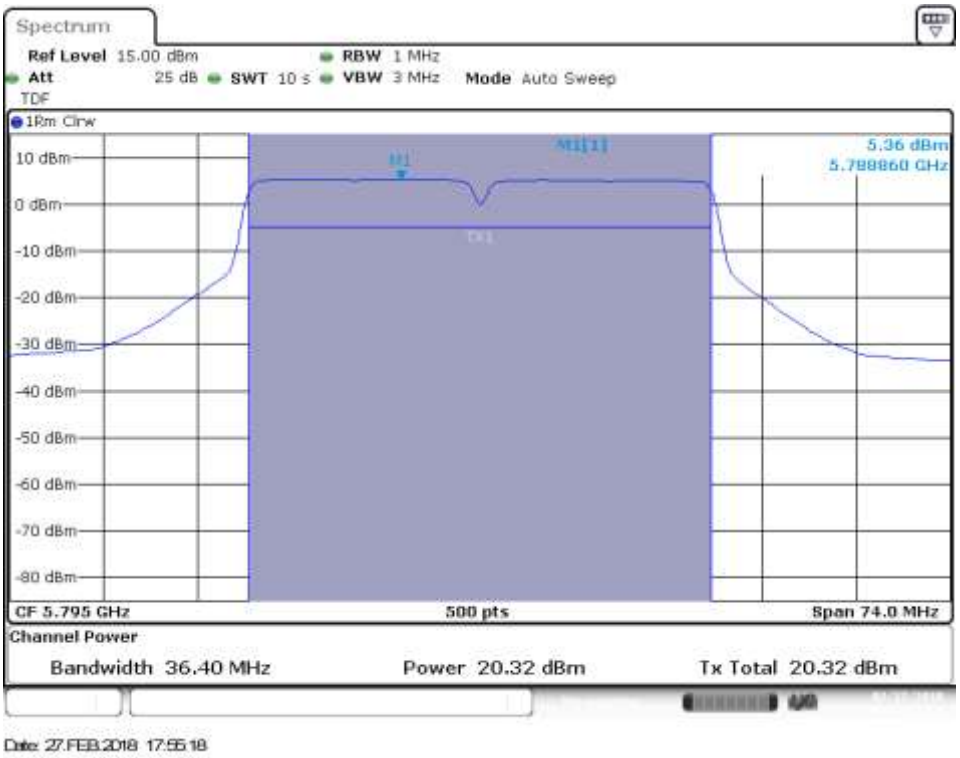
MIMO-A, 802.11n40, HT8

Channel 159F



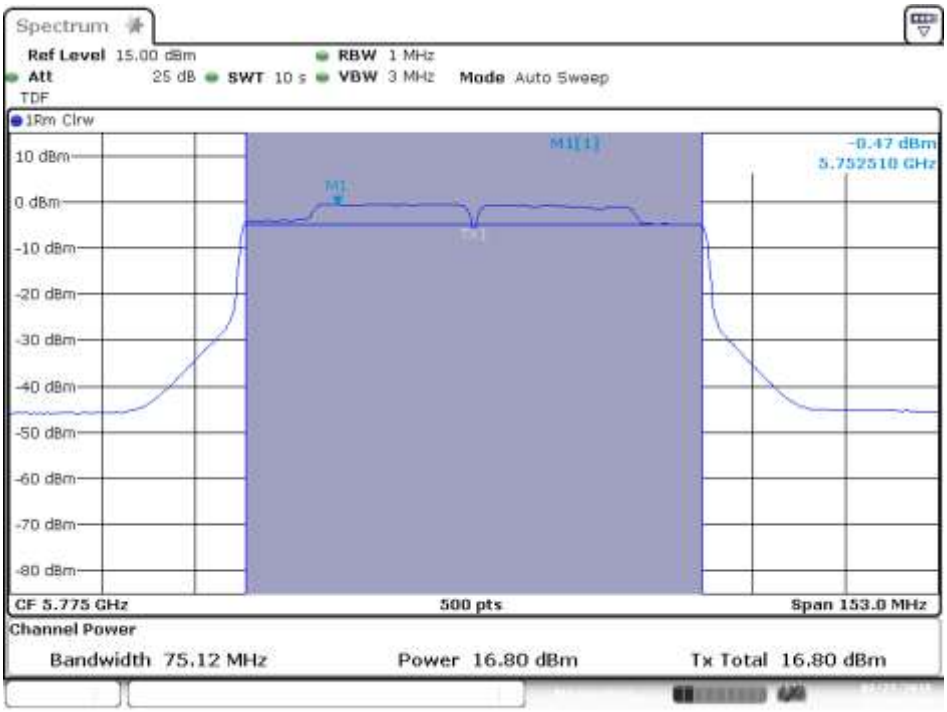
MIMO-B, 802.11n40, HT8

Channel 159F



SISO-A, 802.11ac80, VHT0

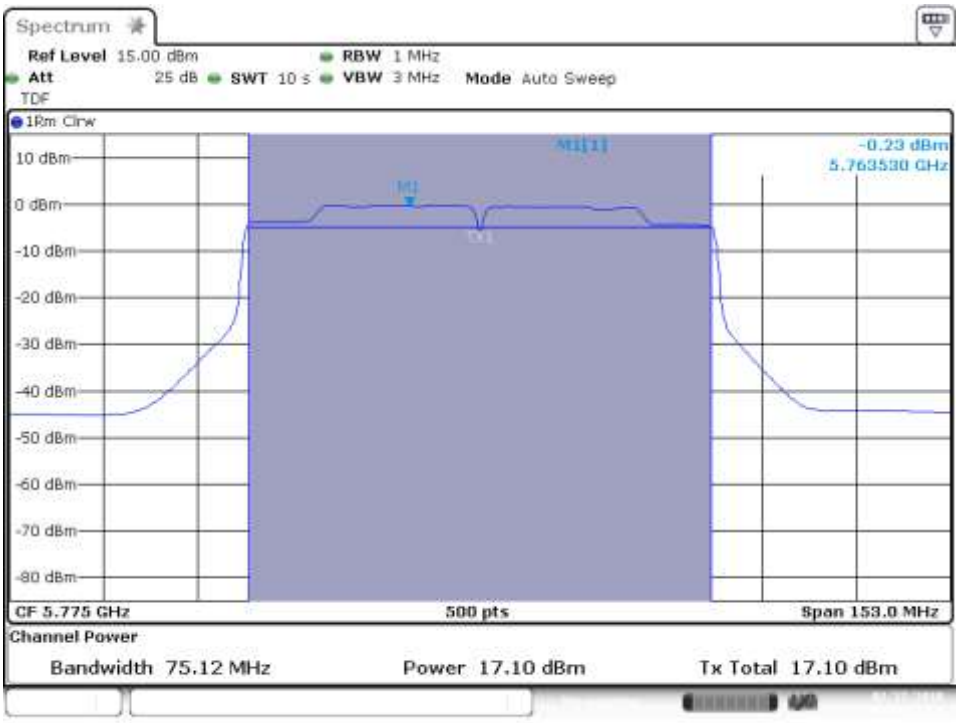
Channel 155ac80



Date: 27.FEB.2018 11:13:14

SISO-B, 802.11ac80, VHT0

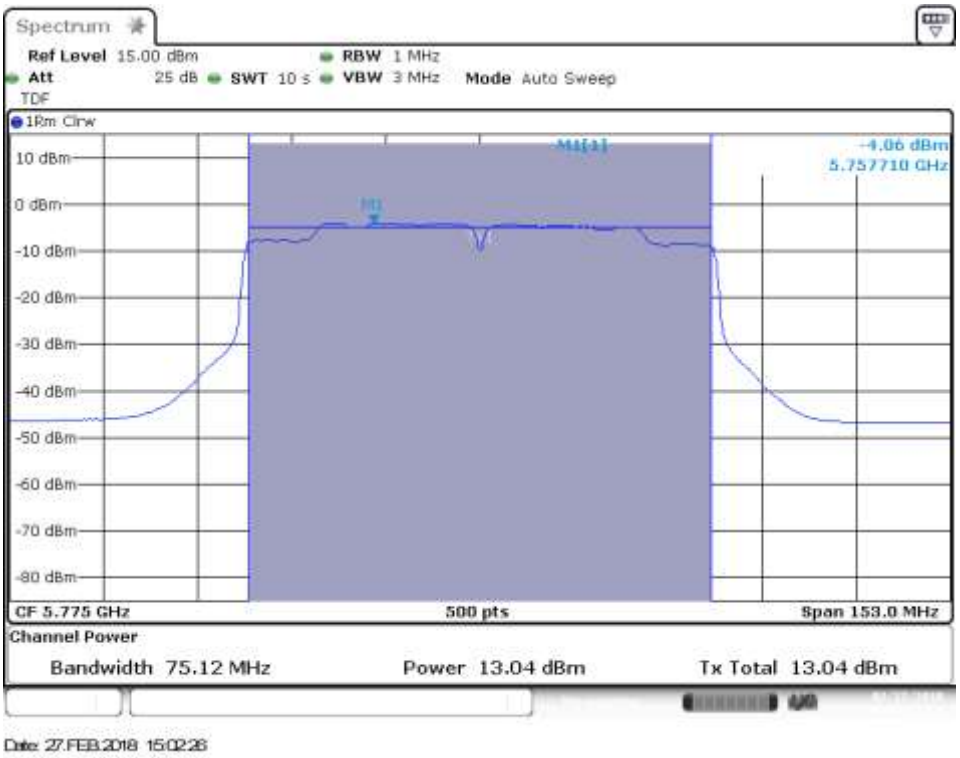
Channel 155ac80



Date: 27.FEB.2018 17:00:15

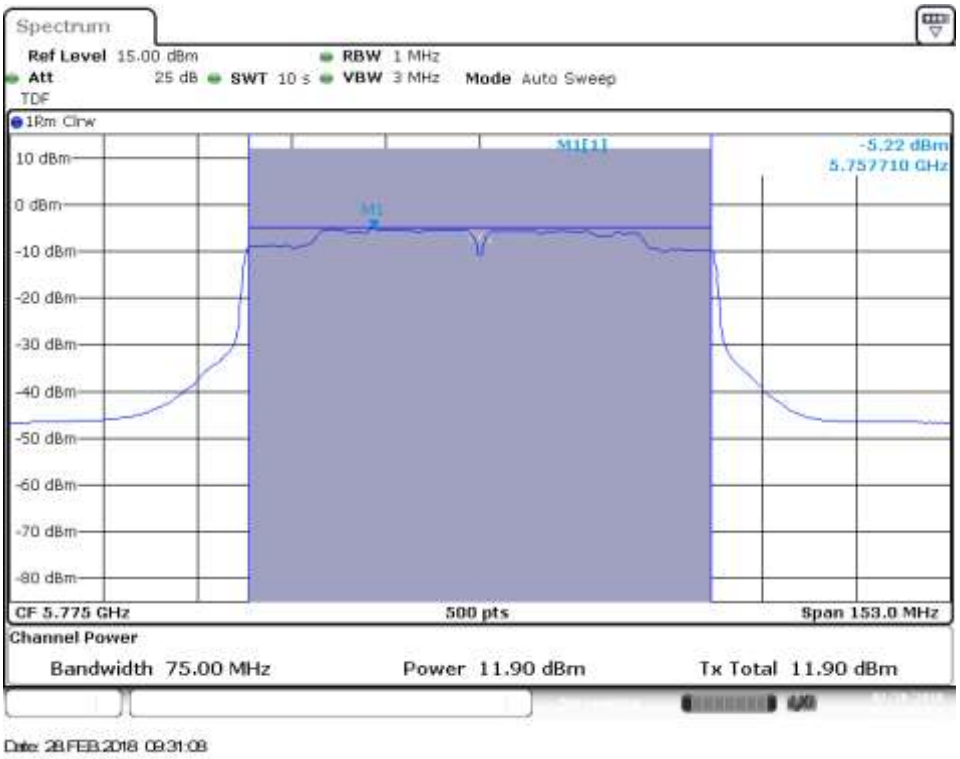
MIMO-A, 802.11ac80, VHT0

Channel 155ac80



MIMO-B, 802.11ac80, VHT0

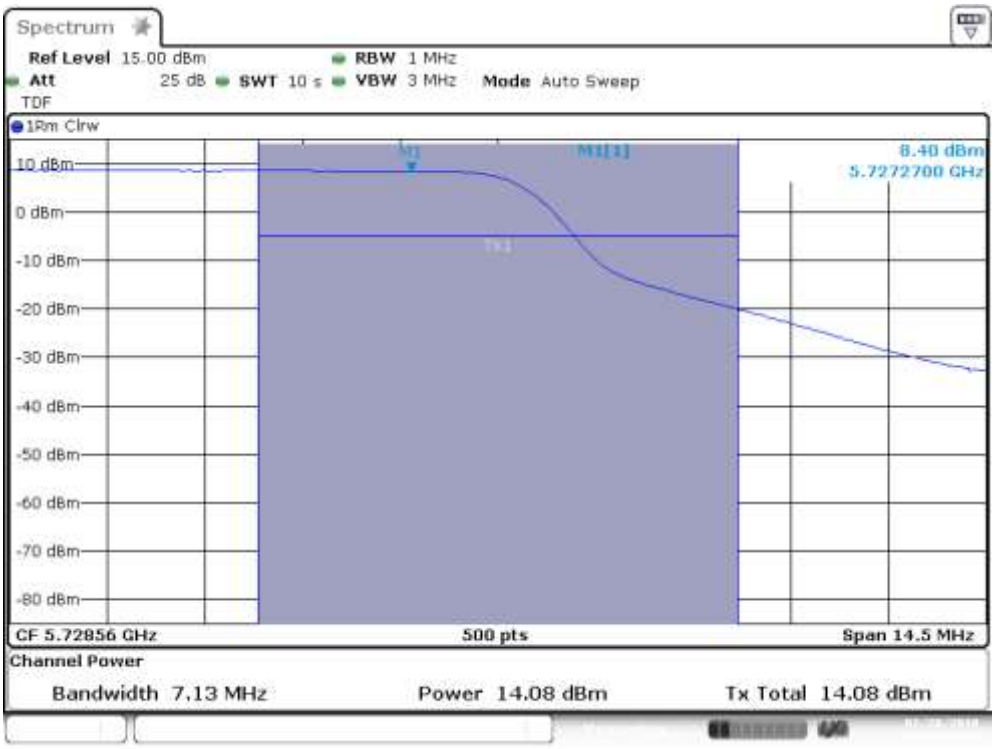
Channel 155ac80



B.3.6 Maximum output power (Overlapped Channel)

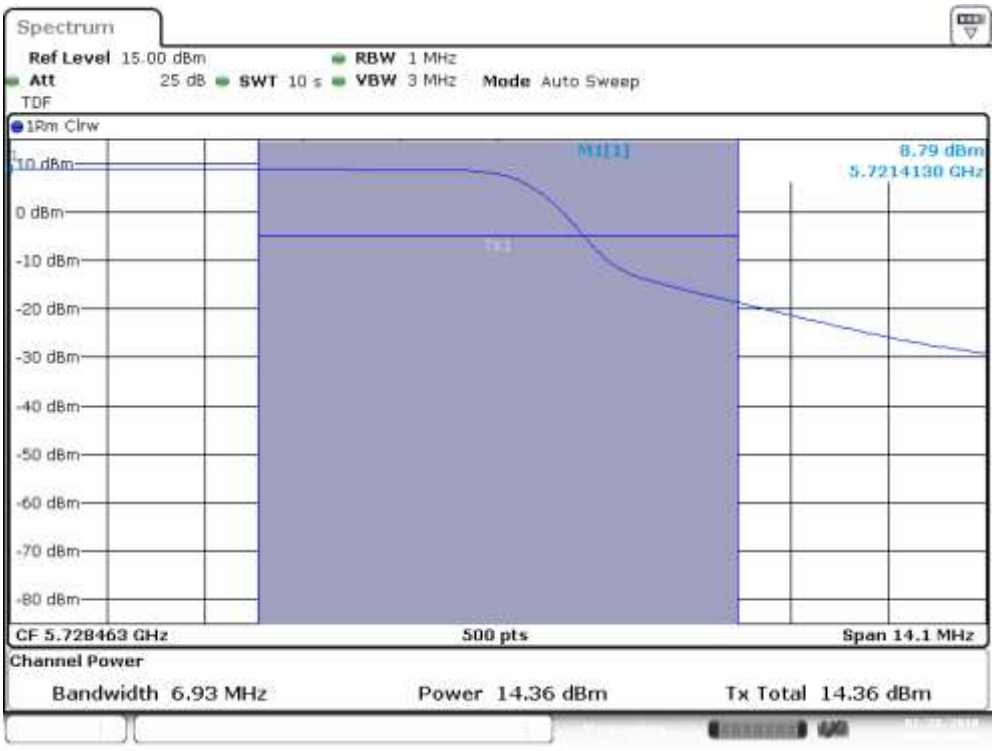
SISO-A, 802.11n20, HT0

Channel 144 (Overlapped Channel)



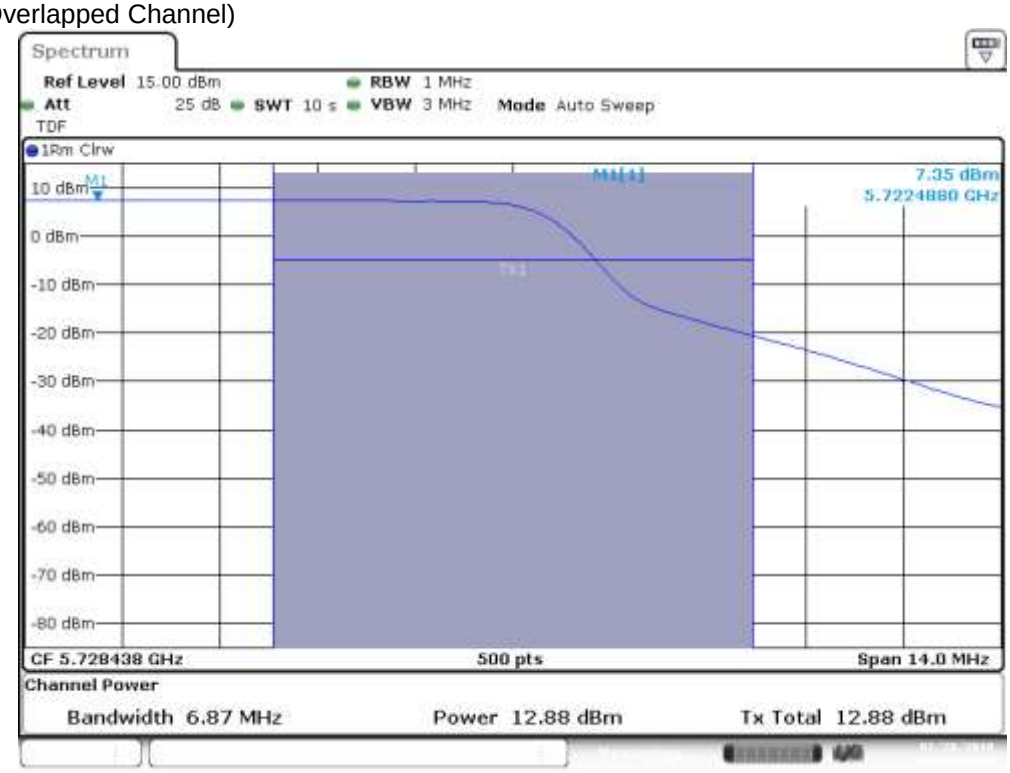
SISO-B, 802.11n20, HT0

Channel 144 (Overlapped Channel)



