

TEST REPORT

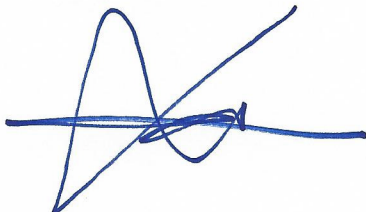
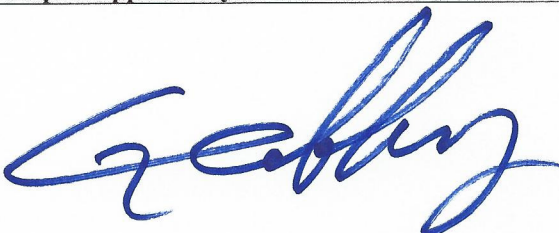
Part 15 Subpart E 15.407

Equipment under test WiFi Module
Model name SWL-Q93T
Derivative Model SWL-CQ93
FCC ID NLMSWLQ93T
Applicant Hanwha Techwin Co., Ltd.
Manufacturer Hanwha Techwin Co., Ltd.
Date of test(s) 2015.11.16 ~ 2015.12.15
Date of issue 2015.12.17

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Revision history

Revision	Date of issue	Test report No.	Description
-	2015.12.17	KES-RF-15T0094	Initial



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1. General information

Applicant: Hanwha Techwin Co., Ltd.
Applicant address: 1204, Changwon-daero, Seongsan-gu, Changwon-si
Gyeongsangnam-do, South Korea
Test site: KES Co., Ltd.
Test site address: C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
473-29, Gayeo-ro, Yeuju-si, Gyeonggi-do, 12658, Korea
FCC rule part(s): 15.407
Test device serial No.: ☒ Production ☐ Pre-production ☐ Engineering
Application purpose: ☒ Original grant ☐ Class I permissive change ☐ Class II permissive change

1.1. EUT description

Equipment under test WiFi Module
Frequency range 2 412 MHz ~ 2 462 MHz(802.11b/g/n_HT20)
5 745 MHz ~ 5 825 MHz(802.11a/n_HT20), 5 755 MHz ~ 5 795 MHz(802.11n_HT40)
5 180 MHz ~ 5 240 MHz(802.11a/n_HT20), 5 190 MHz ~ 5 230 MHz(802.11n_HT40)
5 260 MHz ~ 5 320 MHz(802.11a/n_HT20), 5 270 MHz ~ 5 310 MHz(802.11n_HT40)
5 500 MHz ~ 5 700 MHz(802.11a/n_HT20), 5 510 MHz ~ 5 670 MHz(802.11n_HT40)
Model: SWL-Q93T(Basic), SWL-CQ93(Derivative model)
Modulation technique DSSS, OFDM
Number of channels 2 412 MHz ~ 2 462 MHz(802.11 b/g/n_HT20) : 11ch
5 745 MHz ~ 5 825 MHz(802.11a/n_HT20) : 5ch
5 755 MHz ~ 5 795 MHz(802.11n_HT40) : 2ch
5 180 MHz ~ 5 240 MHz(802.11a/n_HT20) : 4ch
5 190 MHz ~ 5 230 MHz(802.11n_HT40) : 2ch
5 260 MHz ~ 5 320 MHz(802.11a/n_HT20) : 4ch
5 270 MHz ~ 5 310 MHz(802.11n_HT40) : 2ch
5 500 MHz ~ 5 700 MHz(802.11a/n_HT20) : 11ch
5 510 MHz ~ 5 670 MHz(802.11n_HT40) : 5ch
Antenna specification Antenna type: FIPA Antenna
Power source DC 5 V

1.2. Frequency/channel operations

Band1

Ch.	Frequency (MHz)	Mode
36	5 180	11a/n_HT20
.	.	.
44	5 220	11a/n_HT20
.	.	.
48	5240	11a/n_HT20

Ch.	Frequency (MHz)	Mode
38	5 190	11n_HT40
.	.	.
46	5 230	11n_HT40

Band2A

Ch.	Frequency (MHz)	Mode
52	5 260	11a/n_HT20
.	.	.
60	5 300	11a/n_HT20
.	.	.
64	5 320	11a/n_HT20

Ch.	Frequency (MHz)	Mode
54	5 270	11n_HT40
.	.	.
62	5 310	11n_HT40

Band2C

Ch.	Frequency (MHz)	Mode
100	5 500	11a/n_HT20
.	.	.
116	5 580	11a/n_HT20
.	.	.
140	5 700	11a/n_HT20

Ch.	Frequency (MHz)	Mode
102	5 510	11n_HT40
.	.	.
110	5 550	11n_HT40
.	.	.
134	5 670	11n_HT40

Band3

Ch.	Frequency (MHz)	Mode
149	5 745	11a/n_HT20
.	.	.
157	5 785	11a/n_HT20
.	.	.
165	5 825	11a/n_HT20

Ch.	Frequency (MHz)	Mode
151	5 755	11n_HT40
.	.	.
159	5 795	11n_HT40

1.3. Information about derivative model

This is to notify that SWL-CQ93 are same Hardware, Software and components.

1.4. Directional antenna gain for MIMO

Model : SWL-CQ93 (Airlink)

ANT0 Gain (dBi)	ANT1 Gain (dBi)	Total Gain (dBi)	Note
2.378	1.152	3.90	For 5.2 GHz
0.974	-0.330	3.18	For 5.3 GHz
2.023	-0.920	3.35	For 5.5 GHz
1.164	-1.010	3.08	For 5.8 GHz

$$-Ant\ Gain = 10 \log[10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20}]^2 / N_{ANT}$$

2. Summary of tests

Reference	Test description	Test results
15.205(a), 15.209(a) 15.407(b)(1)(2)(3)	General field strength limit (Restricted bands and radiated emission limit)	Pass
15.407(e)	6 dB bandwidth	Pass
15.407(a)	Emission bandwidth (26dB bandwidth)	Pass
15.407(a)(1)	Maximum conducted output power	Pass
15.407(a)(1)	Maximum Power spectral density	Pass
15.407(g)	Frequency stability	Pass
15.207	AC conducted emissions	Pass

Test procedures;

The EUT was tested per the guidance of ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing, the guidance provided in KDB 789033 D02_v01 and KDB 662911 D01 v02r01 were used in the measurement of the EUT.

Pre-scanned maximum output power

Preliminary tests were performed in different data rate as below table and the highest power data rates were chosen for full test in the following section to demonstrate compliance to the FCC limit line.

802.11a

UNII Band	Channel / Ant port	Detector mode	Conducted power(dB m)							
			Data rate(Mbps)							
			6	9	12	18	24	36	48	54
1	Low /Ant0	Peak	18.71	17.56	17.34	18.20	17.66	18.07	17.76	17.75
	Middle/Ant0		18.66	17.79	17.80	17.89	18.08	18.52	18.37	18.25
	High/Ant0		18.95	18.93	18.73	18.36	18.46	18.14	18.31	18.11
2A	Low /Ant0	Peak	18.76	18.50	18.21	17.70	17.78	18.50	17.67	17.63
	Middle/Ant0		18.52	18.25	18.19	18.03	17.83	17.80	17.52	16.95
	High/Ant0		19.36	19.16	19.07	18.36	17.71	18.03	17.90	17.88
2C	Low /Ant0	Peak	19.58	19.56	19.51	18.82	18.94	18.57	18.93	18.82
	Middle/Ant0		18.94	18.49	18.39	18.33	18.28	18.18	18.09	18.00
	High/Ant0		19.53	19.44	18.99	18.86	18.80	18.46	18.23	18.12
3	Low /Ant0	Peak	13.99	13.53	13.35	13.23	13.30	12.93	13.69	13.71
	Middle/Ant0		13.92	13.86	13.25	13.79	13.64	13.13	13.11	13.05
	High/Ant0		14.18	13.90	13.75	13.91	13.13	13.87	13.34	13.23
1	Low /Ant1	Peak	20.46	19.84	19.04	19.12	19.40	19.31	18.94	18.79
	Middle/Ant1		19.78	18.06	18.67	18.40	18.76	18.26	17.96	17.92
	High/Ant1		19.60	18.98	18.59	18.22	18.79	18.69	18.71	18.43
2A	Low /Ant1	Peak	20.43	19.14	18.83	18.75	18.47	18.35	18.38	18.26
	Middle/Ant1		19.20	18.09	17.54	17.39	17.30	17.27	17.32	16.65
	High/Ant1		18.19	17.86	17.36	17.26	17.18	17.15	17.02	16.64
2C	Low /Ant1	Peak	15.60	15.28	15.27	15.53	15.04	14.81	15.46	14.21
	Middle/Ant1		18.48	18.34	18.33	17.95	17.84	17.57	17.55	17.10
	High/Ant1		19.59	18.96	18.50	18.46	18.43	18.23	18.22	18.05
3	Low /Ant1	Peak	18.66	18.55	18.42	18.30	18.19	18.10	18.35	18.26
	Middle/Ant1		18.28	18.12	18.03	17.96	17.92	17.50	17.52	17.84
	High/Ant1		17.82	17.23	17.54	17.46	17.64	17.71	17.80	17.78

802.11a(HT20)

UNII Band	Channel / Ant port	Detector mode	Conducted power(dB m)							
			Data rate(Mbps)							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1	Low /Ant0	Peak	18.66	18.53	17.93	17.50	17.02	17.37	17.58	18.14
	Middle/Ant0		19.16	18.82	18.34	18.02	17.93	18.54	18.00	17.67
	High/Ant0		18.86	18.56	18.60	18.16	18.53	18.33	17.87	17.89
2A	Low /Ant0	Peak	18.37	18.28	18.30	18.18	18.16	17.95	17.74	17.64
	Middle/Ant0		18.95	18.59	17.57	17.73	17.97	17.99	17.52	17.34
	High/Ant0		18.77	18.57	18.46	18.38	17.90	17.88	17.75	17.66
2C	Low /Ant0	Peak	18.79	18.55	18.49	18.48	18.46	18.27	18.24	17.59
	Middle/Ant0		18.56	18.51	18.35	18.14	18.10	17.98	17.96	17.94
	High/Ant0		19.40	19.17	18.85	18.82	18.75	18.74	18.54	17.29
3	Low /Ant0	Peak	12.87	12.35	12.23	12.30	12.52	12.69	12.71	12.33
	Middle/Ant0		14.19	14.10	14.07	13.79	13.64	14.13	13.86	13.83
	High/Ant0		13.01	12.90	12.75	12.91	12.66	12.71	12.34	12.23
1	Low /Ant1	Peak	19.98	19.40	19.37	18.66	18.85	19.19	19.08	19.25
	Middle/Ant1		19.17	19.15	18.21	18.48	17.92	18.25	18.12	17.79
	High/Ant1		19.55	19.40	18.23	18.89	18.97	18.16	19.01	18.18
2A	Low /Ant1	Peak	19.76	19.19	18.88	18.84	18.67	18.72	18.43	18.36
	Middle/Ant1		18.54	18.22	18.20	17.31	17.21	17.20	16.87	16.59
	High/Ant1		18.34	17.91	17.58	17.45	17.42	17.05	16.86	16.49
2C	Low /Ant1	Peak	15.26	15.23	14.97	14.94	14.65	14.50	14.44	14.25
	Middle/Ant1		17.94	17.82	17.69	17.67	17.66	17.60	17.43	17.35
	High/Ant1		19.08	18.81	18.81	18.43	18.37	18.36	18.14	17.87
3	Low /Ant1	Peak	18.35	18.26	18.19	18.07	17.66	17.35	17.26	17.19
	Middle/Ant1		18.15	17.98	17.96	17.92	17.84	17.92	17.84	17.83
	High/Ant1		18.39	18.23	18.16	17.96	17.64	17.82	17.80	17.78

802.11a(HT40)

UNII Band	Channel / Ant port	Detector mode	Conducted power(dB m)							
			Data rate(Mbps)							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
1	Low /Ant0	Peak	17.89	17.24	17.70	17.51	17.61	17.62	17.14	16.73
	Middle/Ant0		-	-	-	-	-	-	-	-
	High/Ant0		18.61	18.56	17.83	17.84	17.73	18.11	18.05	17.92
2A	Low /Ant0	Peak	18.29	18.23	17.72	17.42	17.37	17.30	17.28	16.80
	Middle/Ant0		-	-	-	-	-	-	-	-
	High/Ant0		18.95	18.79	18.26	18.25	18.07	17.97	17.75	17.59
2C	Low /Ant0	Peak	16.56	16.50	16.40	16.36	16.32	16.33	16.27	16.21
	Middle/Ant0		16.24	15.39	15.33	15.21	14.99	14.96	14.81	14.02
	High/Ant0		14.58	14.24	13.81	13.77	13.58	13.54	13.42	13.40
3	Low /Ant0	Peak	13.57	13.49	13.47	13.03	13.16	13.50	13.27	13.08
	Middle/Ant0		-	-	-	-	-	-	-	-
	High/Ant0		13.96	13.80	13.00	13.03	13.76	13.34	13.53	13.57
1	Low /Ant1	Peak	19.58	18.82	18.08	18.04	18.66	18.70	18.91	17.96
	Middle/Ant1		-	-	-	-	-	-	-	-
	High/Ant1		18.68	18.46	17.89	17.92	17.85	17.73	17.48	17.60
2A	Low /Ant1	Peak	19.47	18.49	18.40	18.23	18.16	18.14	18.04	18.05
	Middle/Ant1		-	-	-	-	-	-	-	-
	High/Ant1		17.92	17.78	17.76	17.61	17.22	17.21	16.82	16.81
2C	Low /Ant1	Peak	16.32	15.67	15.56	15.38	15.36	15.34	14.99	14.96
	Middle/Ant1		18.50	18.49	18.11	17.82	17.75	17.60	17.41	16.64
	High/Ant1		18.50	18.01	17.97	17.84	17.74	17.71	17.69	17.42
3	Low /Ant1	Peak	18.82	18.05	18.36	18.70	18.62	17.59	17.77	17.79
	Middle/Ant1		-	-	-	-	-	-	-	-
	High/Ant1		18.53	17.85	17.21	17.56	17.65	18.05	18.15	18.02

802.11a(HT20)

UNII Band	Channel / Ant port	Detector mode	Conducted power(dB m)							
			Data rate(Mbps)							
			MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
1	Low / Ant0+Ant1	Peak	<u>22.38</u>	22.00	21.72	21.13	21.04	21.39	21.40	21.74
	Middle/ Ant0+Ant1		<u>22.18</u>	22.00	21.29	21.27	20.94	21.41	21.07	20.74
	High/ Ant0+Ant1		<u>22.23</u>	222.01	21.43	21.55	21.77	21.26	21.49	21.05
2A	Low / Ant0+Ant1	Peak	<u>22.13</u>	21.77	21.61	21.53	21.43	21.36	21.11	21.03
	Middle/ Ant0+Ant1		<u>21.76</u>	21.42	20.91	20.54	20.62	20.62	20.22	19.99
	High/ Ant0+Ant1		<u>21.57</u>	21.26	21.05	20.95	20.68	20.50	20.34	20.12
2C	Low / Ant0+Ant1	Peak	<u>19.45</u>	19.12	19.01	18.91	18.88	18.87	18.69	18.64
	Middle/ Ant0+Ant1		<u>20.53</u>	20.22	19.95	19.72	19.60	19.49	19.31	18.53
	High/ Ant0+Ant1		<u>19.98</u>	19.53	19.38	19.28	19.15	19.12	19.07	18.87
3	Low / Ant0+Ant1	Peak	<u>19.43</u>	19.25	19.17	19.09	18.82	18.63	18.57	18.42
	Middle/ Ant0+Ant1		<u>19.62</u>	19.47	19.45	19.34	19.24	19.44	19.30	19.29
	High/ Ant0+Ant1		<u>19.50</u>	19.35	19.26	19.14	18.84	18.99	18.89	18.85

802.11a(HT40)

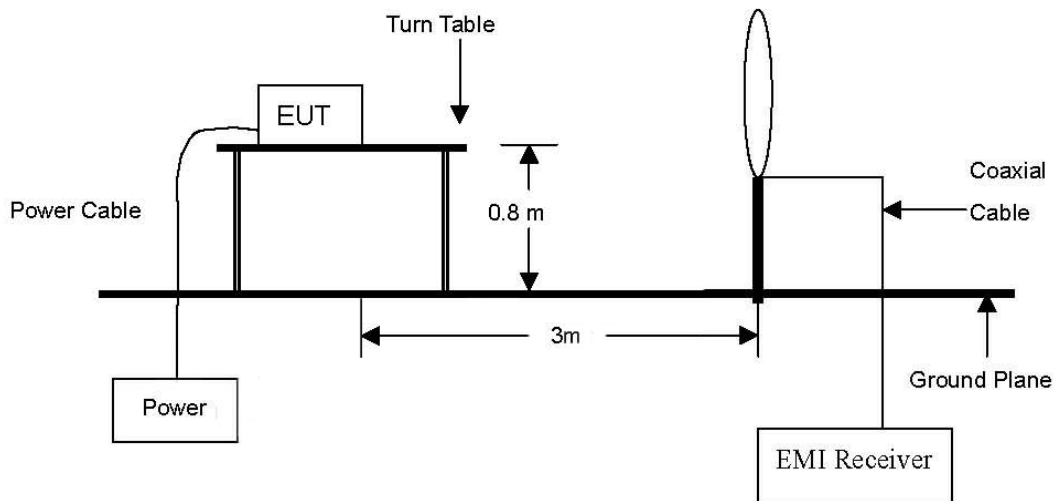
UNII Band	Channel / Ant port	Detector mode	Conducted power(dB m)							
			Data rate(Mbps)							
			MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
1	Low / Ant0+Ant1	Peak	21.83	21.11	20.90	20.79	21.18	21.20	21.12	20.40
	Middle/ Ant0+Ant1		-	-	-	-	-	-	-	-
	High/ Ant0+Ant1		21.66	21.52	20.87	20.89	20.80	20.93	20.78	20.77
2A	Low / Ant0+Ant1	Peak	21.93	21.37	21.08	20.85	20.79	20.75	20.69	20.48
	Middle/ Ant0+Ant1		-	-	-	-	-	-	-	-
	High/ Ant0+Ant1		21.48	21.32	21.03	20.95	20.68	20.62	20.32	20.23
2C	Low / Ant0+Ant1	Peak	19.45	19.12	19.01	18.91	18.88	18.87	18.69	18.64
	Middle/ Ant0+Ant1		20.53	20.22	19.95	19.72	19.60	19.49	19.31	18.53
	High/ Ant0+Ant1		19.98	19.53	19.38	19.28	19.15	19.12	19.07	18.87
3	Low / Ant0+Ant1	Peak	19.95	19.35	19.58	19.74	19.71	19.02	19.09	19.05
	Middle/ Ant0+Ant1		-	-	-	-	-	-	-	-
	High/ Ant0+Ant1		19.83	19.29	18.61	18.06	19.14	19.31	19.44	19.35

3. Test results

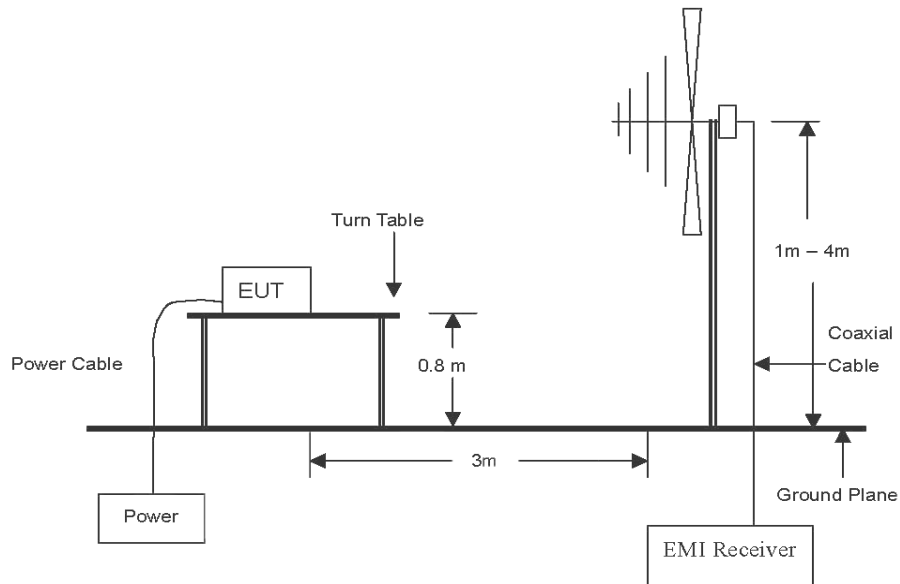
3.1. Radiated restricted band and emissions

Test setup

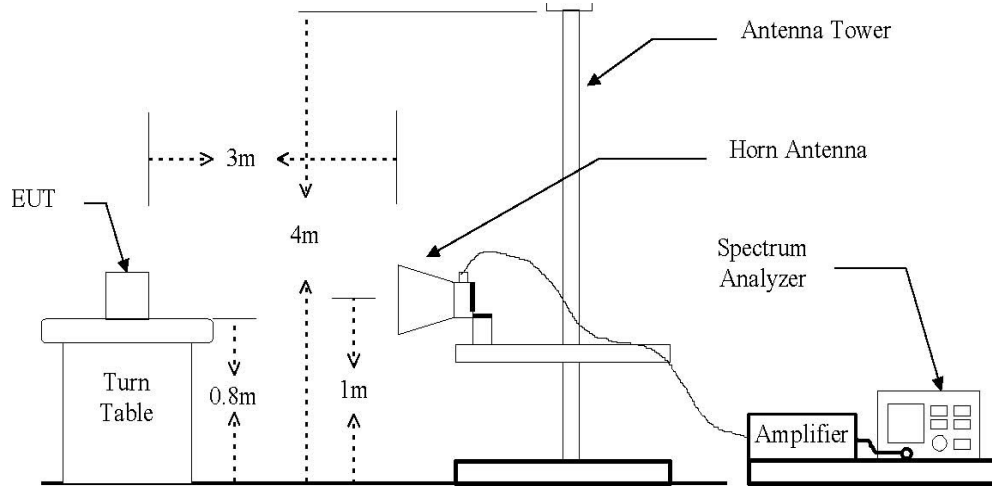
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 40 GHz emissions.



