FCC - TEST REPORT

Report Number	:	**68.950.18.0407.01**	Date of Issue:	**September 25, 2018**
Model	:	**HCE001**		
Product Type	:	Hive View Outdoor		
Applicant	:	Centrica Hive Limited		
Address	:	Millstream, Maidenhead Road, Windsor, Berkshire SL4 5GD United Kingdom Of Great Britain And Northern Ireland		
Manufacturer	:	Centrica Hive Limited		
Address	:	Millstream, Maidenhead Road, Windsor, Berkshire SL4 5GD United Kingdom Of Great Britain And Northern Ireland		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**93**		

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1 Table of Contents

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	502708
IC Registration No:	10320A
Telephone:	86 755 8828 6998
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3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	Hive View Outdoor
Model no.:	HCE001
FCC ID:	WJHHCE001
Rating:	5Vdc, 2.5A supplied by an external adapter
Adapter information:	Adapter Model: HPA001 Adapter Input: 100-240Vac, 50/60Hz; 0.3A Adapter Output: 5.0Vdc, 2.5A
RF Transmission Frequency:	5.150GHz~5.250GHz; 5.250GHz~5.350GHz; 5.470GHz~5.725GHz; 5.725GHz~5.850GHz
Modulation:	802.11a: BPSK, QPSK, 16QAM, 64QAM 802.11n: BPSK, QPSK, 16QAM, 64QAM 802.11ac: BPSK, QPSK, 16QAM, 64QAM, 128QAM, 256QAM
Antenna Type:	Integral Antenna
Antenna Gain:	2.0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a wireless camera which support WiFi at 2.4GHz and 5GHz, Bluetooth function operated at 2.4GHz. Only 5GWiFi test data include in this report.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart E, 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart E - Unlicensed National Information Infrastructure Devices
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

Test Method:
FCC KDB 558074 D01 15.247 Meas Guidance v05
KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices

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5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart E, FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
15.207 Conducted Emission AC Power Port	10	☒	☐	☐
15.403(a)(5) Emission bandwidth	13	☒	☐	☐
15.407(a)(1) 15.407(a)(3) Maximum Conducted Output Power	17	☒	☐	☐
15.407(a)(1) 15.407(a)(3) Peak Power Spectral Density	20	☒	☐	☐
15.407(b)(1) 15.407(b)(4) 15.407(b)(6) 15.407(b)(7) 15.209 Unwanted Emissions	24	☒	☐	☐
Duty Cycle	80	☒	☐	☐
15.407(g) Frequencies Stability	82	☒	☐	☐
15.407(h) Dynamic Frequency Selection (DFS).[a]	85	☒	☐	☐

NOTE 1"[a]": This result include in this report is only the DFS client without radar detection Mode part of the product.

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6 General Remarks

Remarks
This submittal(s) (test report) is intended for FCC ID: WJHHCE001, complies with Section FCC Part 15 Subpart C Rules and FCC Part 15 Subpart E Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

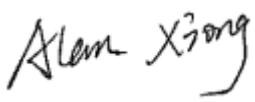
The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	August 20, 2018
Testing Start Date:	September 10, 2018
Testing End Date:	September 25, 2018

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch –

Reviewed by:	Prepared by:	Tested by:
		
John Zhi	Alan Xiong	Tree Zhan
Project Manager	Project Engineer	Test Engineer

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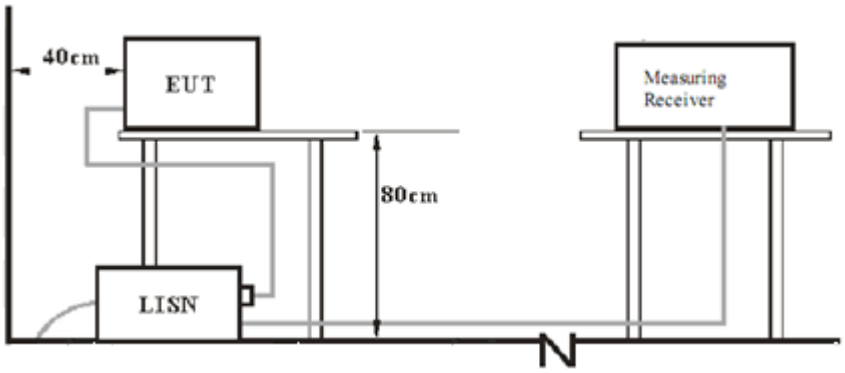
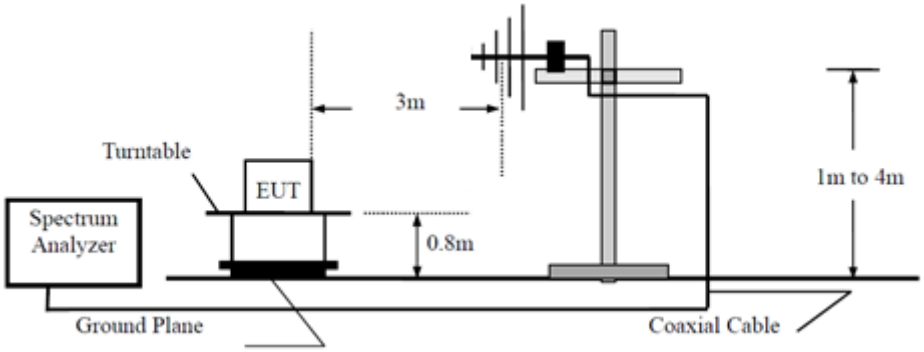
7 Test setups

7.1 AC Power Line Conducted Emission test setups

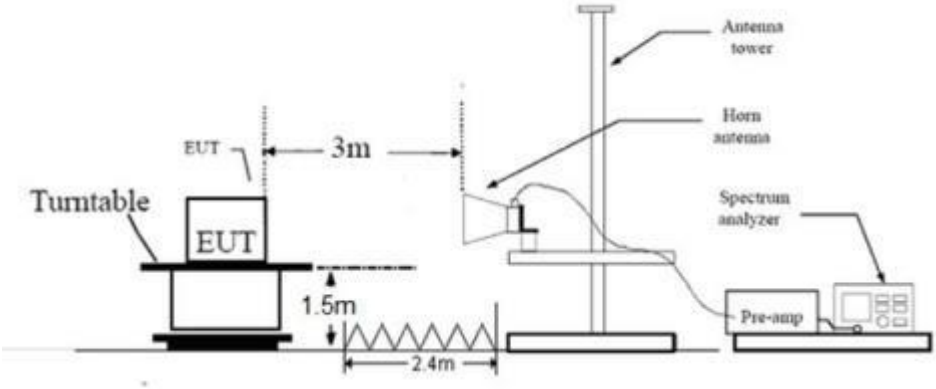


7.2 Radiated test setups

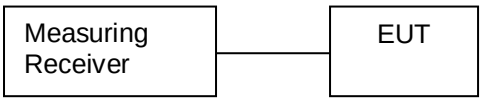
Below 1GHz



Above 1GHz



7.3 Conducted RF test setups



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8. Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
PC	Lenovo	X240	---

In order to find the worst case condition, pre-tests are needed at the presence of different date rate. Preliminary tests have been done on all the configuration for confirming worst case. Date rate below means worst-case rate of each test item.

Band	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac HT20	MCS0
802.11ac HT40	MCS0
802.11ac HT80	MCS0

The system was configured to the following channels

Modulation	Channel	Frequency (MHz)
802.11a / 802.11n20 / 802.11ac20	36	5180
	48	5240
	64	5320
	100	5500
	108	5540
	140	5700
	144	5720
	149	5745
	157	5785
	165	5825
802.11n40 / 802.11ac40	38	5190
	46	5230
	62	5310
	102	5510
	110	5550
	134	5670
	142	5710
	151	5755
	159	5795
802.11ac80	42	5210
	58	5290
	106	5530
	122	5610
	138	5690
	155	5775

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Remark: “*” Decreasing linearly with logarithm of the frequency

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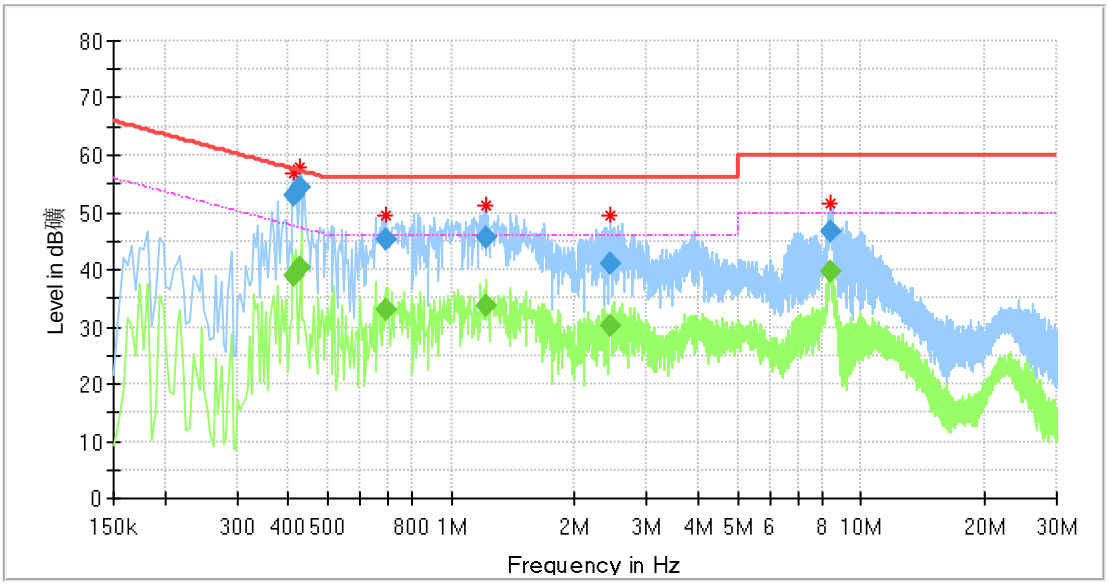
Conducted Emission

Product Type	:	Hive View Outdoor
M/N	:	HCE001
Operating Condition	:	normal working Mode with 5G WiFi traffic
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.413500	---	39.05	47.58	8.53	L1	OFF	10.3
0.413500	53.11	---	57.58	4.47	L1	OFF	10.3
0.425500	---	40.45	47.34	6.89	L1	OFF	10.3
0.425500	54.40	---	57.34	2.94	L1	OFF	10.3
0.689500	---	32.81	46.00	13.19	L1	OFF	10.3
0.689500	45.25	---	56.00	10.75	L1	OFF	10.3
1.218500	---	33.67	46.00	12.33	L1	OFF	10.3
1.218500	45.72	---	56.00	10.28	L1	OFF	10.3
2.438500	---	30.09	46.00	15.91	L1	OFF	10.4
2.438500	41.08	---	56.00	14.92	L1	OFF	10.4
8.442500	---	39.57	50.00	10.43	L1	OFF	10.6
8.442500	46.78	---	60.00	13.22	L1	OFF	10.6

*Correct factor=cable loss + LISN factor

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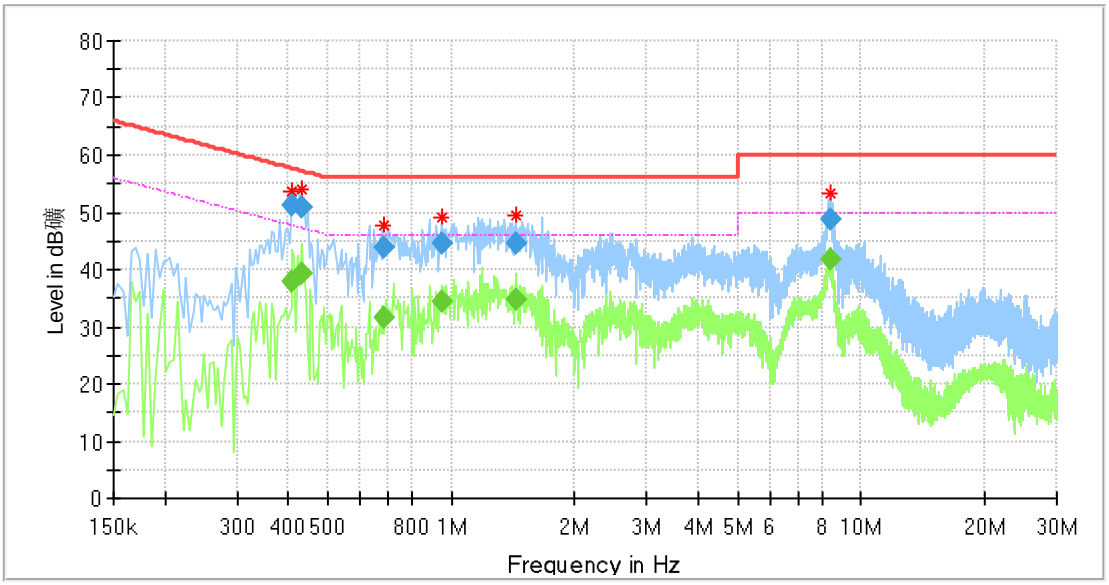
Conducted Emission

Product Type	:	Hive View Outdoor
M/N	:	HCE001
Operating Condition	:	normal working Mode with 5G WiFi traffic
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.409500	---	37.97	47.66	9.69	N	OFF	10.3
0.409500	51.24	---	57.66	6.42	N	OFF	10.3
0.430500	---	39.27	47.24	7.97	N	OFF	10.3
0.430500	50.95	---	57.24	6.29	N	OFF	10.3
0.681500	---	31.74	46.00	14.26	N	OFF	10.3
0.681500	43.86	---	56.00	12.14	N	OFF	10.3
0.945500	---	34.45	46.00	11.55	N	OFF	10.3
0.945500	44.39	---	56.00	11.61	N	OFF	10.3
1.438500	---	34.67	46.00	11.33	N	OFF	10.3
1.438500	44.65	---	56.00	11.35	N	OFF	10.3
8.429500	---	41.82	50.00	8.18	N	OFF	10.7
8.429500	48.88	---	60.00	11.12	N	OFF	10.7

*Correct factor=cable loss + LISN factor

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9.2 Emission bandwidth

1、Test Method of 26dB Bandwidth

According to KDB789033 D02
a) Set RBW = approximately 1% of the emission bandwidth.
b) Set the VBW > RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Limit: No limit

2、Test Method of 6dB Bandwidth

According to KDB789033 D02
a) Set RBW = 100KHz
b) Set the video bandwidth (VBW) ≥ 3 × 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.

Limit: ≥500KHz

3、Test Method of 99% Bandwidth

According to KDB789033 D02
a) Set center frequency to the nominal EUT channel center frequency
b) Set span = 1.5 times to 5.0 times the OBW.
c) Set RBW = 1 % to 5 % of the OBW
d) Set VBW ≥ 3 · RBW
e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f) Use the 99 % power bandwidth function of the instrument (if available).
g) If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Limit: No limit

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Test result as below table:

IEEE 802.11a modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
5.2G Band	Low	5180	16.943	20.520	N/A
	Middle	5240	16.943	20.440	N/A
	High	5320	16.943	20.400	N/A
5.5G Band	Low	5500	16.903	20.400	N/A
	Middle	5540	16.903	20.480	N/A
	High	5700	16.943	20.440	N/A
		5720	16.943	20.320	N/A
		5720_UNII-2C	13.432	15.08	N/A
5.8G Band	Low	5720_UNII-3	3.511	5.24	3.56
	Middle	5745	16.943	N/A	16.360
		5785	16.400	N/A	17.023
	High	5825	16.983	N/A	16.360

IEEE 802.11n-HT20 modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
5.2G Band	Low	5180	18.302	21.320	N/A
	Middle	5240	18.342	20.960	N/A
	High	5320	18.302	21.080	N/A
5.5G Band	Low	5500	18.342	21.200	N/A
	Middle	5540	18.382	21.240	N/A
	High	5700	18.342	21.160	N/A
		5720	18.382	21.280	N/A
		5720_UNII-2C	14.151	15.68	N/A
5.8G Band	Low	5720_UNII-3	4.231	5.6	3.88
	Middle	5745	18.302	N/A	17.720
		5785	18.342	N/A	17.760
	High	5825	18.382	N/A	17.760

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IEEE 802.11n-HT40 modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
5.2G Band	Low	5190	36.683	39.840	N/A
	Middle	5230	36.702	39.880	N/A
	High	5310	36.603	39.920	N/A
5.5G Band	Low	5510	36.603	39.840	N/A
	Middle	5550	36.668	39.910	N/A
	High	5670	36.683	39.920	N/A
		5710	36.683	39.840	N/A
		5710_UNII-2C	33.222	34.92	N/A
5.8G Band	Low	5710_UNII-3	3.4620	4.92	3.92
	Middle	5755	36.683	N/A	36.560
	High	5795	36.603	N/A	36.560

IEEE 802.1ac-VHT20 modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
5.2G Band	Low	5180	18.941	24.680	N/A
	Middle	5240	19.061	22.640	N/A
	High	5320	18.941	21.640	N/A
5.5G Band	Low	5500	18.901	21.880	N/A
	Middle	5540	18.901	22.160	N/A
	High	5700	18.941	21.680	N/A
		5720	19.021	23.080	N/A
		5720_UNII-2C	14.51	16.64	N/A
5.8G Band	Low	5720_UNII-3	4.51	6.44	3.80
	Middle	5745	18.981	N/A	17.640
		5785	18.981	N/A	17.360
	High	5825	18.941	N/A	17.600

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IEEE 802.1ac-VHT40 modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
5.2G Band	Low	5190	36.683	39.840	N/A
	Middle	5230	36.603	39.760	N/A
	High	5310	36.603	39.920	N/A
5.5G Band	Low	5510	36.603	39.840	N/A
	Middle	5550	36.683	39.920	N/A
	High	5670	36.683	39.920	N/A
		5710	36.683	39.840	N/A
		5710_UNII-2C	33.222	34.92	N/A
5.8G Band	Low	5710_UNII-3	3.462	4.92	3.90
	Middle	5755	36.683	N/A	36.560
	High	5795	36.603	N/A	36.560

IEEE 802.1ac-VHT80 modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
5.2G Band	Low	5210	76.244	81.920	N/A
	High	5290	76.084	81.920	N/A
5.5G Band	Low	5530	76.244	81.920	N/A
	High	5610	76.244	81.600	N/A
5.8G Band	155	5775	76.244	N/A	75.520

Remark: “N/A” means “Not Applicable”

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9.3 Maximum conducted output power

Test Method
According to KDB789033 D02

Limits: For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.
For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26dB emission bandwidth in megahertz.
For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

Test result as below table

IEEE 802.11a modulation Test Result

Band	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Power Limit (dBm)
5.2G Band	Low	5180	19.1	24.00
	Middle	5240	19.5	24.00
	High	5320	19.7	24.00
5.5G Band	Low	5500	20.3	24.00
	Middle	5540	20.4	24.00
	High	5700	20.8	24.00
		5720	20.7	24.00
5.8G Band	Low	5745	20.8	30.00
	Middle	5785	20.7	30.00
	High	5825	20.7	30.00

IEEE 802.11n-HT20 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Power Limit (dBm)
5.2G Band	Low	5180	17.6	24.00
	Middle	5240	18.0	24.00
	High	5320	18.2	24.00
5.5G Band	Low	5500	18.7	24.00
	Middle	5540	19.1	24.00
	High	5700	19.2	24.00
		5720	19.2	24.00
5.8G Band	Low	5745	19.3	30.00

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	Middle	5785	19.2	30.00
	High	5825	19.2	30.00

IEEE 802.11n-HT40 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Power Limit (dBm)
5.2G Band	Low	5190	17.7	24.00
	Middle	5230	17.3	24.00
	High	5310	17.6	24.00
5.5G Band	Low	5510	19.3	24.00
	Middle	5550	19.3	24.00
	High	5670	20.1	24.00
		5710	20.1	24.00
5.8G Band	Low	5755	20.0	30.00
	High	5795	20.1	30.00

IEEE 802.11ac-VHT20 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Power Limit (dBm)
5.2G Band	Low	5180	18.2	24.00
	Middle	5240	18.2	24.00
	High	5320	18.3	24.00
5.5G Band	Low	5500	19.7	24.00
	Middle	5540	20.3	24.00
	High	5700	20.8	24.00
		5720	20.6	24.00
5.8G Band	Low	5745	20.6	30.00
	Middle	5785	20.8	30.00
	High	5825	20.8	30.00

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IEEE 802.11ac-VHT40 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Power Limit (dBm)
5.2G Band	Low	5190	18.2	24.00
	Middle	5230	18.2	24.00
	High	5310	18.2	24.00
5.5G Band	Low	5510	19.8	24.00
	Middle	5550	20.3	24.00
	High	5670	20.6	24.00
		5710	20.5	24.00
5.8G Band	Low	5755	20.7	30.00
	High	5795	20.8	30.00

IEEE 802.11ac-VHT80 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Power Limit (dBm)
5.2G Band	Low	5210	18.1	24.00
	High	5290	18.1	24.00
5.5G Band	Low	5530	19.9	24.00
	High	5610	20.5	24.00
5.8G Band	155	5775	20.5	30.00

Remark: the 11 dBm + 10 log B is greater than 250mW.

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9.4 Maximum power spectral density

Test Method

According to KDB789033 D02

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in section II.B.I.a).

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.

e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

Limit: The maximum power spectral density shall not exceed 11dBm for the 5.15-5.25GHz, 5.25-5.35GHz, 5.47-5.725 GHz Band and 30dBm for the 5.8GHz Band in any 1 megahertz band.

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IEEE 802.11a modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
5.2G Band	Low	5180	7.61	11.00
	Middle	5240	7.86	11.00
	High	5320	9.93	11.00
5.5G Band	Low	5500	10.46	11.00
	Middle	5540	10.13	11.00
	High	5700	10.89	11.00
		5720_UNII-2C	5.7	11.00
5.8G Band	Low	5720_UNII-3	4.17	30.00
		5745	8.38	30.00
	Middle	5785	8.09	30.00
	High	5825	8.88	30.00

IEEE 802.11n-HT20 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
5.2G Band	Low	5180	7.37	11.00
	Middle	5240	7.55	11.00
	High	5320	9.31	11.00
5.5G Band	Low	5500	10.24	11.00
	Middle	5540	9.18	11.00
	High	5700	10.59	11.00
		5720_UNII-2C	5.56	11.00
5.8G Band	Low	5720_UNII-3	4.01	30.00
		5745	8.2	30.00
	Middle	5785	8.11	30.00
	High	5825	8.75	30.00

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IEEE 802.11n-HT40 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
5.2G Band	Low	5190	6.52	11.00
	Middle	5230	6.83	11.00
	High	5310	7.78	11.00
5.5G Band	Low	5510	9.38	11.00
	Middle	5550	9.12	11.00
	High	5670	9.22	11.00
		5710_UNII-2C	4.58	11.00
5.8G Band	Low	5710_UNII-3	3.54	11.00
		5755	7.22	30.00
	High	5795	6.64	30.00

IEEE 802.11ac-VHT20 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
5.2G Band	Low	5180	6.99	11.00
	Middle	5240	7.5	11.00
	High	5320	8.5	11.00
5.5G Band	Low	5500	9.13	11.00
	Middle	5540	9.01	11.00
	High	5700	9.66	11.00
		5720_UNII-2C	5.5	11.00
5.8G Band	Low	5720_UNII-3	5.03	30.00
		5745	7.9	30.00
	Middle	5785	6.94	30.00
	High	5825	8.06	30.00

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IEEE 802.11ac-VHT40 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
5.2G Band	Low	5190	6.52	11.00
	Middle	5230	6.53	11.00
	High	5310	7.78	11.00
5.5G Band	Low	5510	9.38	11.00
	Middle	5550	9.32	11.00
	High	5670	9.22	11.00
		5710_UNII-2C	4.58	11.00
5.8G Band	Low	5710_UNII-3	3.54	11.00
		5755	7.22	30.00
	High	5795	6.64	30.00

IEEE 802.11ac-VHT80 modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
5.2G Band	Low	5210	4.19	11.00
	High	5290	5.52	11.00
5.5G Band	Low	5530	6.68	11.00
	High	5610	5.67	11.00
5.8G Band	155	5775	4.28	30.00

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9.5 Unwanted emissions

Test Method
According to KBD789033 D02

Limits:
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.
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.
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.
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.

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.
The provisions of §15.205 apply to intentional radiators operating under this section.

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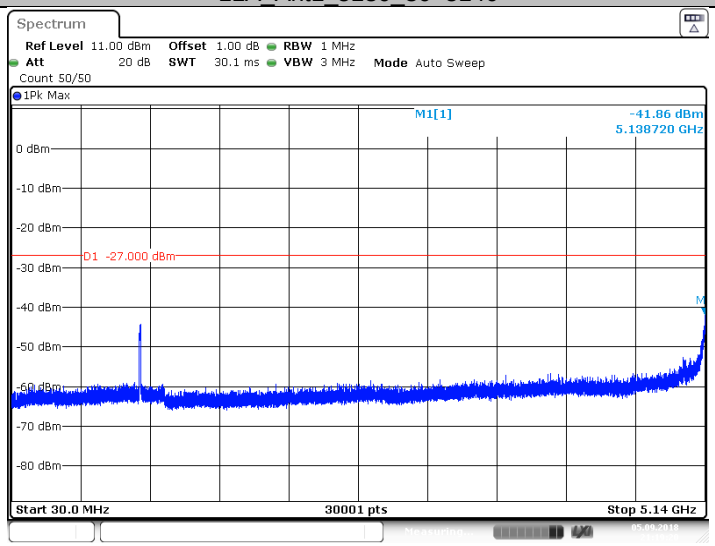
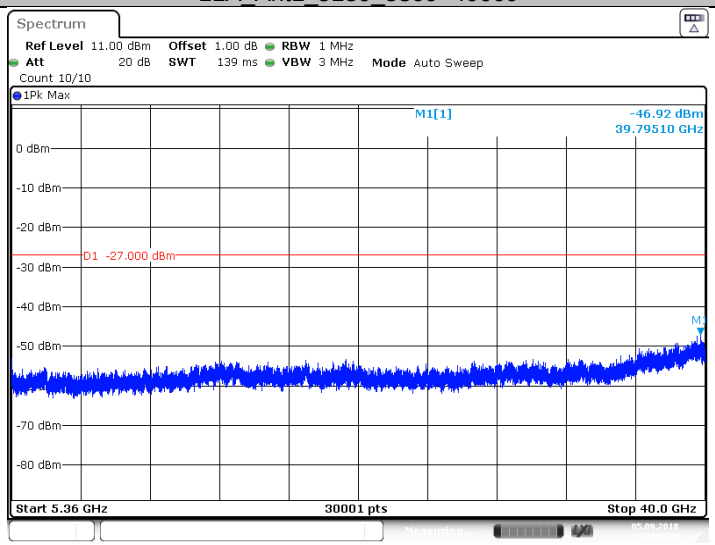
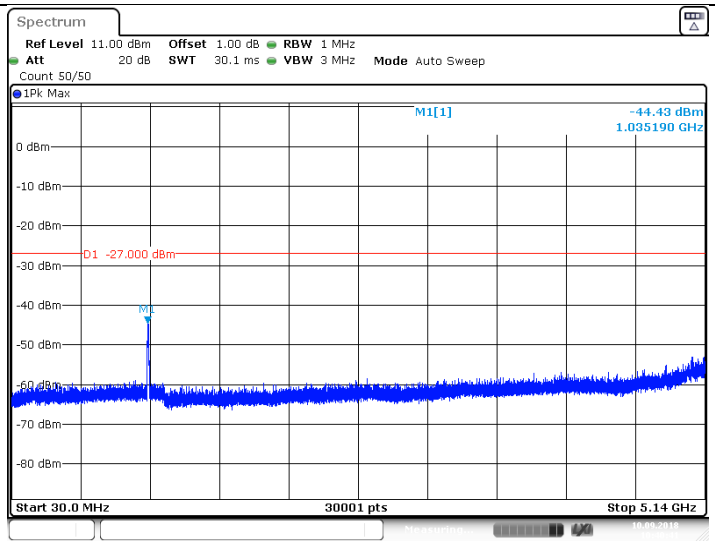
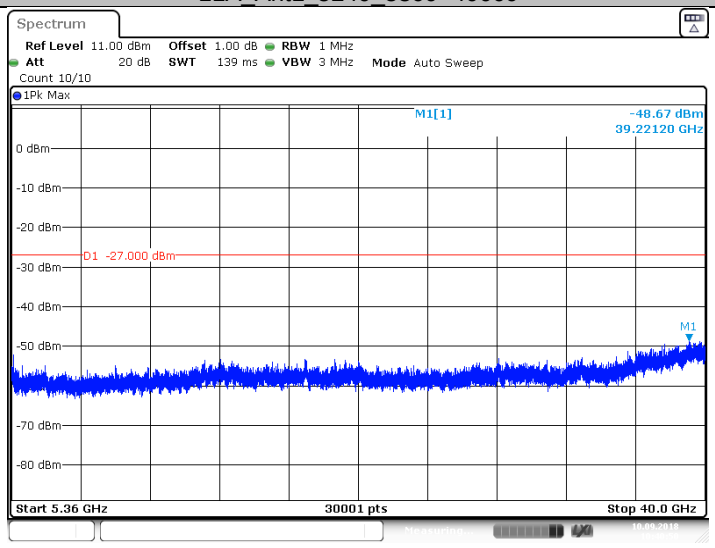
Transmitting spurious emission test result as below (Conducted Mode):