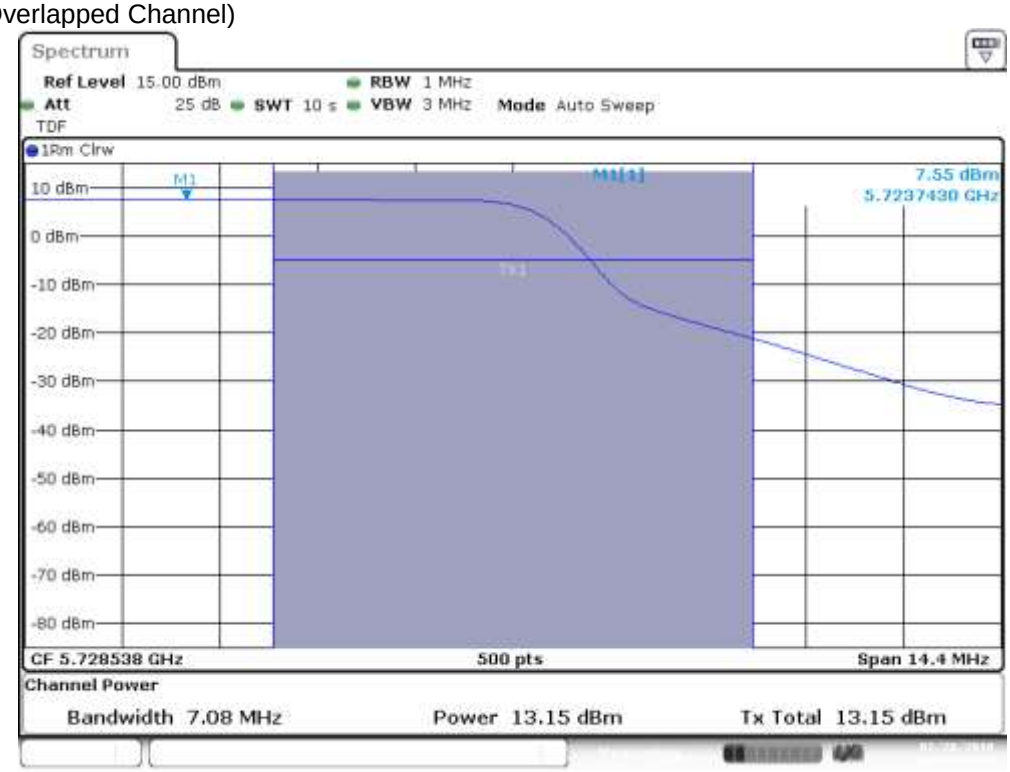
MIMO-A, 802.11n20, HT8

Channel 144 (Overlapped Channel)



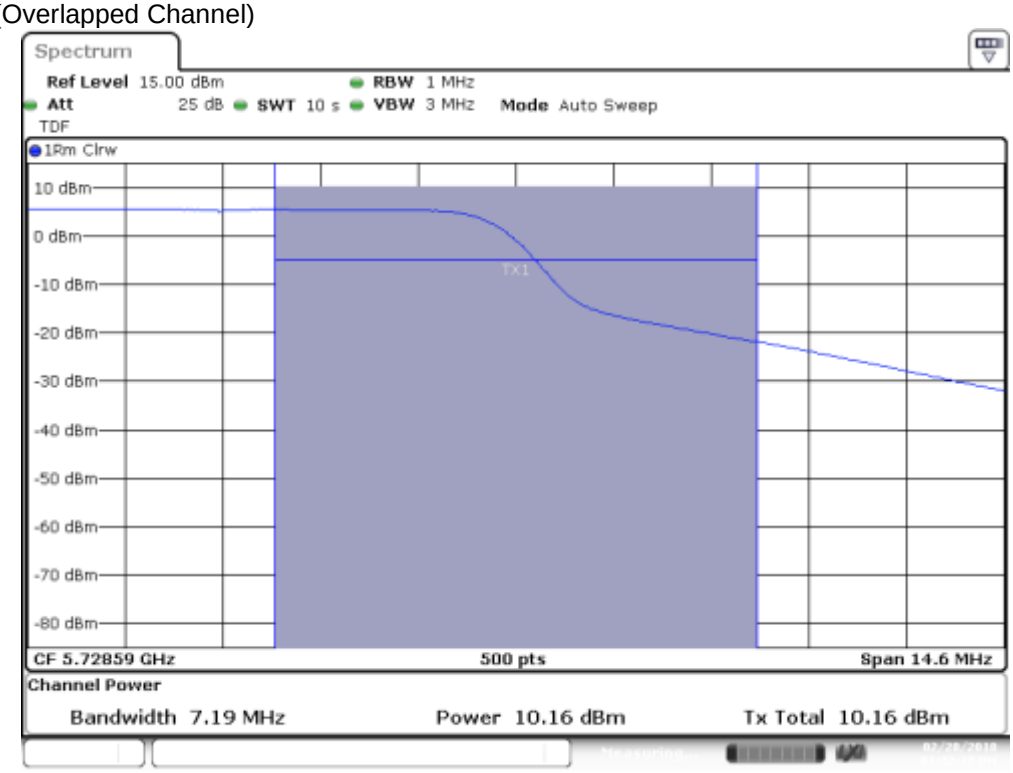
MIMO-B, 802.11n20, HT8

Channel 144 (Overlapped Channel)



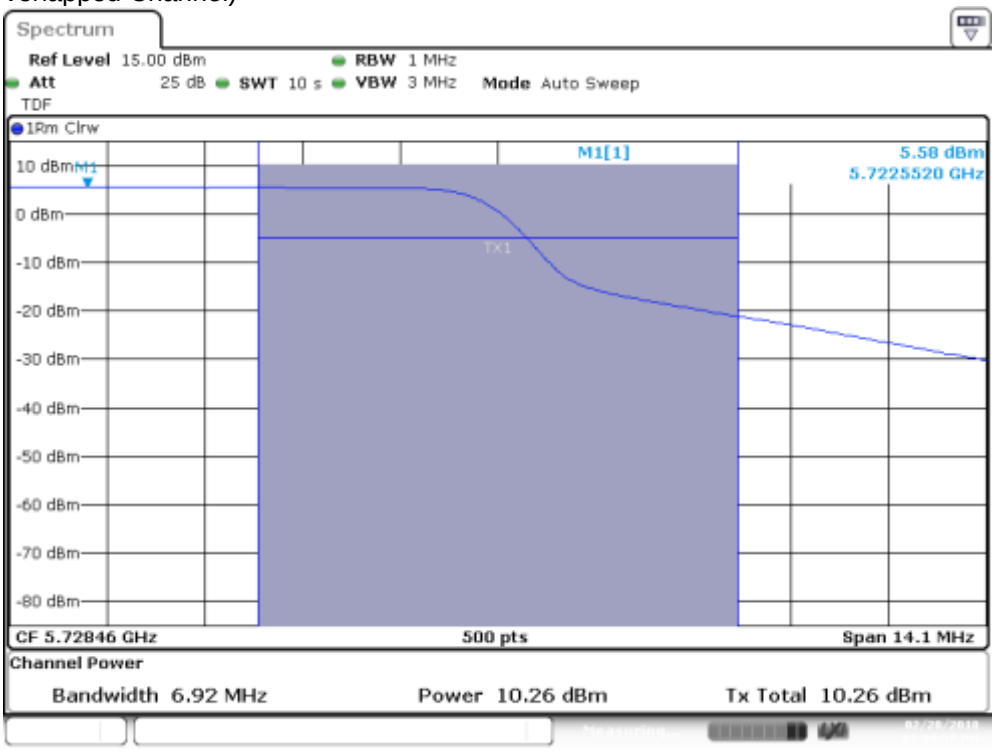
SISO-A, 802.11n40, HT0

Channel 142F (Overlapped Channel)



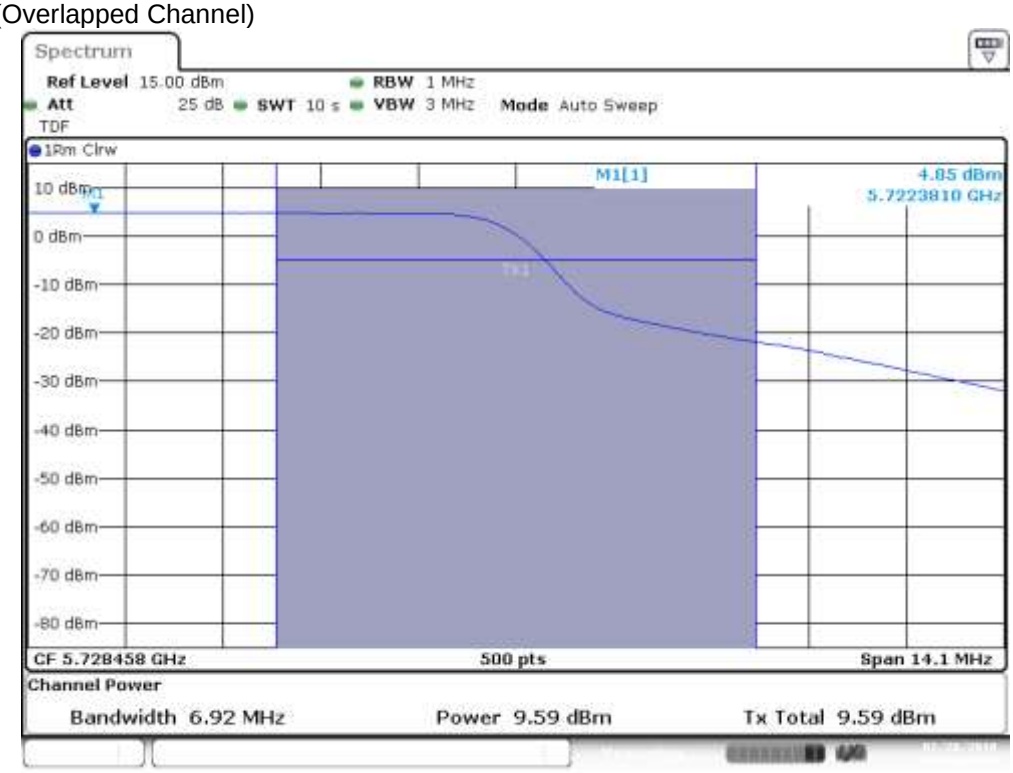
SISO-B, 802.11n40, HT0

Channel 142F (Overlapped Channel)



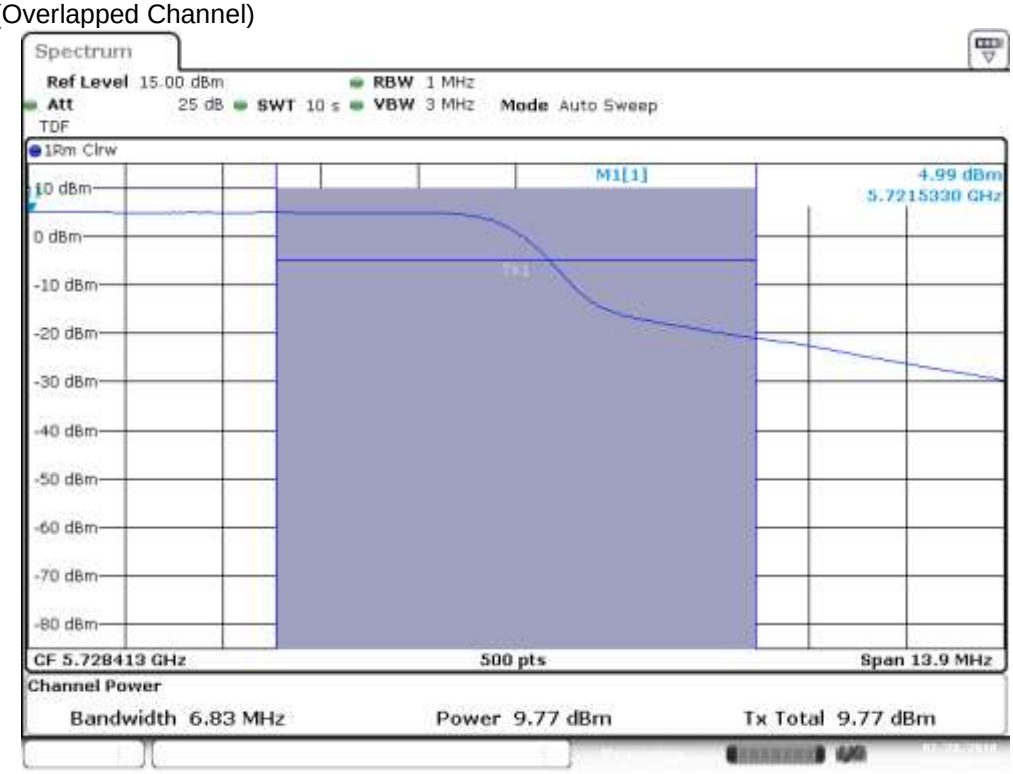
MIMO-A, 802.11n40, HT8

Channel 142F (Overlapped Channel)



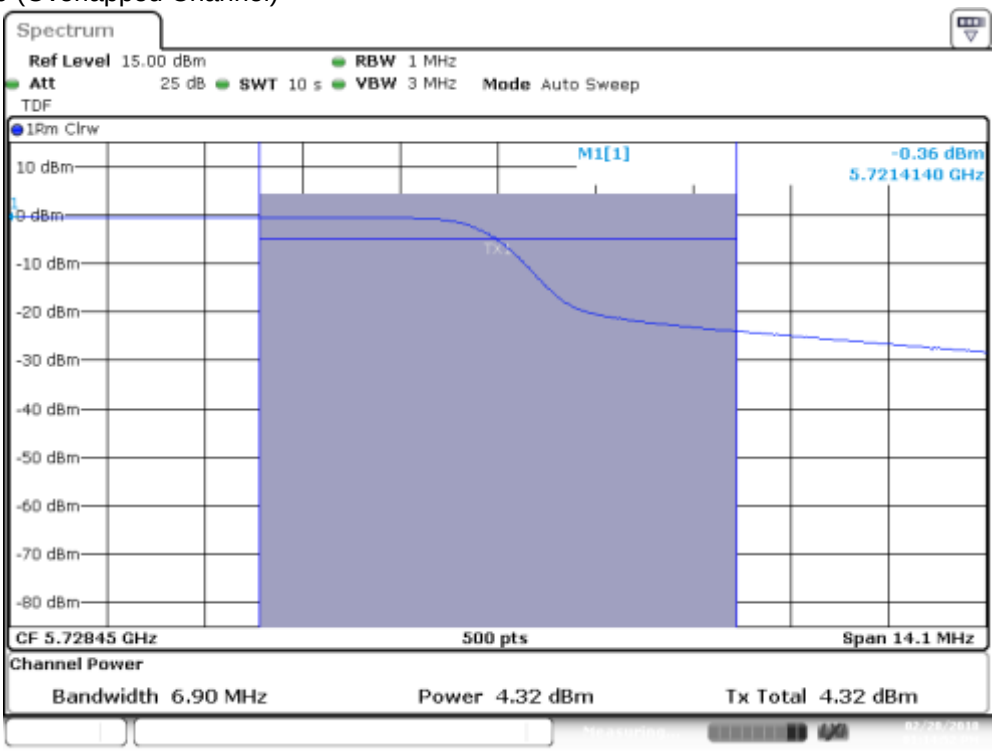
MIMO-B, 802.11n40, HT8

Channel 142F (Overlapped Channel)



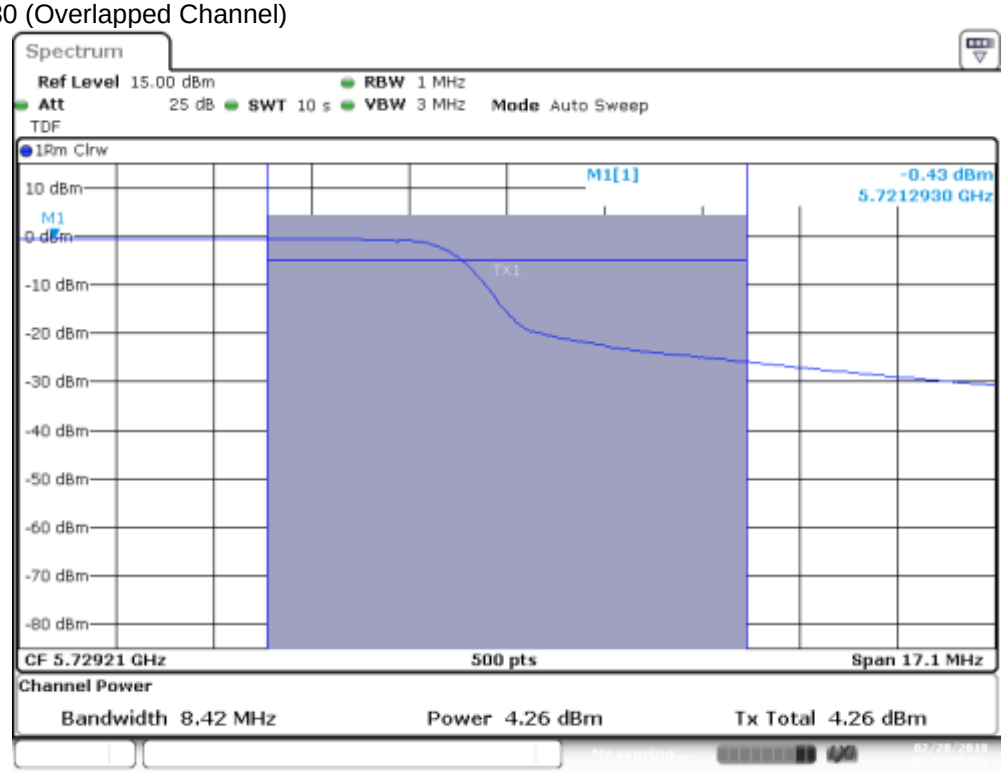
SISO-A, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