Test procedure

Radiated emissions from the EUT were measured according to the dictates in section KDB 789033 D02 v01 and ANSI C63.4-2009

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site or open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test receiver system was set to peak detect function and specified bandwidth with maximum hold mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be retested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note.

All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

1. Average Field Strength Measurements per Section II.G.6

Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.

Set RBW = 1 MHz.

Set VBW = 3 MHz ($\geq 3 \times \text{RBW}$).

Set detector = power average(RMS).

Set sweep time = auto.

Trace (RMS) averaging was performed over at least 100 traces.

2. Peak Field Strength Measurements per Section II.G.5

Analyzer center frequency was set to the frequency of the radiated spurious emission of interest.

Set RBW = 1 MHz.

Set VBW = 3 MHz ($\geq 3 \times \text{RBW}$).

Set detector = Peak.

Set sweep time = auto.

Trace mode = max hold.

Allow sweeps to continue until the trace stabilizes.

Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

Frequency (MHz)	Distance (Meters)	Radiated ($\mu\text{V/m}$)
0.009 ~ 0.490	300	2 400 / F(kHz)
0.490 ~ 1.705	30	24 000 / F(kHz)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

According to 15.205(a), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

According to 15.205(b), Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements.

According to 15.407(b),

(b) Undesirable emission limits: Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p of –27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p of –27 dBm/MHz.

(3) For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p of –27 dBm/MHz.

(4) For transmitters operating in the 5.725–5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p of –17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p of –27 dBm/MHz.

(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz.

A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in § 15.207.

$$*EIRP[dBm] = E[dB\mu V/m] - 95.2$$

$$EIRP \text{ of } -27 \text{ dBm/MHz} = 68.2 \text{ dB}\mu V/m \text{ (3m)}$$

Test results (Below 30 MHz)

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 180 MHz (Worst case)
Channel: 36

Frequency (MHz)	Level (dBμV)	Ant. Pol.	Correction factors (dB/m)	F _d (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No signal detected							

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 260 MHz (Worst case)
Channel: 52

Frequency (MHz)	Level (dBμV)	Ant. Pol.	Correction factors (dB/m)	F _d (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No signal detected							

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 700 MHz (Worst case)
Channel: 140

Frequency (MHz)	Level (dBμV)	Ant. Pol.	Correction factors (dB/m)	F _d (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No signal detected							

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 785 MHz (Worst case)
Channel: 157

Frequency (MHz)	Level (dBμV)	Ant. Pol.	Correction factors (dB/m)	F _d (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No signal detected							

Note.

1. All spurious emission at channels are almost the same below 30 MHz, so that 802.11a Band were chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss + F_d
3. $F_d = 40\log(D_m / D_s)$

Where:

F_d = Distance factor in dB
D_m = Measurement distance in meters
D_s = Specification distance in meters

Test results (Below 1 000 MHz)

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 180 MHz (Worst case)
Channel: 36

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
99.840	27.01	H	8.84	0.79	36.64	43.52	6.88
116.330	23.60	H	10.32	0.86	34.78	43.52	8.74
167.740	21.95	H	12.33	1.06	35.34	43.52	8.18
216.240	25.80	H	10.74	1.33	37.87	46.02	8.15
231.760	26.55	V	11.31	1.35	39.21	46.02	6.81
347.190	17.12	V	14.89	1.65	33.66	46.02	12.36
403.450	16.05	V	16.16	1.84	34.05	46.02	11.97

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 260 MHz (Worst case)
Channel: 52

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
100.810	27.46	H	8.93	0.79	37.18	43.52	6.34
116.330	23.44	H	10.32	0.86	34.62	43.52	8.90
173.560	23.59	H	11.75	1.09	36.43	43.52	7.09
230.790	27.82	V	11.27	1.35	40.44	46.02	5.58
231.760	27.61	H	11.31	1.35	40.27	46.02	5.75
288.020	20.27	H	13.38	1.57	35.22	46.02	10.80
346.220	20.07	H	14.86	1.65	36.58	46.02	9.44

Note.

1. All spurious emission at channels are almost the same below 1 GHz, so that low channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 700 MHz (Worst case)
Channel: 140

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
99.840	26.96	H	8.84	0.79	36.59	43.52	6.93
145.430	18.69	V	12.90	0.92	32.51	43.52	11.01
173.560	23.50	V	11.75	1.09	36.34	43.52	7.18
216.240	23.46	H	10.74	1.33	35.53	46.02	10.49
230.790	29.35	H	11.27	1.35	41.97	46.02	4.05
263.770	17.92	V	12.49	1.45	31.86	46.02	14.16
346.220	20.90	H	14.86	1.65	37.41	46.02	8.61

Note.

1. All spurious emission at channels are almost the same below 1 GHz, so that high channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Mode: 802.11 n_HT20(MIMO)
Transfer rate: 6 Mbps
Distance of measurement: 3 meter
Operating frequency: 5 785 MHz (Worst case)
Channel: 157

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dBμV)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
100.810	27.07	H	8.93	0.79	36.79	43.52	6.73
166.770	22.85	H	12.43	1.06	36.34	43.52	7.18
173.560	21.95	V	11.75	1.09	34.79	43.52	8.73
230.790	29.05	H	11.27	1.35	41.67	46.02	4.35
231.760	26.79	V	11.31	1.35	39.45	46.02	6.57
261.830	22.22	H	12.42	1.44	36.08	46.02	9.94
346.220	19.80	H	14.86	1.65	36.31	46.02	9.71

Note.

1. All spurious emission at channels are almost the same below 1 GHz, so that middle channel was chosen at representative in final test.
2. Actual = Reading + Ant. factor + Cable loss
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Test results (Above 1 000 MHz)

-Antenna port 0

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 180 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4782.10	45.44	Peak	H	7.91	53.35	74.00	20.65
4987.90	57.29	Peak	V	9.38	66.67	74.00	7.33
4998.95	29.24	Avg	V	9.46	38.70	54.00	15.30
10360.00	32.53	Peak	H	23.36	55.89	68.20	12.31

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 220 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10440.00	33.97	Peak	H	23.49	57.46	68.20	10.74
10440.00	32.25	Peak	V	23.49	55.74	68.20	12.46

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 240 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10480.00	33.38	Peak	H	23.59	56.97	68.20	11.23
10480.00	31.25	Peak	V	23.59	54.84	68.20	13.36

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 260 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10520.00	31.44	Peak	H	23.18	54.62	68.20	13.58
10520.00	30.25	Peak	V	23.18	53.43	68.20	14.77

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 300 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10600.00	32.42	Peak	H	23.72	56.14	68.20	12.06
10600.00	31.85	Peak	V	23.72	55.57	68.20	12.63

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 320 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5405.14	44.72	Peak	H	10.69	55.41	74.00	18.59
5350.30	25.85	Avg	H	10.52	36.37	54.00	17.63
5398.63	43.03	Peak	V	10.67	53.70	74.00	20.30
10640.00	32.32	Peak	H	23.86	56.18	68.20	12.02
10640.00	31.59	Peak	V	23.86	55.45	68.20	12.75

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 500 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5465.14	45.05	Peak	H	10.87	55.92	74.00	18.08
5469.69	25.64	Avg	H	10.88	36.52	54.00	17.48
5455.88	45.15	Peak	V	10.84	55.99	74.00	18.01
5469.69	25.22	Avg	V	10.88	36.11	54.00	17.89
11000.00	36.21	Peak	H	22.91	59.12	68.20	9.08
11000.00	30.95	Peak	V	22.91	53.86	68.20	14.34

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 580 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11160.00	35.91	Peak	H	23.70	59.61	68.20	8.59
11160.00	32.00	Peak	V	23.70	55.70	68.20	12.50

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 700 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11400.00	34.54	Peak	H	24.58	59.12	68.20	9.08
11400.00	32.10	Peak	V	24.58	56.68	68.20	11.52



Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 745 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Emission levels are not reported much lower than the limits by over 20 dB							

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 785 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11570.00	33.77	Peak	H	31.21	64.98	68.20	3.22

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 825 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11653.00	36.76	Peak	H	24.62	61.38	68.20	6.82

-Antenna port 1

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 180 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5149.00	50.43	Peak	H	9.92	60.35	74.00	13.65
5149.30	32.71	Avg	H	9.92	42.63	54.00	11.37
5147.00	48.97	Peak	V	9.91	58.88	74.00	15.12
5149.30	31.12	Avg	V	9.92	41.04	54.00	12.96
10360.00	34.24	Peak	H	23.36	57.60	68.20	10.60
10360.00	32.15	Peak	V	23.36	55.51	68.20	12.69

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 220 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10440.00	33.51	Peak	H	23.49	57.00	68.20	11.20
10440.00	32.62	Peak	V	23.49	56.11	68.20	12.09

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 240 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10480.00	31.96	Peak	H	23.59	55.55	68.20	12.65
10480.00	31.48	Peak	V	23.59	55.07	68.20	13.13

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 260 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10520.00	31.54	Peak	H	23.18	54.72	68.20	13.48
10520.00	31.20	Peak	V	23.18	54.38	68.20	13.82

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 300 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10600.00	32.56	Peak	H	23.72	56.28	68.20	11.92
10600.00	32.12	Peak	V	23.72	55.84	68.20	12.36

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 320 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5353.04	50.29	Peak	H	10.53	60.82	74.00	13.18
5350.30	29.78	Avg	H	10.52	40.30	54.00	13.70
5350.65	45.97	Peak	V	10.53	56.50	74.00	17.50
5350.30	27.33	Avg	V	10.52	37.85	54.00	16.15
10640.00	32.65	Peak	H	23.86	56.51	68.20	11.69
10640.00	32.05	Peak	V	23.86	55.91	68.20	12.29

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 500 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5469.54	51.54	Peak	H	10.88	62.42	74.00	11.58
5440.11	30.11	Avg	H	10.79	40.90	54.00	13.10
5469.31	45.19	Peak	V	10.88	56.07	74.00	17.93
5440.27	27.35	Avg	V	10.80	38.15	54.00	15.85
11000.00	34.80	Peak	H	22.91	57.71	68.20	10.49
11000.00	31.27	Peak	V	22.91	54.18	68.20	14.02

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 580 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11160.00	33.26	Peak	H	23.70	56.96	68.20	11.24
11160.00	31.12	Peak	V	23.70	54.82	68.20	13.38

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 700 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11400.00	33.88	Peak	H	24.58	58.46	68.20	9.74
11400.00	31.44	Peak	V	24.58	56.02	68.20	12.18



Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 745 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
Emission levels are not reported much lower than the limits by over 20 dB							

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 785 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11570.00	34.25	Peak	H	24.17	58.42	68.20	9.78

Mode: 802.11a
Transfer rate: 6 Mbps
Operating frequency: 5 825 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11650.00	35.43	Peak	H	24.61	60.04	68.20	8.16
11650.00	32.27	Peak	V	24.61	56.88	68.20	11.32

-Antenna 0 + Antenna 1

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 180 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5149.00	48.64	Peak	H	9.92	58.56	74.00	15.44
5149.30	30.25	Avg	H	9.92	40.17	54.00	13.83
4954.30	46.78	Peak	V	9.14	55.92	74.00	18.08
5149.30	31.15	Avg	V	9.92	41.07	54.00	12.93
10360.00	31.75	Peak	H	23.36	54.33	68.20	13.09
10360.00	30.97	Peak	V	23.36	43.51	68.20	13.87

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 220 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10440.00	32.38	Peak	H	23.49	55.87	68.20	12.33
10440.00	31.24	Peak	V	23.49	54.73	68.20	13.47

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 240 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10480.00	31.42	Peak	H	23.59	55.01	68.20	13.19
10480.00	30.55	Peak	V	23.59	54.14	68.20	14.06

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 260 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10520.00	32.45	Peak	H	27.95	60.40	74.00	13.60
10520.00	32.01	Peak	V	27.95	59.96	74.00	14.04

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 300 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
10600.00	32.16	Peak	H	28.14	60.30	74.00	13.70
10600.00	32.01	Peak	V	28.14	60.15	74.00	13.85

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 320 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5351.30	49.50	Peak	H	10.53	60.03	74.00	13.97
5350.30	27.21	Avg	H	10.52	37.73	54.00	16.27
5350.22	46.62	Peak	V	10.52	57.14	74.00	16.86
5350.30	26.45	Avg	V	10.52	36.97	54.00	17.03
10640.00	33.47	Peak	H	28.23	61.70	74.00	12.30
10640.00	32.85	Peak	V	28.23	61.08	74.00	12.92

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 500 MHz

Frequency (MHz)	Level (dB μ V)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5469.07	52.04	Peak	H	10.88	62.92	74.00	11.08
5469.68	26.97	Avg	H	10.88	37.85	54.00	16.15
5392.89	48.36	Peak	V	10.65	59.01	74.00	14.99
5469.68	26.15	Avg	V	10.88	37.03	54.00	16.97
11000.00	35.67	Peak	H	22.91	58.58	68.20	9.62
11000.00	31.43	Peak	V	22.91	54.34	68.20	13.86

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 580 MHz

Frequency (MHz)	Level (dB μ V)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11160.00	34.29	Peak	H	23.70	57.99	68.20	10.21
11160.00	31.30	Peak	V	23.70	55.00	68.20	13.20

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 700 MHz

Frequency (MHz)	Level (dB μ V)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
11400.00	34.80	Peak	H	24.58	59.38	68.20	8.82
11400.00	30.86	Peak	V	24.58	55.44	68.20	12.76



Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 745 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11490.00	36.09	Peak	H	23.97	60.06	68.20	8.14

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 785 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11570.00	39.27	Peak	H	24.17	63.44	68.20	4.76

Mode: 802.11n (HT20)
Transfer rate: MCS8
Operating frequency: 5 825 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11650.00	41.72	Peak	H	24.61	66.33	68.20	1.87
11650.00	33.37	Peak	V	24.61	57.98	68.20	10.22

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 190 MHz

Frequency (MHz)	Level (dB μ V)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5149.00	53.58	Peak	H	9.92	63.50	74.00	10.50
5149.30	34.52	Avg	H	9.92	44.44	54.00	9.56
5149.00	49.66	Peak	V	9.92	59.58	74.00	14.42
5149.30	32.78	Avg	V	9.92	42.70	54.00	11.30
10380.00	32.78	Peak	H	27.61	60.39	68.20	7.81
10380.00	31.85	Peak	V	27.61	59.46	68.20	8.74

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 230 MHz

Frequency (MHz)	Level (dB μ V)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
10460.00	32.78	Peak	H	27.80	60.58	68.20	7.62
10460.00	32.11	Peak	V	27.80	59.91	68.20	8.29

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 270 MHz

Frequency (MHz)	Level (dB μ V)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
10540.00	33.08	Peak	H	23.24	56.32	68.20	11.88
10540.00	32.75	Peak	V	23.24	55.99	68.20	12.21

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 310 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5350.65	54.58	Peak	H	10.53	65.11	74.00	8.89
5350.16	32.34	Avg	H	10.52	42.86	54.00	11.14
5350.46	50.30	Peak	V	10.52	60.82	74.00	13.18
5350.16	29.42	Avg	V	10.52	39.94	54.00	14.06
10620.00	33.13	Peak	H	23.76	56.89	68.20	11.31
10620.00	21.56	Peak	V	23.76	45.32	68.20	22.88

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 510 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
5467.05	52.43	Peak	H	10.88	63.31	74.00	10.69
5469.83	30.44	Avg	H	10.88	41.32	54.00	12.68
5469.26	50.05	Peak	V	10.88	60.93	74.00	13.07
5469.83	29.77	Avg	V	10.88	40.65	54.00	13.35
11020.00	33.30	Peak	H	23.02	56.32	68.20	11.88
11020.00	32.05	Peak	V	23.02	55.07	68.20	13.13

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 550 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11100.00	31.30	Peak	H	23.33	54.63	68.20	13.57
11100.00	31.11	Peak	V	23.33	54.44	68.20	13.76



Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 670 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11300.00	33.36	Peak	H	24.42	57.78	68.20	10.42
11300.00	32.05	Peak	V	24.42	56.47	68.20	11.73

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 755 MHz

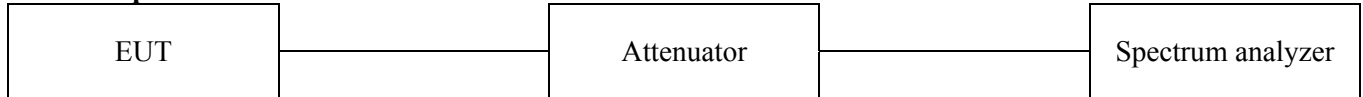
Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11510.00	33.46	Peak	H	24.04	57.50	68.20	10.70

Mode: 802.11n (HT40)
Transfer rate: MCS8
Operating frequency: 5 795 MHz

Frequency (MHz)	Level (dBμV)	Detect	Ant. Pol.	Correction factors (dB/m)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11590.00	34.34	Peak	H	24.42	58.76	68.20	9.44

3.2. 6 dB bandwidth

Test setup



Test procedure

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

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

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

Limit

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

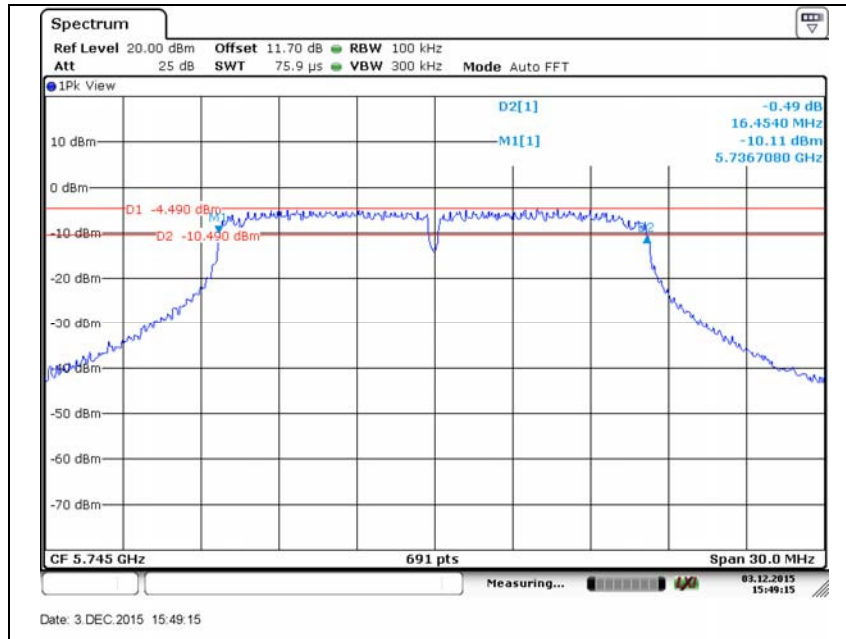


Test results

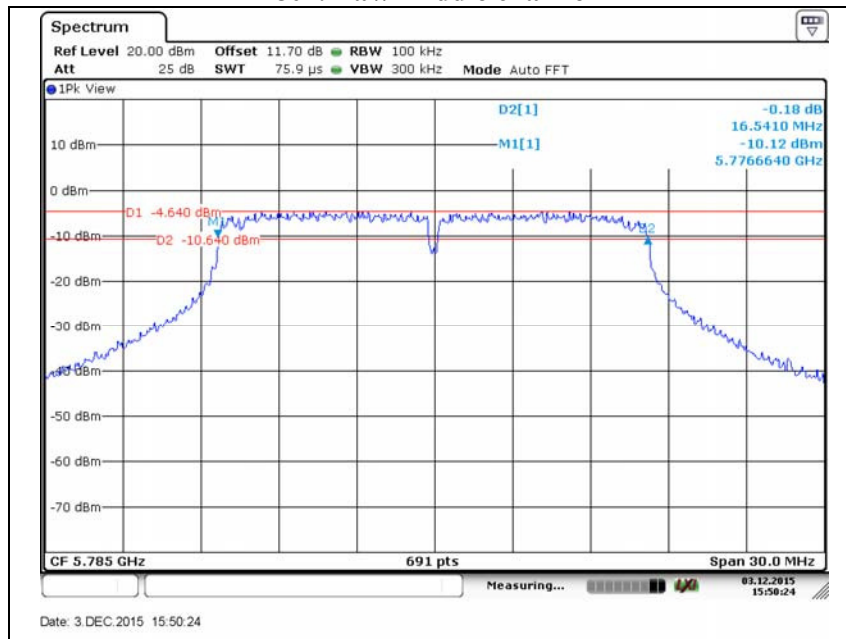
UNII Band	Antenna port	Operation mode	Frequency(MHz)	6 dB bandwidth(MHz)	Limit(MHz)
Band 3	0	802.11a	5 745	16.45	0.5
			5 785	16.54	
			5 825	16.54	
		802.11n(HT20)	5 745	17.67	
			5 785	17.76	
			5 825	17.76	
		802.11n(HT40)	5 755	36.47	
			5 795	36.47	
	1	802.11a	5 745	16.54	
			5 785	16.54	
			5 825	16.54	
		802.11n(HT20)	5 745	17.76	
			5 785	17.71	
			5 825	17.71	
		802.11n(HT40)	5 755	36.47	
			5 795	36.47	

