FCC - TEST REPORT

Report Number	: 68.950.19.0066.01	Date of Issue:	March 13, 2019
Model	: TEMI S1		
Product Type	: Temi Personal Computer Robot		
Applicant	: Roboteam Home Technology (Shenzhen) Co., Ltd		
Address	: 22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD, FUTIAN DISTRICT, SHENZHEN, CHINA		
Manufacturer	: Roboteam Home Technology (Shenzhen) Co., Ltd		
Address	: 22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD, FUTIAN DISTRICT, SHENZHEN, CHINA		
Test Result	: ■ Positive ☐ Negative		
Total pages including Appendices	: 115		

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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
Fax:	86 755 8828 5299

3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	Temi Personal Computer Robot
Model no.:	TEMI S1
FCC ID:	2ASJLTEMIS1
Rating:	Supplied by 14.4Vdc, 15.6Ah Li-ion Battery 19Vdc, 5.0A Charged by an external adapter
Adapter information:	Adapter Model: AY120BA-ZF190500M Adapter Input: 100-240Vac, 50/60Hz; 1.8A Max Adapter Output: 19.0Vdc, 5.0A
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:	2.5dBi
Description of the EUT:	The Equipment Under Test (EUT) is a smart robot 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, 10-1-2018 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart E - Unlicensed National Information Infrastructure Devices
FCC Part 15 Subpart C 10-1-2018 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	18	☒	☐	☐
15.407(a)(1) 15.407(a)(3) Peak Power Spectral Density	22	☒	☐	☐
15.407(b)(1) 15.407(b)(4) 15.407(b)(6) 15.407(b)(7) 15.209 Unwanted Emissions	26	☒	☐	☐
Duty Cycle	104	☒	☐	☐
15.407(g) Frequencies Stability	106	☒	☐	☐
15.407(h) Dynamic Frequency Selection (DFS).[a]	109	☒	☐	☐

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: 2ASJLTEMIS1, 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.

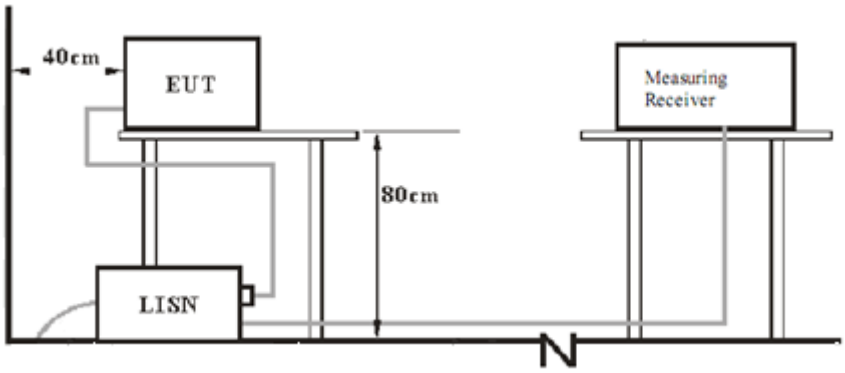
Sample Received Date:	February 25, 2019
Testing Start Date:	February 27, 2019
Testing End Date:	March 8, 2019

- 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

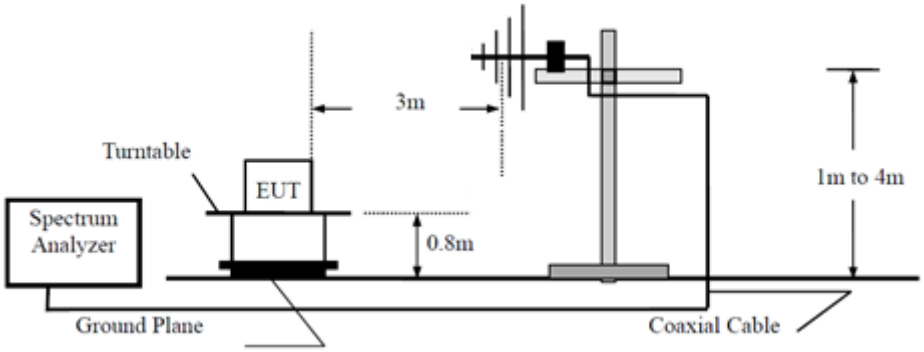
7 Test setups

7.1 AC Power Line Conducted Emission test setups

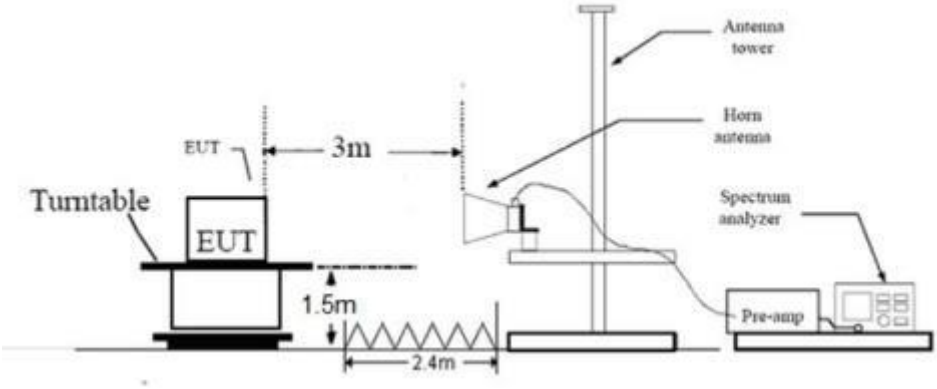


7.2 Radiated test setups

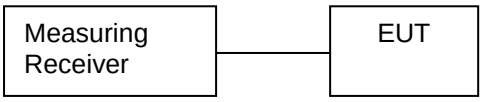
Below 1GHz



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
	44	5220
	48	5240
	52	5260
	60	5300
	64	5320
	100	5500
	120	5600
	140	5700
	144	5720
	149	5745
	157	5785
	165	5825
802.11n40 / 802.11ac40	38	5190
	46	5230
	54	5270
	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 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

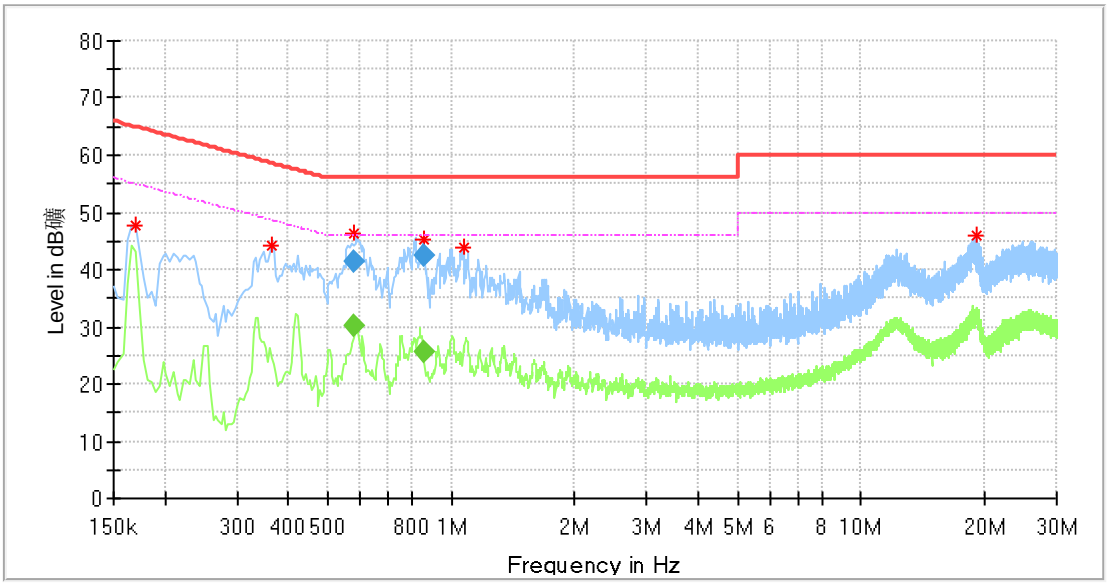
According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

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

Conducted Emission

Product Type	:	Temi Personal Computer Robot
M/N	:	TEMI S1
Operating Condition	:	Charging Mode
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Read Level (dBµV)	Corr. (dB)
0.170000	47.78	---	64.96	17.18	L1	37.58	10.2
0.366000	44.25	---	58.59	14.34	L1	33.95	10.3
0.581500	46.25	---	56.00	9.75	L1	35.95	10.3
0.581500	---	30.23	46.00	15.77	L1	19.93	10.3
0.581500	41.47	---	56.00	14.53	L1	31.17	10.3
0.857500	---	25.67	46.00	20.33	L1	15.37	10.3
1.070000	43.76	---	56.00	12.24	L1	33.46	10.3
19.074000	46.11	---	60.00	13.89	L1	35.11	11.0

Remark:
Max Peak= Read level + Corrector factor
Correct factor=cable loss + LISN factor

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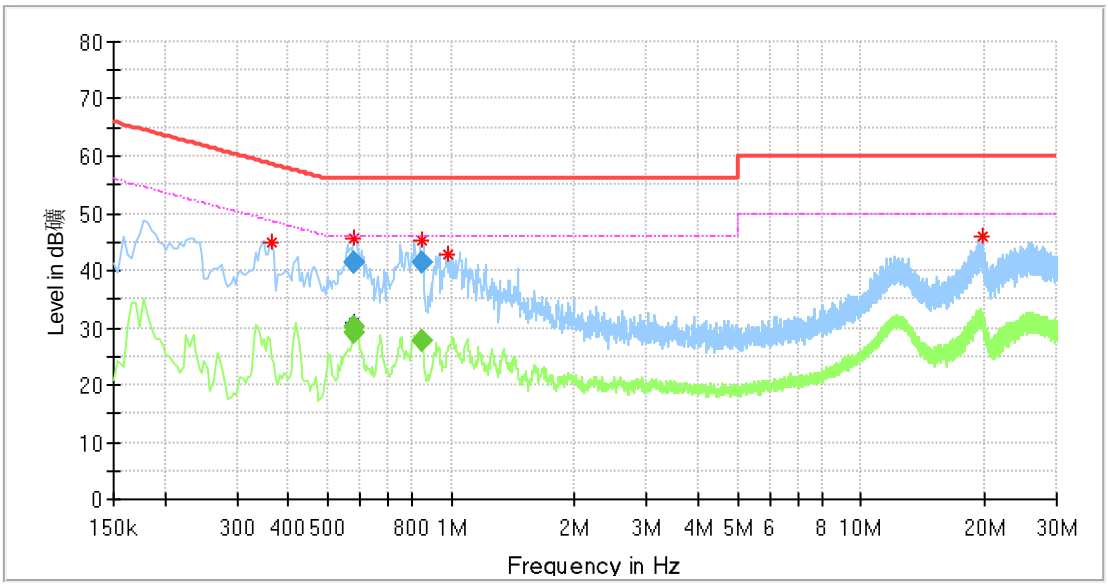
Conducted Emission

Product Type	:	Temi Personal Computer Robot
M/N	:	TEMI S1
Operating Condition	:	Charging Mode
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Read Level (dBµV)	Corr. (dB)
0.366000	44.75	---	58.59	13.84	N	34.45	10.3
0.577500	---	29.13	46.00	16.87	N	18.83	10.3
0.577500	41.56	---	56.00	14.44	N	31.26	10.3
0.581500	---	30.33	46.00	15.67	N	20.03	10.3
0.581500	41.25	---	56.00	14.75	N	30.95	10.3
0.849500	---	27.67	46.00	18.33	N	17.37	10.3
0.849500	41.28	---	56.00	14.72	N	30.98	10.3
0.982000	42.88	---	56.00	13.12	N	32.58	10.3
19.690000	46.11	---	60.00	13.89	N	34.91	11.2

Remark:
Max Peak= Read level + Corrector factor
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_SISO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)		Measured 26dB Bandwidth (MHz)		Measured 6dB Bandwidth (MHz)	
			Ant1	Ant2	Ant1	Ant2	Ant1	Ant2
U-NII-1	Low	5180	17.902	17.902	21.400	21.400	N/A	N/A
	Middle	5220	17.862	17.942	21.560	21.440	N/A	N/A
	High	5240	17.902	17.982	21.440	21.520	N/A	N/A
U-NII-2A	Low	5260	17.862	17.902	21.520	21.440	N/A	N/A
	Middle	5300	17.862	17.902	21.400	21.480	N/A	N/A
	High	5320	17.862	17.862	21.520	21.520	N/A	N/A
U-NII-2C	Low	5500	17.902	17.862	21.560	21.600	N/A	N/A
	Middle	5600	17.862	17.902	21.680	21.600	N/A	N/A
	High	5700	17.862	17.862	21.720	21.520	N/A	N/A
		5720	17.862	17.902	21.640	21.640	N/A	N/A
		5720_UNII-2C	14.071	14.071	15.92	15.84	N/A	N/A
U-NII-3	Low	5720_UNII-3	3.791	3.831	5.72	5.80	N/A	N/A
	Middle	5745	17.862	17.902	N/A	N/A	16.440	16.440
		5785	17.902	17.902	N/A	N/A	16.440	16.440
	High	5825	17.902	17.902	N/A	N/A	16.440	16.440

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IEEE 802.11n-HT20_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
U-NII-1	Low	5180	18.781	21.640	N/A
	Middle	5220	18.901	21.680	N/A
	High	5240	18.941	21.600	N/A
U-NII-2A	Low	5260	18.861	21.600	N/A
	Middle	5300	18.781	21.760	N/A
	High	5320	18.861	21.880	N/A
U-NII-2C	Low	5500	18.821	21.840	N/A
	Middle	5600	18.861	21.880	N/A
	High	5700	18.821	21.840	N/A
		5720	18.781	21.880	N/A
		5720_UNII-2C	14.431	16	N/A
U-NII-3	Low	5720_UNII-3	4.351	5.88	N/A
	Middle	5745	18.781	N/A	17.680
		5785	18.861	N/A	17.680
	High	5825	18.781	N/A	17.680

IEEE 802.11n-HT40_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
U-NII-1	Low	5190	36.843	40.720	N/A
	High	5230	36.923	40.800	N/A
U-NII-2A	Low	5270	36.923	40.560	N/A
	High	5310	36.843	40.560	N/A
U-NII-2C	Low	5510	36.923	40.800	N/A
	Middle	5550	36.923	40.640	N/A
	High	5670	36.923	40.720	N/A
		5710	37.003	40.720	N/A
		5710_UNII-2C	33.462	35.4	N/A
U-NII-3	Low	5710_UNII-3	3.541	5.32	N/A
	Middle	5755	36.923	N/A	36.560
	High	5795	36.923	N/A	36.480

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IEEE 802.1ac-VHT20_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
U-NII-1	Low	5180	18.821	21.560	N/A
	Middle	5220	18.861	21.760	N/A
	High	5240	18.861	21.560	N/A
U-NII-2A	Low	5260	18.861	21.640	N/A
	Middle	5300	18.781	21.760	N/A
	High	5320	18.821	21.640	N/A
U-NII-2C	Low	5500	18.821	21.920	N/A
	Middle	5600	18.821	21.680	N/A
	High	5700	18.821	21.880	N/A
		5720	18.741	21.880	N/A
		5720_UNII-2C	14.391	16	N/A
U-NII-3	Low	5720_UNII-3	4.351	5.88	N/A
	Middle	5745	18.781	N/A	17.680
		5785	18.781	N/A	17.680
	High	5825	18.821	N/A	17.680

IEEE 802.1ac-VHT40 modulation Test Result

Band	Channel	Channel Frequency (MHz)	Measured 99% Bandwidth (MHz)	Measured 26dB Bandwidth (MHz)	Measured 6dB Bandwidth (MHz)
U-NII-1	Low	5190	36.843	40.480	N/A
	High	5230	36.763	40.640	N/A
U-NII-2A	Low	5270	37.003	40.640	N/A
	High	5310	36.843	40.480	N/A
U-NII-2C	Low	5510	36.923	40.640	N/A
	Middle	5550	36.923	40.880	N/A
	High	5670	37.003	40.720	N/A
		5710	36.923	40.800	N/A
		5710_UNII-2C	33.462	35.32	N/A
U-NII-3	Low	5710_UNII-3	3.462	5.48	N/A
	Middle	5755	36.923	N/A	36.560
	High	5795	36.923	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)
U-NII-1	Low	5210	76.084	82.880	N/A
U-NII-2A	High	5290	76.244	83.200	N/A
U-NII-2C	Low	5530	76.244	82.560	N/A
	Middle	5610	76.084	83.360	N/A
	High	5690	76.244	83.040	N/A
	High	5690_UNII-2C	73.042	76.44	N/A
U-NII-3	Low	5690_UNII-3	3.202	6.6	N/A
	High	5775	76.404	N/A	75.580

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_SISO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum Conducted Output Power (dBm)		Power Limit (dBm)
			Ant1	Ant2	
U-NII-1	Low	5180	17.2	14.0	24.00
	Middle	5220	16.2	13.8	24.00
	High	5240	16.2	14.8	24.00
U-NII-2A	Low	5260	15.6	14.3	24.00
	Middle	5300	15.0	12.8	24.00
	High	5320	14.4	12.5	24.00
U-NII-2C	Low	5500	13.5	13.0	24.00
	Middle	5600	13.4	14.1	24.00
	High	5700	14.0	14.9	24.00
		5720	13.6	14.4	24.00
U-NII-3	Low	5745	13.9	14.7	30.00
	Middle	5785	15.6	14.4	30.00
	High	5825	15.1	14.5	30.00

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IEEE 802.11n-HT20_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum Conducted Output Power (dBm)			Power Limit (dBm)
			Ant1	Ant2	SUM	
U-NII-1	Low	5180	17.2	14.8	18.1	24.00
	Middle	5220	16.6	14.2	17.5	24.00
	High	5240	16.7	14.9	18.0	24.00
U-NII-2A	Low	5260	15.9	14.3	17.6	24.00
	Middle	5300	15.2	12.7	16.2	24.00
	High	5320	14.6	12.5	16.4	24.00
U-NII-2C	Low	5500	12.9	12.9	15.5	24.00
	Middle	5600	11.7	14.6	16.2	24.00
	High	5700	11.4	14.9	16.6	24.00
		5720	11.5	14.5	16.3	24.00
U-NII-3	Low	5745	11.8	14.6	17.0	30.00
	Middle	5785	12.1	14.4	16.6	30.00
	High	5825	12.2	14.2	17.0	30.00

IEEE 802.11n-HT40_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum Conducted Output Power (dBm)			Power Limit (dBm)
			Ant1	Ant2	SUM	
U-NII-1	Low	5190	16.5	12.7	17.3	24.00
	High	5230	16.0	13.5	17.1	24.00
U-NII-2A	Low	5270	16.2	14.6	18.0	24.00
	High	5310	15.4	13.3	17.1	24.00
U-NII-2C	Low	5510	12.3	13.2	16.0	24.00
	Middle	5550	12.4	14.6	17.0	24.00
	High	5670	11.9	15.1	17.4	24.00
		5720	11.8	14.9	17.1	24.00
U-NII-3	Low	5755	12.5	14.8	17.5	30.00
	High	5795	12.5	15.3	17.2	30.00

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IEEE 802.11ac-VHT20_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum Conducted Output Power (dBm)			Power Limit (dBm)
			Ant1	Ant2	SUM	
U-NII-1	Low	5180	16.8	14.6	18.0	24.00
	Middle	5220	16.2	14.1	17.5	24.00
	High	5240	16.3	14.7	18.2	24.00
U-NII-2A	Low	5260	15.7	14.3	17.6	24.00
	Middle	5300	14.9	12.6	16.3	24.00
	High	5320	14.6	12.4	16.5	24.00
U-NII-2C	Low	5500	12.4	12.8	15.5	24.00
	Middle	5600	11.0	13.9	16.2	24.00
	High	5700	11.0	14.8	16.7	24.00
		5720	11.1	14.6	16.5	24.00
U-NII-3	Low	5745	11.9	14.5	17.0	30.00
	Middle	5785	12.0	14.4	16.6	30.00
	High	5825	12.1	14.3	16.9	30.00

IEEE 802.11ac-VHT40_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum Conducted Output Power (dBm)			Power Limit (dBm)
			Ant1	Ant2	SUM	
U-NII-1	Low	5190	16.3	13.0	17.4	24.00
	High	5230	16.3	13.7	17.0	24.00
U-NII-2A	Low	5270	16.2	14.6	18.0	24.00
	High	5310	15.4	13.3	17.0	24.00
U-NII-2C	Low	5510	12.3	13.4	16.1	24.00
	Middle	5550	12.4	13.8	16.9	24.00
	High	5670	12.1	15.3	17.4	24.00
		5720	12.5	15.0	17.1	24.00
U-NII-3	Low	5755	12.5	15.0	17.4	30.00
	High	5795	12.6	14.9	17.3	30.00

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IEEE 802.11ac-VHT80_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum Conducted Output Power (dBm)			Power Limit (dBm)
			Ant1	Ant2	SUM	
U-NII-1	42	5210	15.4	12.4	16.1	24.00
U-NII-2A	58	5290	15.2	13.2	16.9	24.00
U-NII-2C	Low	5530	11.4	13.0	15.5	24.00
	Middle	5610	10.7	13.9	15.8	24.00
	High	5690	10.7	14.7	16.2	24.00
U-NII-3	155	5755	11.8	13.9	16.2	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.l.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.

IEEE 802.11a_SISO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum PSD (dBm/MHz)		PSD Limit (dBm/MHz)
			Ant1	Ant2	
U-NII-1	Low	5180	7.92	5.13	11.00
	Middle	5220	7.67	6.12	11.00
	High	5240	7.63	5.70	11.00
U-NII-2A	Low	5260	6.24	4.65	11.00
	Middle	5300	5.97	5.15	11.00
	High	5320	5.90	4.87	11.00
U-NII-2C	Low	5500	5.50	5.10	11.00
	Middle	5600	5.76	6.18	11.00
	High	5700	5.66	6.48	11.00
		5720_UNII-2C	5.63	6.23	11.00
U-NII-3		5720_UNII-3	0.67	0.53	30.00
	Low	5745	2.19	5.60	30.00
	Middle	5785	2.13	4.56	30.00
	High	5825	2.60	4.46	30.00

IEEE 802.11n-HT20_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
U-NII-1	Low	5180	9.00	11.00
	Middle	5220	10.24	11.00
	High	5240	9.73	11.00
U-NII-2A	Low	5260	8.31	11.00
	Middle	5300	8.78	11.00
	High	5320	8.96	11.00
U-NII-2C	Low	5500	9.48	11.00
	Middle	5600	10.14	11.00
	High	5700	10.01	11.00
		5720_UNII-2C	9.51	11.00
U-NII-3		5720_UNII-3	8.44	11.00
	Low	5745	9.54	30.00
	Middle	5785	8.50	30.00
	High	5825	7.85	30.00

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IEEE 802.11n-HT40_MIMO modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
U-NII-1	Low	5190	5.67	11.00
	High	5230	6.15	11.00
U-NII-2A	Low	5270	6.26	11.00
	High	5310	6.33	11.00
U-NII-2C	Low	5510	6.55	11.00
	Middle	5550	7.6	11.00
	High	5670	7.82	11.00
		5710_UNII-2C	8.07	11.00
U-NII-3	Low	5710_UNII-3	6.06	11.00
		5755	6.9	30.00
	High	5795	5.42	30.00

IEEE 802.11ac-VHT20_MIMO modulation Test Result

Band	Channel	Channel Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
U-NII-1	Low	5180	9.01	11.00
	Middle	5220	10.41	11.00
	High	5240	9.56	11.00
U-NII-2A	Low	5260	8.45	11.00
	Middle	5300	9.06	11.00
	High	5320	8.66	11.00
U-NII-2C	Low	5500	9.34	11.00
	Middle	5600	9.66	11.00
	High	5700	10.2	11.00
		5720_UNII-2C	9.77	11.00
U-NII-3		5720_UNII-3	8.21	11.00
	Low	5745	8.9	30.00
	Middle	5785	8.27	30.00
	High	5825	8.7	30.00

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IEEE 802.11ac-VHT40_MIMO modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
U-NII-1	Low	5190	5.54	11.00
	High	5230	6.72	11.00
U-NII-2A	Low	5270	6.88	11.00
	High	5310	6.88	11.00
U-NII-2C	Low	5510	6.96	11.00
	Middle	5550	6.85	11.00
	High	5670	8.34	11.00
		5710_UNII-2C	8.02	11.00
U-NII-3	Low	5710_UNII-3	6.44	11.00
		5755	6.67	30.00
	High	5795	5.8	30.00

IEEE 802.11ac-VHT80_MIMO modulation Test Result

Band	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)
U-NII-1	42	5210	2.8	11.00
U-NII-2A	58	5290	3.21	11.00
U-NII-2C	Low	5530	3.28	11.00
	Middle	5610	4.8	11.00
	High	5690_UNII-2C	5.04	11.00
		5690_UNII-3	1.98	11.00
U-NII-3	155	5775	2.79	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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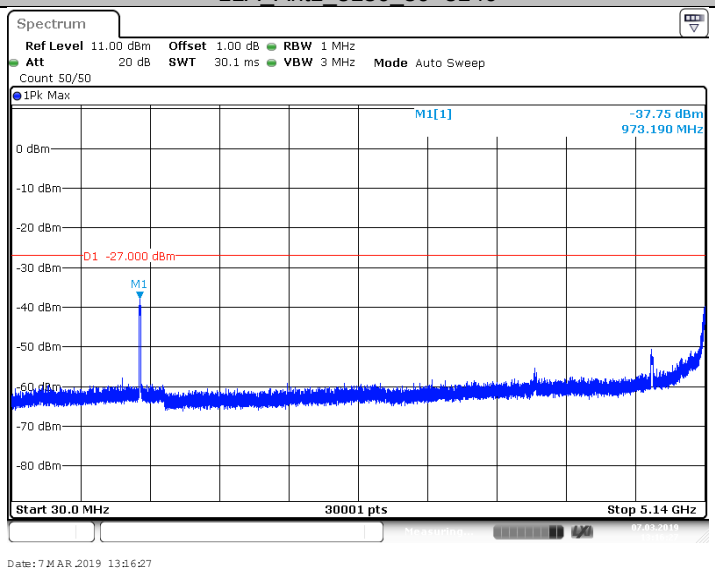
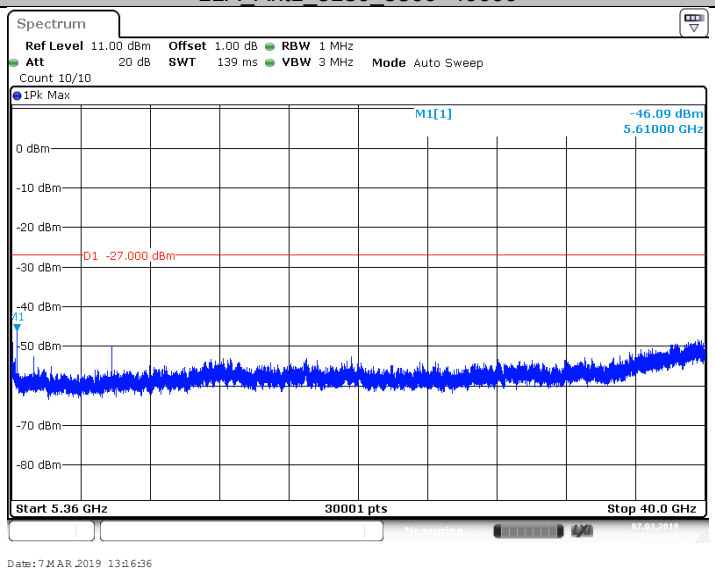
Transmitting spurious emission test result as below (Conducted Mode):