IEEE 802.11a modulation Test Result

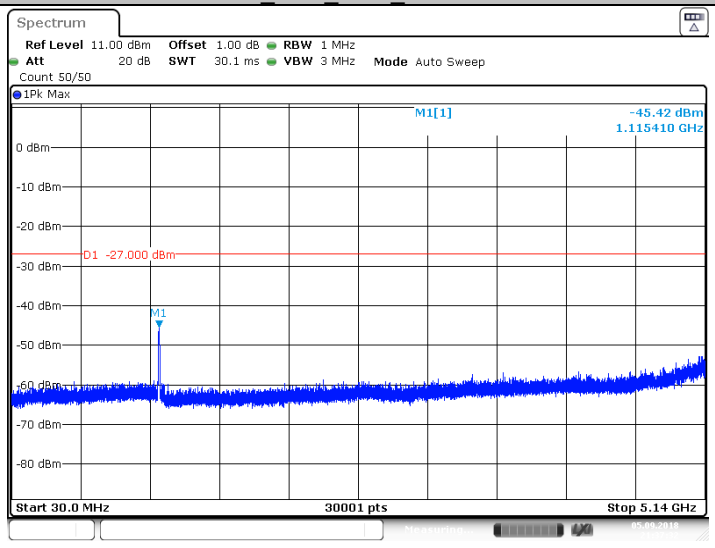
11A_Ant1_5180_30~5140

11A_Ant1_5180_5360~40000

11A_Ant1_5240_30~5140



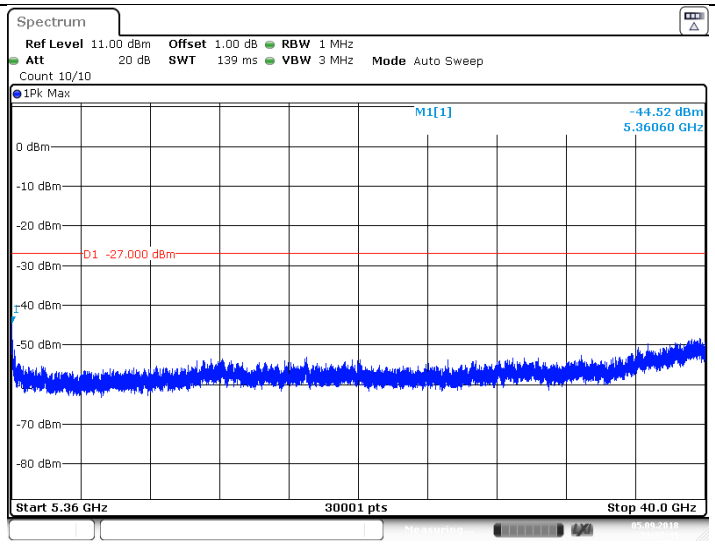
11A_Ant1_5240_5360~40000



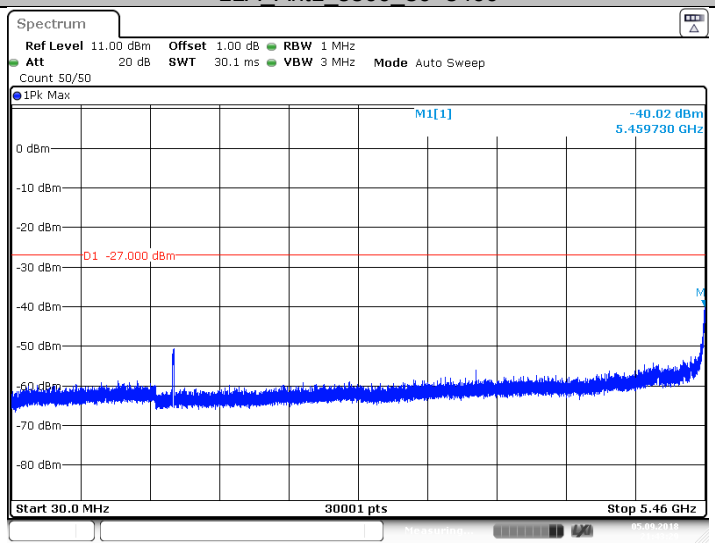
11A_Ant1_5320_30~5140



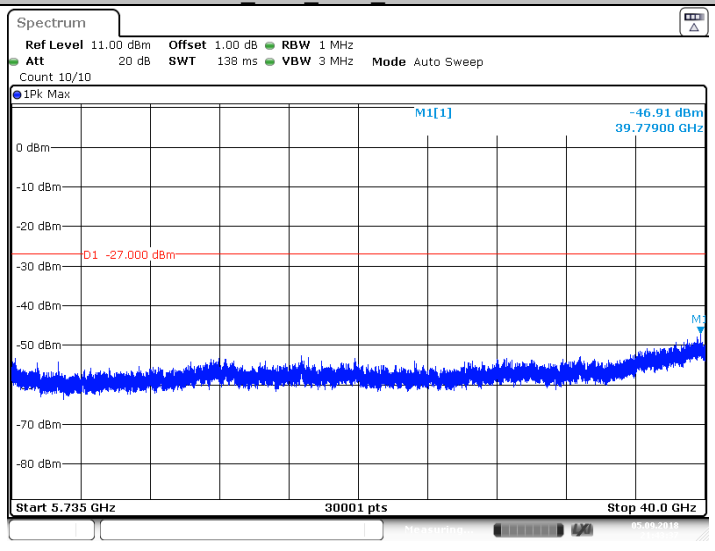
11A_Ant1_5320_5360~40000



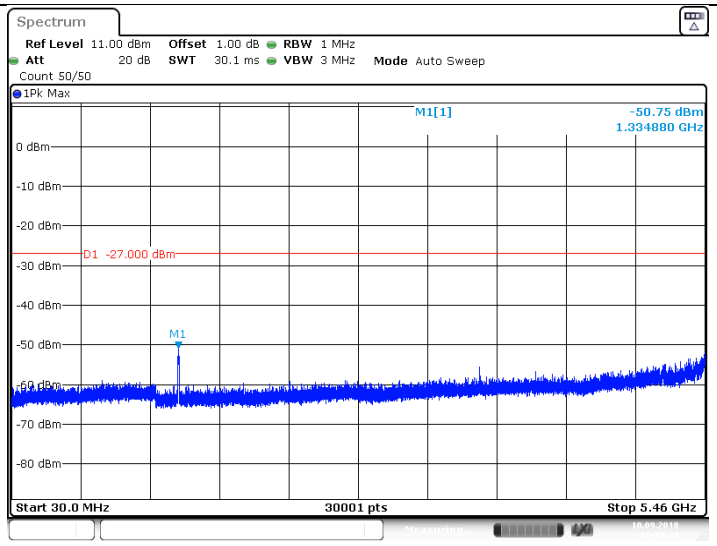
11A_Ant1_5500_30~5460



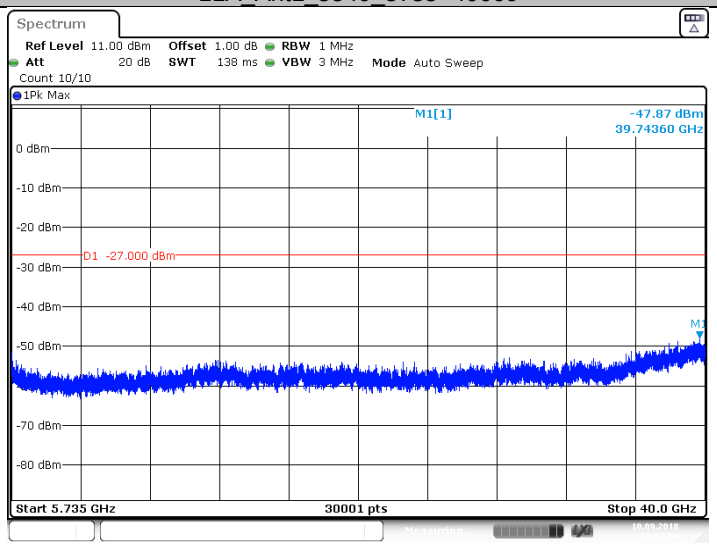
11A_Ant1_5500_5735~40000



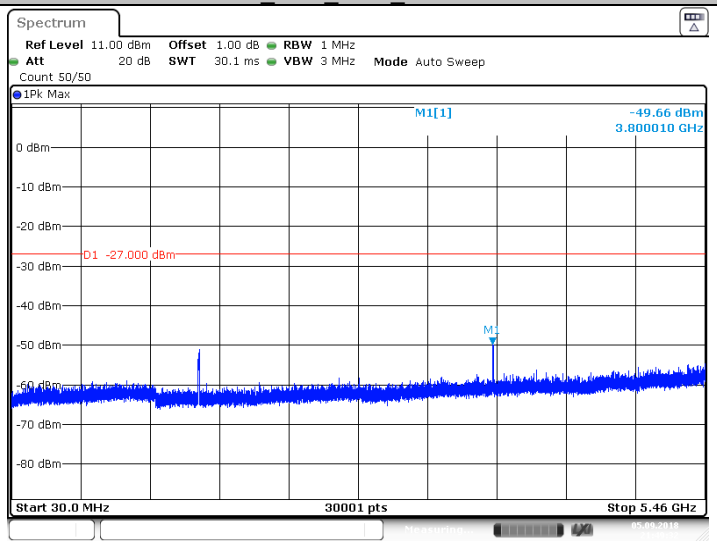
11A_Ant1_5540_30~5460



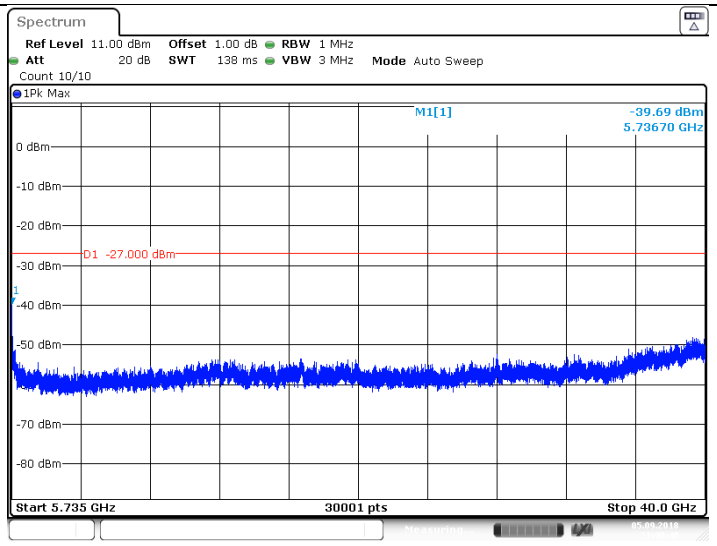
11A_Ant1_5540_5735~40000



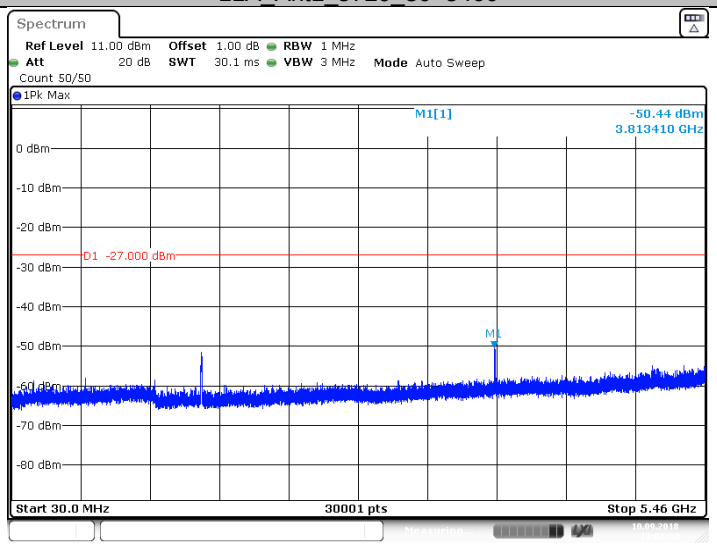
11A_Ant1_5700_30~5460



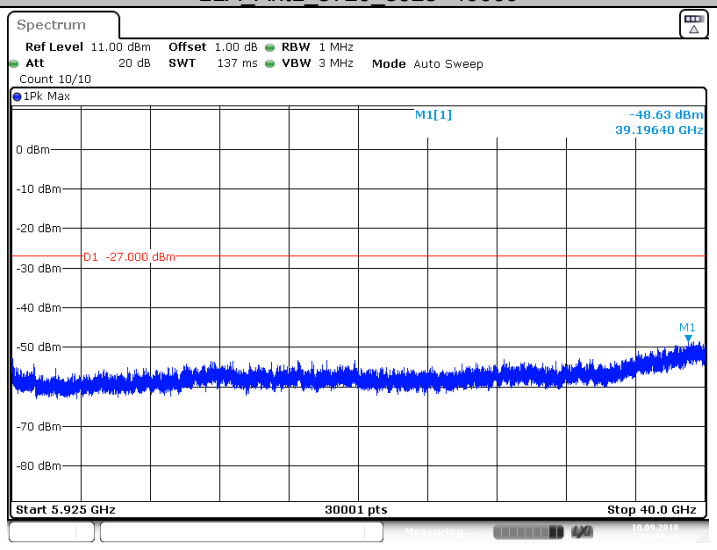
11A_Ant1_5700_5735~40000



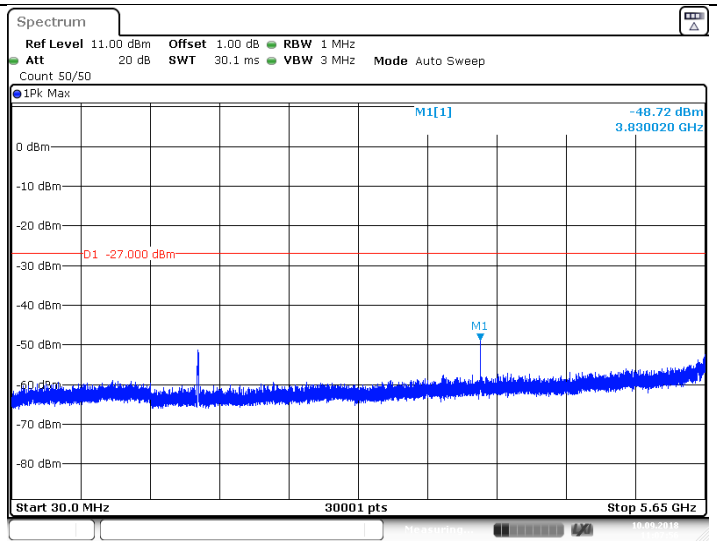
11A_Ant1_5720_30~5460



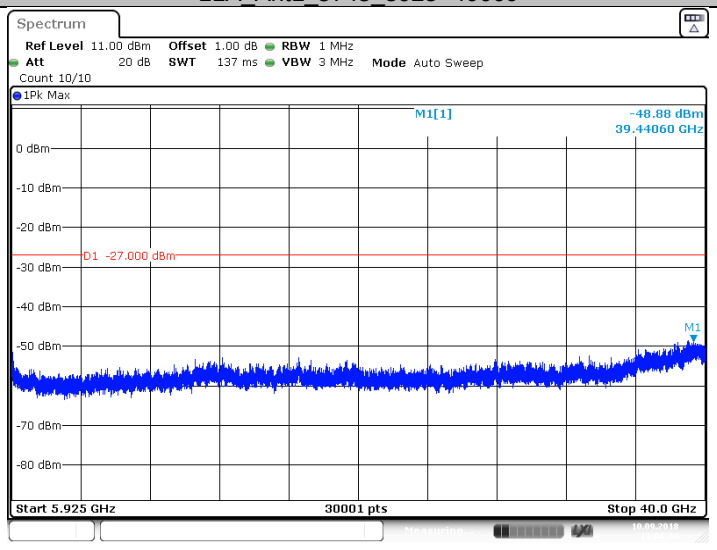
11A_Ant1_5720_5925~40000



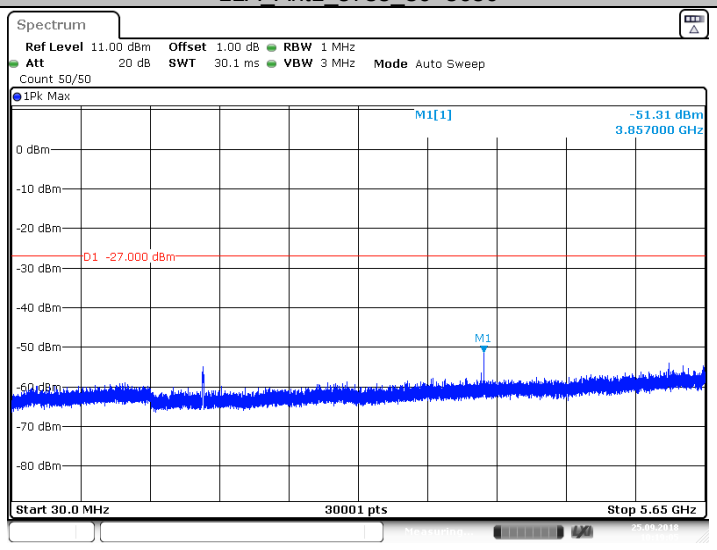
11A_Ant1_5745_30~5650



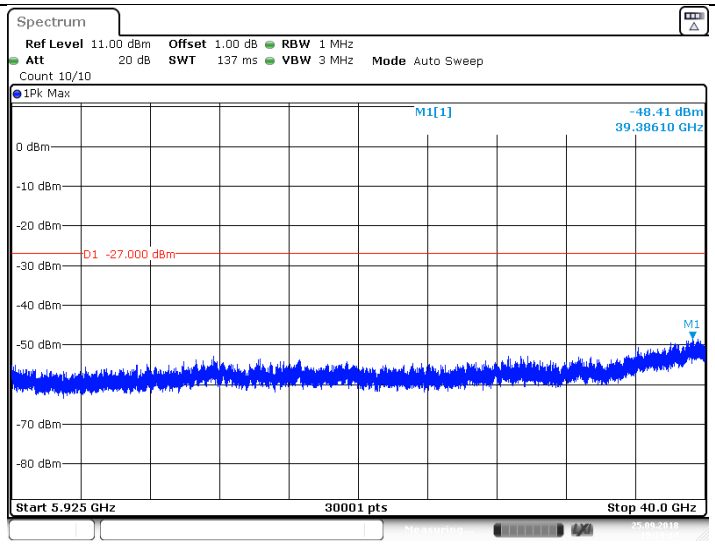
11A_Ant1_5745_5925~40000



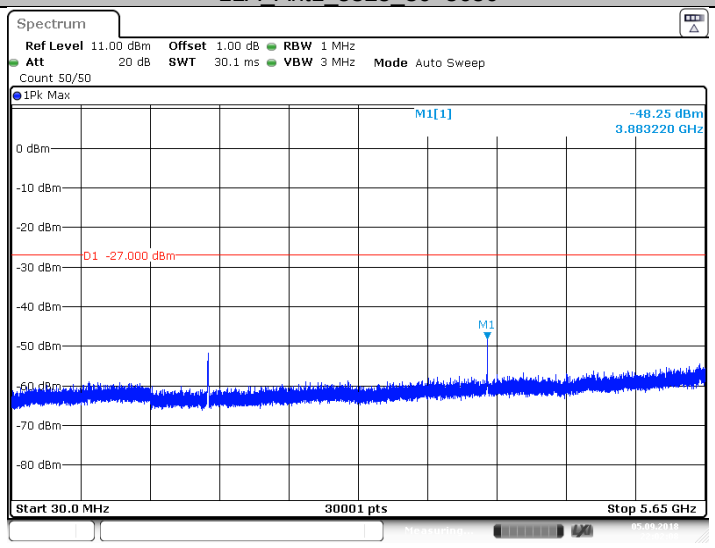
11A_Ant1_5785_30~5650



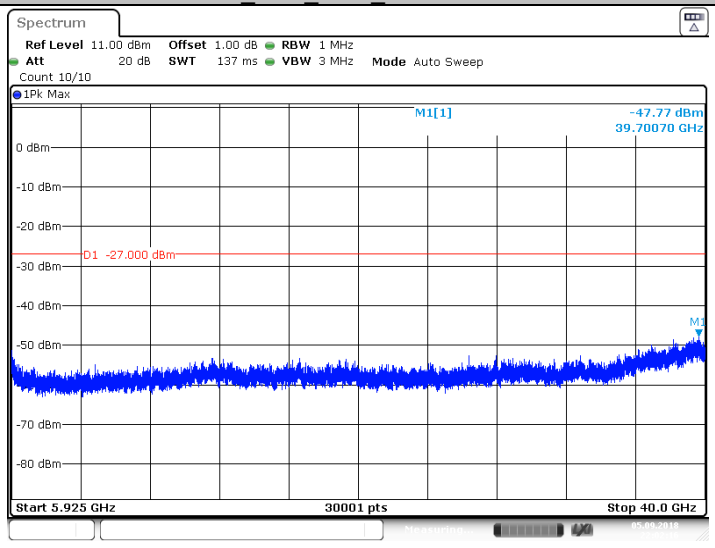
11A_Ant1_5785_5925~40000



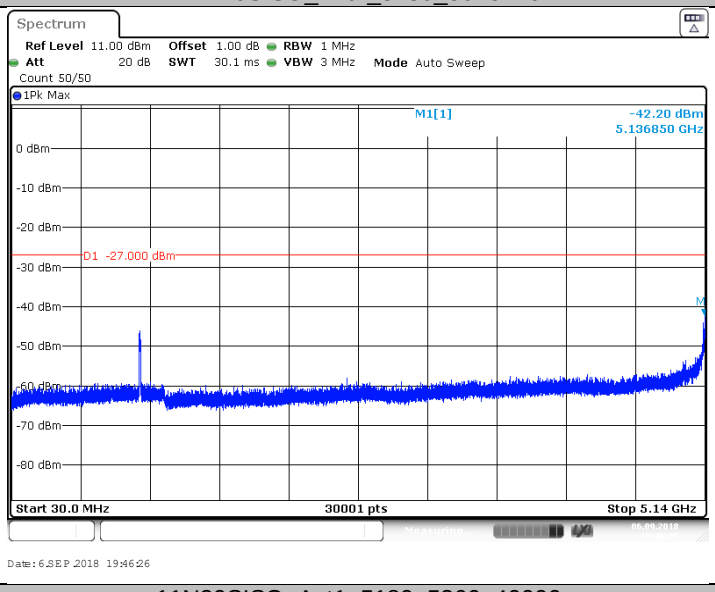
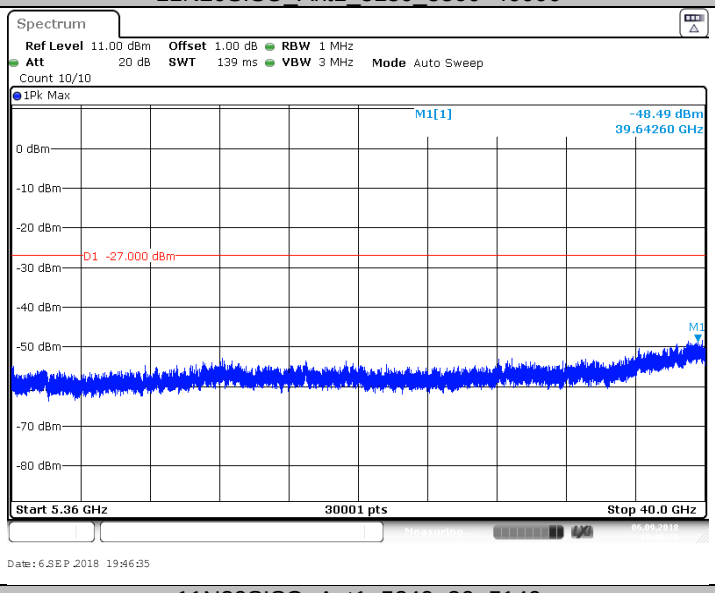
11A_Ant1_5825_30~5650