- Antenna port 0 (Band3)

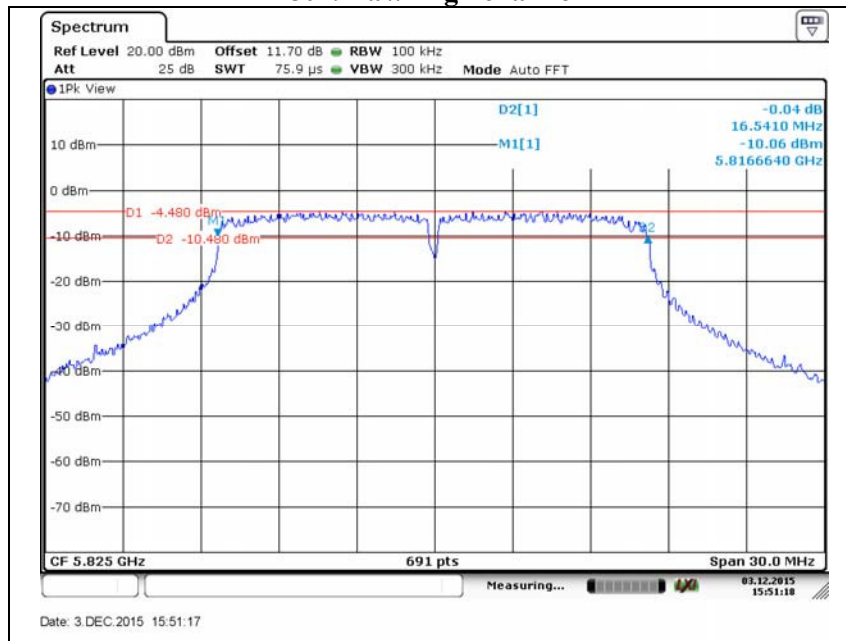
802.11a // Low channel



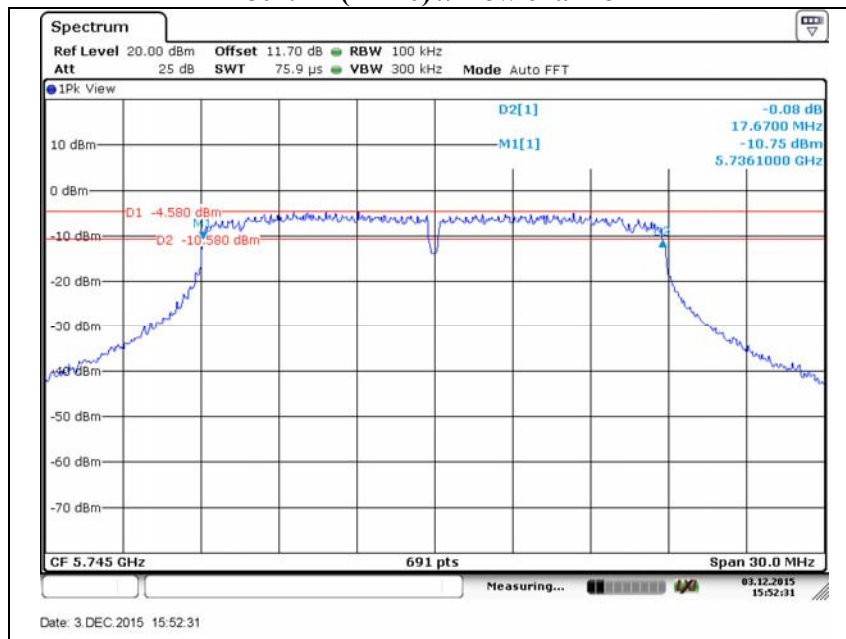
802.11a // Middle channel



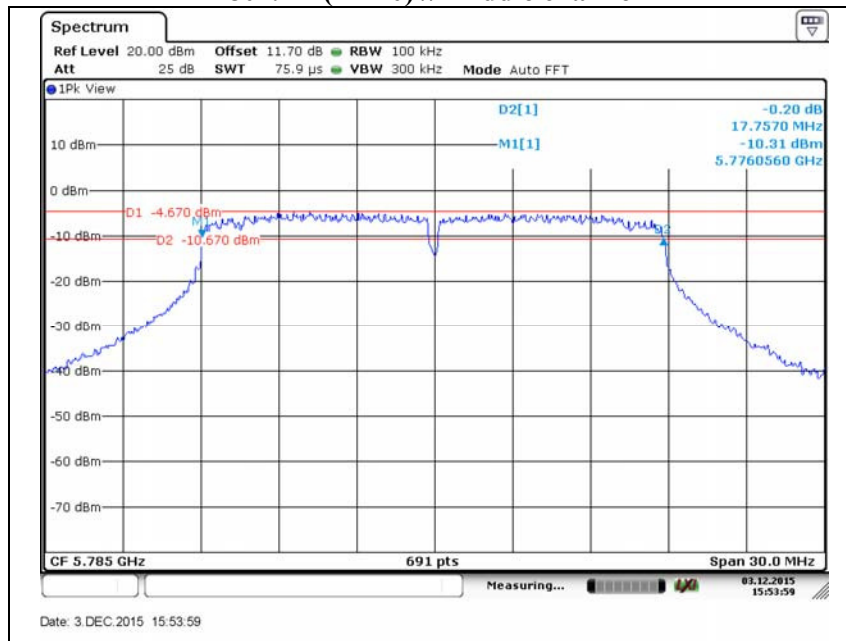
802.11a // High channel



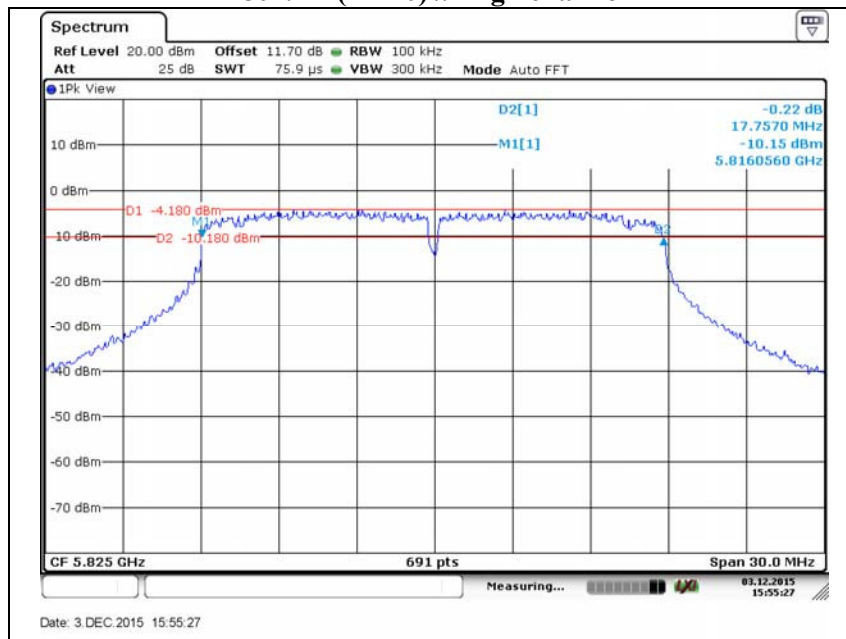
802.11n(HT20) // Low channel



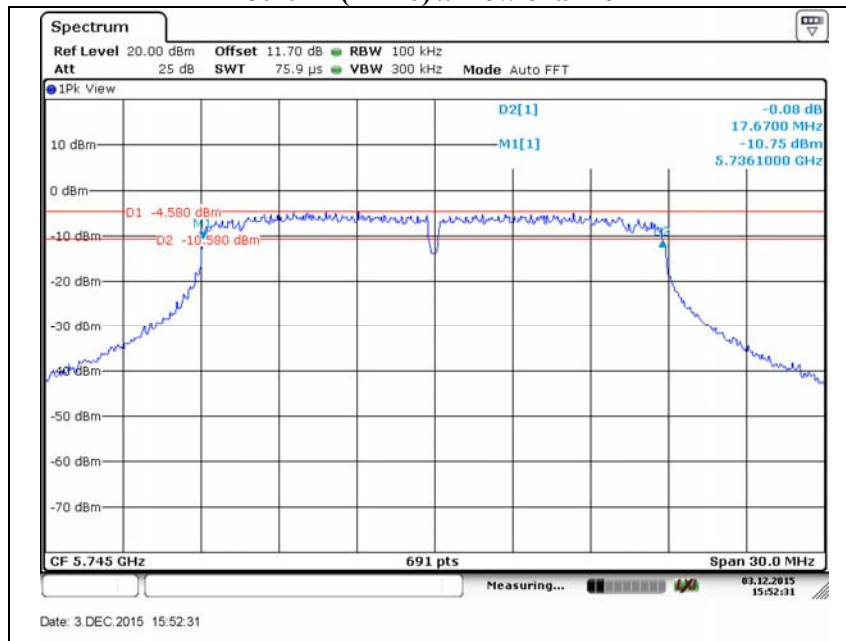
802.11n(HT20) // Middle channel



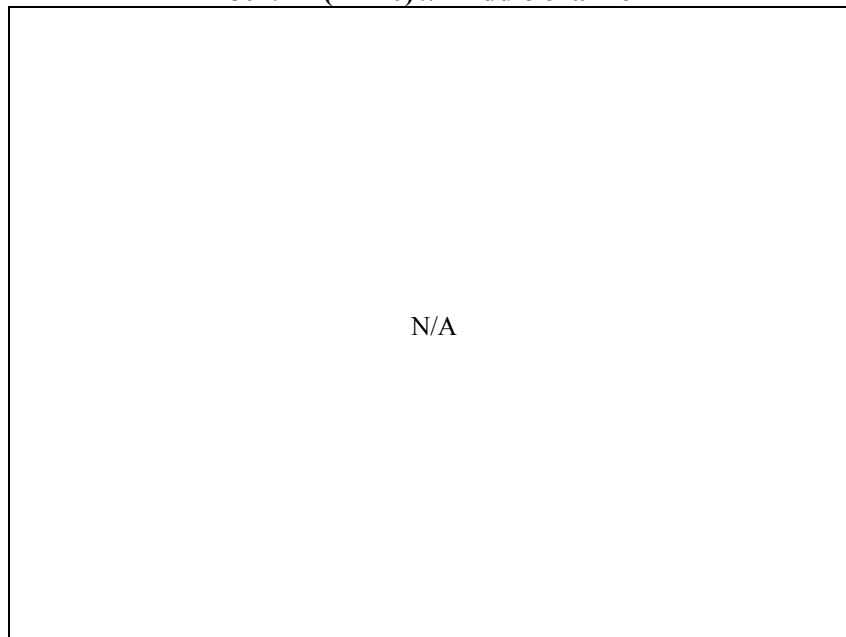
802.11n(HT20) // High channel



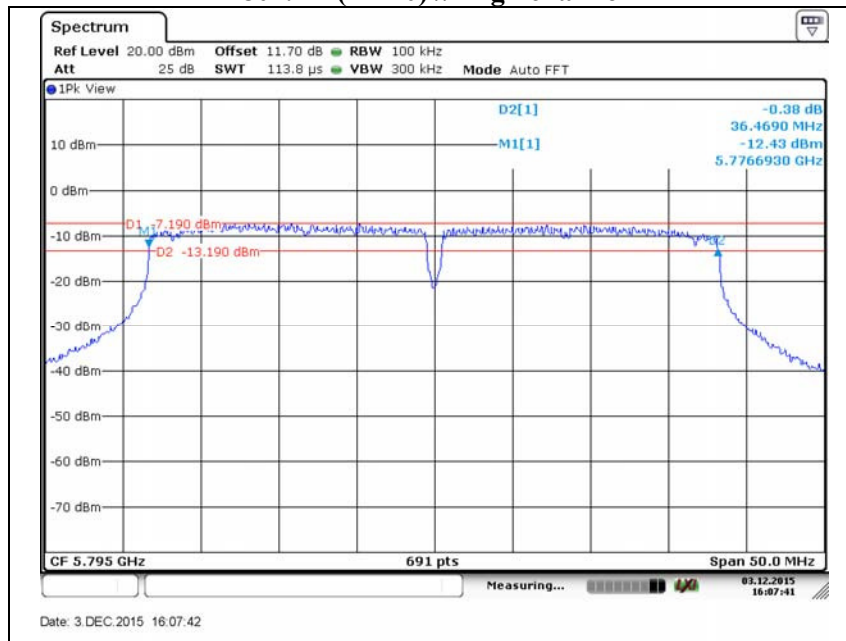
802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel

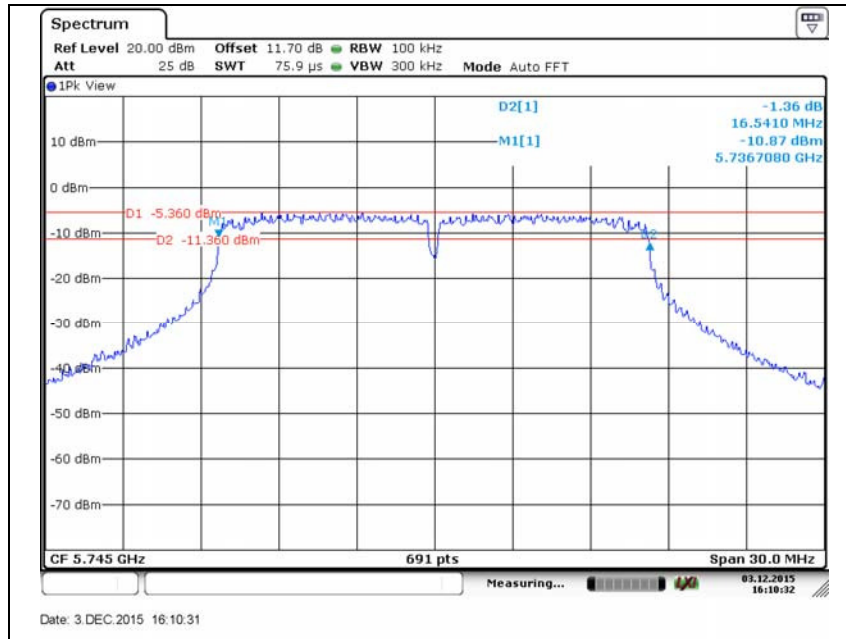


802.11n(HT40) // High channel

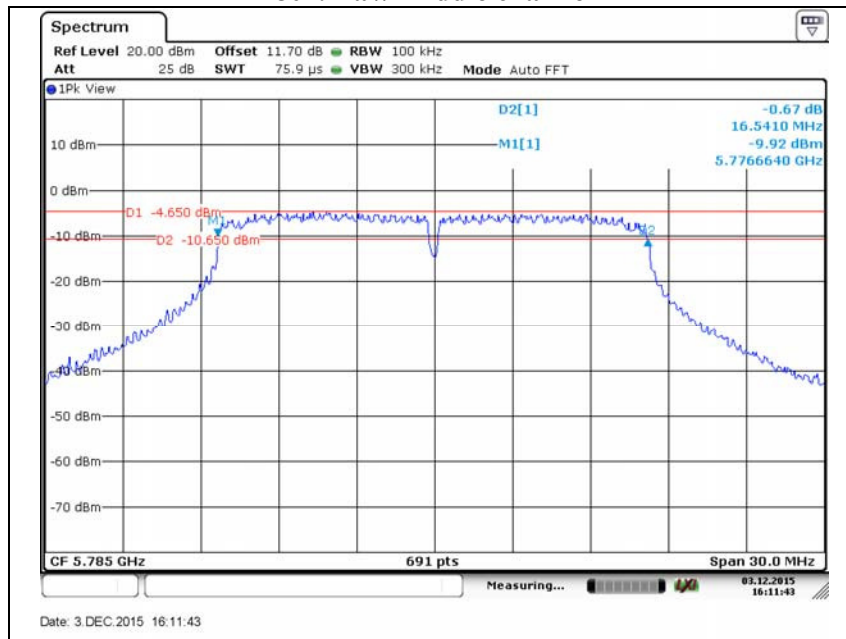


- Antenna port 1 (Band3)