IEEE 802.11a modulation Test Result

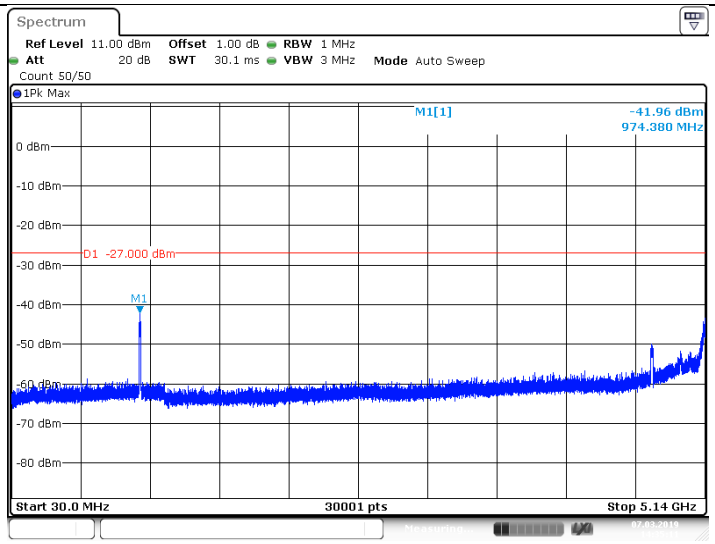
11A_Ant1_5180_30~5140



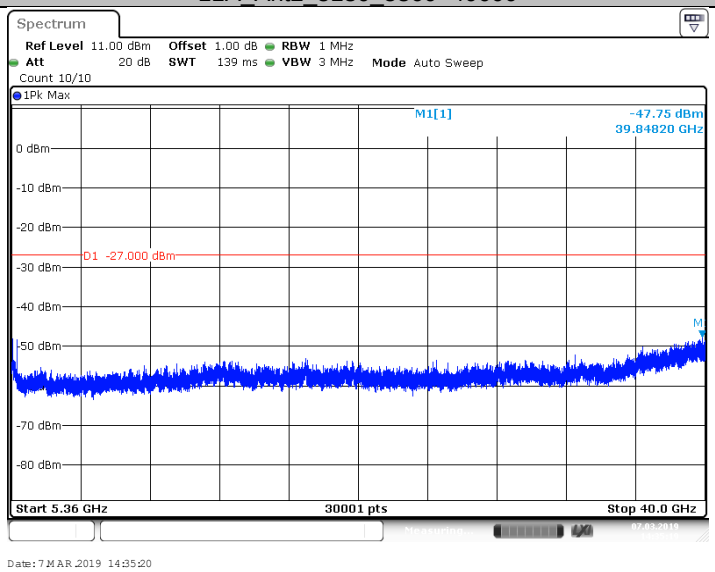
11A_Ant1_5180_5360~40000



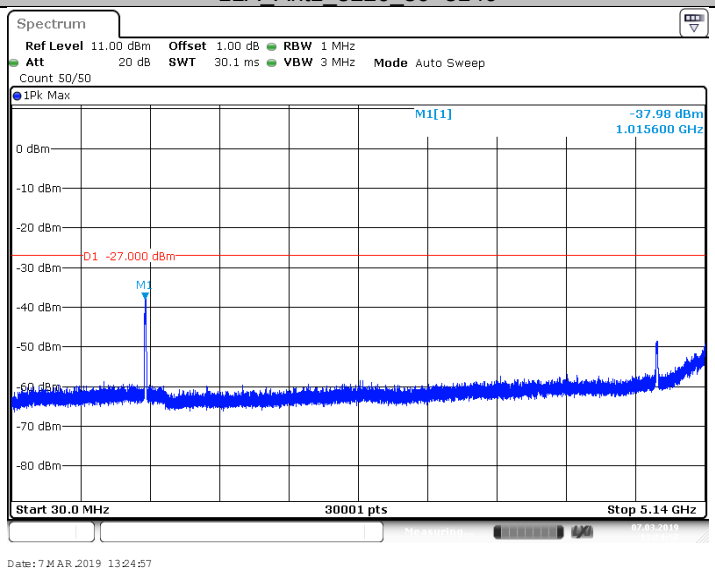
11A_Ant2_5180_30~5140



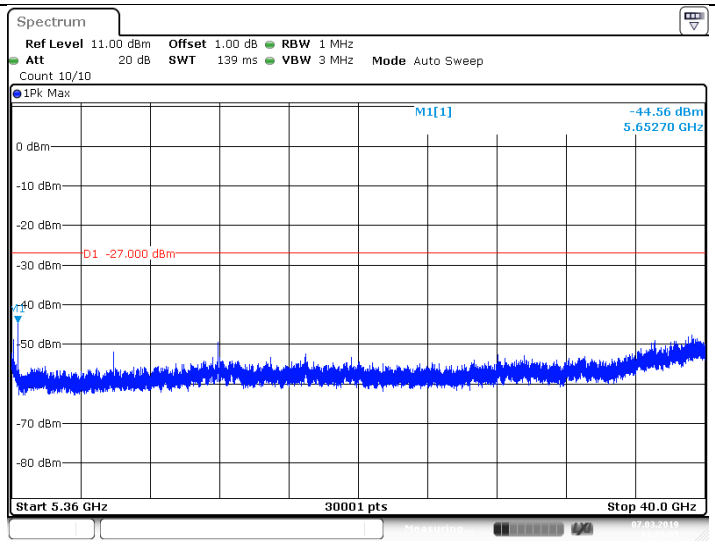
11A_Ant2_5180_5360~40000



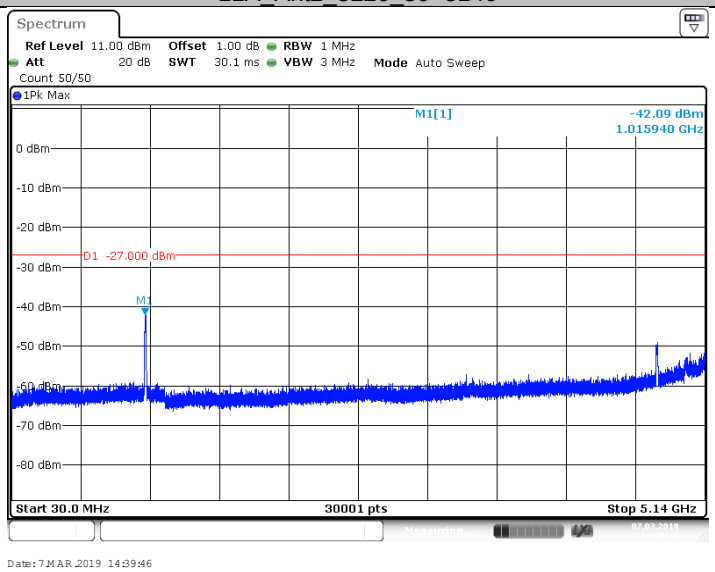
11A_Ant1_5220_30~5140



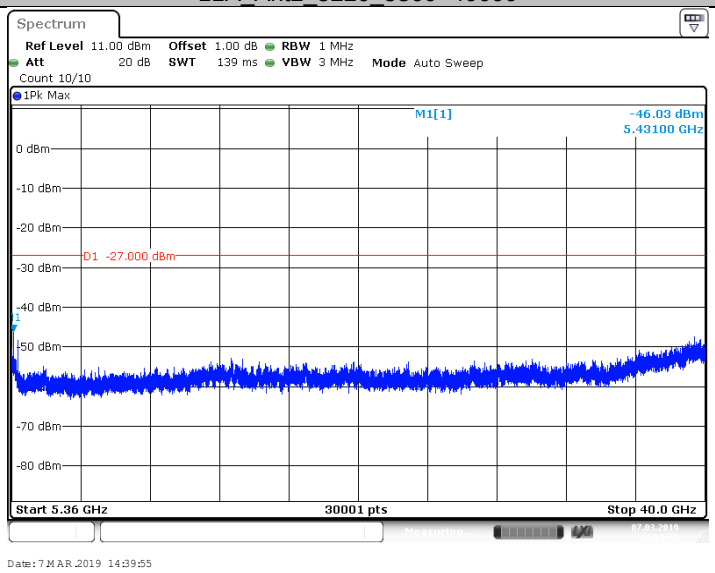
11A_Ant1_5220_5360~40000



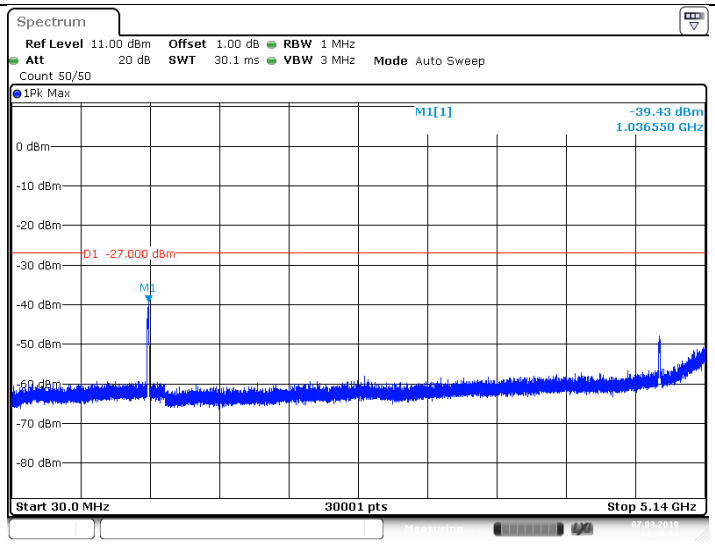
11A_Ant2_5220_30~5140



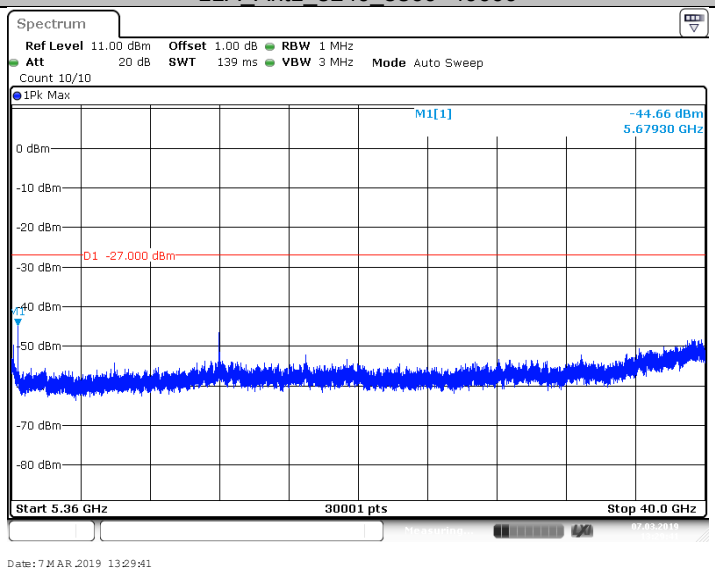
11A_Ant2_5220_5360~40000



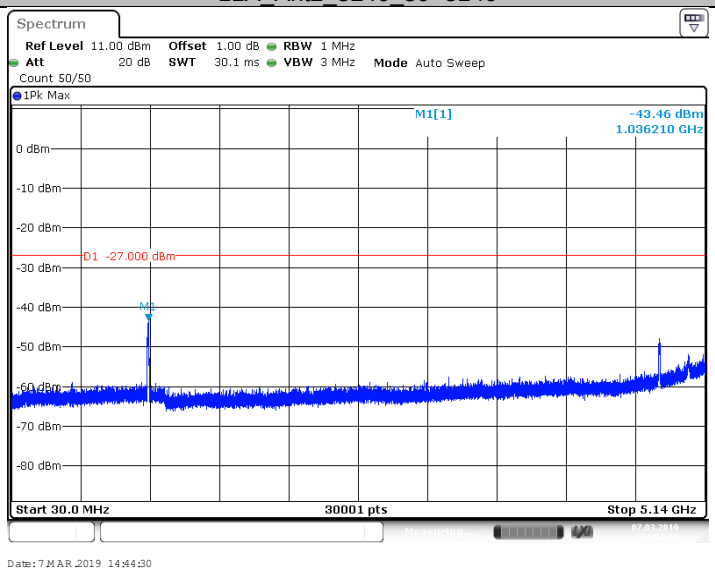
11A_Ant1_5240_30~5140



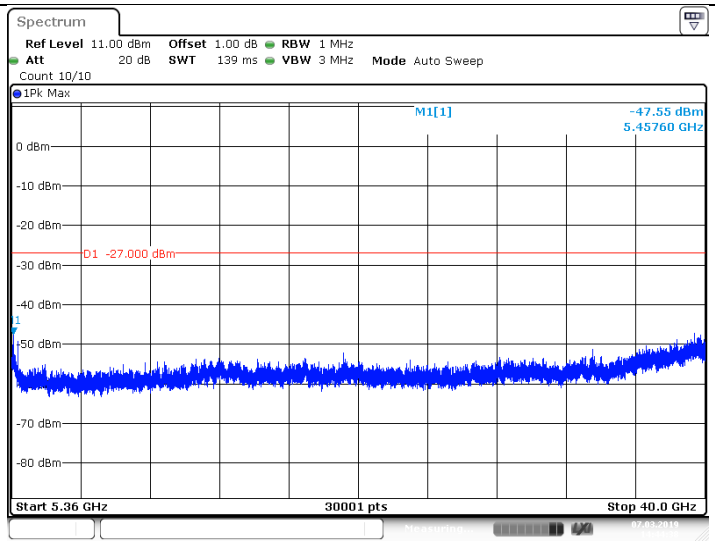
11A_Ant1_5240_5360~40000



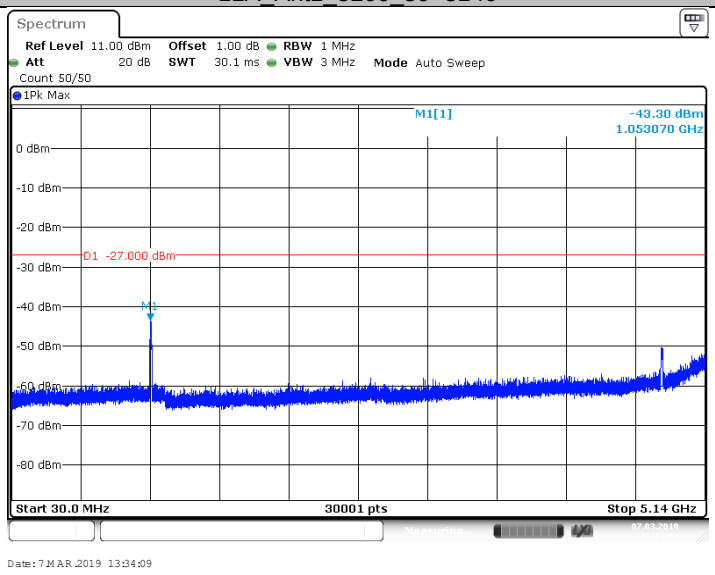
11A_Ant2_5240_30~5140



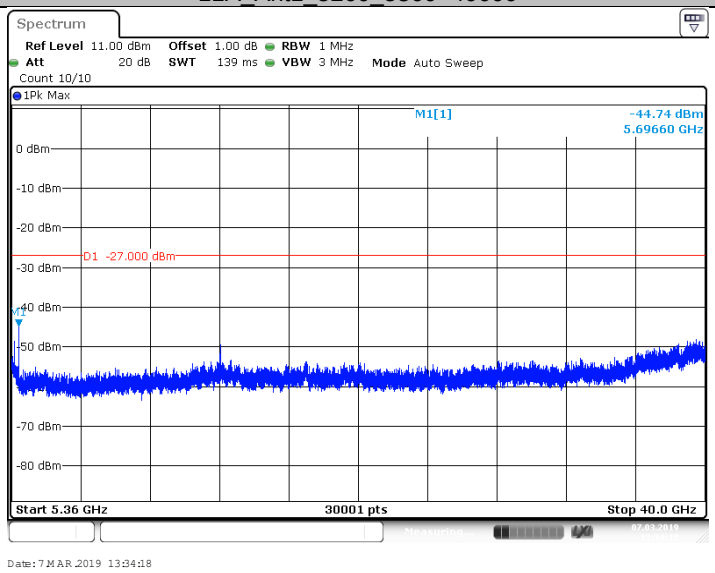
11A_Ant2_5240_5360~40000



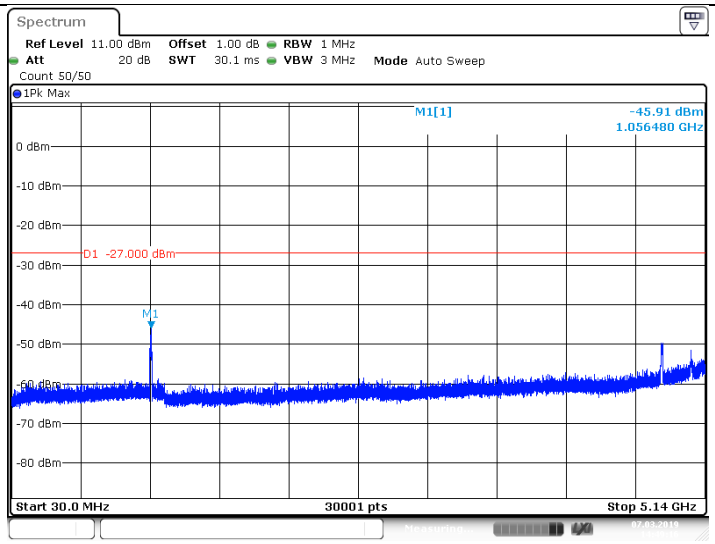
11A_Ant1_5260_30~5140



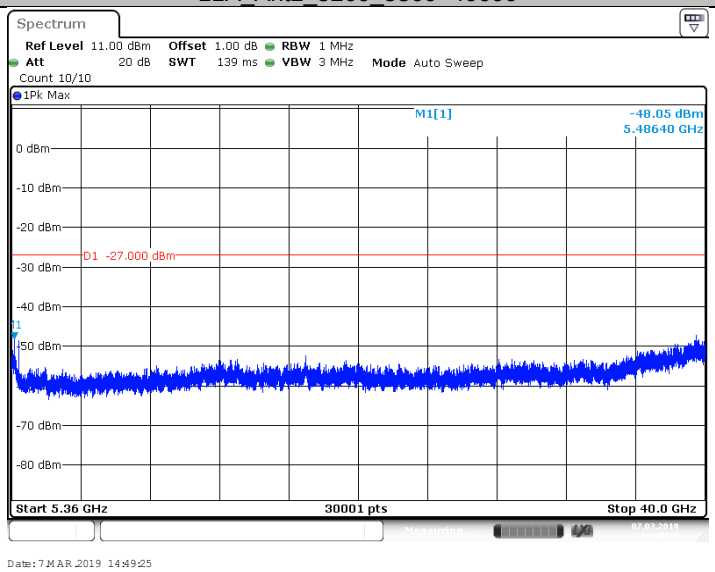
11A_Ant1_5260_5360~40000



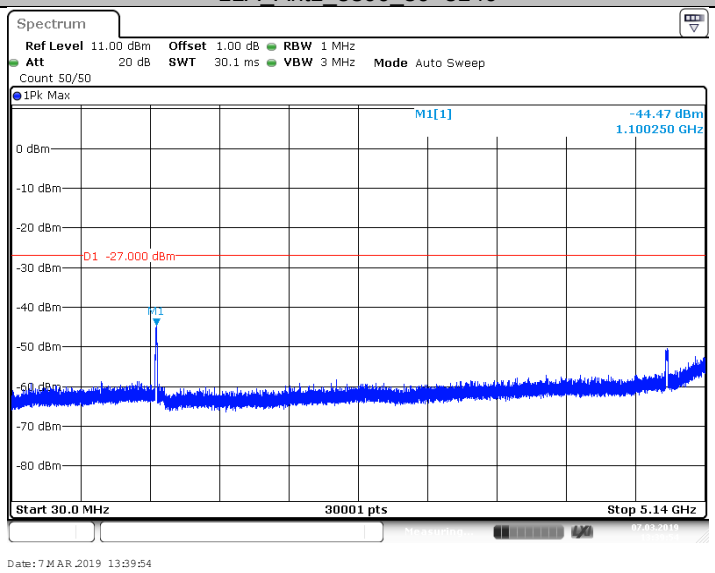
11A_Ant2_5260_30~5140



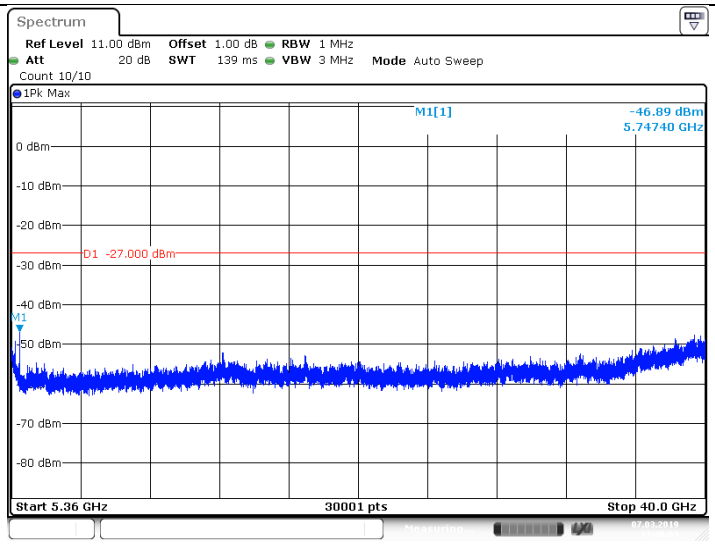
11A_Ant2_5260_5360~40000



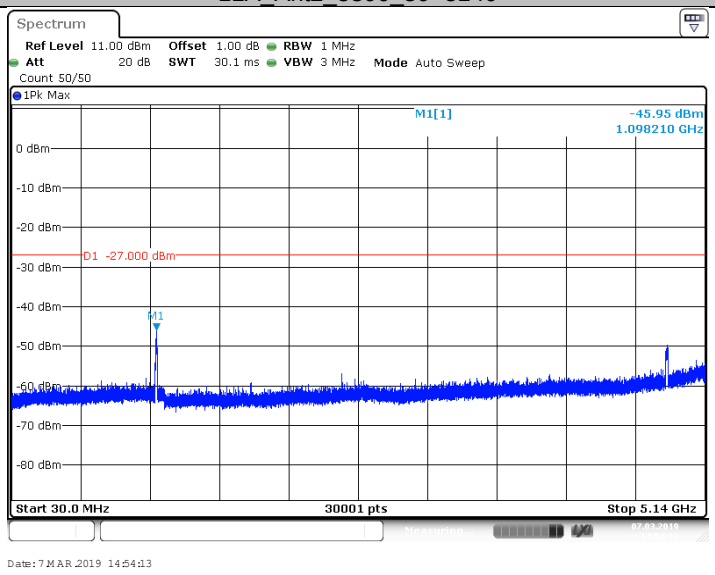
11A_Ant1_5300_30~5140



11A_Ant1_5300_5360~40000



11A_Ant2_5300_30~5140



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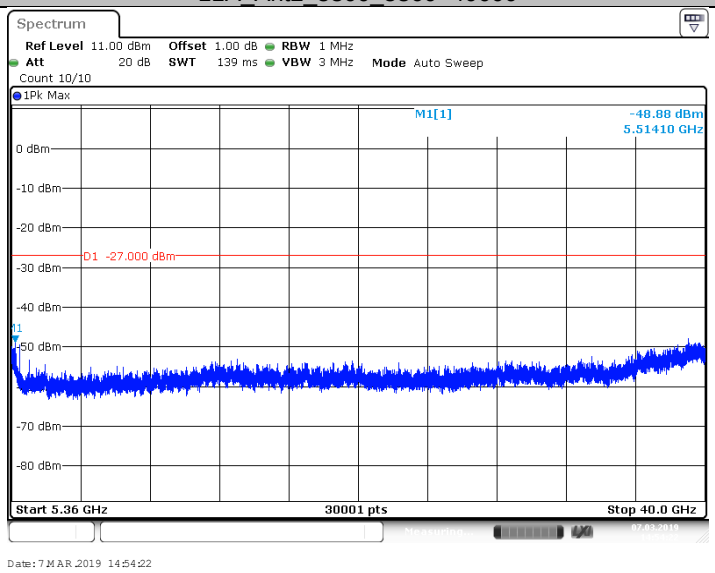

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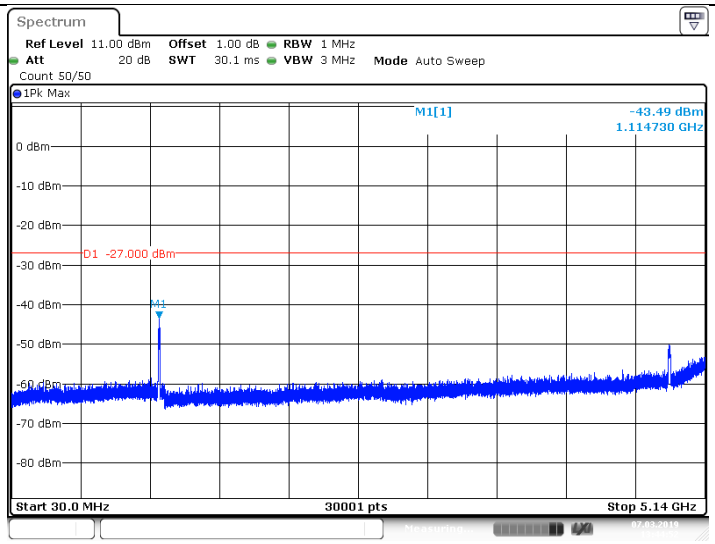

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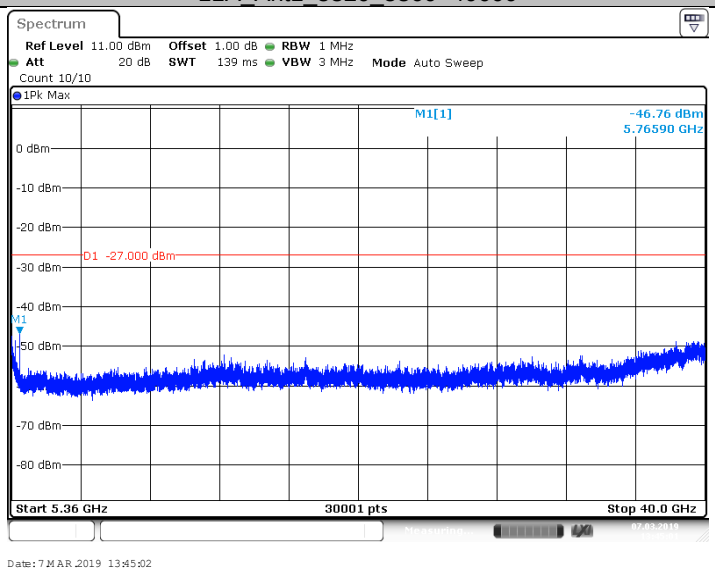

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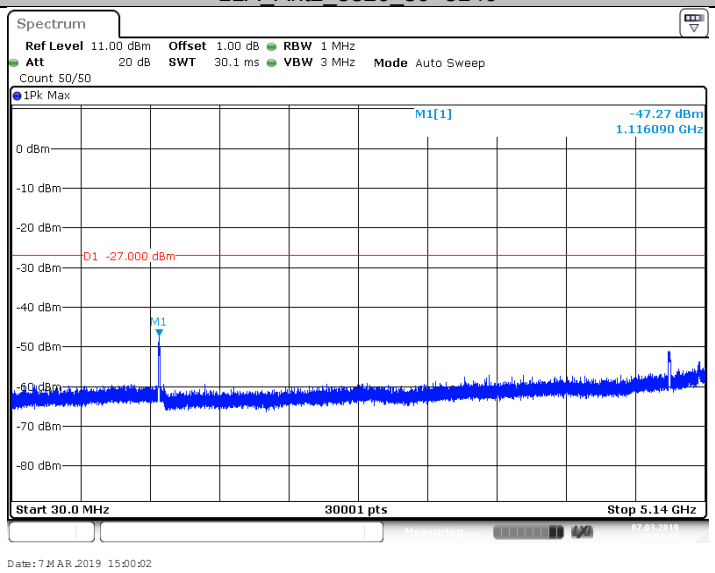

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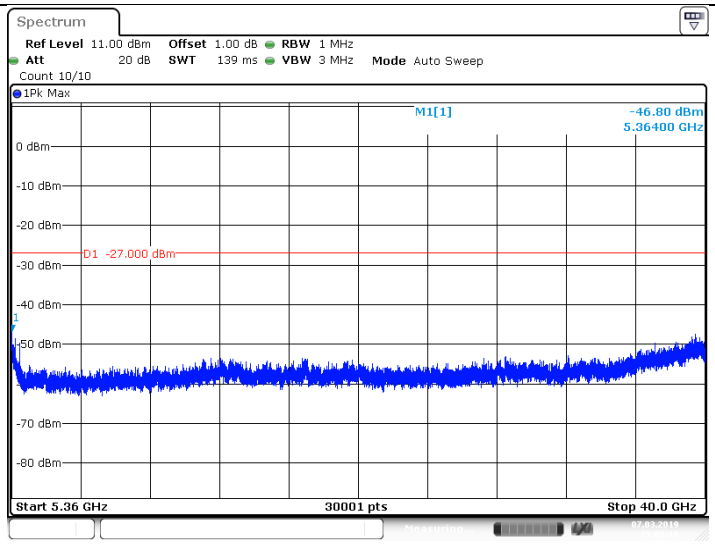

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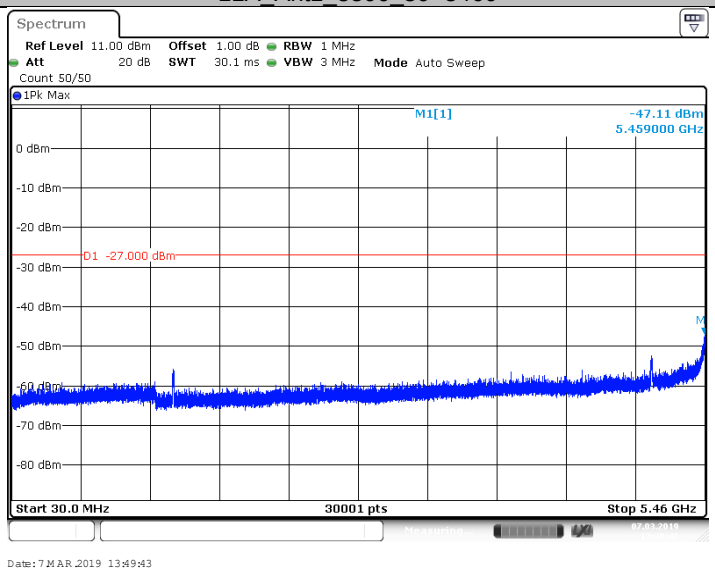
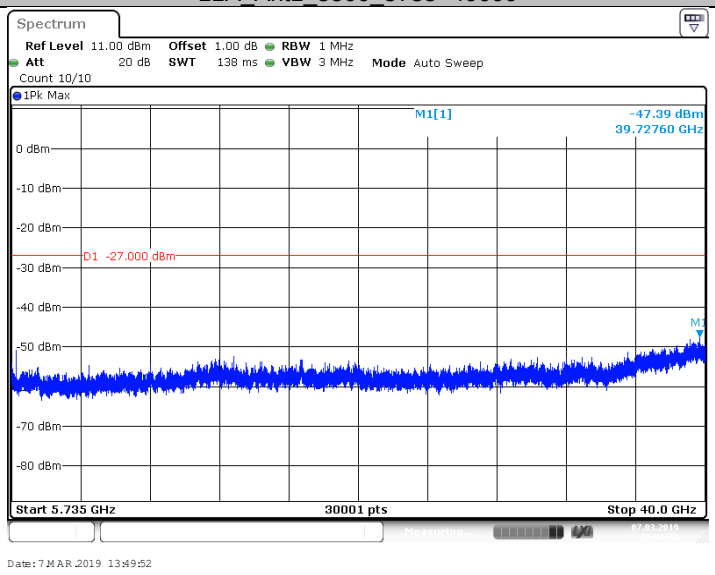


11A_Ant1_5500_5735~40000



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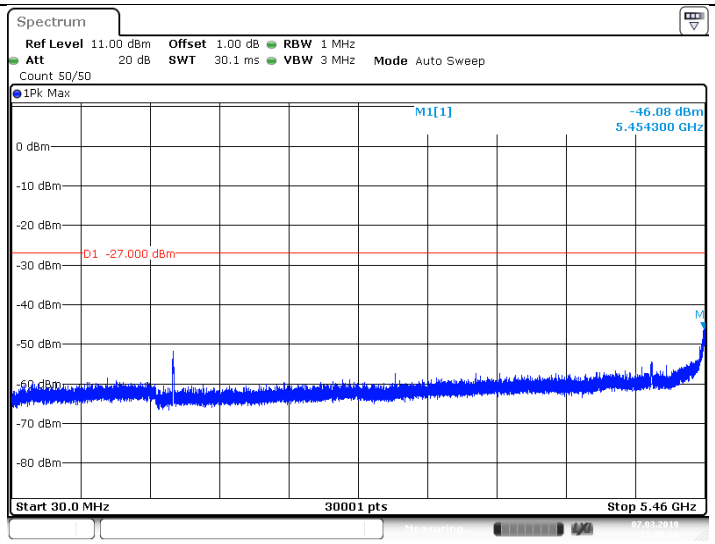

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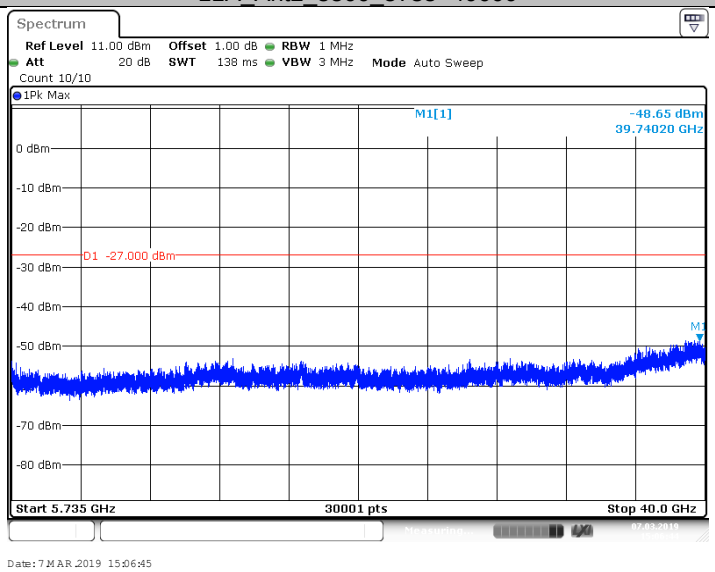

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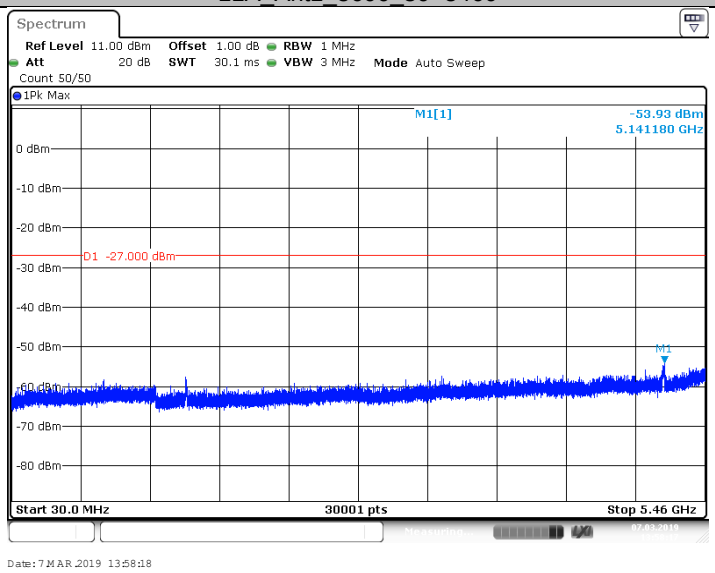

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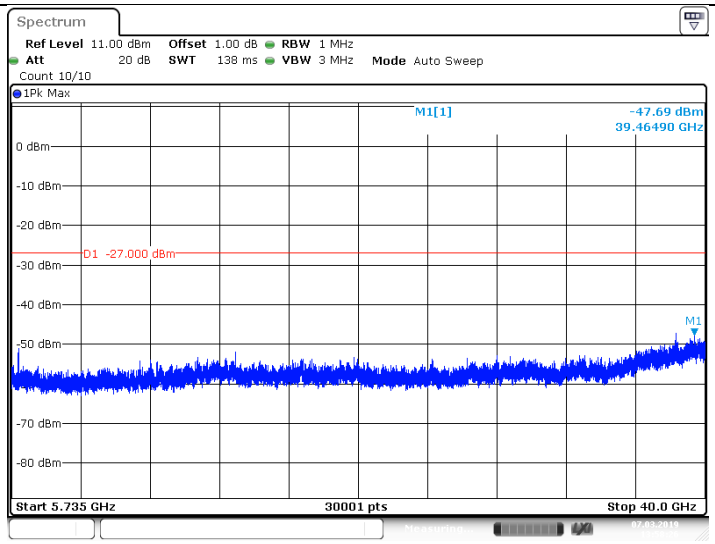

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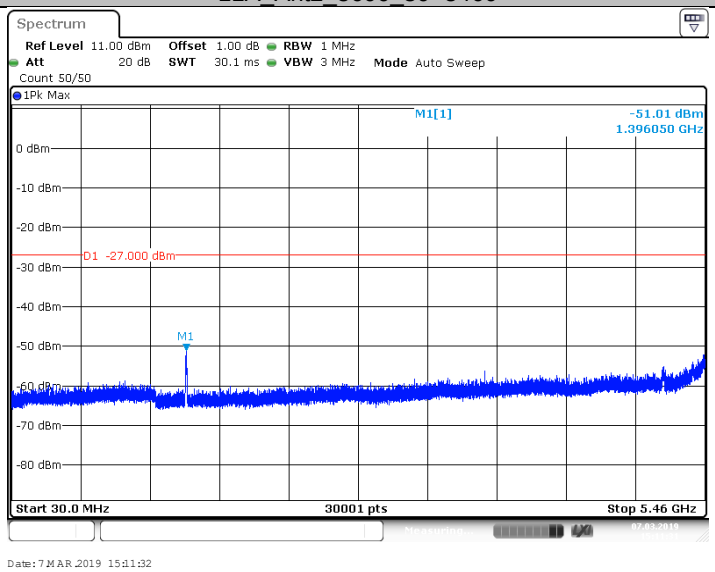

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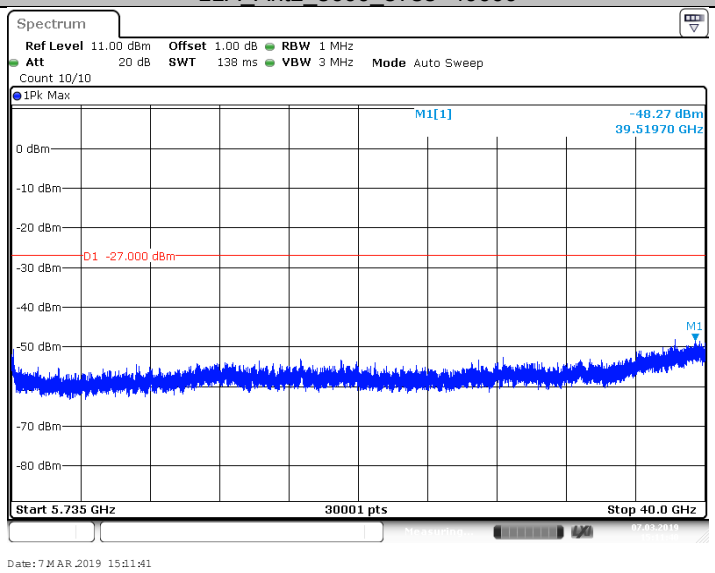

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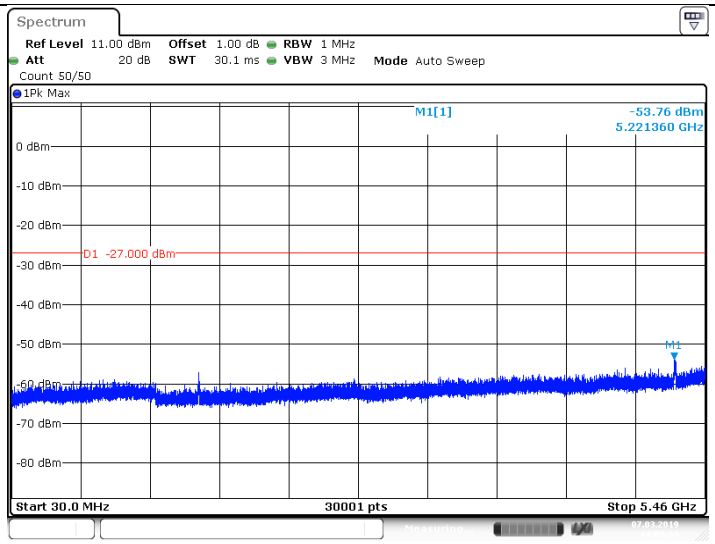

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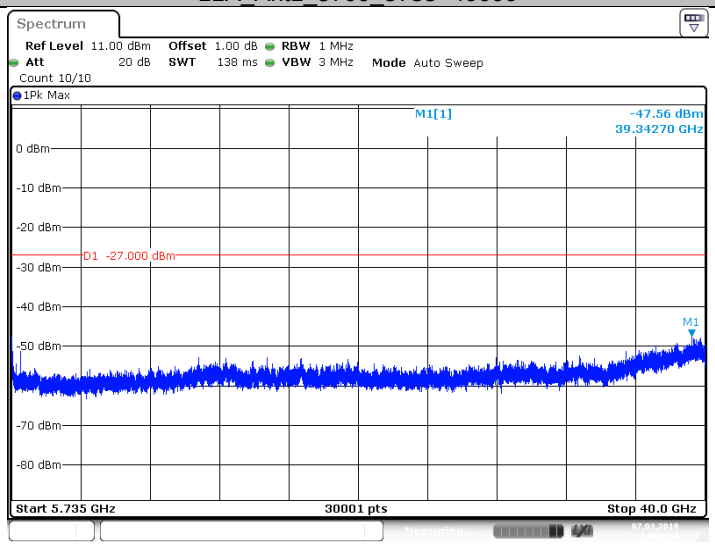

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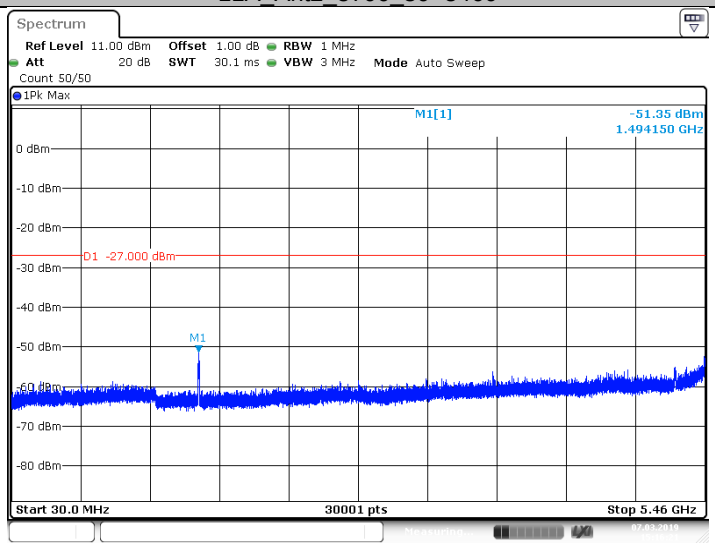

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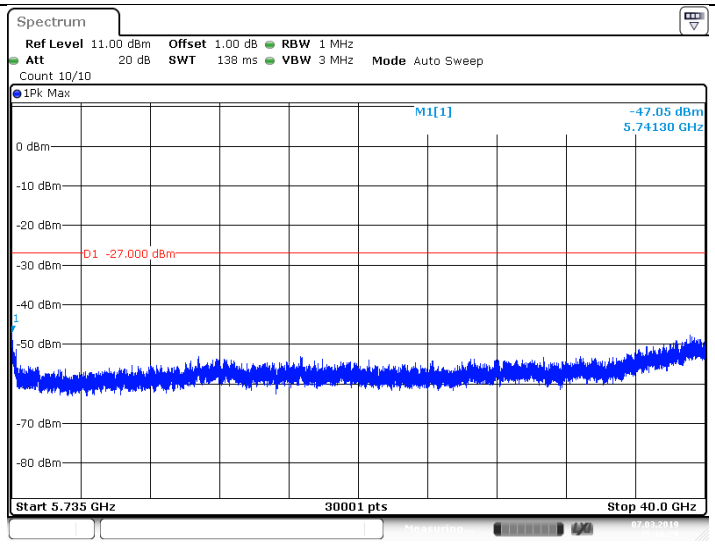

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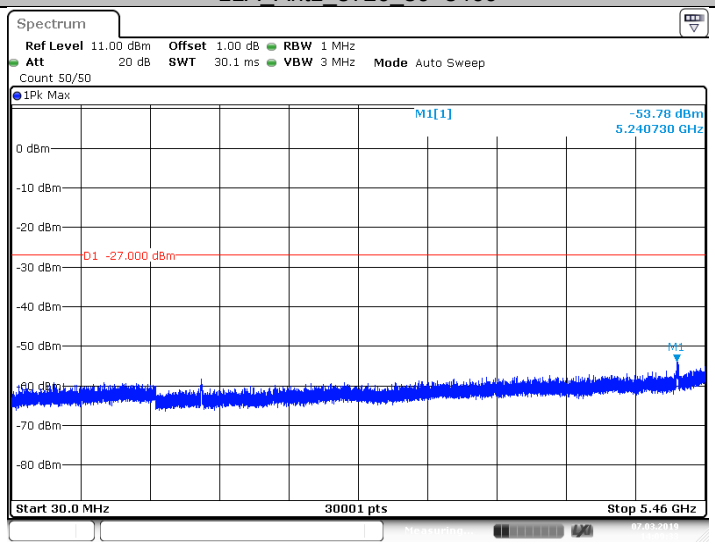

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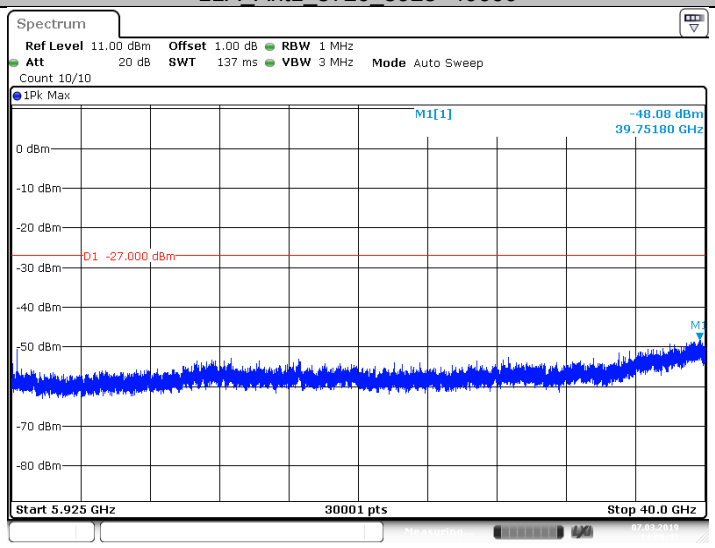

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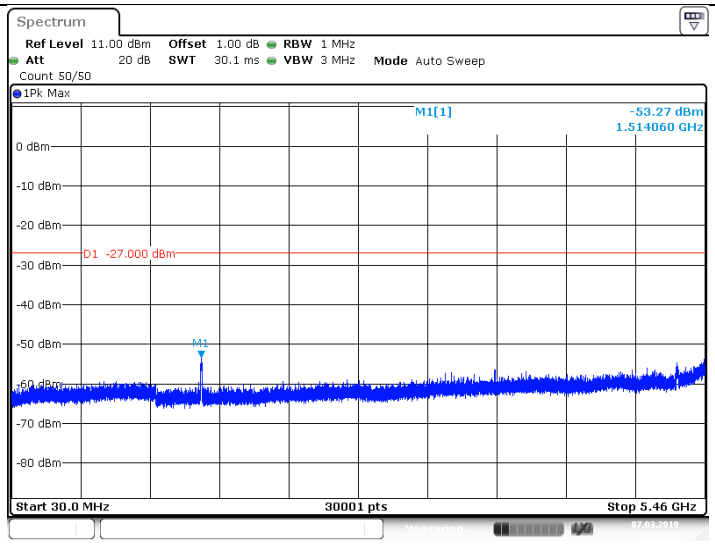

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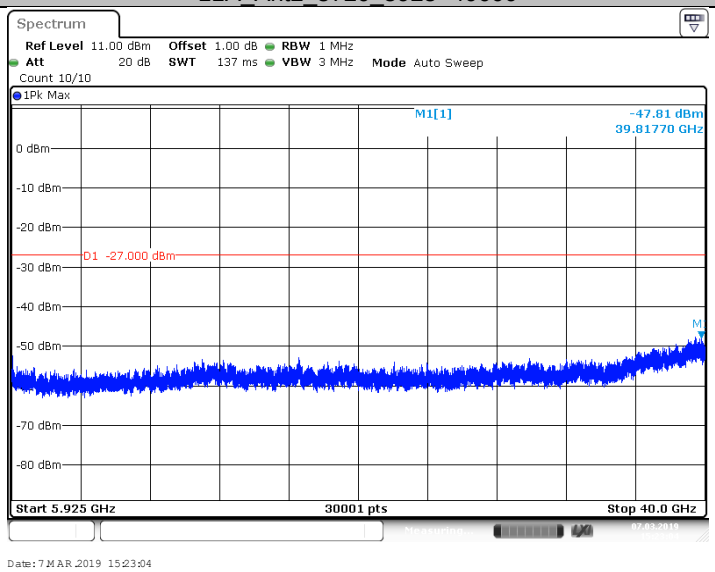

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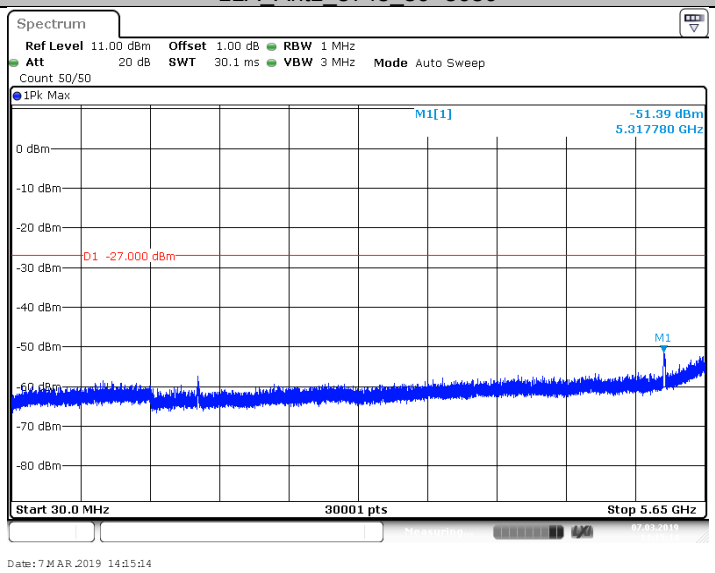