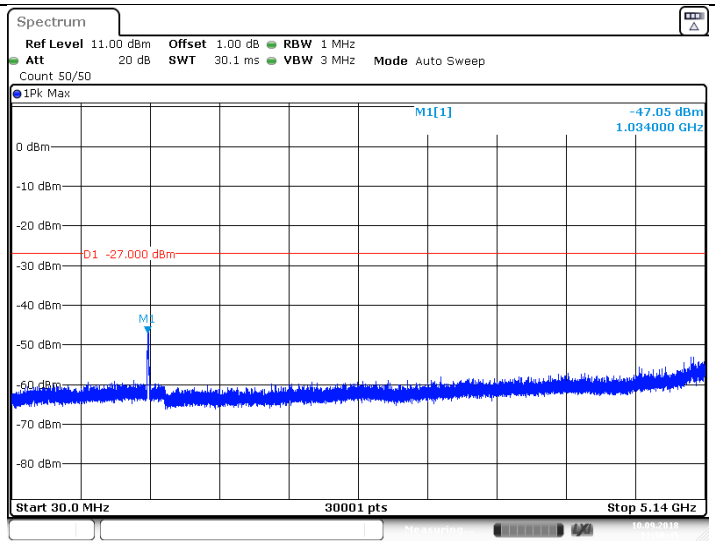


11A_Ant1_5825_5925~40000

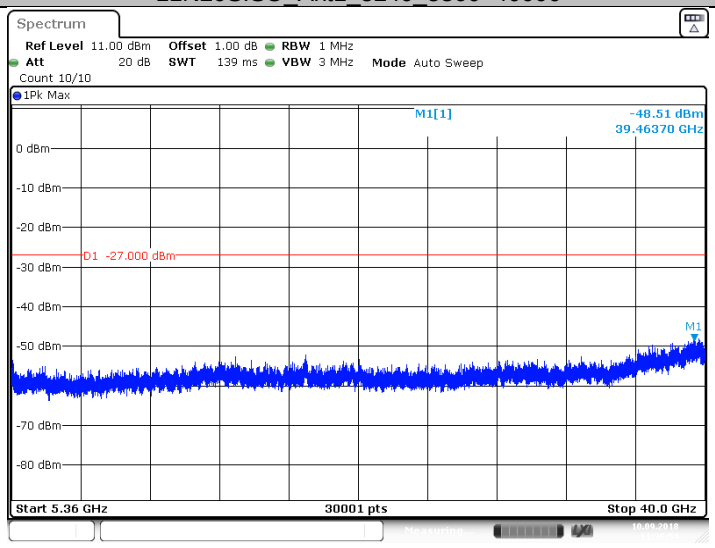


IEEE 802.11n-HT20 modulation Test Result

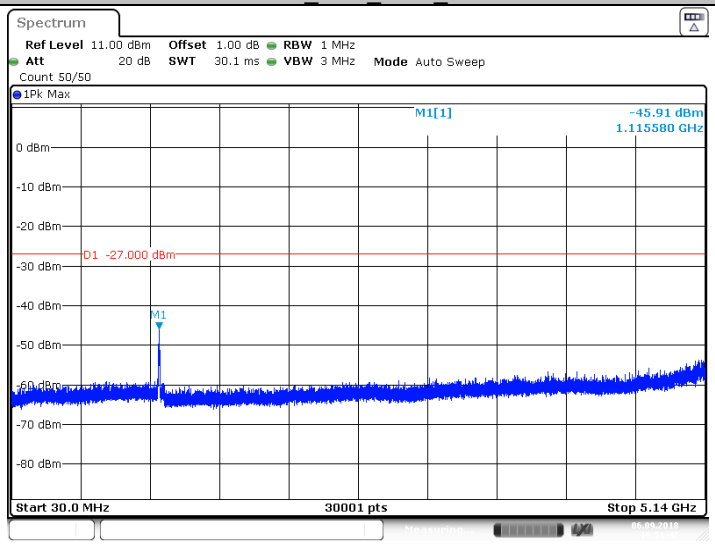
11N20SISO_Ant1_5180_30~5140

11N20SISO_Ant1_5180_5360~40000

11N20SISO_Ant1_5240_30~5140



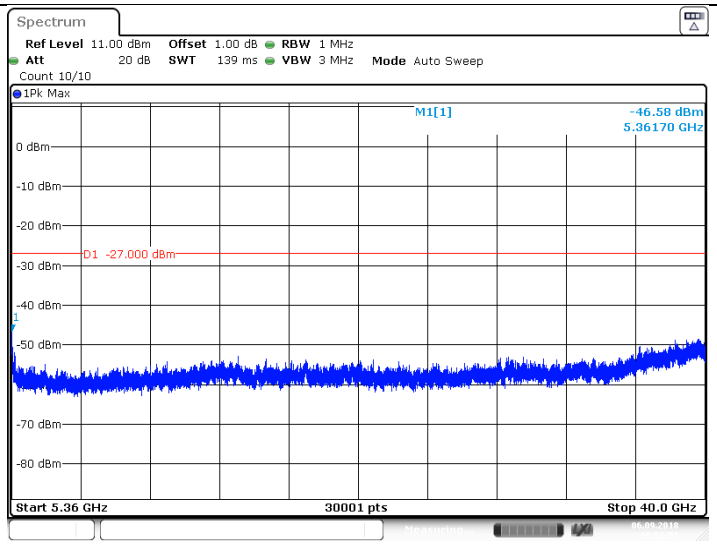
11N20SISO_Ant1_5240_5360~40000



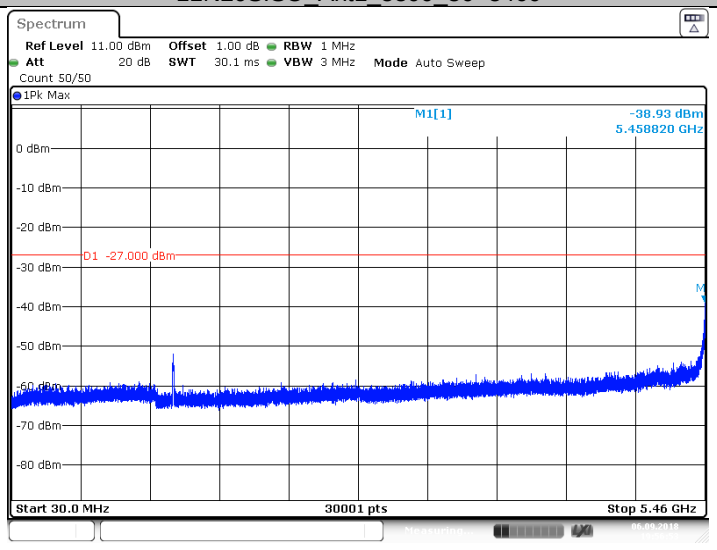
11N20SISO_Ant1_5320_30~5140



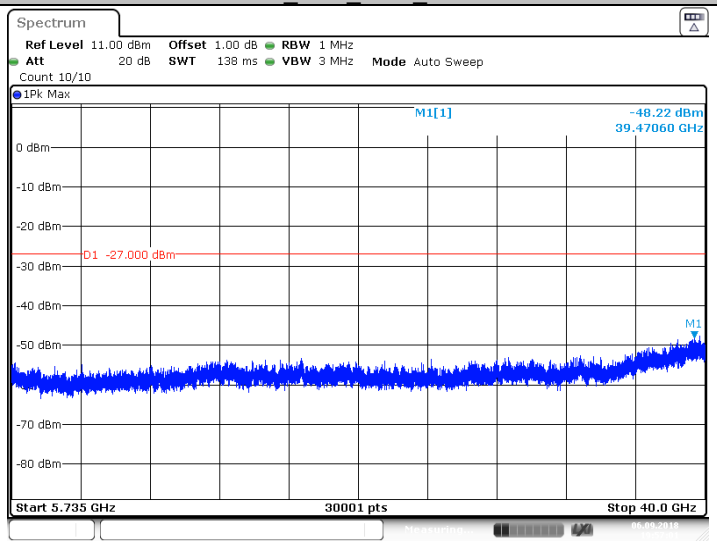
11N20SISO_Ant1_5320_5360~40000



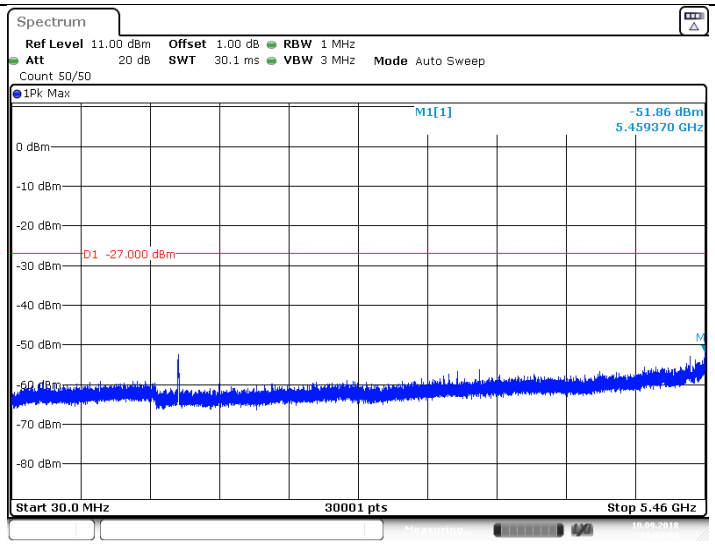
11N20SISO_Ant1_5500_30~5460



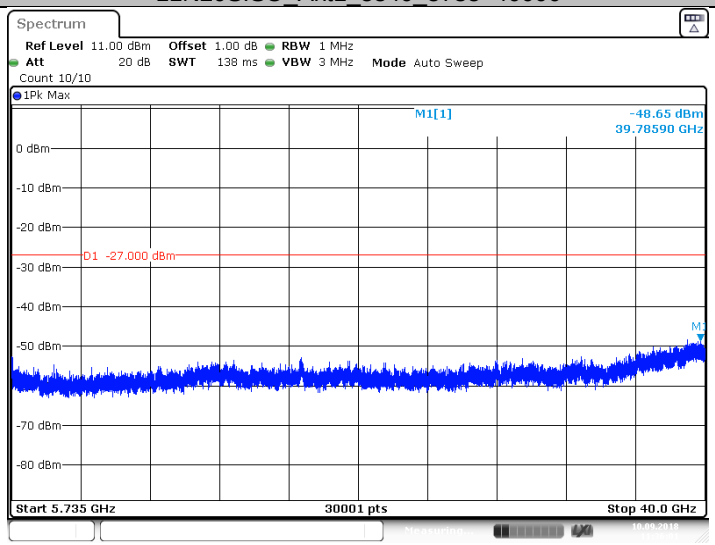
11N20SISO_Ant1_5500_5735~40000



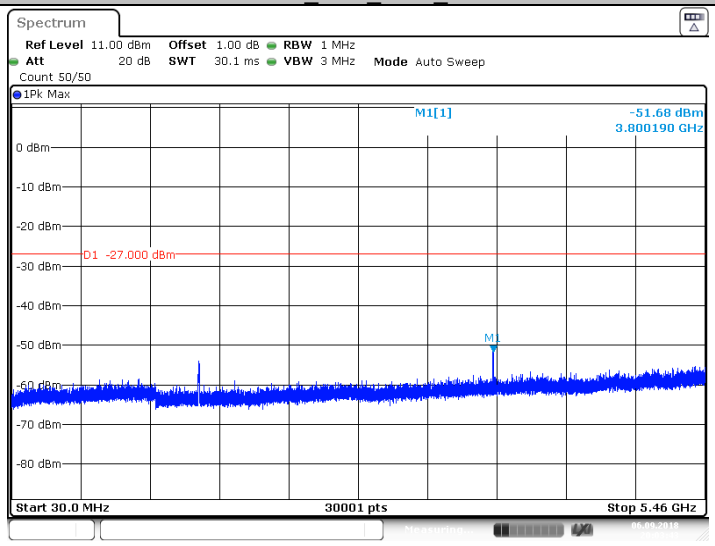
11N20SISO_Ant1_5540_30~5460



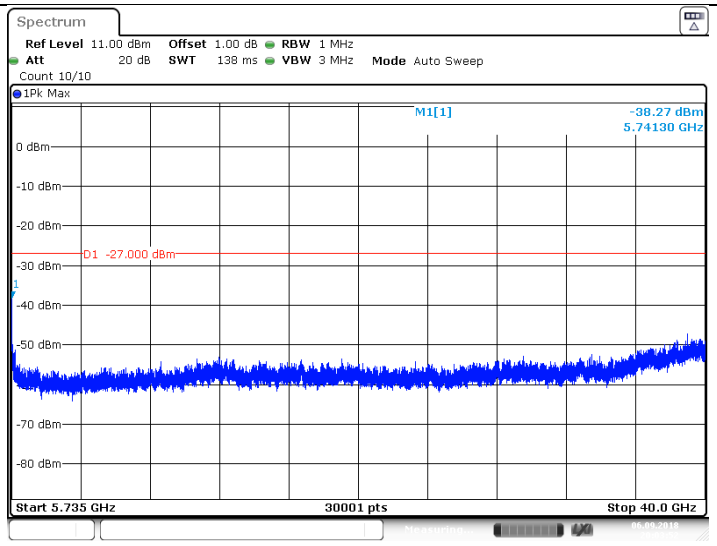
11N20SISO_Ant1_5540_5735~40000



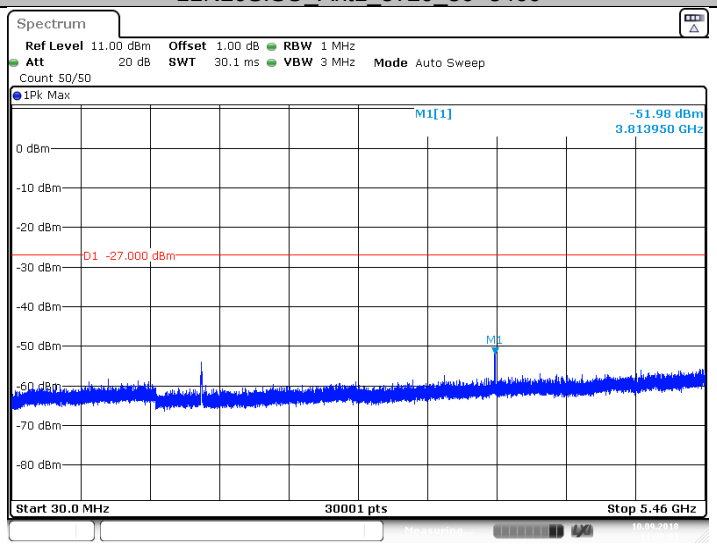
11N20SISO_Ant1_5700_30~5460



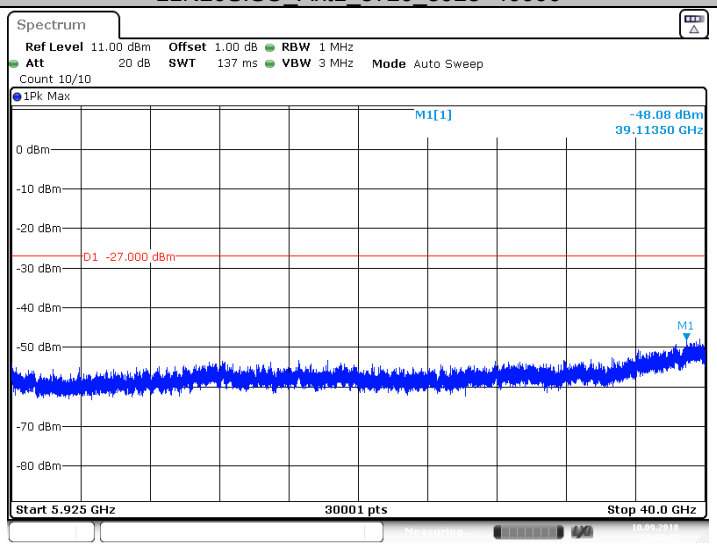
11N20SISO_Ant1_5700_5735~40000



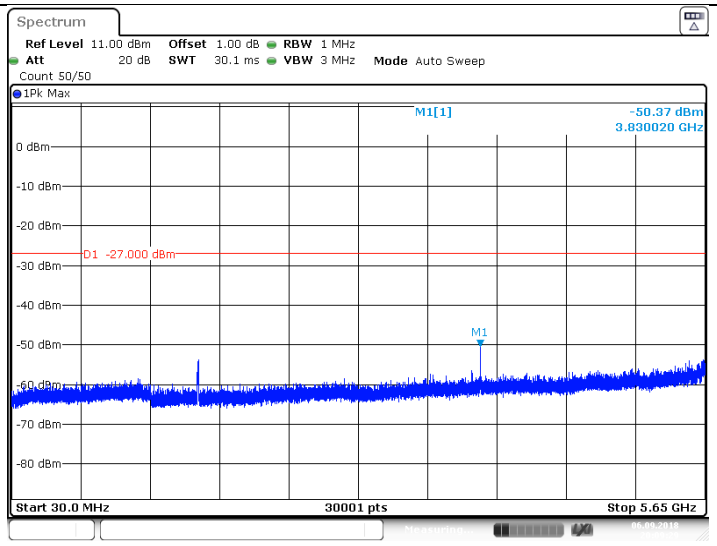
11N20SISO_Ant1_5720_30~5460



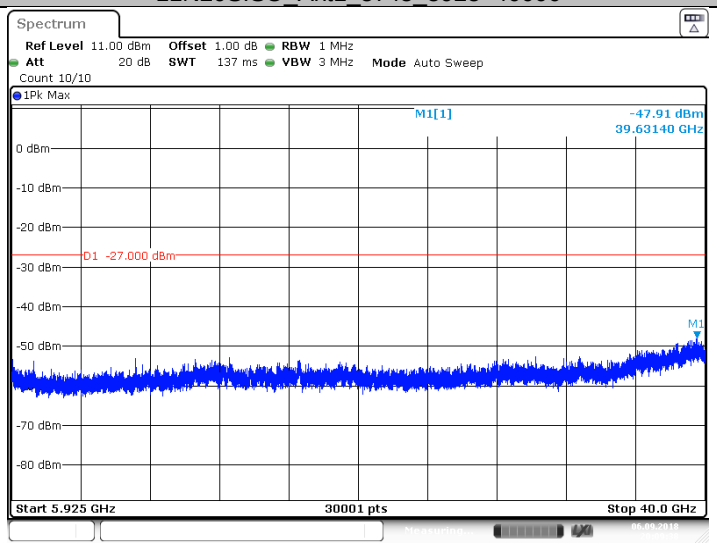
11N20SISO_Ant1_5720_5925~40000



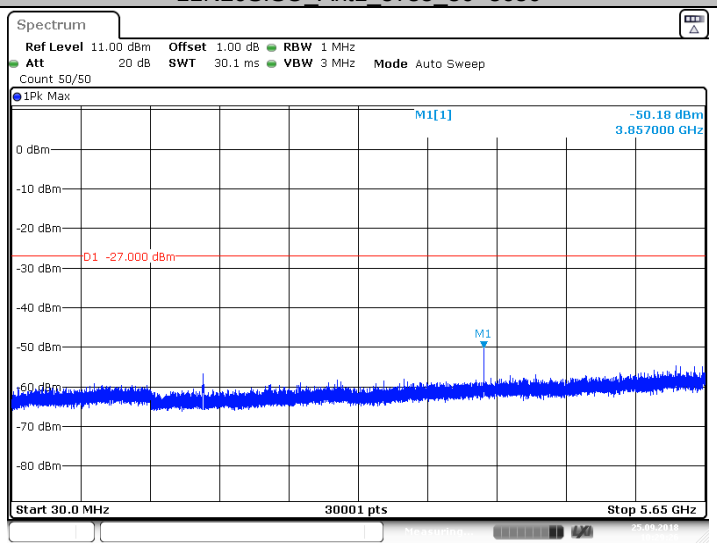
11N20SISO_Ant1_5745_30~5650



11N20SISO_Ant1_5745_5925~40000



11N20SISO_Ant1_5785_30~5650



11N20SISO_Ant1_5785_5925~40000

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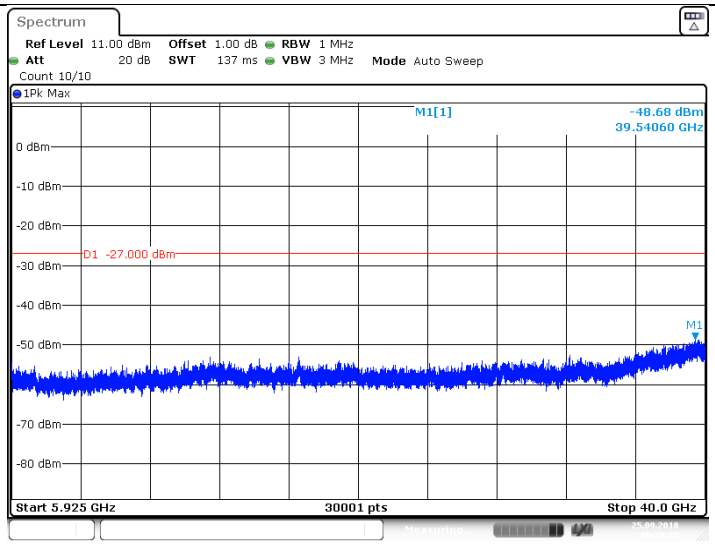
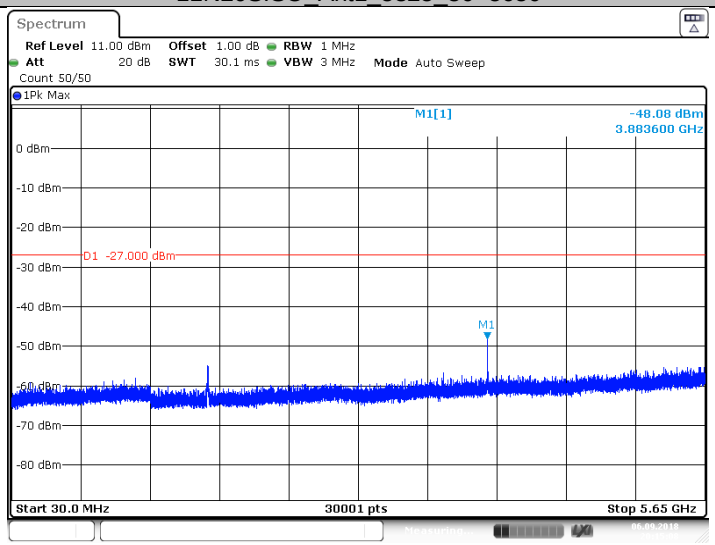
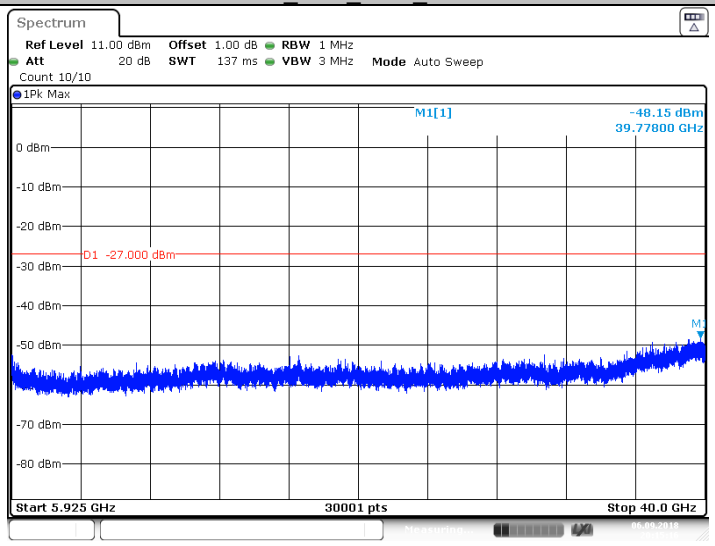


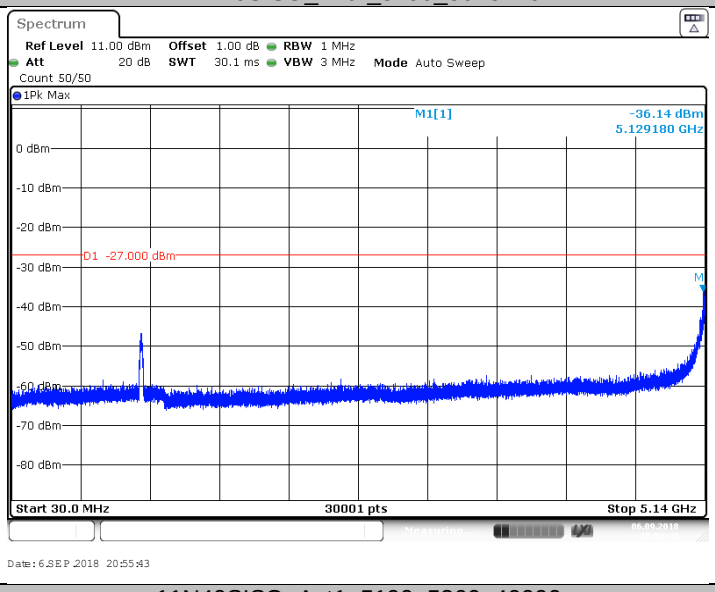
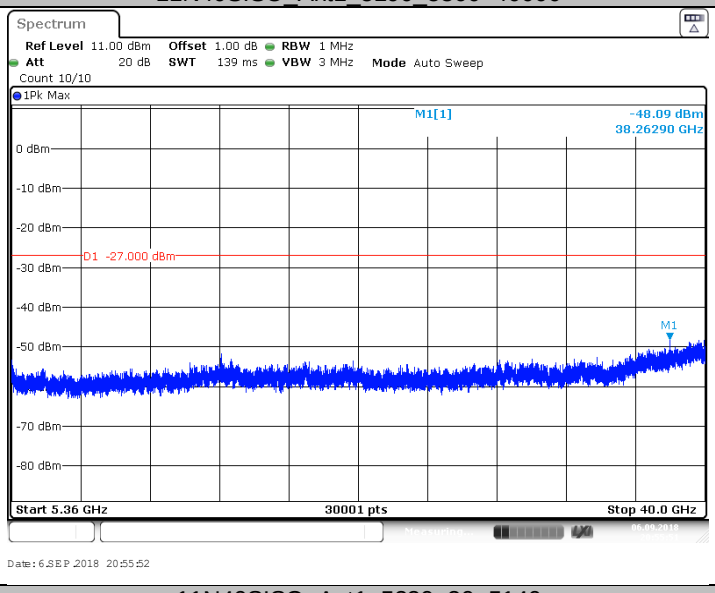
11N20SISO_Ant1_5825_30~5650