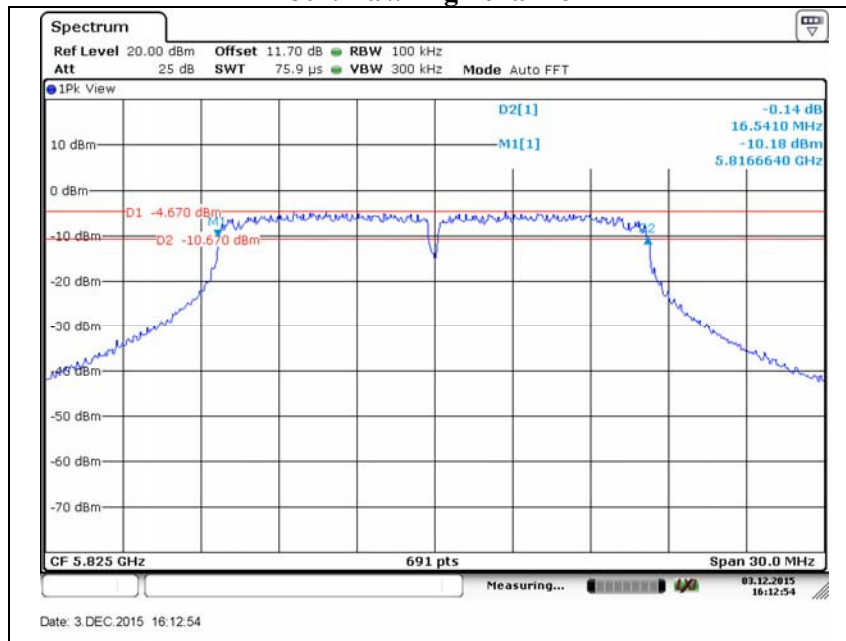
802.11a // Low channel



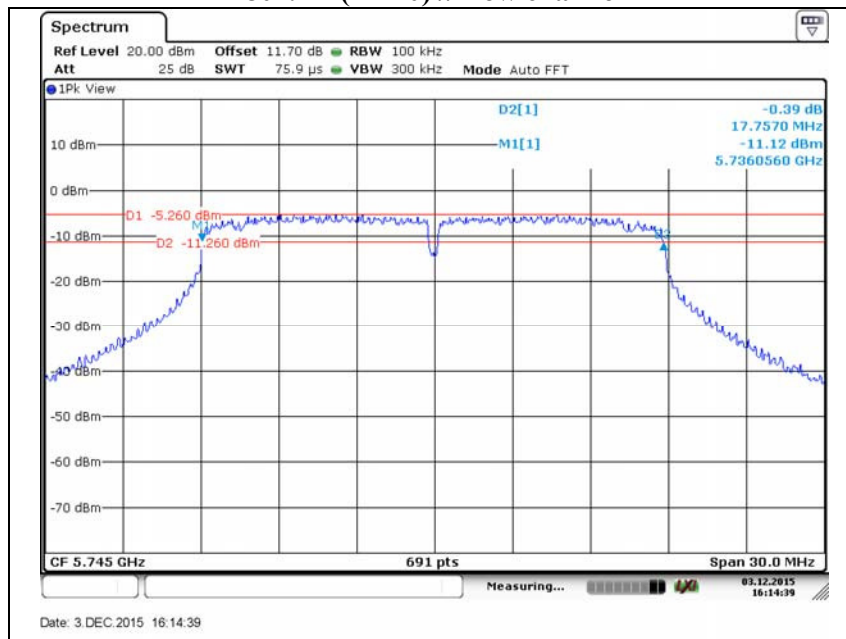
802.11a // Middle channel



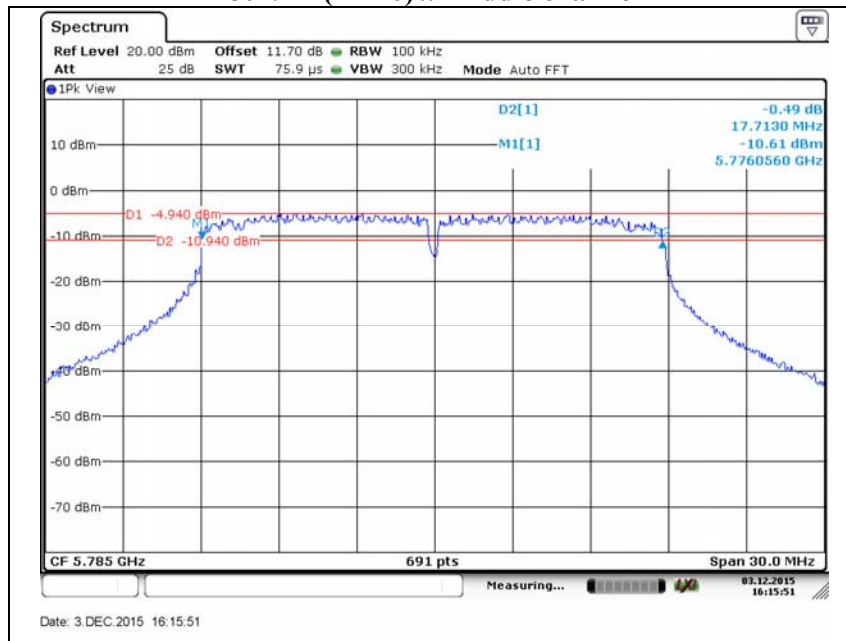
802.11a // High channel



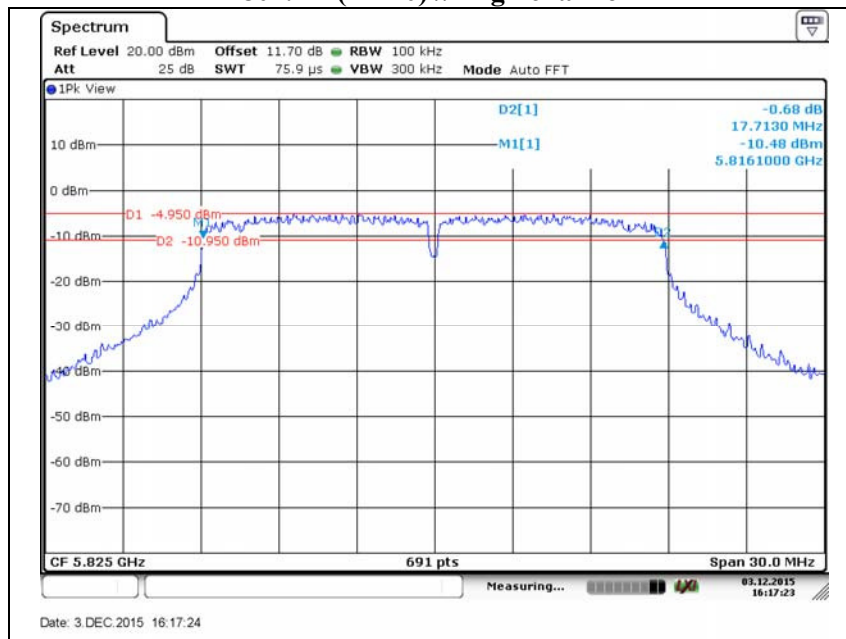
802.11n(HT20) // Low channel



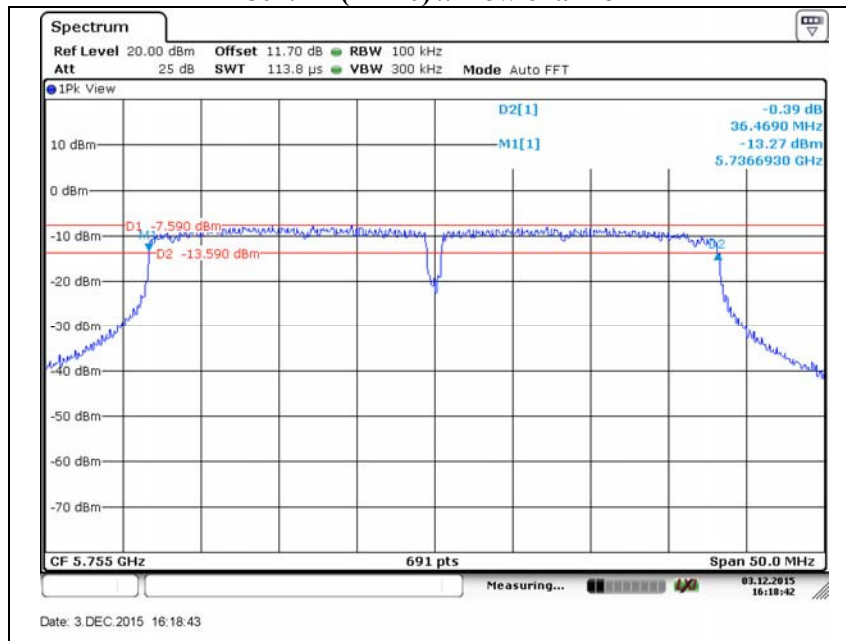
802.11n(HT20) // Middle channel



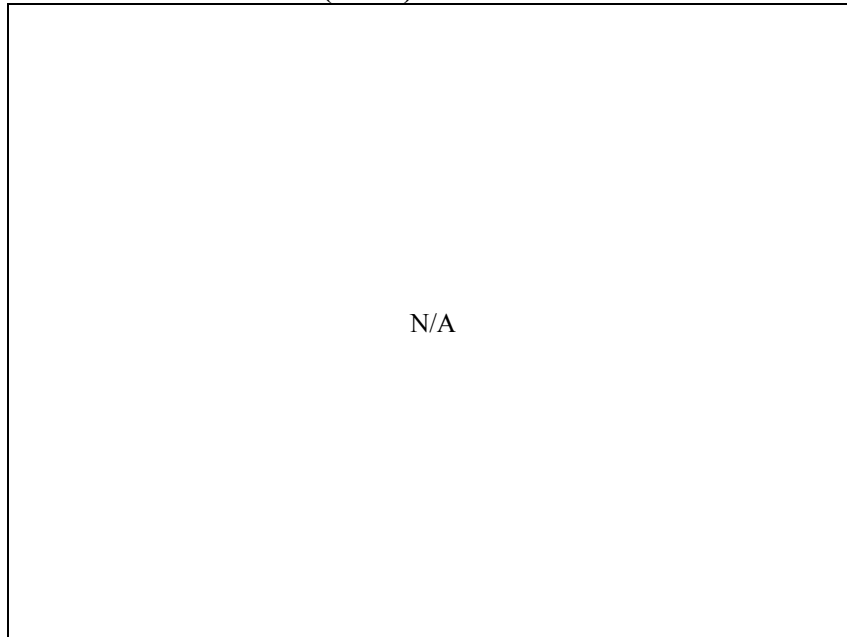
802.11n(HT20) // High channel



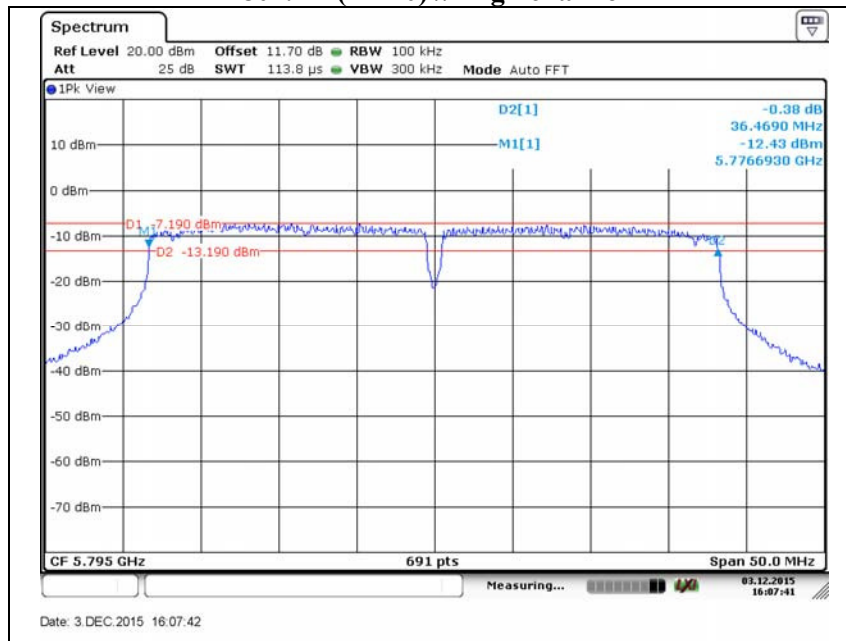
802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel

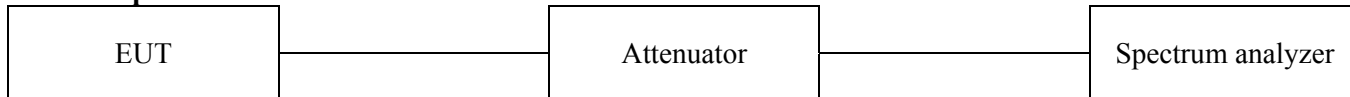


802.11n(HT40) // High channel



3.3. Emission bandwidth (26 dB bandwidth)

Test setup



Test procedure

KDB 789033 D02 v01 – Section C

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = Peak.
- Trace mode = max hold.
- 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%.

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

Limit

N/A

Test results

UNII Band	Antenna port	Operation mode	Frequency(MHz)	26 dB bandwidth(MHz)	Limit(MHz)
Band 1	0	802.11a	5 180	22.71	N/A
			5 220	22.71	
			5 240	22.40	
		802.11n(HT20)	5 180	23.18	
			5 220	23.49	
			5 240	23.71	
		802.11n(HT40)	5 190	47.24	
			5 230	46.11	
	1	802.11a	5 180	22.10	
			5 220	22.66	
			5 240	21.97	
		802.11n(HT20)	5 180	23.18	
			5 220	23.49	
			5 240	23.36	
		802.11n(HT40)	5 190	47.32	
			5 230	46.89	
Band 2A	0	802.11a	5 260	21.84	N/A
			5 300	22.27	
			5 320	22.06	
		802.11n(HT20)	5 260	22.66	
			5 300	22.62	
			5 320	22.32	
		802.11n(HT40)	5 270	47.50	
			5 310	47.50	
	1	802.11a	5 260	21.45	
			5 300	21.62	
			5 320	22.19	
		802.11n(HT20)	5 260	24.14	
			5 300	23.62	
			5 320	23.23	
		802.11n(HT40)	5 270	46.19	
			5 310	47.58	

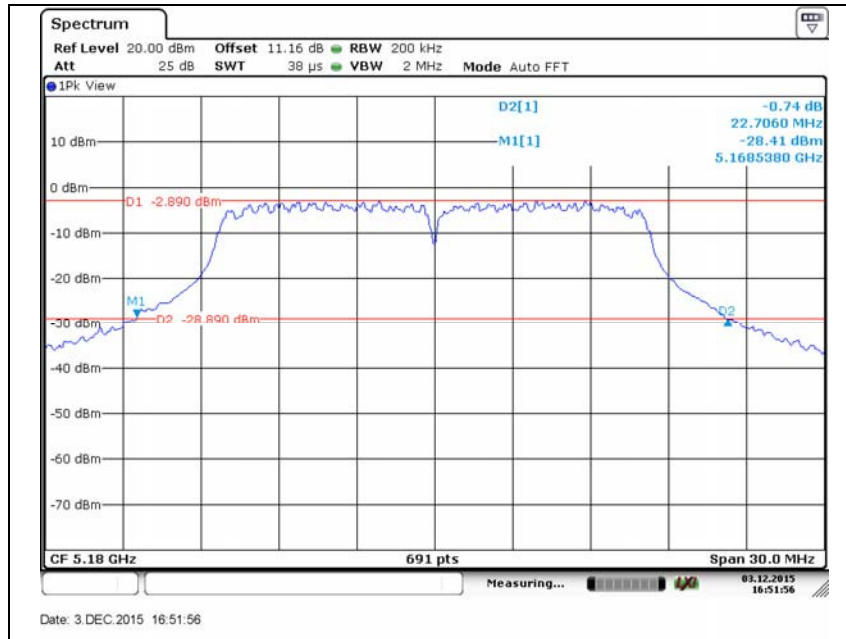
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.



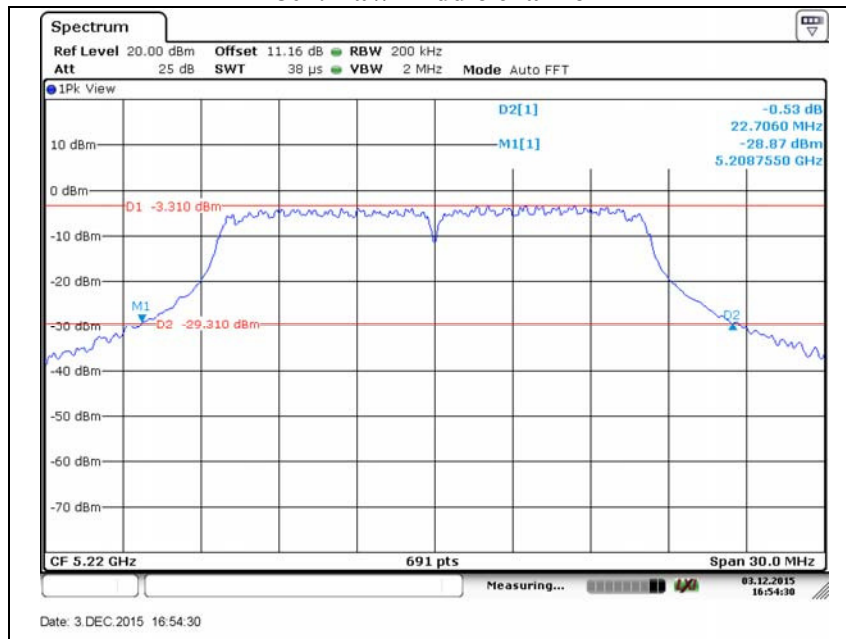
UNII Band	Antenna port	Operation mode	Frequency(MHz)	26 dB bandwidth(MHz)	Limit(MHz)
Band 2C	0	802.11a	5 500	21.88	N/A
			5 580	21.53	
			5 700	21.97	
		802.11n(HT20)	5 500	23.05	
			5 580	22.62	
			5 700	23.18	
		802.11n(HT40)	5 510	47.41	
			5 550	47.24	
			5 567	46.98	
	1	802.11a	5 180	21.80	
			5 220	21.53	
			5 240	21.66	
		802.11n(HT20)	5 180	22.71	
			5 220	22.58	
			5 240	22.53	
		802.11n(HT40)	5 510	47.32	
			5 550	46.45	
			5 567	46.72	

- Antenna port 0 (Band1)