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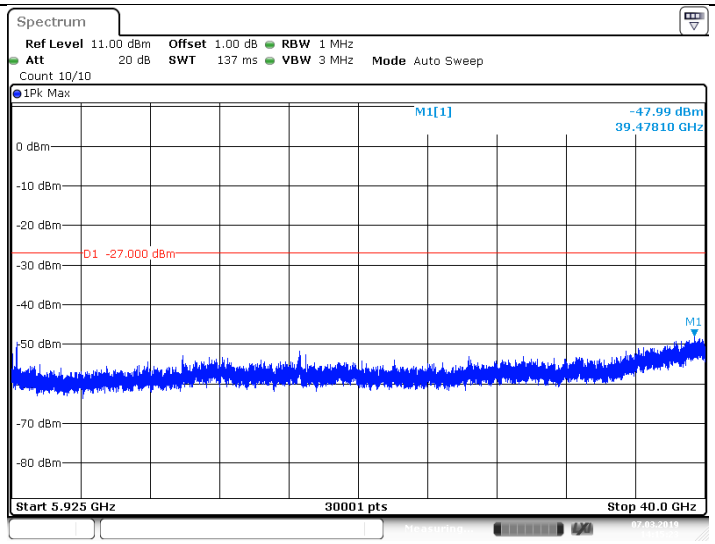

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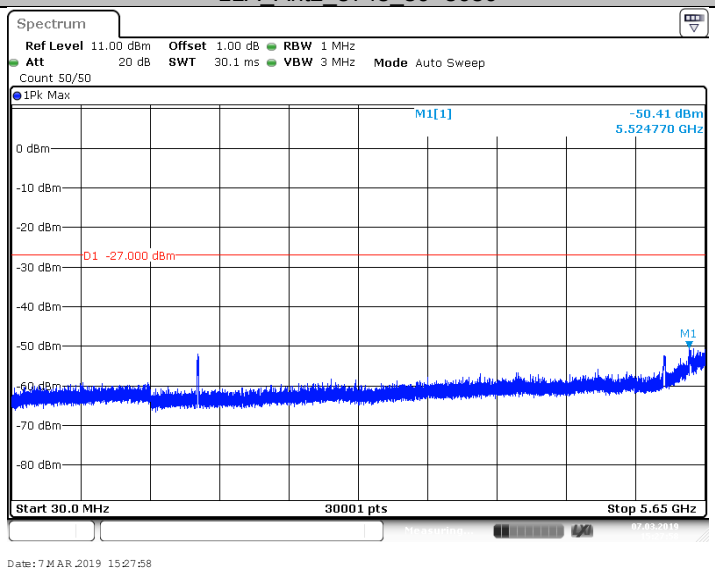

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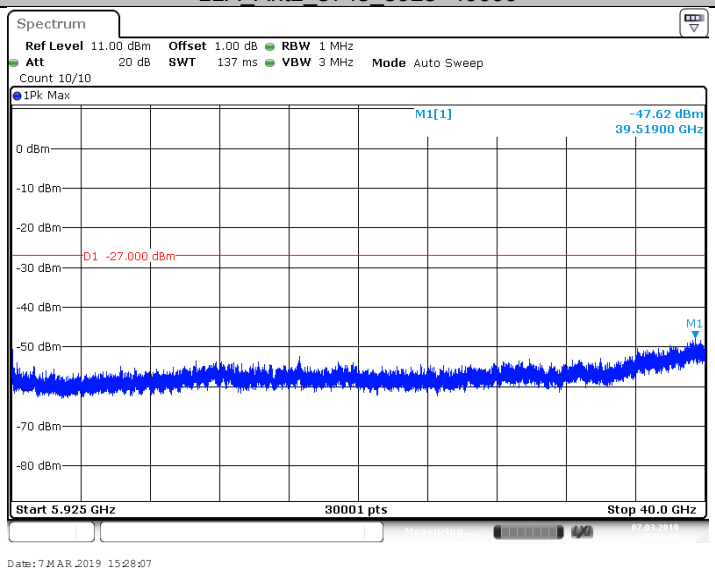

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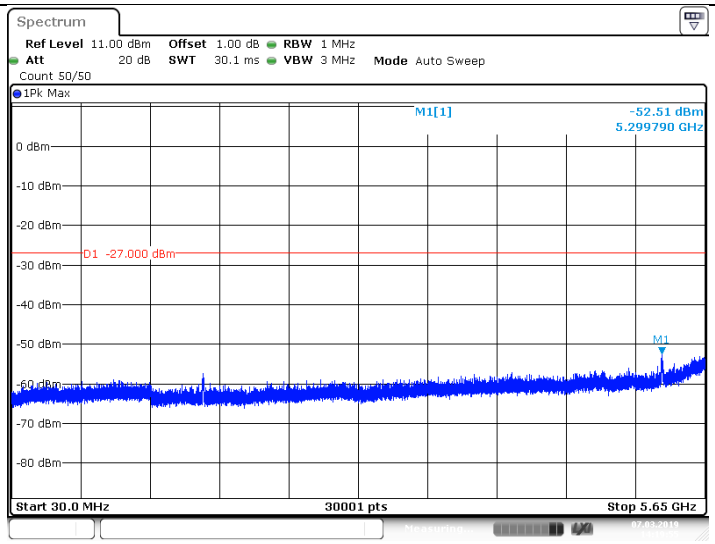

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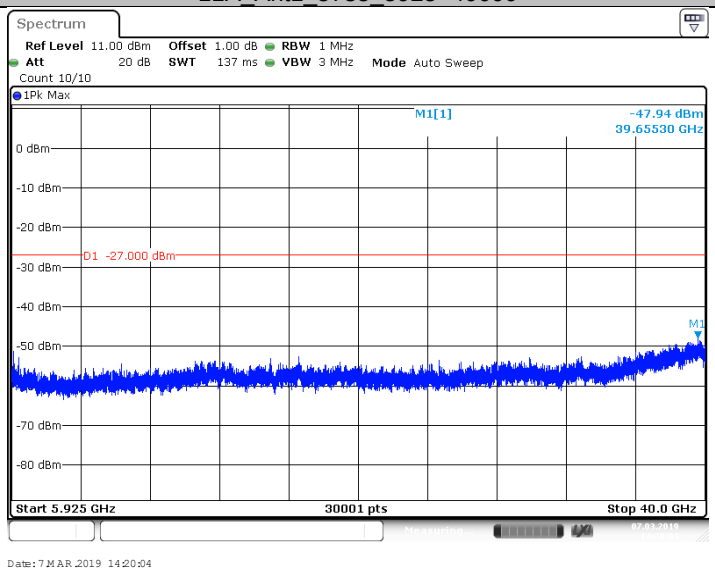

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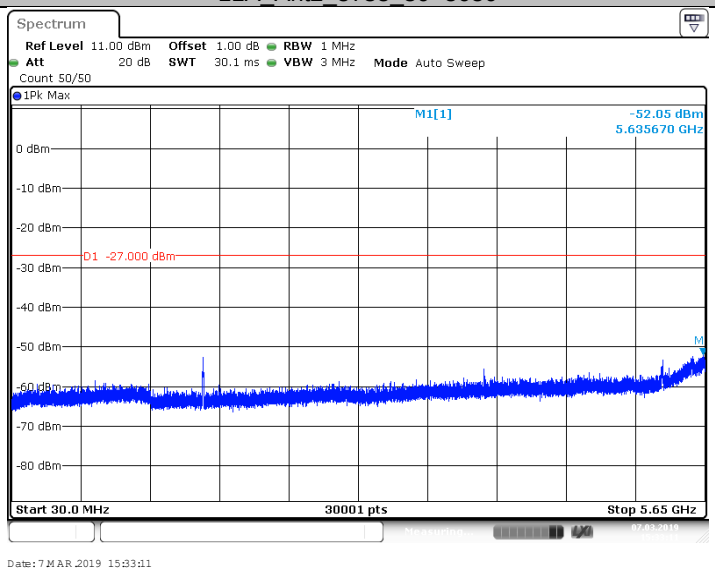

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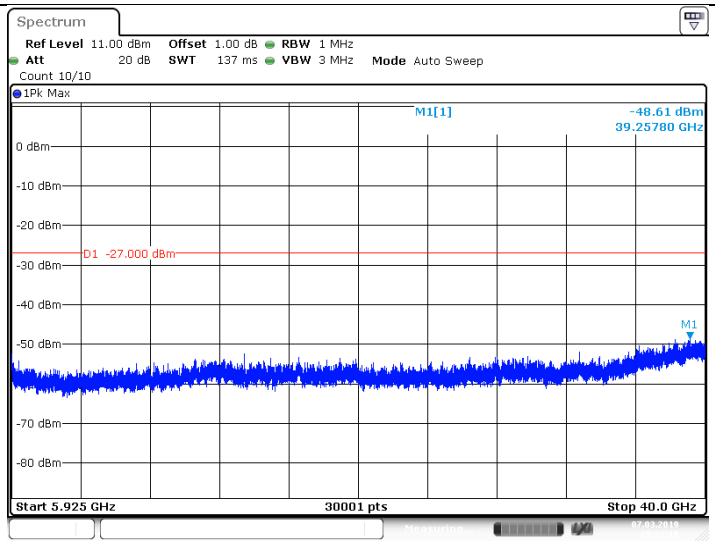

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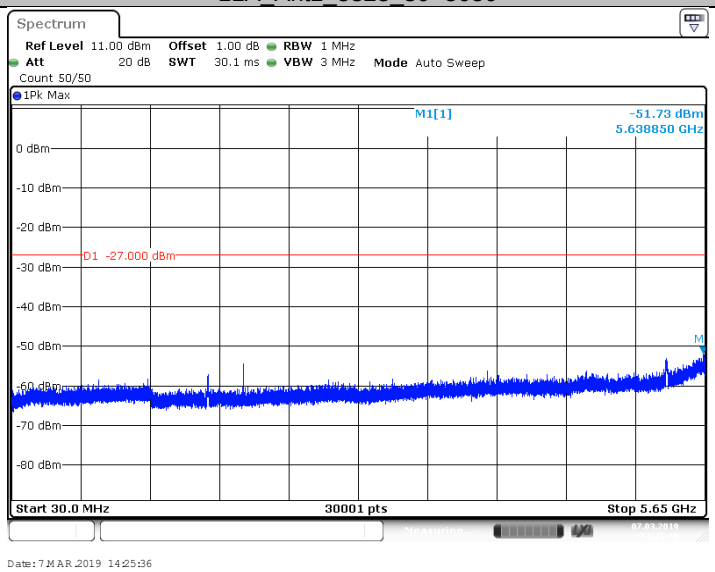

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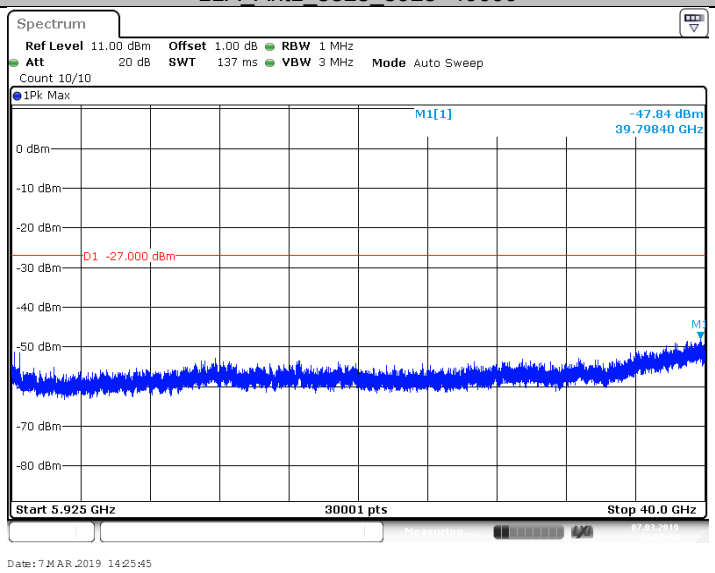

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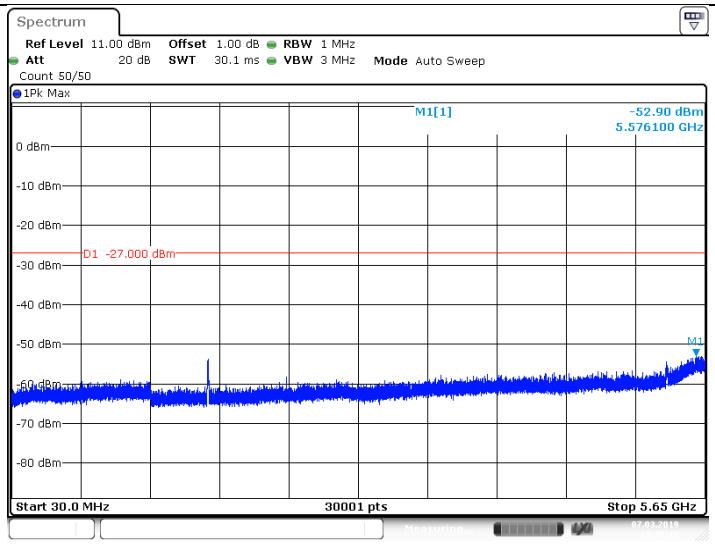

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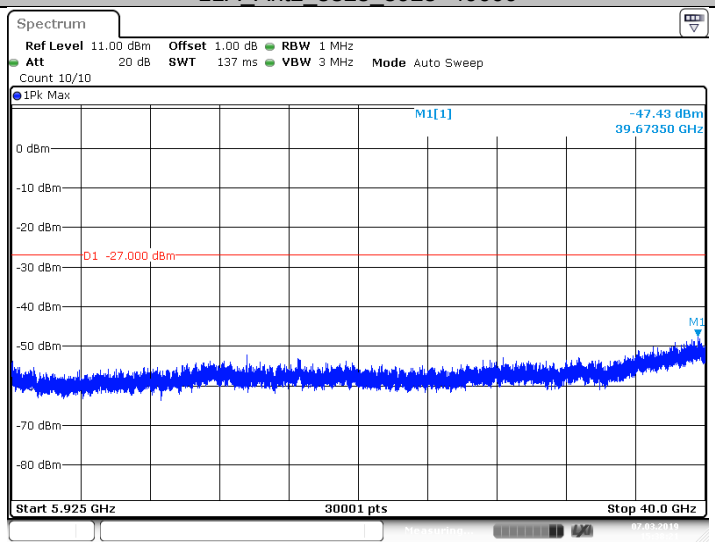
11A_Ant2_5825_5925~40000



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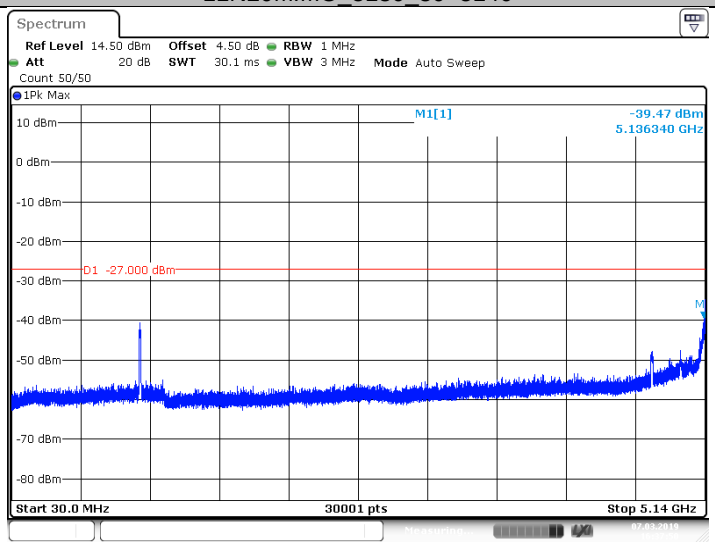
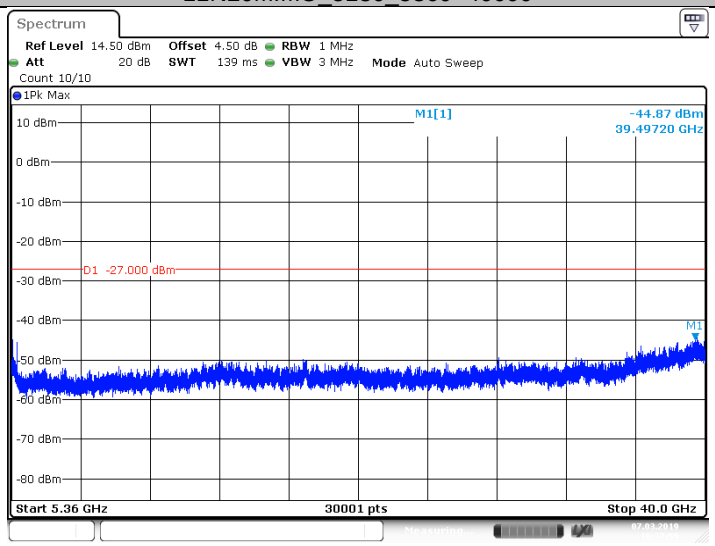
IEEE 802.11n_MIMO modulation Test Result

11N20MIMO_5180_30~5140


Date: 7 MAR 2019 16:37:50

11N20MIMO_5180_5360~40000


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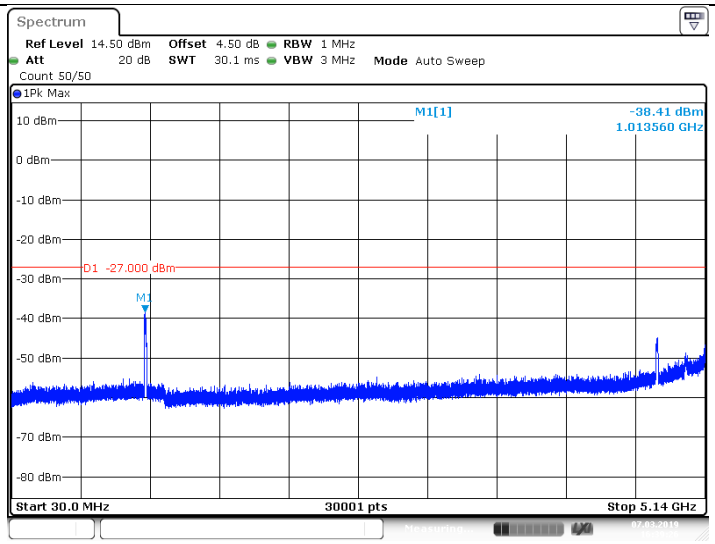
11N20MIMO_5220_30~5140



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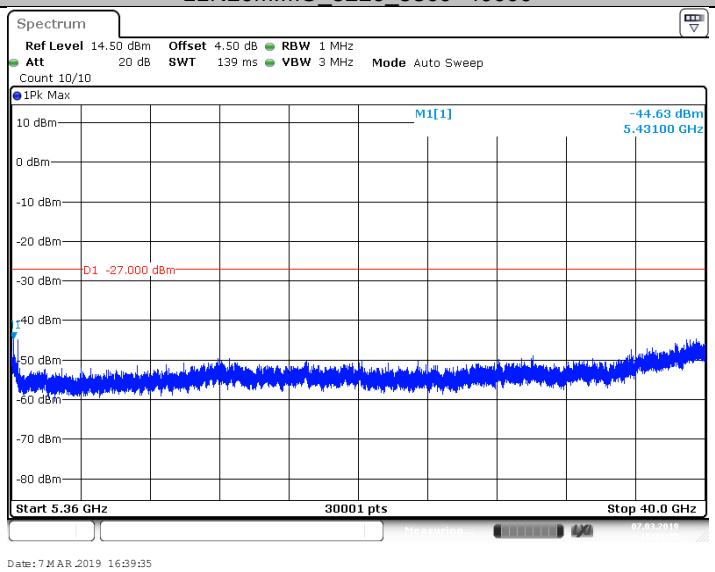
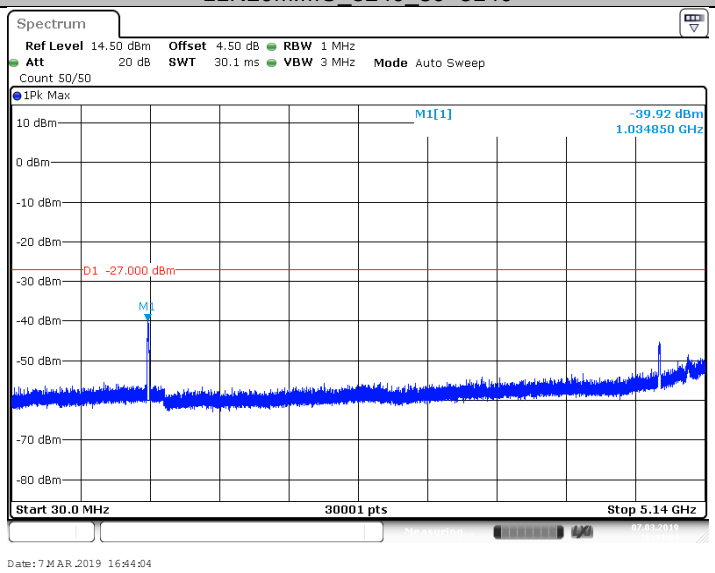


11N20MIMO_5240_30~5140



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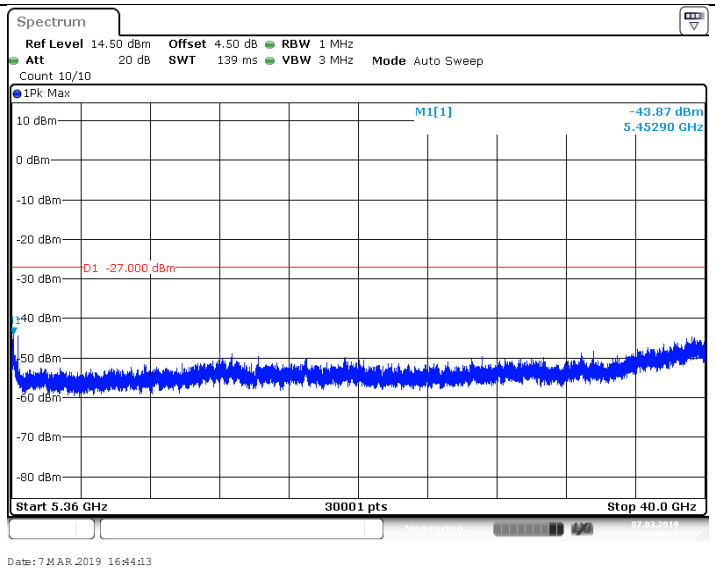

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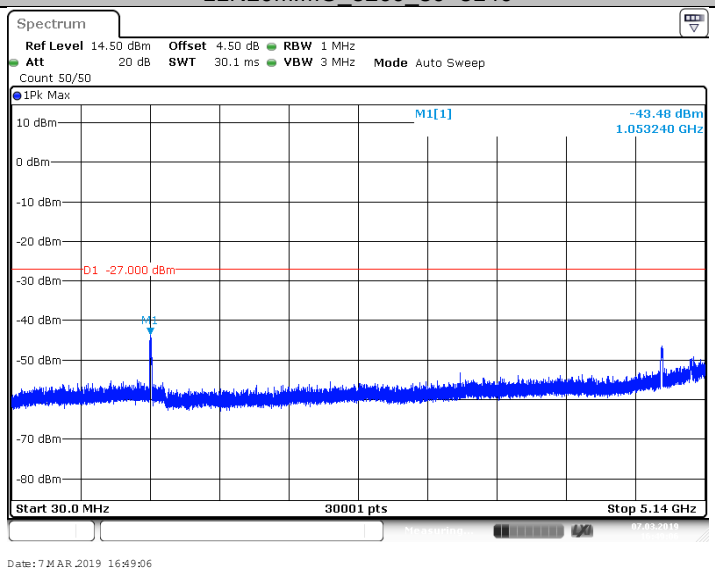

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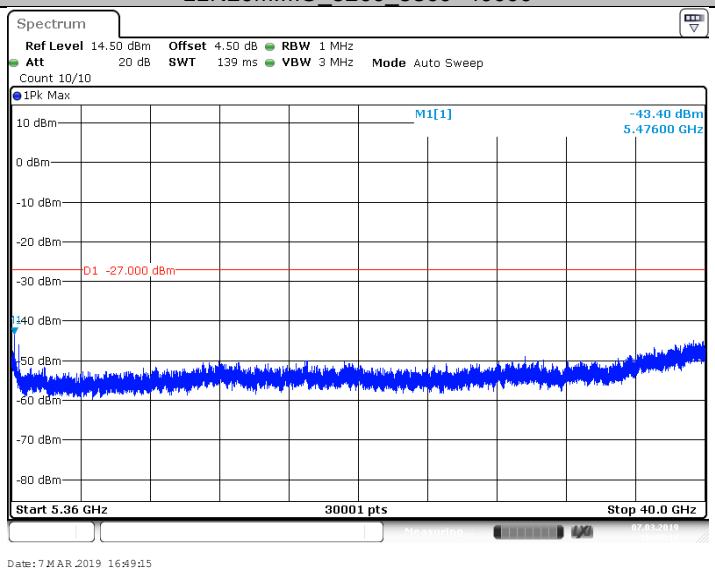

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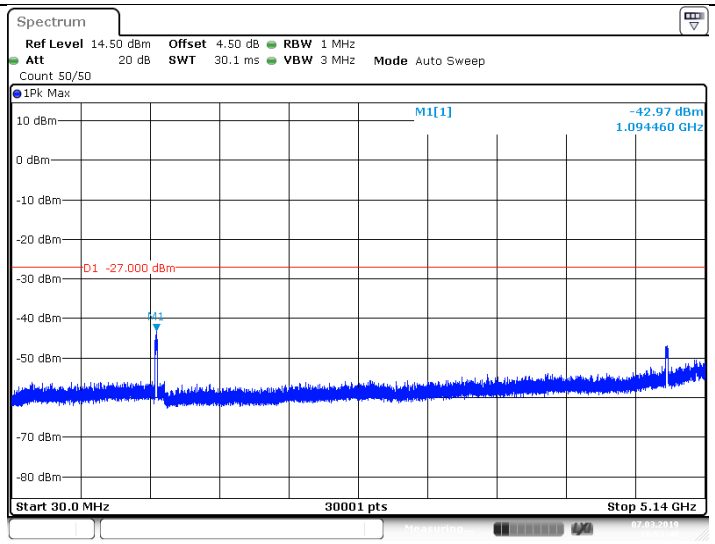
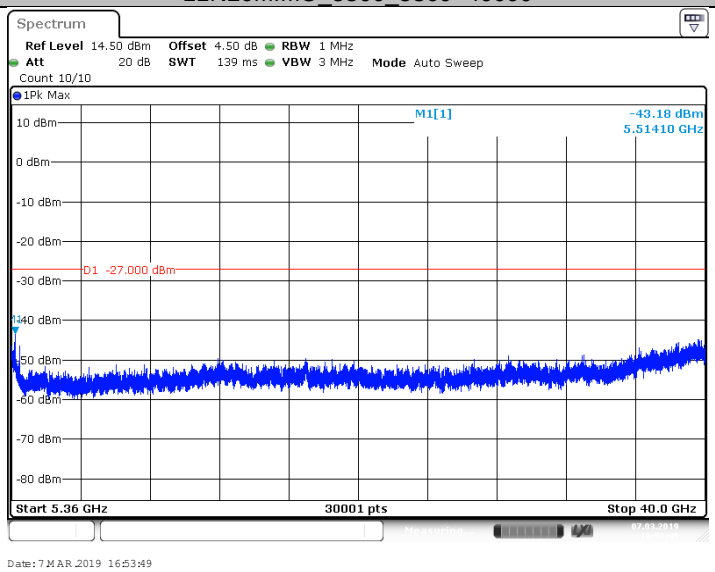


11N20MIMO_5300_5360~40000



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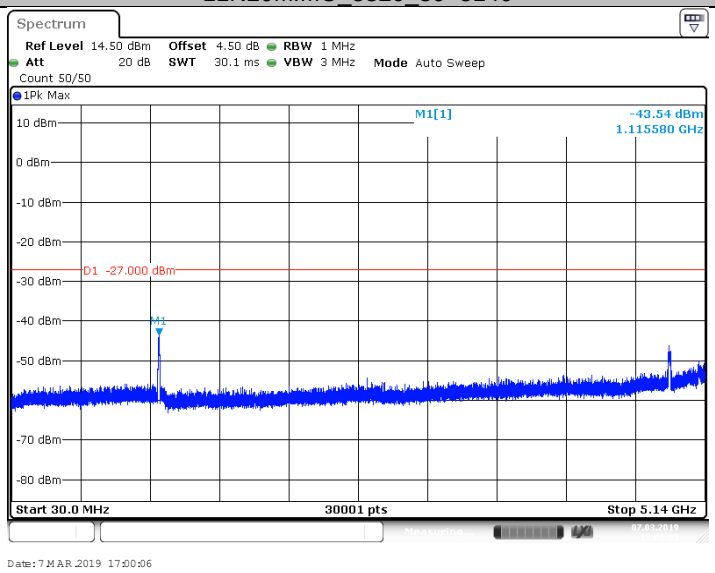

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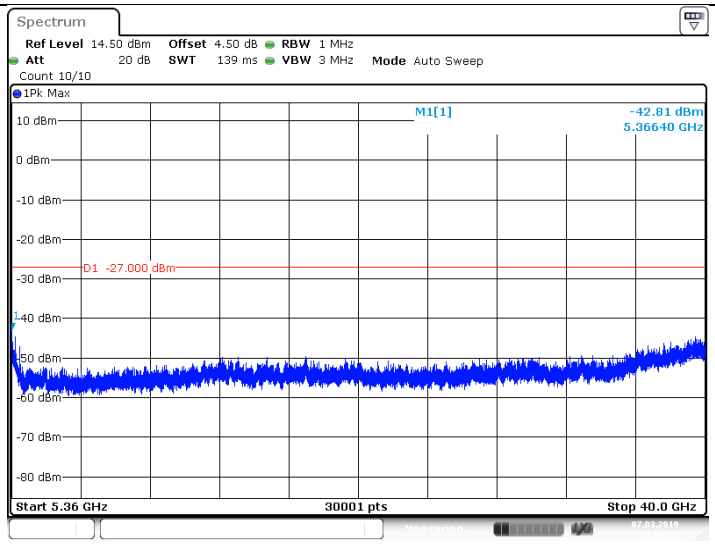

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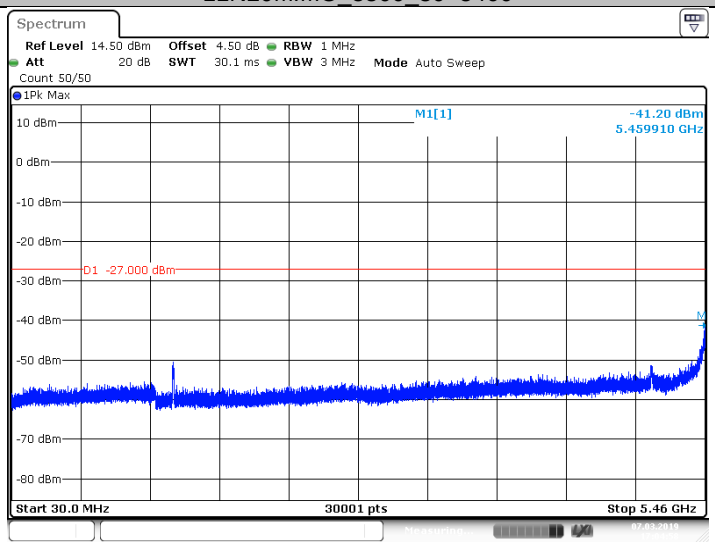
11N20MIMO_5500_30~5460



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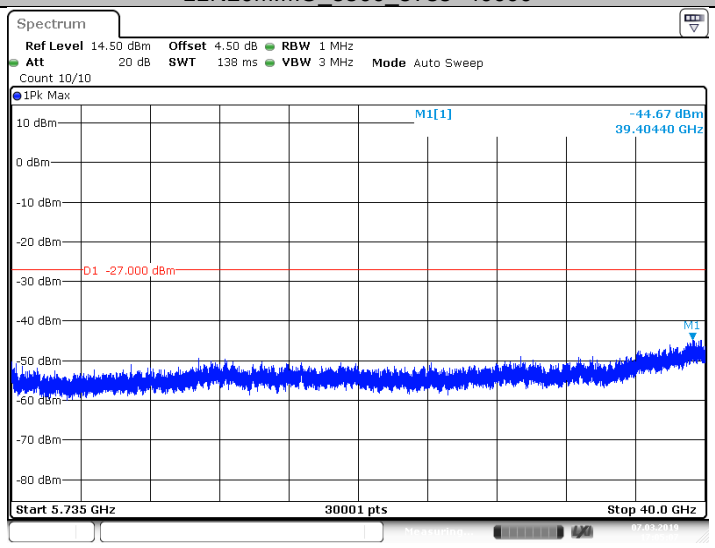
11N20MIMO_5500_5735~40000



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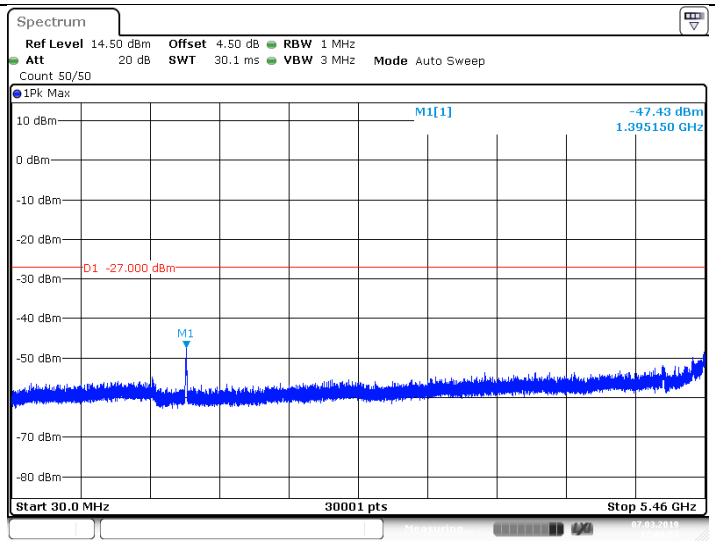

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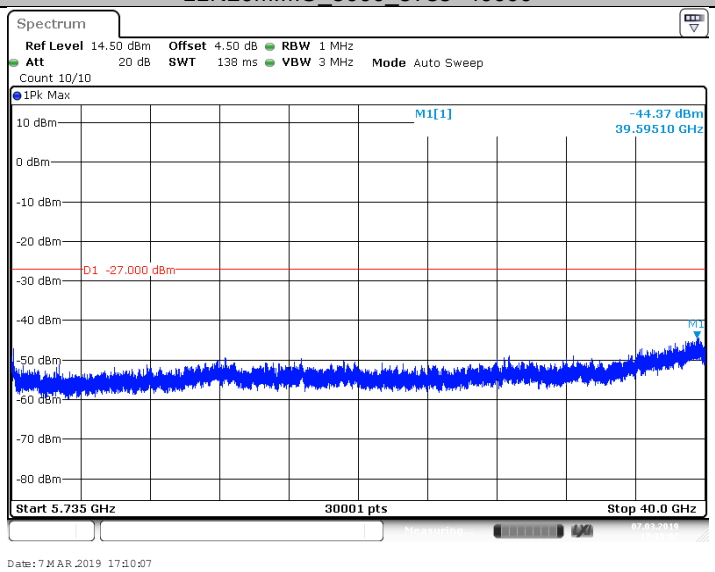

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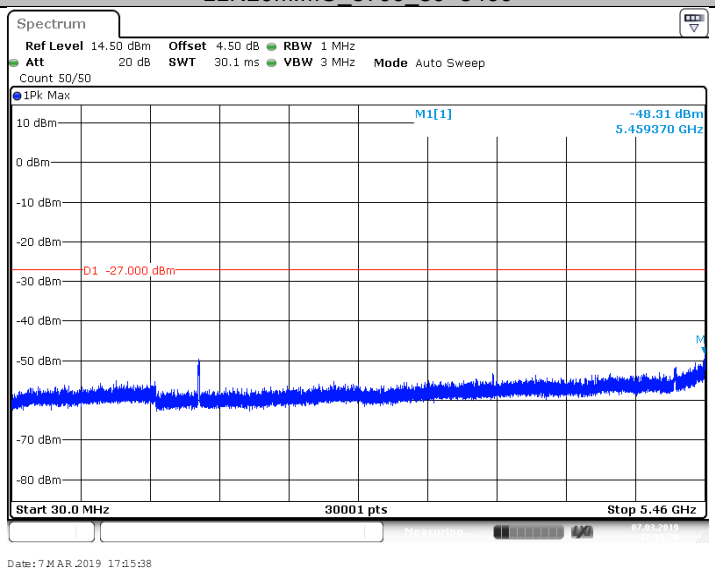

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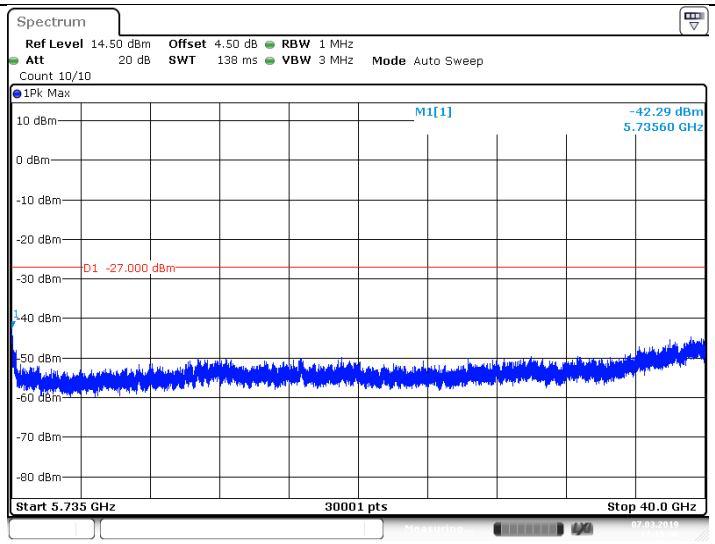