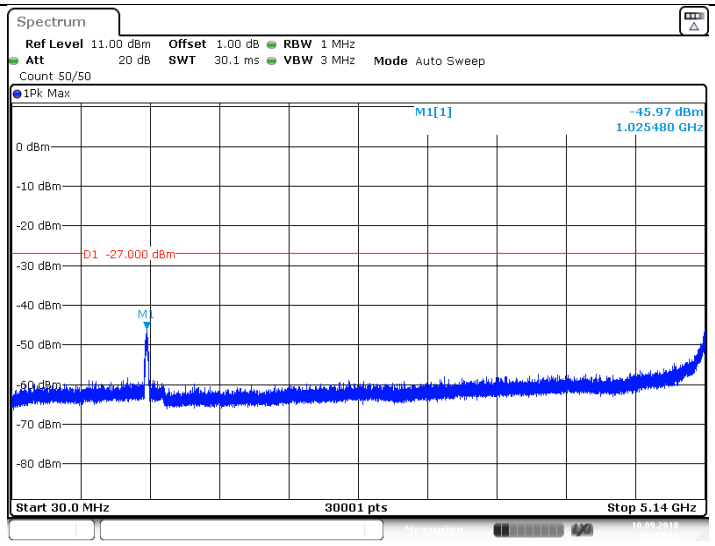


11N20SISO_Ant1_5825_5925~40000

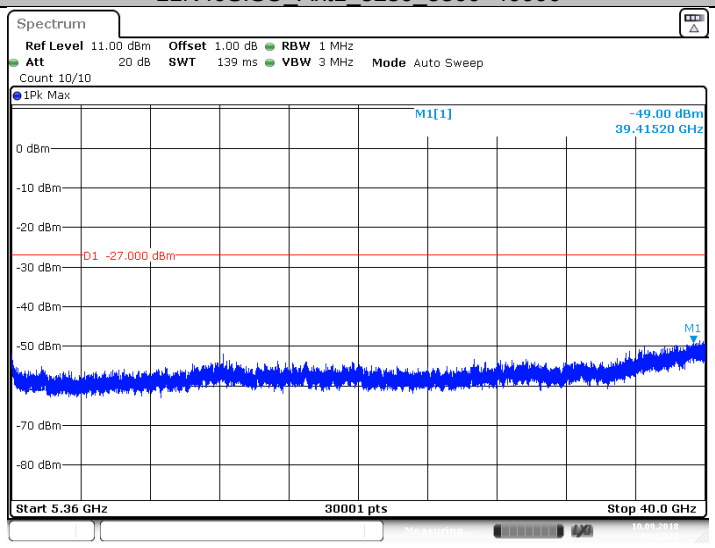


IEEE 802.11n-HT40 modulation Test Result

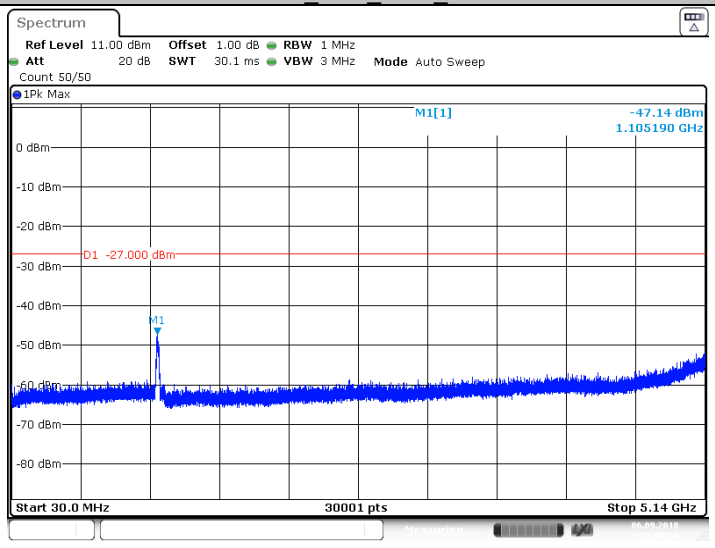
11N40SISO_Ant1_5190_30~5140

11N40SISO_Ant1_5190_5360~40000

11N40SISO_Ant1_5230_30~5140



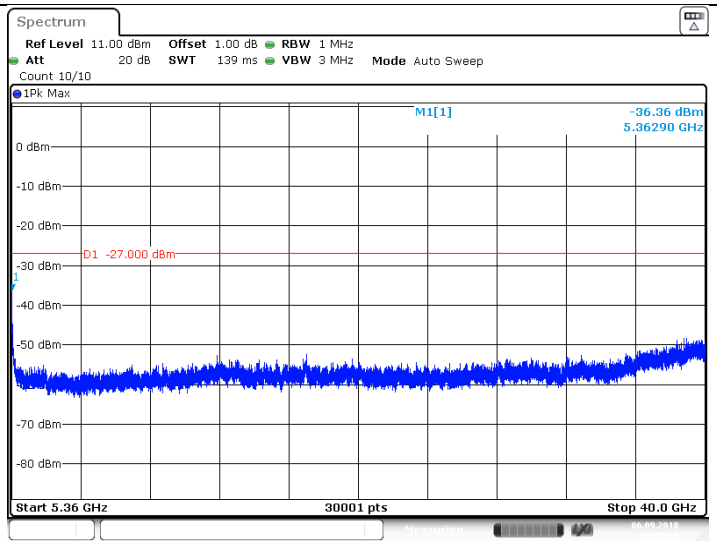
11N40SISO_Ant1_5230_5360~40000



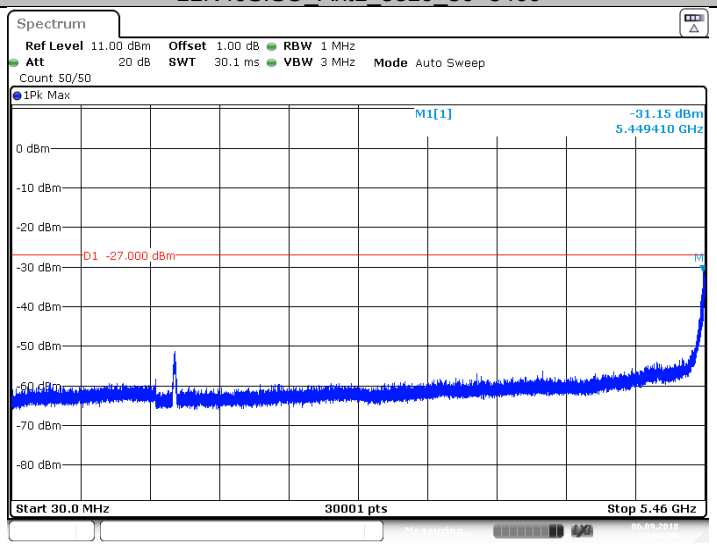
11N40SISO_Ant1_5310_30~5140



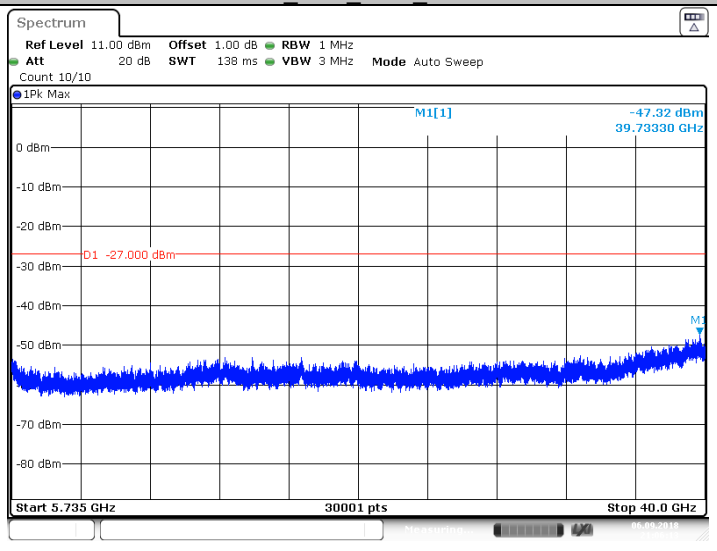
11N40SISO_Ant1_5310_5360~40000



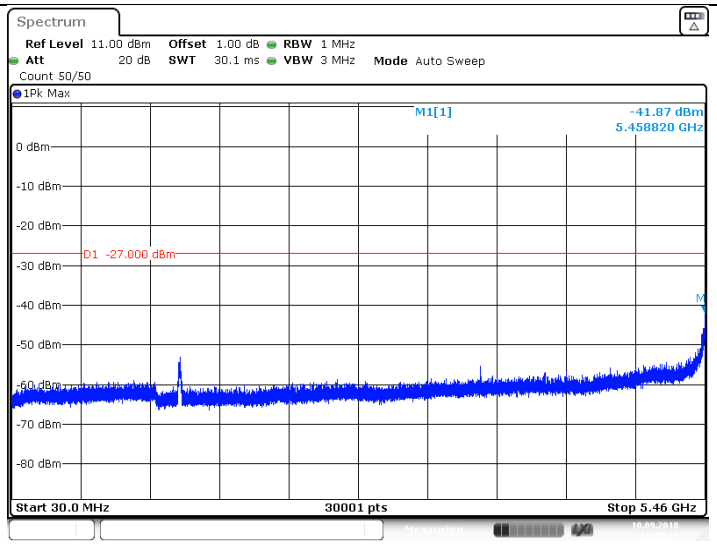
11N40SISO_Ant1_5510_30~5460



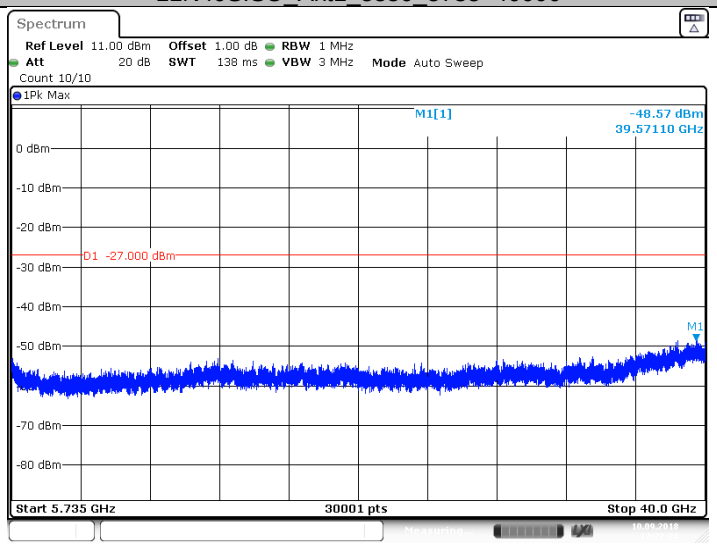
11N40SISO_Ant1_5510_5735~40000



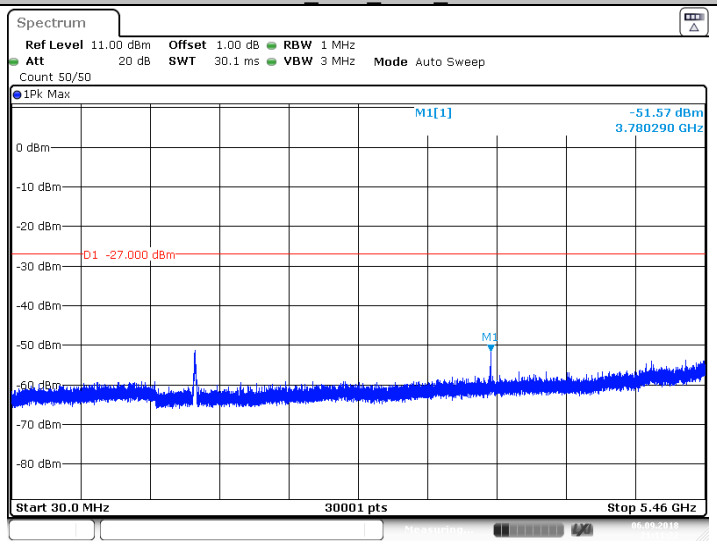
11N40SISO_Ant1_5550_30~5460



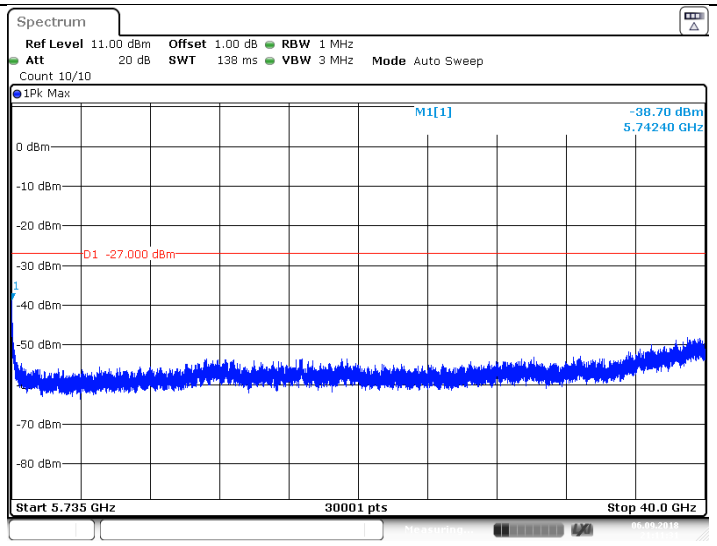
11N40SISO_Ant1_5550_5735~40000



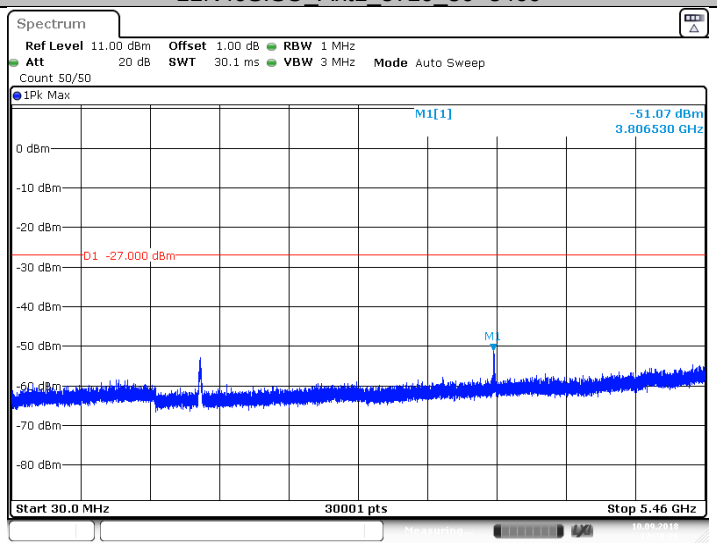
11N40SISO_Ant1_5670_30~5460



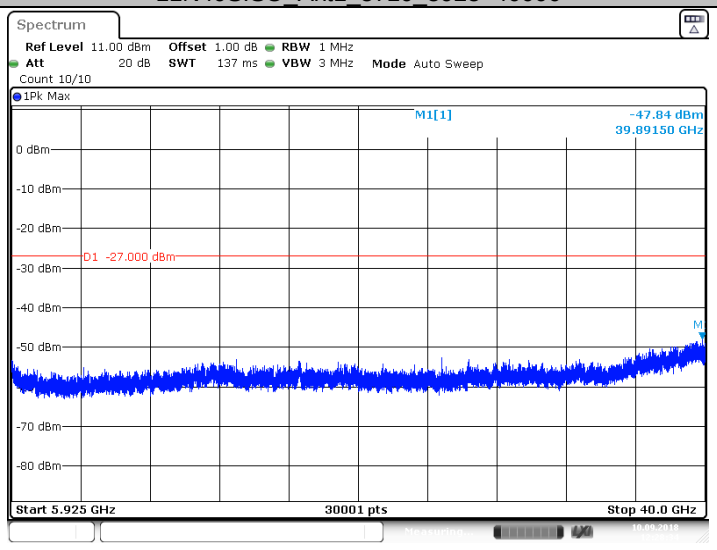
11N40SISO_Ant1_5670_5735~40000



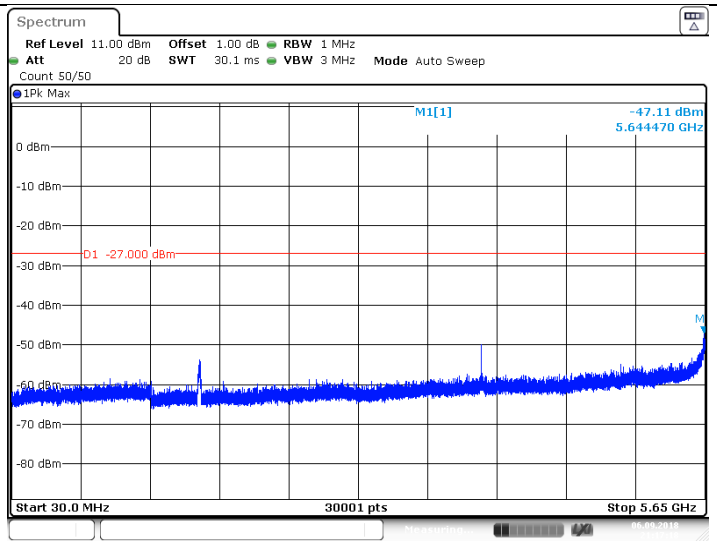
11N40SISO_Ant1_5710_30~5460



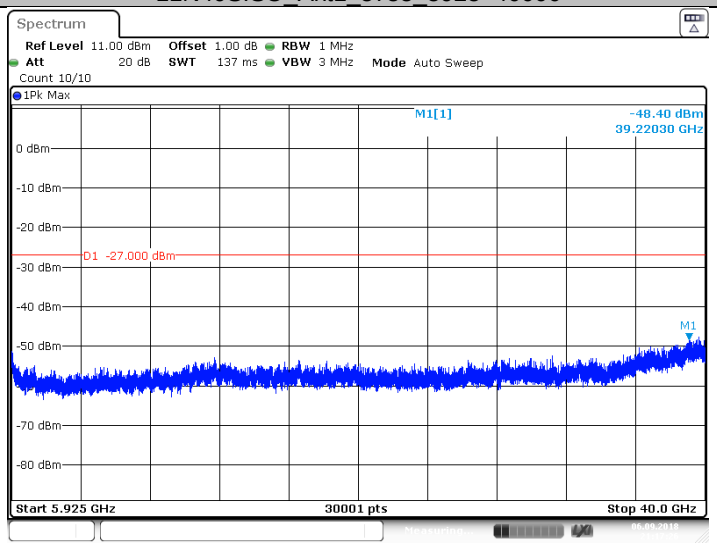
11N40SISO_Ant1_5710_5925~40000



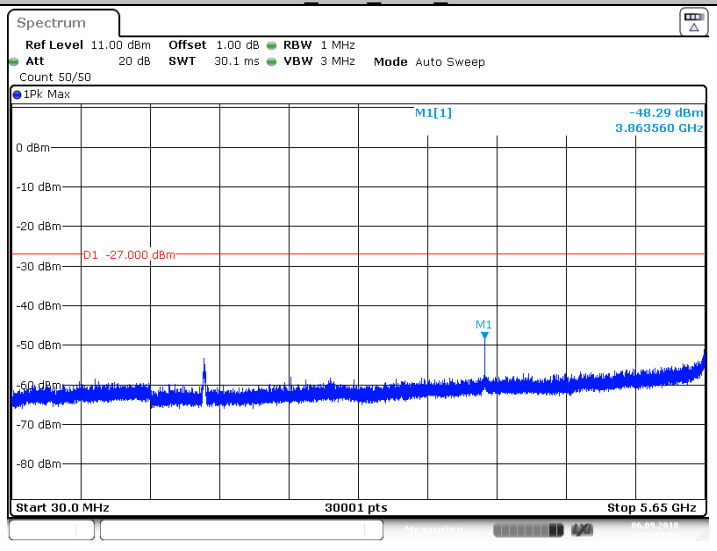
11N40SISO_Ant1_5755_30~5650



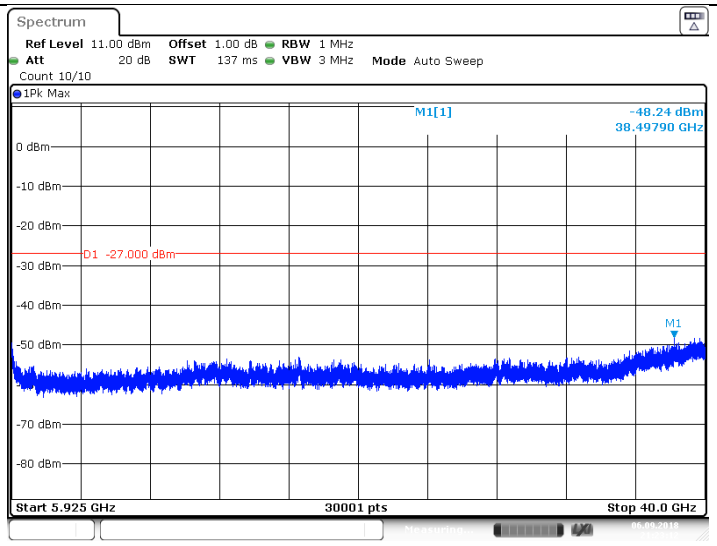
11N40SISO_Ant1_5755_5925~40000



11N40SISO_Ant1_5795_30~5650

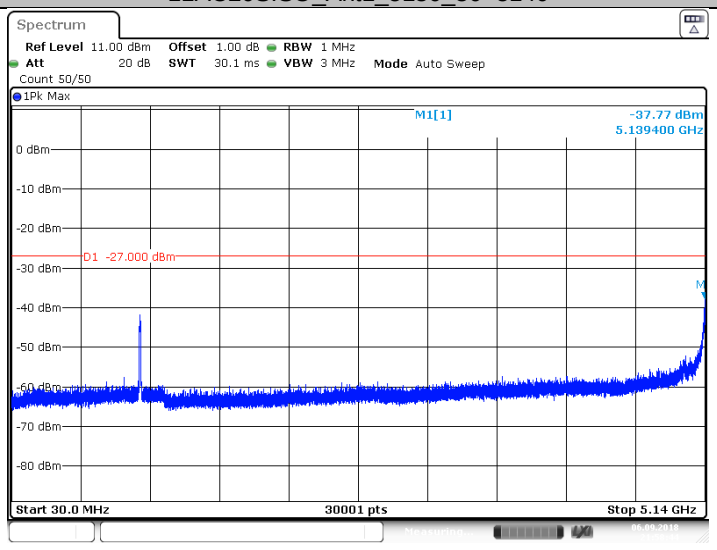


11N40SISO_Ant1_5795_5925~40000

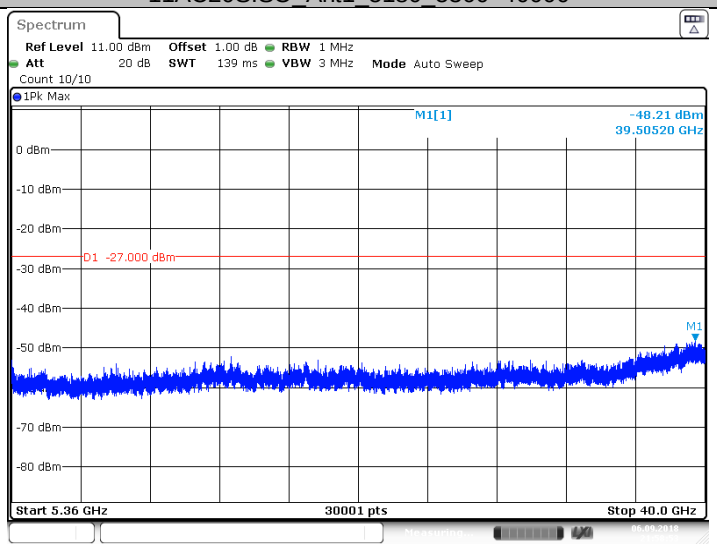


IEEE 802.11ac-HT20 modulation Test Result

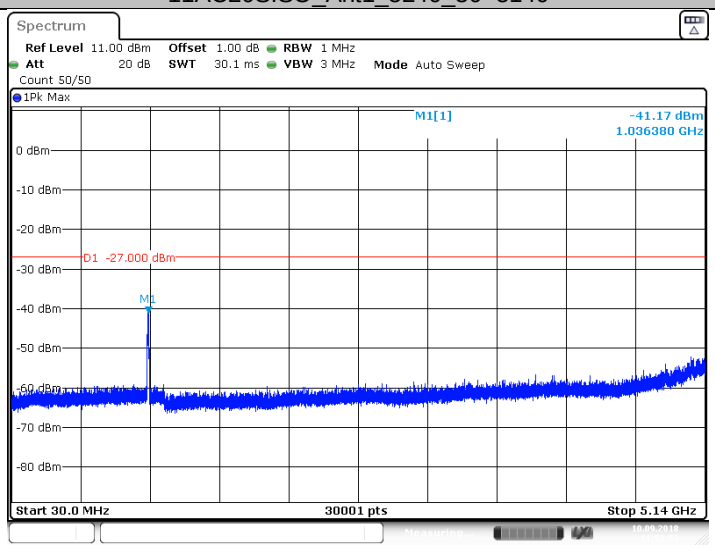
11AC20SISO_Ant1_5180_30~5140



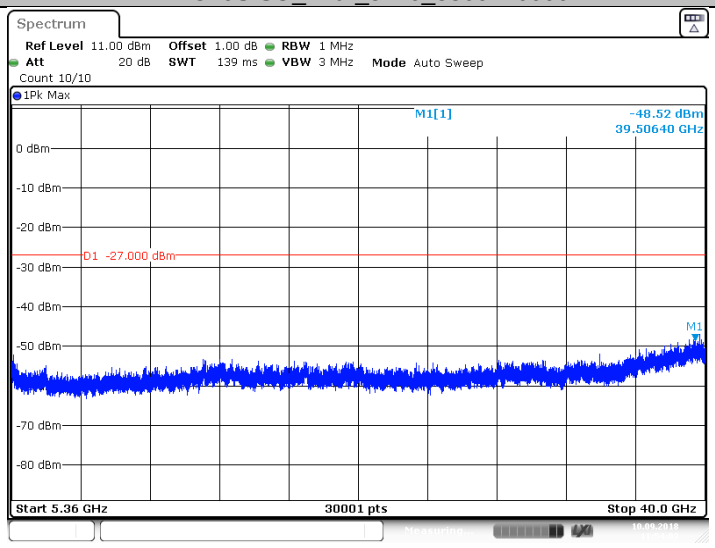
11AC20SISO_Ant1_5180_5360~40000



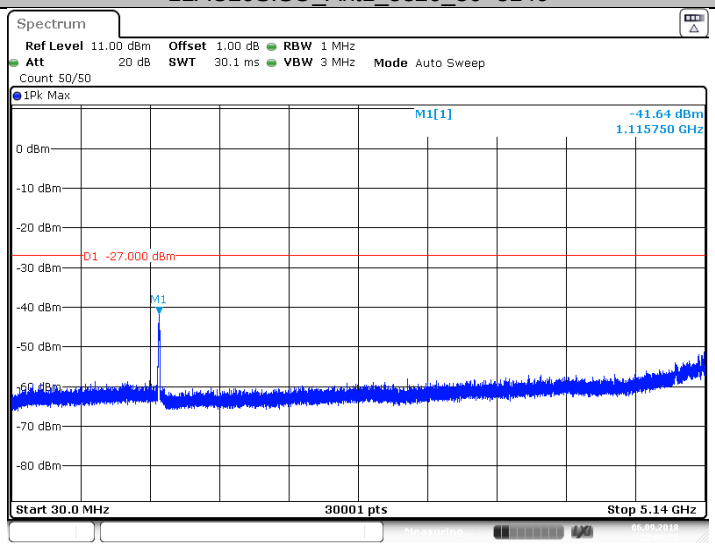
11AC20SISO_Ant1_5240_30~5140



11AC20SISO_Ant1_5240_5360~40000



11AC20SISO_Ant1_5320_30~5140



11AC20SISO_Ant1_5320_5360~40000

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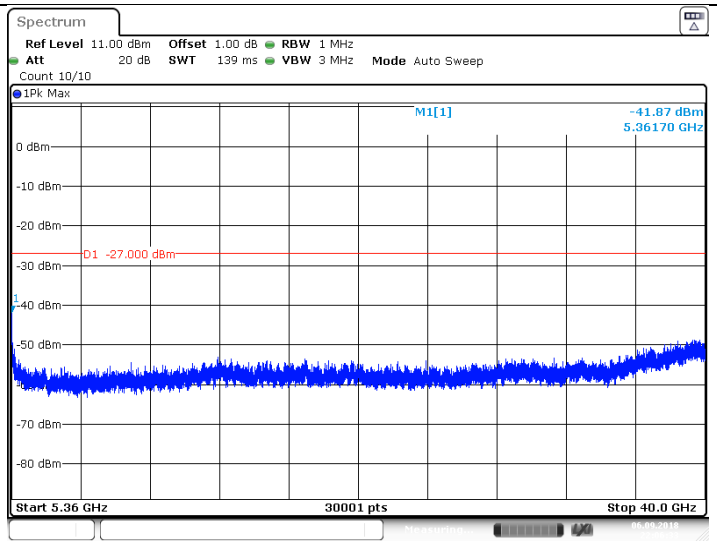
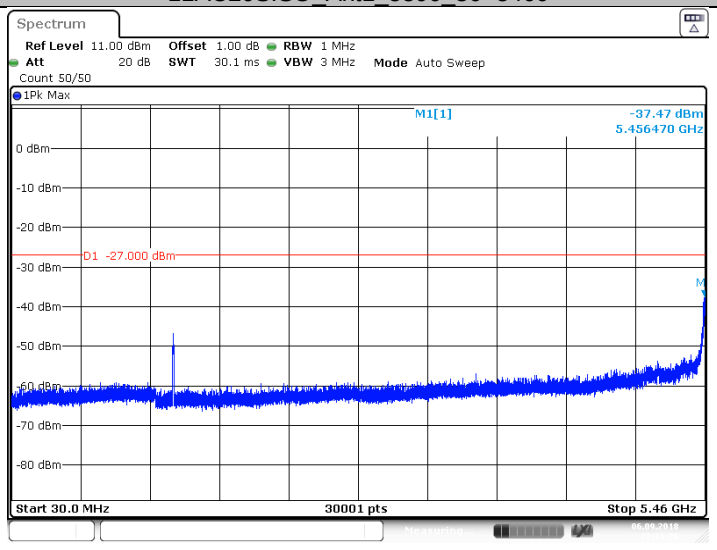
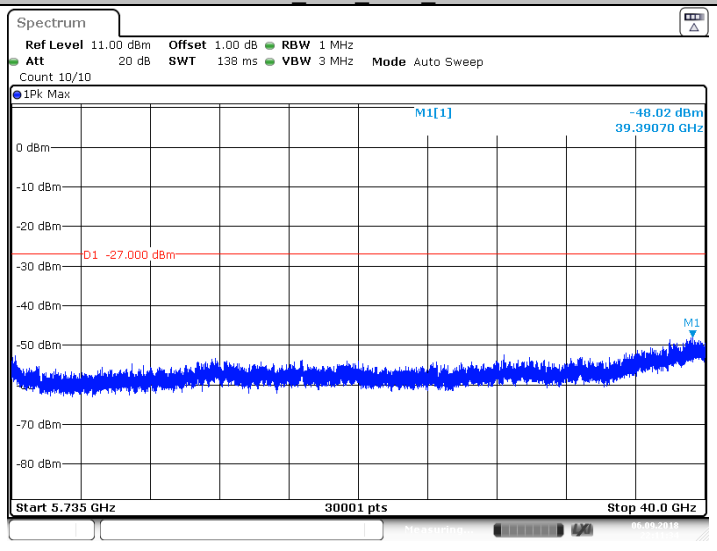


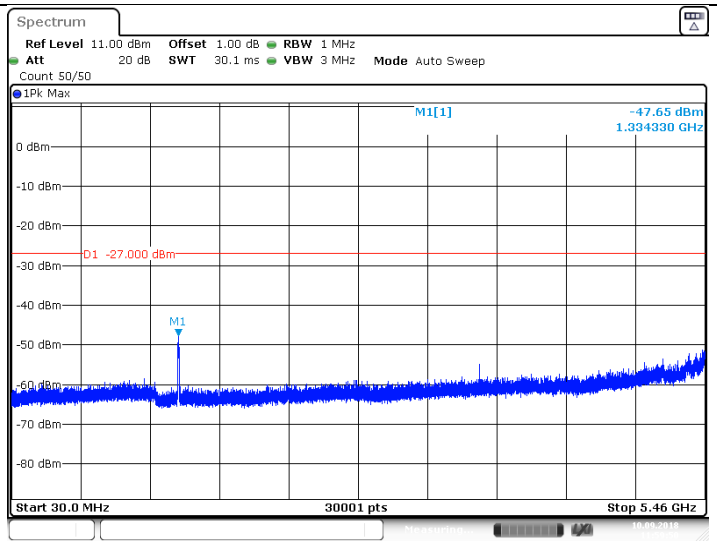
11AC20SISO_Ant1_5500_30~5460



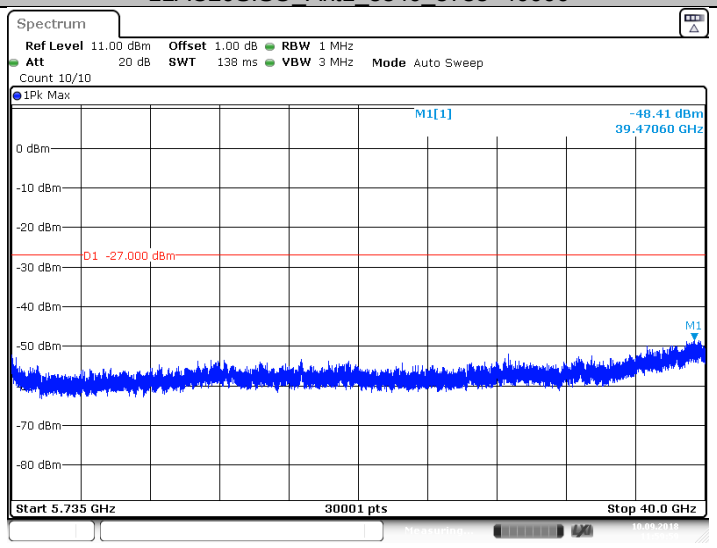
11AC20SISO_Ant1_5500_5735~40000



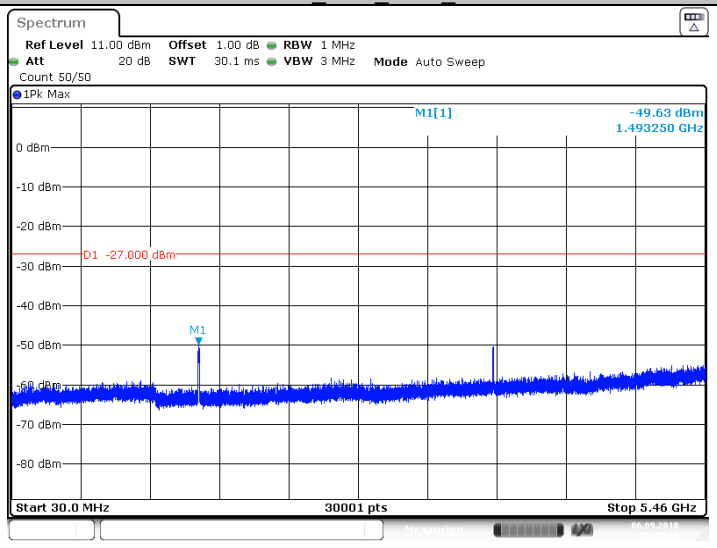
11AC20SISO_Ant1_5540_30~5460



11AC20SISO_Ant1_5540_5735~40000



11AC20SISO_Ant1_5700_30~5460



11AC20SISO_Ant1_5700_5735~40000

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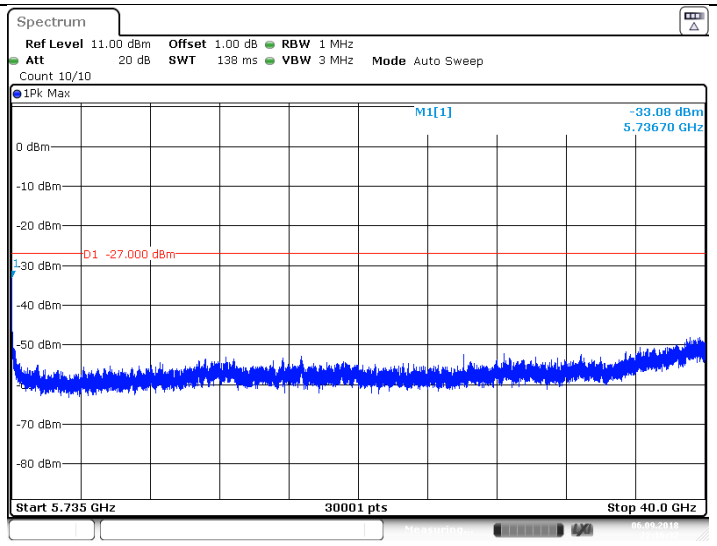
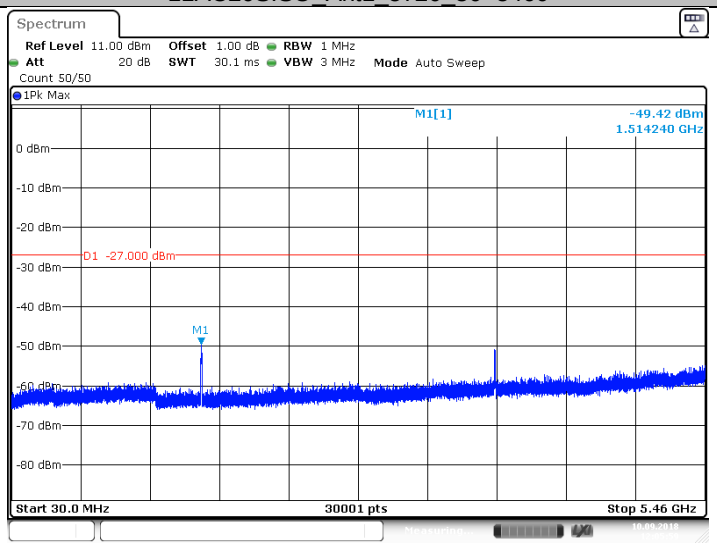
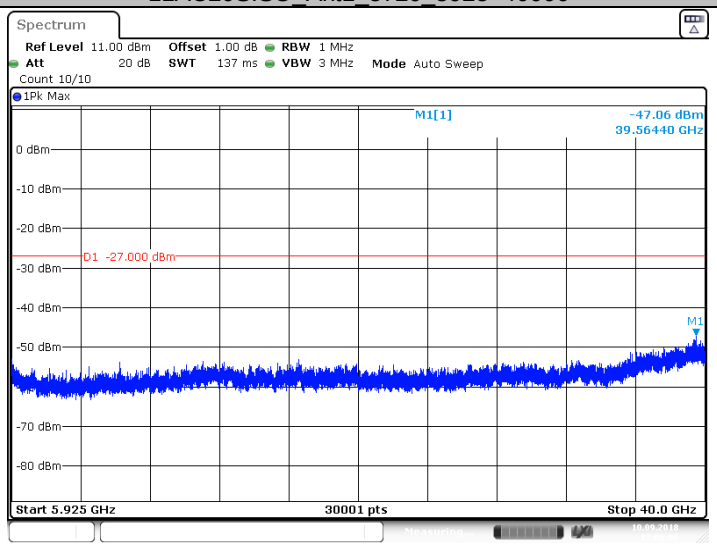