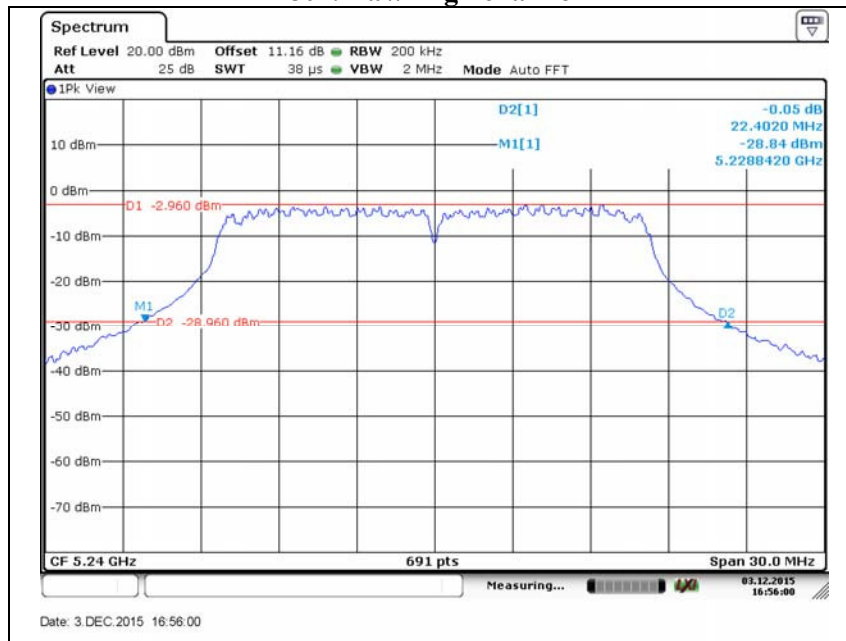
802.11a // Low channel



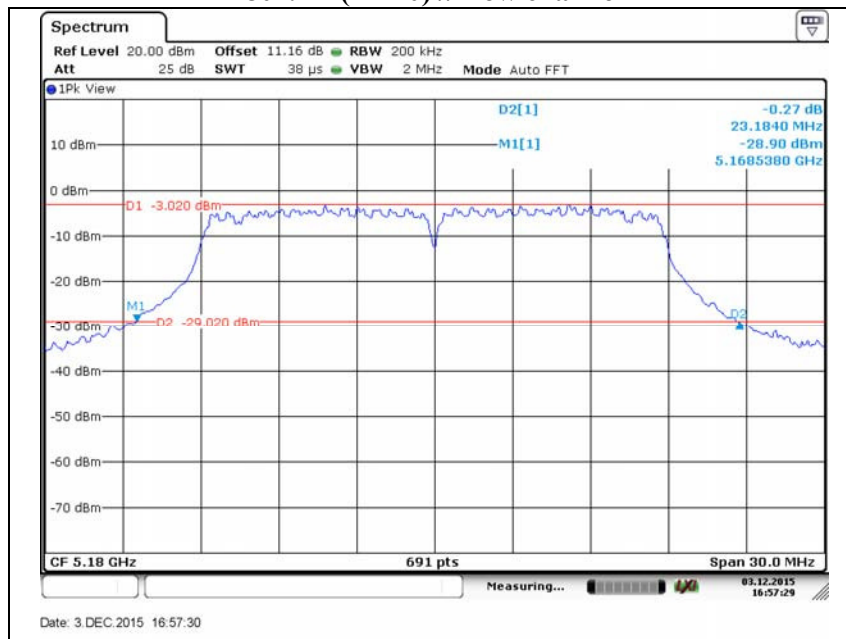
802.11a // Middle channel



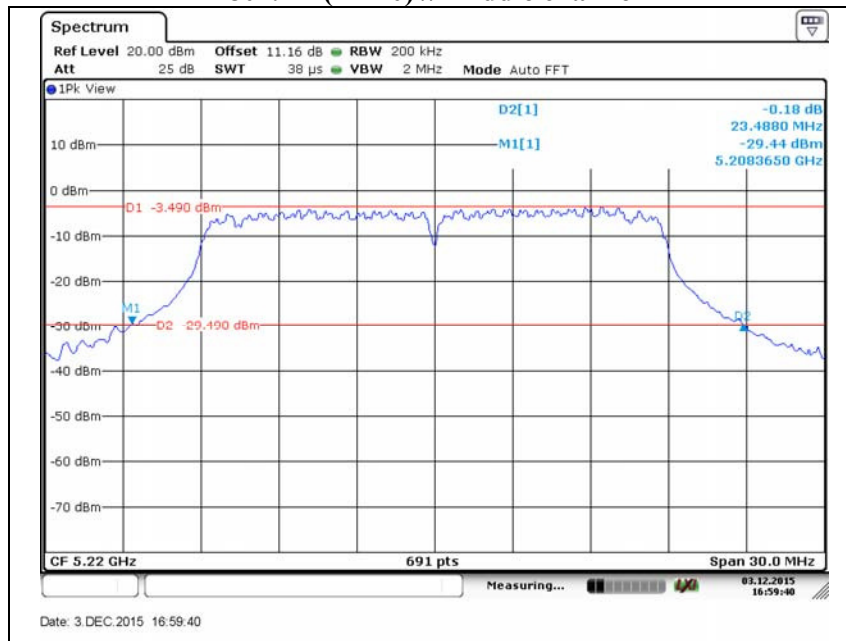
802.11a // High channel



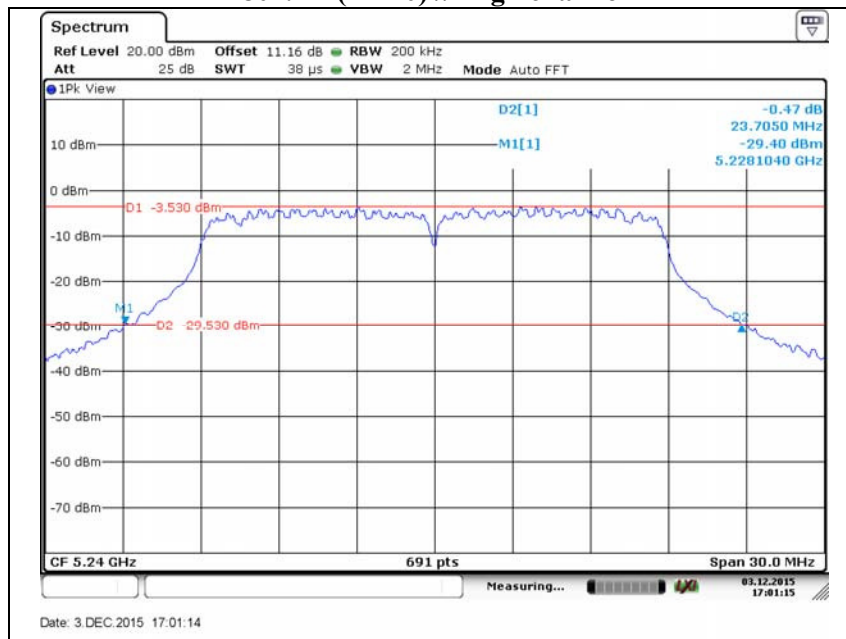
802.11n(HT20) // Low channel



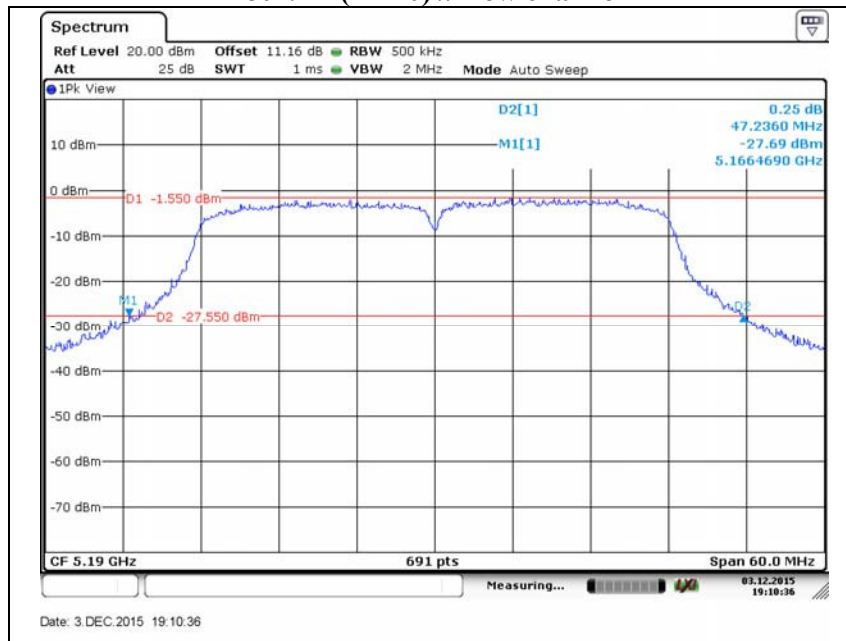
802.11n(HT20) // Middle channel



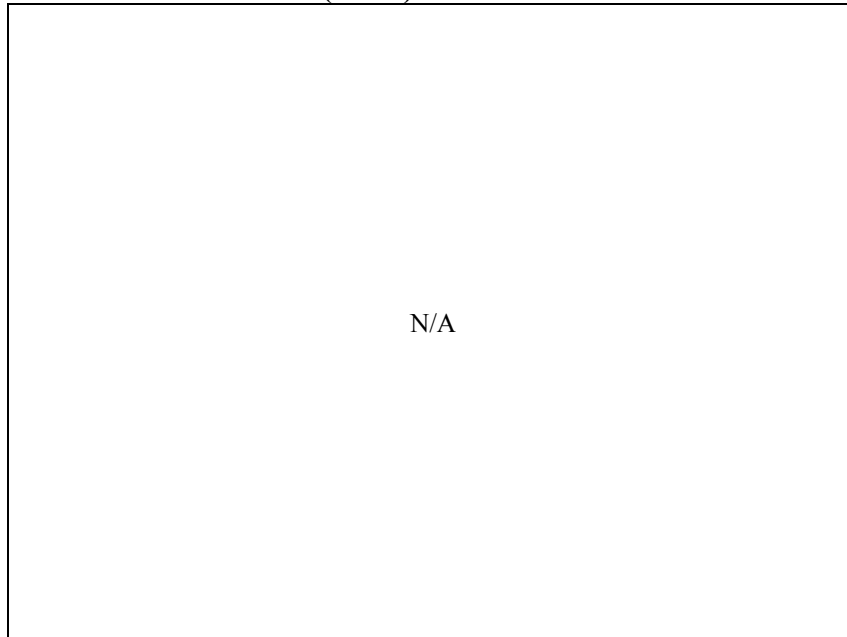
802.11n(HT20) // High channel



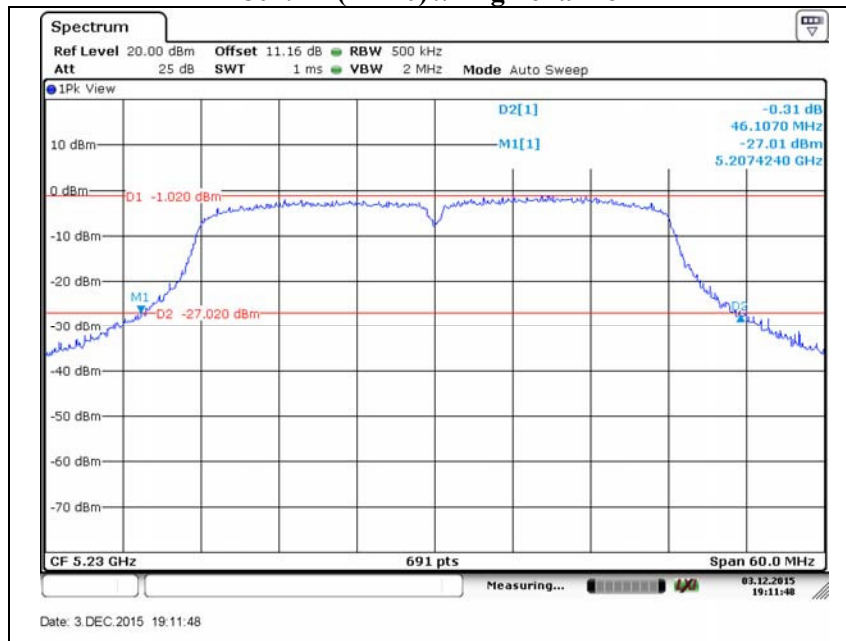
802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel

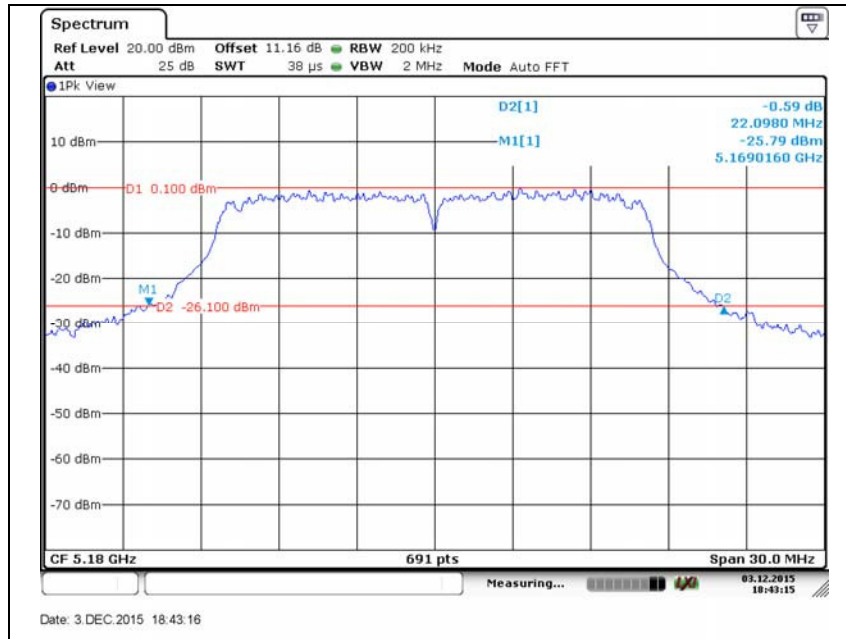


802.11n(HT40) // High channel

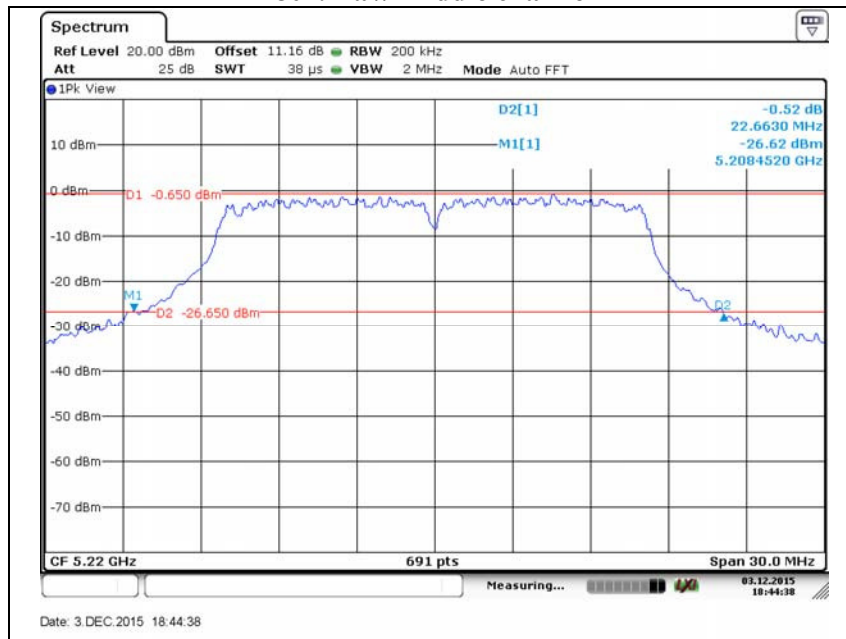


- Antenna port 1 (Band1)

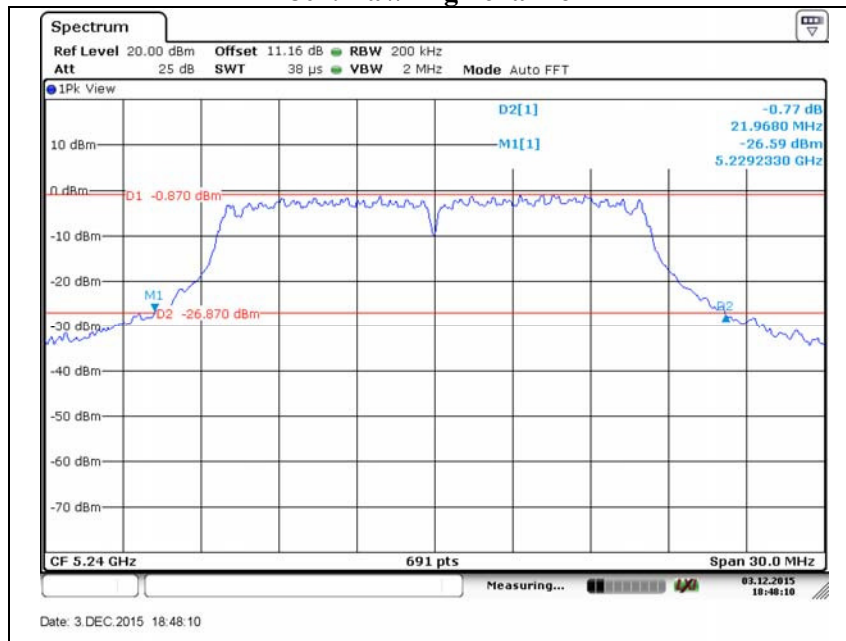
802.11a // Low channel



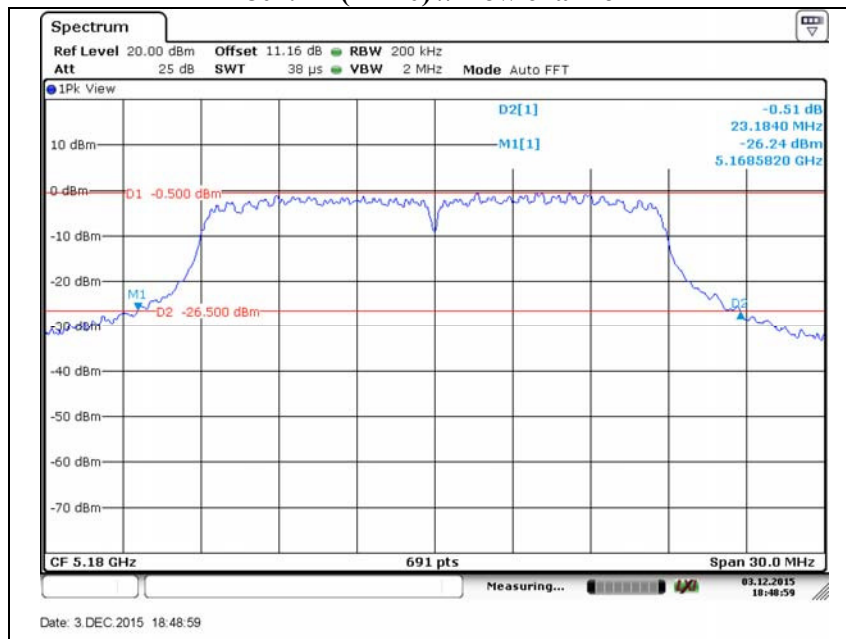
802.11a // Middle channel



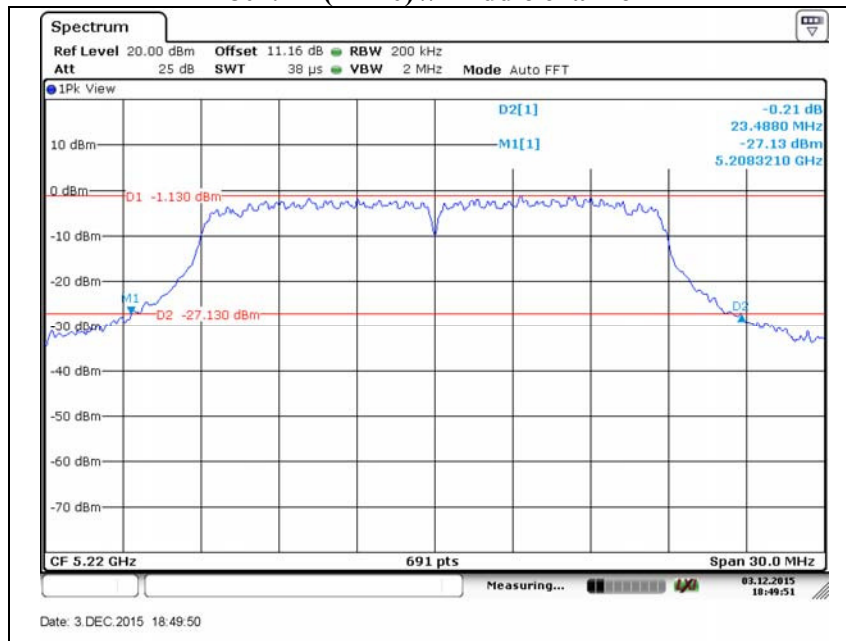
802.11a // High channel



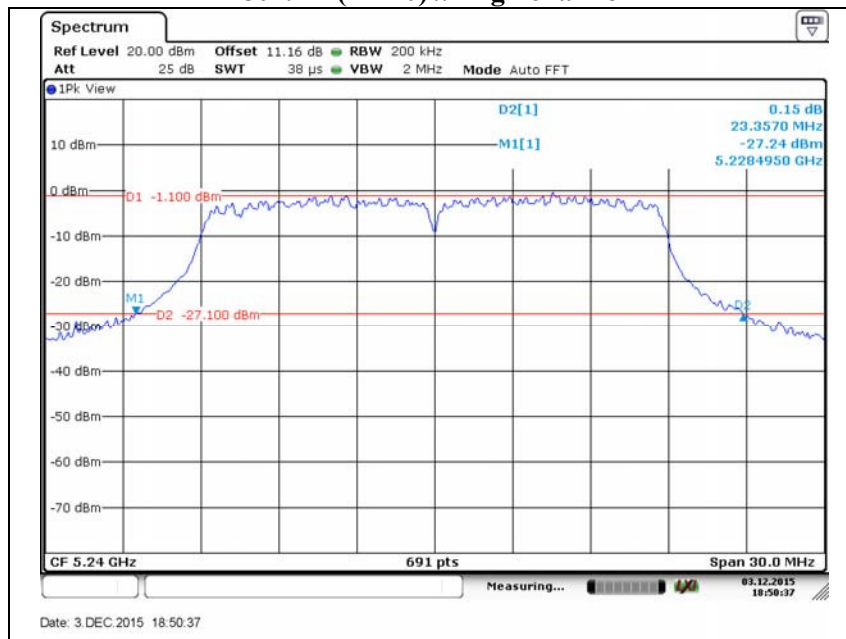
802.11n(HT20) // Low channel



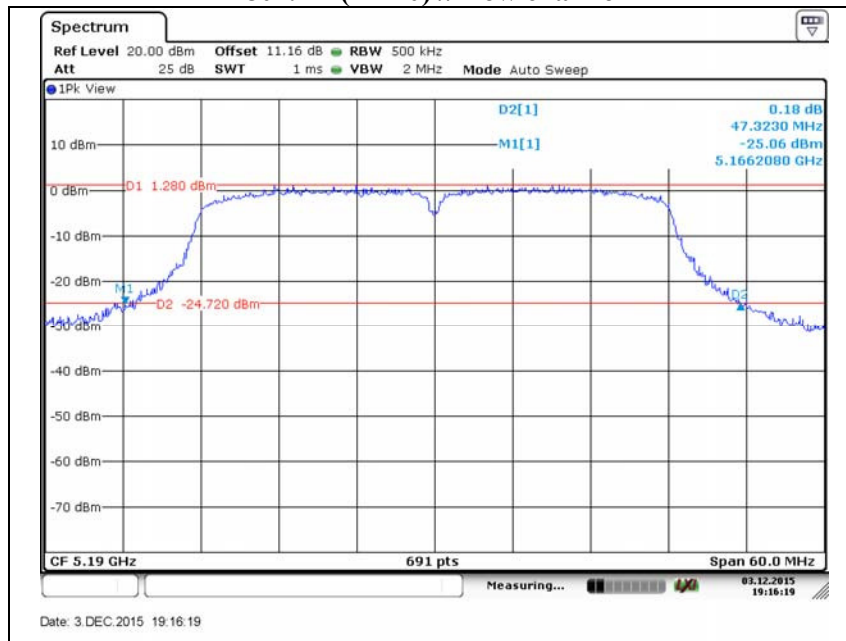
802.11n(HT20) // Middle channel



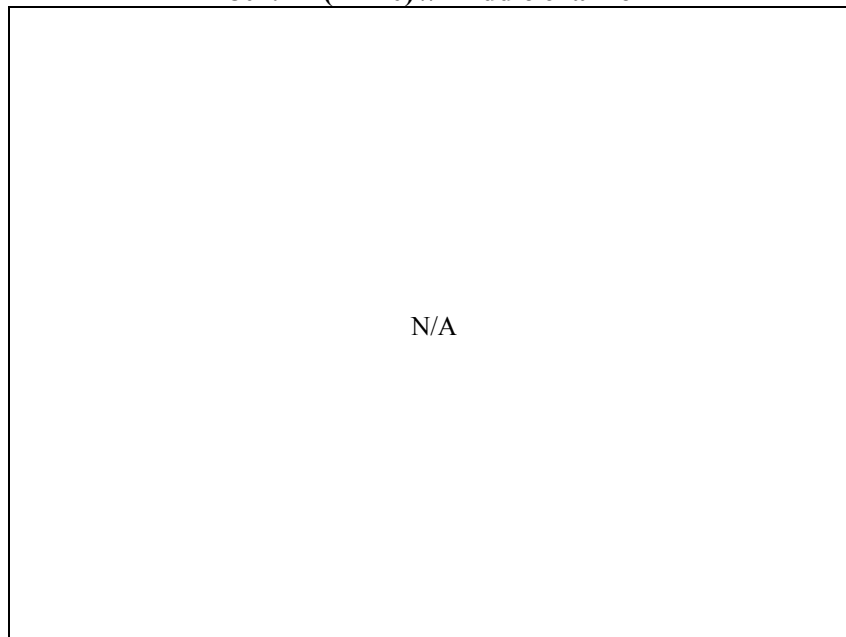
802.11n(HT20) // High channel



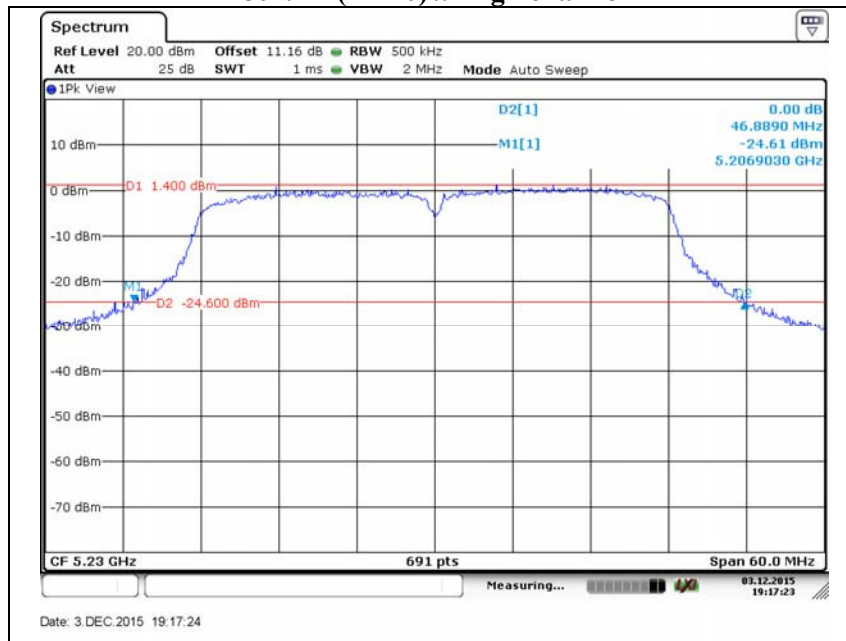
802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel