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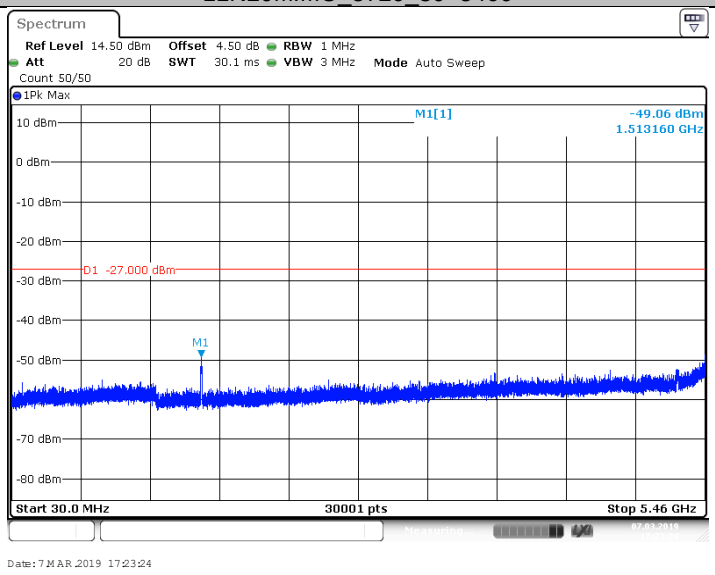
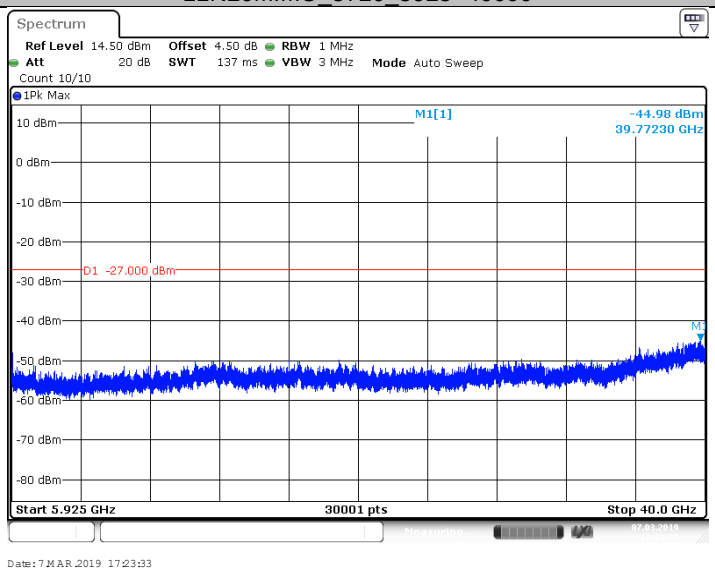


11N20MIMO_5720_5925~40000



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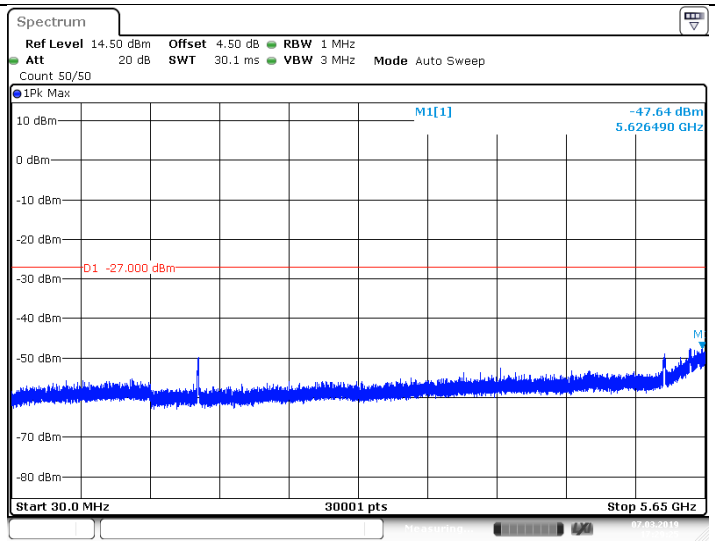

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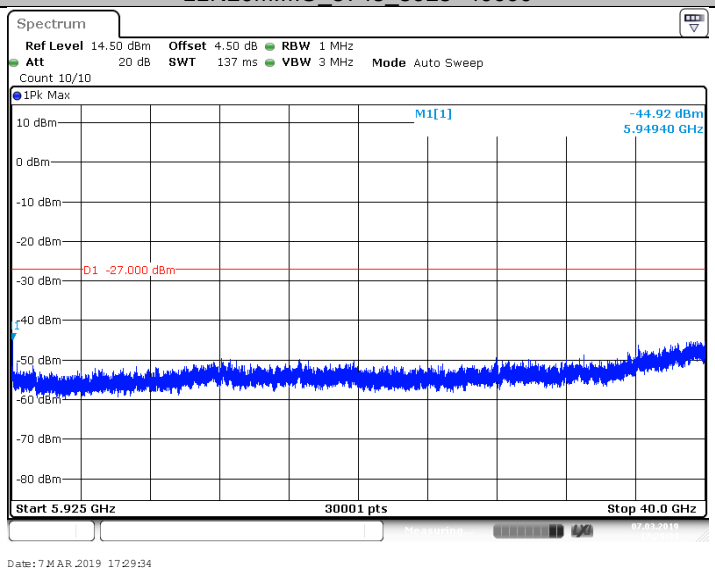
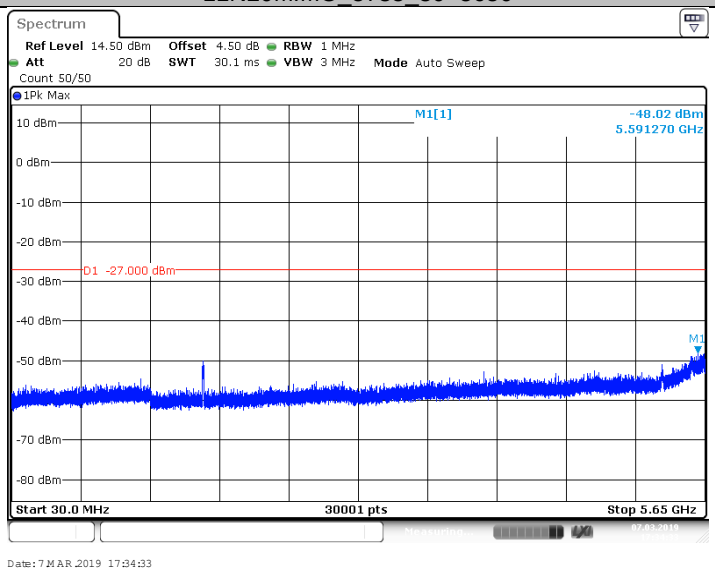


11N20MIMO_5785_30~5650



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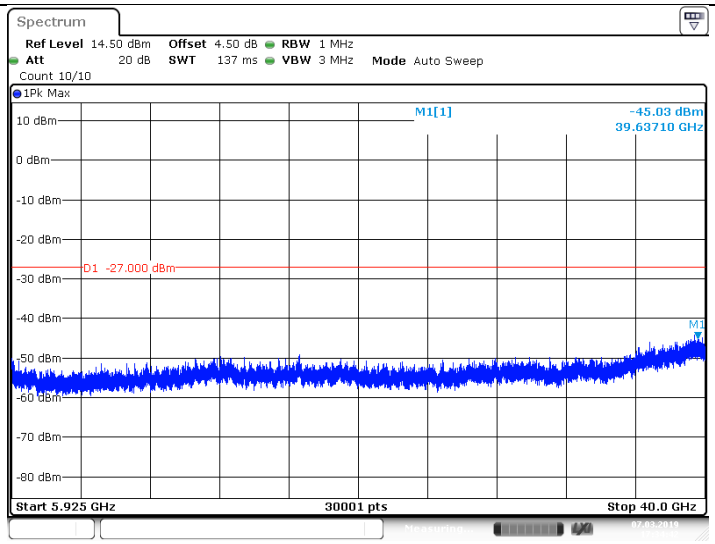

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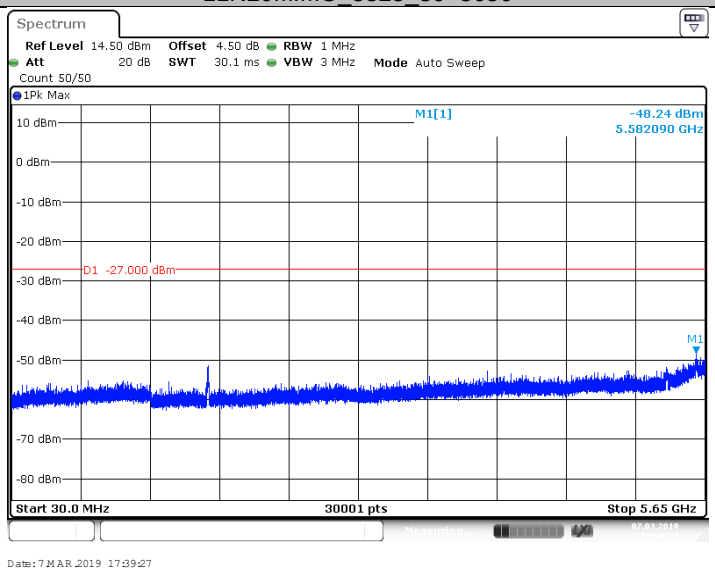

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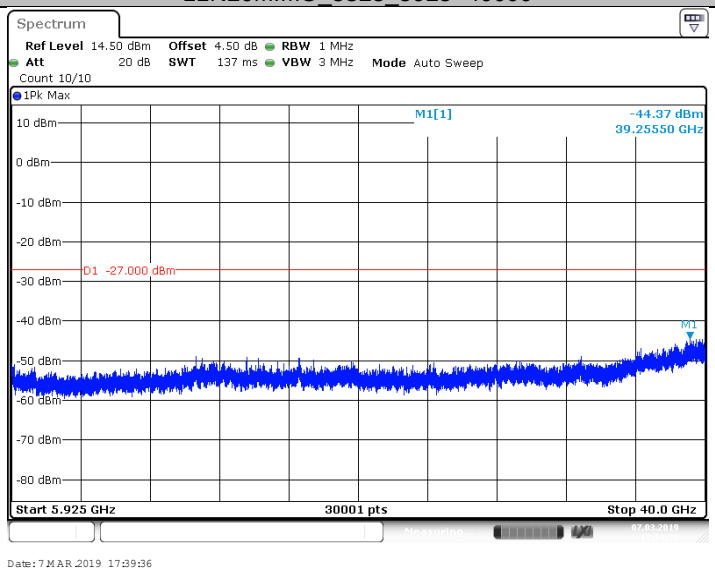
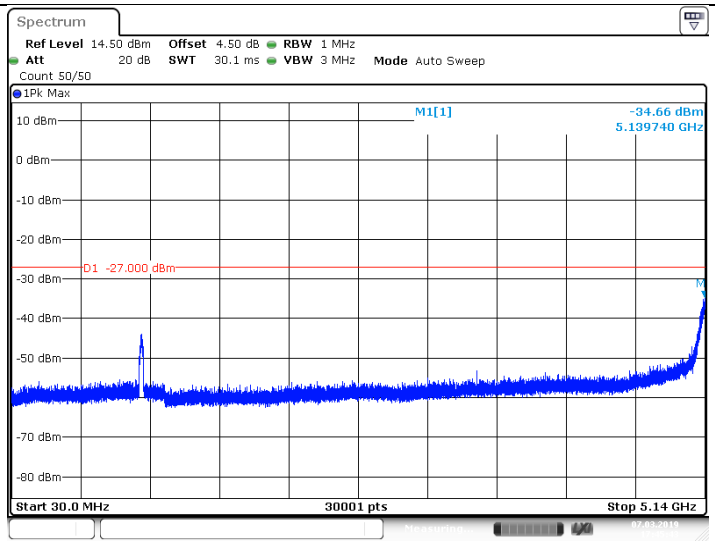


11N40MIMO_5190_30~5140



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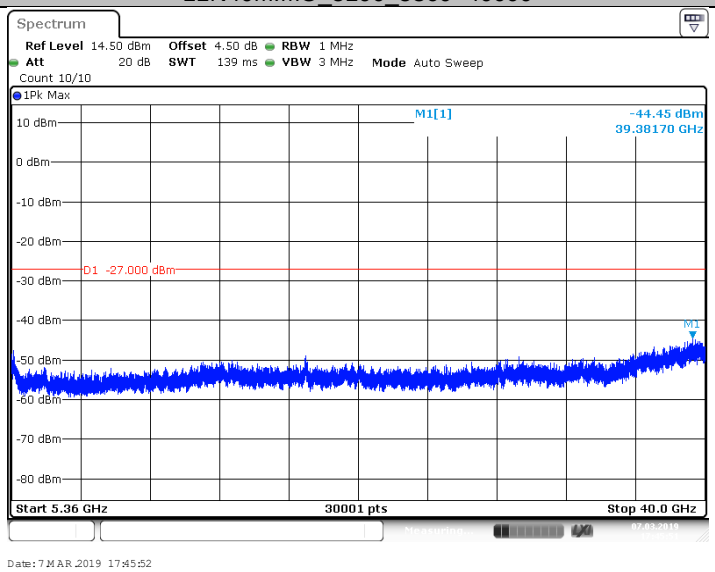
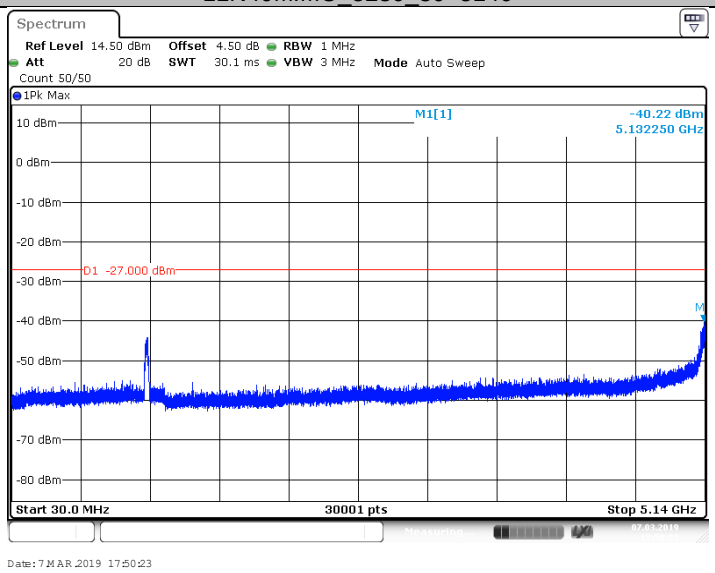


11N40MIMO_5230_30~5140



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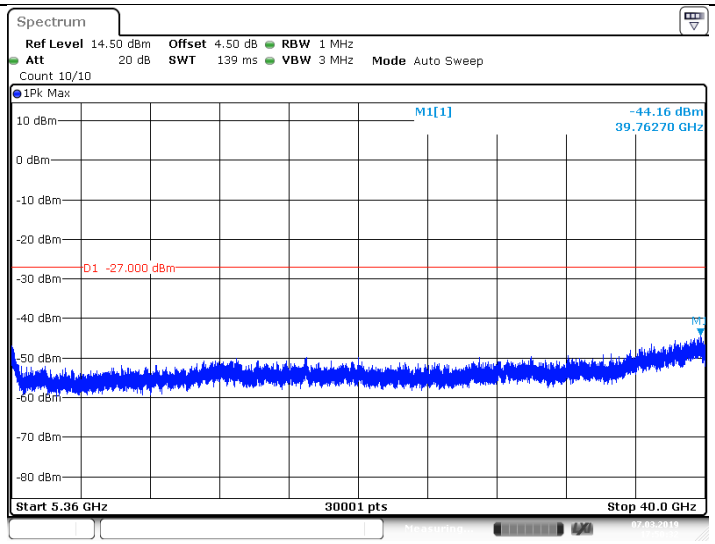

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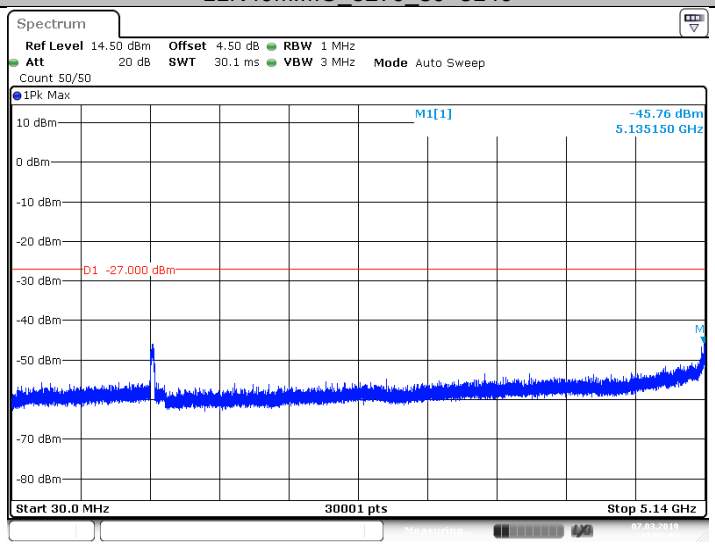

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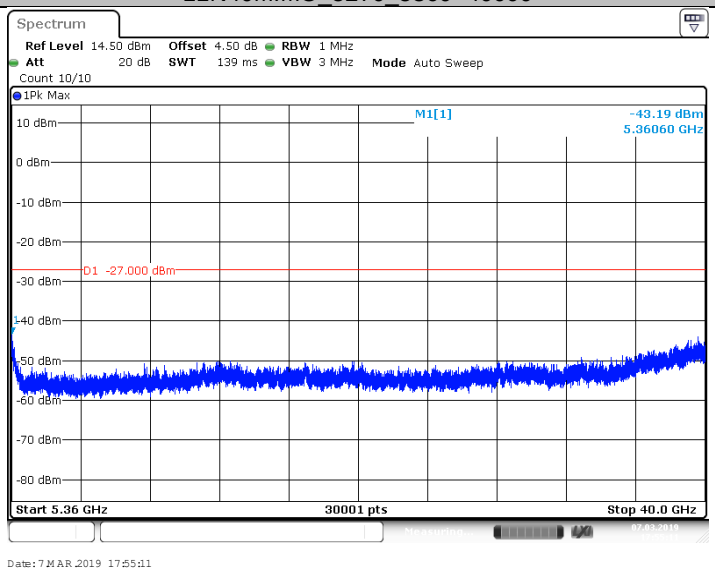
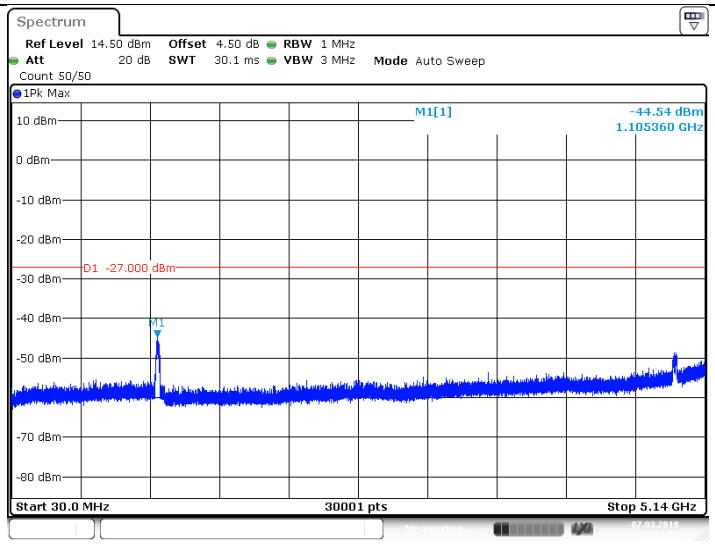


11N40MIMO_5310_30~5140



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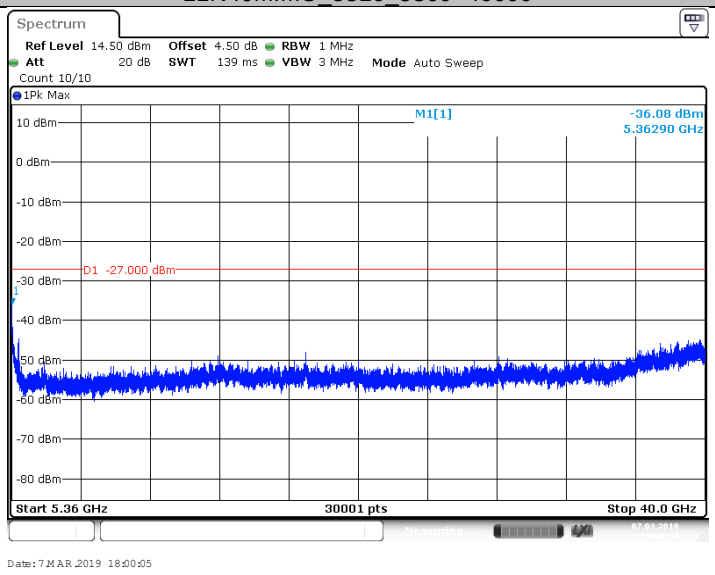

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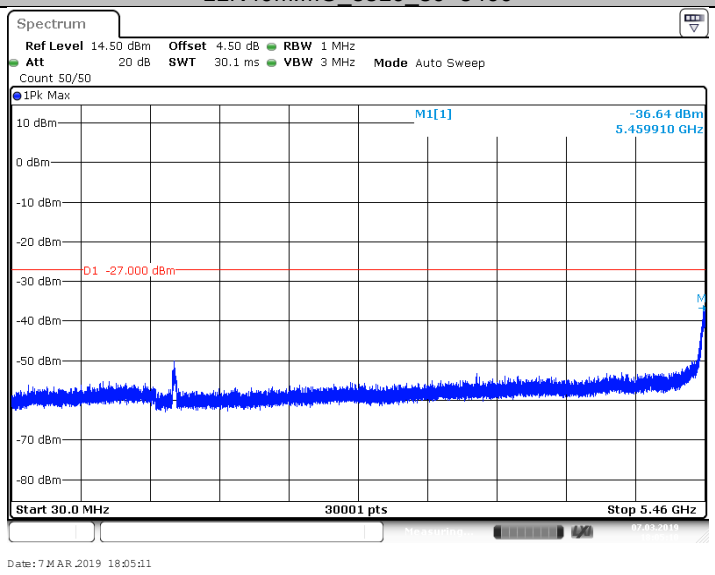

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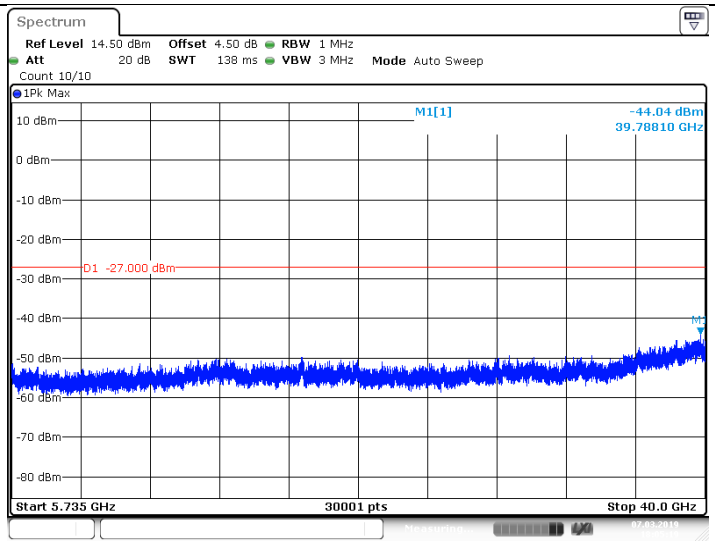

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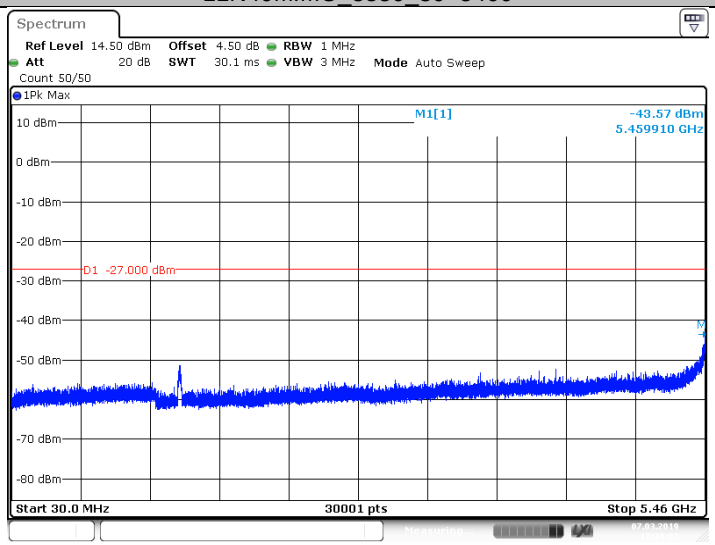

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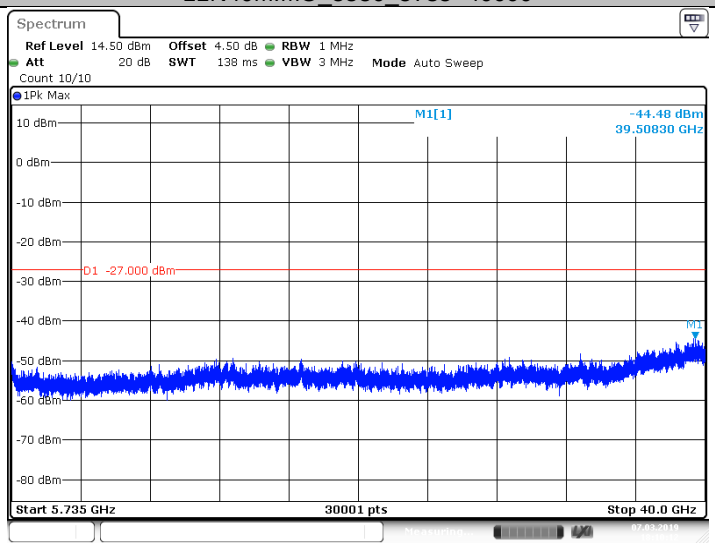

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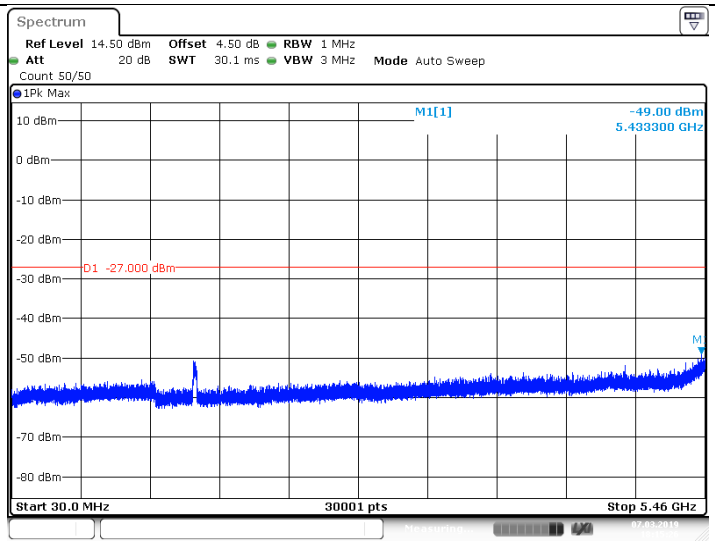

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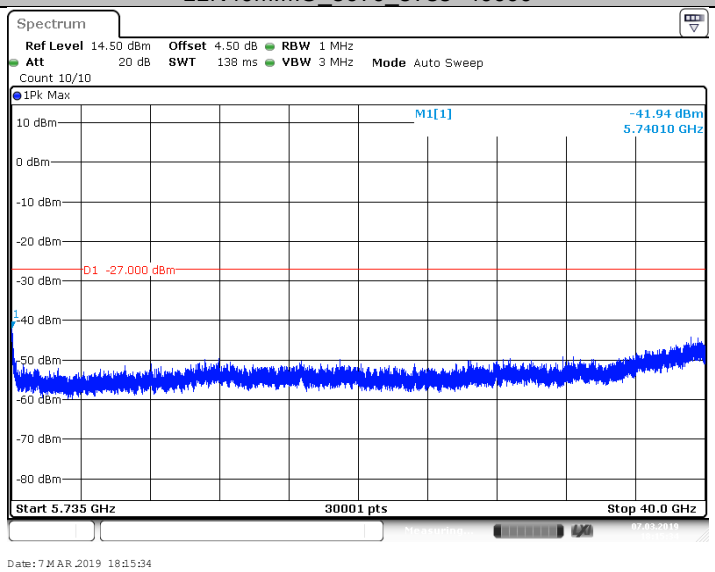
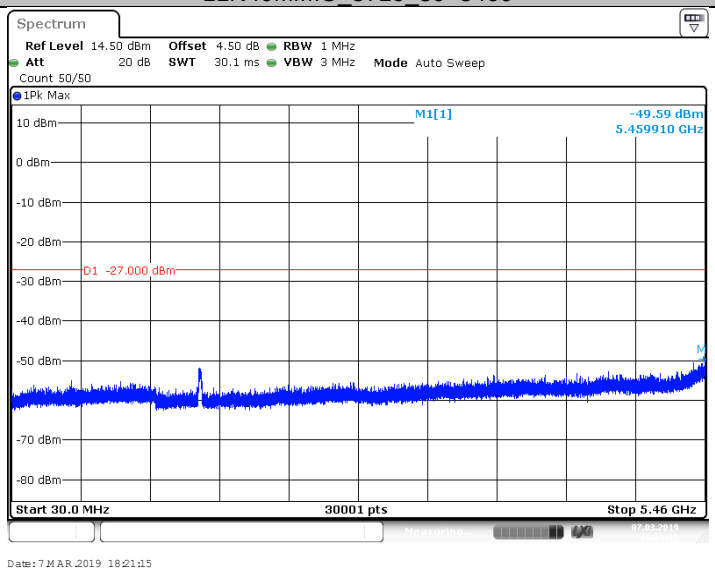
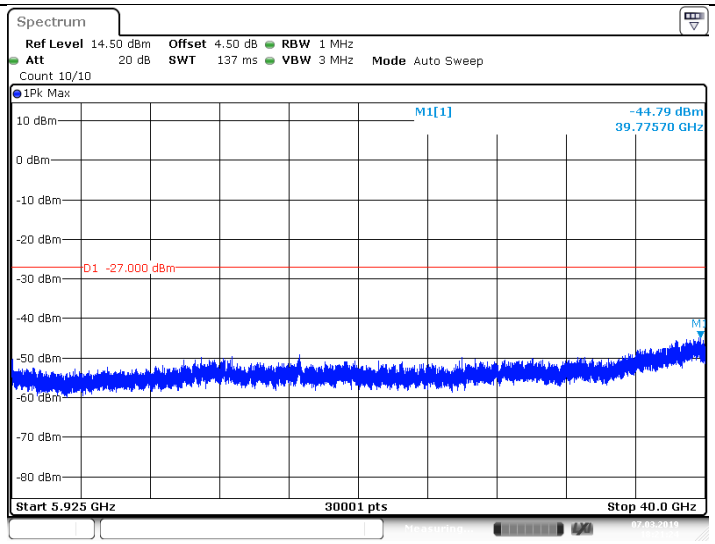


11N40MIMO_5710_30~5460



11N40MIMO_5710_5925~40000



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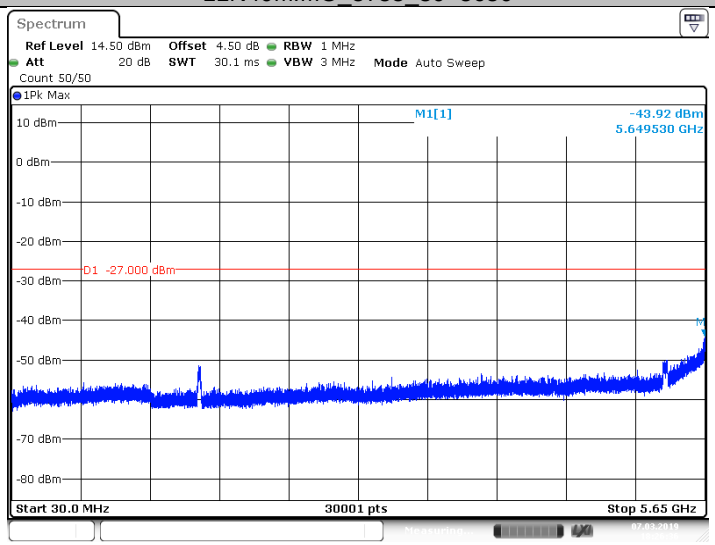
11N40MIMO_5755_30~5650



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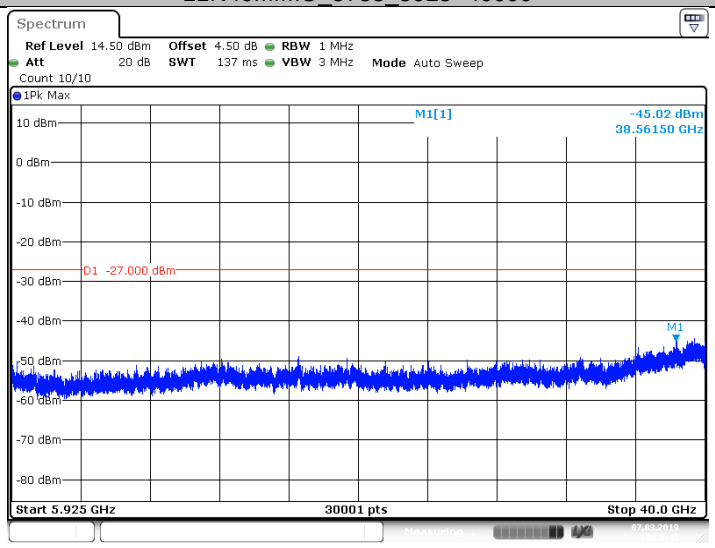
11N40MIMO_5755_5925~40000



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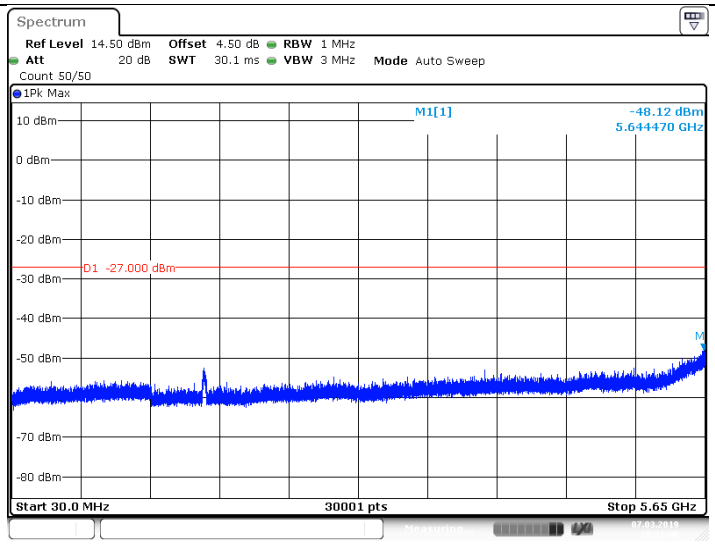

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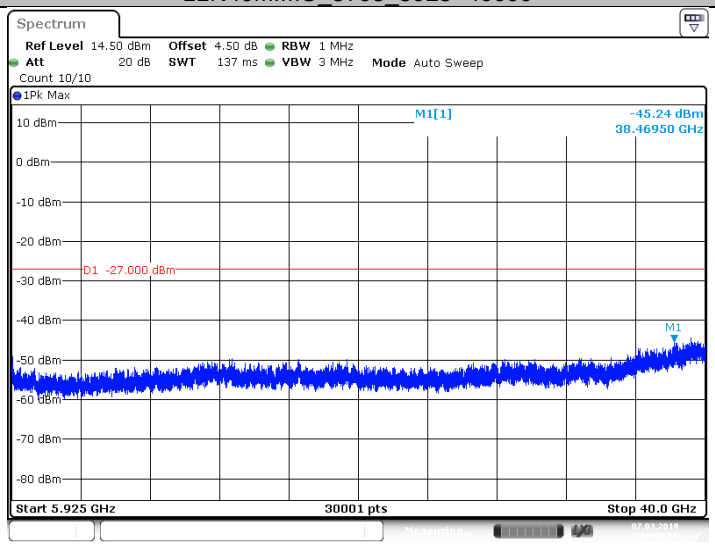
11N40MIMO_5795_5925~40000



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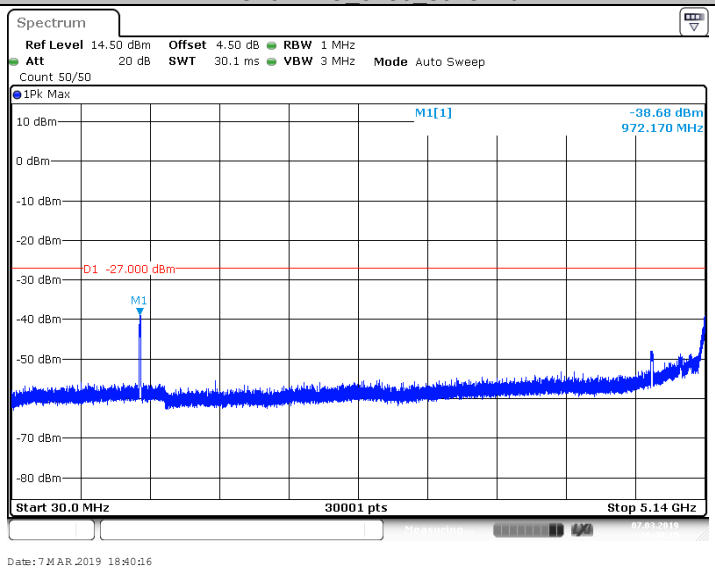
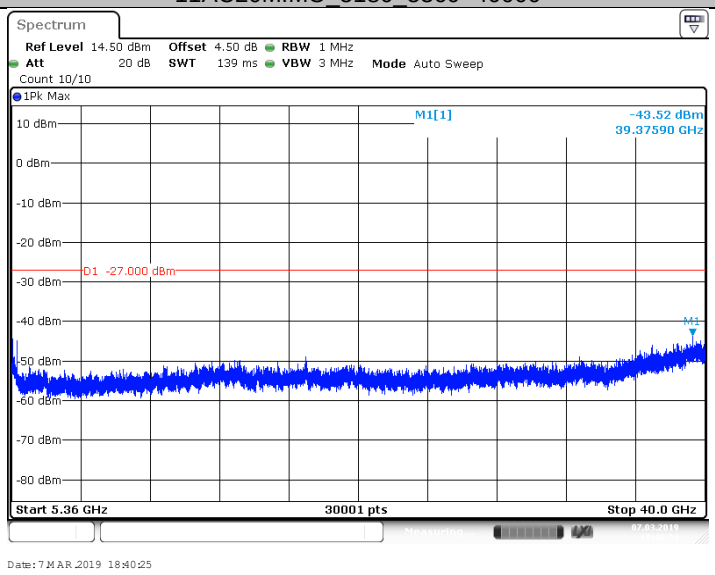
IEEE 802.11ac_MIMO modulation Test Result

11AC20MIMO_5180_30~5140



11AC20MIMO_5180_5360~40000



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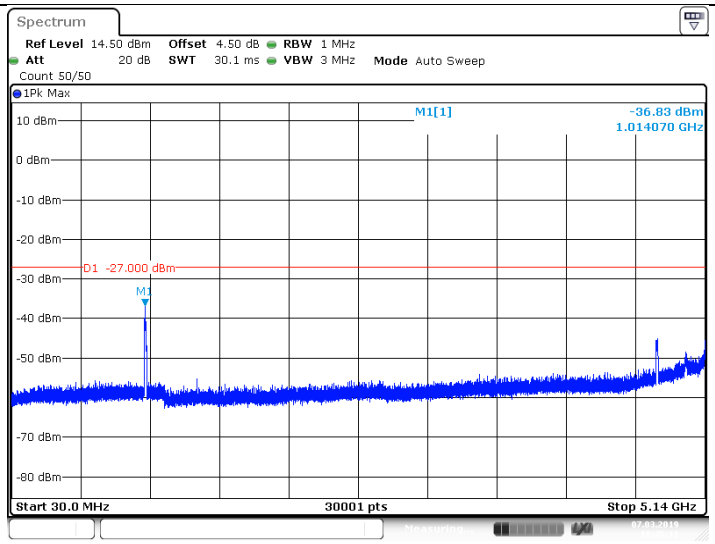