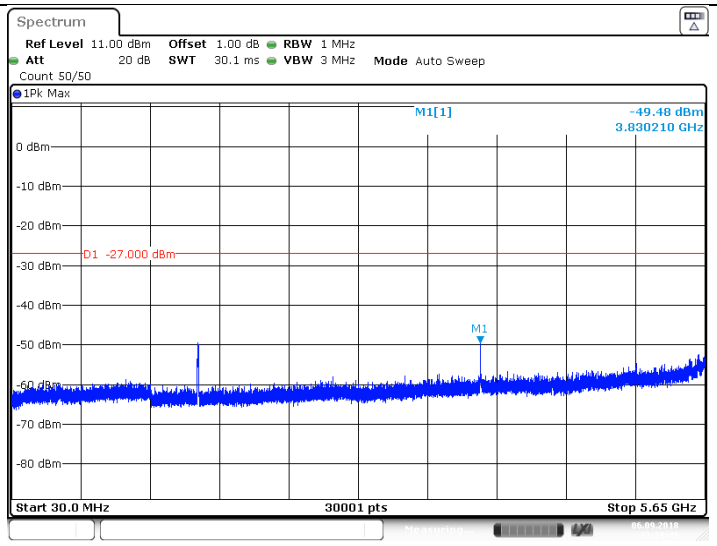
11AC20SISO_Ant1_5720_30~5460



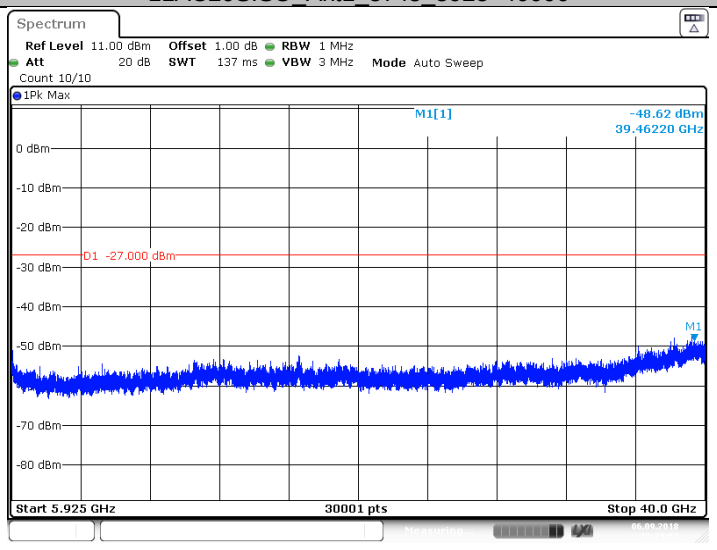
11AC20SISO_Ant1_5720_5925~40000



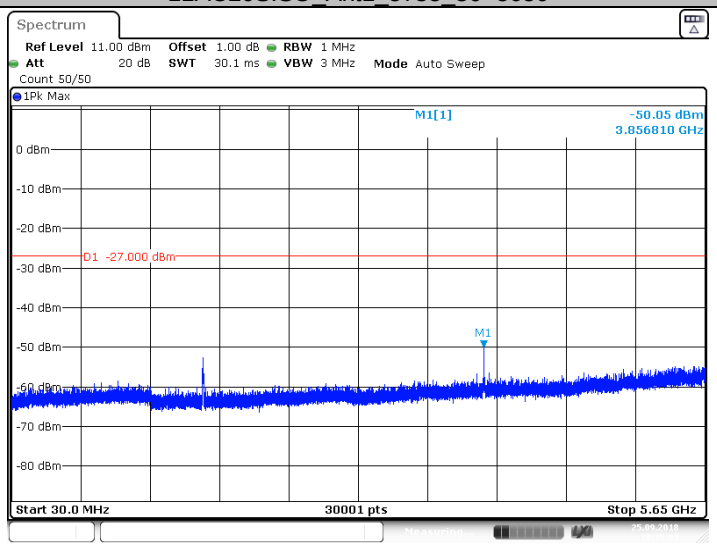
11AC20SISO_Ant1_5745_30~5650



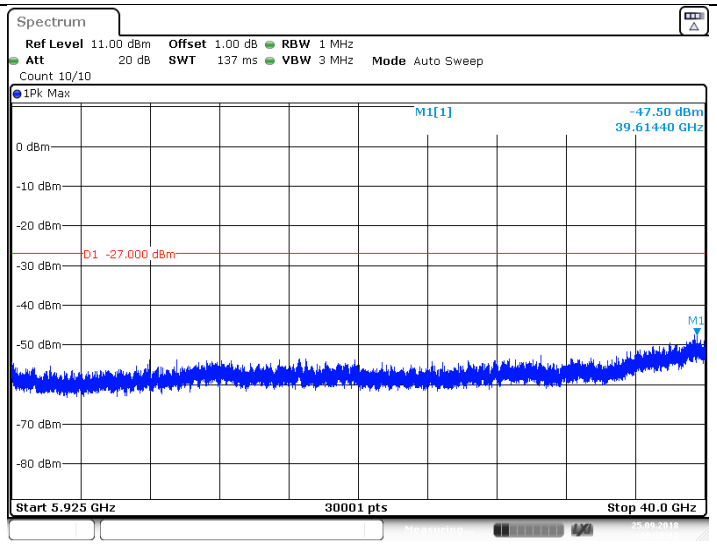
11AC20SISO_Ant1_5745_5925~40000



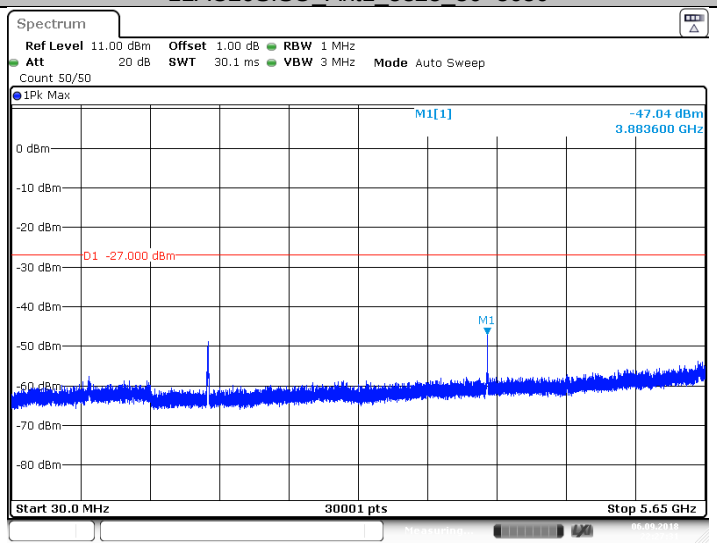
11AC20SISO_Ant1_5785_30~5650



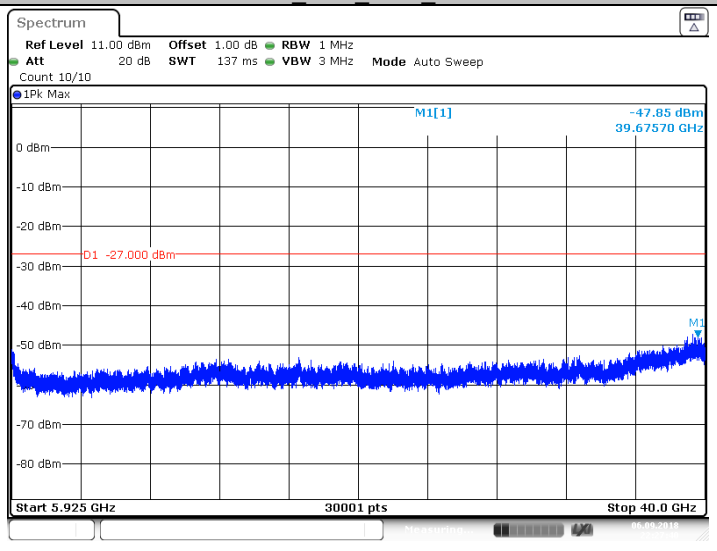
11AC20SISO_Ant1_5785_5925~40000



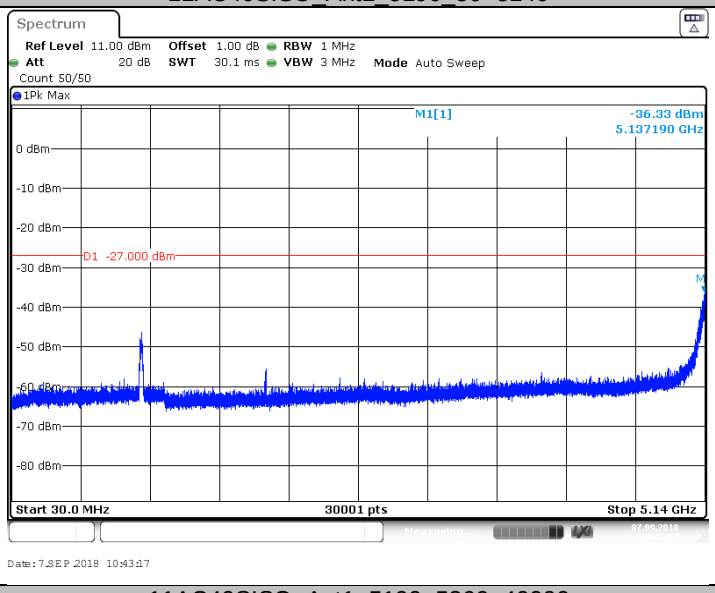
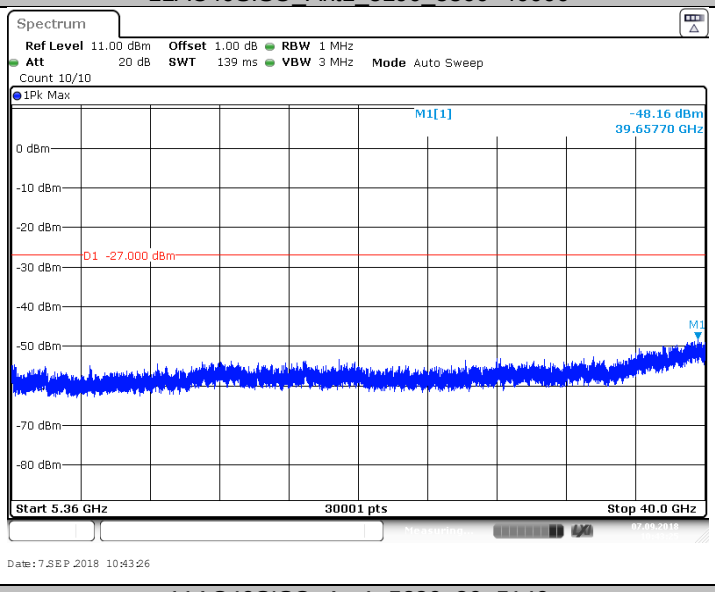
11AC20SISO_Ant1_5825_30~5650