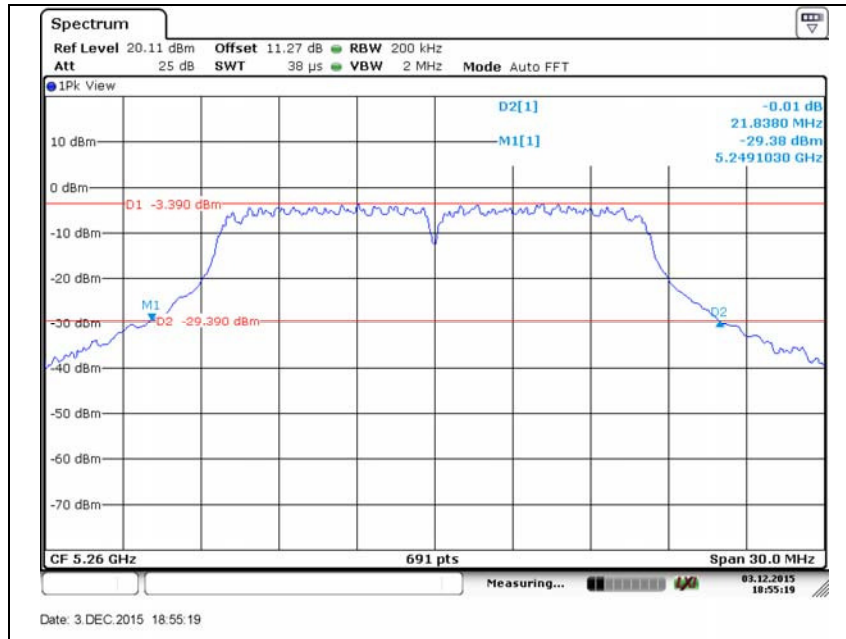


802.11n(HT40) // High channel

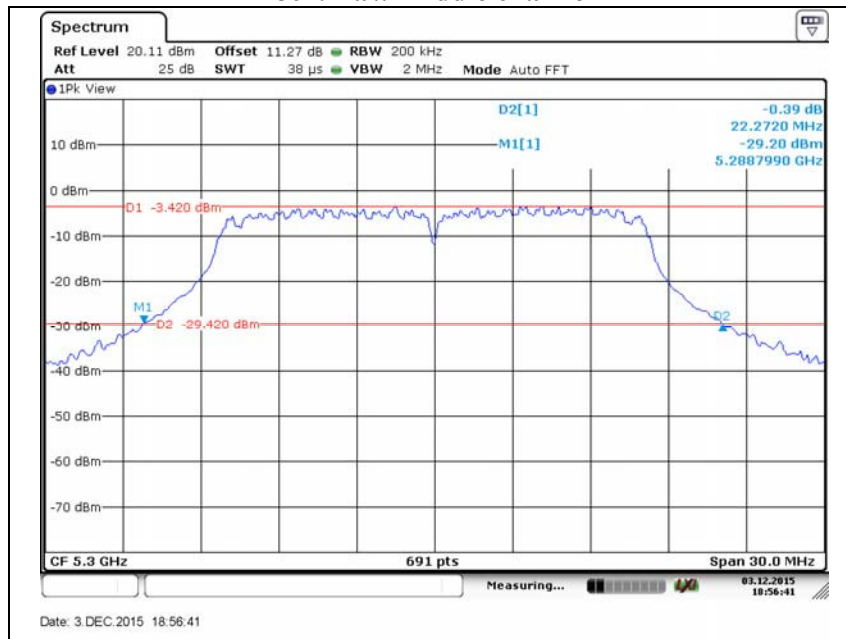


- Antenna port 0 (Band2A)

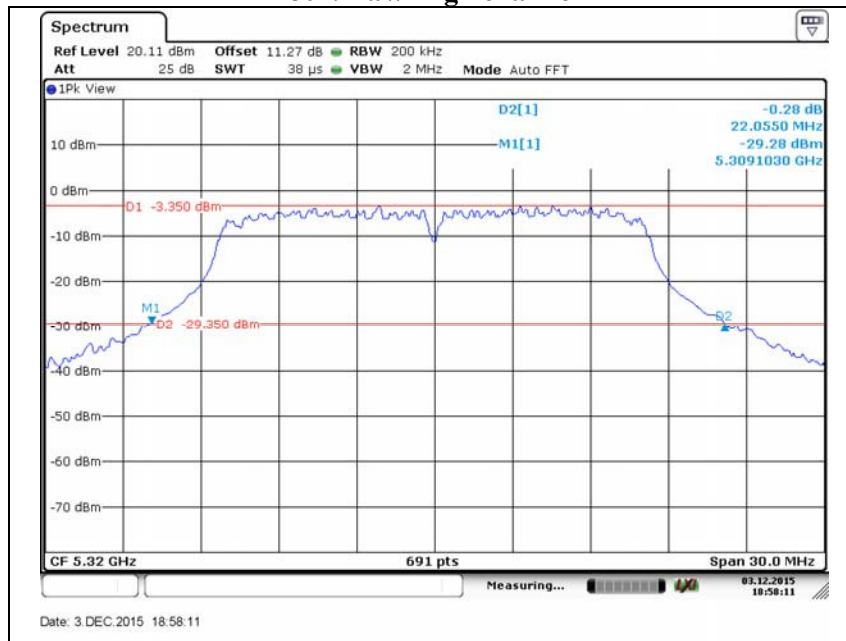
802.11a // Low channel



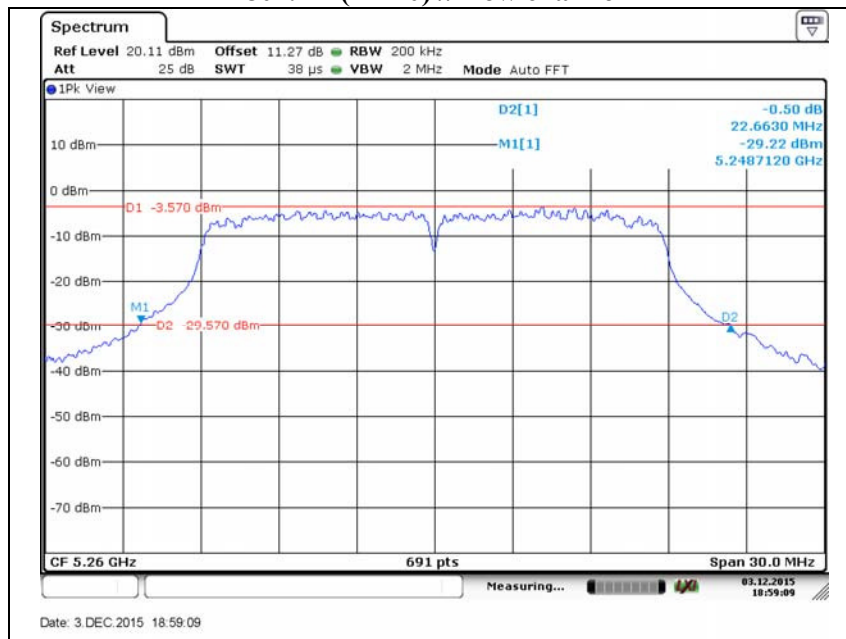
802.11a // Middle channel



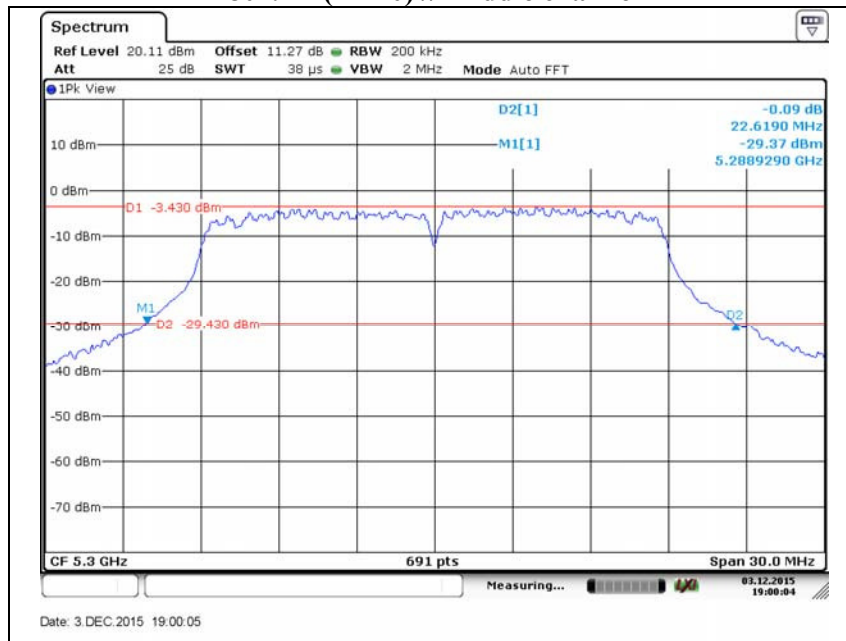
802.11a // High channel



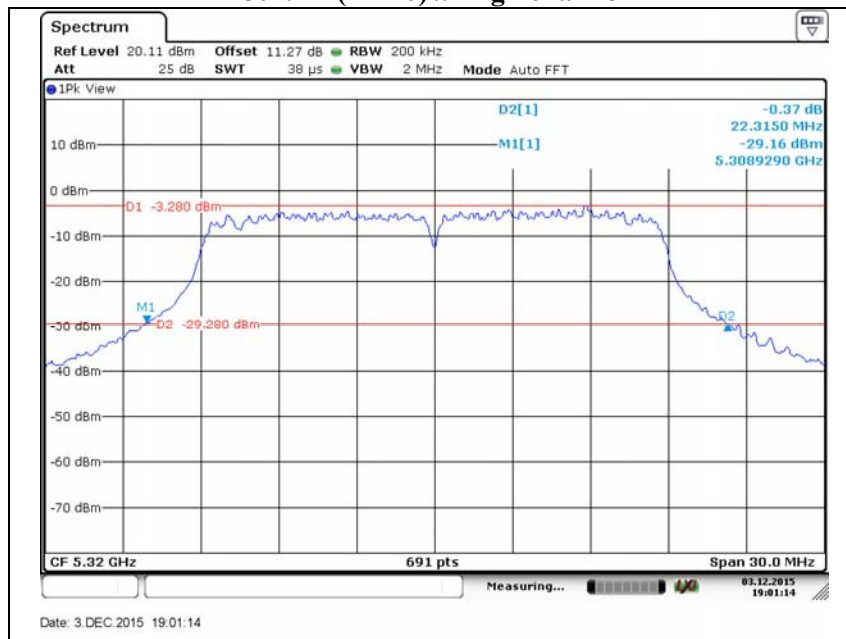
802.11n(HT20) // Low channel



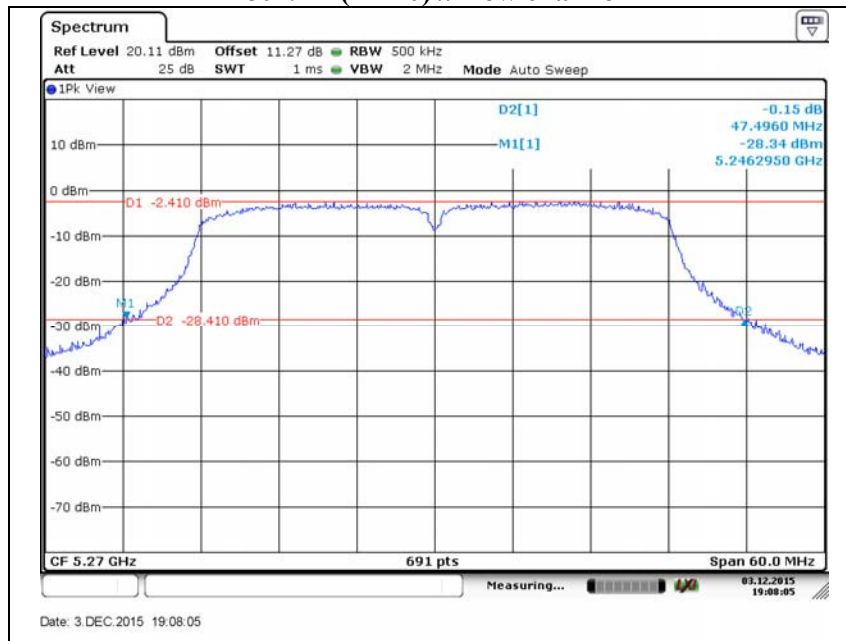
802.11n(HT20) // Middle channel



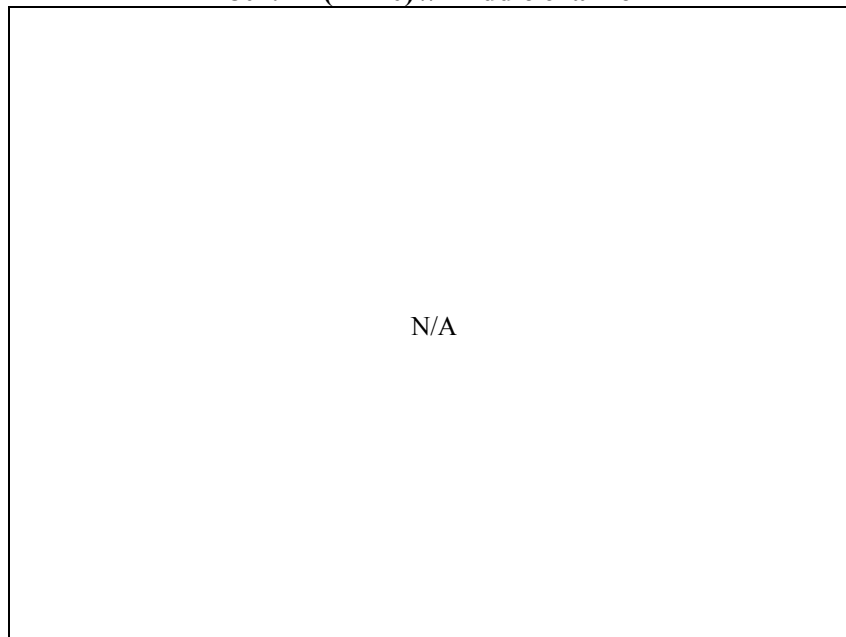
802.11n(HT20) // High channel



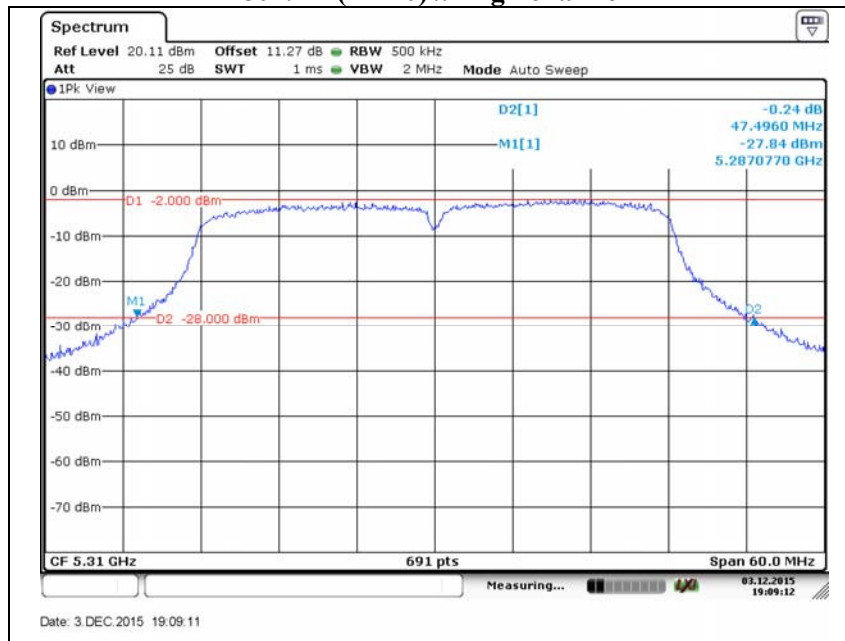
802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel



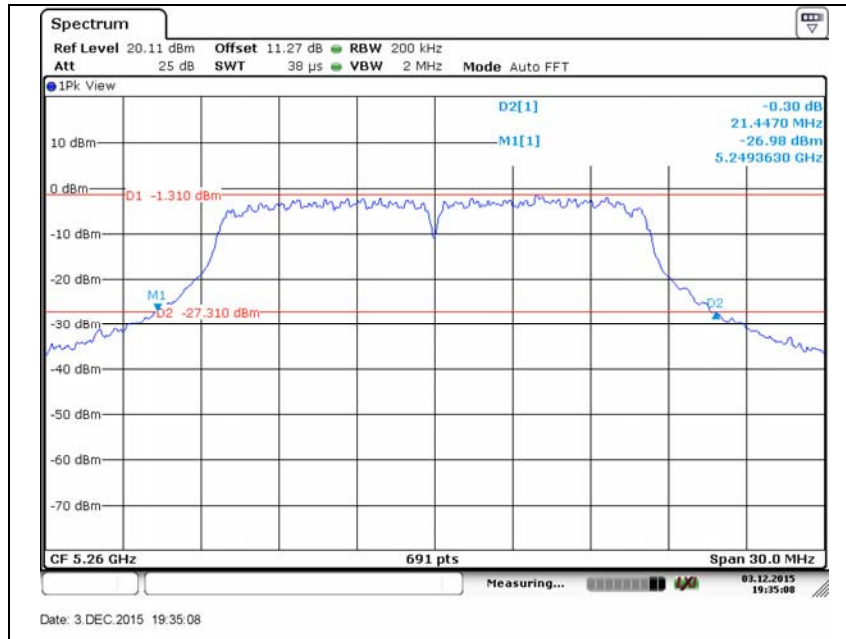
802.11n(HT40) // High channel



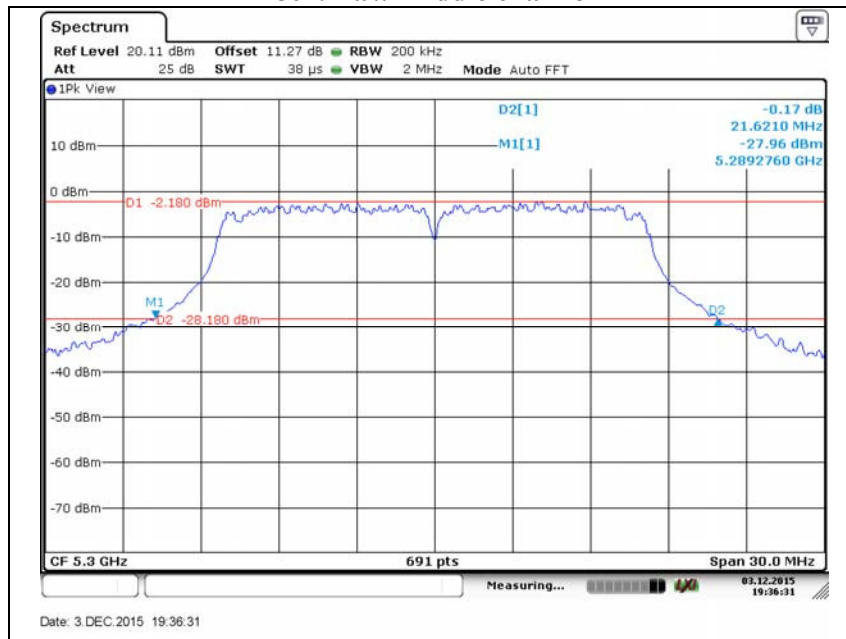
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- Antenna port 1 (Band2A)