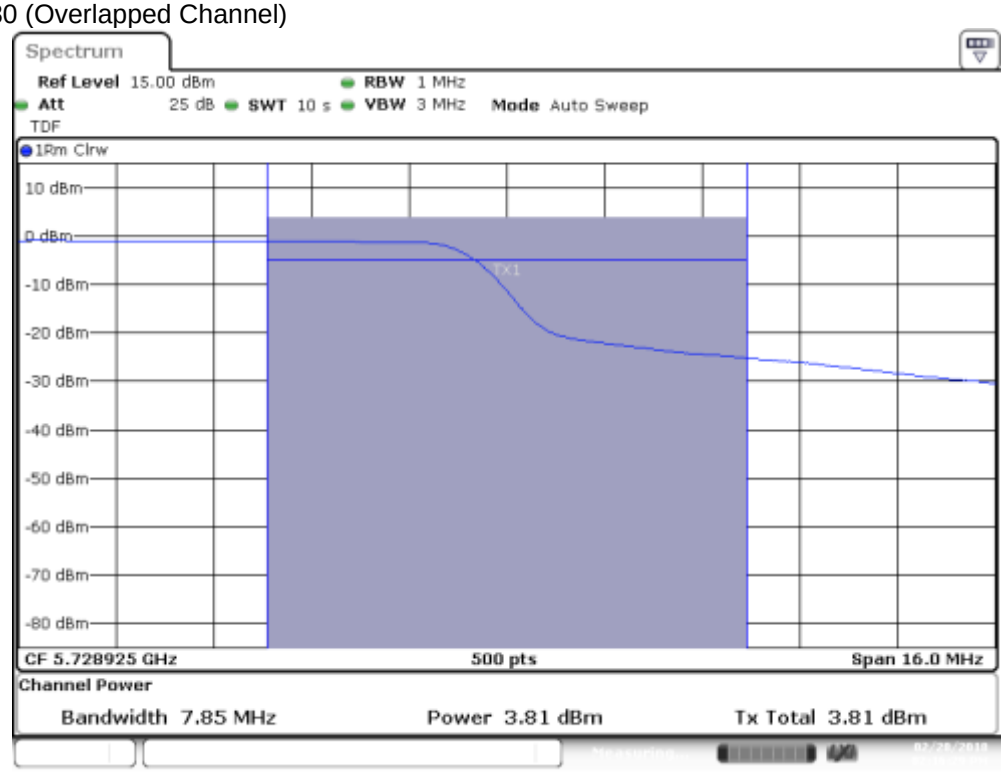
SISO-B, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



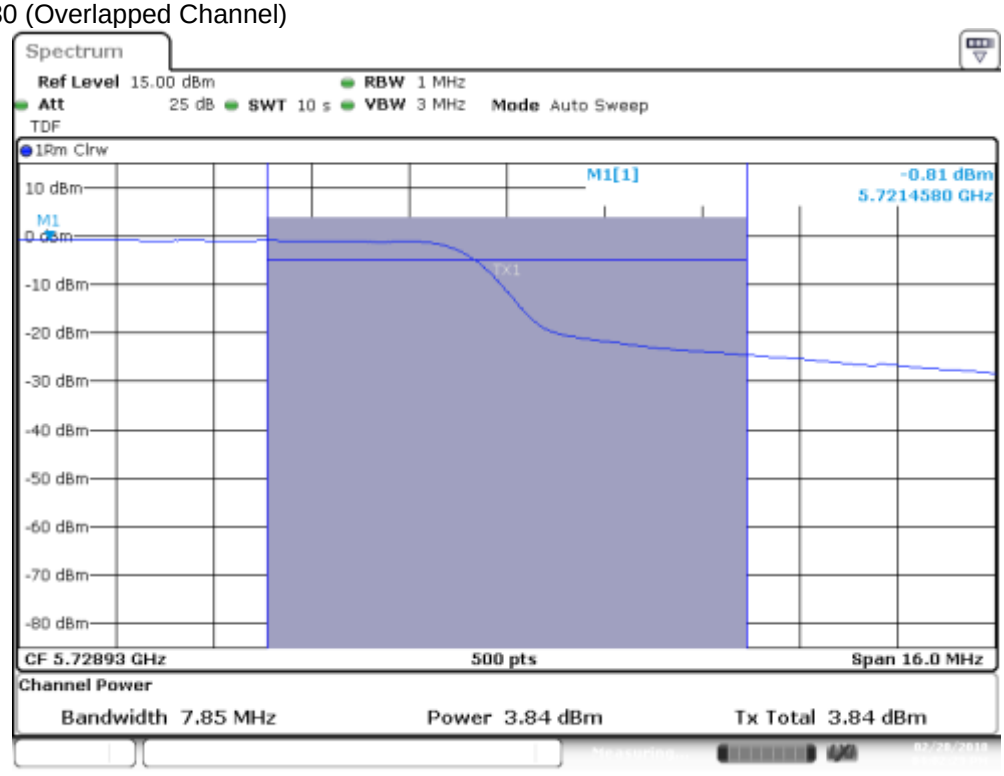
MIMO-A, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



MIMO-B, 802.11ac80, VHT0

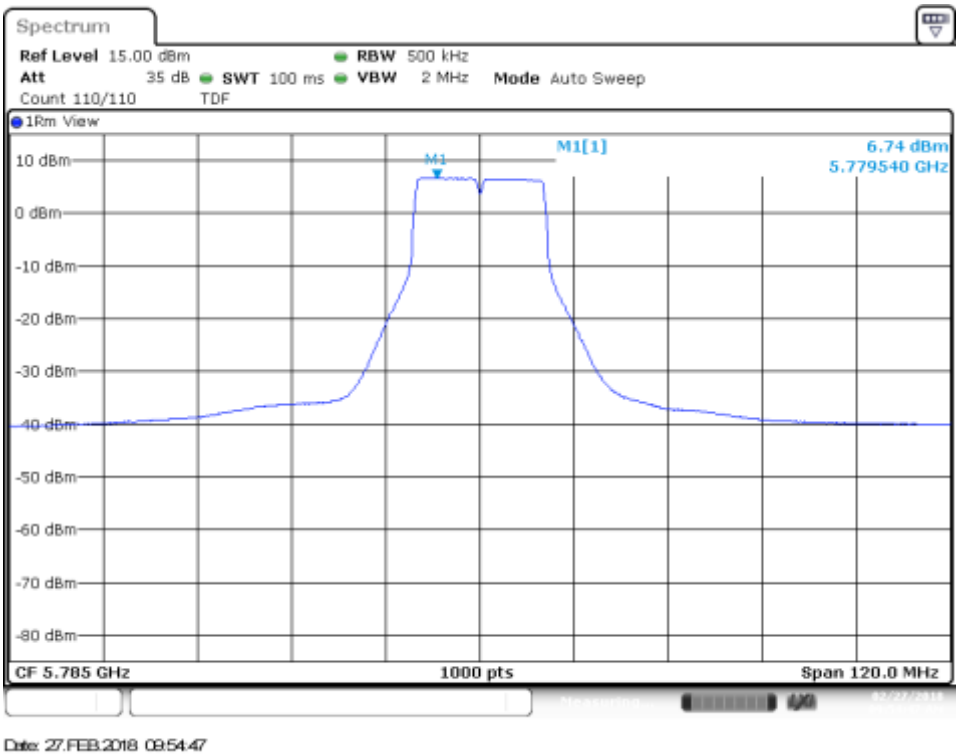
Channel 138ac80 (Overlapped Channel)