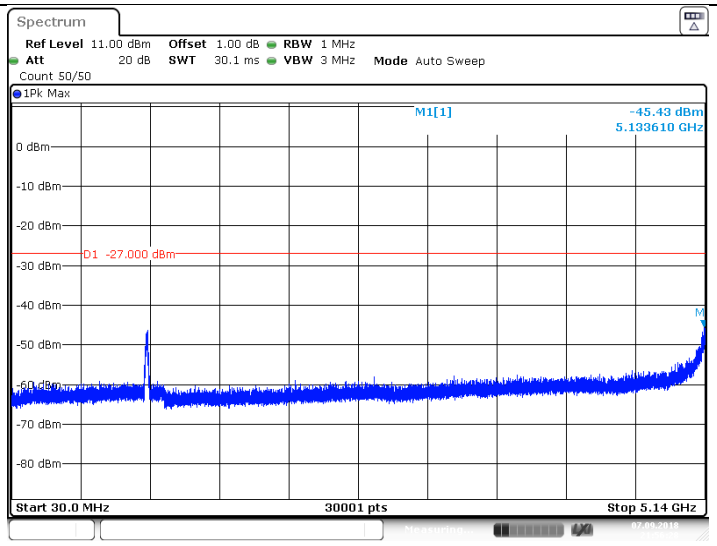


11AC20SISO_Ant1_5825_5925~40000

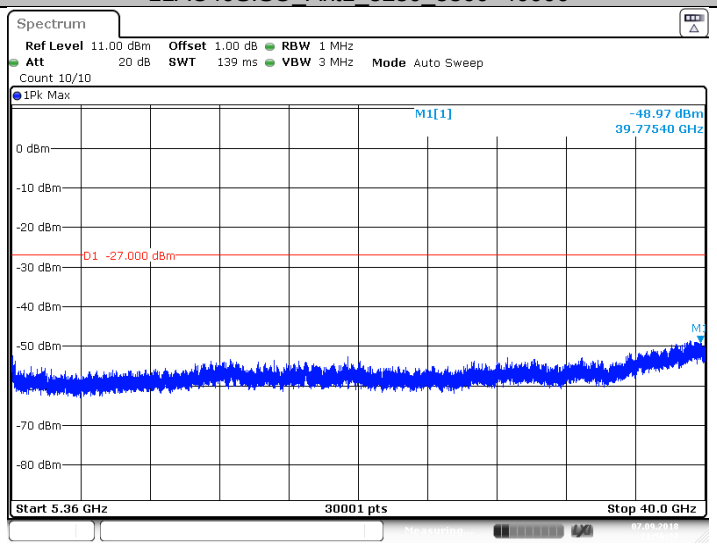


IEEE 802.11ac-HT40 modulation Test Result

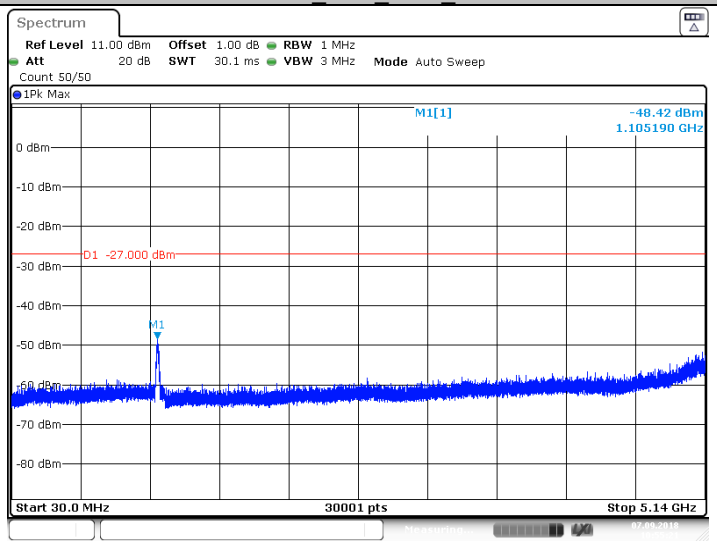
11AC40SISO_Ant1_5190_30~5140

11AC40SISO_Ant1_5190_5360~40000

11AC40SISO_Ant1_5230_30~5140



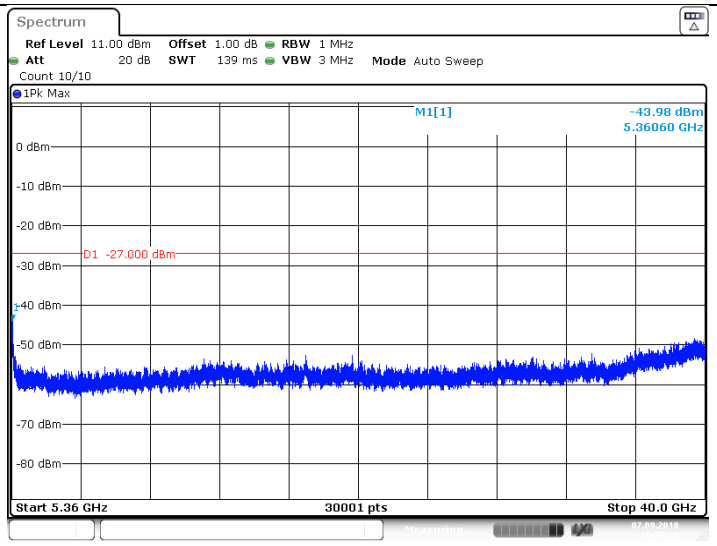
11AC40SISO_Ant1_5230_5360~40000



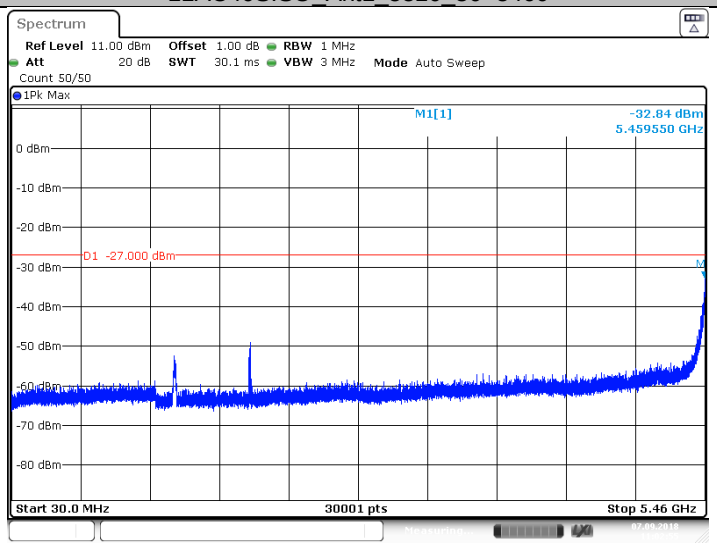
11AC40SISO_Ant1_5310_30~5140



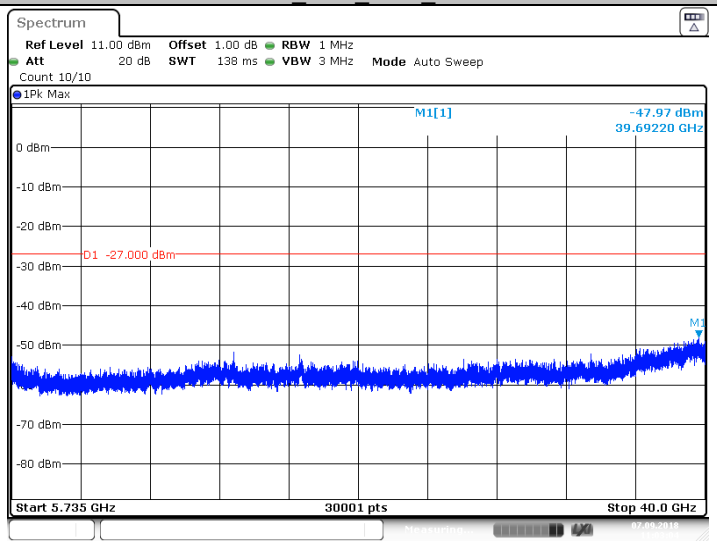
11AC40SISO_Ant1_5310_5360~40000



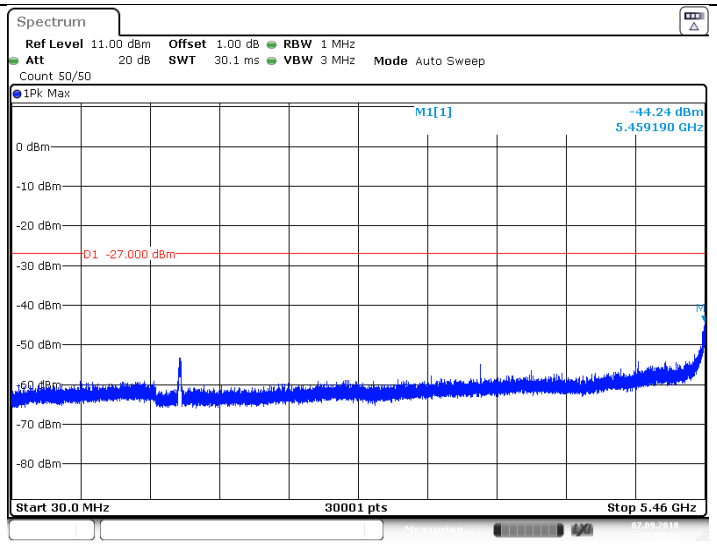
11AC40SISO_Ant1_5510_30~5460



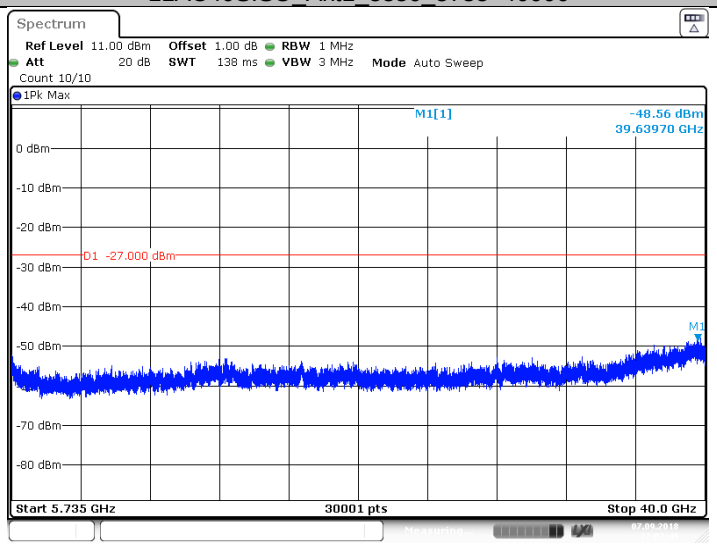
11AC40SISO_Ant1_5510_5735~40000



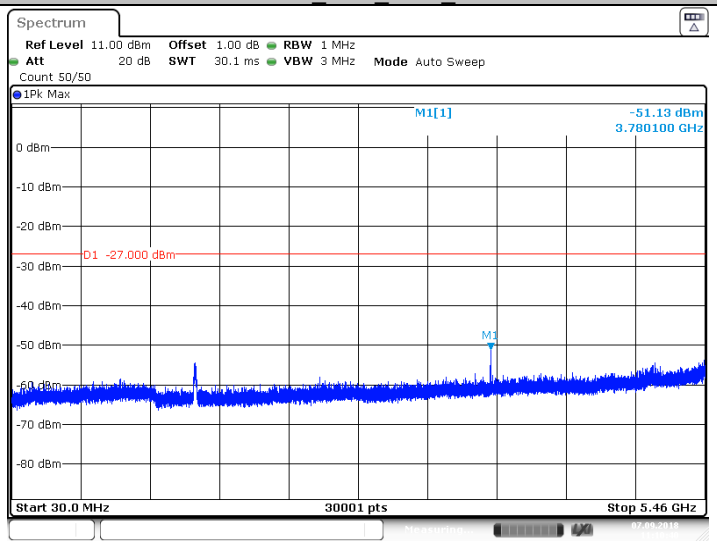
11AC40SISO_Ant1_5550_30~5460



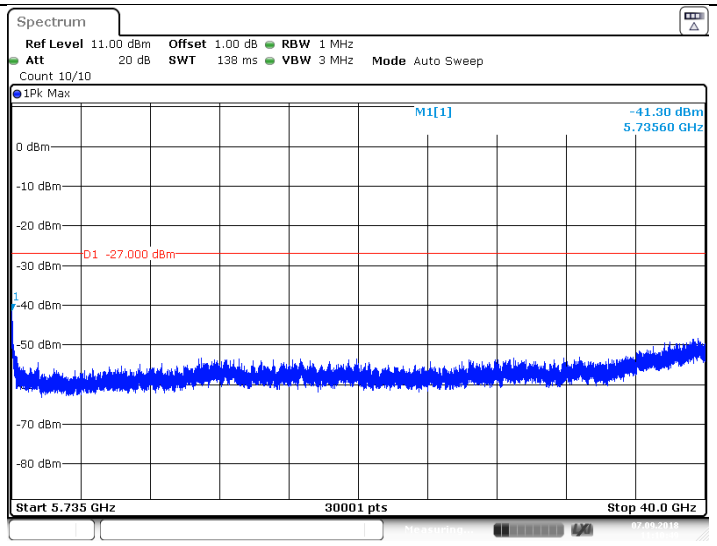
11AC40SISO_Ant1_5550_5735~40000



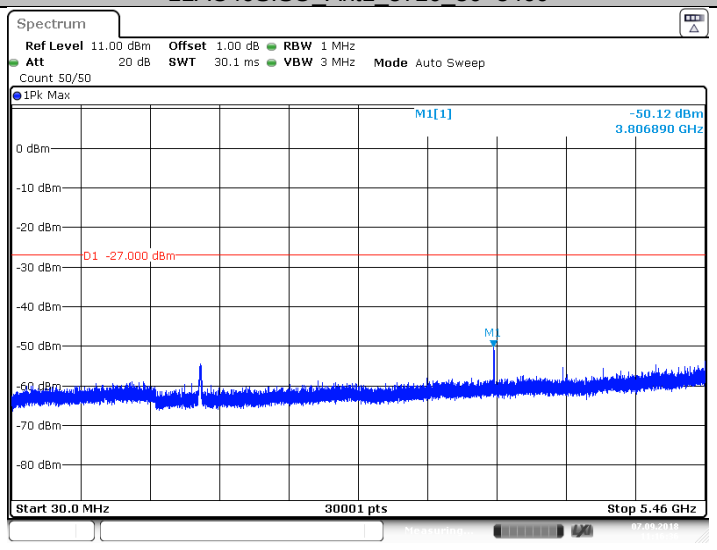
11AC40SISO_Ant1_5670_30~5460



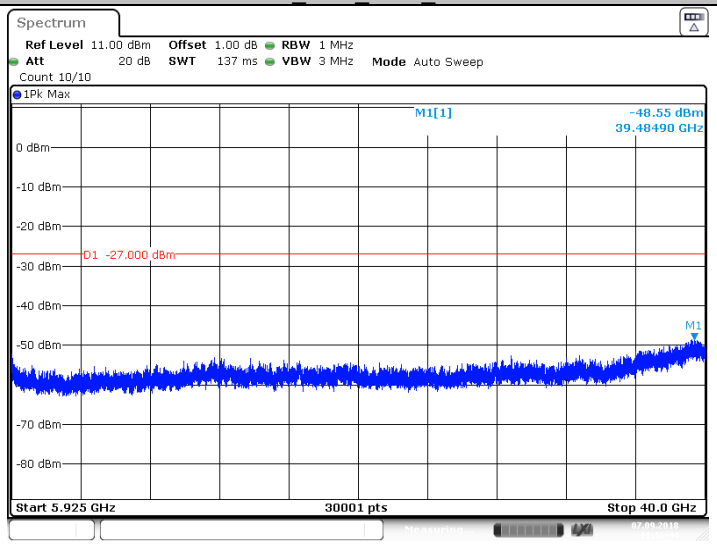
11AC40SISO_Ant1_5670_5735~40000



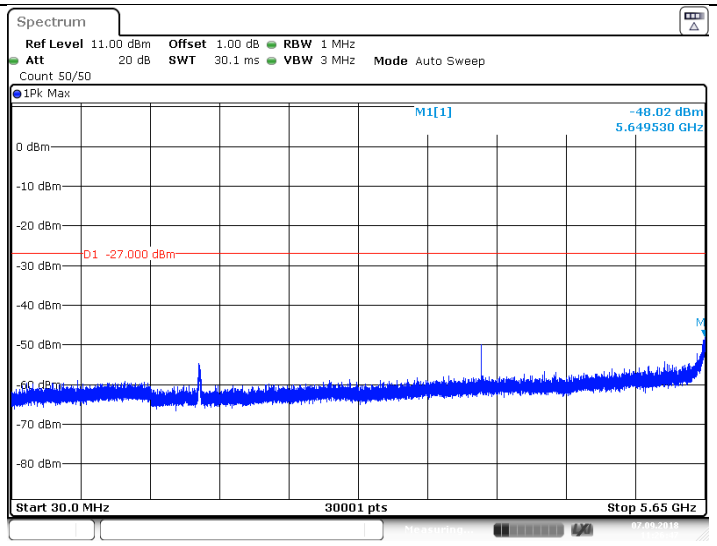
11AC40SISO_Ant1_5710_30~5460



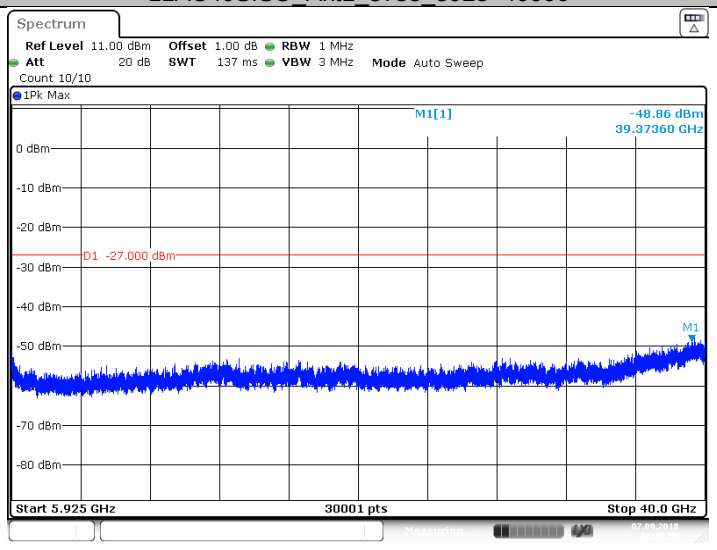
11AC40SISO_Ant1_5710_5925~40000



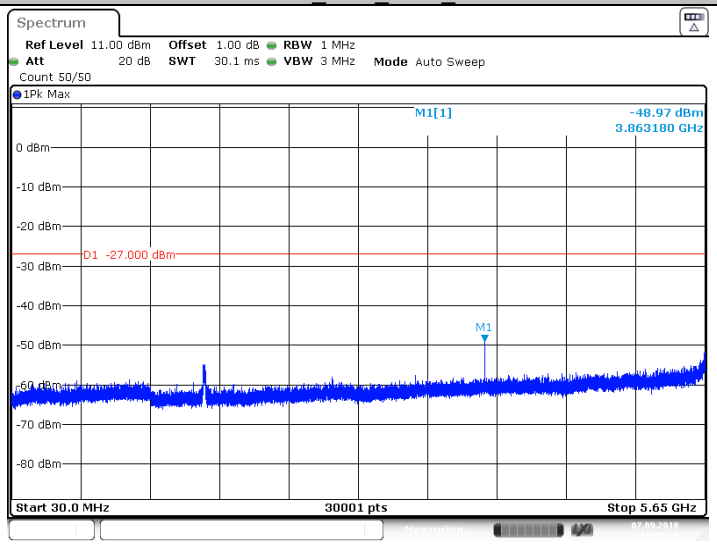
11AC40SISO_Ant1_5755_30~5650



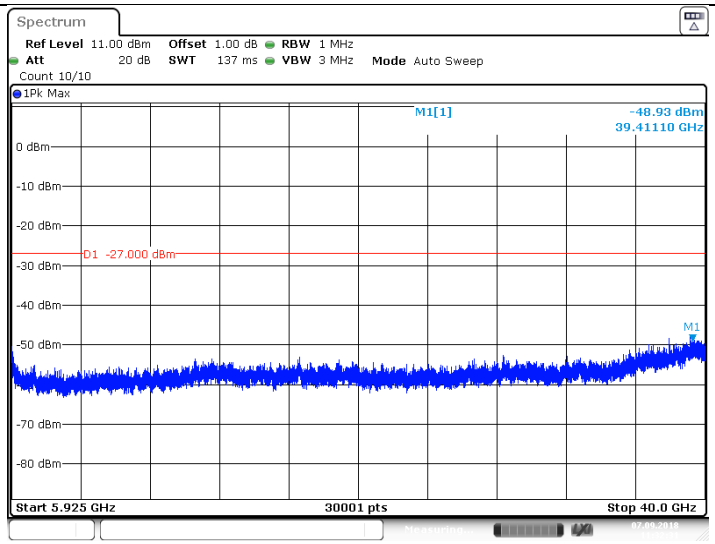
11AC40SISO_Ant1_5755_5925~40000



11AC40SISO_Ant1_5795_30~5650

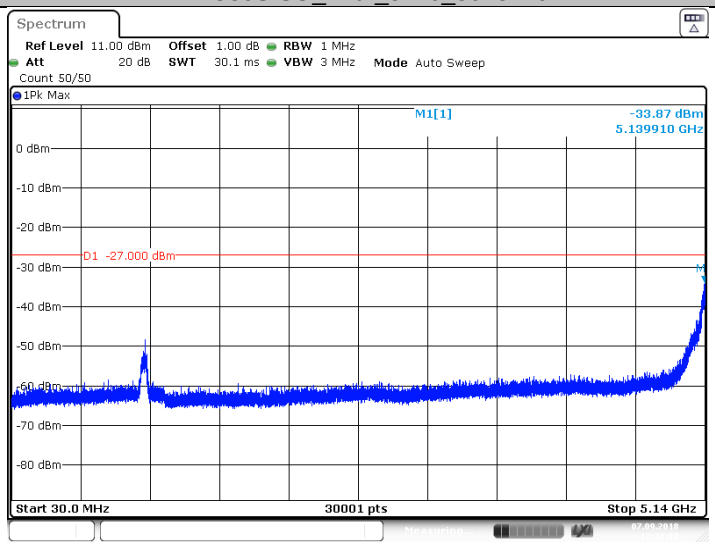


11AC40SISO_Ant1_5795_5925~40000

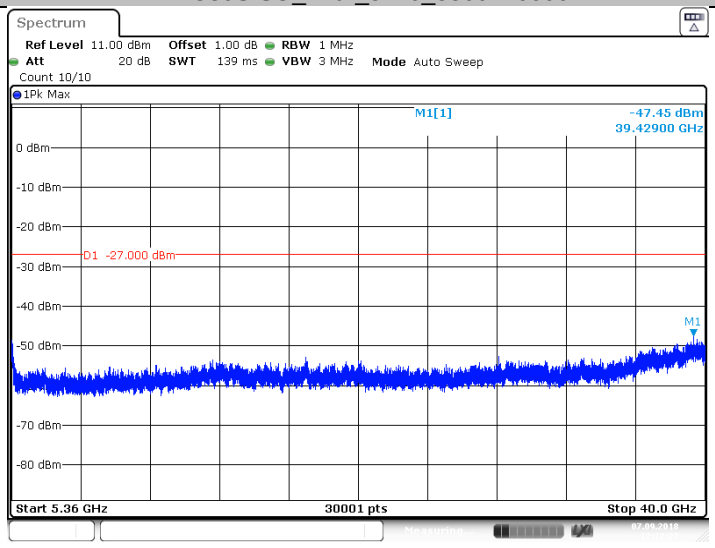


IEEE 802.11ac-HT80 modulation Test Result

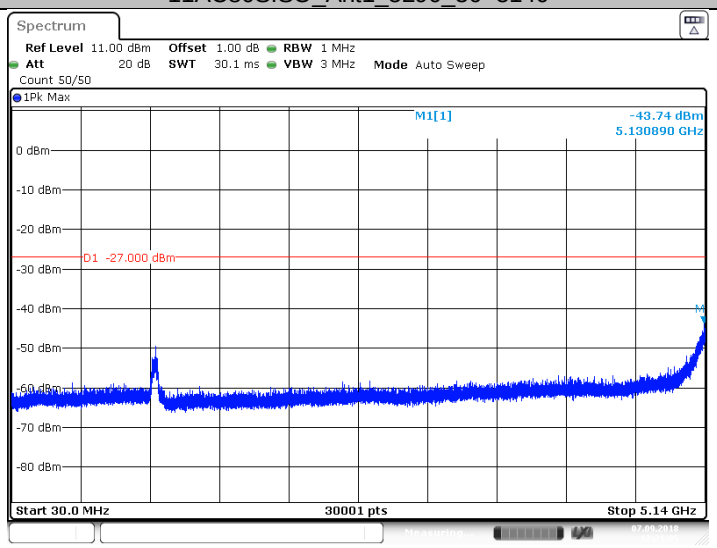
11AC80SISO_Ant1_5210_30~5140



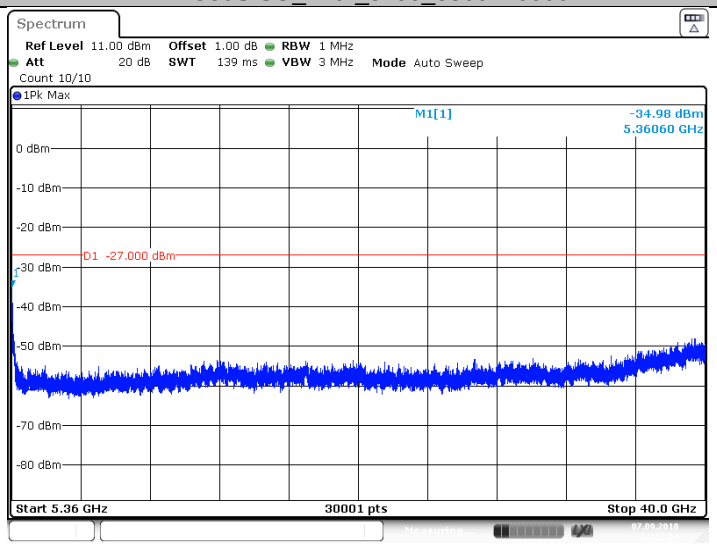
11AC80SISO_Ant1_5210_5360~40000



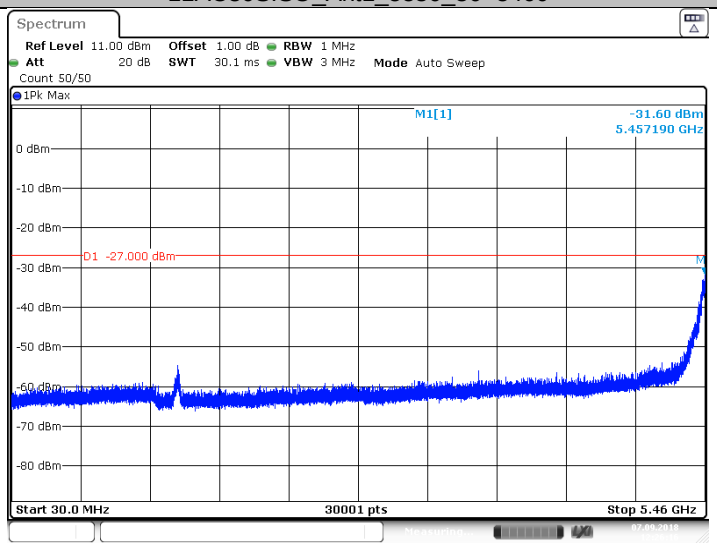
11AC80SISO_Ant1_5290_30~5140



11AC80SISO_Ant1_5290_5360~40000



11AC80SISO_Ant1_5530_30~5460



11AC80SISO_Ant1_5530_5735~40000

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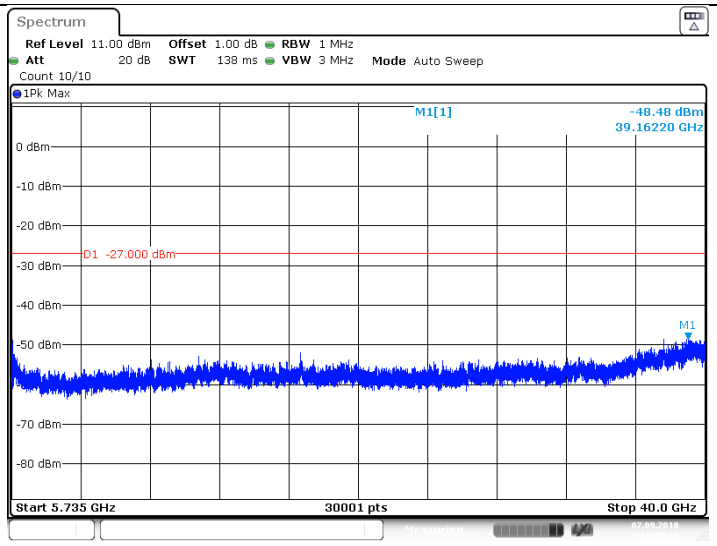
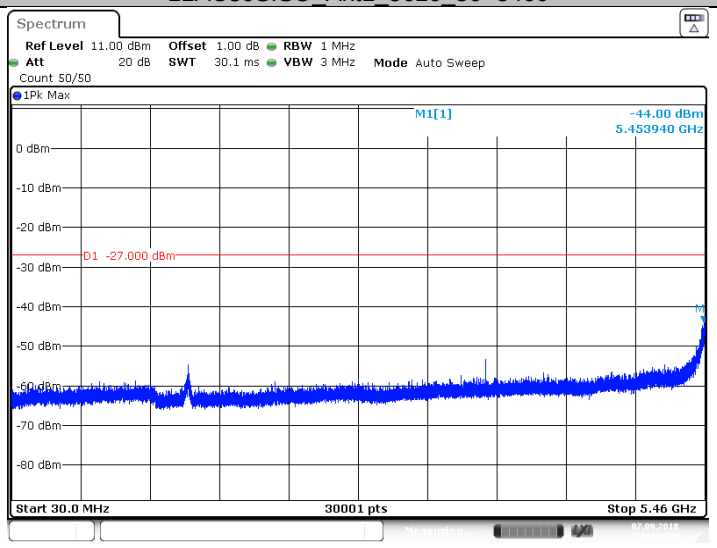
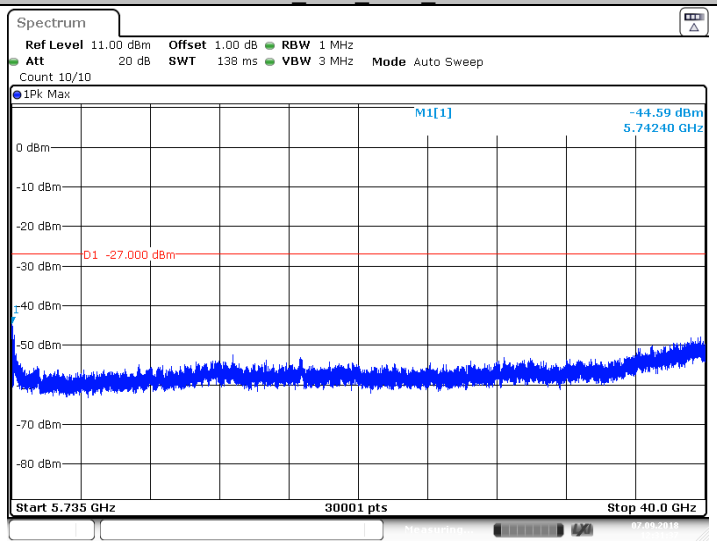


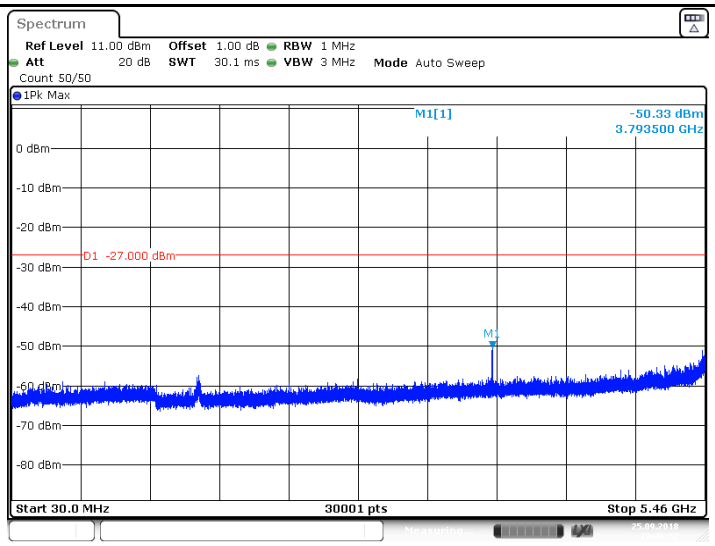
11AC80SISO_Ant1_5610_30~5460



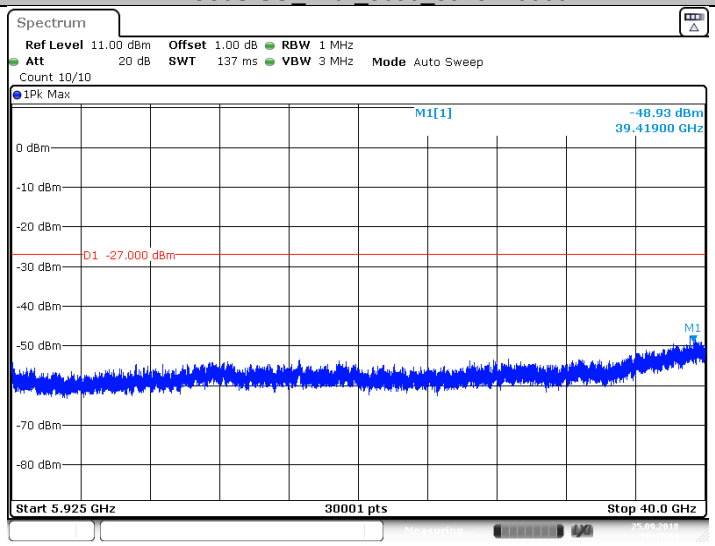
11AC80SISO_Ant1_5610_5735~40000



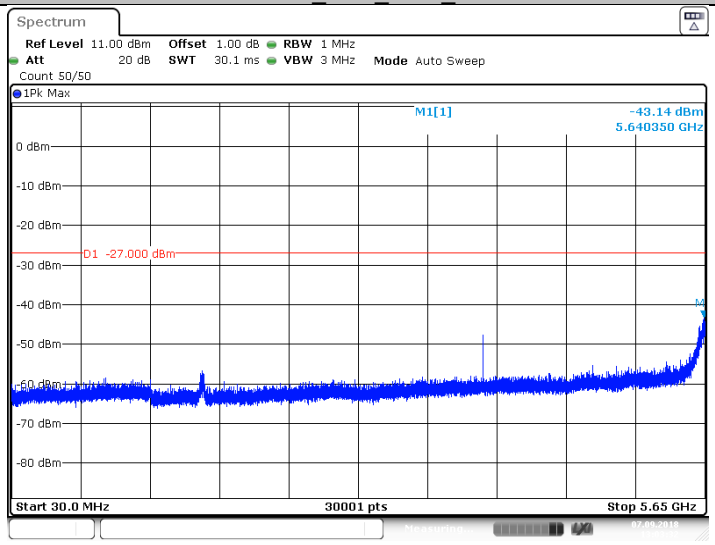
11AC80SISO_Ant1_5690_30~5460



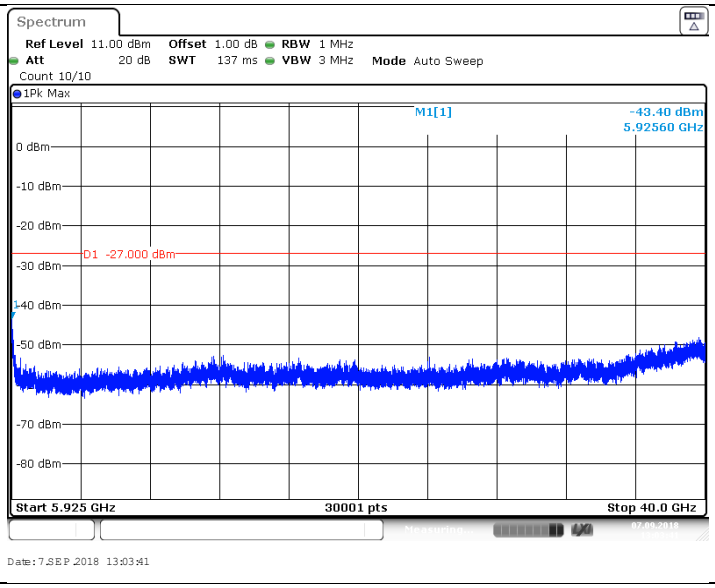
11AC80SISO_Ant1_5690_5925~40000



11AC80SISO_Ant1_5775_30~5650



11AC80SISO_Ant1_5775_5925~40000



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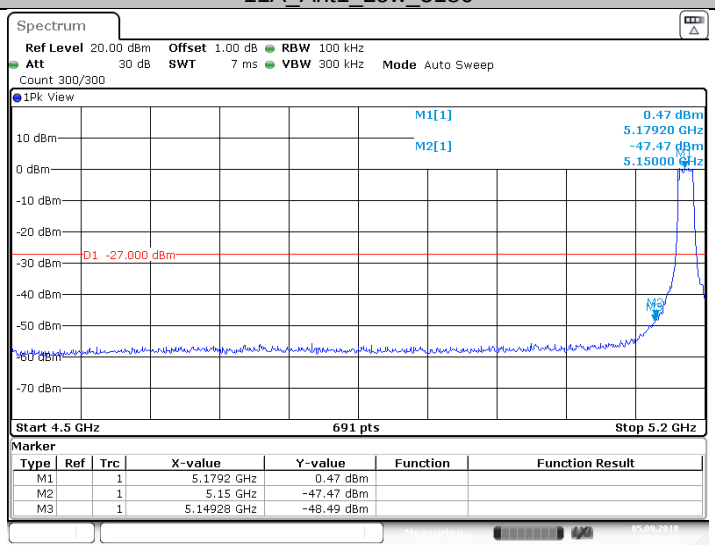
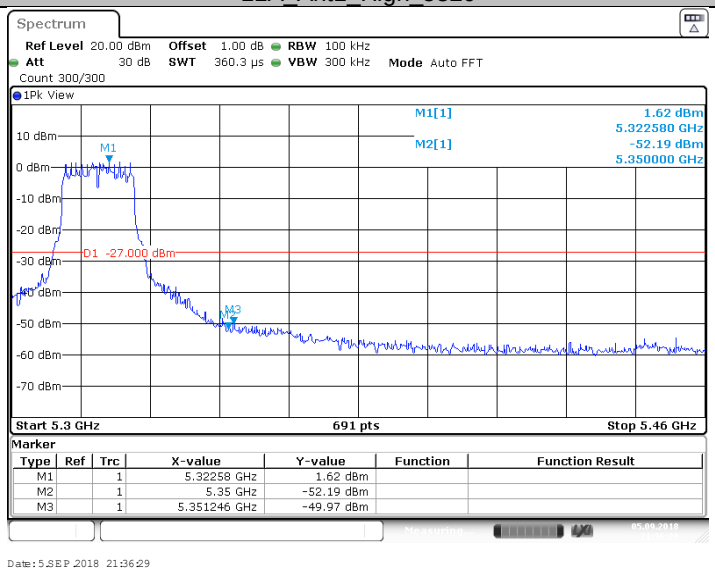
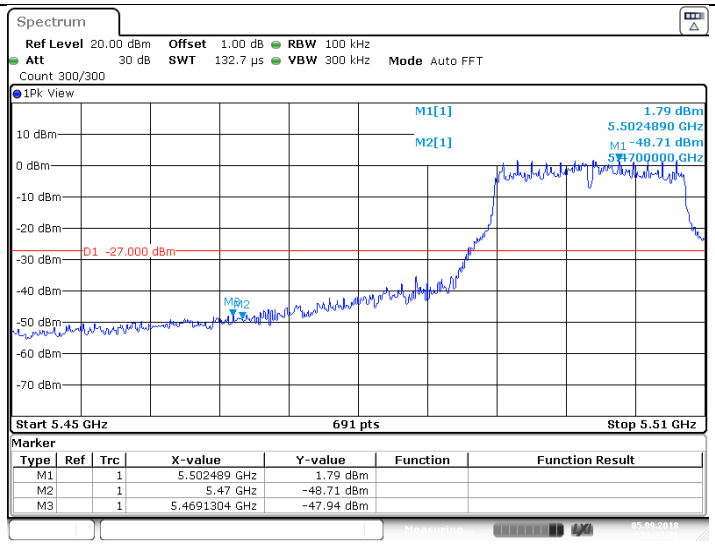
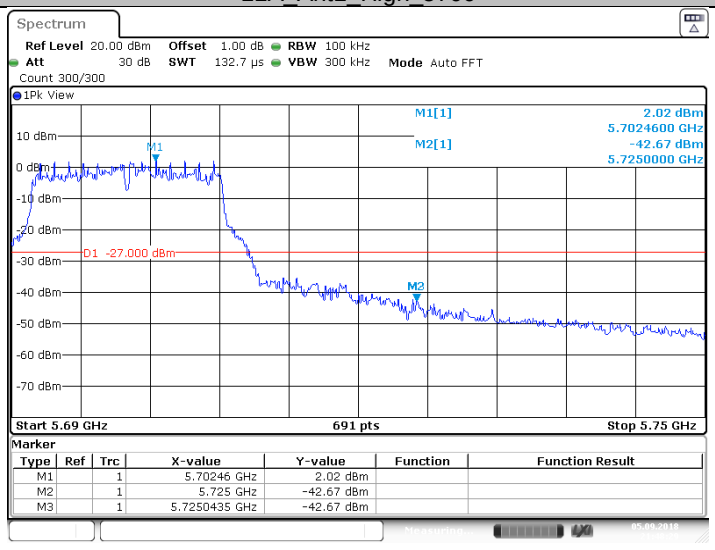
Transmitting spurious emission test result as below (Band edge measurements):