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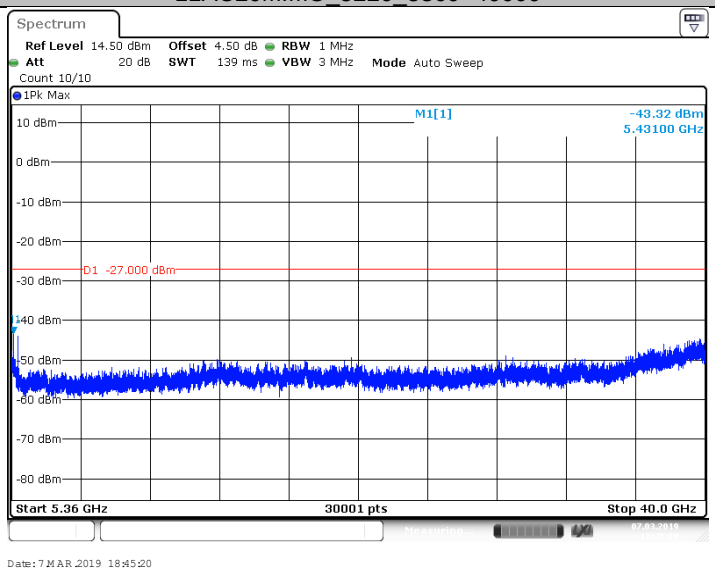
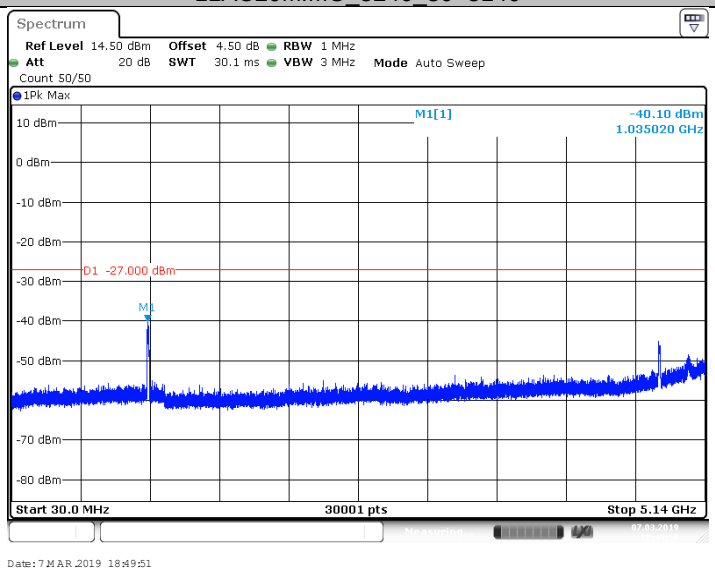


11AC20MIMO_5240_30~5140



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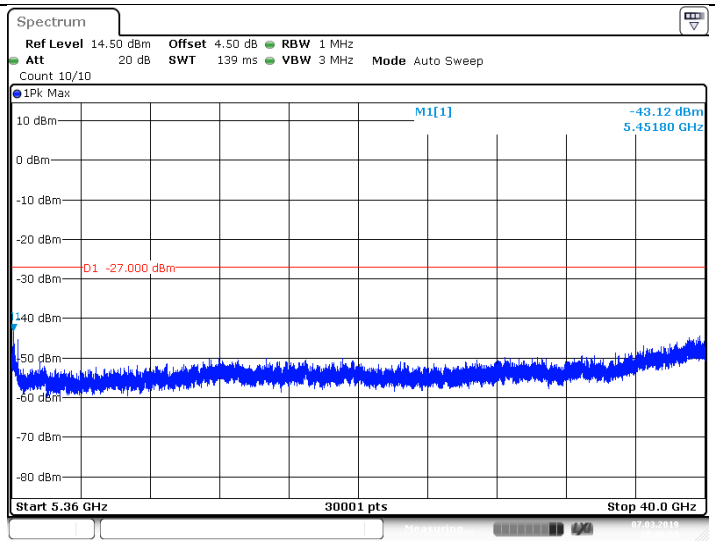
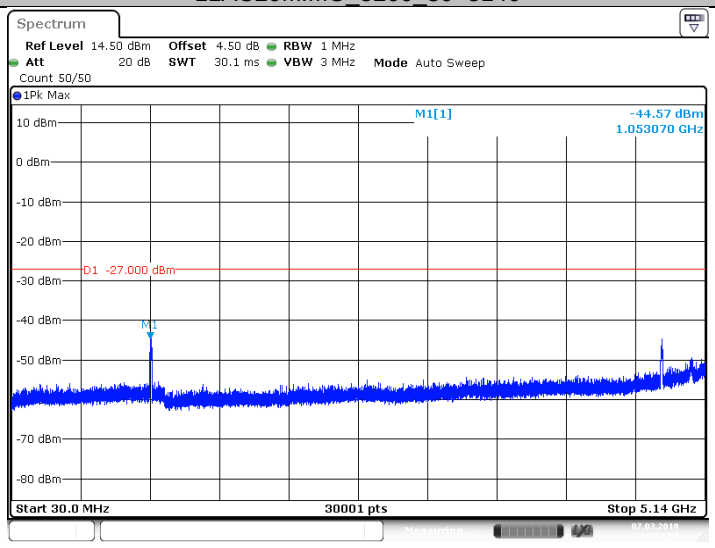
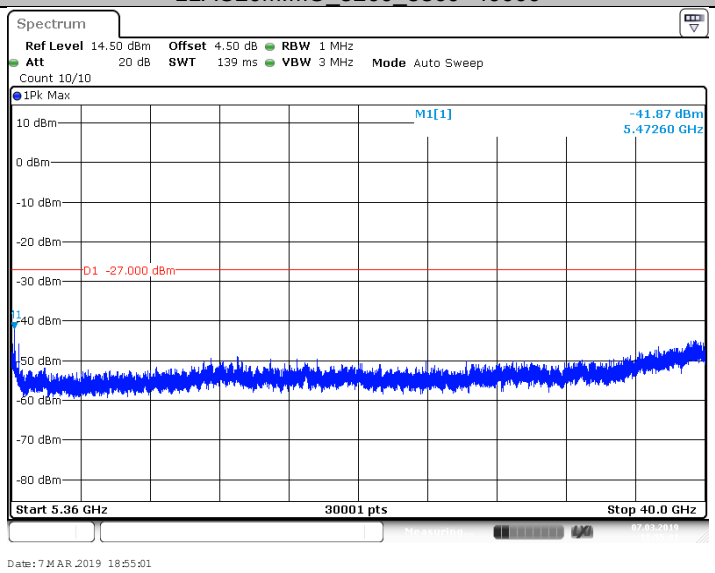


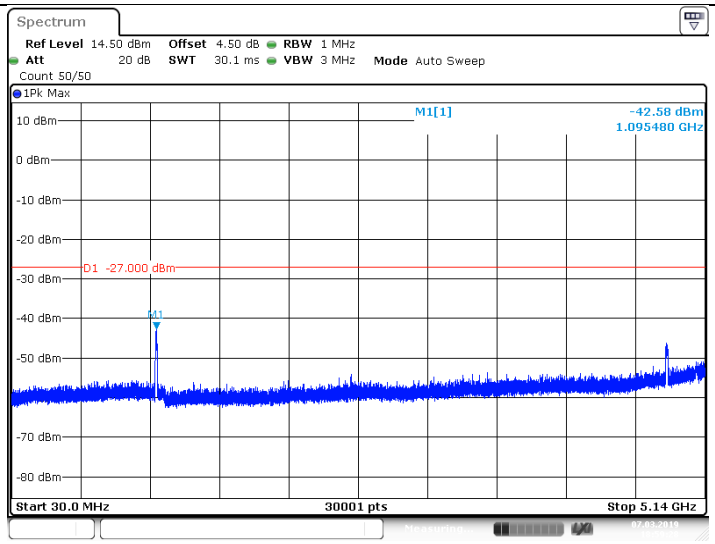
11AC20MIMO_5260_30~5140



11AC20MIMO_5260_5360~40000



11AC20MIMO_5300_30~5140



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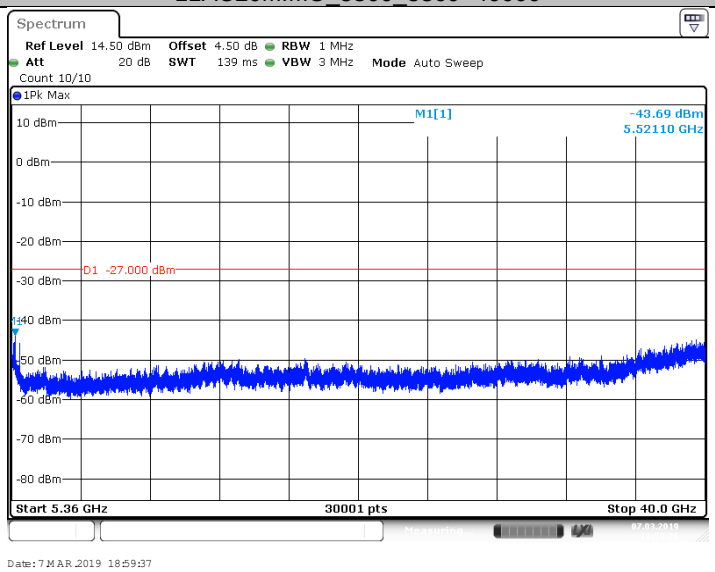

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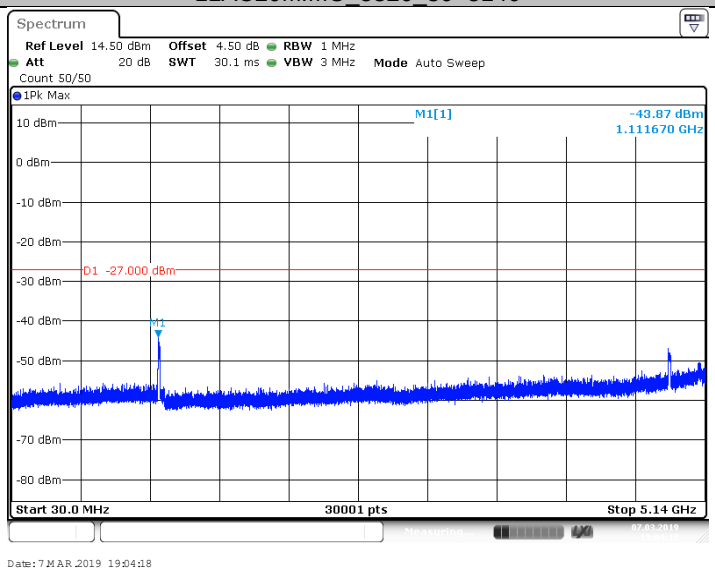

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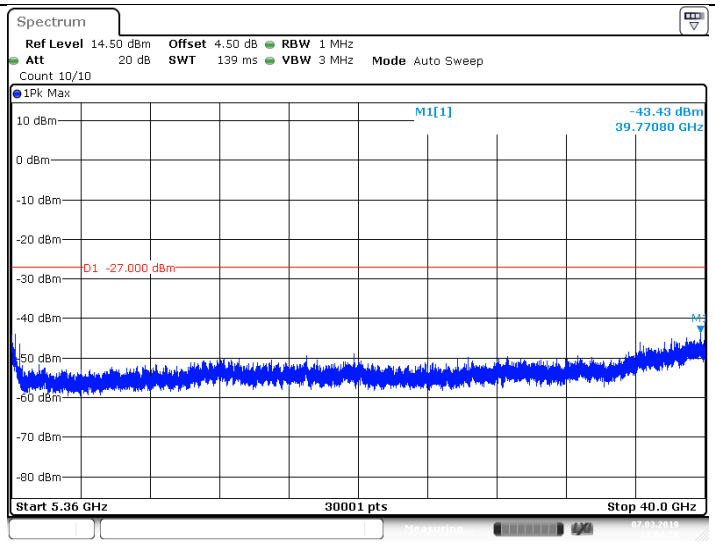

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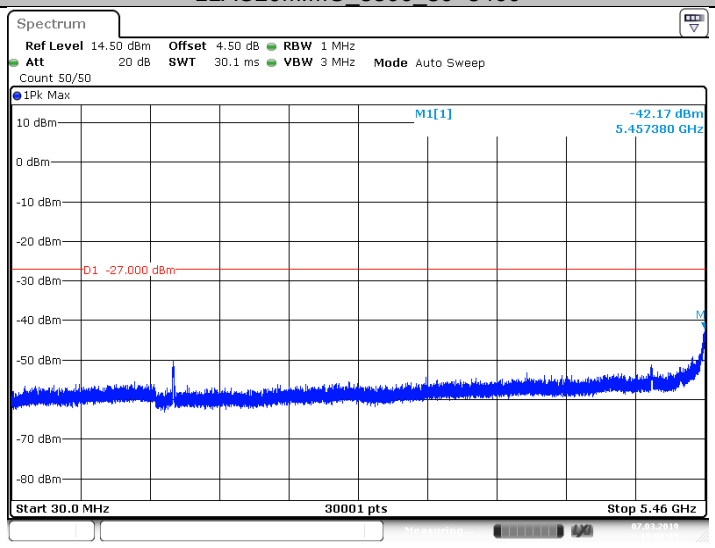
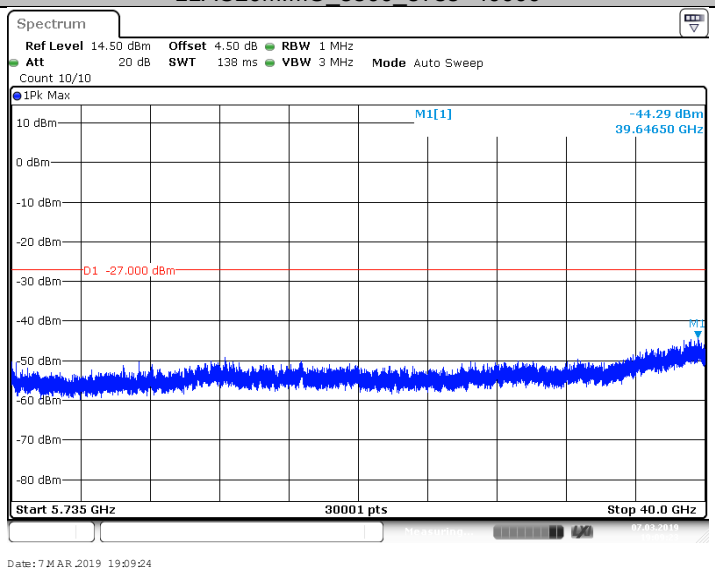
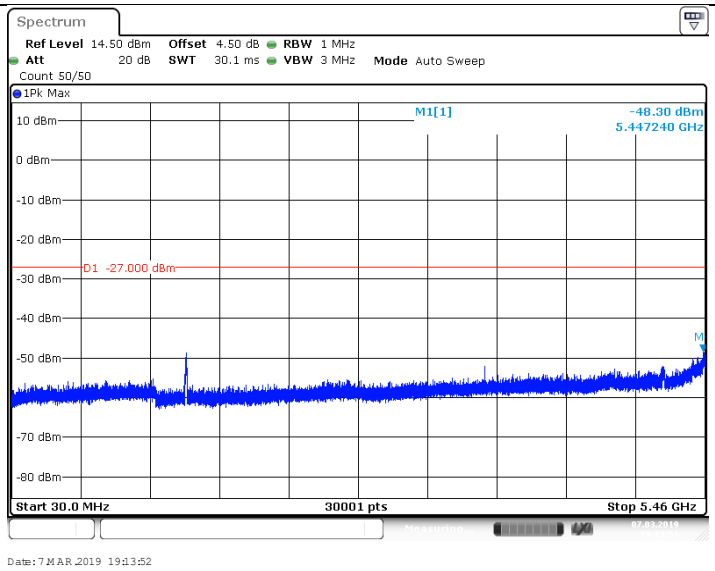


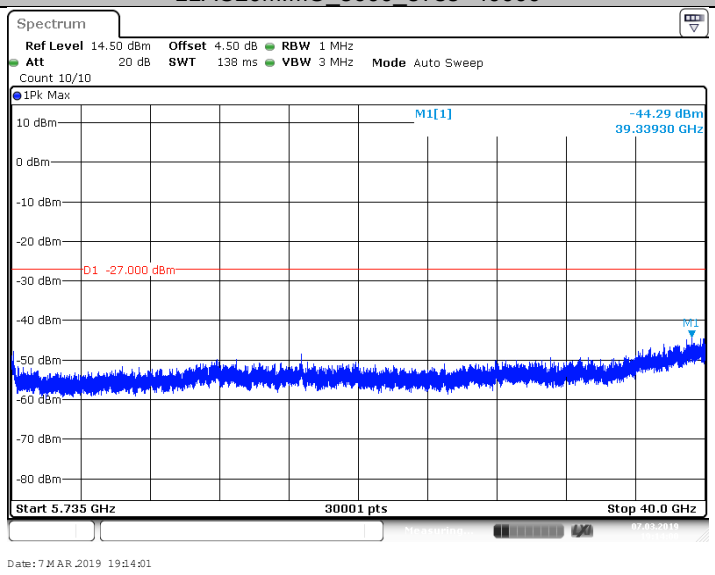
11AC20MIMO_5500_5735~40000



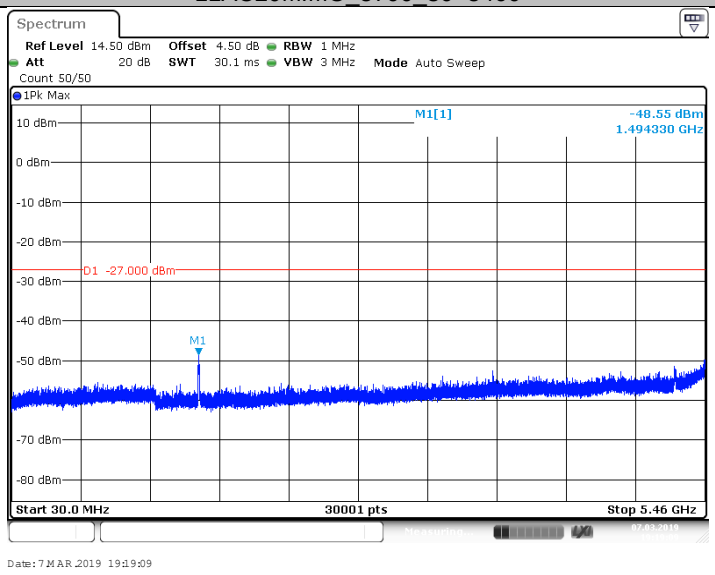
11AC20MIMO_5600_30~5460



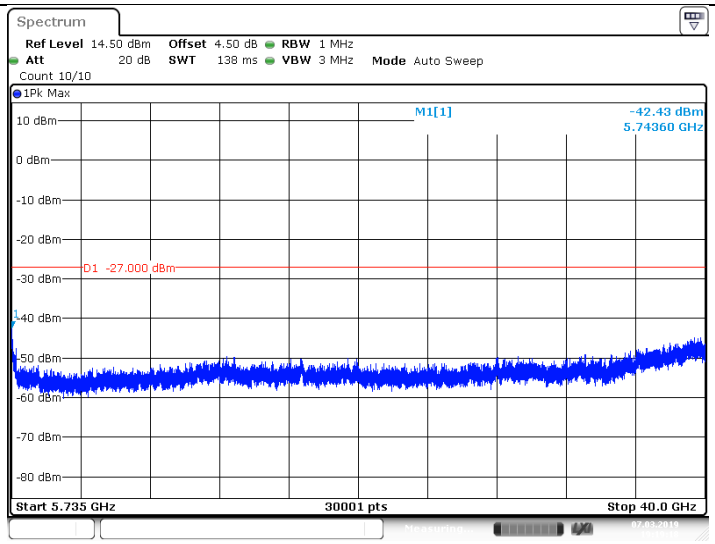
11AC20MIMO_5600_5735~40000



11AC20MIMO_5700_30~5460



11AC20MIMO_5700_5735~40000



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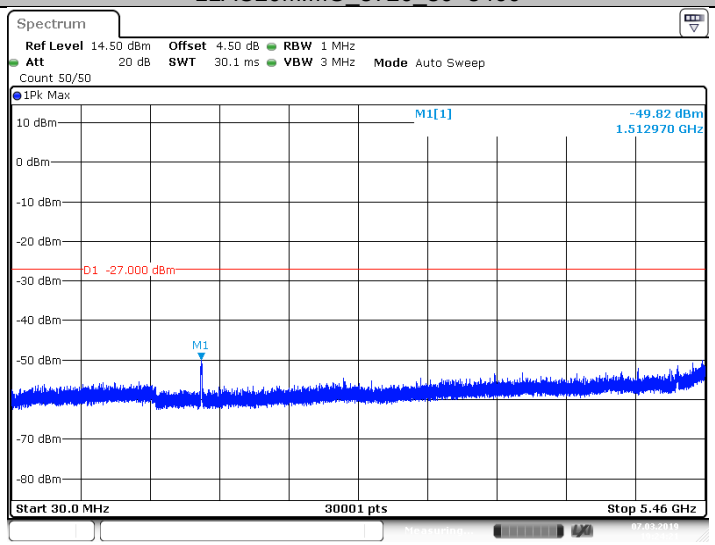

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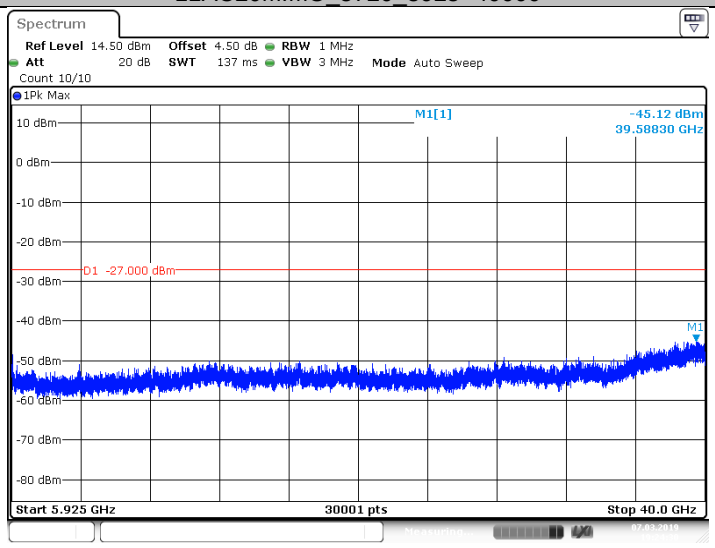

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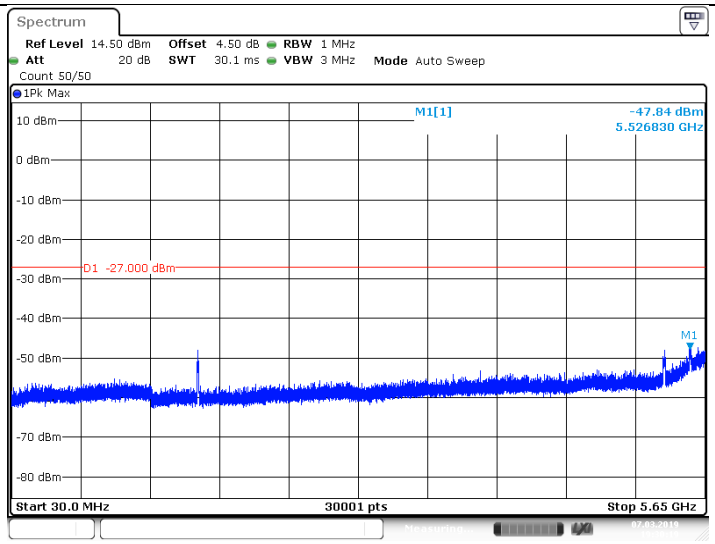

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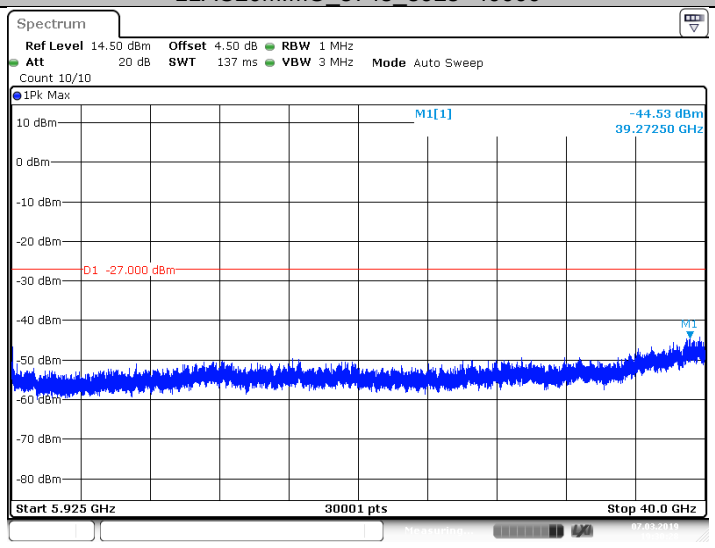

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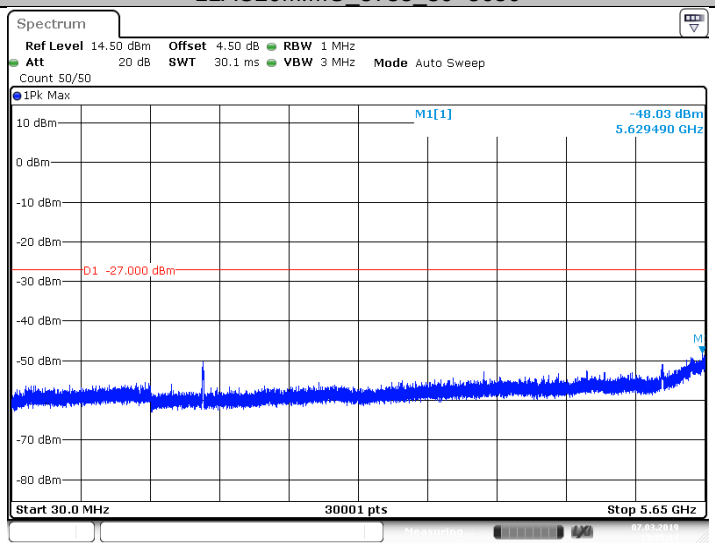

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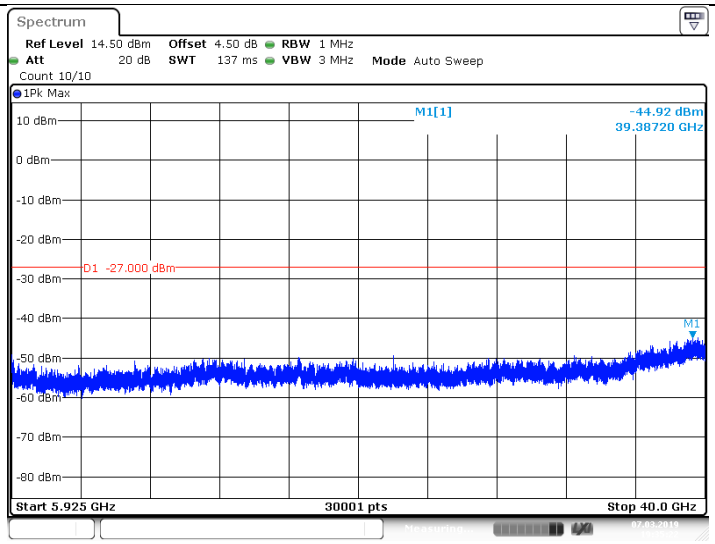

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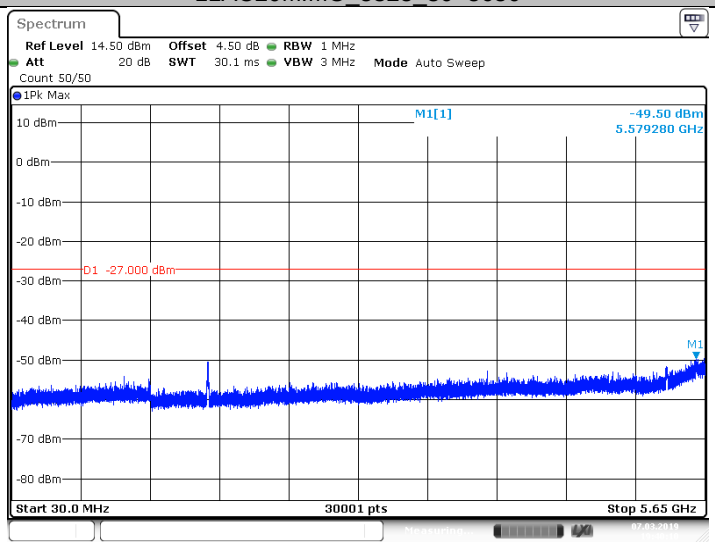

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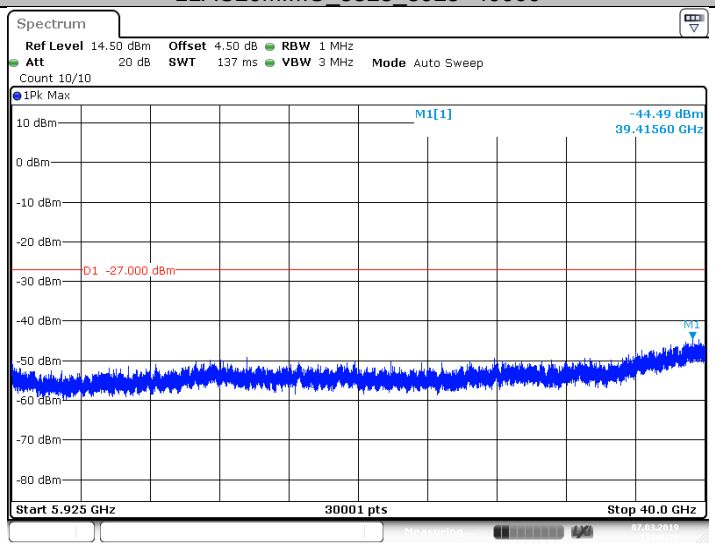

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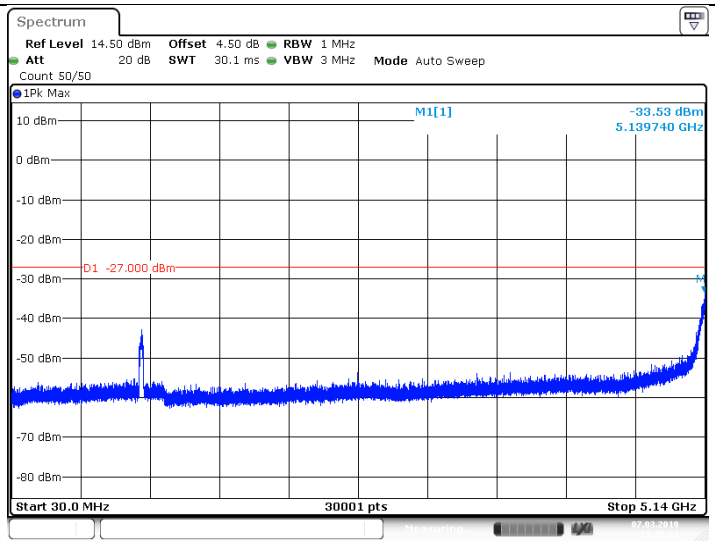
11AC40MIMO_5190_30~5140



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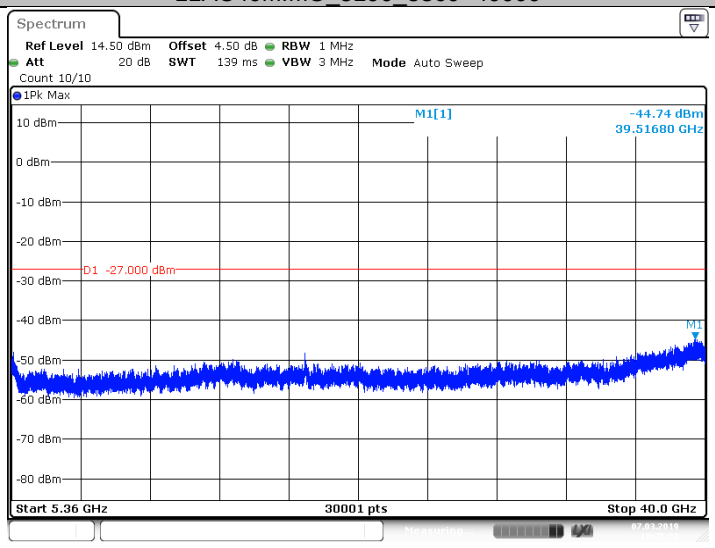

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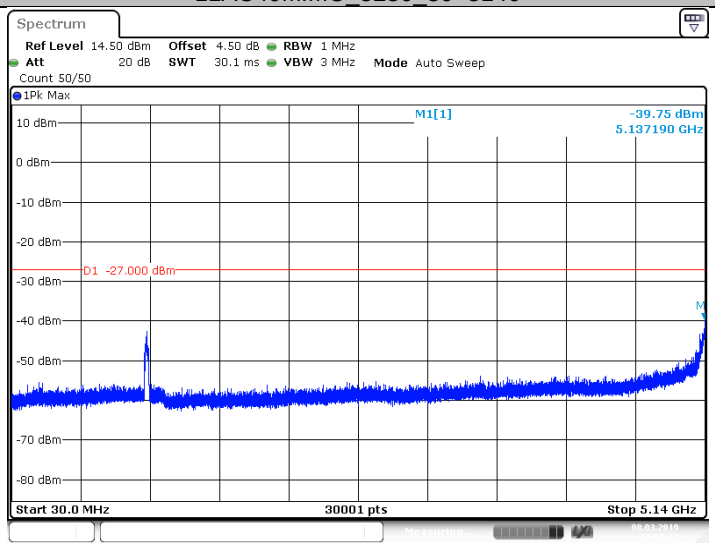

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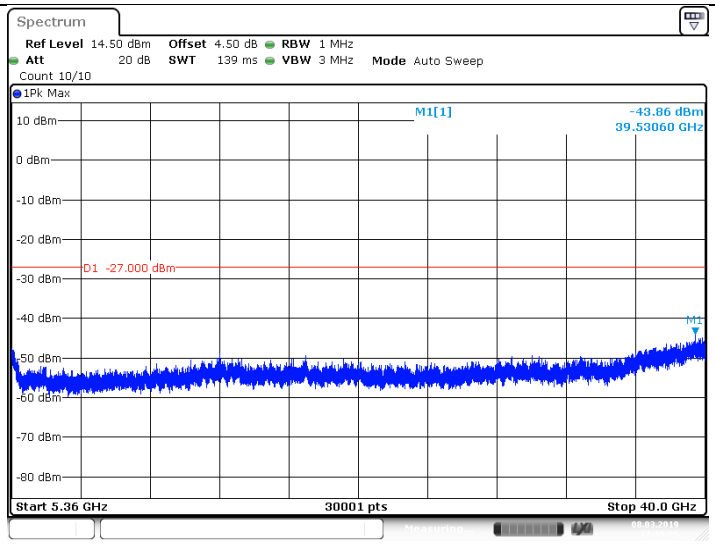

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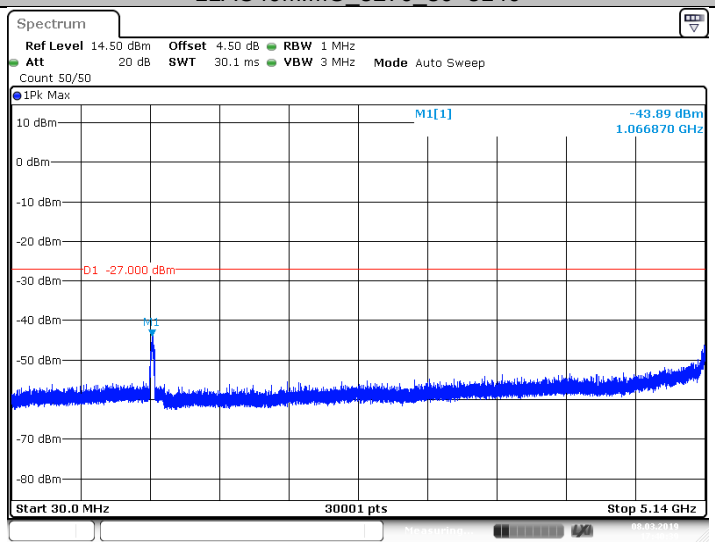

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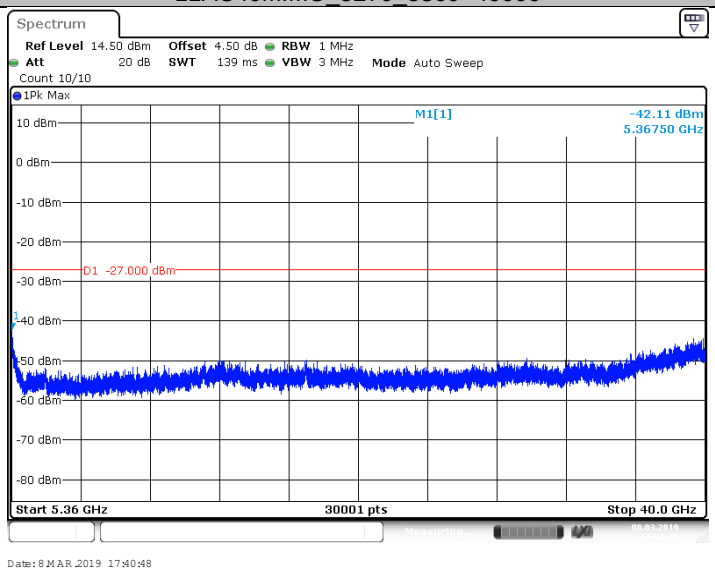
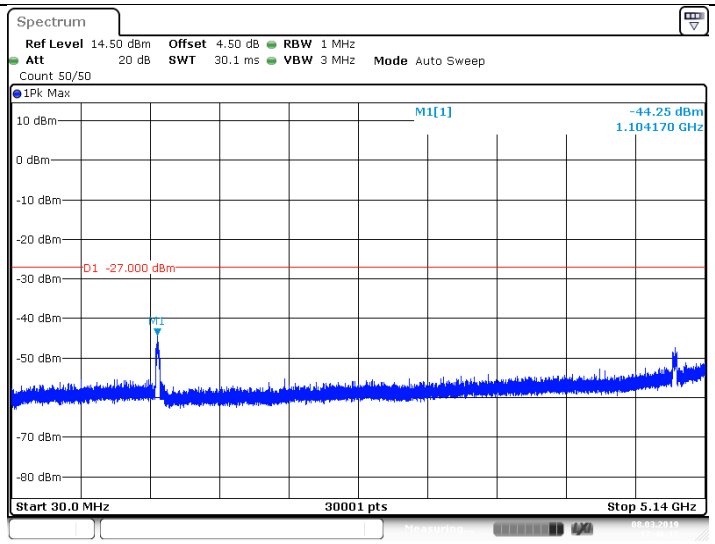