B.3.7 Peak power spectral Density

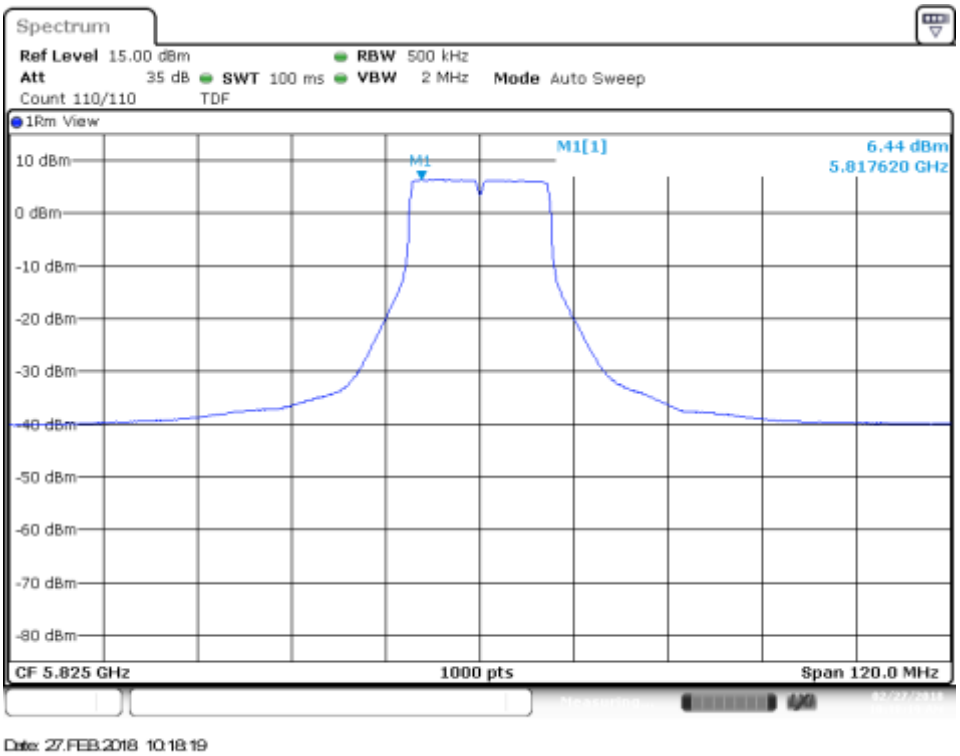
SISO-A, 802.11a, 6Mbps

Channel 157



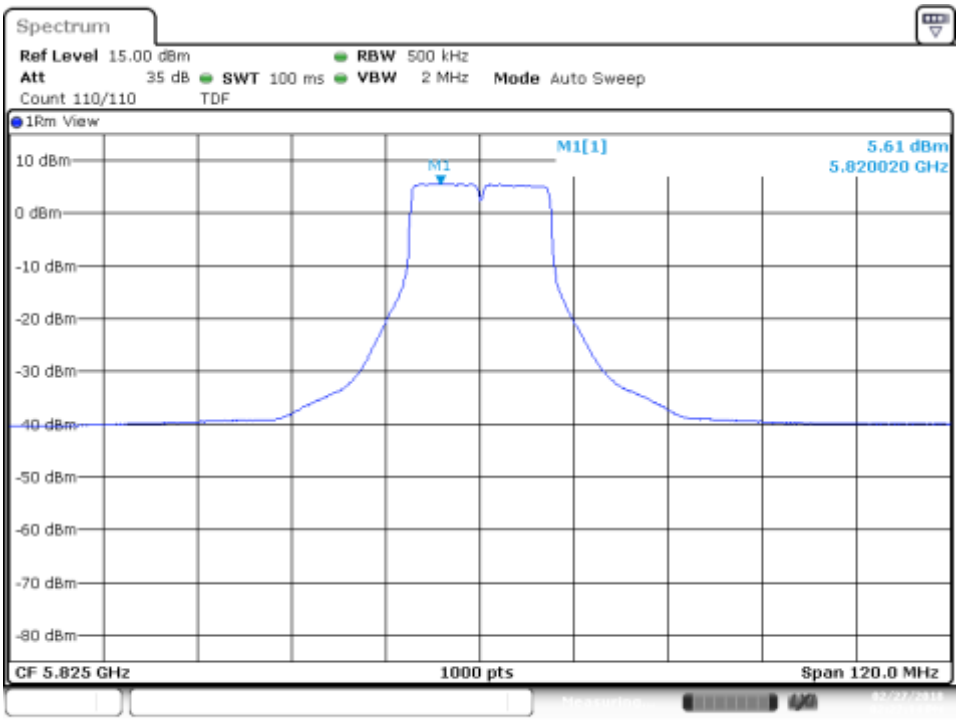
SISO-A, 802.11n20, HT0

Channel 165



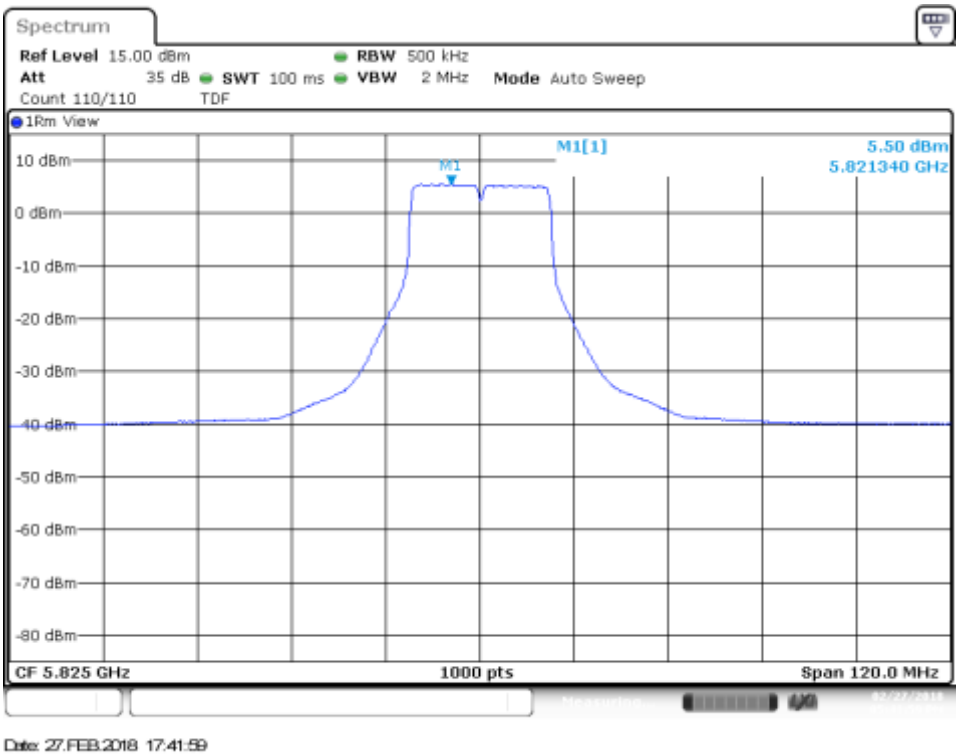
MIMO-A, 802.11n20, HT8

Channel 165



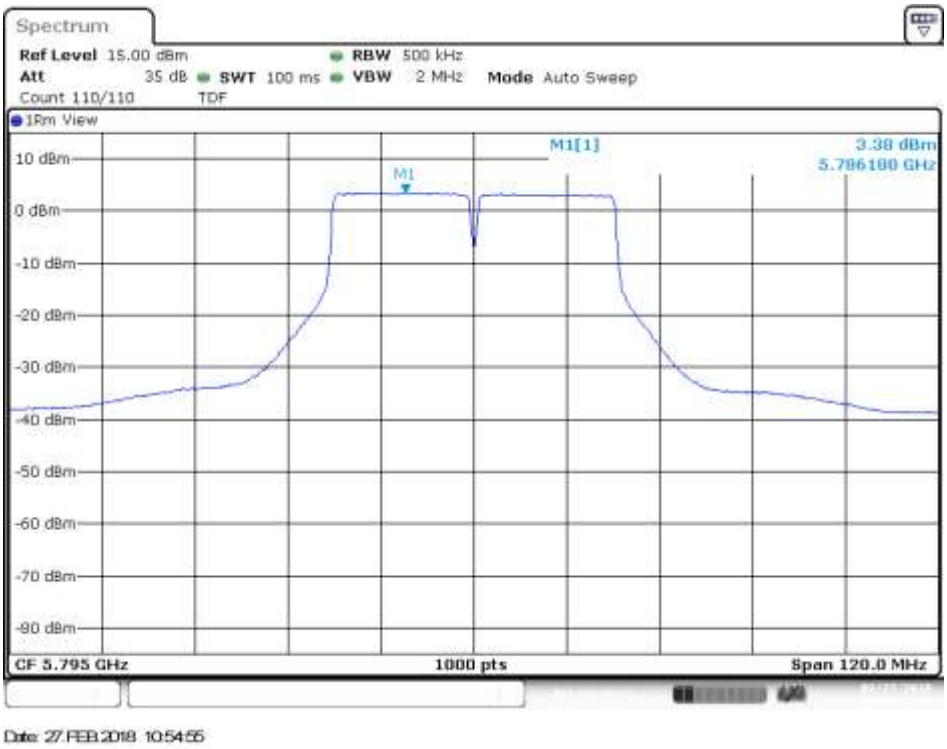
MIMO-B, 802.11n20, HT8

Channel 165



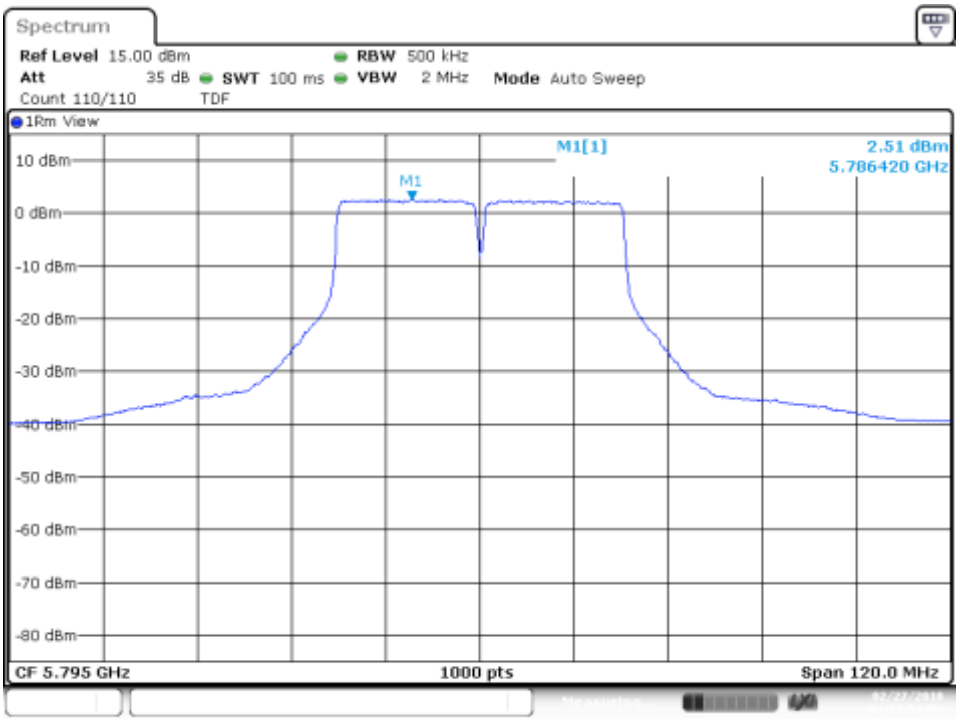
SISO-A, 802.11n40, HT0

Channel 159F



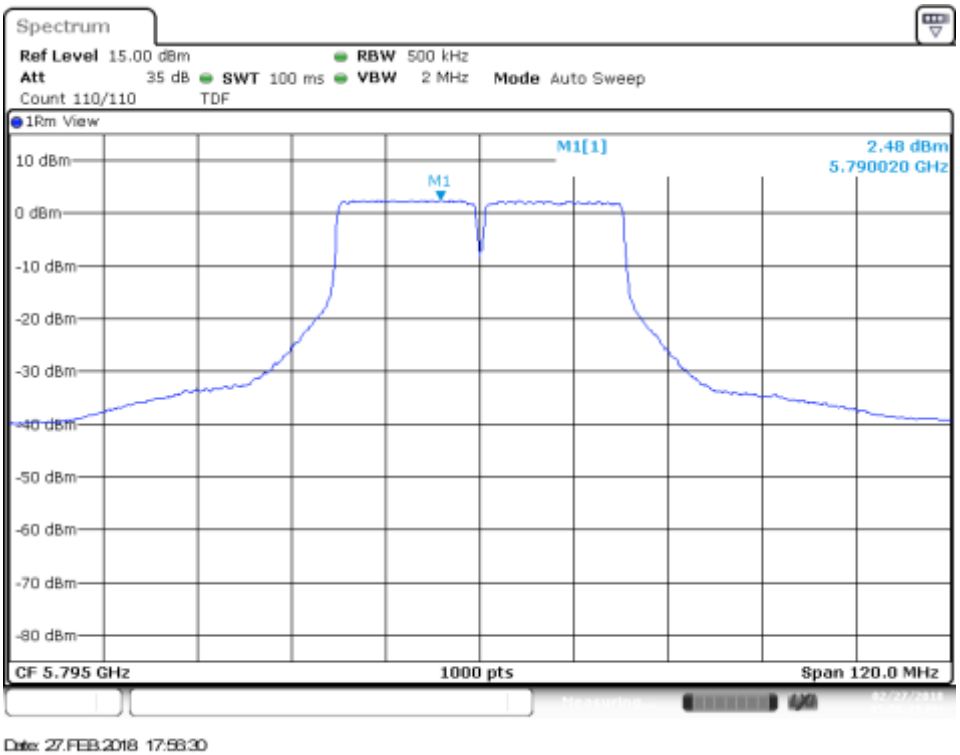
MIMO-A, 802.11n40, HT8

Channel 159F



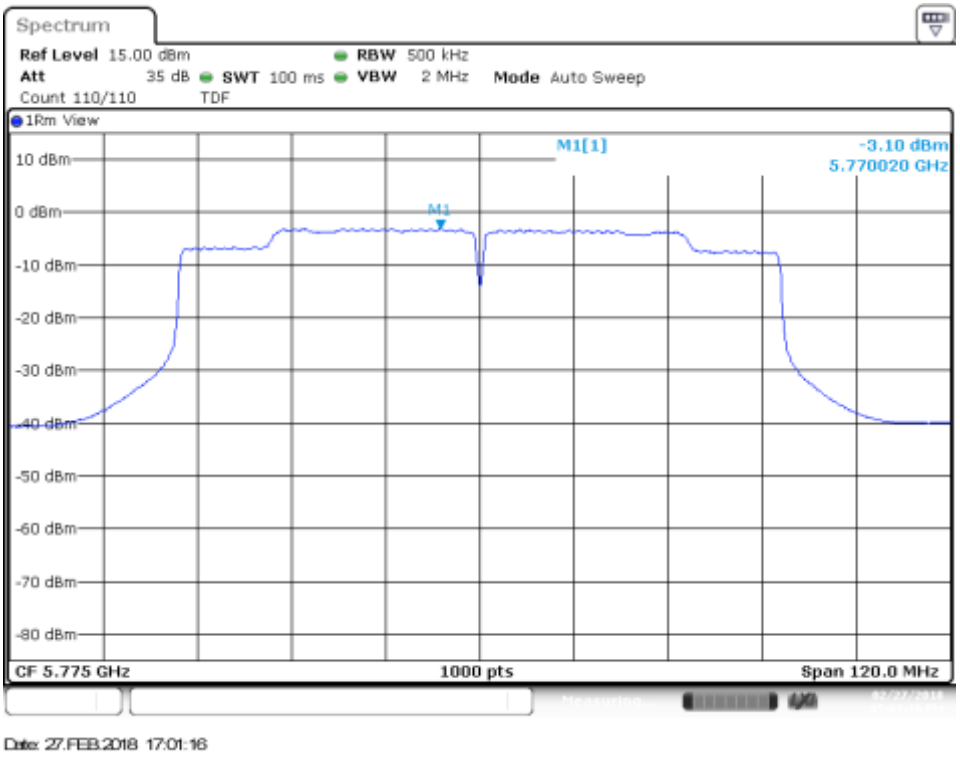
MIMO-B, 802.11n40, HT8

Channel 159F



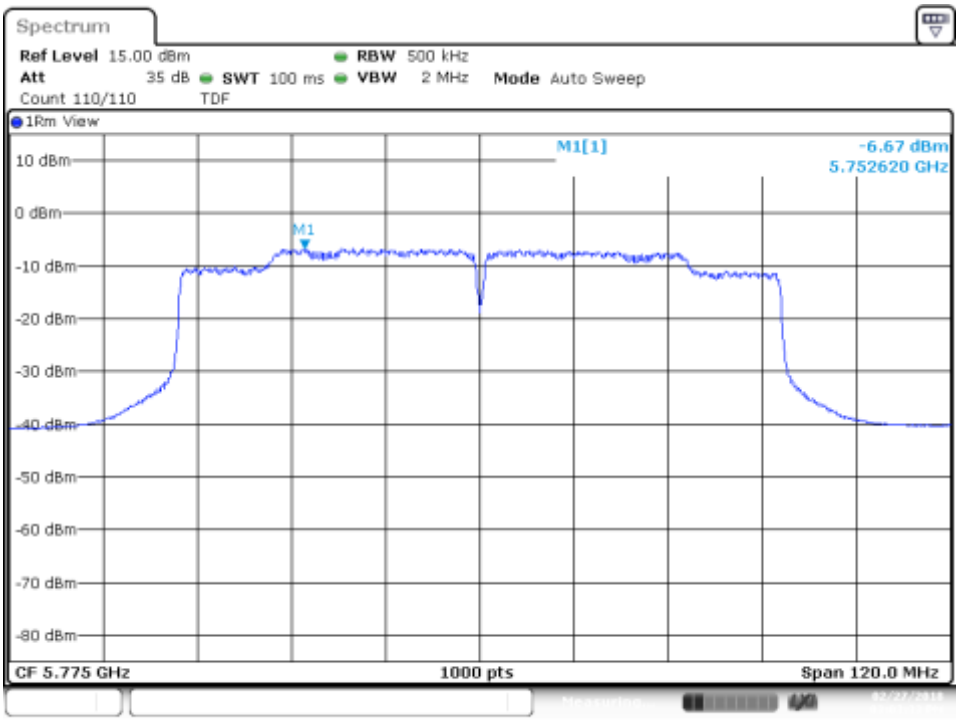
SISO-B, 802.11ac80, VHT0

Channel 155ac80



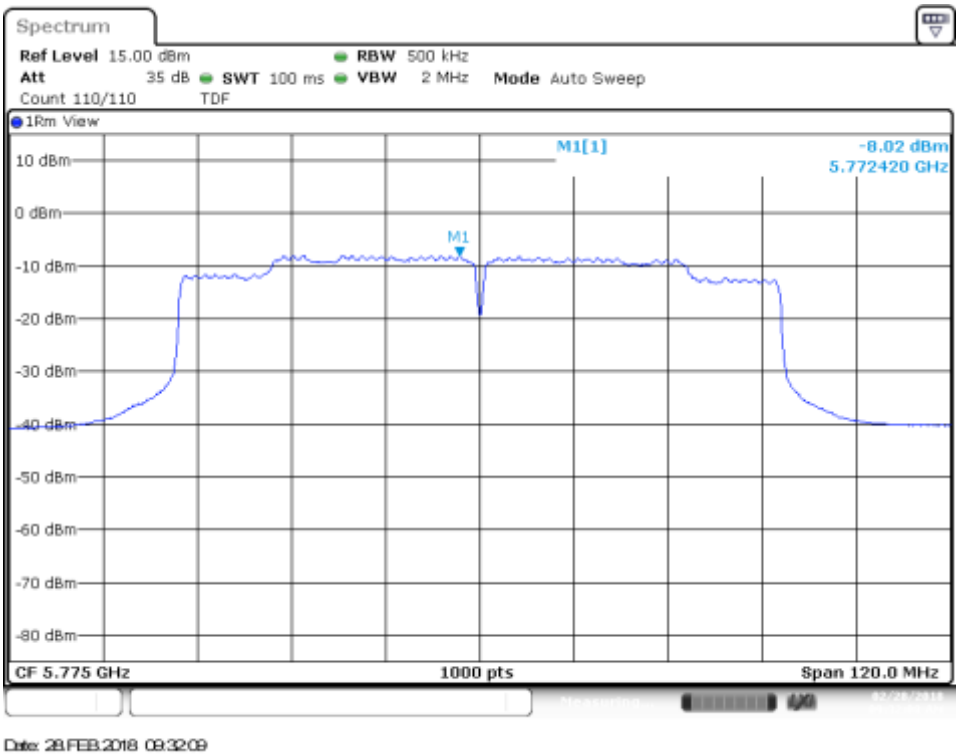
MIMO-A, 802.11 ac80, VHT0

Channel 155ac80



MIMO-B, 802.11 ac80, VHT0

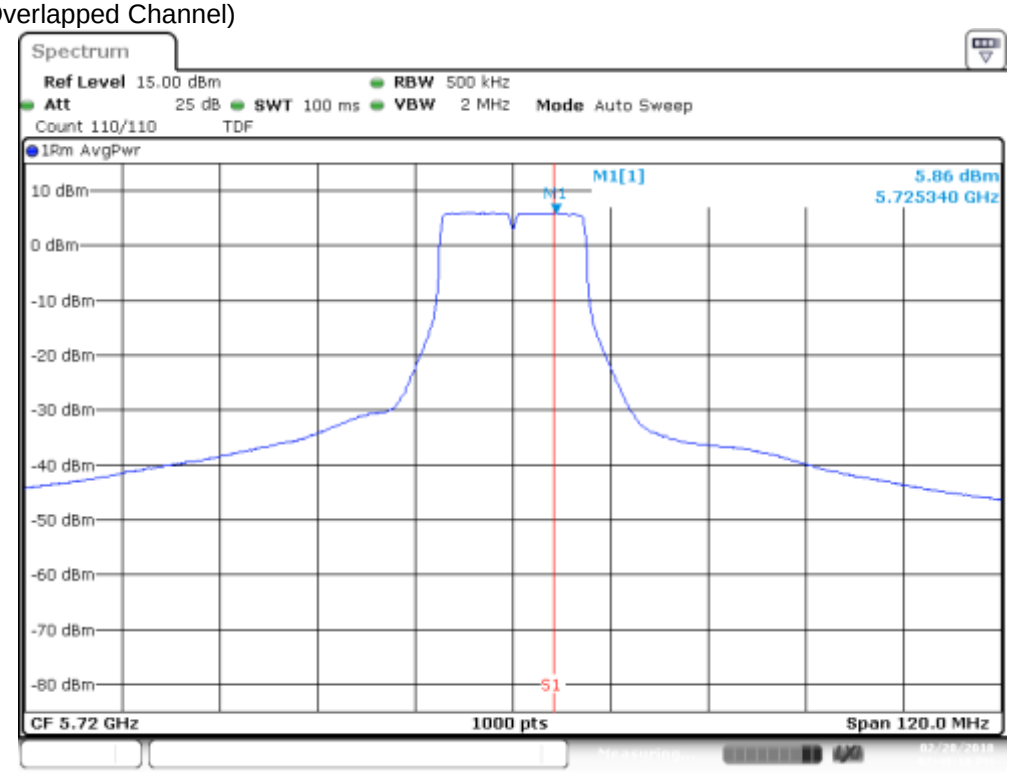
Channel 155ac80



B.3.8 Peak power spectral Density (Overlapped Channel)

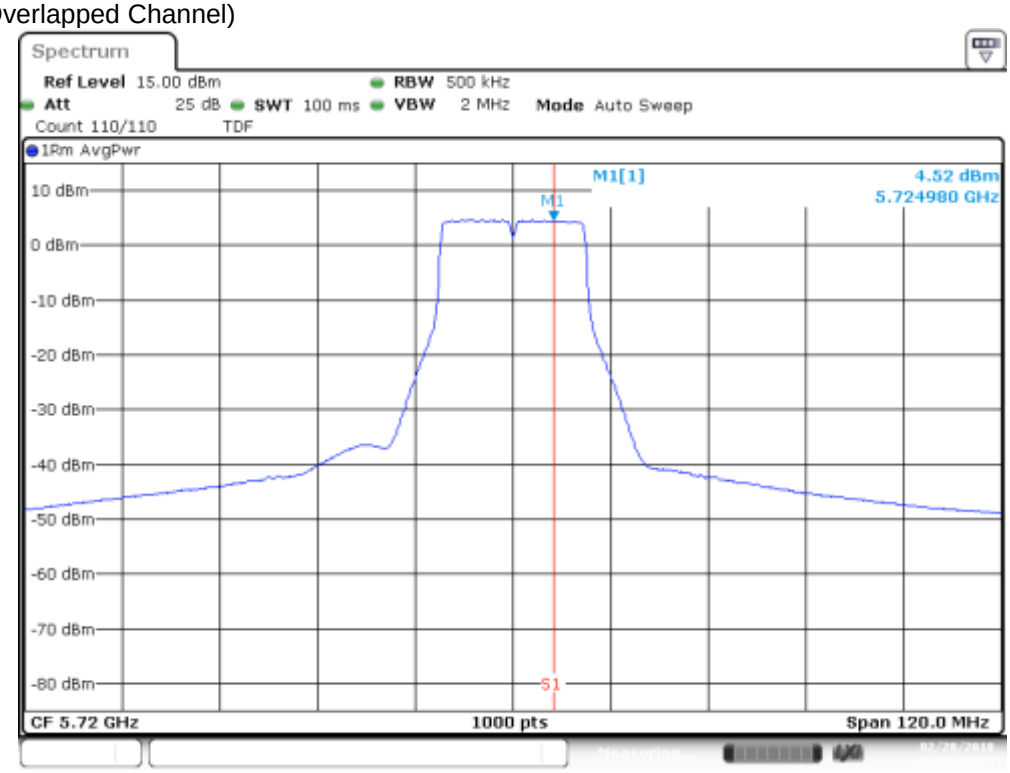
SISO-B, 802.11n20, HT0

Channel 144 (Overlapped Channel)



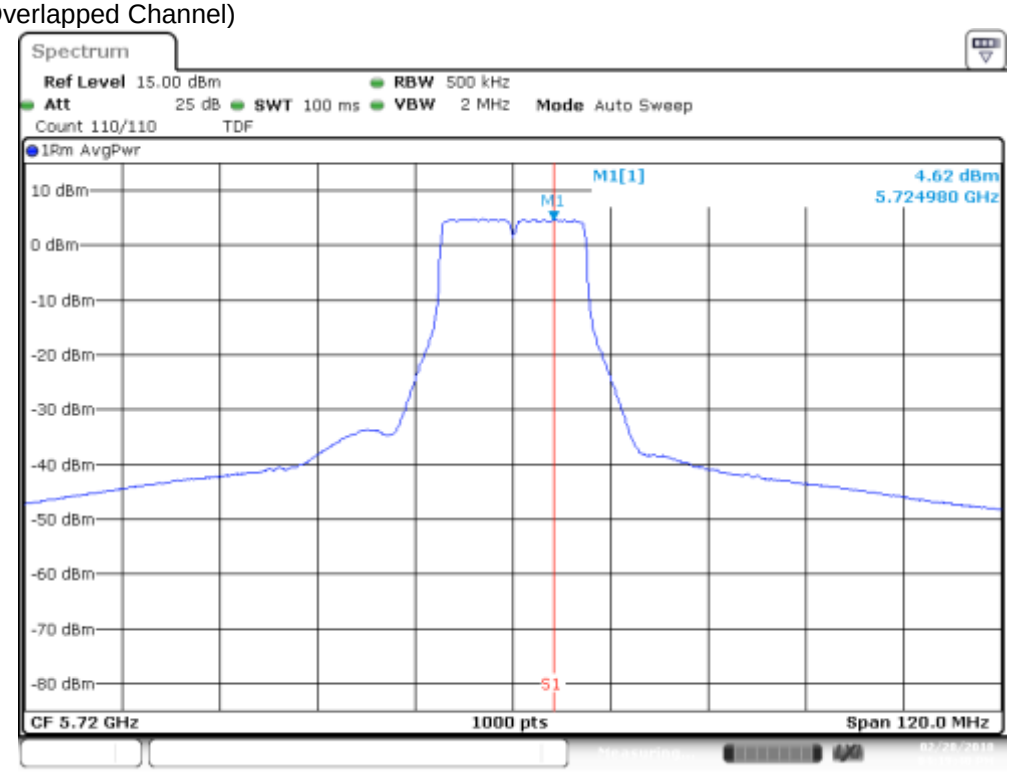
MIMO-A, 802.11n20, HT8

Channel 144 (Overlapped Channel)