IEEE 802.11a modulation Test Result

11A_Ant1_Low_5180

11A_Ant1_High_5320

11A_Ant1_Low_5500

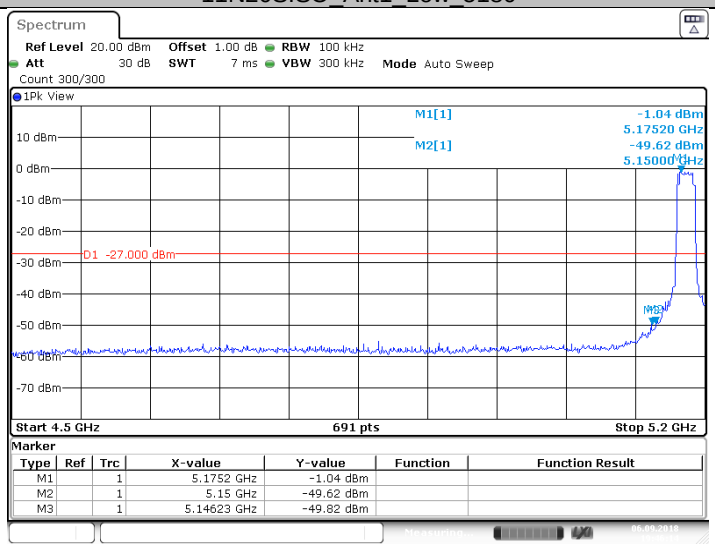


11A_Ant1_High_5700

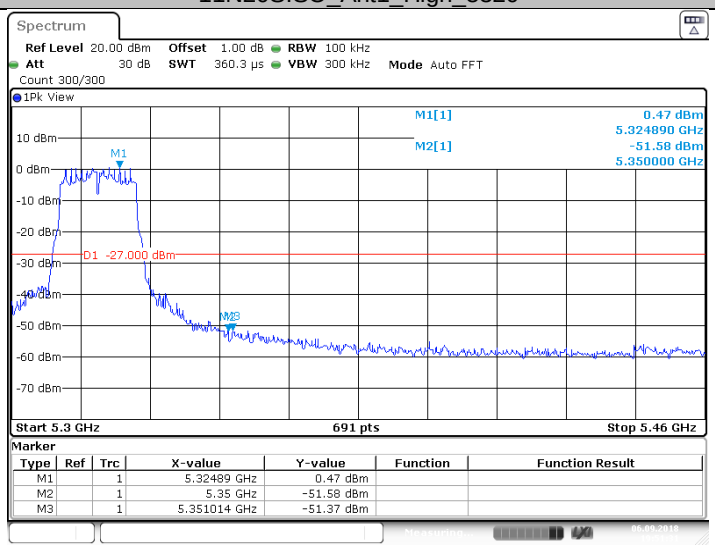


IEEE 802.11n-HT20 modulation Test Result

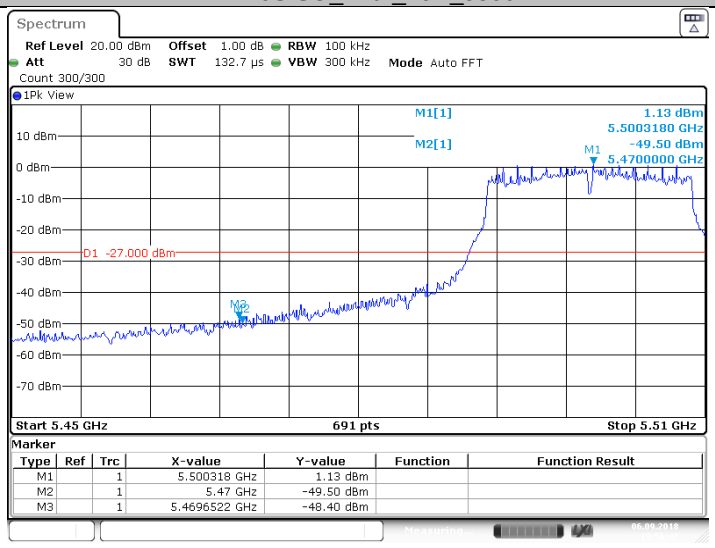
11N20SISO_Ant1_Low_5180



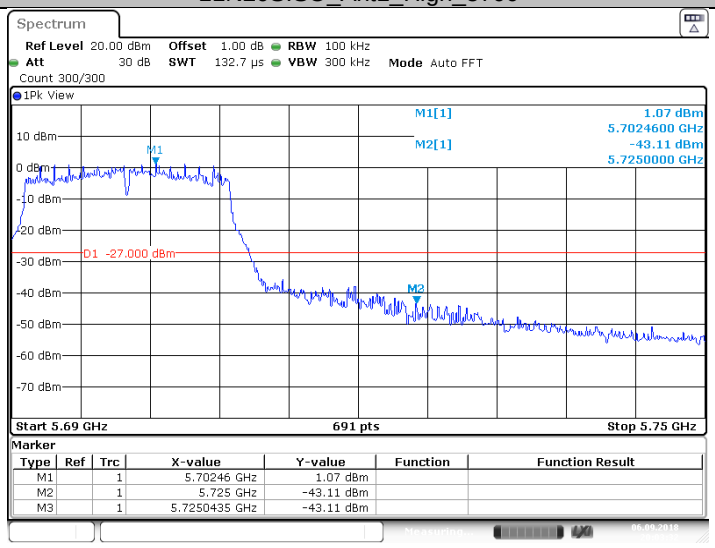
11N20SISO_Ant1_High_5320



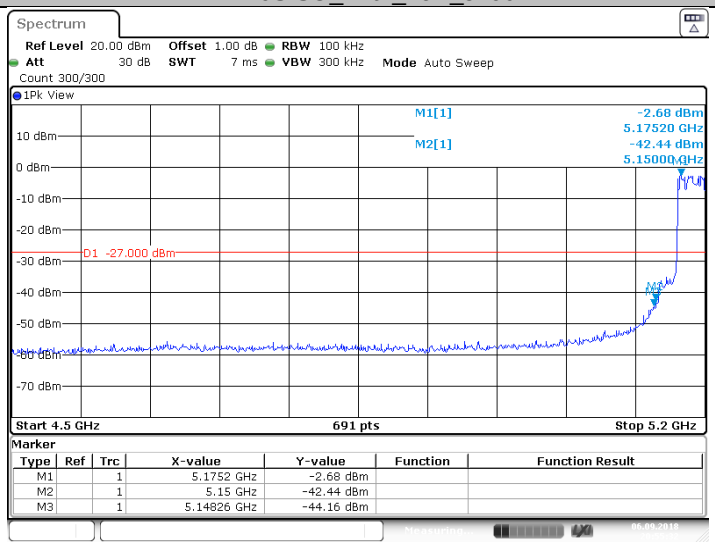
11N20SISO_Ant1_Low_5500

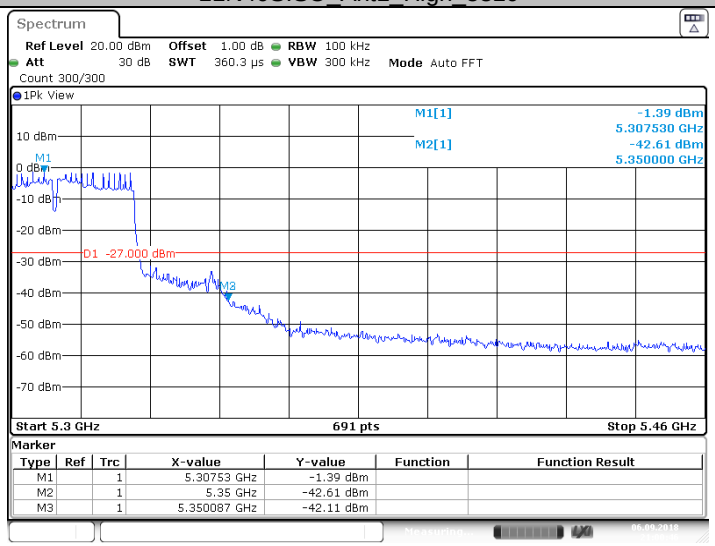


11N20SISO_Ant1_High_5700

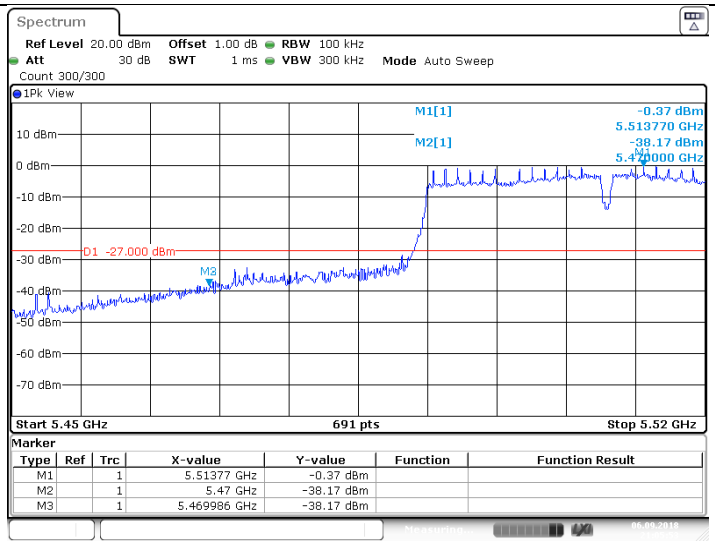


IEEE 802.11n-HT40 modulation Test Result

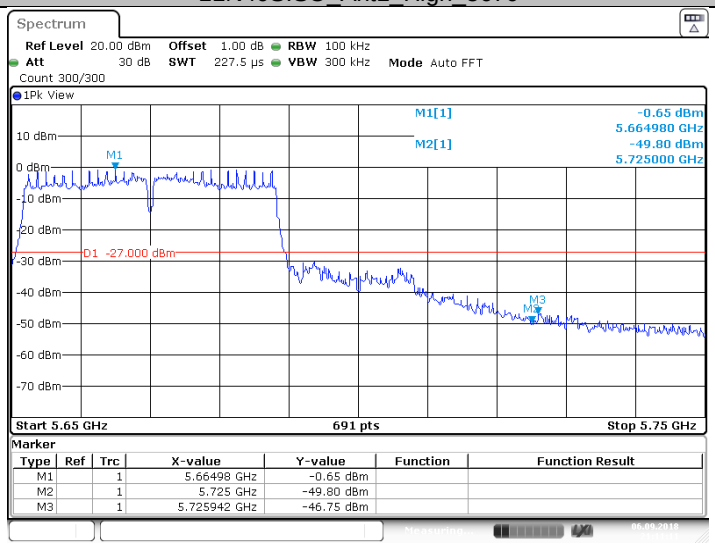
11N40SISO_Ant1_Low_5190


11N40SISO_Ant1_High_5310


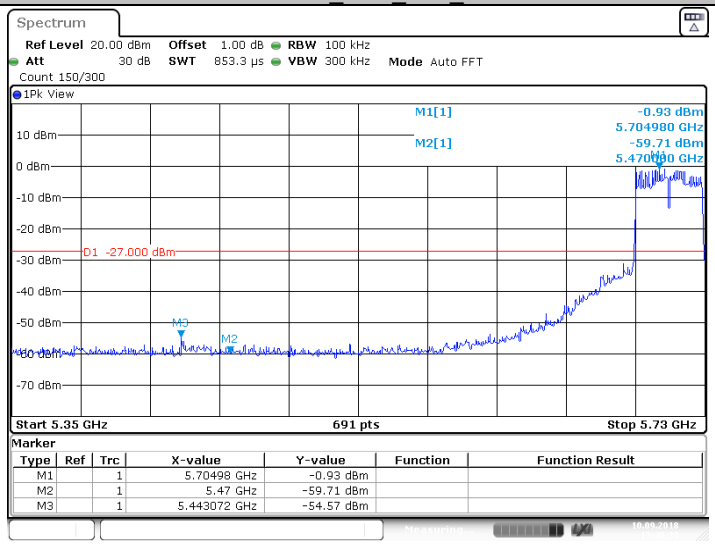
11N40SISO_Ant1_Low_5510



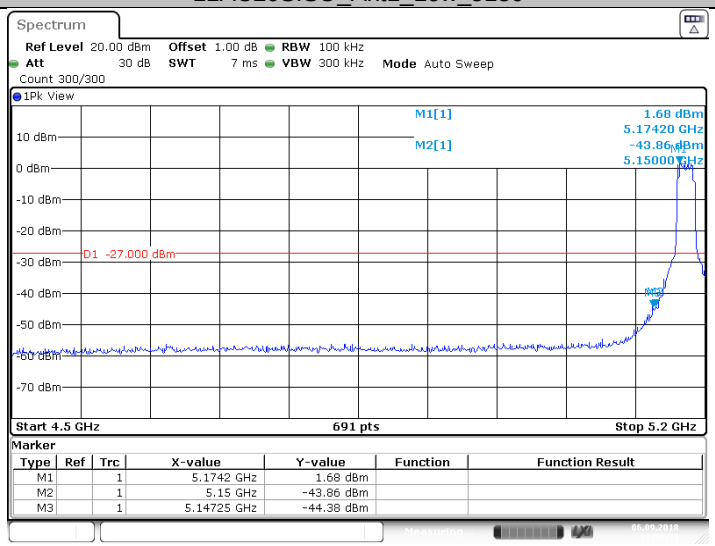
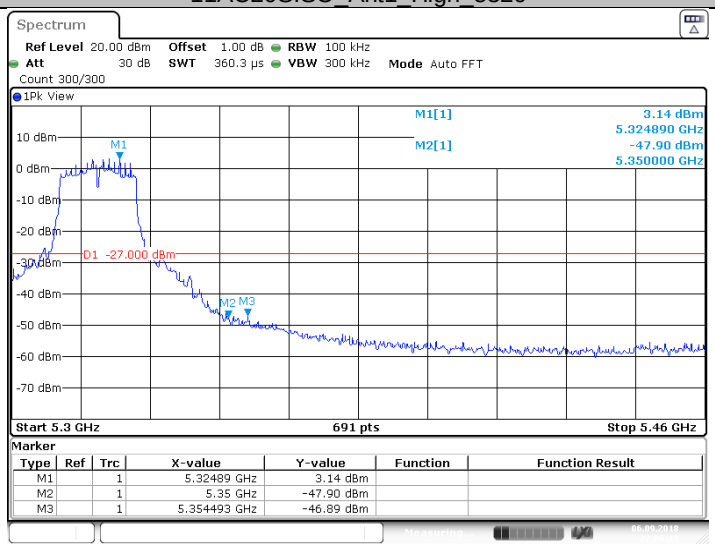
11N40SISO_Ant1_High_5670

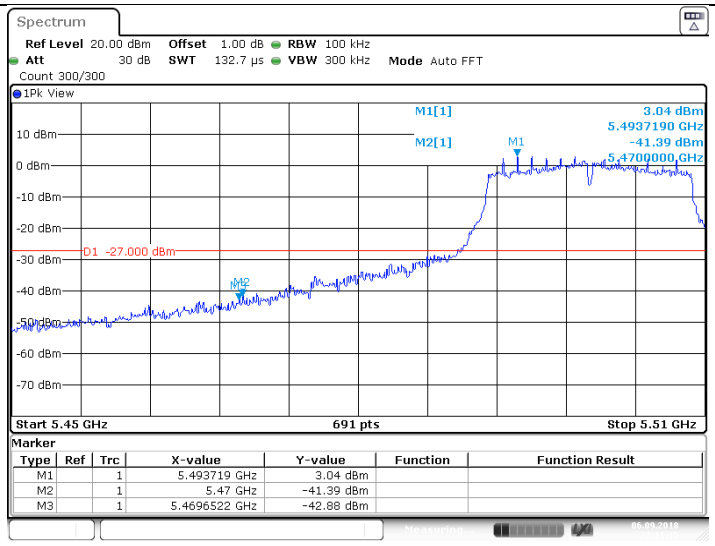


11N40SISO_Ant1_Low_5710

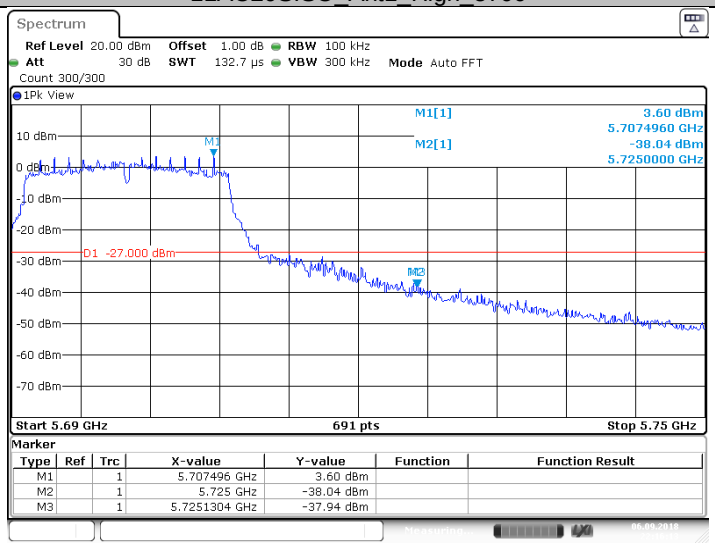


IEEE 802.11ac-HT20 modulation Test Result

11AC20SISO_Ant1_Low_5180

11AC20SISO_Ant1_High_5320

11AC20SISO_Ant1_Low_5500

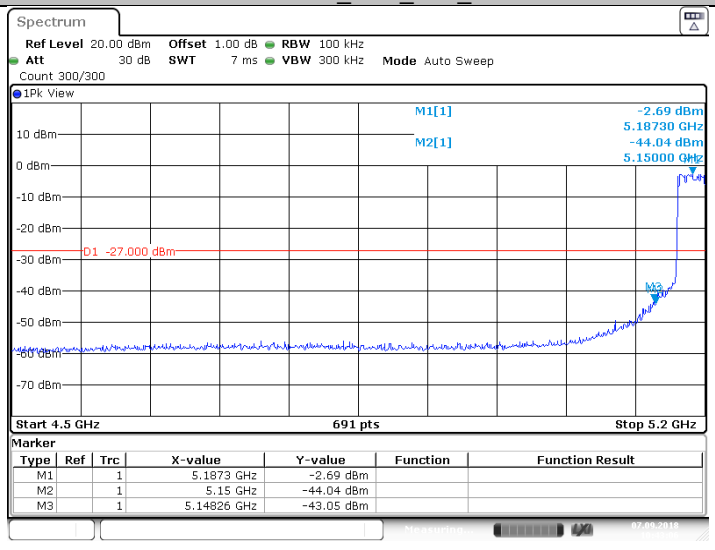


11AC20SISO_Ant1_High_5700



IEEE 802.11ac-HT40 modulation Test Result

11AC40SISO_Ant1_Low_5190



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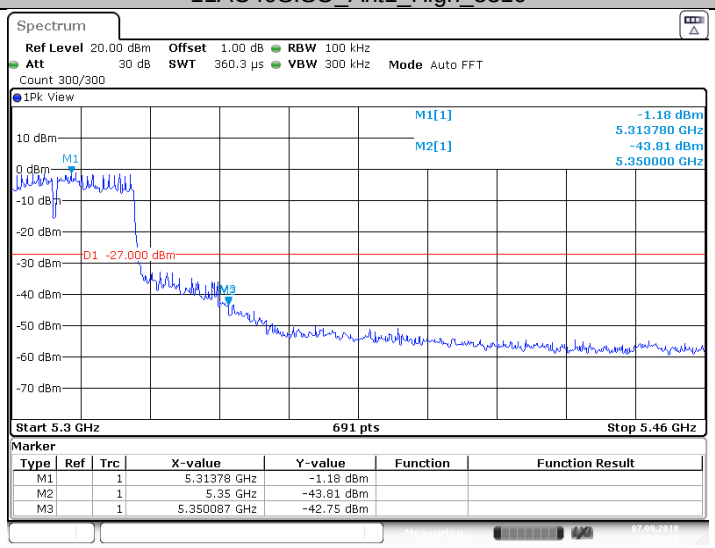
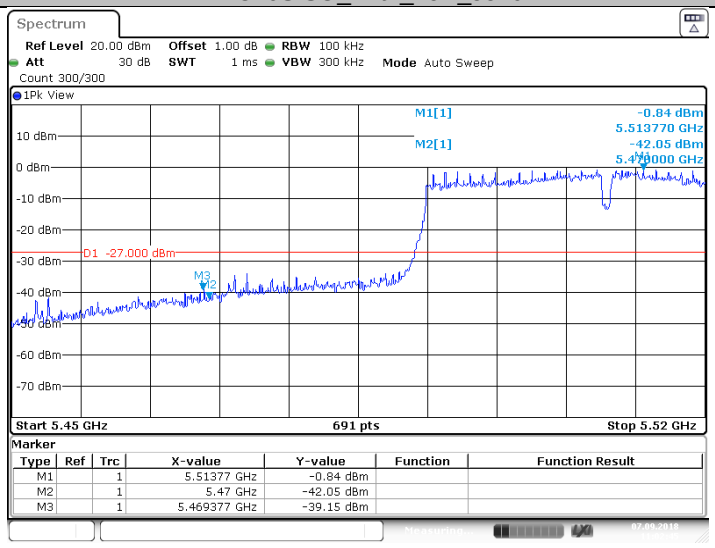
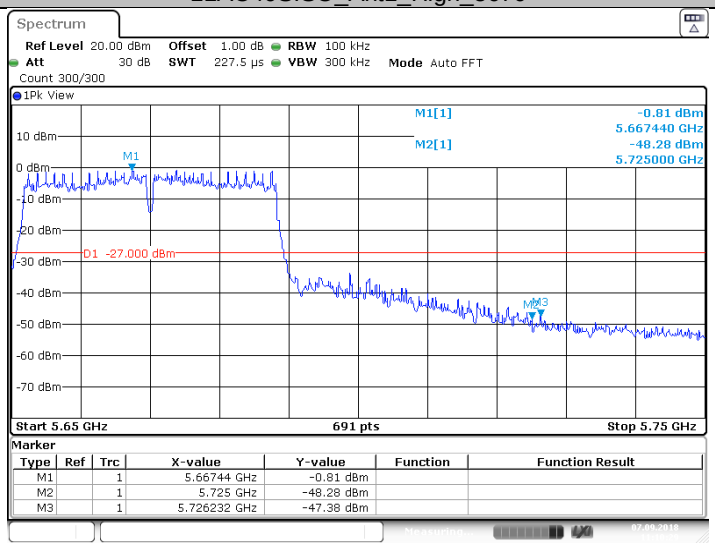
11AC40SISO_Ant1_High_5310



11AC40SISO_Ant1_Low_5510



11AC40SISO_Ant1_High_5670



11AC40SISO_Ant1_Low_5755

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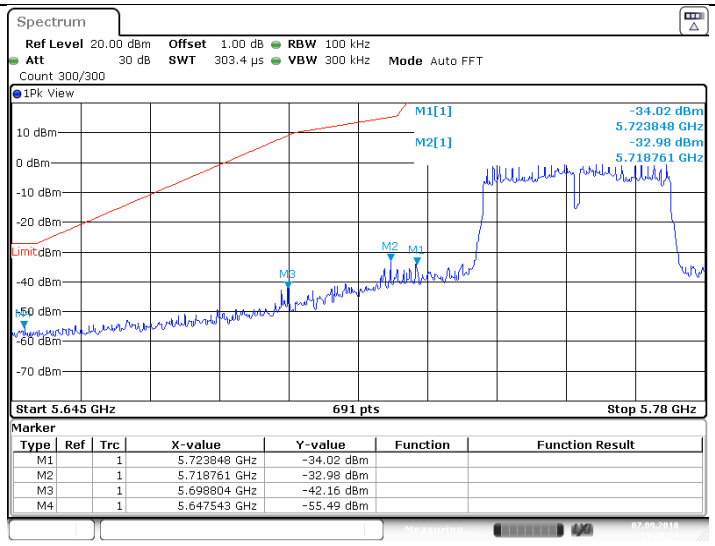
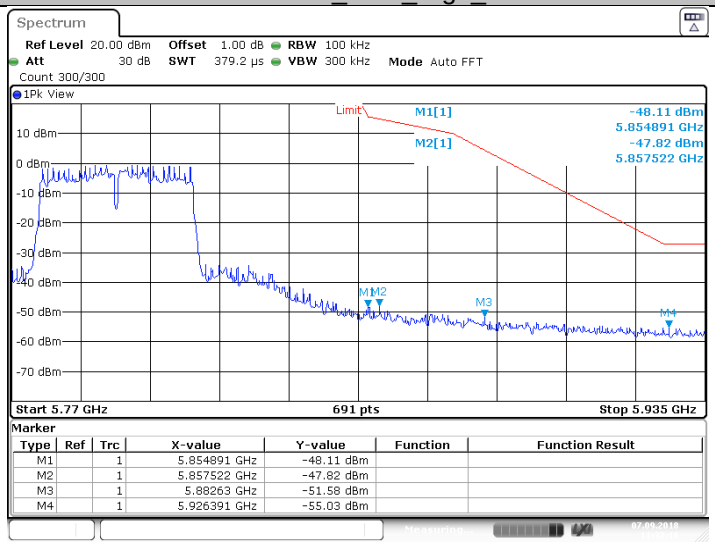
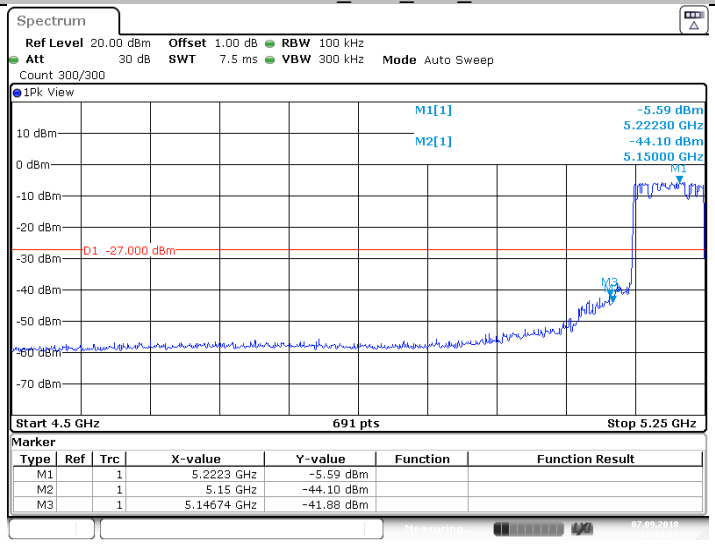


11AC40SISO_Ant1_High_5795

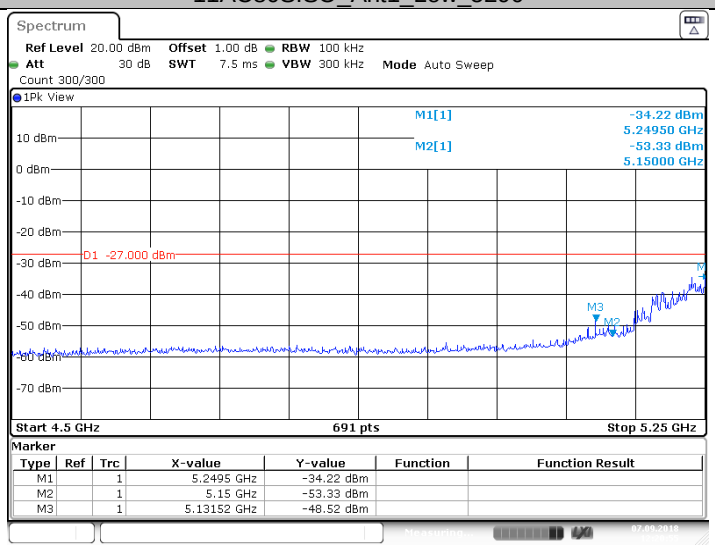


IEEE 802.11ac-HT80 modulation Test Result

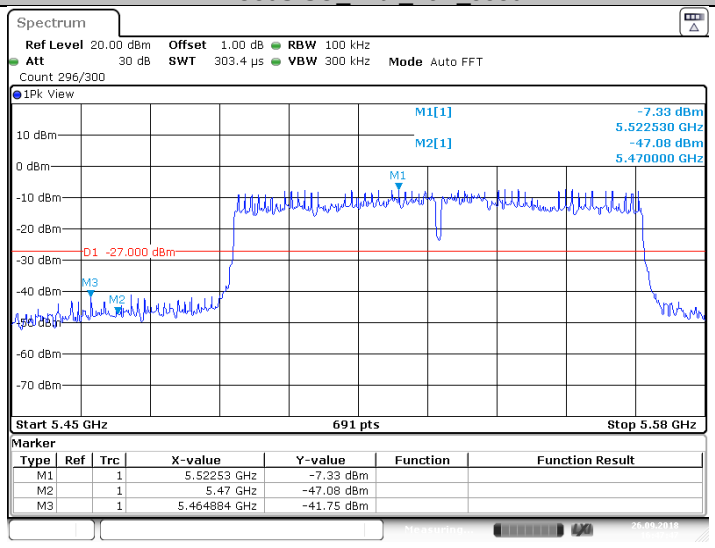
11AC80SISO_Ant1_Low_5210



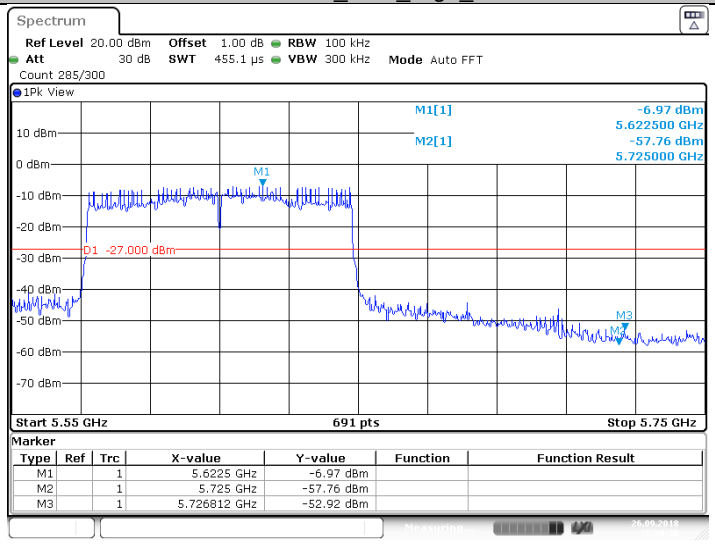
11AC80SISO_Ant1_Low_5290



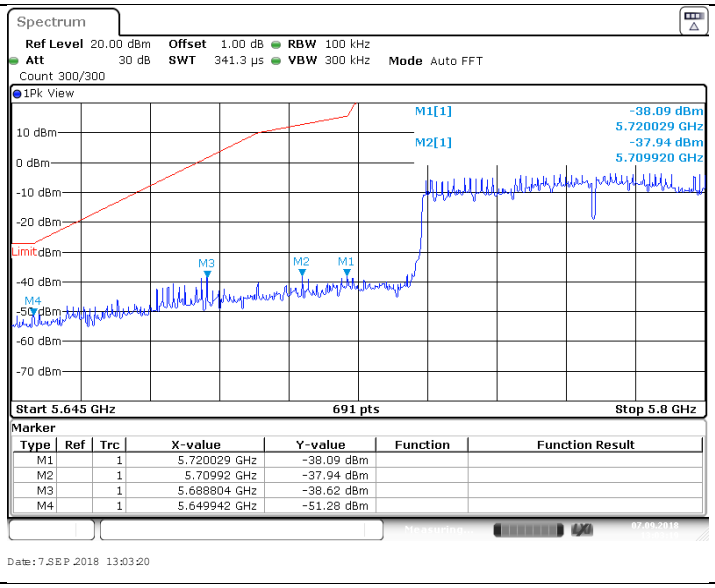
11AC80SISO_Ant1_Low_5530



11AC80SISO_Ant1_High_5610



11AC80SISO_Ant1_Low_5775



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Transmitting spurious emission test result as below (Radiated Mode):