11AC40MIMO_5310_30~5140



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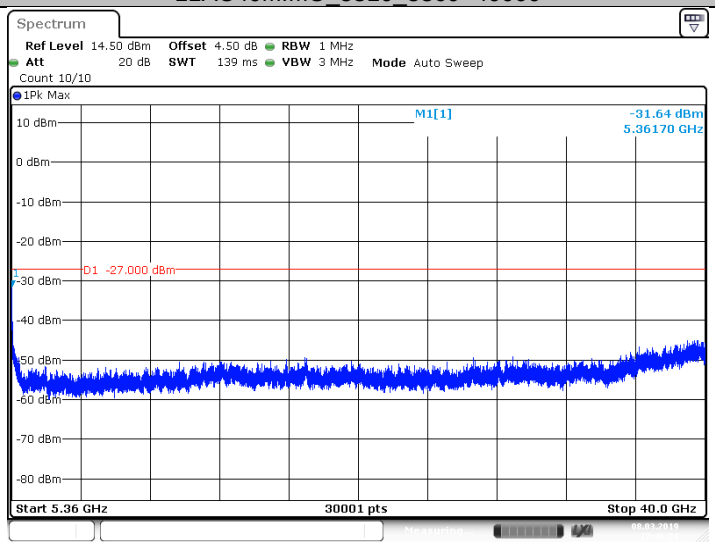

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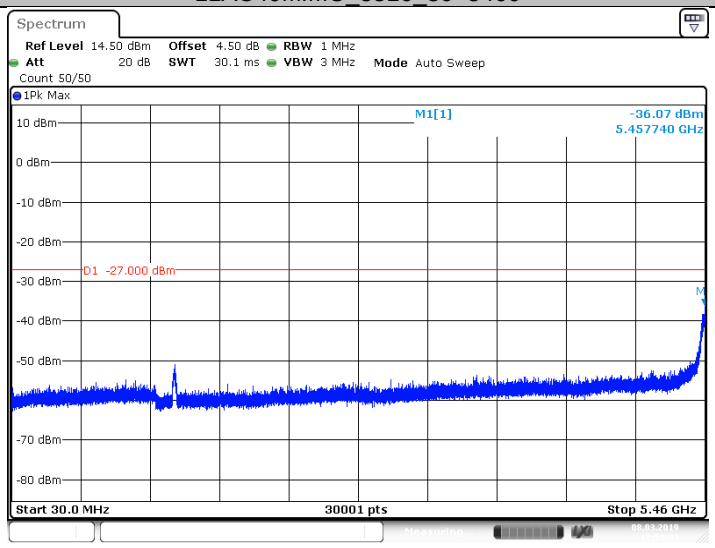

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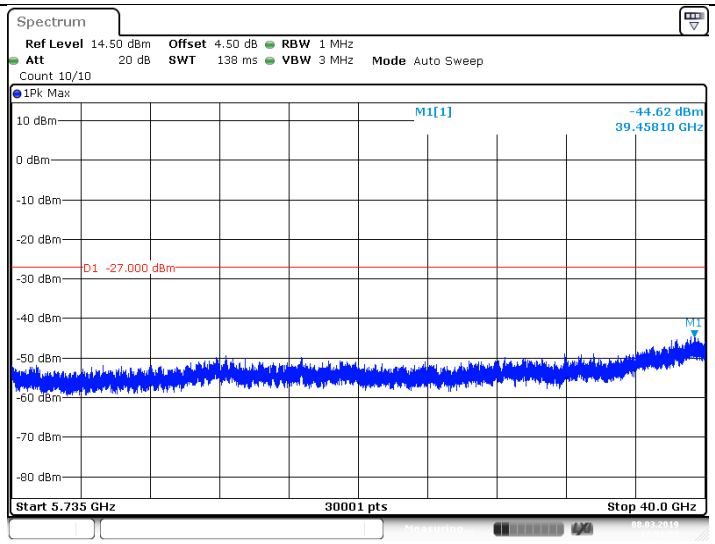

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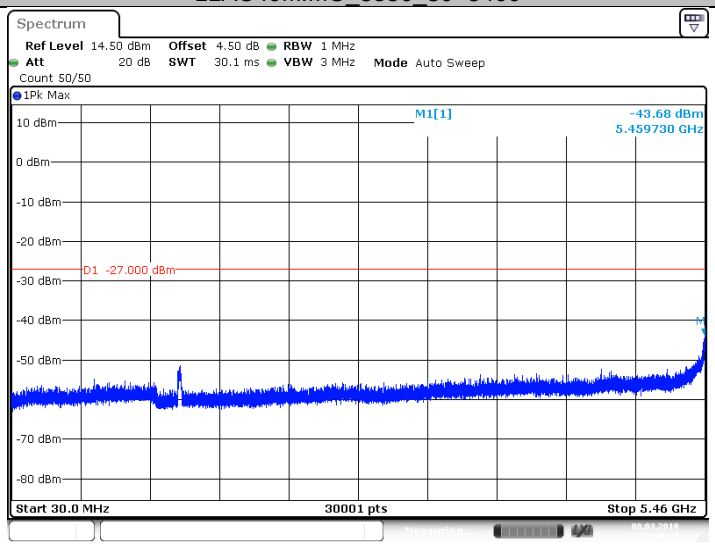

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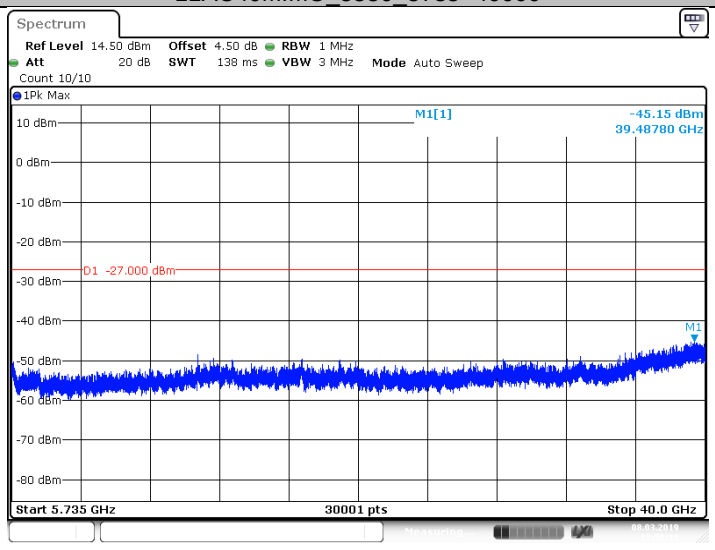

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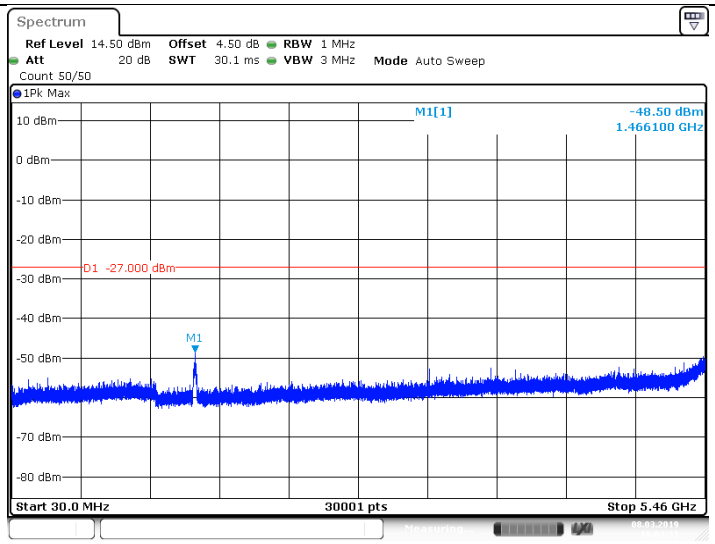

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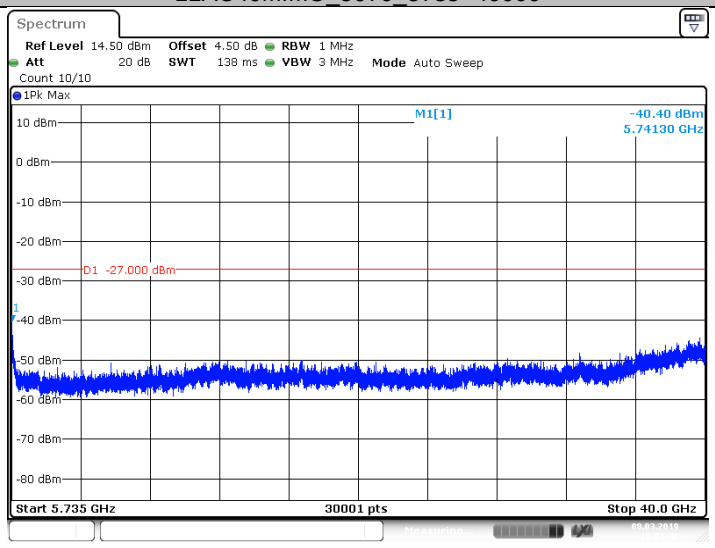

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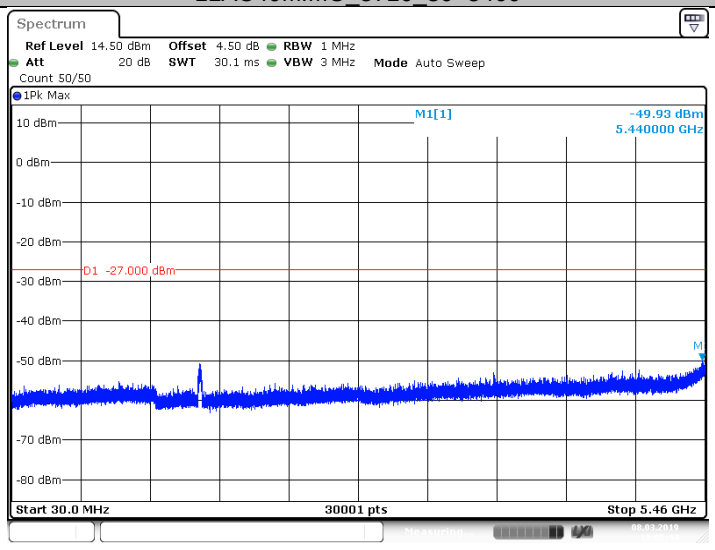

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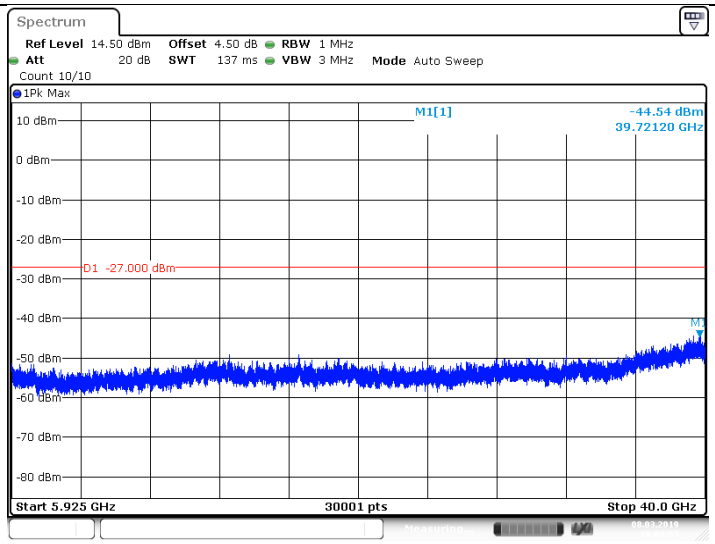

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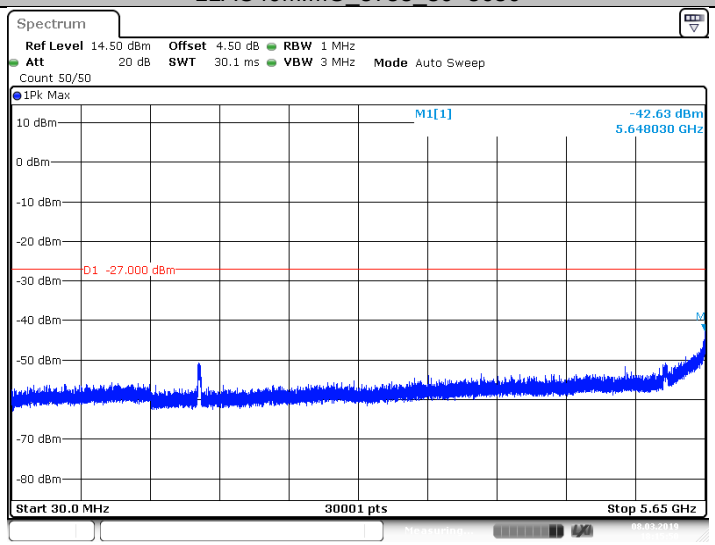

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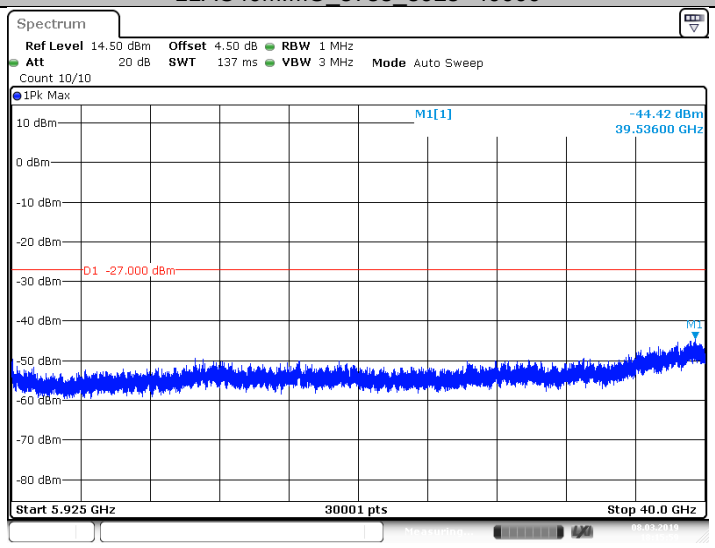

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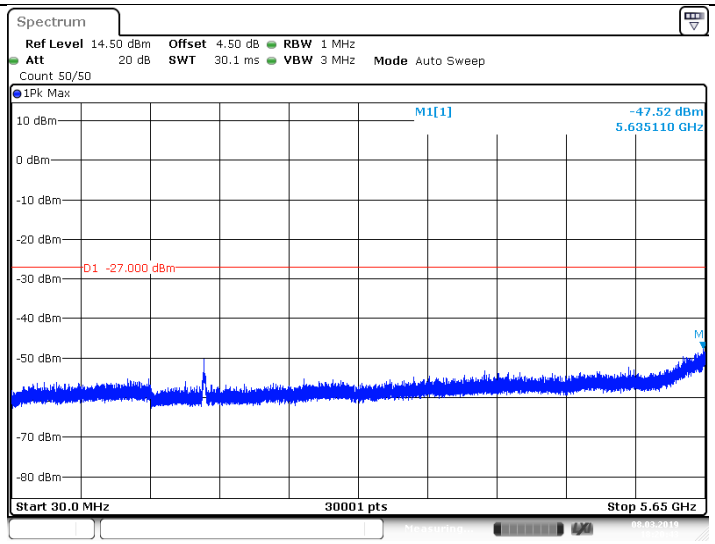

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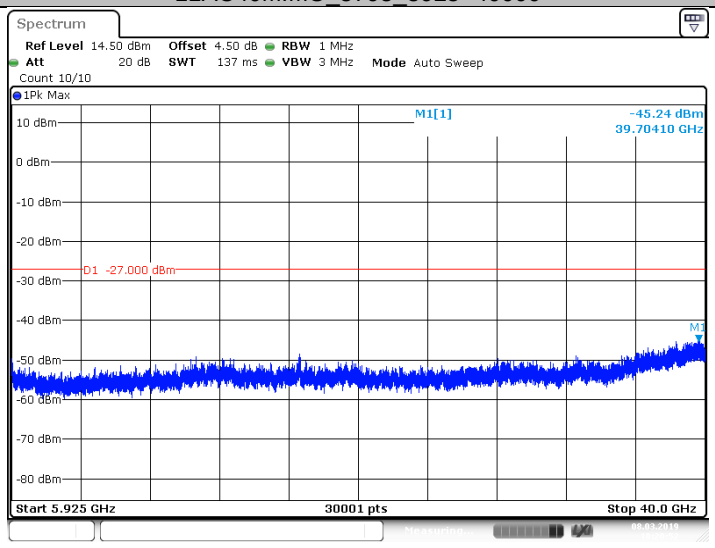

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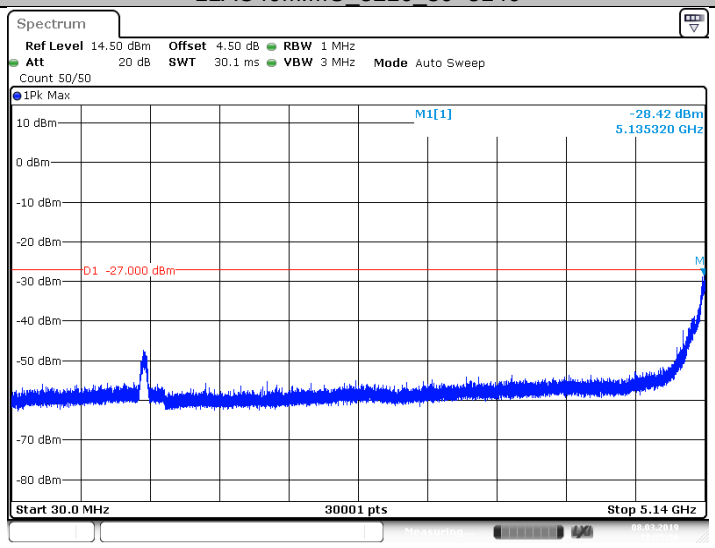

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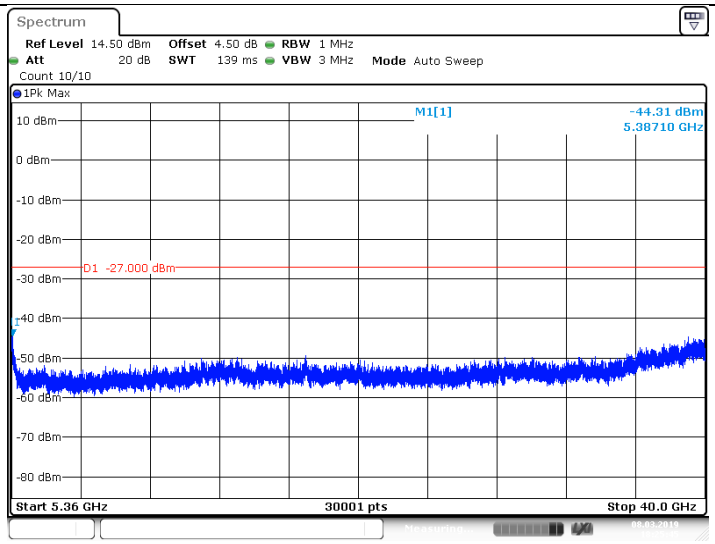

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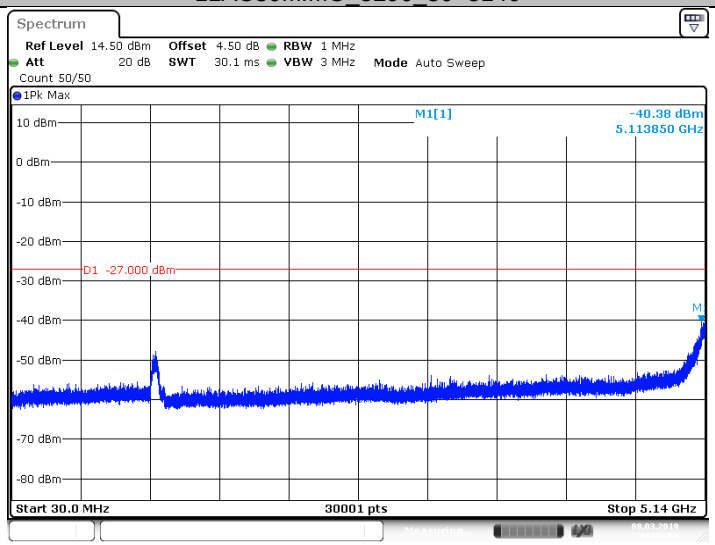

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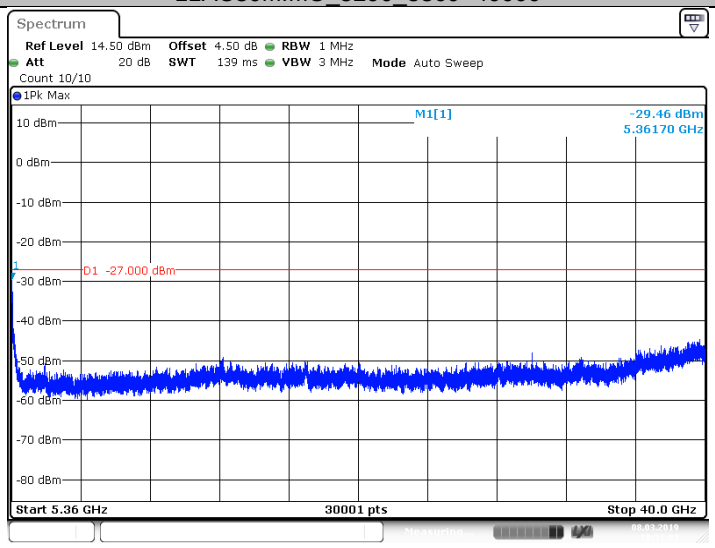

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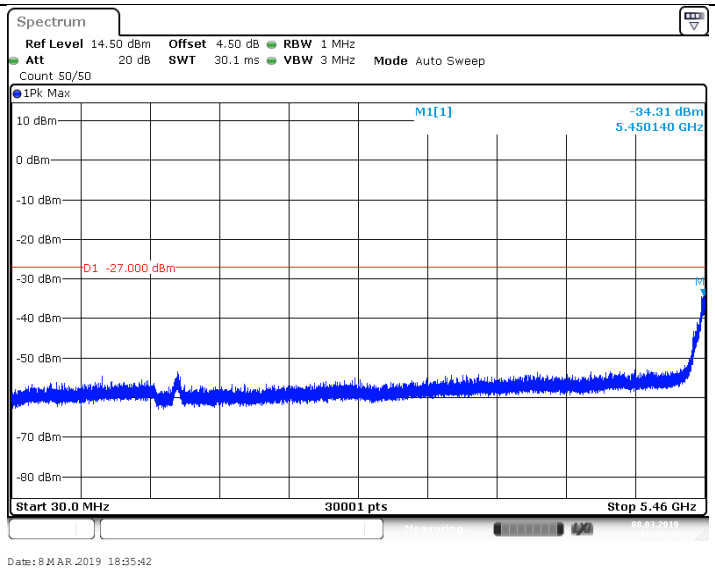
11AC80MIMO_5530_30~5460



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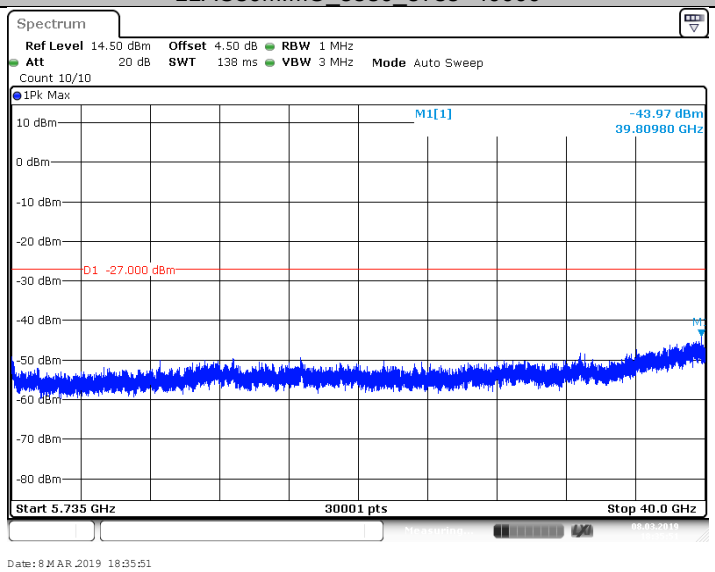

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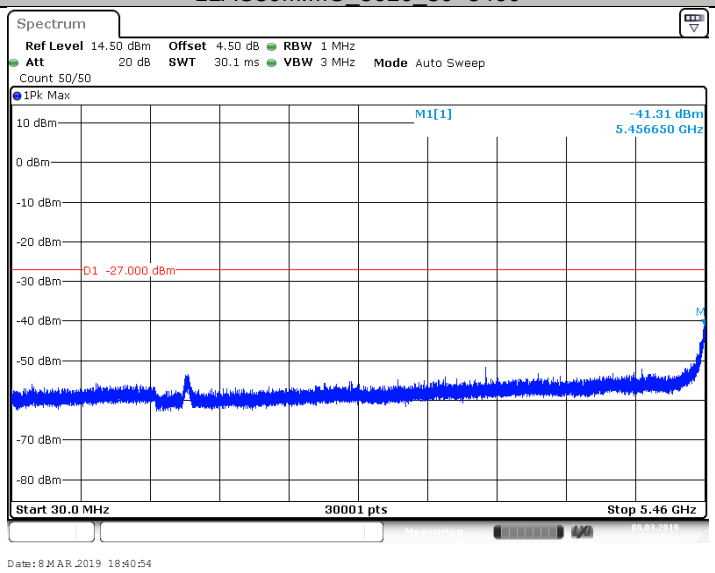

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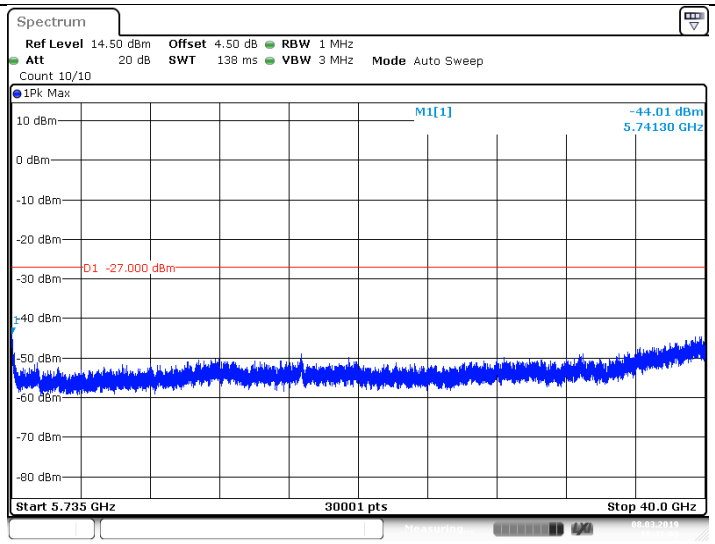

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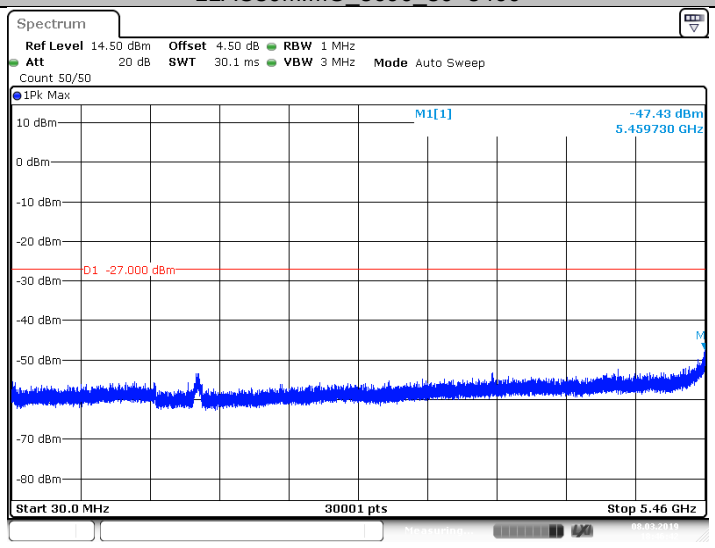

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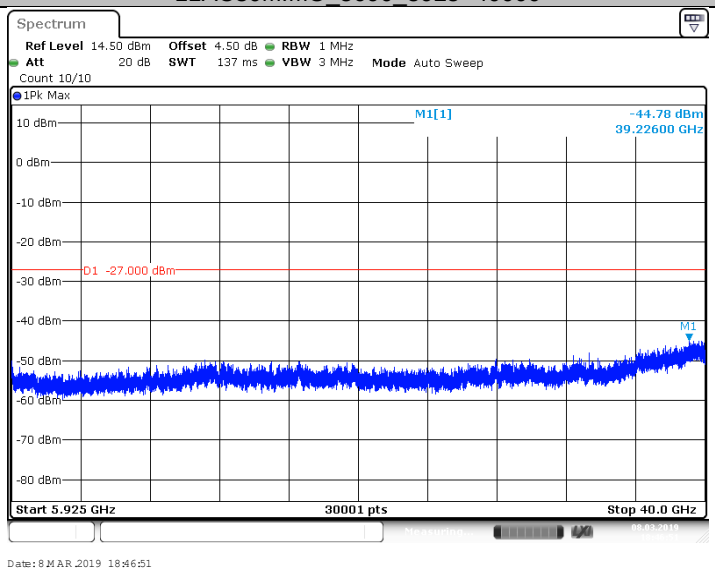

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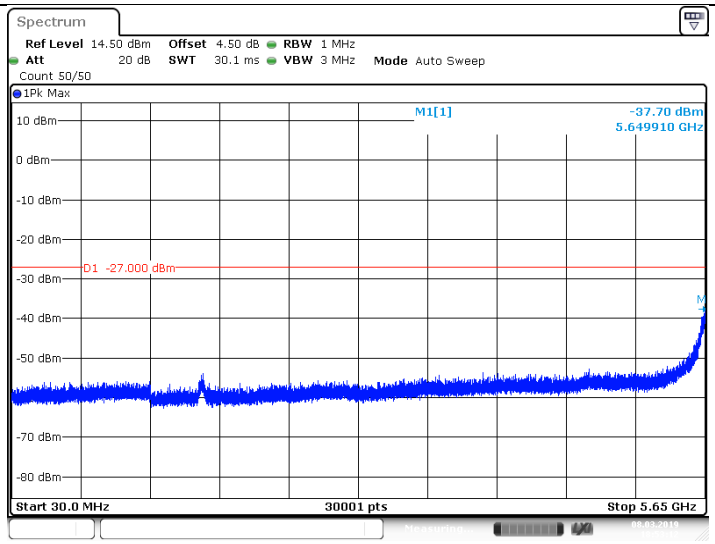

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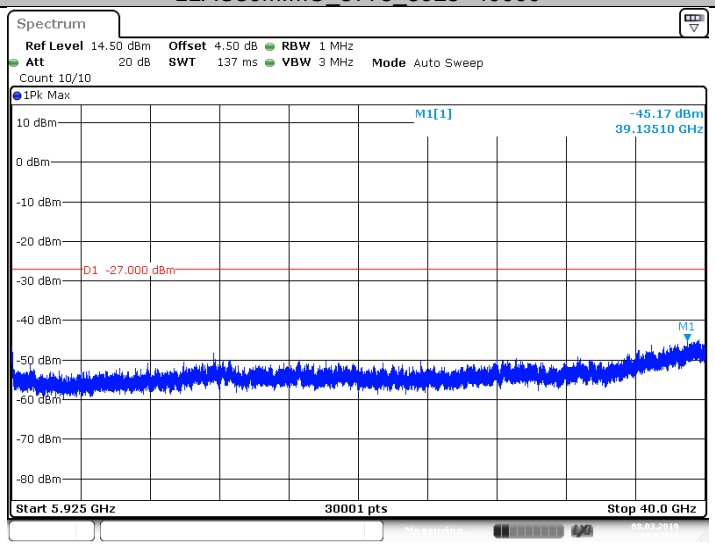

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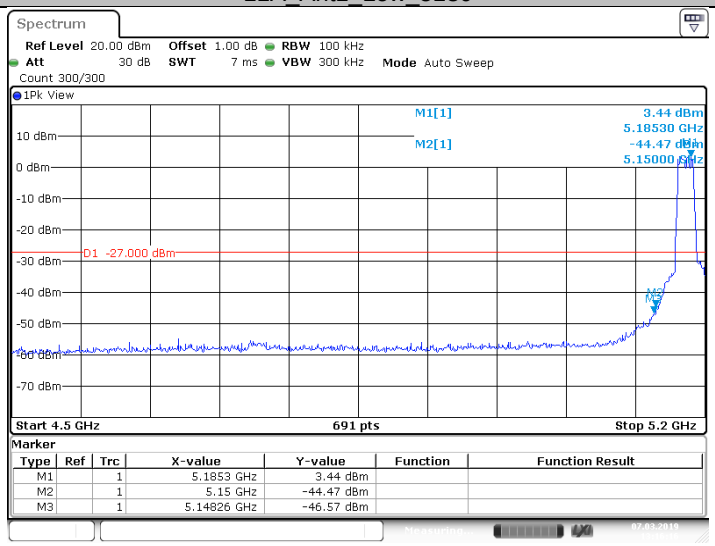
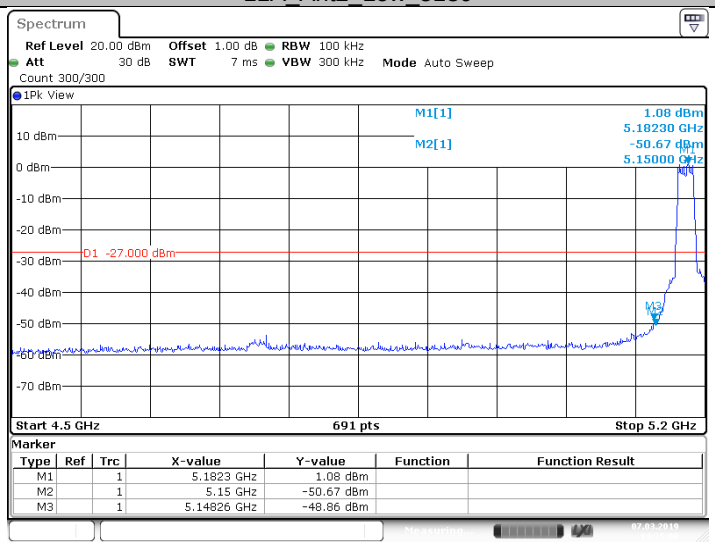
Transmitting spurious emission test result as below (Band edge measurements):

IEEE 802.11a modulation Test Result

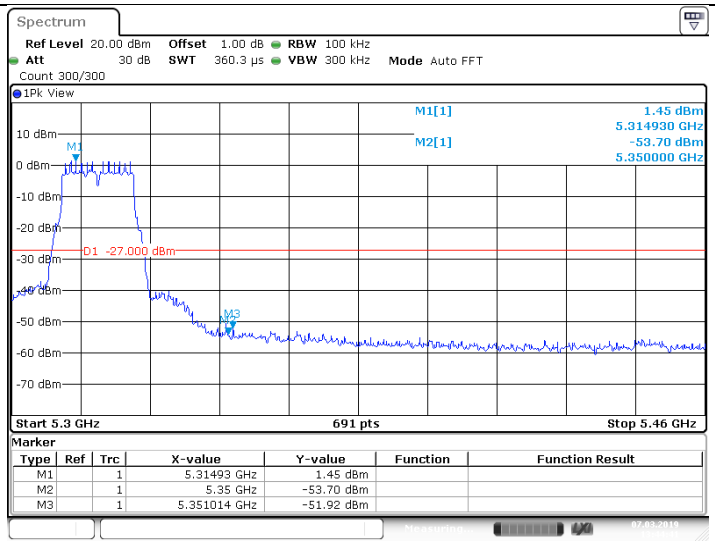
11A_Ant1_Low_5180



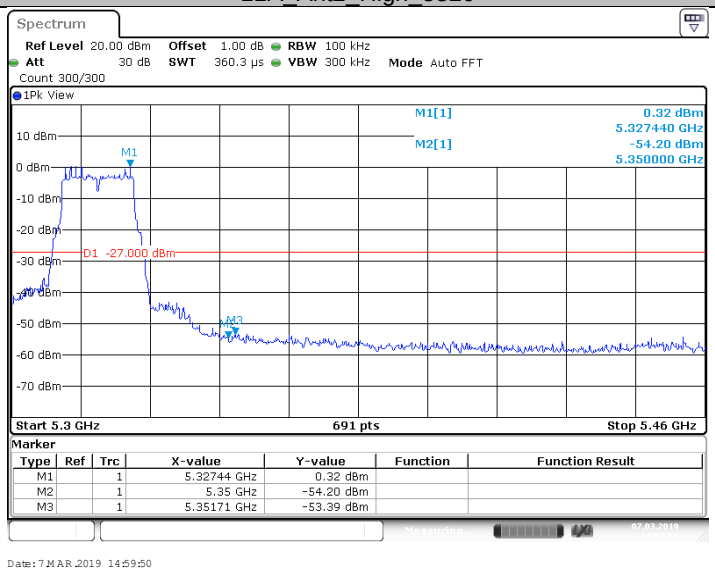
11A_Ant2_Low_5180



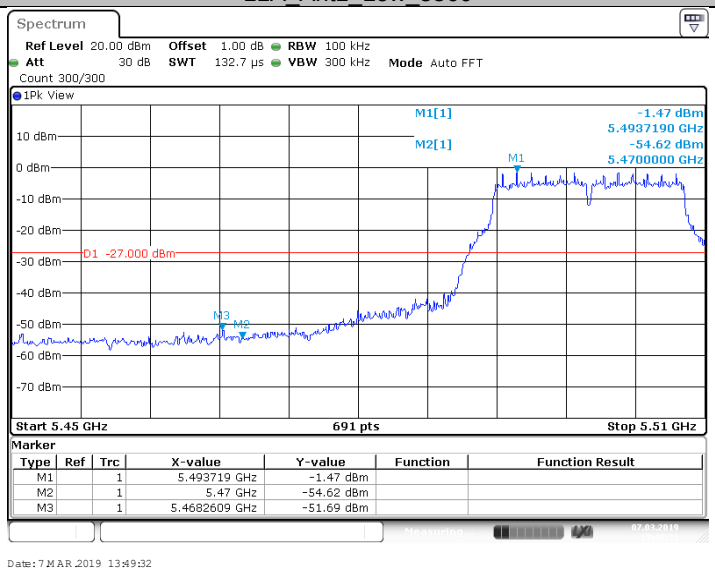
11A_Ant1_High_5320



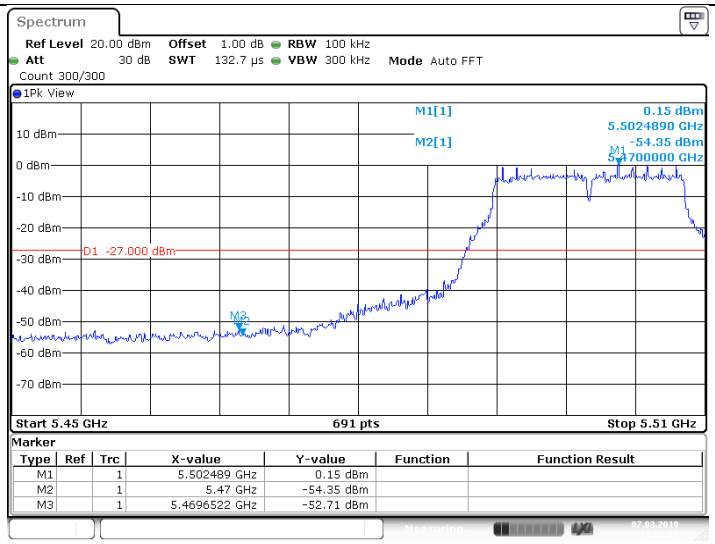
11A_Ant2_High_5320



11A_Ant1_Low_5500



11A_Ant2_Low_5500



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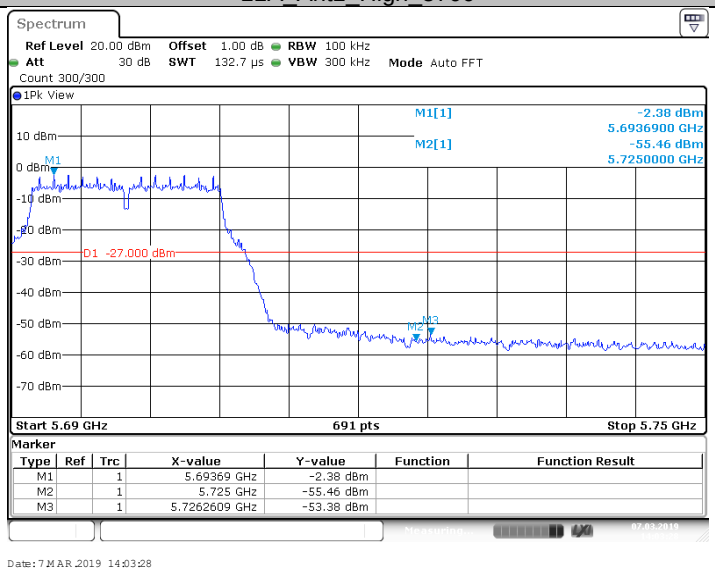
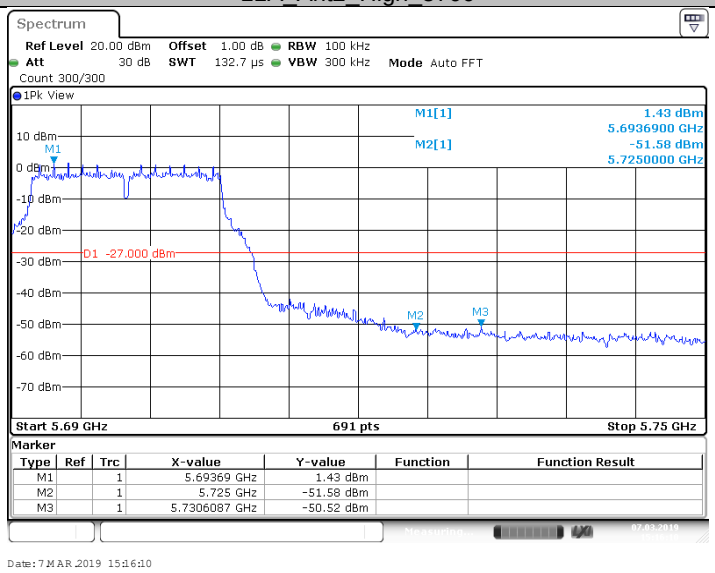