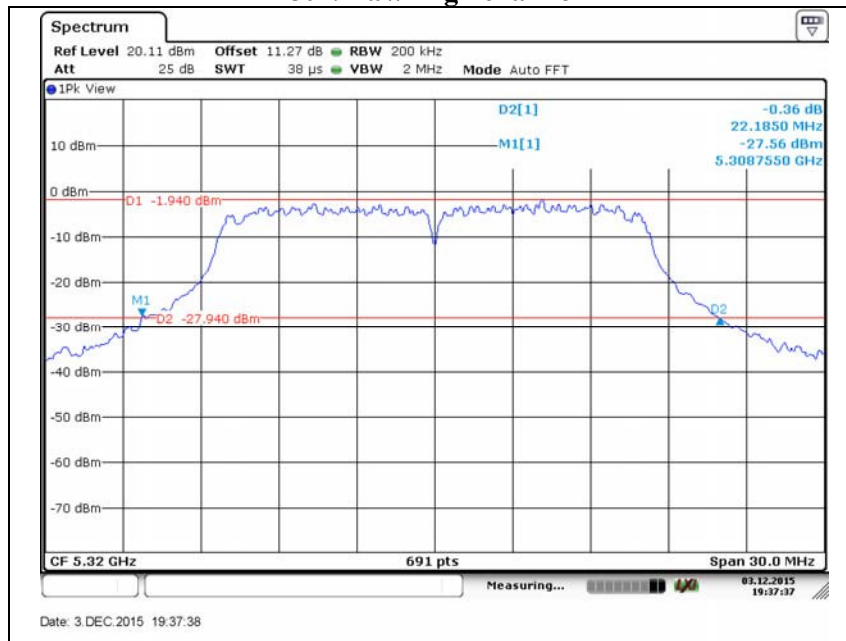
802.11a // Low channel



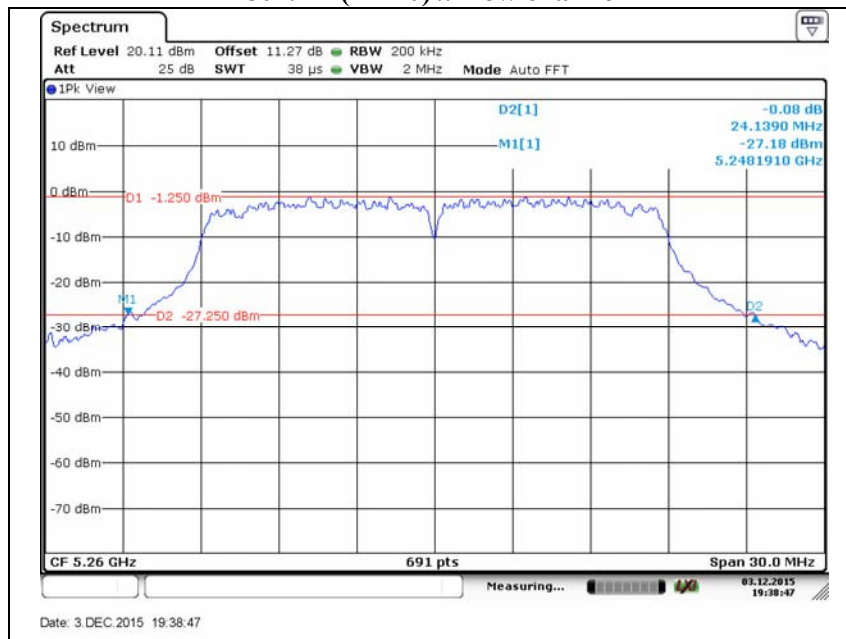
802.11a // Middle channel



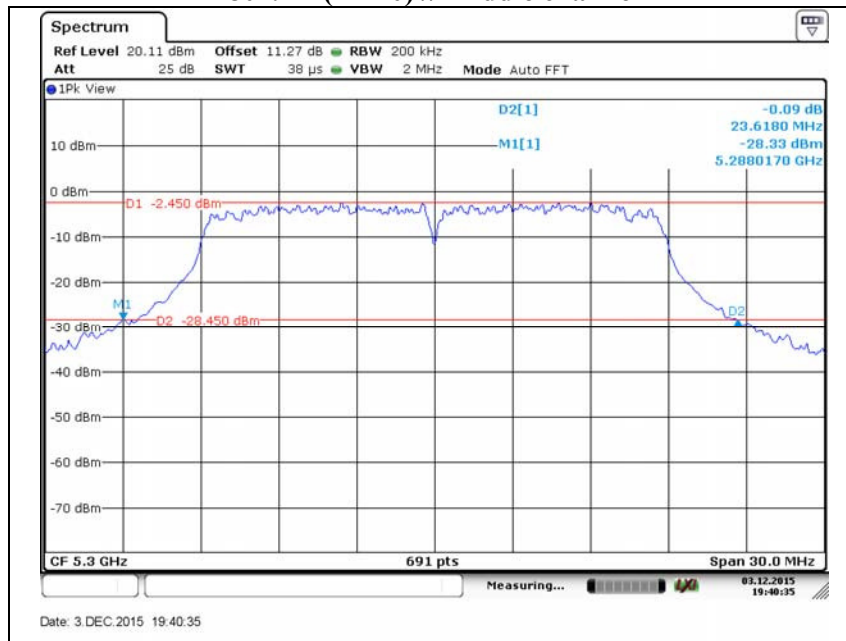
802.11a // High channel



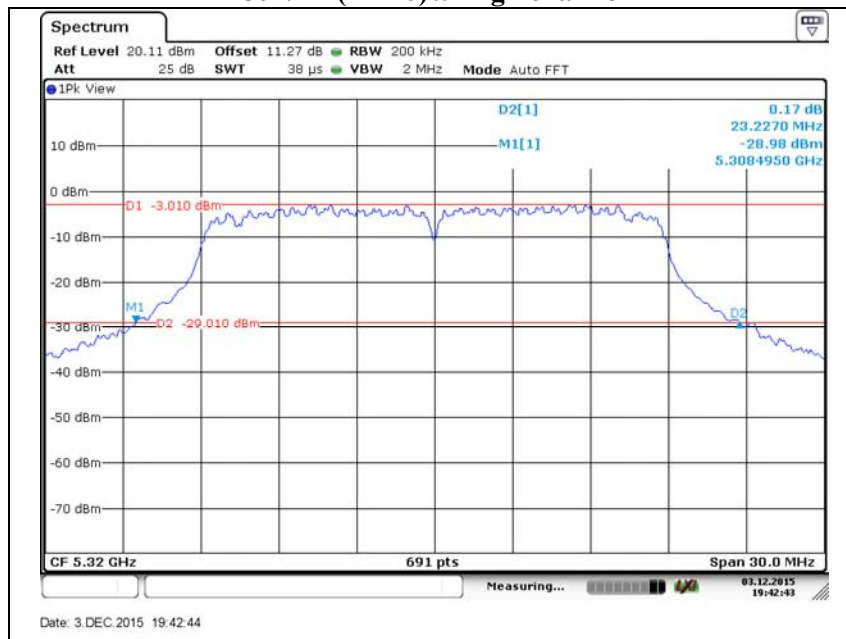
802.11n(HT20) // Low channel



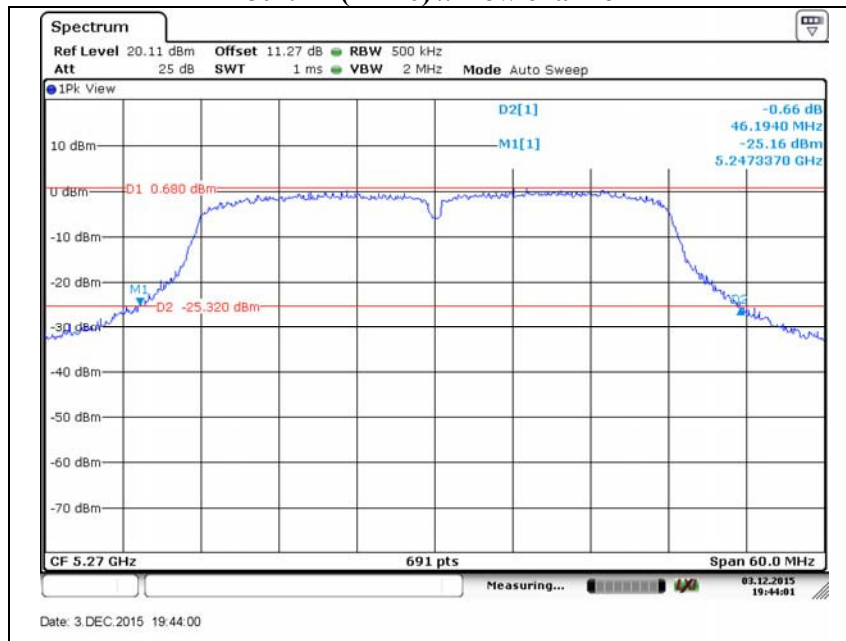
802.11n(HT20) // Middle channel



802.11n(HT20) // High channel

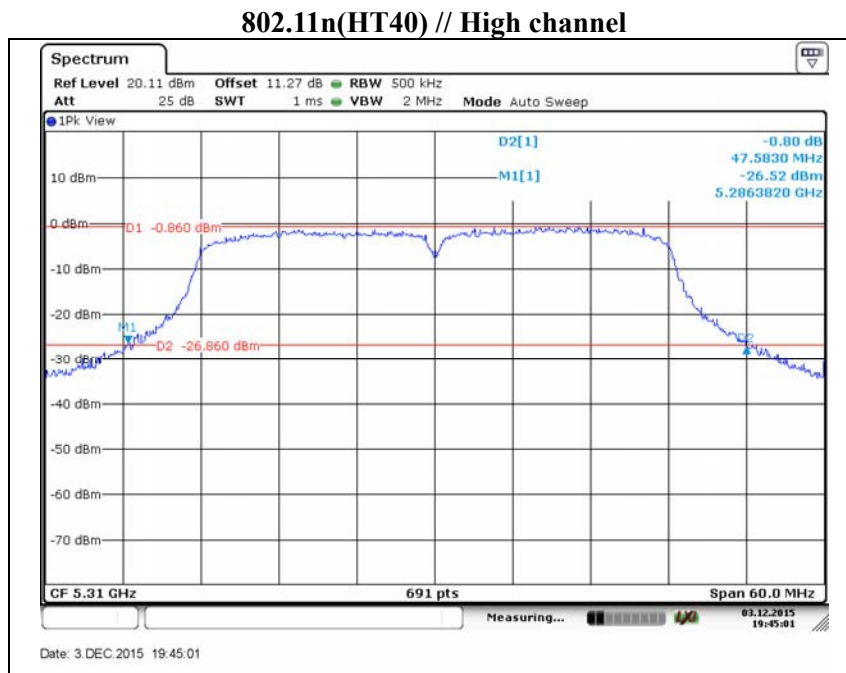


802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel

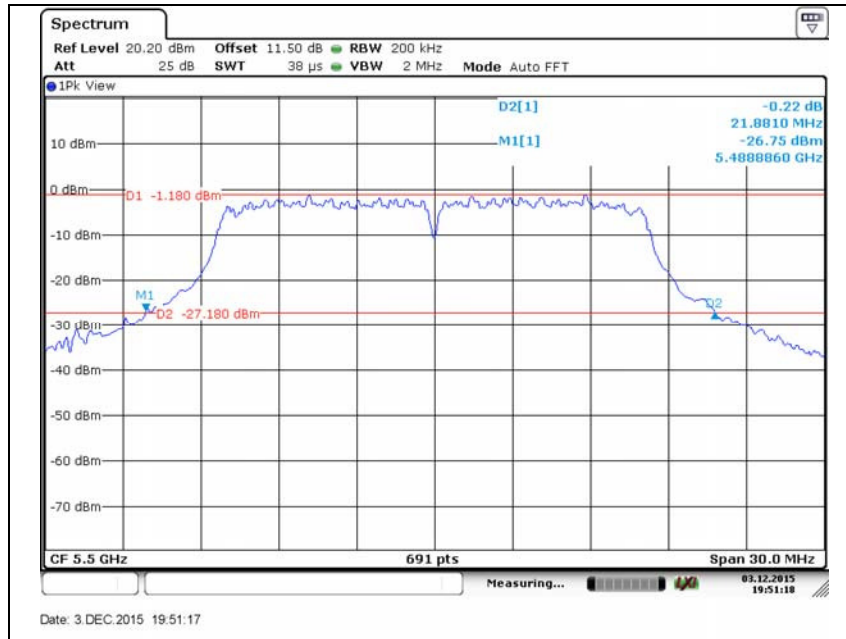
N/A



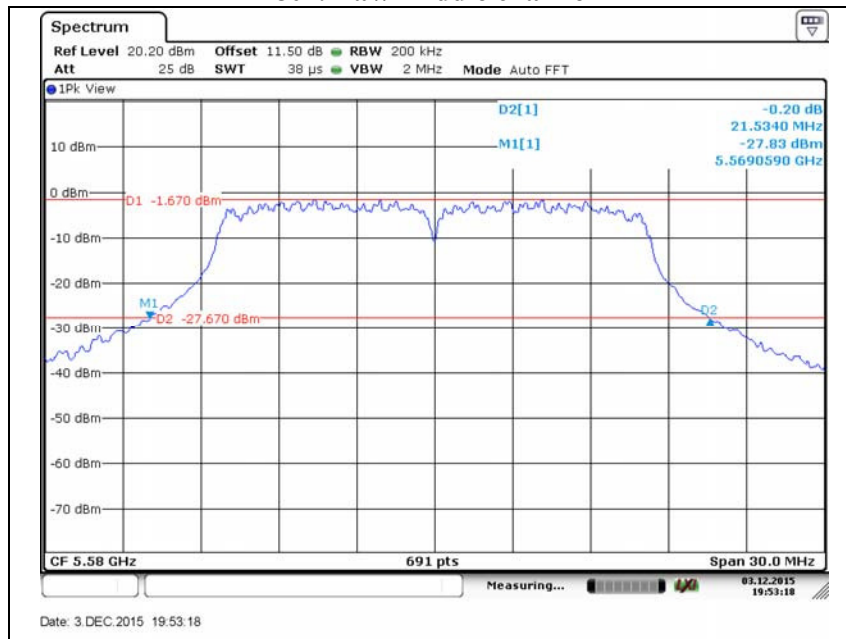
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- Antenna port 0 (Band2C)