Test Method

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3meter chamber room for test. The table was
   rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four 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 rotatable table was turned
5. Use the following spectrum analyzer settings According to C63.10:
   For Above 1GHz
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 1MHz, VBW≥RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
   For Below 1GHz
   Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function =
   peak, Trace = max hold.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

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Limit

According to part 15.247(d), the radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

802.11A Modulation 5180MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBμV/m	dB		
168.01	-30.0	28.18	Horizontal	43.50	15.32	QP	Pass
294.92	-26.0	29.54	Horizontal	46.00	16.46	QP	Pass
324.02	-25.5	34.65	Horizontal	46.00	11.35	QP	Pass
405.01	-23.9	34.29	Horizontal	46.00	11.71	QP	Pass
468.01	-22.3	41.64	Horizontal	46.00	4.36	QP	Pass
168.01	-30.0	26.95	Vertical	43.50	16.55	QP	Pass
396.01	-24.2	32.95	Vertical	46.00	13.05	QP	Pass
417.78	-23.6	31.87	Vertical	46.00	14.13	QP	Pass
468.01	-22.3	38.31	Vertical	46.00	7.69	QP	Pass
3300.06	-1.7	42.53	Horizontal	74	31.47	PK	Pass
6117.81	4.9	41.71	Horizontal	74	32.29	PK	Pass
*5150	1.8	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	3.2	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
3453.25	-0.5	39.92	Vertical	74	34.08	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5240MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBμV/m	dB		
3300.06	-1.7	41.61	Horizontal	74	32.39	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
2332.56	-6.0	35.06	Vertical	74	38.94	PK	Pass
3493.38	-0.3	38.47	Vertical	74	35.53	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5320MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBµV/m	dB		
3300.06	-1.7	41.17	Horizontal	74	32.83	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
3300.06	-1.7	35.06	Vertical	74	37.37	PK	Pass
6110.31	4.9	41.06	Vertical	74	32.94	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5500MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBµV/m	dB		
3300.06	-1.7	40.54	Horizontal	74	33.46	PK	Pass
6108.81	4.9	40.47	Horizontal	74	33.53	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
3300.06	-1.7	36.21	Vertical	74	37.79	PK	Pass
3666.63	-0.7	37.11	Vertical	74	36.89	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5540MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBµV/m	dB		
3300.06	-1.7	41.63	Horizontal	74	32.37	PK	Pass
3693.25	-0.5	35.77	Horizontal	74	38.23	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
3300.06	-1.7	37.16	Vertical	74	36.84	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass

Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5700MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBμV/m	dB		
3300.06	-1.7	41.68	Horizontal	74	32.32	PK	Pass
3799.94	-0.7	37.84	Horizontal	74	36.16	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
3300.06	-1.7	36.67	Vertical	74	37.33	PK	Pass
3799.94	-0.7	44.00	Vertical	74	30.00	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5745MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBμV/m	dB		
3300.06	-1.7	41.01	Horizontal	74	32.99	PK	Pass
3829.94	-1.2	39.05	Horizontal	74	34.95	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass
7000-40000	---	---	Horizontal	74	---	PK	Pass
3300.06	-1.7	39.23	Vertical	74	34.77	PK	Pass
3829.94	-1.2	41.69	Vertical	74	32.31	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

802.11A Modulation 5825MHz Test Result

Frequency	Corr. Factor	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m		dBμV/m	dB		
3300.06	-1.7	41.80	Horizontal	74	32.20	PK	Pass
3883.38	-1.1	43.85	Horizontal	74	30.15	PK	Pass
*5150	1.9	---	Horizontal	74	---	PK	Pass
*5350	2.3	---	Horizontal	74	---	PK	Pass
*5460	2.8	---	Horizontal	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Horizontal	74	---	PK	Pass

7000-40000	---	---	Horizontal	74	---	PK	Pass
3300.06	-1.7	41.45	Vertical	74	32.55	PK	Pass
3883.38	-1.1	44.08	Vertical	74	29.92	PK	Pass
*5150	1.9	---	Vertical	74	---	PK	Pass
*5350	2.3	---	Vertical	74	---	PK	Pass
*5460	2.8	---	Vertical	74	---	PK	Pass
Other Frequency (1000-7000)	---	---	Vertical	74	---	PK	Pass
7000-40000	---	---	Vertical	74	---	PK	Pass

Remark:

(1) Above 1GHz Corrector factor= Antenna Factor +Cable Loss - Amp. factor
(2) Below 1GHz Corrector factor= Antenna Factor +Cable Loss
(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
(4) We test all modes and only the worst case (802.11a modulation) recorded in the report.
(5) Testing is carried out with frequency rang 9KHz to 40GHz, which below 30MHz and data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 30dB below the permissible limits or the field strength is too small to be measured.

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9.6 Duty Cycle

Test Data:

TestMode	Antenna	Channel	Duty Cycle [%]
11A	Ant1	5180	62.95
		5240	63.39
		5320	63.39
		5500	62.95
		5540	62.95
		5700	62.95
		5720	62.95
		5745	63.23
		5825	62.95

TestMode	Antenna	Channel	Duty Cycle [%]
11N20SISO	Ant1	5180	61.21
		5240	61.21
		5320	61.21
		5500	61.21
		5540	61.40
		5700	61.21
		5720	61.68
		5745	61.21
		5825	61.68

TestMode	Antenna	Channel	Duty Cycle [%]
11N40SISO	Ant1	5190	86.37
		5230	86.37
		5310	86.51
		5510	86.37
		5550	86.51
		5670	86.51
		5710	86.51
		5755	86.51
		5795	86.51

TestMode	Antenna	Channel	Duty Cycle [%]
11AC20SISO	Ant1	5180	92.86
		5240	92.86
		5320	92.86
		5500	92.86
		5540	92.78
		5700	92.86
		5720	92.86
		5745	92.86
		5825	92.86

TestMode	Antenna	Channel	Duty Cycle [%]
11AC40SISO	Ant1	5190	49.69
		5230	49.69
		5310	49.08
		5510	49.69
		5550	49.39
		5670	49.08
		5710	49.69
		5755	49.08
		5795	49.69

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TestMode	Antenna	Channel	Duty Cycle [%]
11AC80SISO	Ant1	5210	40.15
		5290	39.86
		5530	39.86
		5610	40.15
		5690	41.30
		5775	40.58

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9.7 Frequencies Stability

Test Method:

1, Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn on the EUT and tune it to one of the number of frequency shown in section 8.
b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT, or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.
c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level
d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit
e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize
f) While maintaining a control on the chamber to the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.
g) Measure the frequency at each of frequency specified in section 8.
h) Switch OFF the EUT but do not switch OFF the oscillator heater.
i) Lower the chamber temperature by not more that 10℃, and allow the temperature inside the chamber to stabilize.
j) Repeat step f) through step i) down to the lowest specified temperature.

2, Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature. An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency-measuring instrument.
b) Turn the EUT to one of the number if frequencies required in Section8. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level.
c) Measure the frequency at each of the frequencies specified in section 8.
d) Repeat the above procedure at 85% and 115% of the nominal supply voltage.

Limit: It is required that that the emissions are maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

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Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)
	5180
V nom(V)	5180.0430
V max(V)	5179.9570
V min(V)	5179.9570
Max. Deviation Frequency	0.0430
Max. Frequency Error (ppm)	8.30

Frequency Error vs. Temperature:

Test Conditions (°C)	Measured Frequency (MHz)
	5180
-20	5180.0383
45	5180.0327
Max. Deviation Frequency	0.0383
Max. Frequency Error (ppm)	7.51

Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)
	5500
V nom(V)	5500.0241
V max(V)	5500.0211
V min(V)	5500.0205
Max. Deviation Frequency	0.0241
Max. Frequency Error (ppm)	4.38

Frequency Error vs. Temperature:

Test Conditions (°C)	Measured Frequency (MHz)
	5500
-20	5500.0194
45	5500.0172
Max. Deviation Frequency	0.0194
Max. Frequency Error (ppm)	4.20

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Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)
	5745
V nom(V)	5745.0430
V max(V)	5745.0430
V min(V)	5745.0430
Max. Deviation Frequency	0.0430
Max. Frequency Error (ppm)	7.48

Frequency Error vs. Temperature:

Test Conditions (°C)	Measured Frequency (MHz)
	5745
-20	5745.0420
45	5745.0411
Max. Deviation Frequency	0.0420
Max. Frequency Error (ppm)	7.31

Remark 1: V min(V) = 85% of the nominal supply voltage
V max(V)=115% of the nominal supply voltage
Remake 2: we test all frequencies which specified in section 8 and only show these representative frequencies.

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9.8 Dynamic Frequency Selection (DFS)

1、General Test Condition

Parameteers of EUT	
Frequency	5250 – 5350 MHz & 5470 – 5725 MHz
Operational Mode	Slave
Modulation:	OFDM
Channel Bandwidth:	20 MHz , 40 MHz，80 MHz

Note: This device was functioned as a Slave device during the DFS

2、Test requirement

The manufacturer shall whether the EUT is capable of operating as a master and a client. Id the EUT is capable of operating in more than one operating mode then each operating mode shall be tested separately.

DFS Applicability

Requirement	Operational Mode		
	Master	Client Without Radar Detection	**Client With Radar Detection**
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

DFS Applicability During Normal Operation

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Radar Detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Yes	Not required
Uniform Spreading	Yes	Yes	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

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3、Test Limited

According to KDB 905462 D02 Table 4 DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
Note 1: *Channel Move Time* and the *Channel Closing Transmission Time* should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. **Note 2:** The *Channel Closing Transmission Time* is comprised of 200 milliseconds starting at the beginning of the *Channel Move Time* plus any additional intermittent control signals required to facilitate a *Channel* move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. **Note 3:** During the *U-NII Detection Bandwidth* detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

4、Calibration of Radar Waveform

(1) A 50ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master.
(2) The interference Radar Detection Threshold Level is -62dBm+3.7dB+1.5dB=-55.8dBm that had been taken into account the output power range and antenna gain.
(3) The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3MHz. The spectrum analyzer had offset -1.5dB to compensate RF cable loss 1.5dB.
(4) The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was -62dBm+3.7dB+1.5dB=-55.8dBm. Capture the spectrum analyzer plots on short pulse radar waveform.

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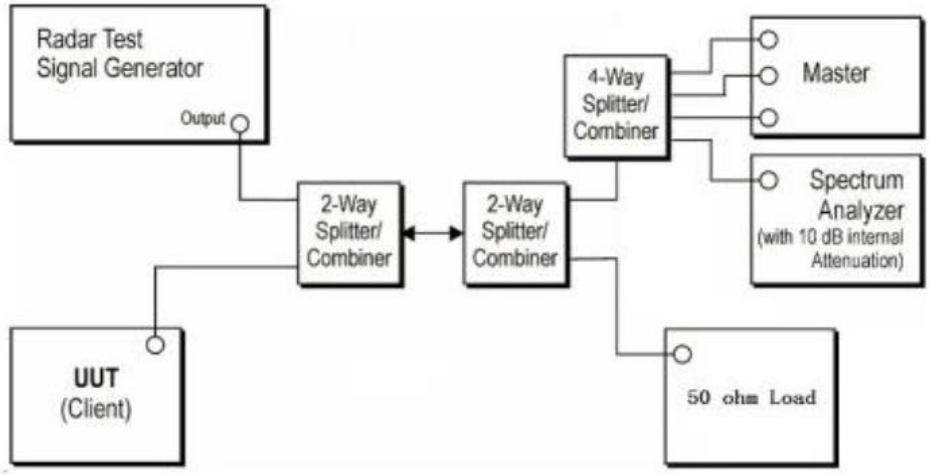
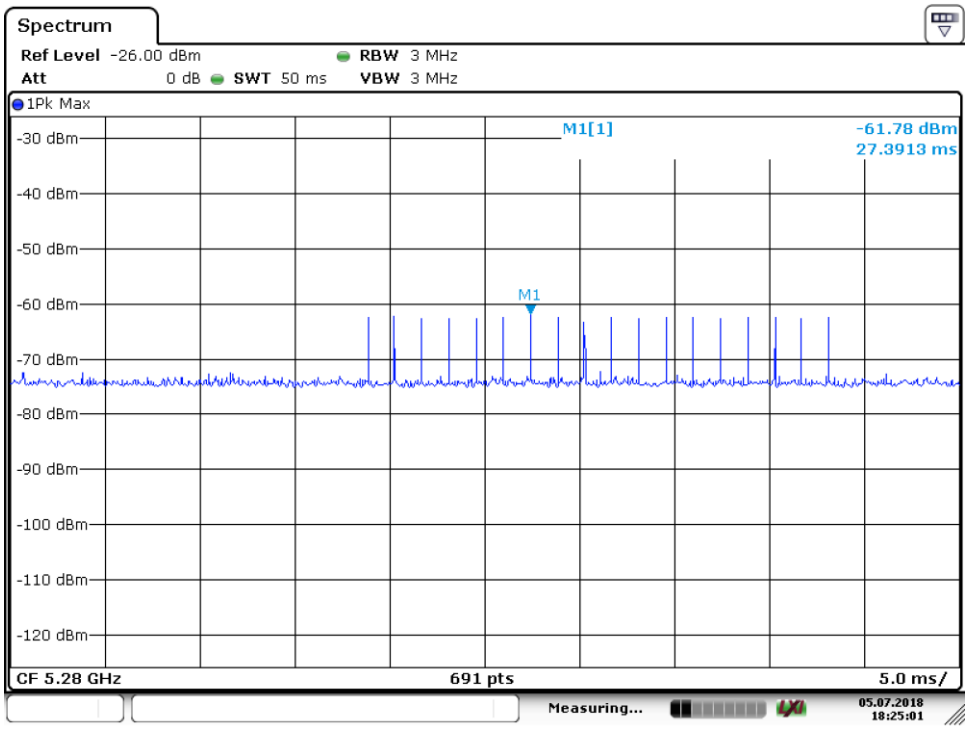
Conducted Calibration Setup:



Radar Waveform Calibration result:



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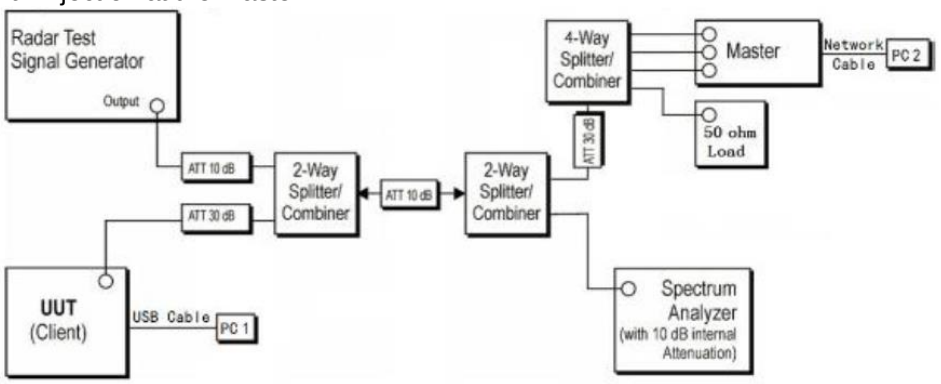
Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period.

Block Diagram of test setup test procedure.

(1) The Radar Pulse generator is setup to provide a pulse at frequency that the master and client are operating, A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.
(2) The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -55.8dBm at the antenna of the master device.
(3) A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.
(4) EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using test software in order to properly load the network for the entire period of the test.
(5) When radar burst with a Level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection threshold +1dB.
(6) Observer the transmissions of the EUT at the end of the radar Burst on the Operating channel. Measure and record the transmissions form the UUT during The observation time (channel move time). One 15 seconds plot is reported for the short pulse radar type 0. The plot for the short pulse radar burst. The channel move time will be calculated based on the zoom in 600ms plot of the short pulse radar type.
(7) Measurement of the aggregate duration of the channel closed transmission time method. With the spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (3.0)=S(12000ms)/B(4000); where dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of channel closing transmission time is calculated by: C(ms)=N X Dwell (0.3ms); where C is the closing time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and dwell is the dwell time per bin.
(8) Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

Test Setup:
Setup for client with injection at the master.



5、Test Result

Clause	Test Parameter	Remarks	Pass/Fail
15.407	DFS Detection Threshold	No Applicable	N/A
15.407	Channel Availability Check time	No Applicable	N/A
15.407	Channel Move time	Applicable	Pass
15.407	Channel Closing Transmission Time	Applicable	Pass
15.407	Non-Occupancy Period	Applicable	Pass
15.407	Uniform Spreading	No Applicable	N/A
15.407	U-NII Detection Bandwidth	No Applicable	N/A

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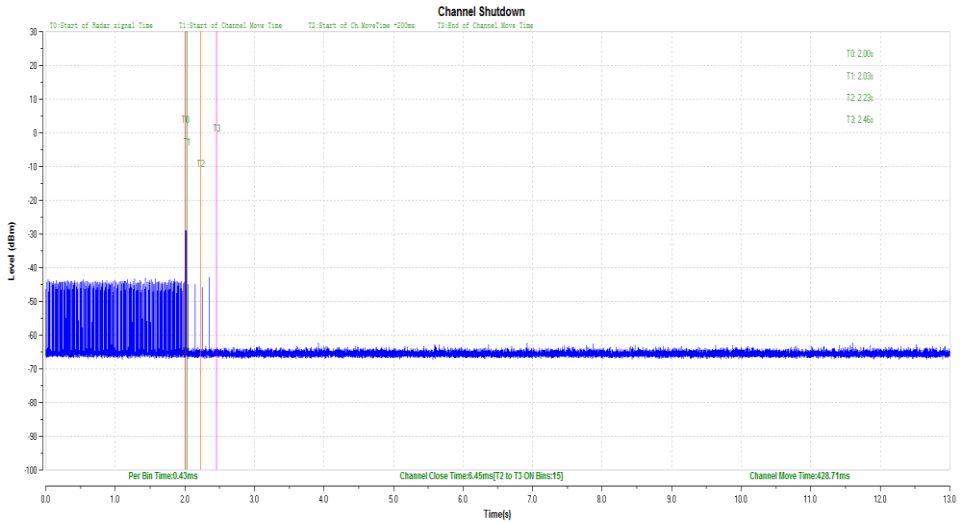
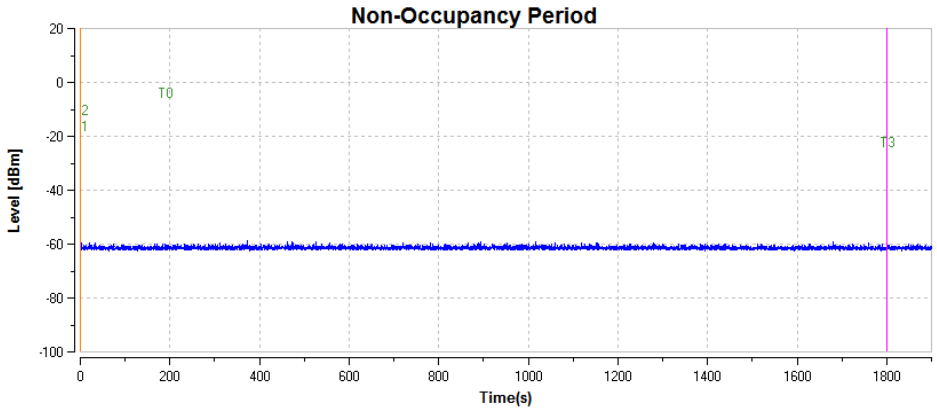
TX(20M)





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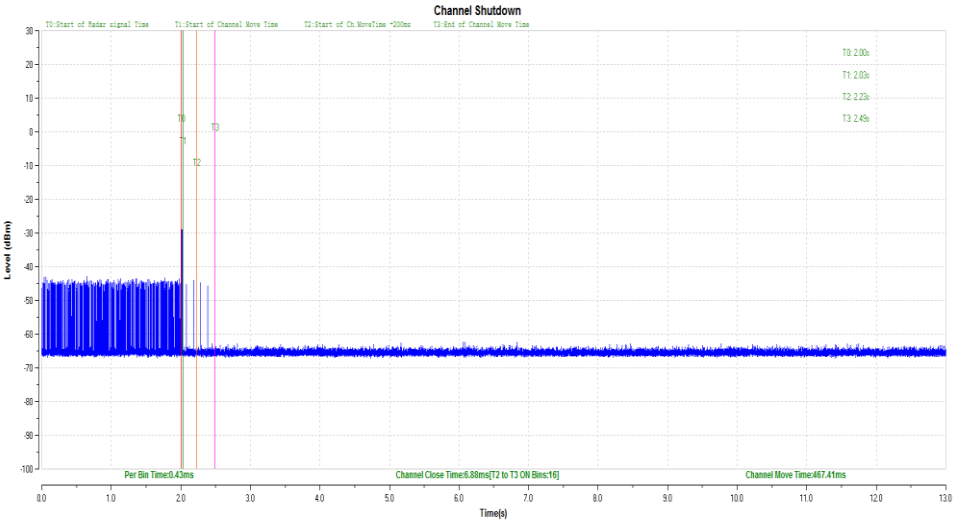
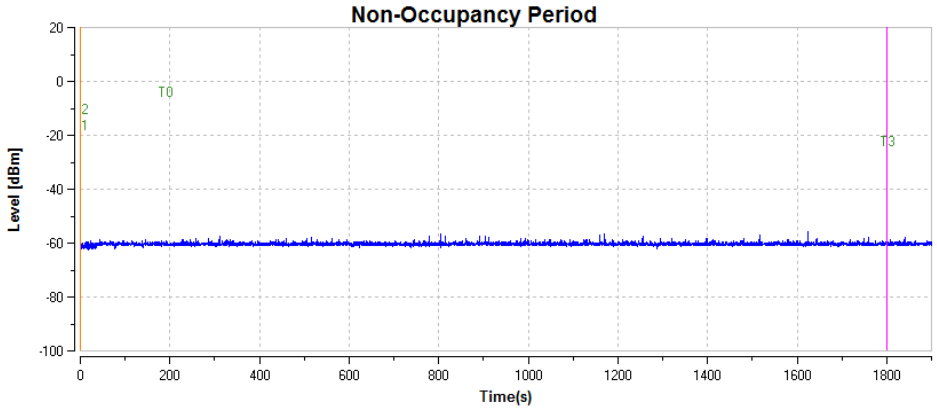
TX(40M)





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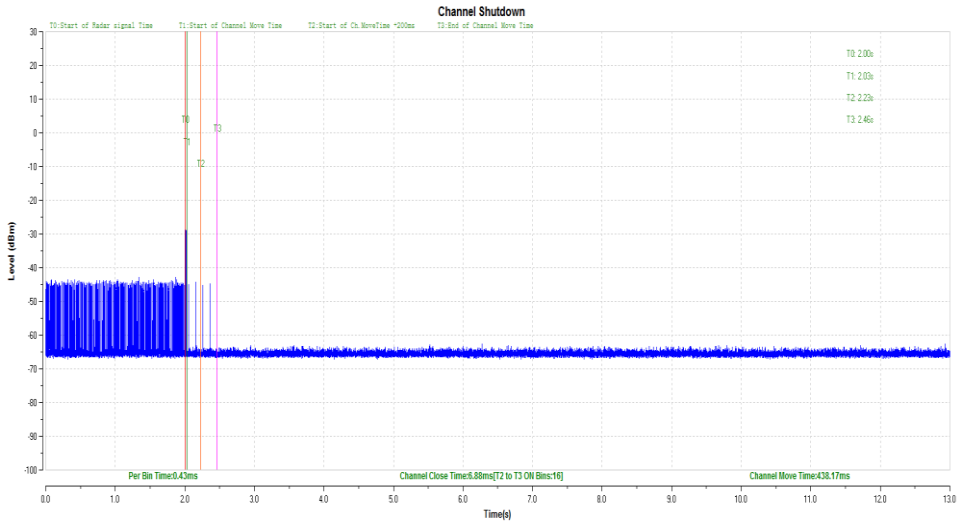
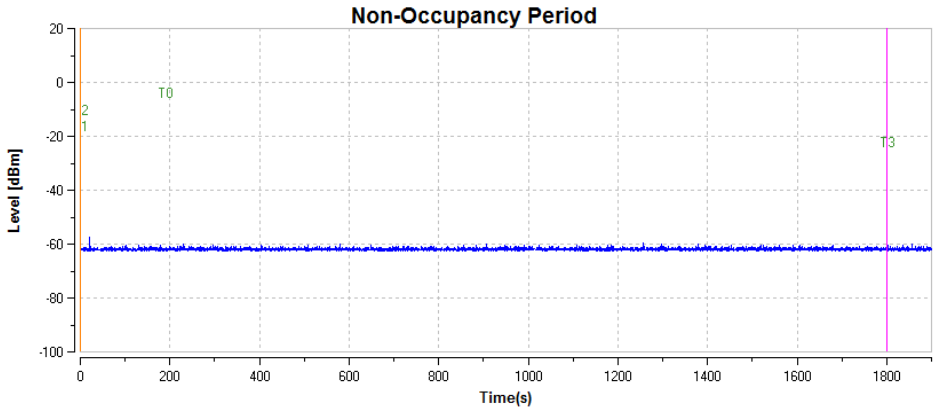
TX(80M)





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10 Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2019-7-6
LISN	Rohde & Schwarz	ENV4200	100249	2019-7-6
LISN	Rohde & Schwarz	ENV432	101318	2019-7-6
LISN	Rohde & Schwarz	ENV216	100326	2019-7-6
ISN	Rohde & Schwarz	ENY81	100177	2019-7-6
ISN	Rohde & Schwarz	ENY81-CA6	101664	2019-7-6
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2019-6-30
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2019-6-30
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2019-7-6
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
Attenuator	Agilent	8491A	MY39264334	2019-7-6
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

TS8997 Test System

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2019-7-6
Vector Signal Generator	Rohde & Schwarz	SMBV100A	262825	2019-7-6
Communication Synthetical Test Instrument	Rohde & Schwarz	CMW 270	101251	2019-5-31
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2019-7-6
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2019-7-6
Power Splitter	Weinschel	1580	SC319	2019-7-5
10dB Attenuator	Weinschel	4M-10	43152	2019-7-6
10dB Attenuator	R&S	DNF	DNF-001	2019-7-6
10dB Attenuator	R&S	DNF	DNF-002	2019-7-6
10dB Attenuator	R&S	DNF	DNF-003	2019-7-6
10dB Attenuator	R&S	DNF	DNF-004	2019-7-6
Test software	Rohde & Schwarz	EMC32	Version 10.38.00	N/A
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A

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11 System Measurement Uncertainly

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz	3.21dB
Uncertainty for Radiated Emission 25MHz-3000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;
Uncertainty for Radiated Emission 3000MHz-18000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;
Uncertainty for Radiated Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 1.16dB Frequency test involved: 0.6×10^{-7}

THE END

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