11A_Ant2_High_5700



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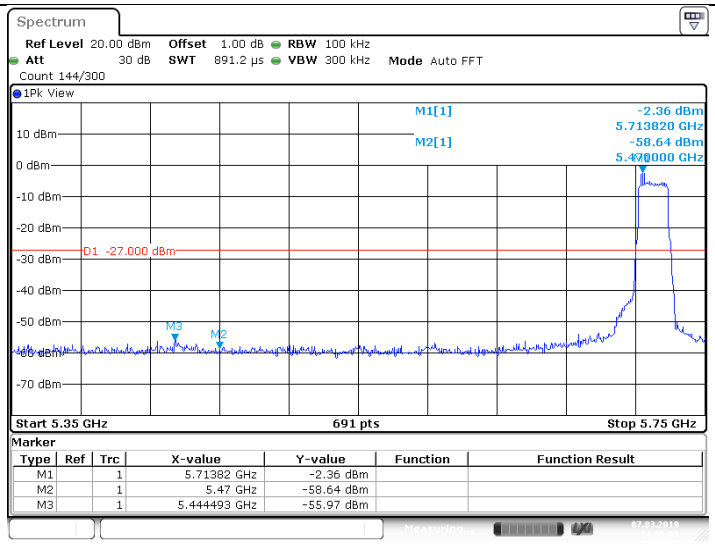

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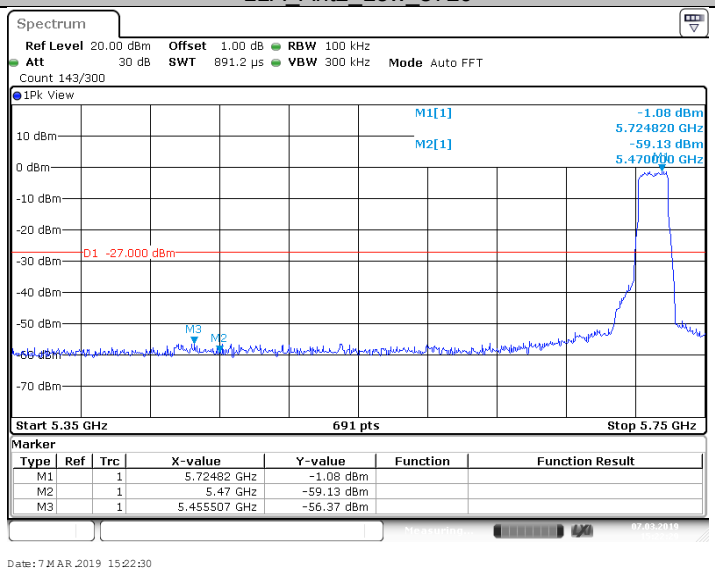

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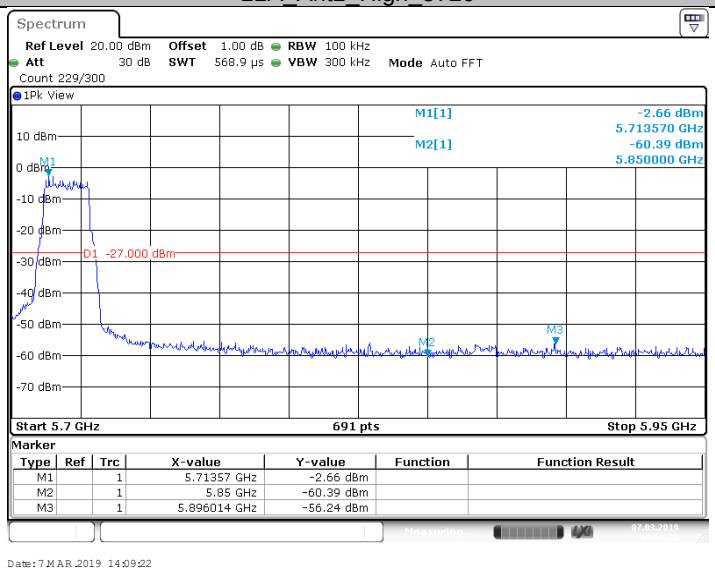
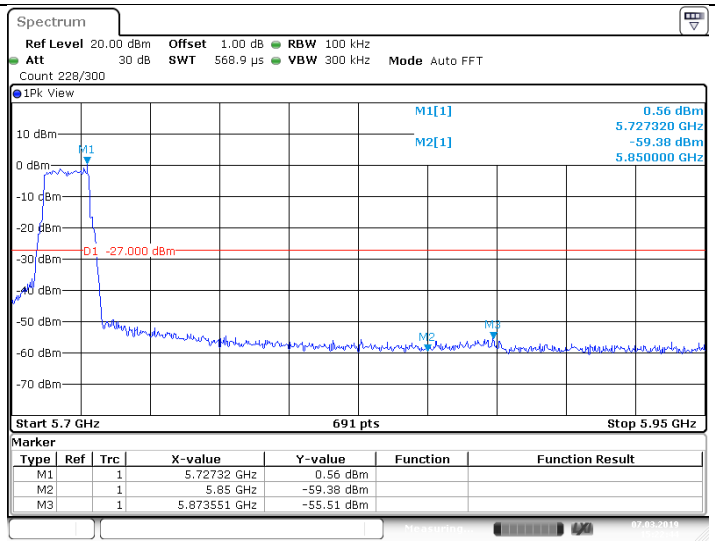
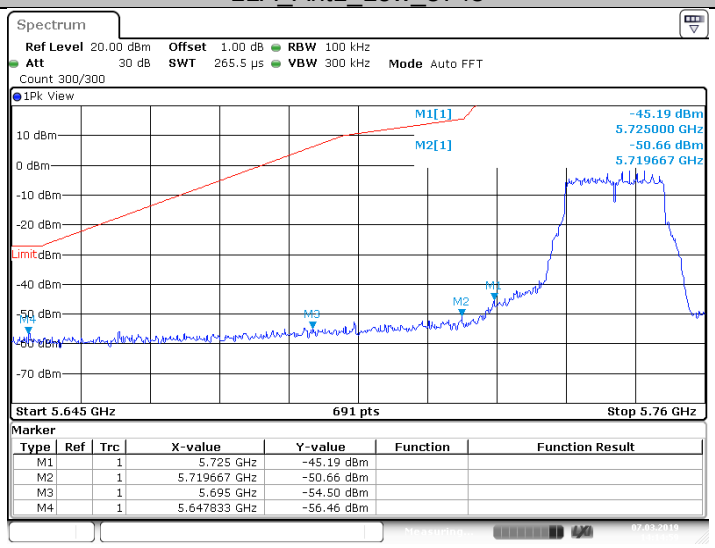


11A_Ant2_High_5720



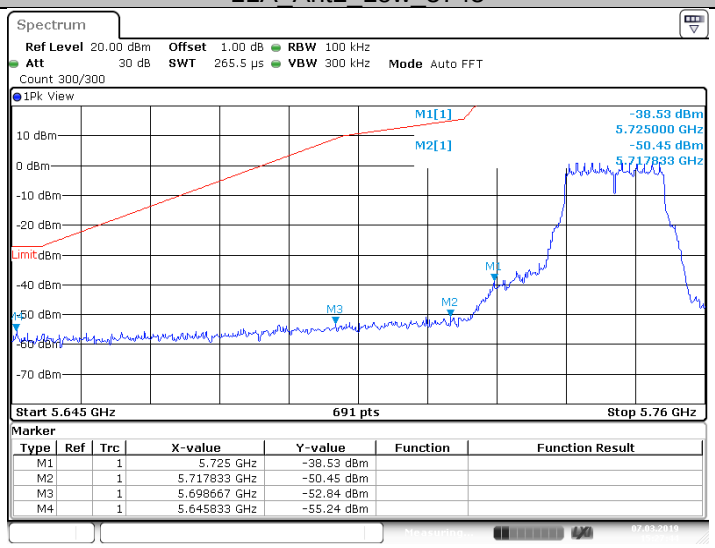
Date: 7 MAR 2019 15:22:44

11A_Ant1_Low_5745



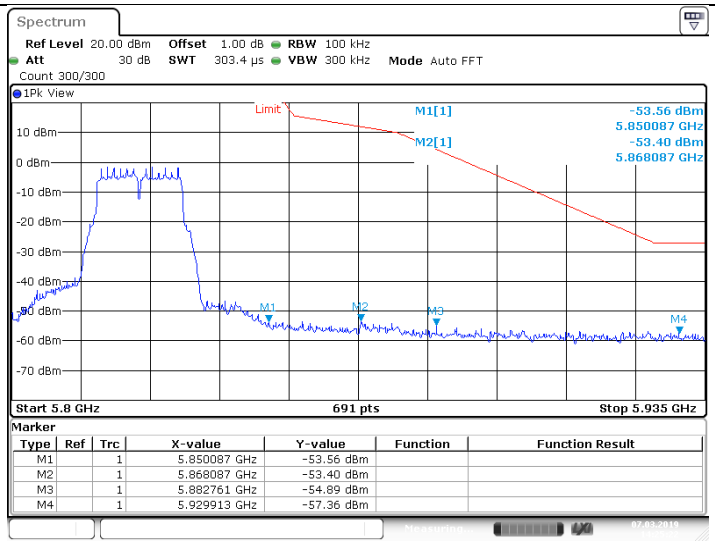
Date: 7 MAR 2019 14:15:00

11A_Ant2_Low_5745

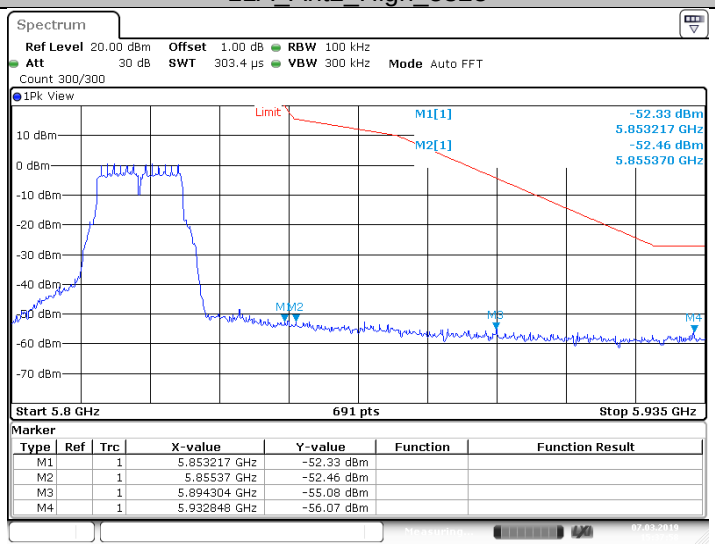


Date: 7 MAR 2019 15:27:44

11A_Ant1_High_5825

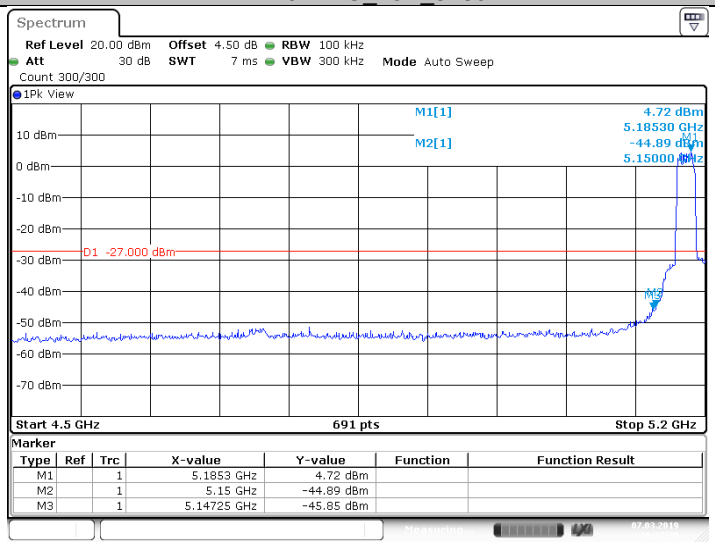


11A_Ant2_High_5825

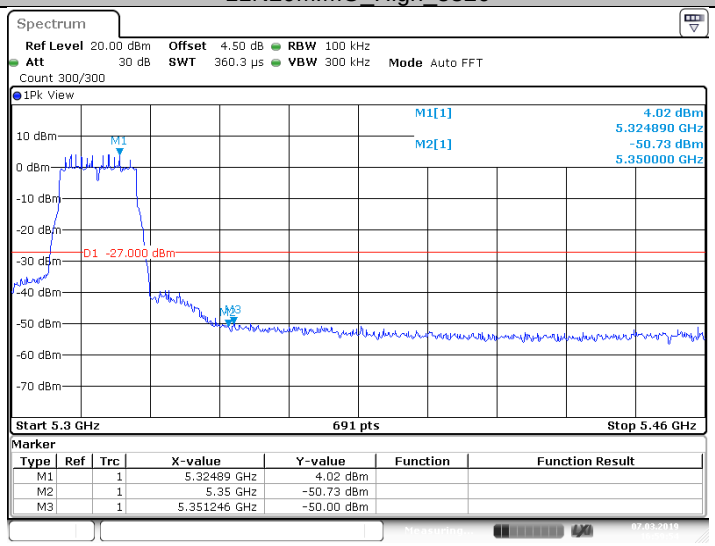


IEEE 802.11n_MIMO modulation Test Result

11N20MIMO_Low_5180

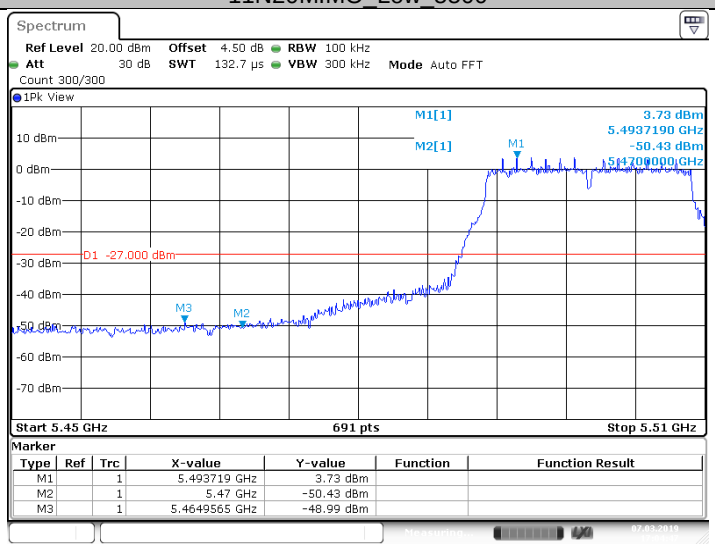


11N20MIMO_High_5320



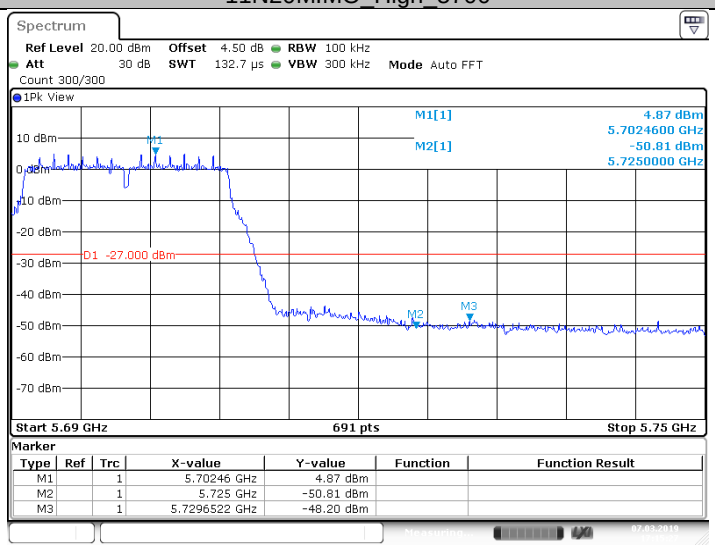
Date: 7 MAR 2019 16:59:54

11N20MIMO_Low_5500



Date: 7 MAR 2019 17:04:47

11N20MIMO_High_5700



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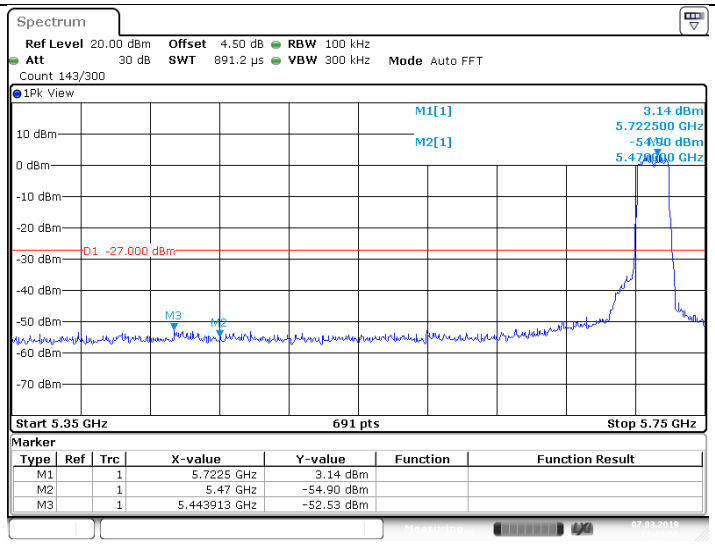
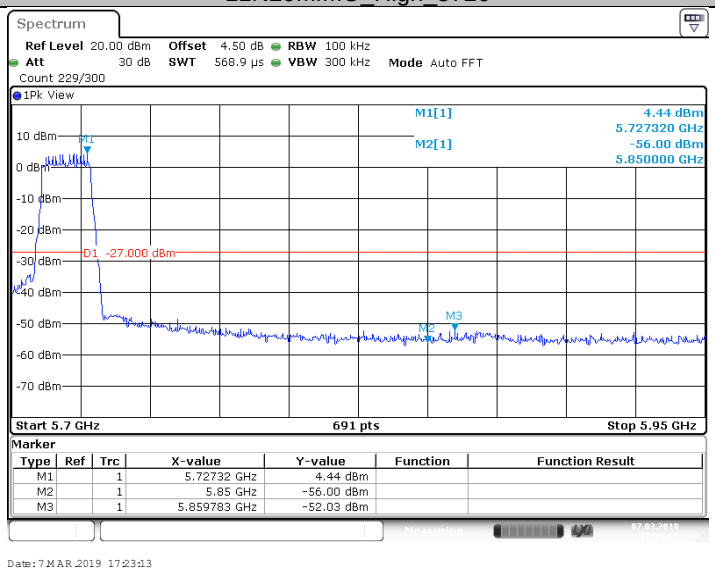
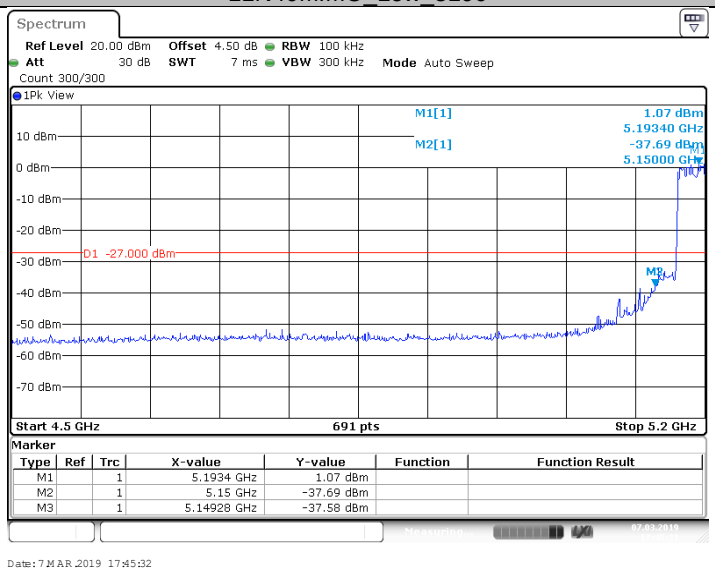
11N20MIMO_Low_5720



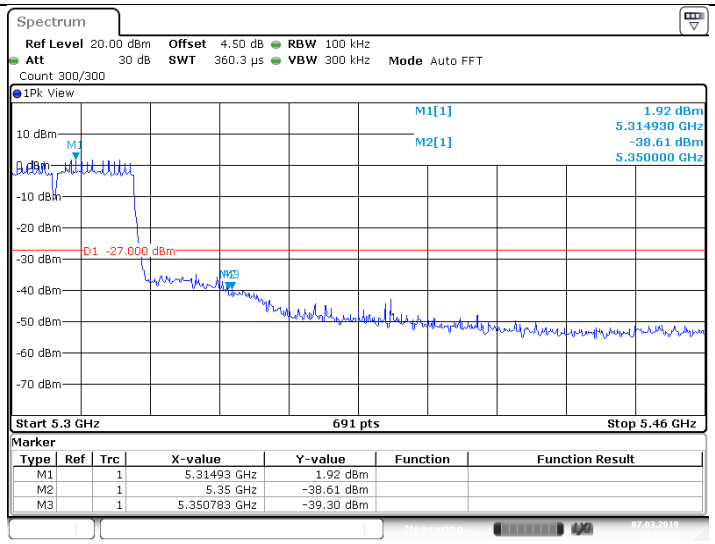
11N20MIMO_High_5720



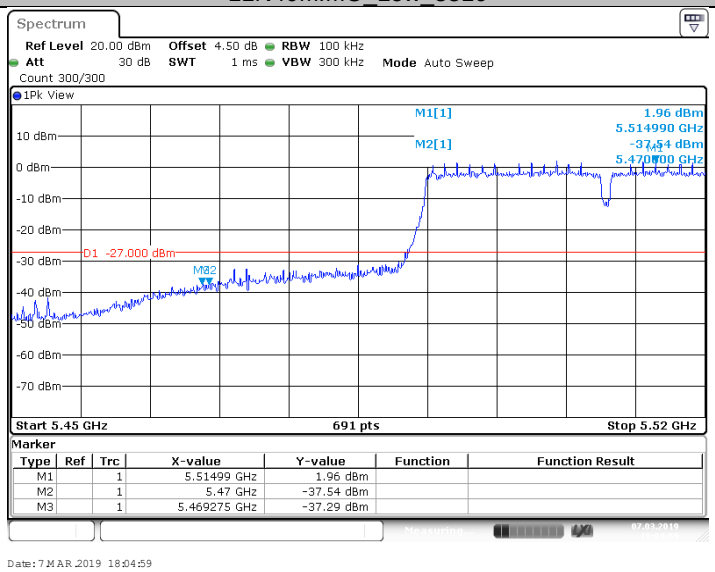
11N40MIMO_Low_5190



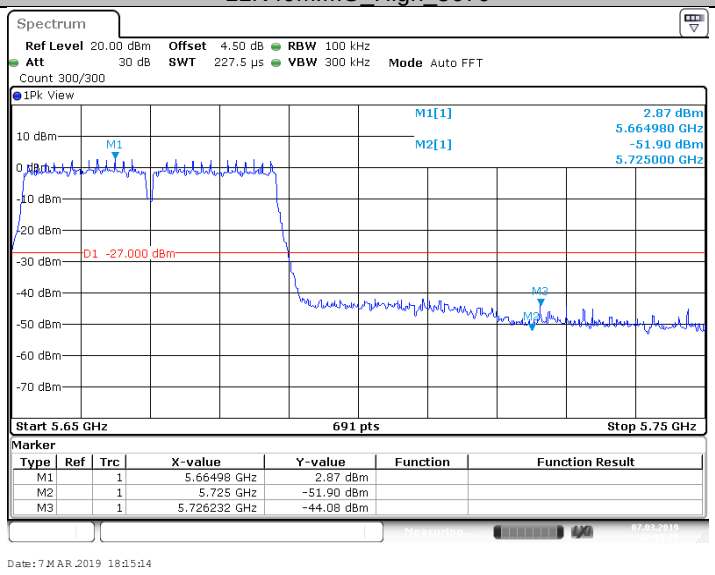
11N40MIMO_High_5310



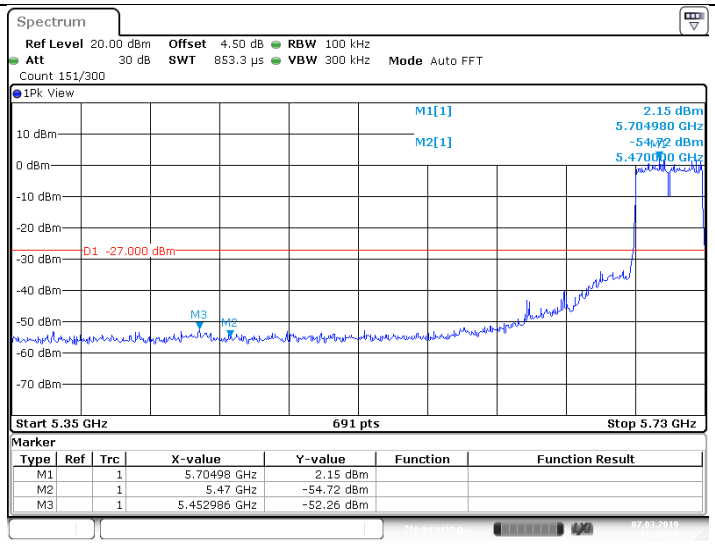
11N40MIMO_Low_5510



11N40MIMO_High_5670



11N40MIMO_Low_5710



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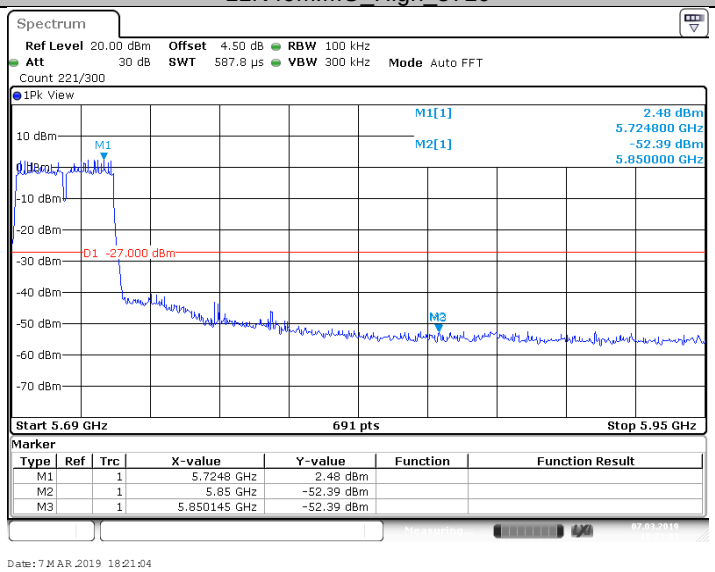
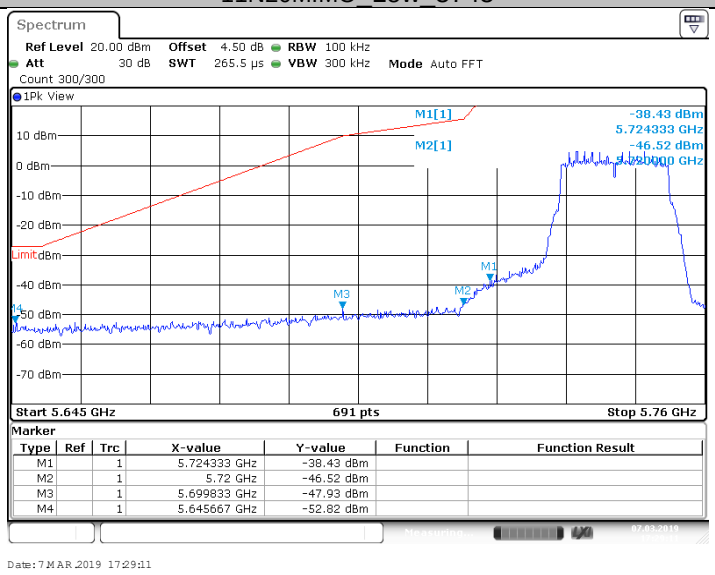
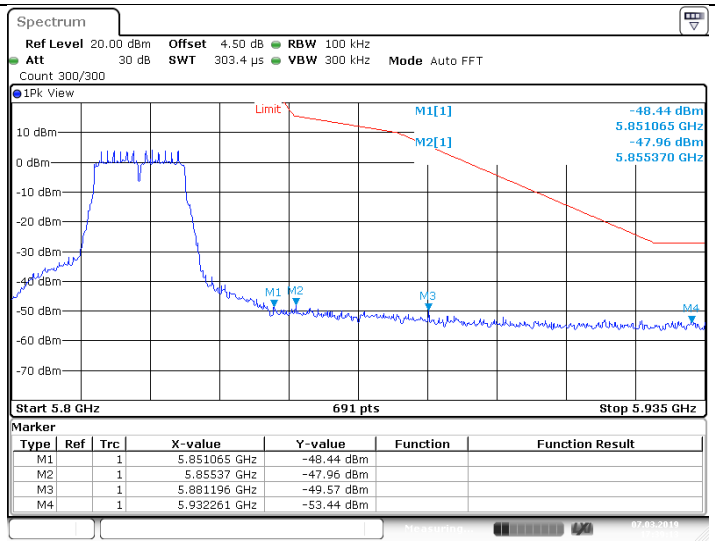


11N20MIMO_Low_5745



11N20MIMO_High_5825

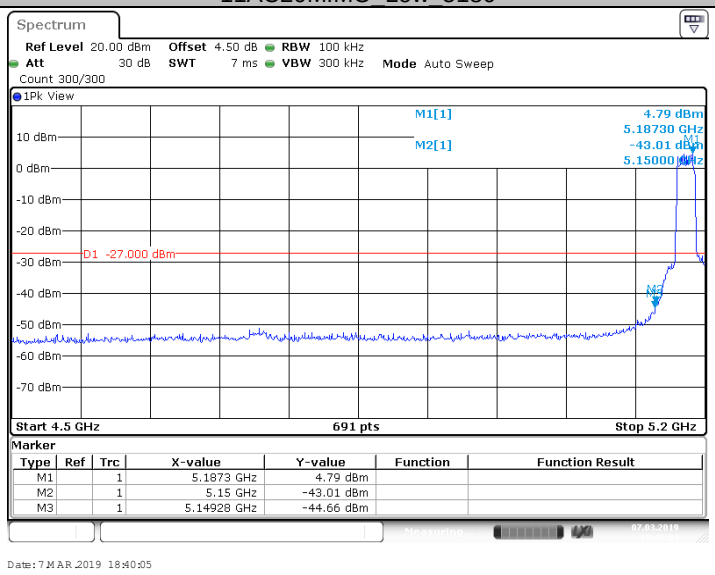


11N40MIMO_Low_5755

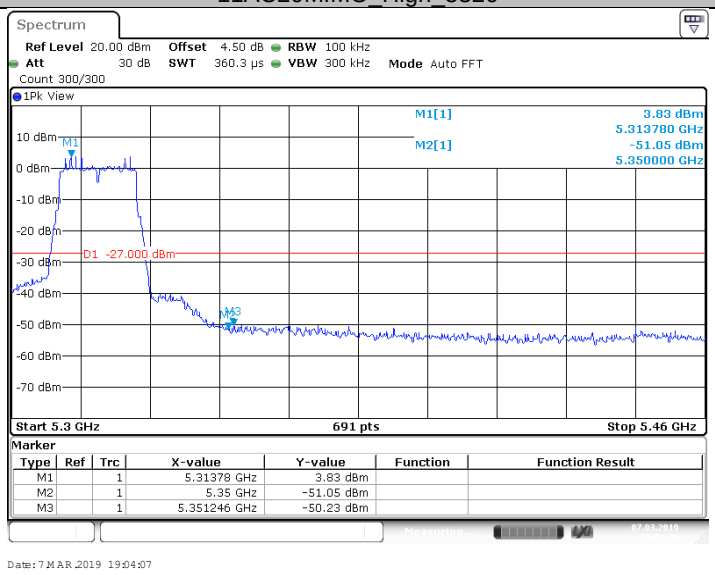
11N40MIMO_High_5795

IEEE 802.11ac_MIMO modulation Test Result

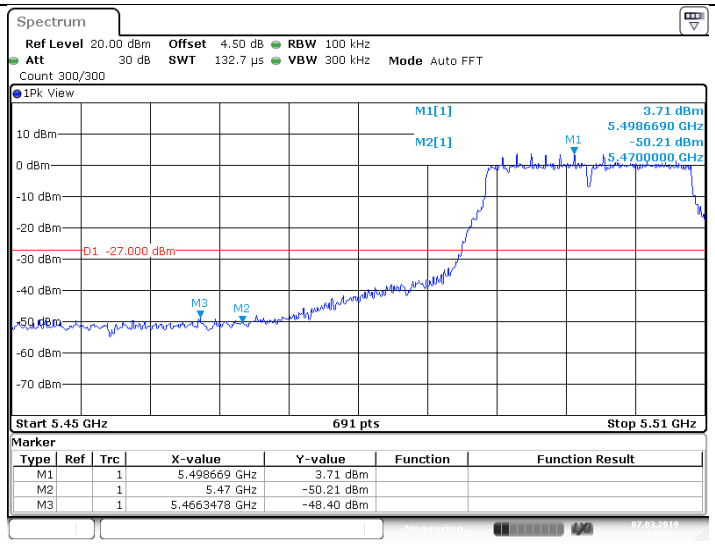
11AC20MIMO_Low_5180



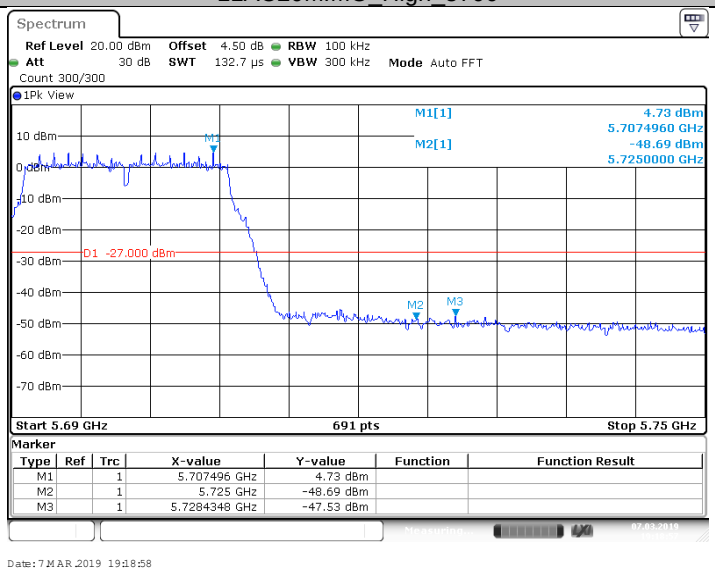
11AC20MIMO_High_5320



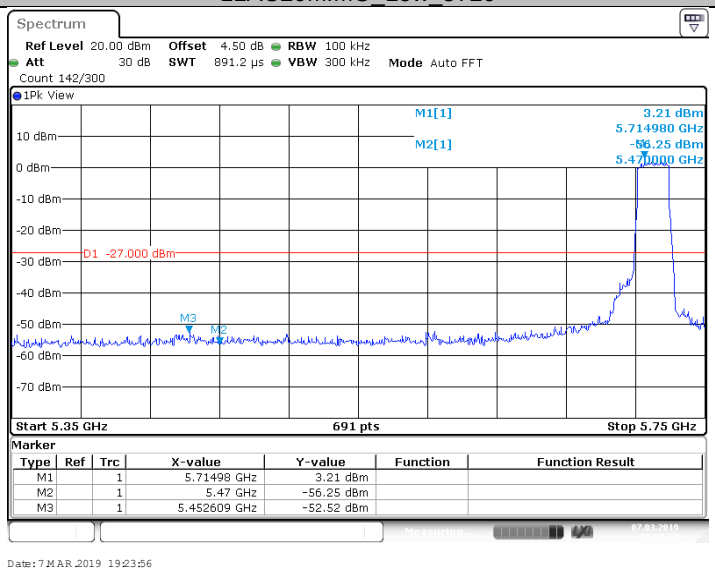
11AC20MIMO_Low_5500



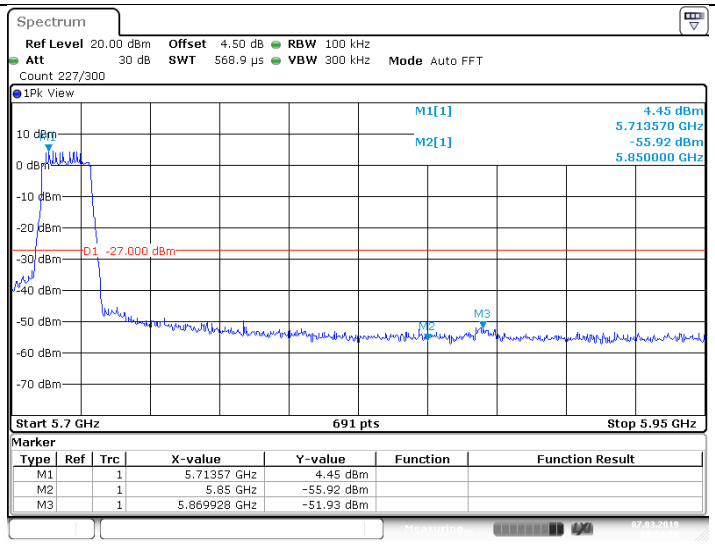
11AC20MIMO_High_5700



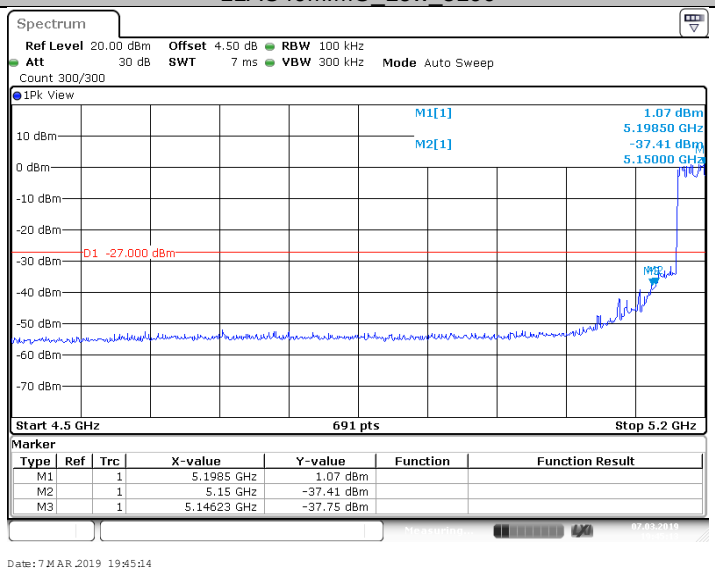
11AC20MIMO_Low_5720



11AC20MIMO_High_5720



11AC40MIMO_Low_5190



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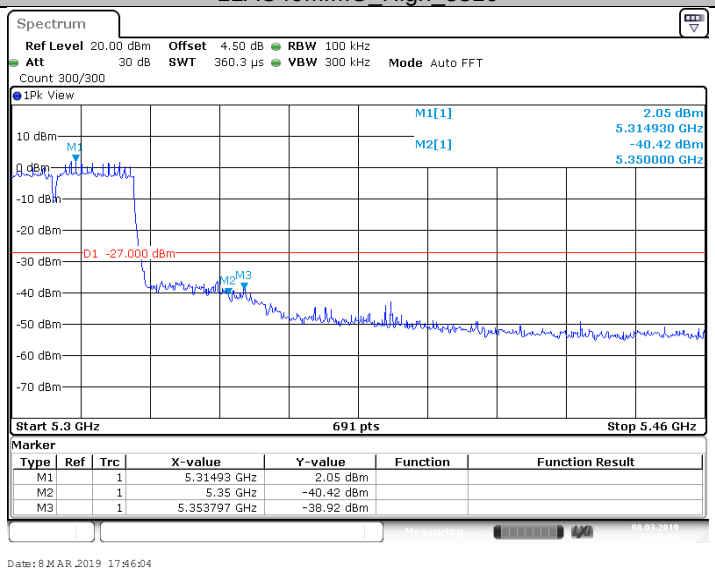