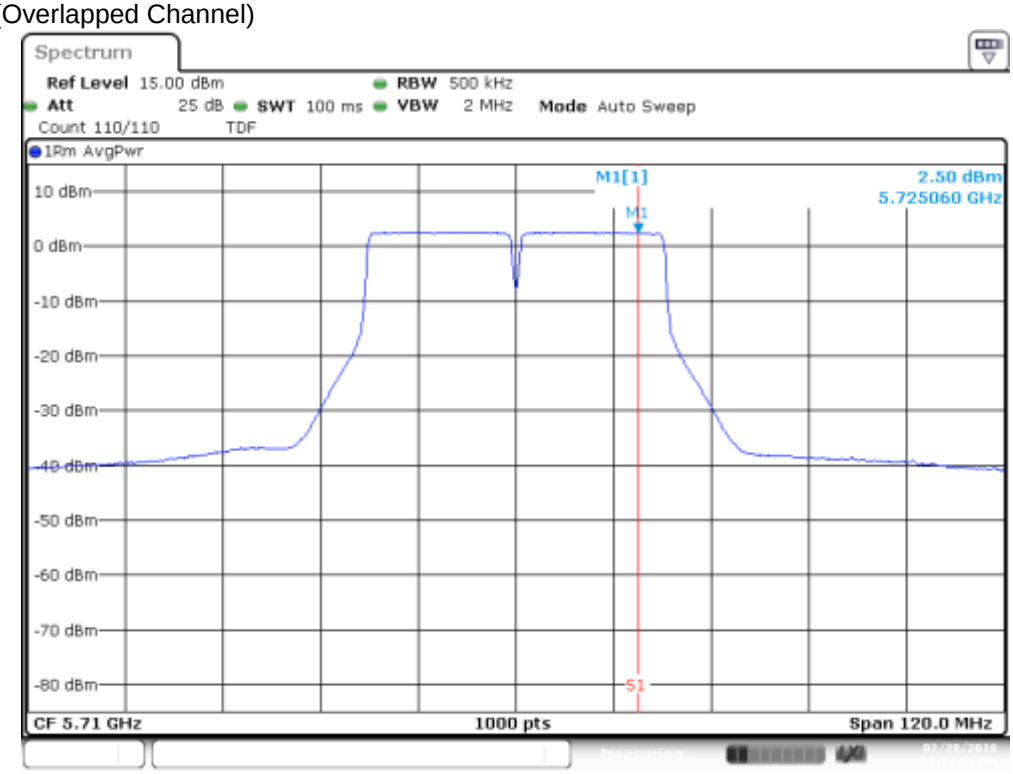
MIMO-B, 802.11n20, HT8

Channel 144 (Overlapped Channel)



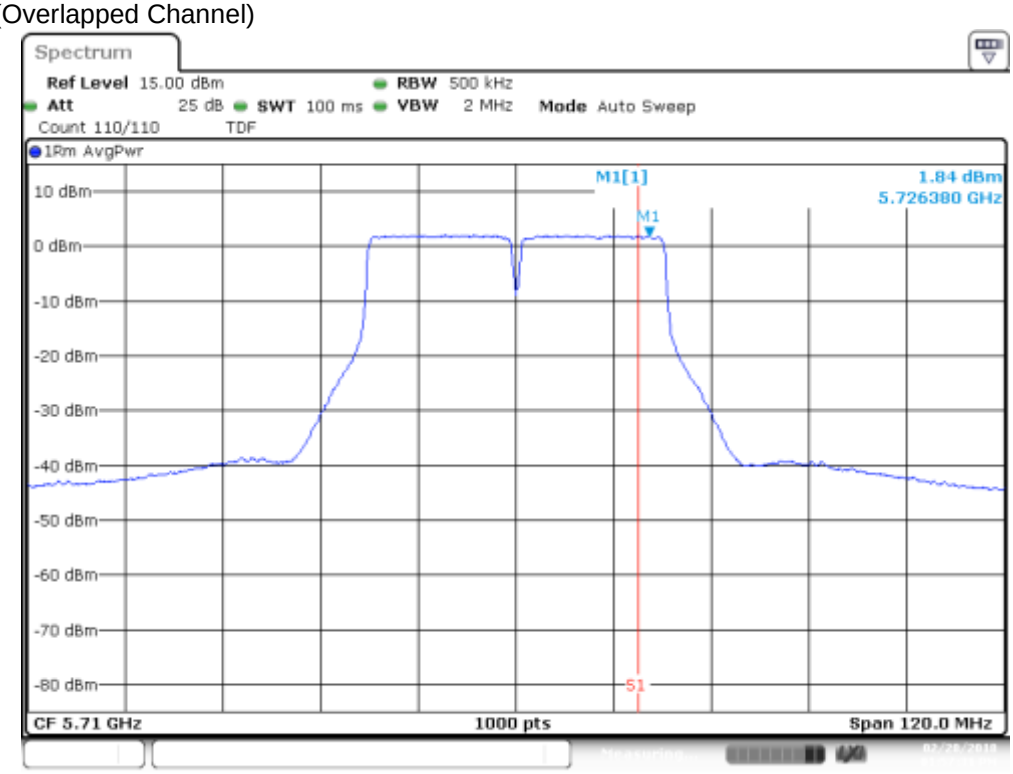
SISO-B, 802.11n40, HT0

Channel 142F (Overlapped Channel)



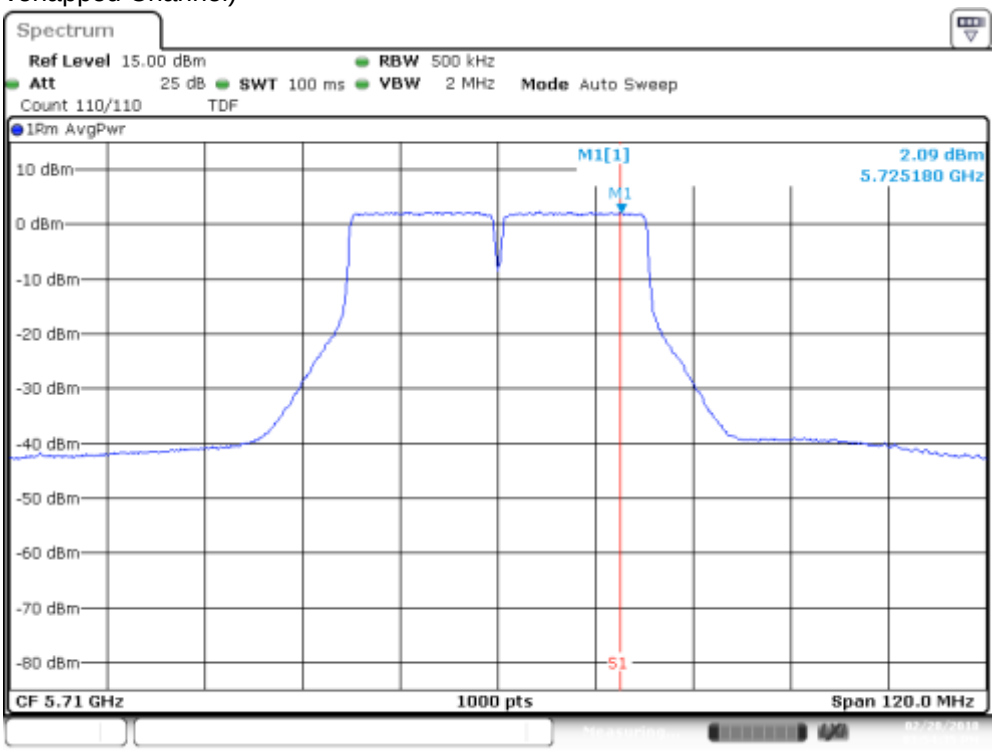
MIMO-A, 802.11n40, HT8

Channel 142F (Overlapped Channel)



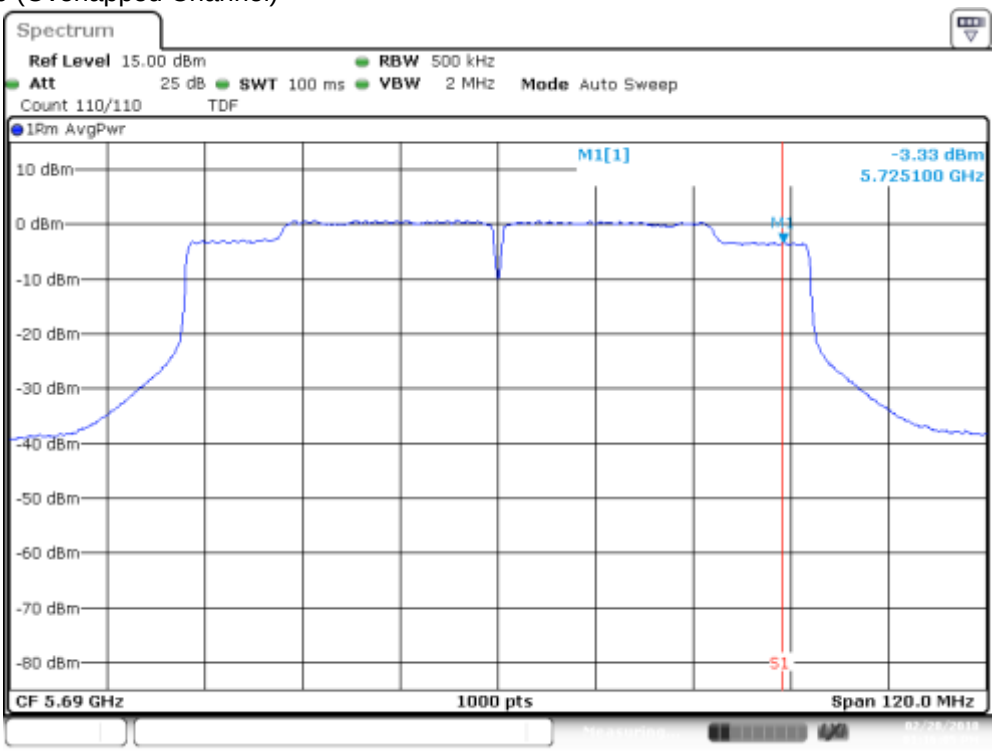
MIMO-B, 802.11n40, HT8

Channel 142F (Overlapped Channel)



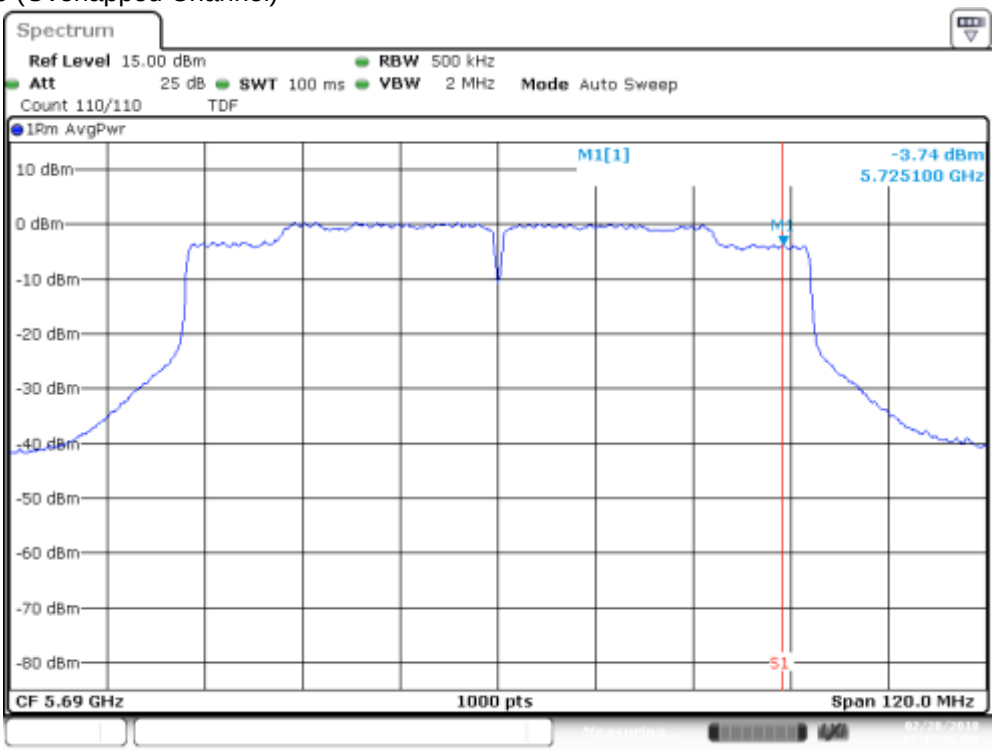
SISO-A, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



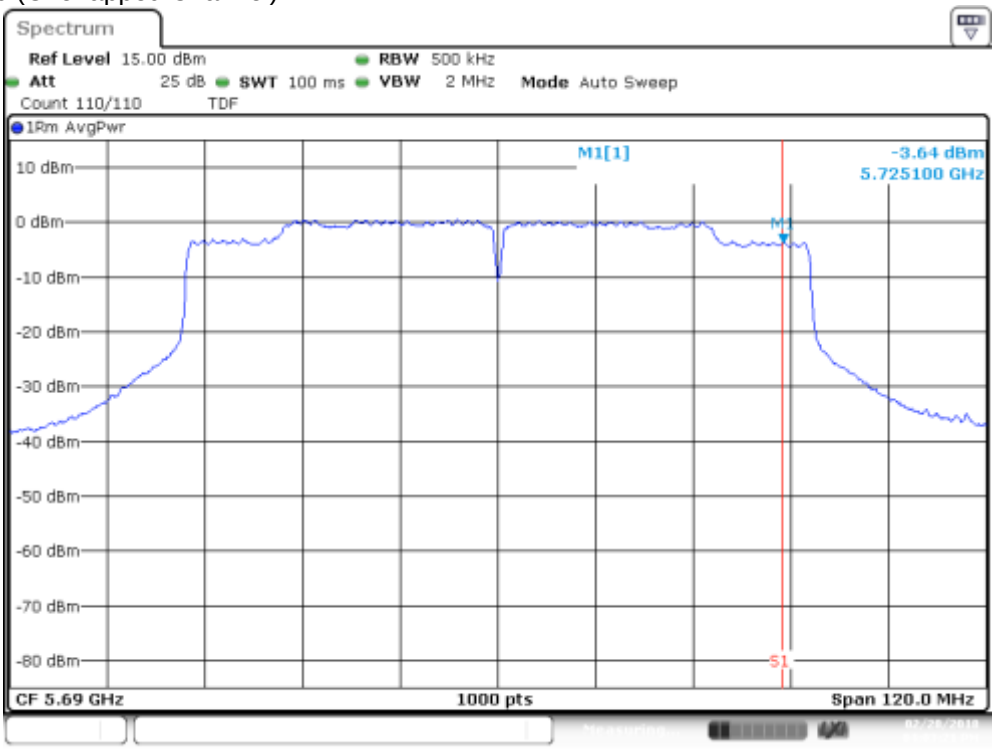
MIMO-A, 802.11ac80, VHT0

Channel 138ac80 (Overlapped Channel)



MIMO-B, 802.11ac80, VHT0

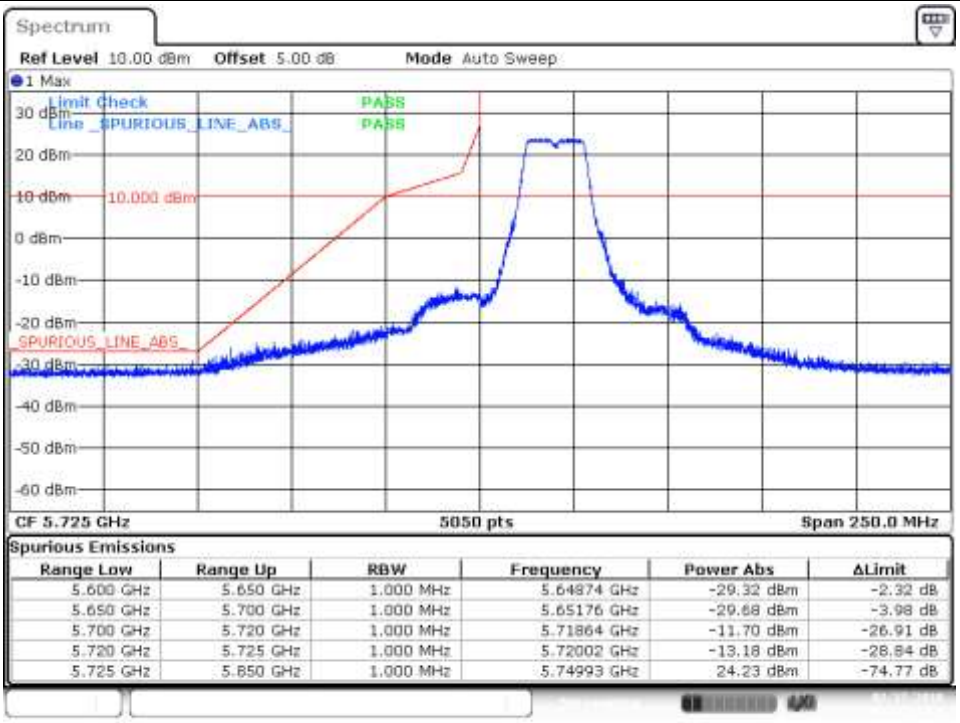
Channel 138ac80 (Overlapped Channel)



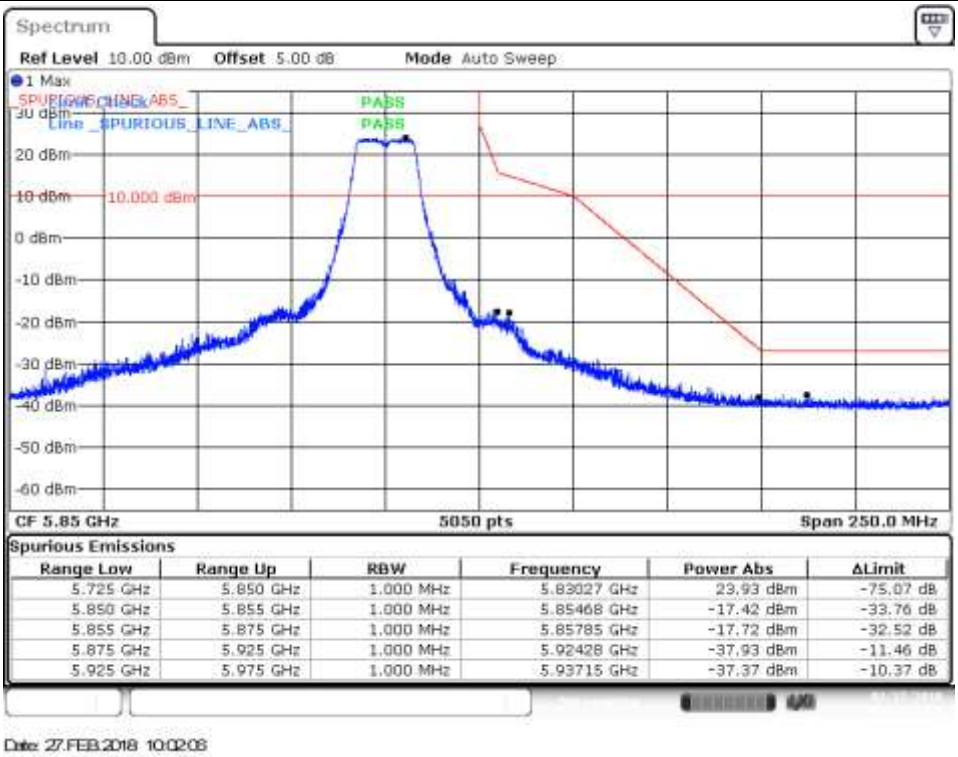
B.3.9 Undesirable emission limits : Band Edge (Conducted)