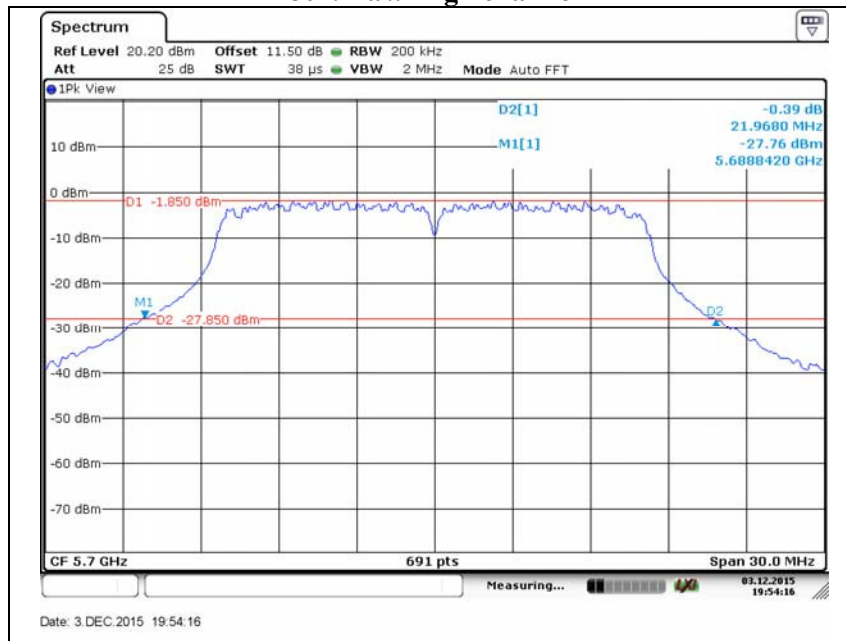
802.11a // Low channel



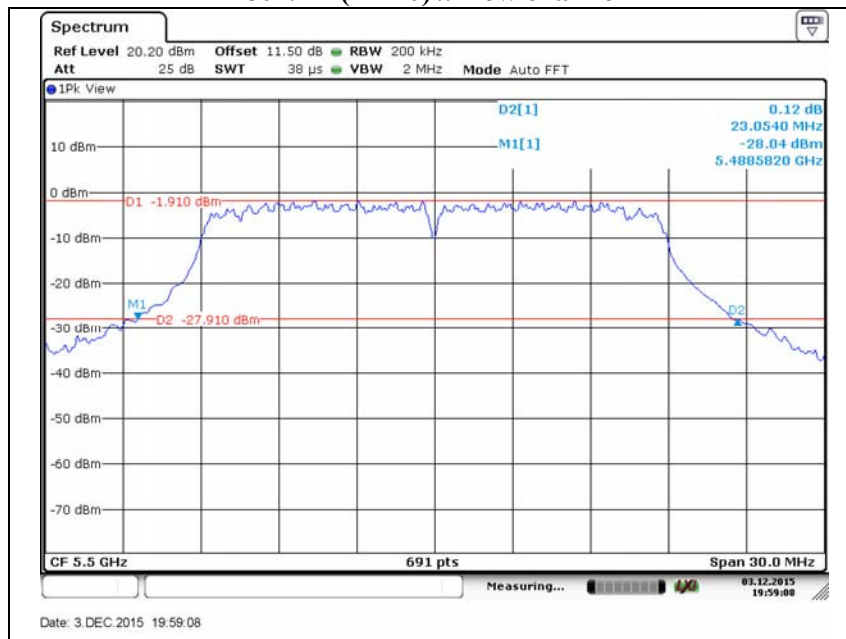
802.11a // Middle channel



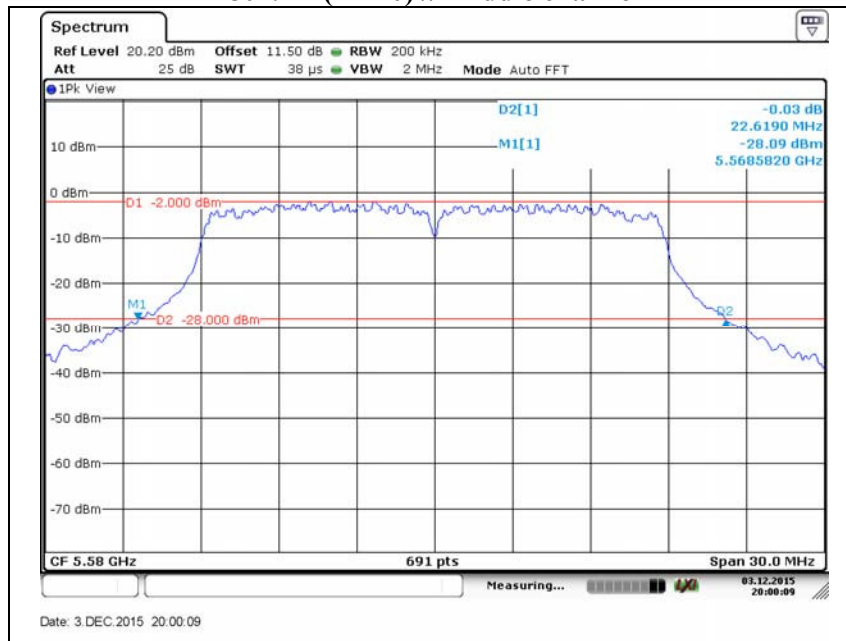
802.11a // High channel



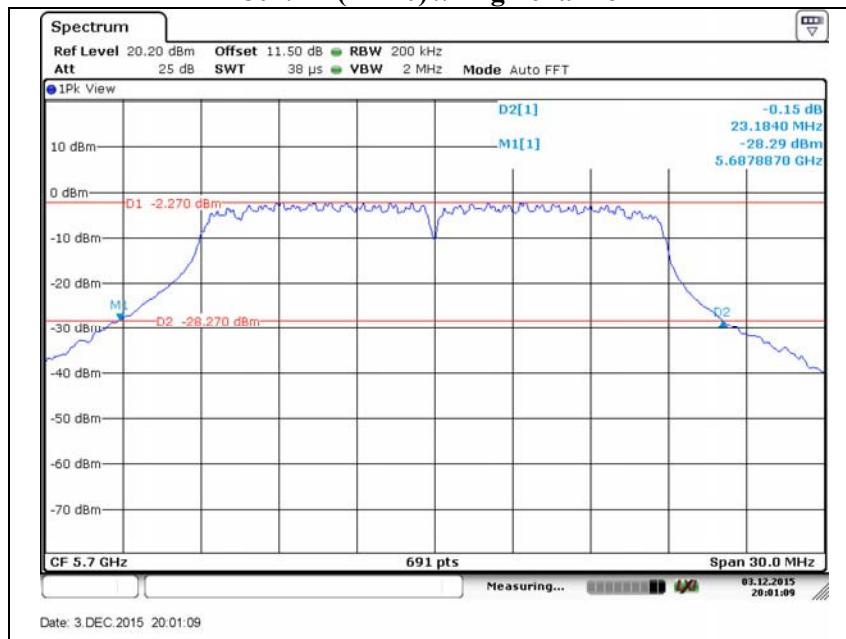
802.11n(HT20) // Low channel



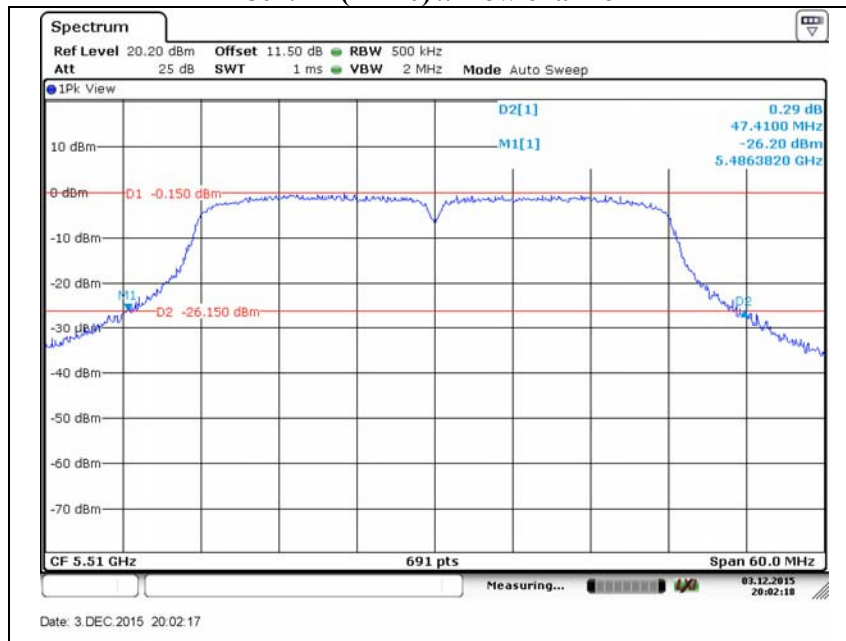
802.11n(HT20) // Middle channel



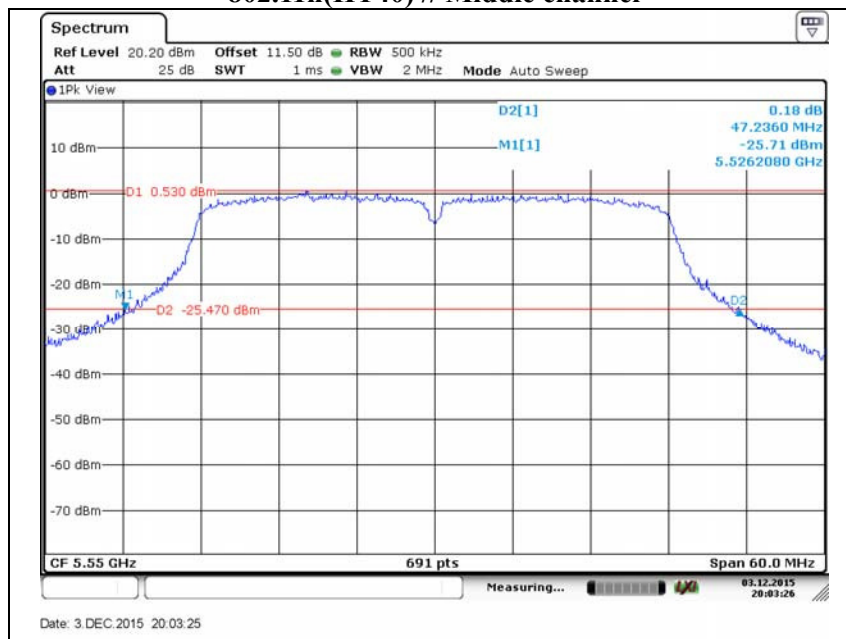
802.11n(HT20) // High channel



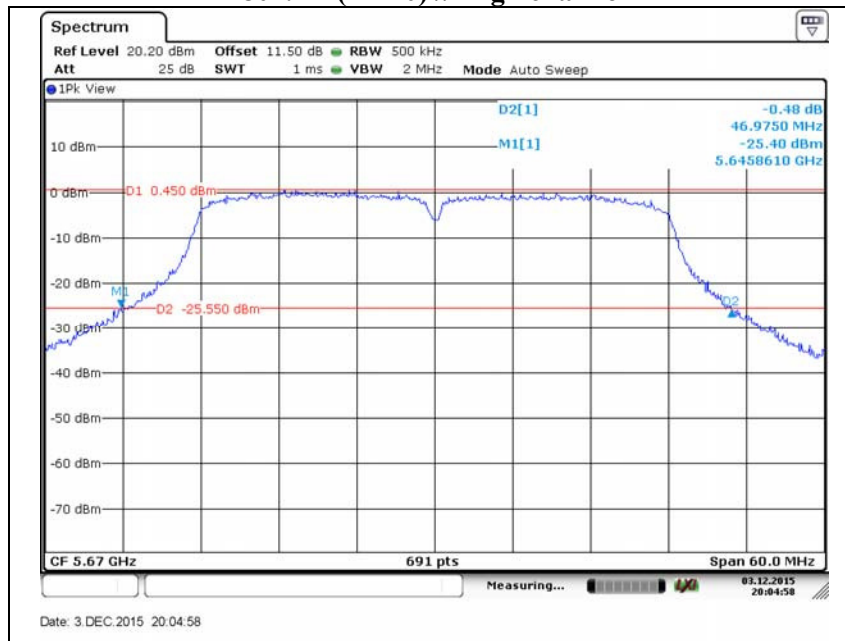
802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel



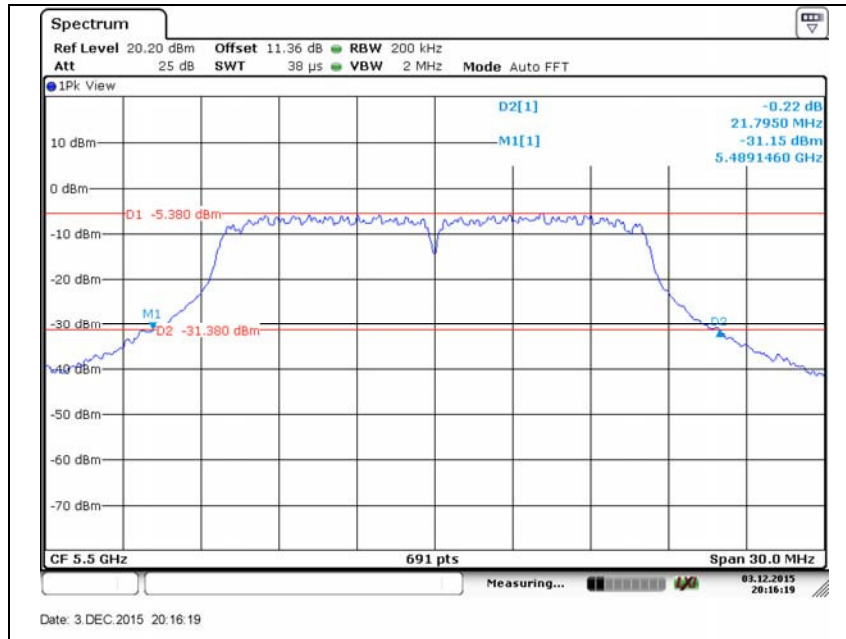
802.11n(HT40) // High channel



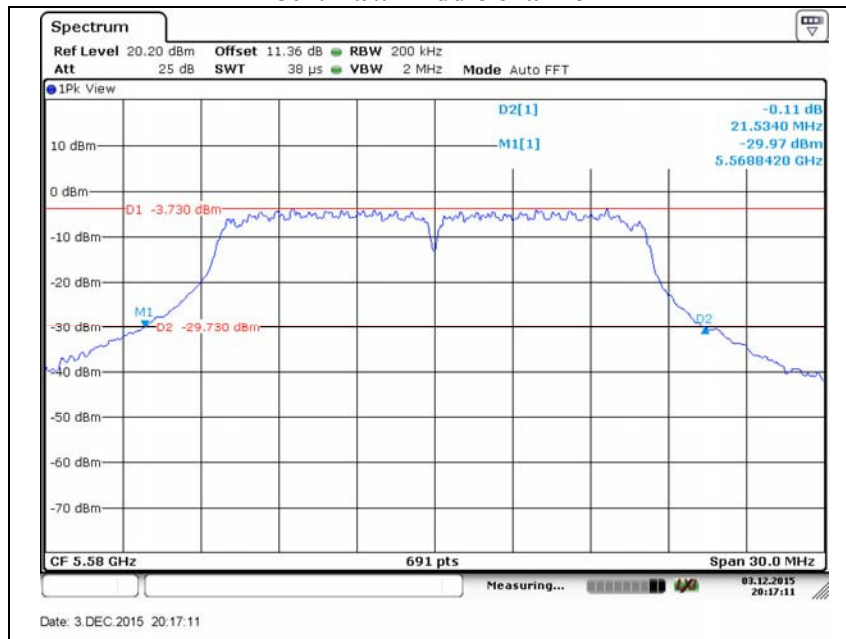
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- Antenna port 1 (Band2C)

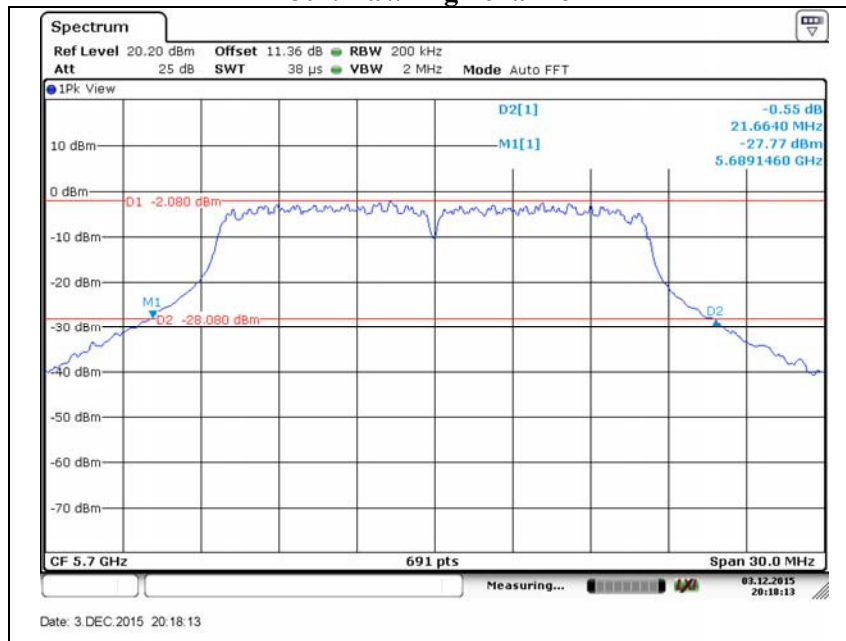
802.11a // Low channel



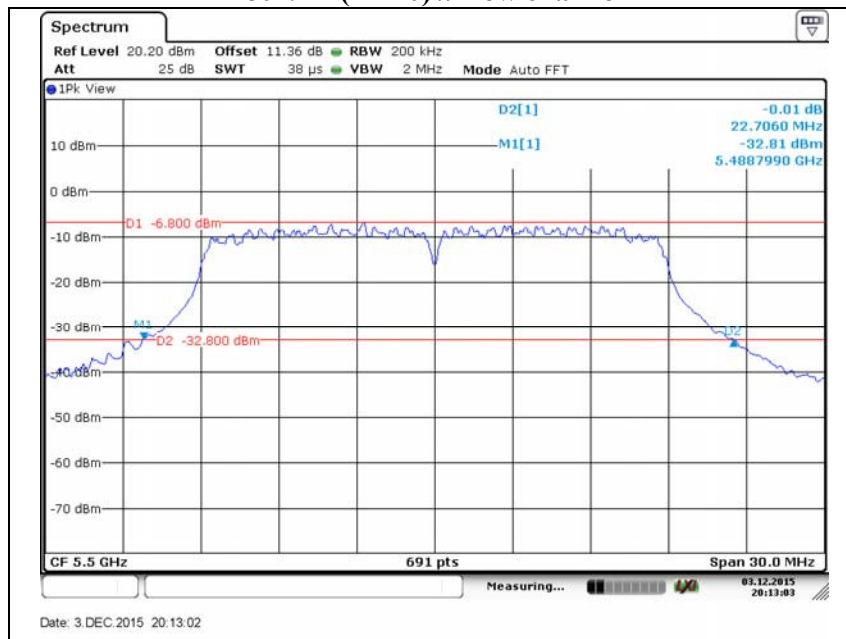
802.11a // Middle channel



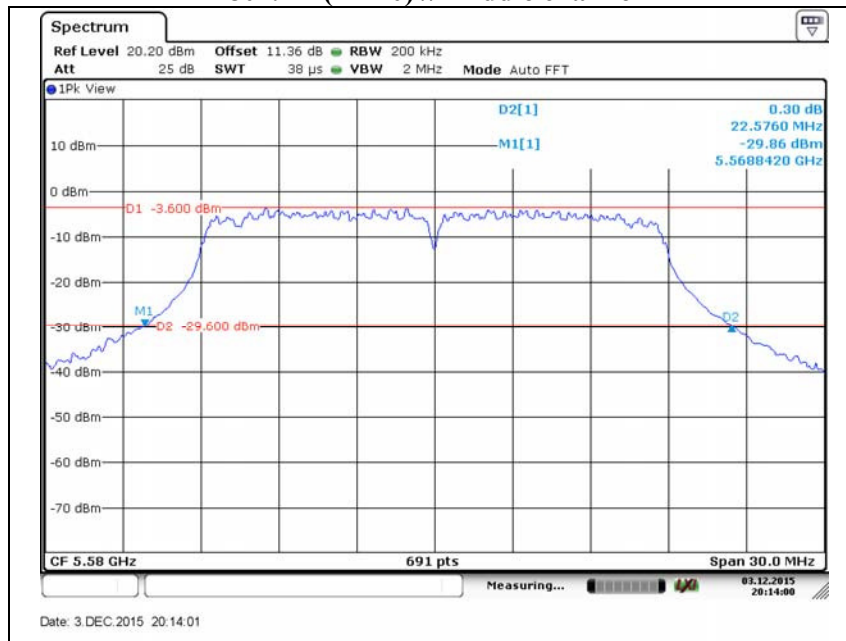
802.11a // High channel



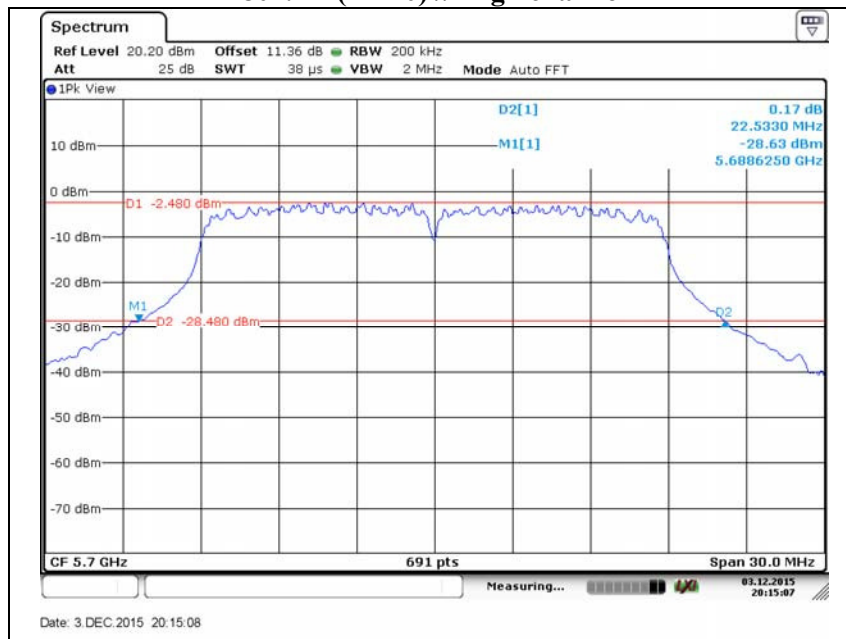
802.11n(HT20) // Low channel



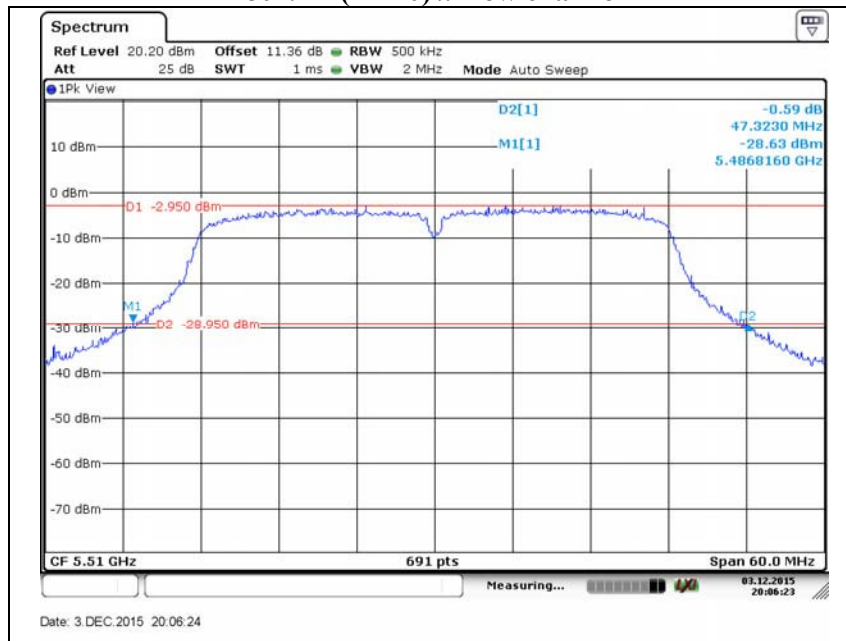
802.11n(HT20) // Middle channel



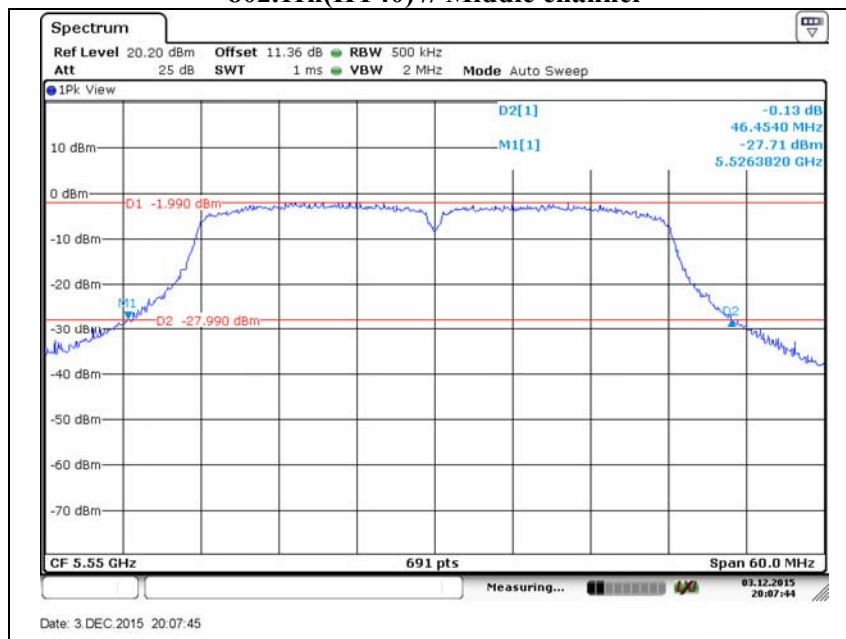
802.11n(HT20) // High channel



802.11n(HT40) // Low channel



802.11n(HT40) // Middle channel



802.11n(HT40) // High channel