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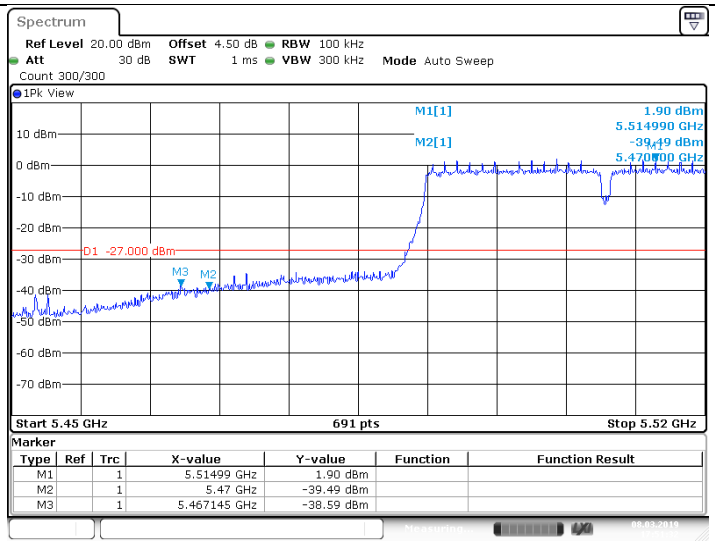
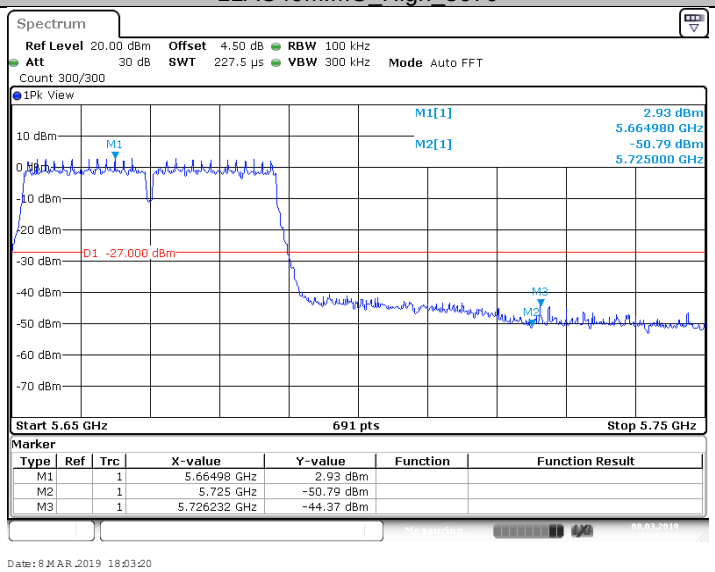
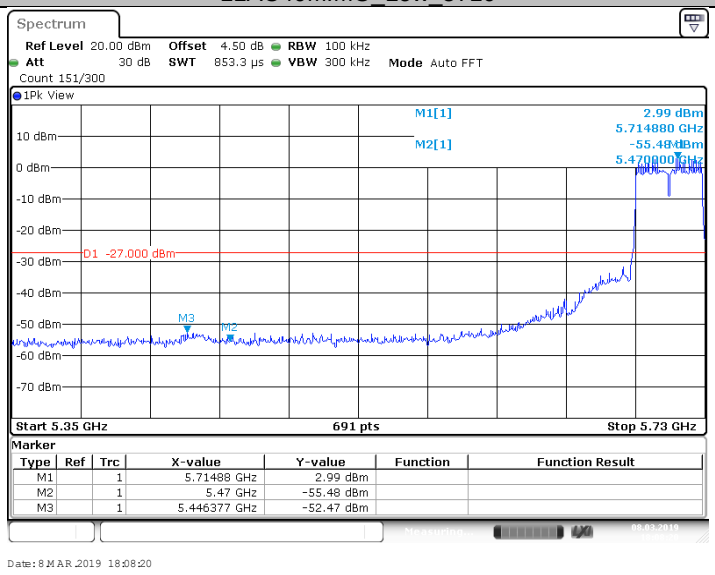


11AC40MIMO_High_5670



11AC40MIMO_Low_5710



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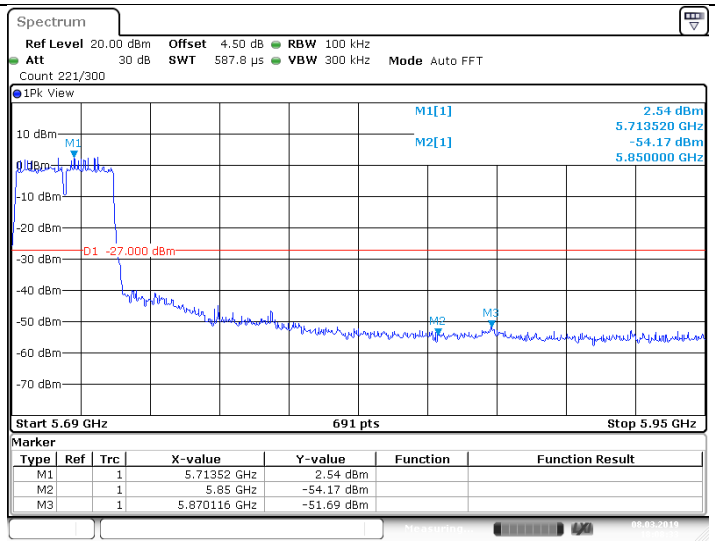
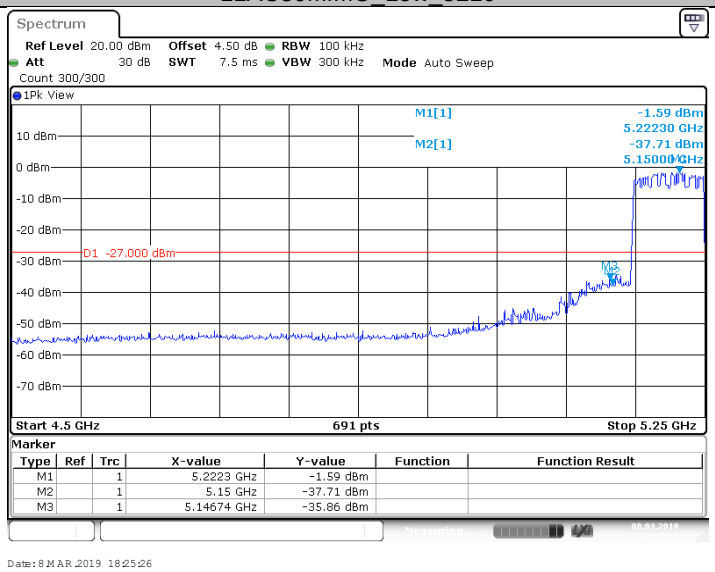
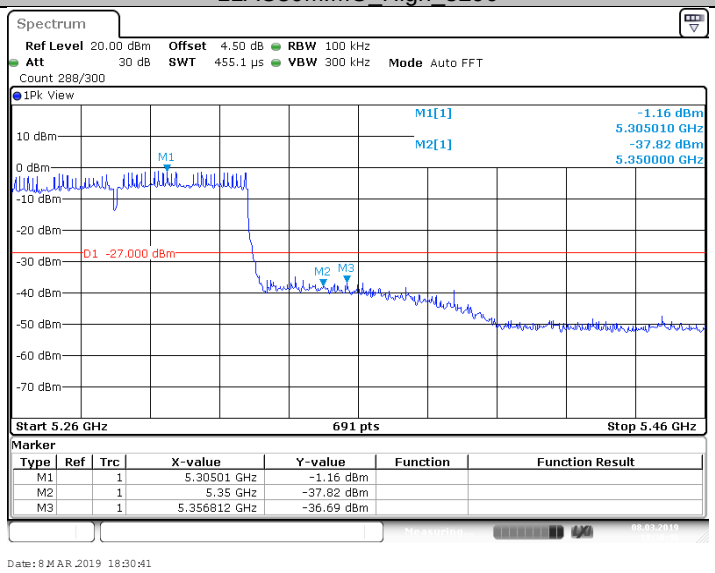


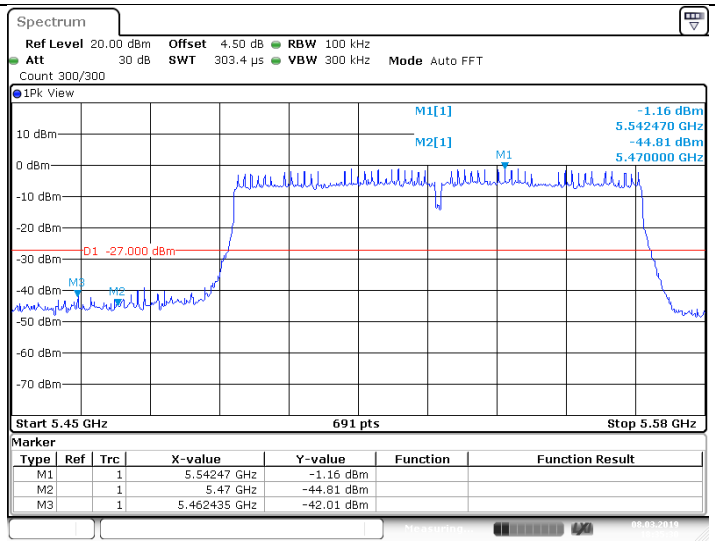
11AC80MIMO_Low_5210



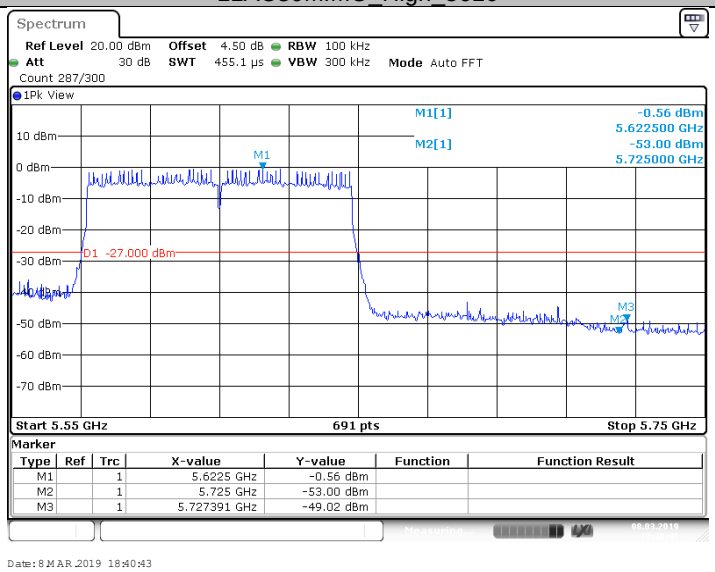
11AC80MIMO_High_5290



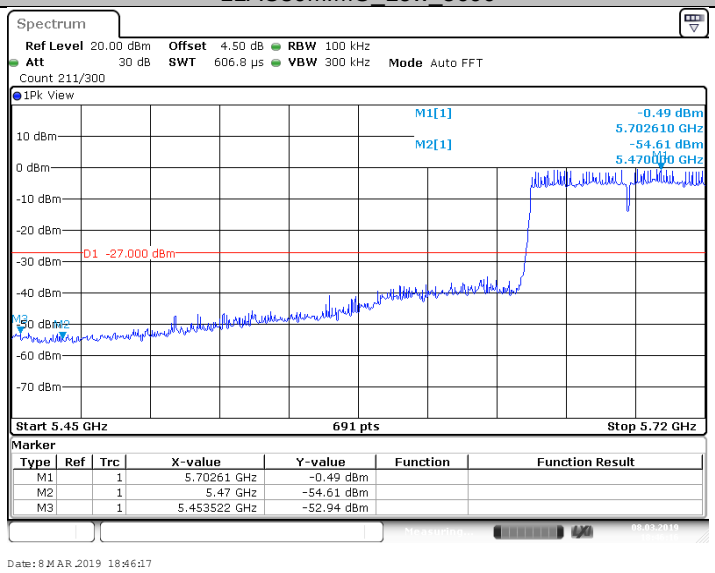
11AC80MIMO_Low_5530



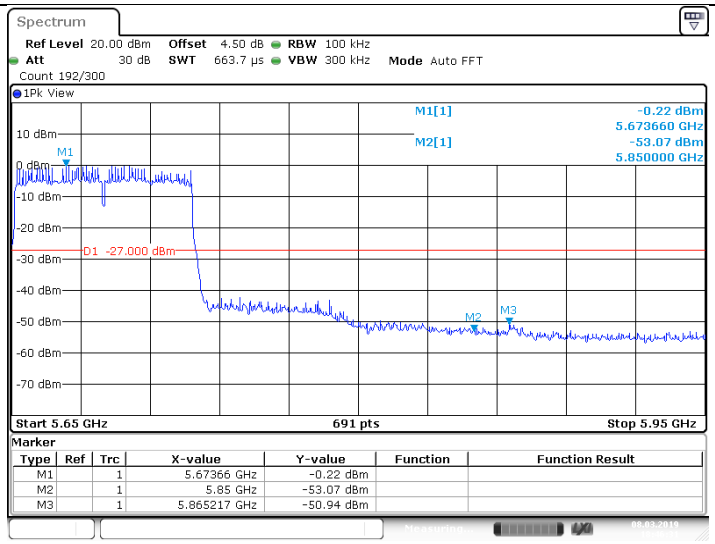
11AC80MIMO_High_5610



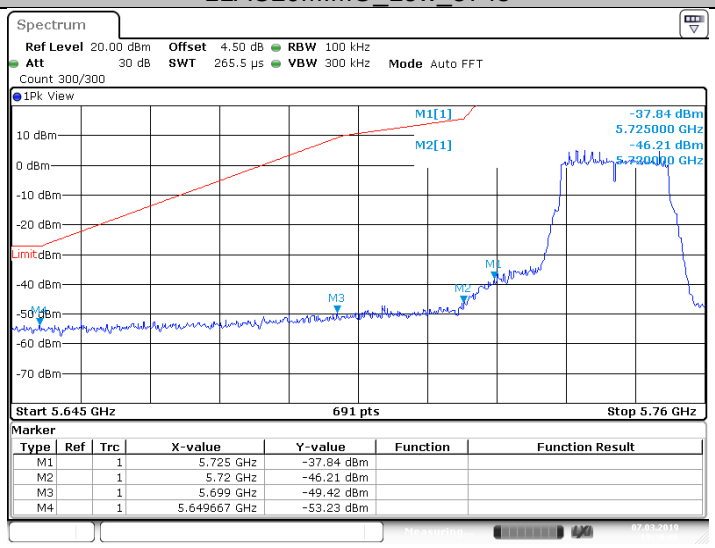
11AC80MIMO_Low_5690



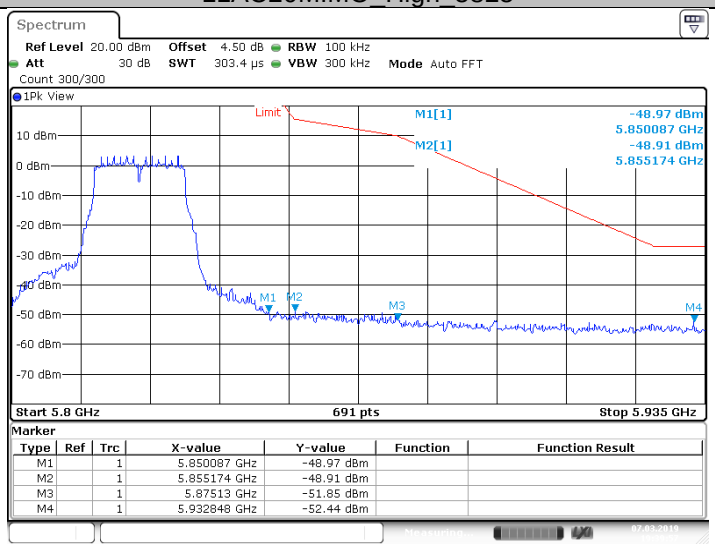
11AC80MIMO_High_5690



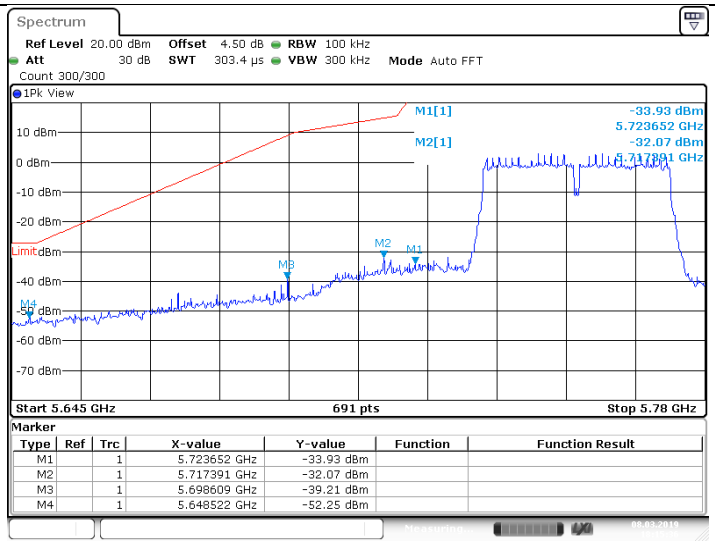
11AC20MIMO_Low_5745



11AC20MIMO_High_5825



11AC40MIMO_Low_5755



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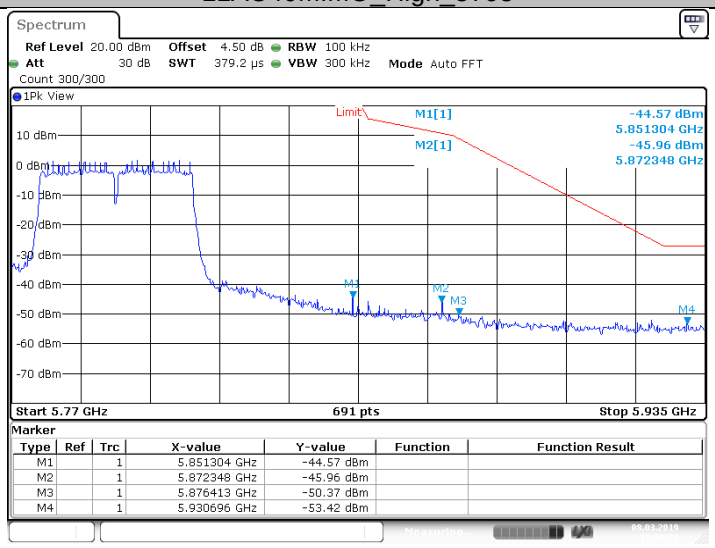
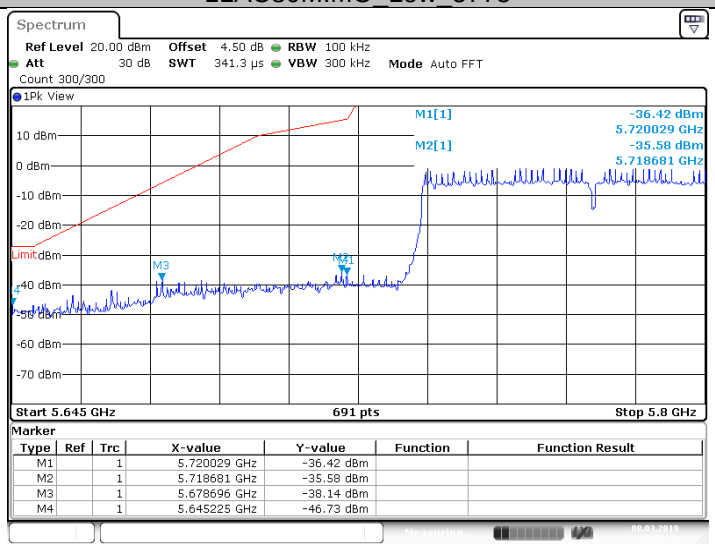
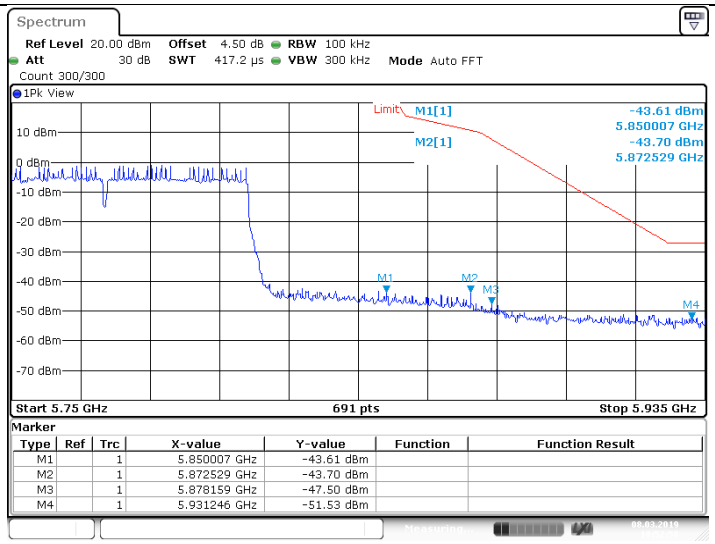


11AC80MIMO_Low_5775



11AC80MIMO_High_5775



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	5.850007 GHz	-43.61 dBm		
M2		1	5.872529 GHz	-43.70 dBm		
M3		1	5.878159 GHz	-47.50 dBm		
M4		1	5.931246 GHz	-51.53 dBm		

Date: 8.MAR.2019 18:52:58

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.

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	Read level	Polarization	Limit	Margin	Detector	Result
MHz	dB	dBuV/m	dBuV/m		dBµV/m	dB		
335.77	-25.1	39.60	64.70	Horizontal	46	6.40	QP	Pass
480.08	-22.3	42.73	65.03	Horizontal	46	3.27	QP	Pass
528.04	-21.3	43.64	64.94	Horizontal	46	2.36	QP	Pass
Other frequency	---	---	---	Horizontal	---	---	QP	Pass
83.99	-30.8	32.15	62.95	Vertical	40	7.85	QP	Pass
111.48	-27.9	31.51	59.41	Vertical	43.5	11.99	QP	Pass
432.07	-23.4	35.71	59.11	Vertical	46	10.29	QP	Pass
Other frequency	---	---	---	Vertical	---	---	QP	Pass
2039.88	-8.9	38.15	47.05	Horizontal	74	35.85	PK	Pass
2856.25	-4.4	38.15	42.55	Horizontal	74	35.85	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
2880.06	-4.4	41.23	45.63	Vertical	74	32.77	PK	Pass
4490.13	1.3	41.72	40.42	Vertical	74	32.28	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) Corrected Amplitude = Read level + Corrector factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

(2) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

(3) We test all modes and only the worst case (802.11a modulation 5180MHz Channel) recorded in the report.

(4) 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.

9.6 Duty Cycle

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Use the following spectrum analyzer settings:
   Span = 0, RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
3. Allow the trace to stabilize. Mark the OFF time and ON time. and the duty cycle is T_{on} / T_{on}+T_{off}
4. Repeat above procedures until all frequencies measured were complete.

TestMode	Antenna	Channel	Duty Cycle [%]
11ASISO	Ant1	5180	97.02
	Ant2	5180	97.02
	Ant1	5220	97.02
	Ant2	5220	97.02
	Ant1	5240	97.11
	Ant2	5240	97.02
	Ant1	5260	97.02
	Ant2	5260	97.11
	Ant1	5300	97.11
	Ant2	5300	97.11
	Ant1	5320	97.11
	Ant2	5320	97.11
	Ant1	5500	97.02
	Ant2	5500	97.11
	Ant1	5600	97.11
	Ant2	5600	97.02
	Ant1	5700	97.02
	Ant2	5700	97.02
	Ant1	5720	97.02
	Ant2	5720	97.02
	Ant1	5745	97.02
	Ant2	5745	97.02
	Ant1	5785	97.02
	Ant2	5785	97.02
	Ant1	5825	97.11
	Ant2	5825	97.11

TestMode	Antenna	Channel	Duty Cycle [%]
11N20MIMO	Ant1+Ant2	5180	96.92
		5220	96.83
		5240	96.92
		5260	96.92
		5300	96.83
		5320	96.92
		5500	96.92
		5600	96.92
		5700	96.83
		5720	96.92
		5745	96.83
		5785	96.92
		5825	96.92
11N20MIMO	Ant1+Ant2	5190	93.97
		5230	93.96
		5270	93.97
		5310	93.78
		5510	93.96

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		5550	93.96
		5670	93.96
		5710	93.97
		5755	93.96
		5795	93.97

TestMode	Antenna	Channel	Duty Cycle [%]
11AC20MIMO	Ant1+Ant2	5180	96.94
		5220	96.94
		5240	96.85
		5260	96.94
		5300	96.85
		5320	96.85
		5500	96.85
		5600	96.94
		5700	96.94
		5720	96.94
		5745	96.85
		5785	96.94
		5825	96.85
TestMode	Antenna	Channel	Duty Cycle [%]
11AC40MIMO	Ant1+Ant2	5190	94.02
		5230	93.85
		5270	93.85
		5310	94.03
		5510	93.85
		5550	94.03
		5670	94.03
		5710	93.85
		5755	93.85
		5795	94.02
TestMode	Antenna	Channel	Duty Cycle [%]
11AC80MIMO	Ant1+Ant2	5210	88.58
		5290	88.58
		5530	88.24
		5610	88.58
		5690	88.58
		5775	88.58

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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.

Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)
	5180
V nom(V)	5179.9400
V max(V)	5179.9550
V min(V)	5179.9560
Max. Deviation Frequency	-0.0600
Max. Frequency Error (ppm)	-11.58

Frequency Error vs. Temperature:

Test Conditions (°C)	Measured Frequency (MHz)
	5180
0	5179.9400
40	5179.9550
Max. Deviation Frequency	-0.0600
Max. Frequency Error (ppm)	-11.58

Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)
	5500
V nom(V)	5499.9400
V max(V)	5499.9550
V min(V)	5499.9550
Max. Deviation Frequency	-0.0600
Max. Frequency Error (ppm)	-10.91

Frequency Error vs. Temperature:

Test Conditions (°C)	Measured Frequency (MHz)
	5500
0	5499.9550
40	5499.9550
Max. Deviation Frequency	-0.0450
Max. Frequency Error (ppm)	-8.18

Frequency Error vs. Voltage:

Test Conditions	Measured Frequency (MHz)
	5745
V nom(V)	5745.0430
V max(V)	5744.9400
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
0	5744.9400
40	5744.9550
Max. Deviation Frequency	0.0450
Max. Frequency Error (ppm)	-7.83

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

3、Test Limited

According to KDB 905462 D02 Table 4 DFS Response Requirement Values

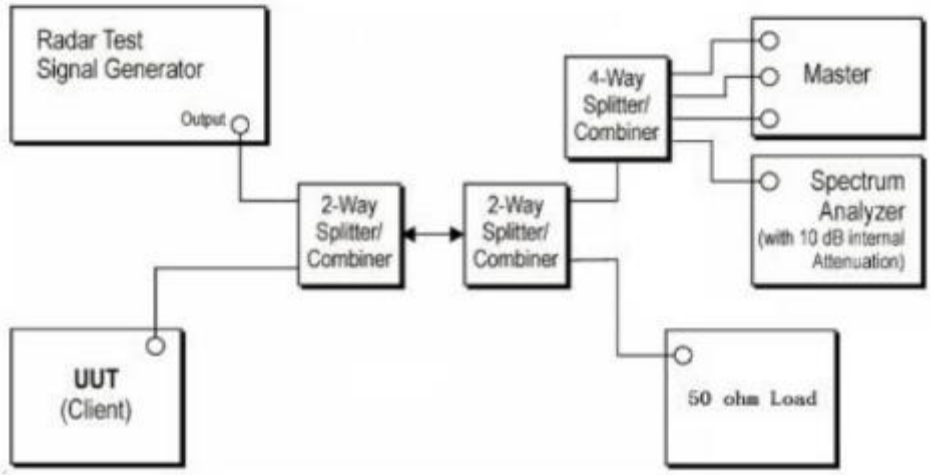
Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	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.

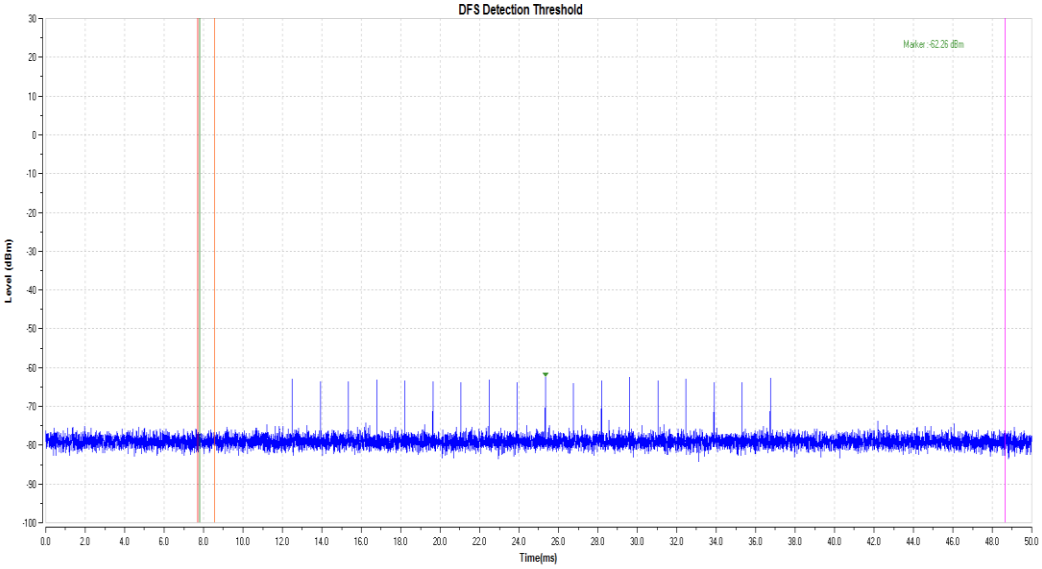
4、Calibration of Radar Waveform

(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.

Conducted Calibration Setup:



Radar Waveform Calibration result:



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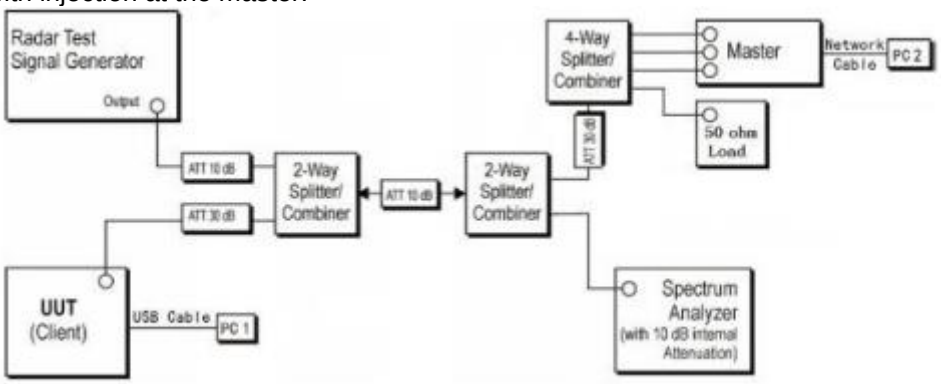
Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period.

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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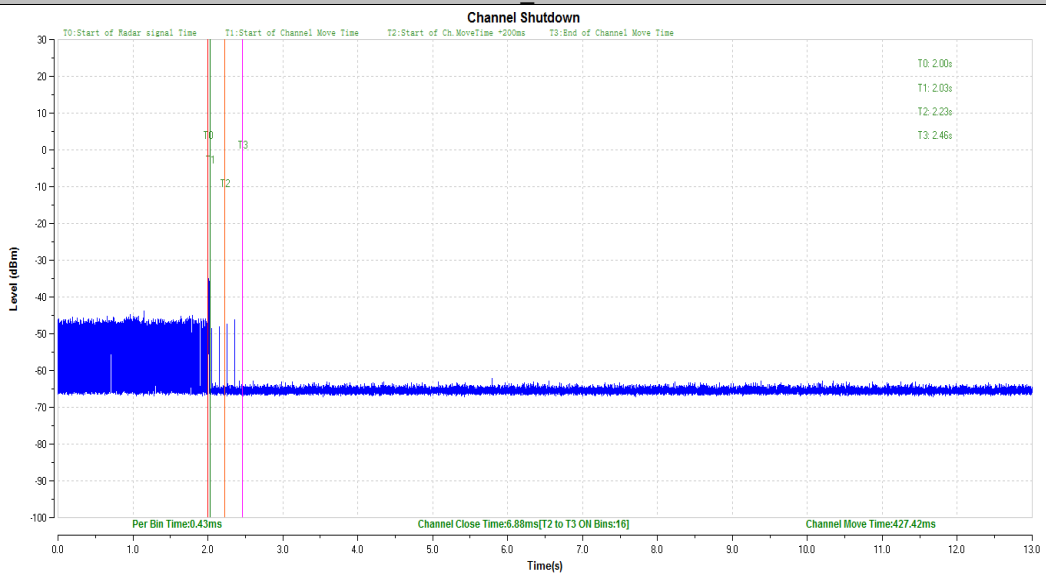
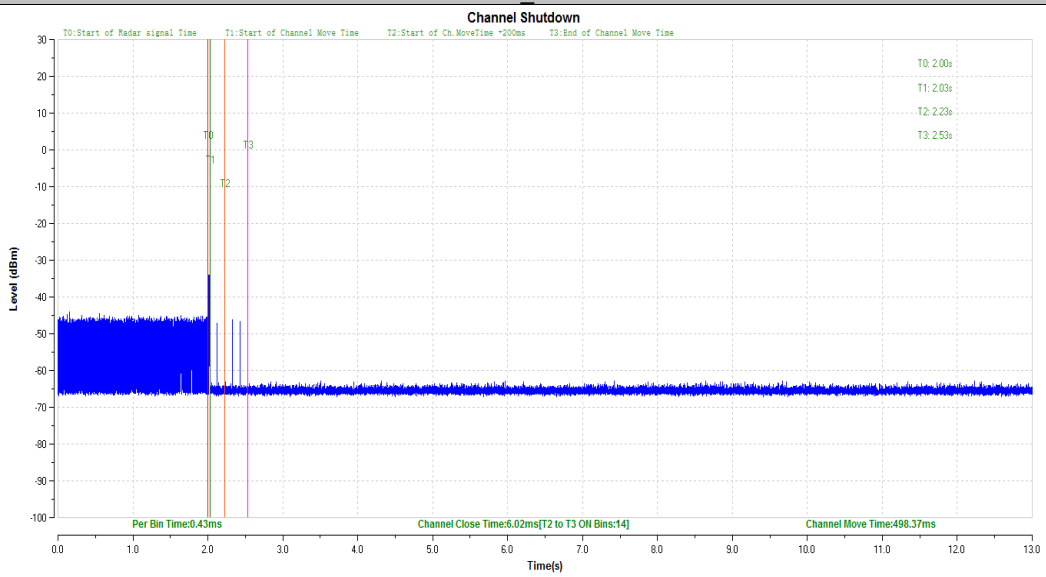
TestMode	Channel	CCT[s]	Limit[s]	CMT[s]	Limit[s]	Verdict
11A	5290	6.88	60	427.42	10000	PASS

11AC_5290



TestMode	Channel	CCT[s]	Limit[s]	CMT[s]	Limit[s]	Verdict
11A	5530	6.02	60	498.37	10000	PASS

11AC_5530



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

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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