802.11a, 6Mbps – Chain A

BE Low Freq Section, Peak – CH149

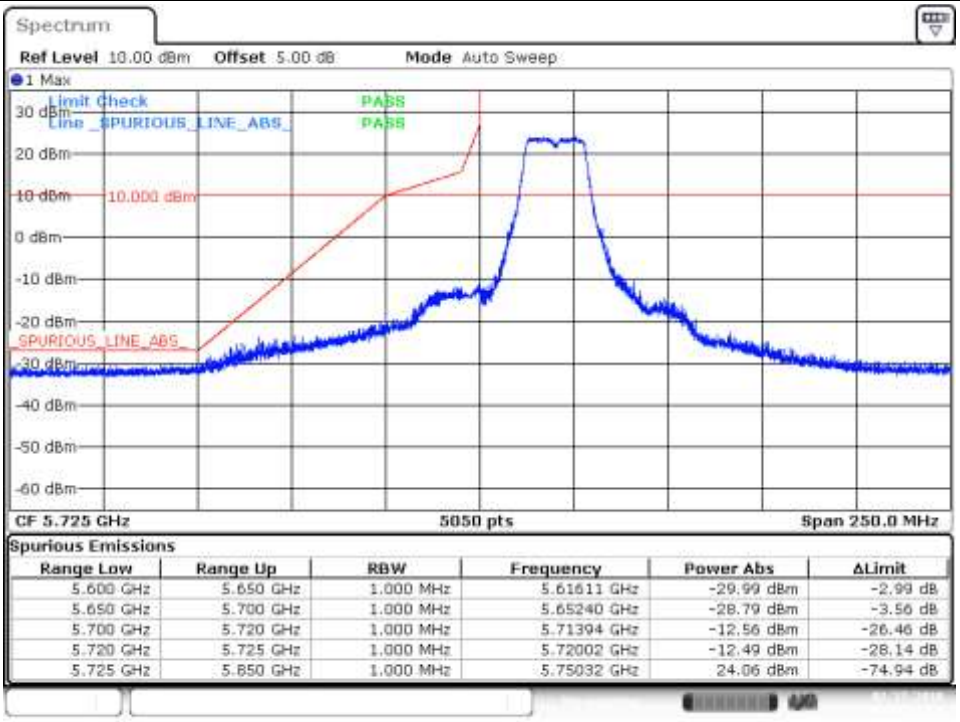


BE High Freq Section, Peak – CH165

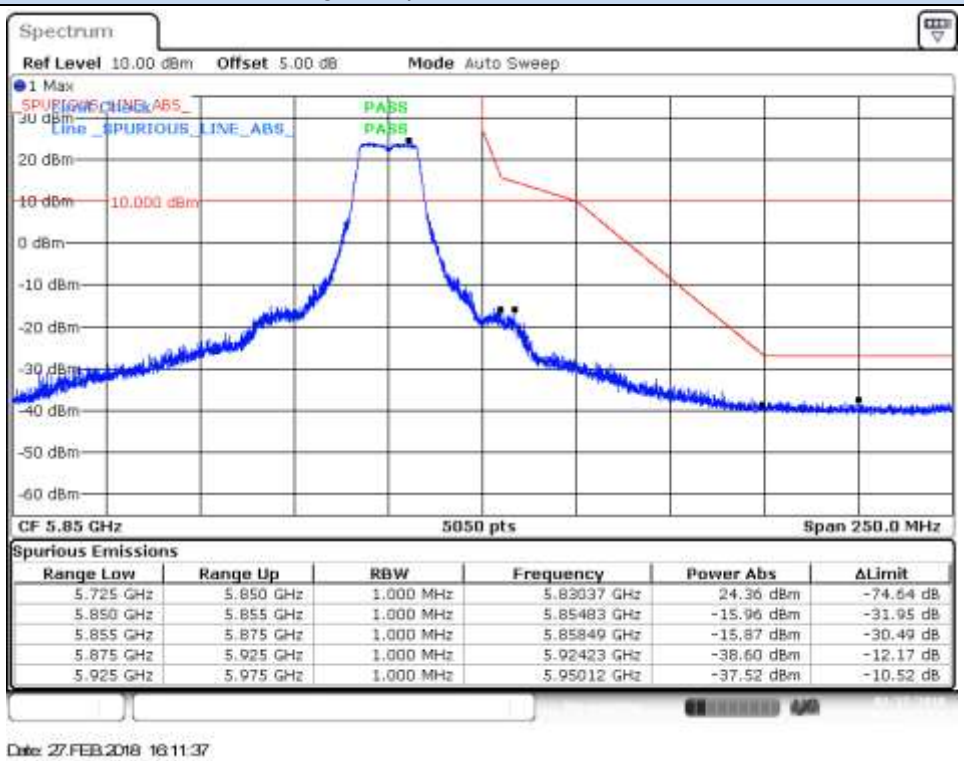


802.11a, 6Mbps – Chain B

BE Low Freq Section, Peak – CH149

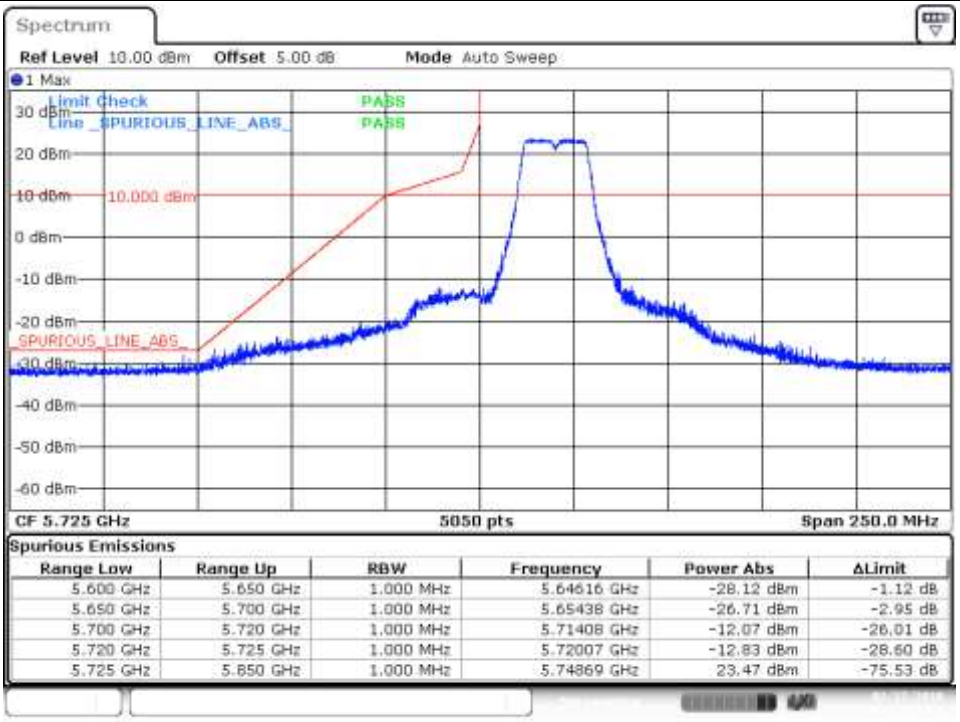


BE High Freq Section, Peak – CH165

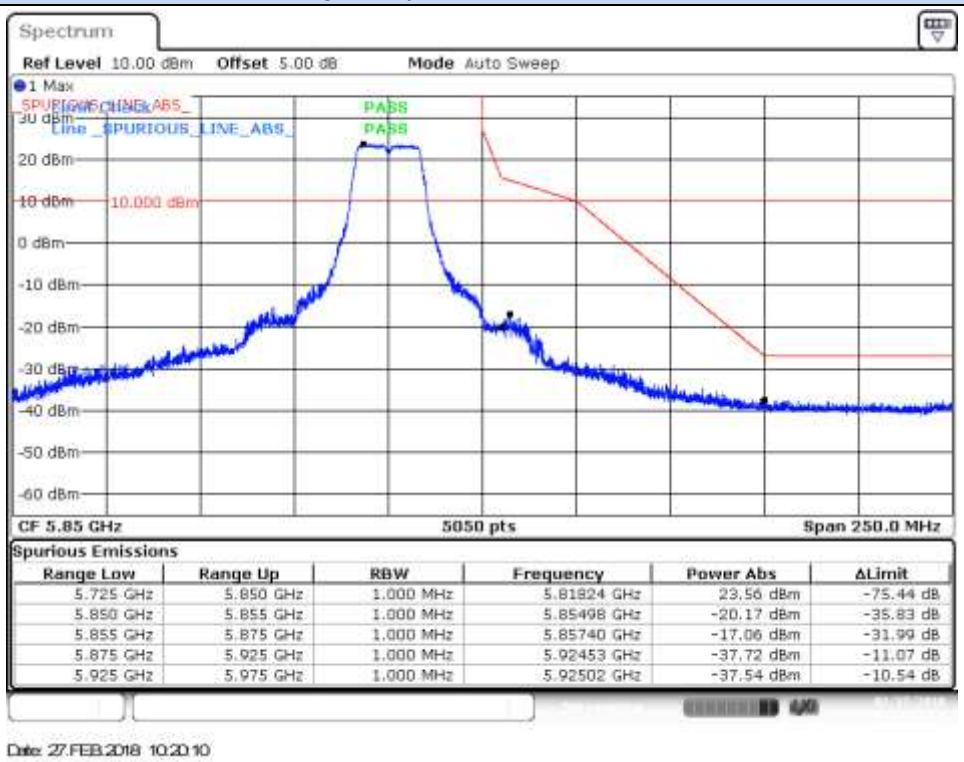


802.11n20, HT0 – SISO - Chain A

BE Low Freq Section, Peak – CH149

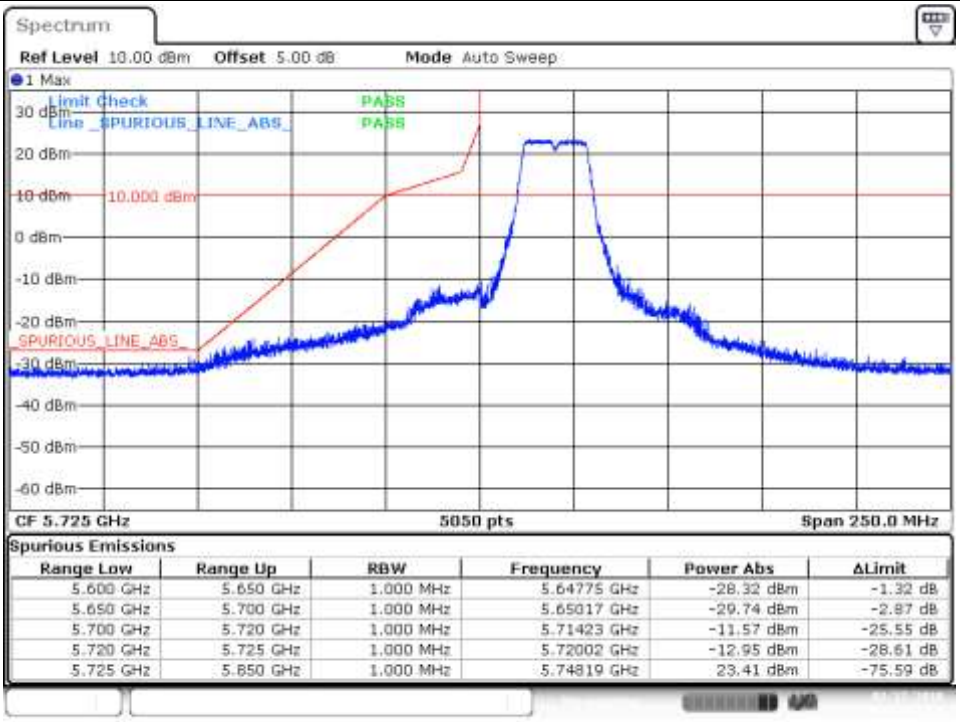


BE High Freq Section, Peak – CH165

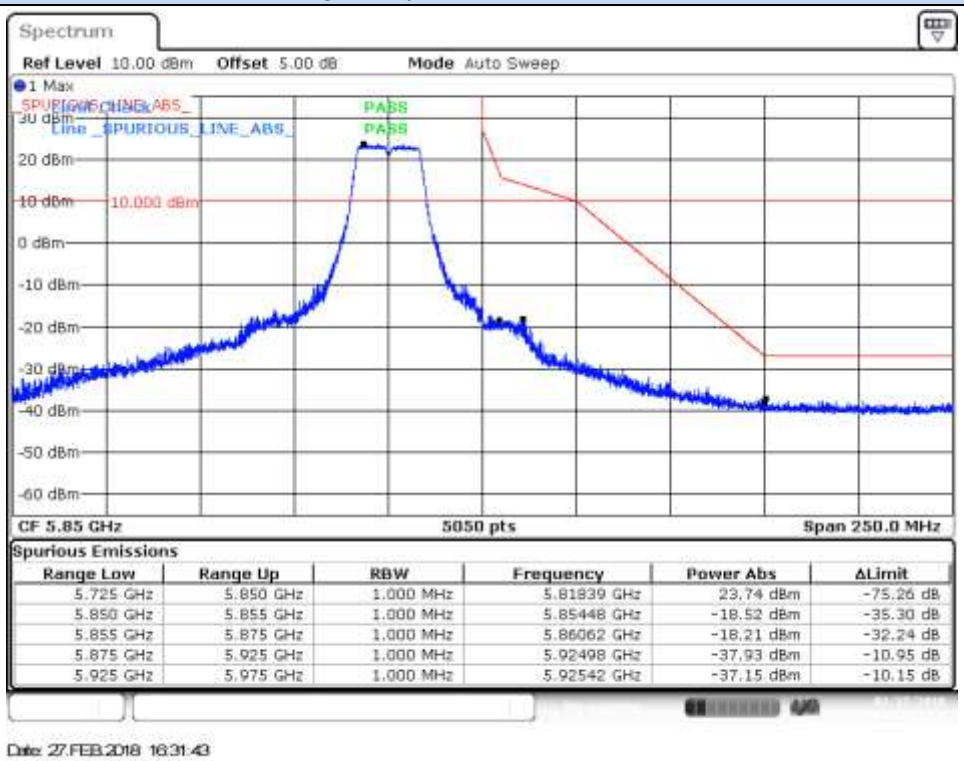


802.11n20, HT0 – SISO - Chain B

BE Low Freq Section, Peak – CH149

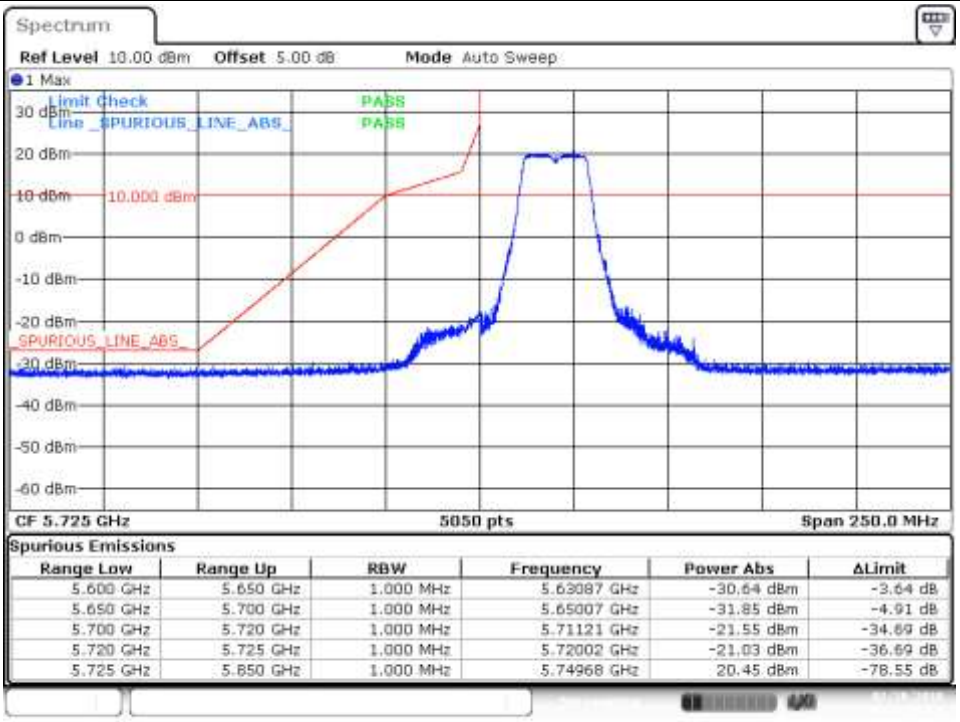


BE High Freq Section, Peak – CH165

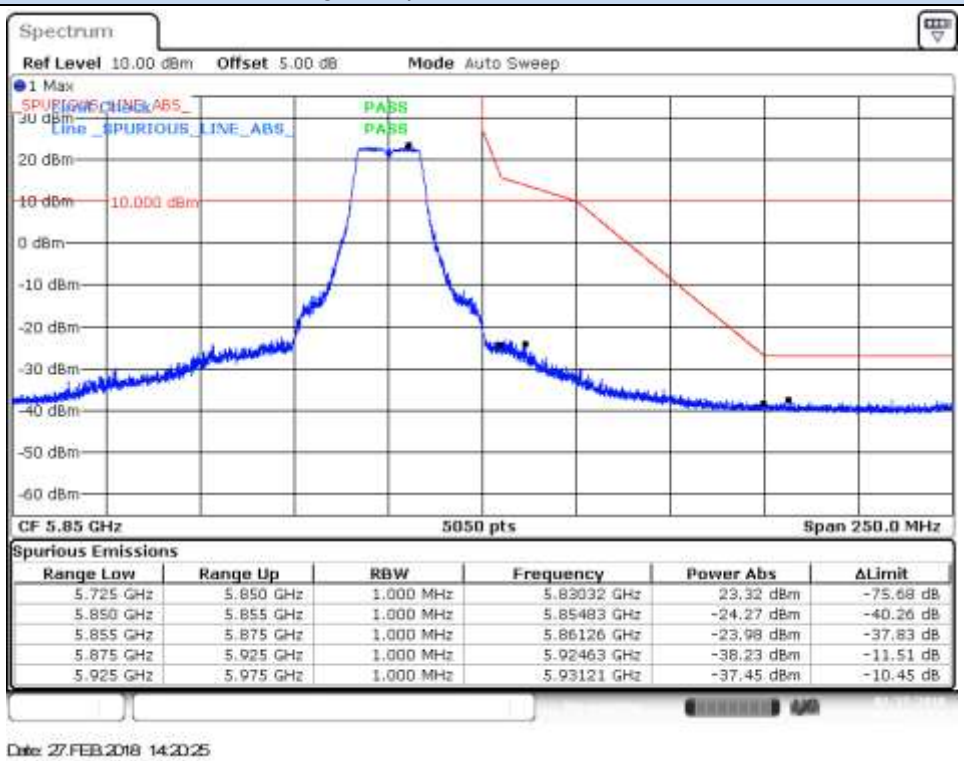


802.11n20, HT8 – MIMO - Chain A

BE Low Freq Section, Peak – CH149

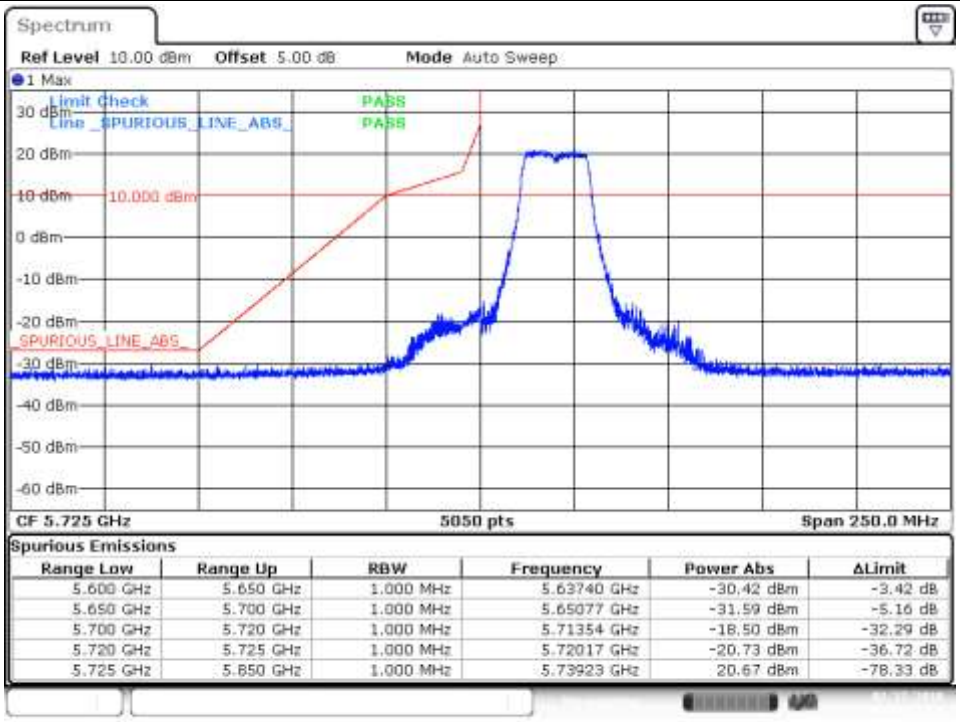


BE High Freq Section, Peak – CH165

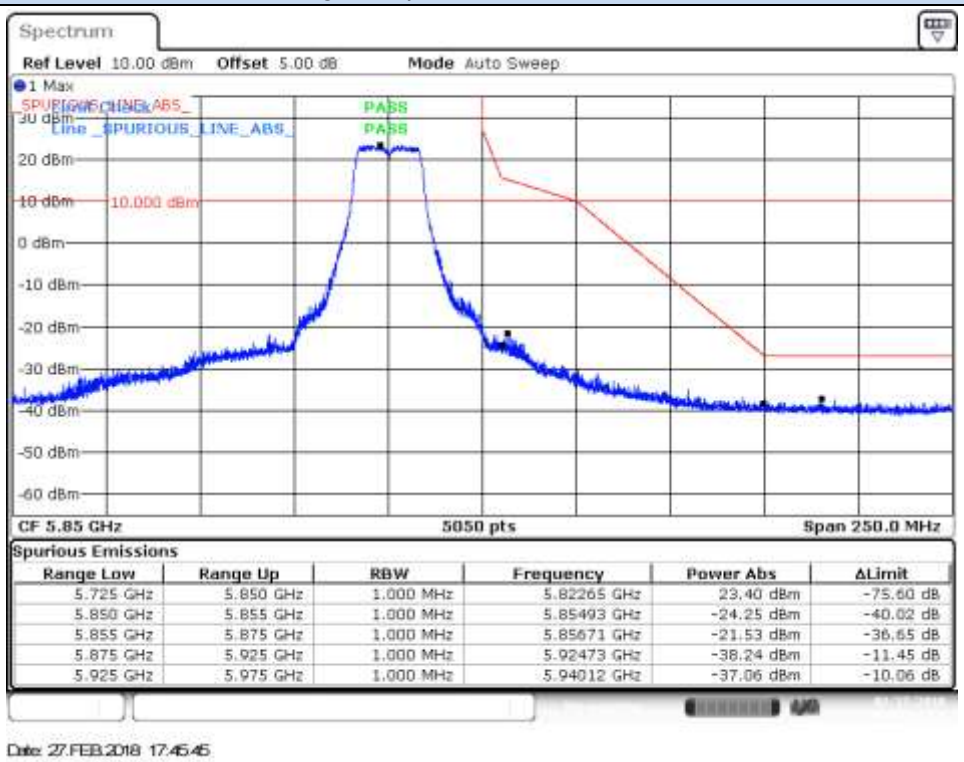


802.11n20, HT8 – MIMO - Chain B

BE Low Freq Section, Peak – CH149

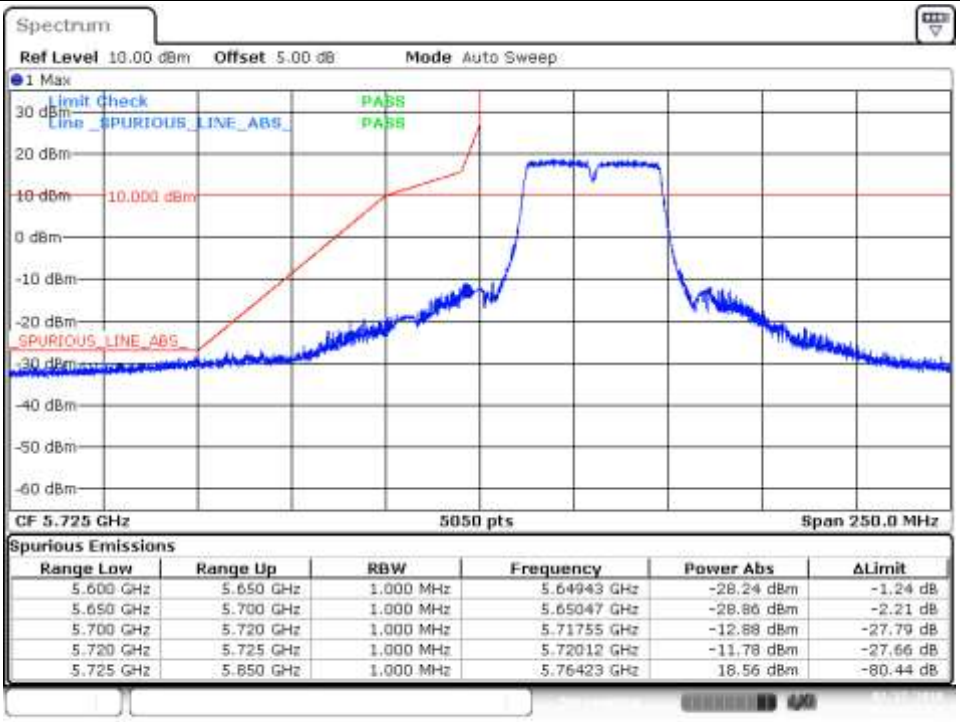


BE High Freq Section, Peak – CH165

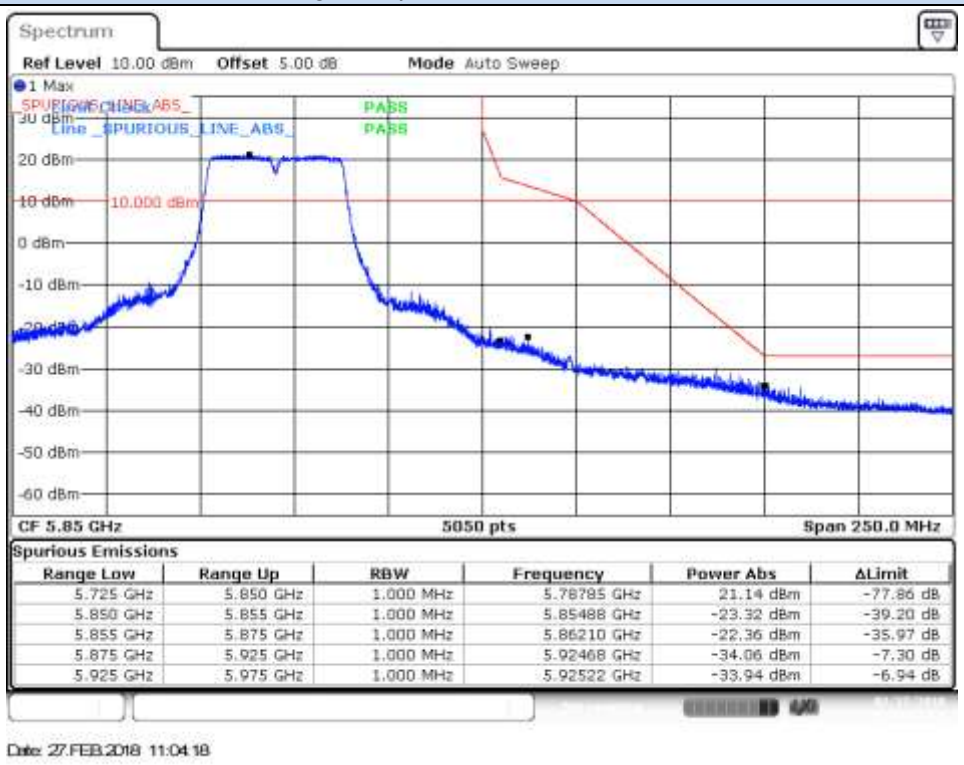


802.11n40, HT0 – SISO - Chain A

BE Low Freq Section, Peak – CH151F

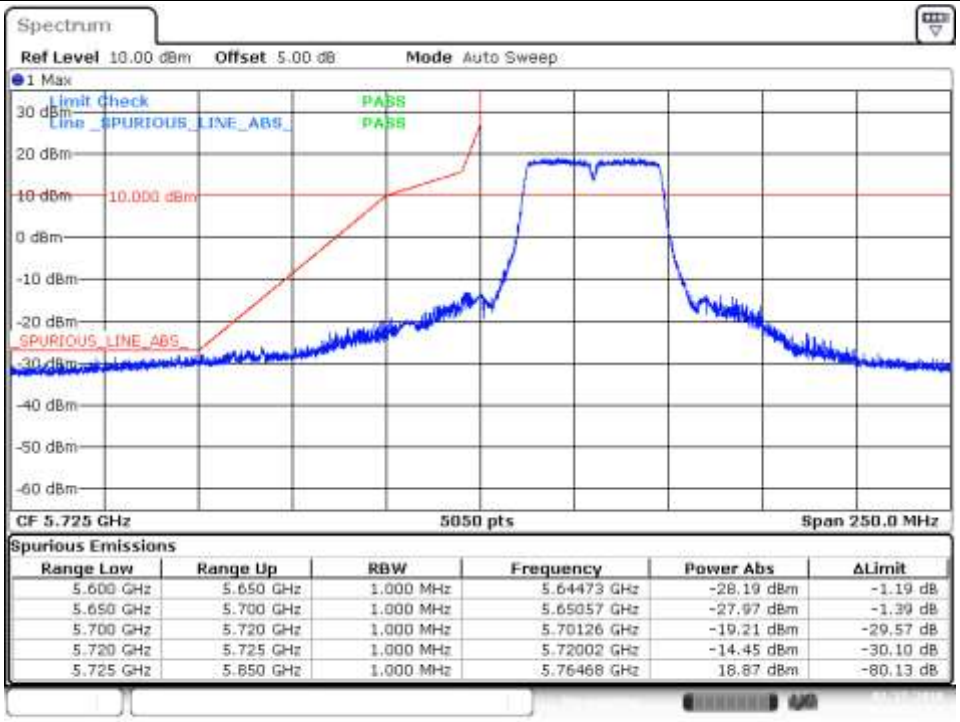


BE High Freq Section, Peak – CH159F



802.11n40, HT0 – SISO - Chain B

BE Low Freq Section, Peak – CH151F



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.600 GHz	5.650 GHz	1.000 MHz	5.64473 GHz	-28.19 dBm	-1.19 dB
5.650 GHz	5.700 GHz	1.000 MHz	5.65057 GHz	-27.97 dBm	-1.39 dB
5.700 GHz	5.720 GHz	1.000 MHz	5.70126 GHz	-19.21 dBm	-29.57 dB
5.720 GHz	5.725 GHz	1.000 MHz	5.72002 GHz	-14.45 dBm	-30.10 dB
5.725 GHz	5.850 GHz	1.000 MHz	5.76468 GHz	18.87 dBm	-80.13 dB

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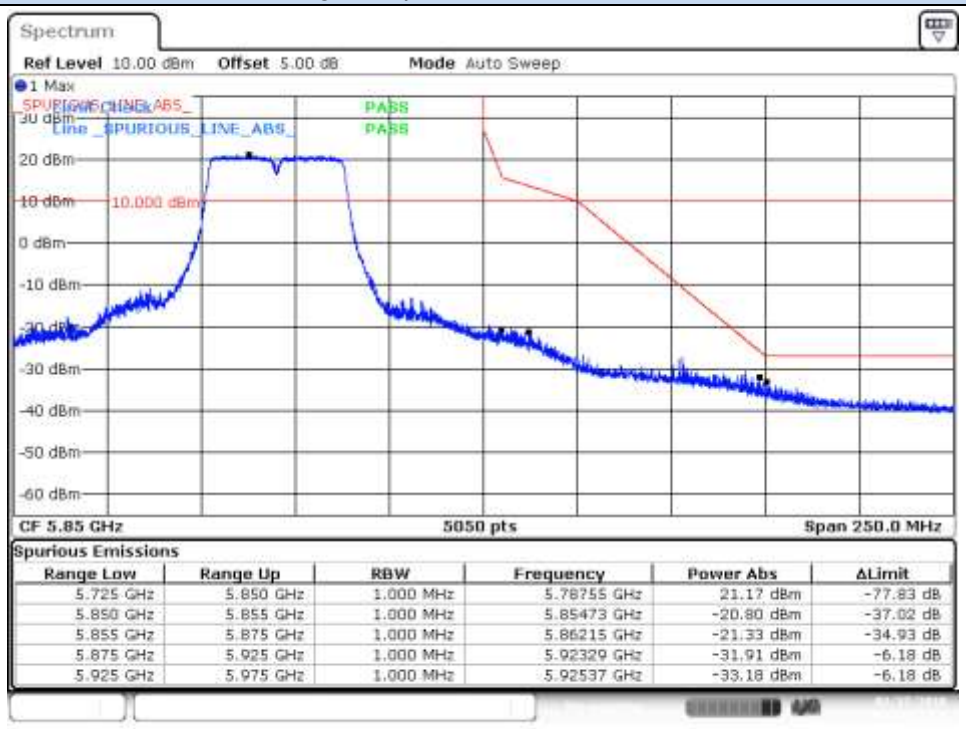
BE High Freq Section, Peak – CH159F



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.725 GHz	5.850 GHz	1.000 MHz	5.78755 GHz	21.17 dBm	-77.83 dB
5.850 GHz	5.855 GHz	1.000 MHz	5.85473 GHz	-20.80 dBm	-37.02 dB
5.855 GHz	5.875 GHz	1.000 MHz	5.86215 GHz	-21.33 dBm	-34.93 dB
5.875 GHz	5.925 GHz	1.000 MHz	5.92329 GHz	-31.91 dBm	-6.18 dB
5.925 GHz	5.975 GHz	1.000 MHz	5.92537 GHz	-33.18 dBm	-6.18 dB

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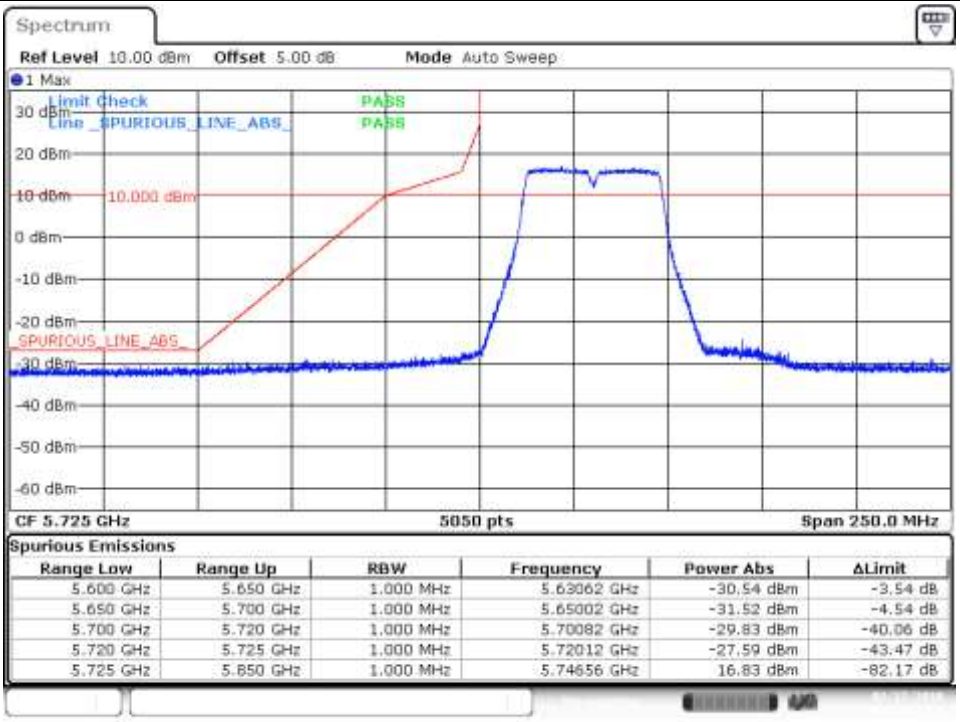
802.11n40, HT8 – MIMO - Chain A

BE Low Freq Section, Peak – CH151F



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.600 GHz	5.650 GHz	1.000 MHz	5.63062 GHz	-30.54 dBm	-3.54 dB
5.650 GHz	5.700 GHz	1.000 MHz	5.65002 GHz	-31.52 dBm	-4.54 dB
5.700 GHz	5.720 GHz	1.000 MHz	5.70082 GHz	-29.83 dBm	-40.06 dB
5.720 GHz	5.725 GHz	1.000 MHz	5.72012 GHz	-27.59 dBm	-43.47 dB
5.725 GHz	5.850 GHz	1.000 MHz	5.74656 GHz	16.83 dBm	-82.17 dB

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BE High Freq Section, Peak – CH159F

Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.725 GHz	5.850 GHz	1.000 MHz	5.79017 GHz	20.23 dBm	-78.77 dB
5.850 GHz	5.855 GHz	1.000 MHz	5.85483 GHz	-27.69 dBm	-43.68 dB
5.855 GHz	5.875 GHz	1.000 MHz	5.87339 GHz	-29.62 dBm	-40.07 dB
5.875 GHz	5.925 GHz	1.000 MHz	5.92260 GHz	-36.48 dBm	-11.25 dB
5.925 GHz	5.975 GHz	1.000 MHz	5.92557 GHz	-36.66 dBm	-9.66 dB

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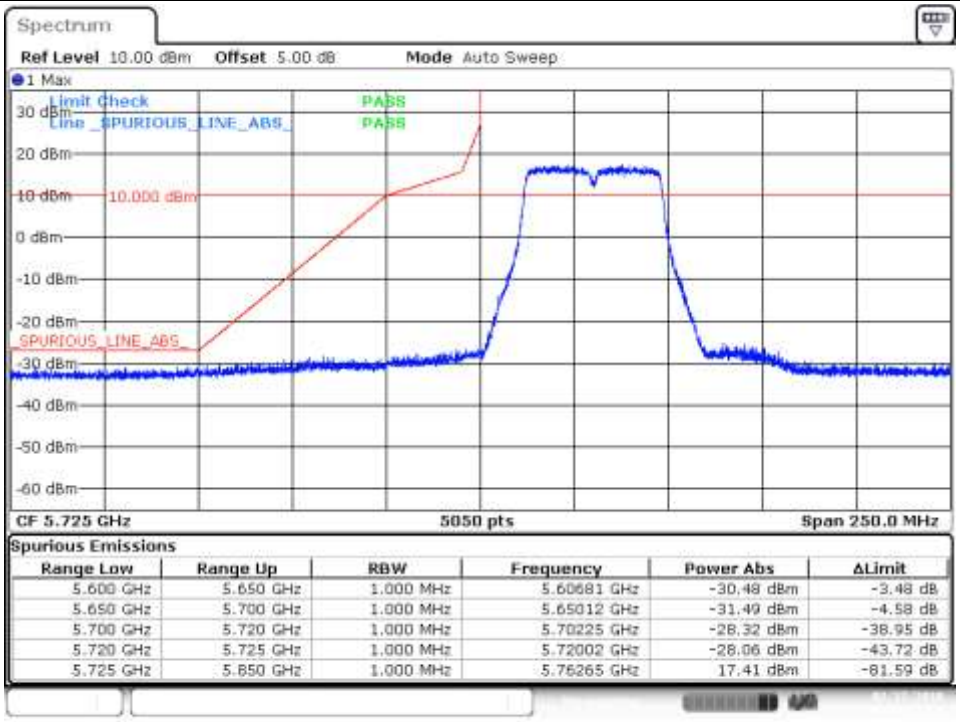
802.11n40, HT8 – MIMO - Chain B

BE Low Freq Section, Peak – CH151F



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.600 GHz	5.650 GHz	1.000 MHz	5.60681 GHz	-30.48 dBm	-3.48 dB
5.650 GHz	5.700 GHz	1.000 MHz	5.65012 GHz	-31.49 dBm	-4.58 dB
5.700 GHz	5.720 GHz	1.000 MHz	5.70225 GHz	-28.32 dBm	-38.95 dB
5.720 GHz	5.725 GHz	1.000 MHz	5.72002 GHz	-28.06 dBm	-43.72 dB
5.725 GHz	5.850 GHz	1.000 MHz	5.76265 GHz	17.41 dBm	-81.59 dB

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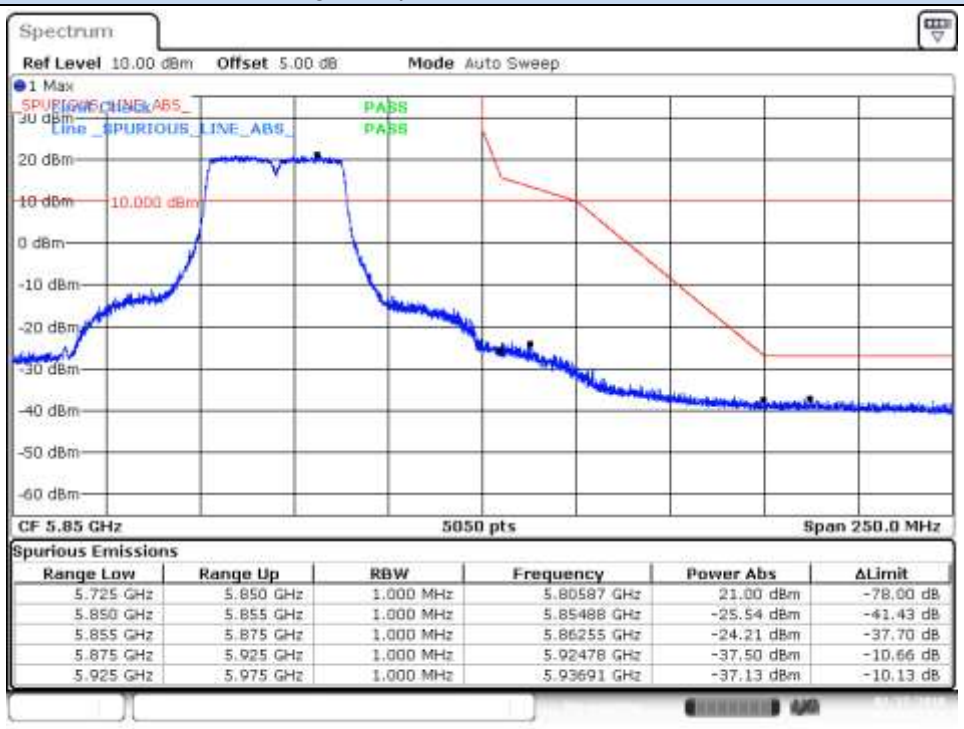
BE High Freq Section, Peak – CH159F



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.725 GHz	5.850 GHz	1.000 MHz	5.80587 GHz	21.00 dBm	-78.00 dB
5.850 GHz	5.855 GHz	1.000 MHz	5.85488 GHz	-25.54 dBm	-41.43 dB
5.855 GHz	5.875 GHz	1.000 MHz	5.86255 GHz	-24.21 dBm	-37.70 dB
5.875 GHz	5.925 GHz	1.000 MHz	5.92478 GHz	-37.50 dBm	-10.66 dB
5.925 GHz	5.975 GHz	1.000 MHz	5.93691 GHz	-37.13 dBm	-10.13 dB

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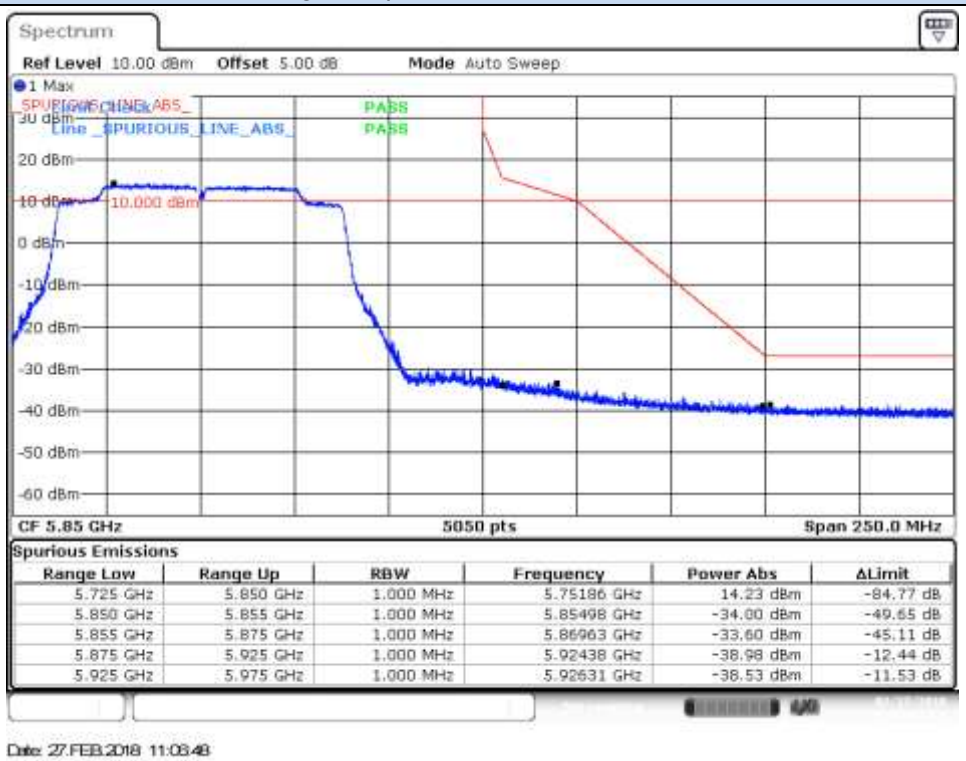
802.11ac80, VHT0 – SISO - Chain A

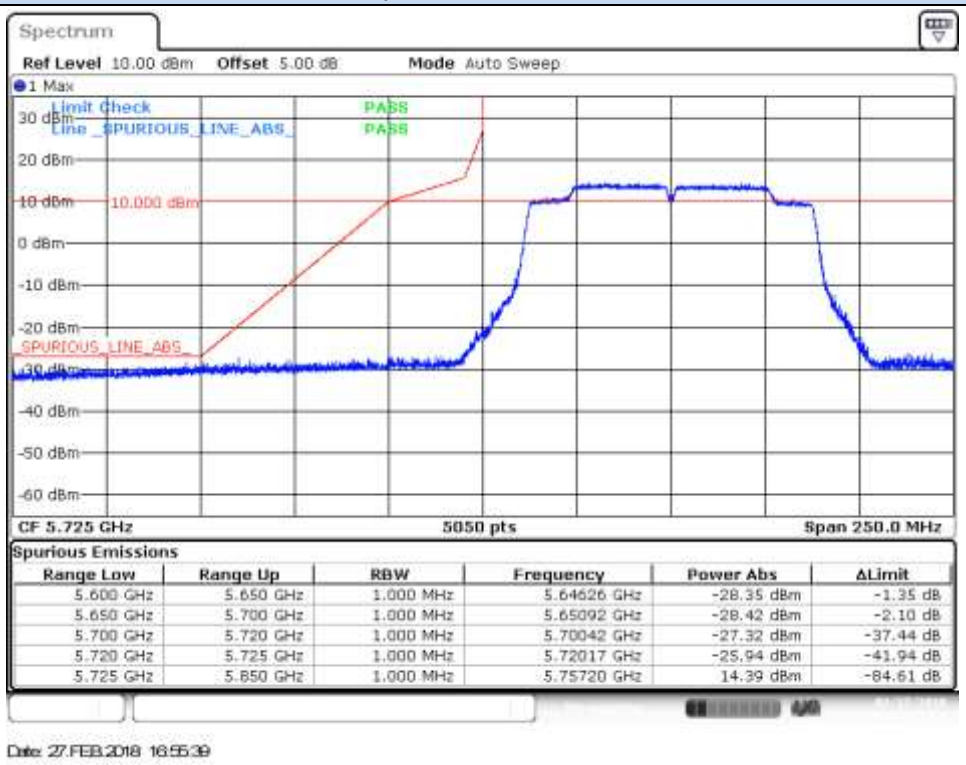
BE Low Freq Section, Peak – CH155ac80

BE High Freq Section, Peak – CH155ac80

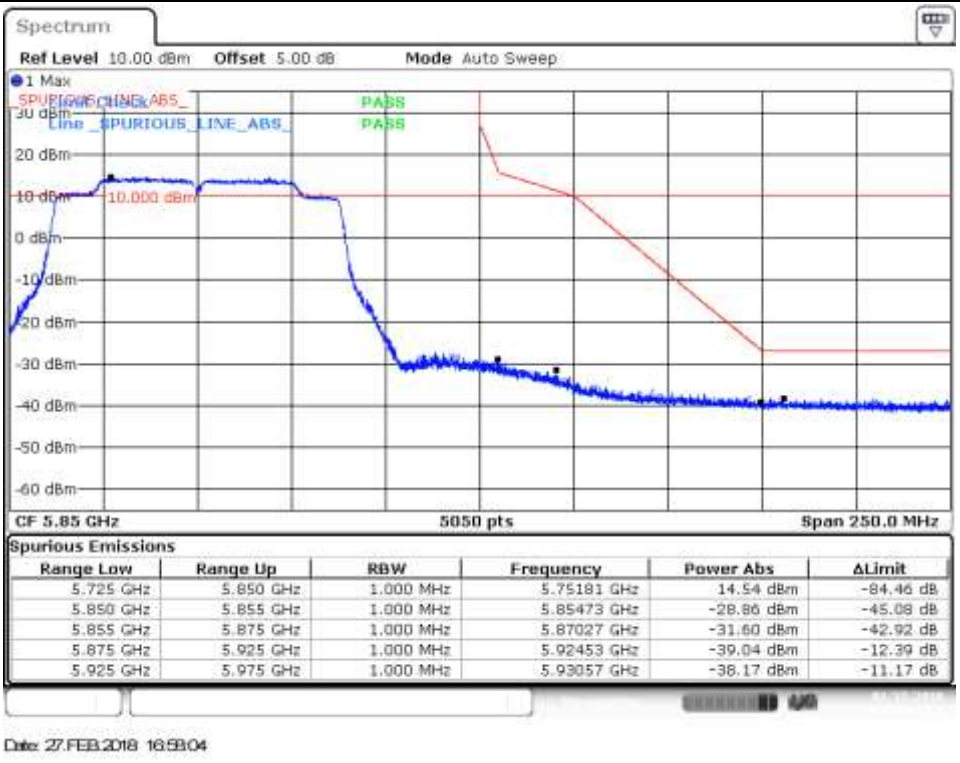


802.11ac80, VHT0 – SISO - Chain B

BE Low Freq Section, Peak – CH155ac80



BE High Freq Section, Peak – CH155ac80



802.11ac80, VHT0 – MIMO - Chain A

BE Low Freq Section, Peak – CH155ac80

Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.600 GHz	5.650 GHz	1.000 MHz	5.60478 GHz	-30.65 dBm	-3.65 dB
5.650 GHz	5.700 GHz	1.000 MHz	5.65032 GHz	-31.82 dBm	-5.06 dB
5.700 GHz	5.720 GHz	1.000 MHz	5.70092 GHz	-29.66 dBm	-39.91 dB
5.720 GHz	5.725 GHz	1.000 MHz	5.72012 GHz	-28.30 dBm	-44.18 dB
5.725 GHz	5.850 GHz	1.000 MHz	5.75819 GHz	10.74 dBm	-88.26 dB

Date: 27.FEB.2018 14:59:51

BE High Freq Section, Peak – CH155ac80

Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
5.725 GHz	5.850 GHz	1.000 MHz	5.75775 GHz	10.80 dBm	-88.20 dB
5.850 GHz	5.855 GHz	1.000 MHz	5.85488 GHz	-38.22 dBm	-54.10 dB
5.855 GHz	5.875 GHz	1.000 MHz	5.87196 GHz	-37.26 dBm	-48.11 dB
5.875 GHz	5.925 GHz	1.000 MHz	5.92448 GHz	-39.18 dBm	-12.57 dB
5.925 GHz	5.975 GHz	1.000 MHz	5.96087 GHz	-38.43 dBm	-11.43 dB

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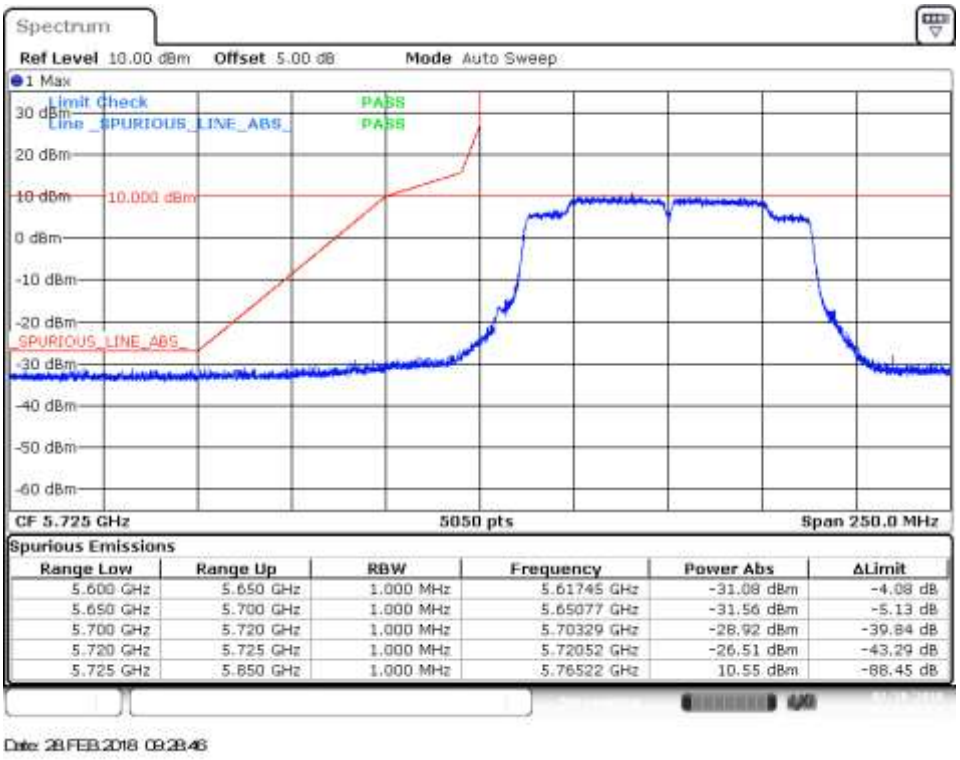
802.11ac80, VHT0 – MIMO - Chain B

BE Low Freq Section, Peak – CH155ac80



BE High Freq Section, Peak – CH155ac80