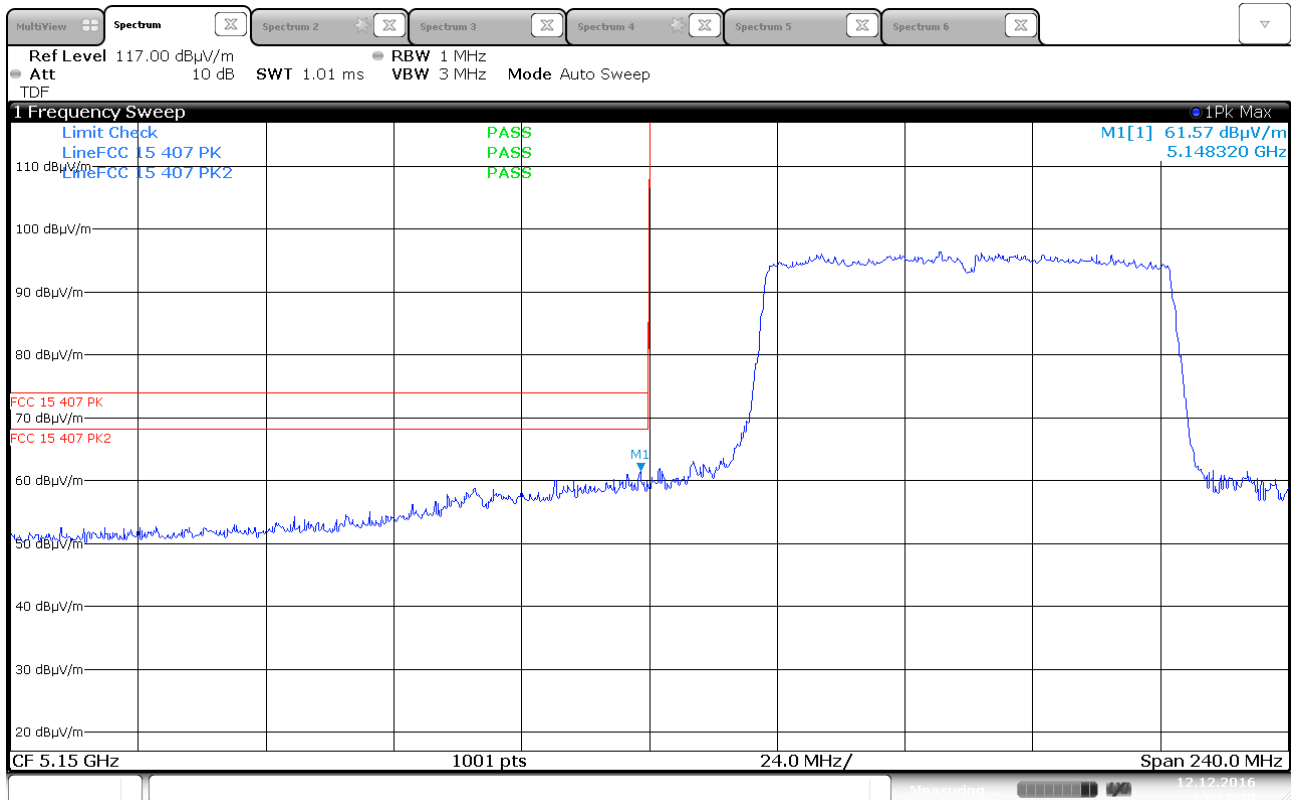
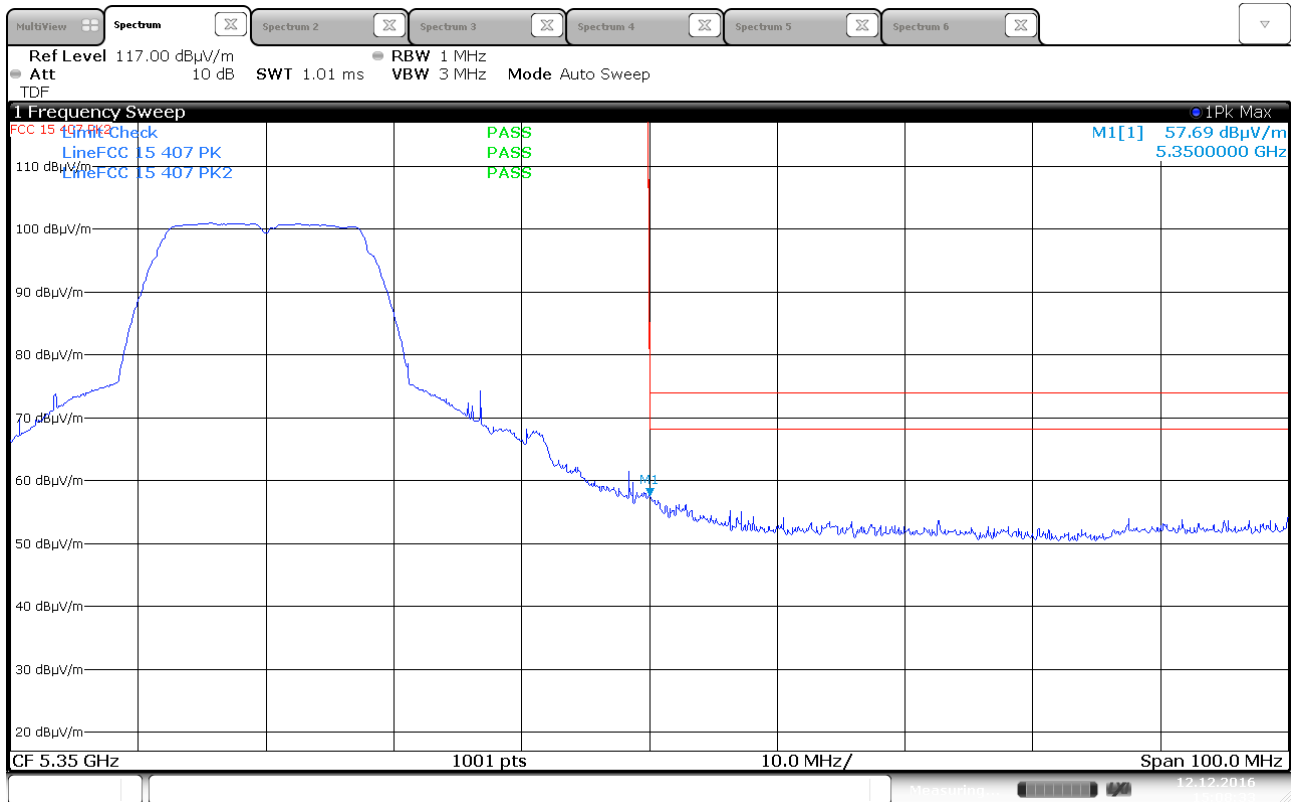
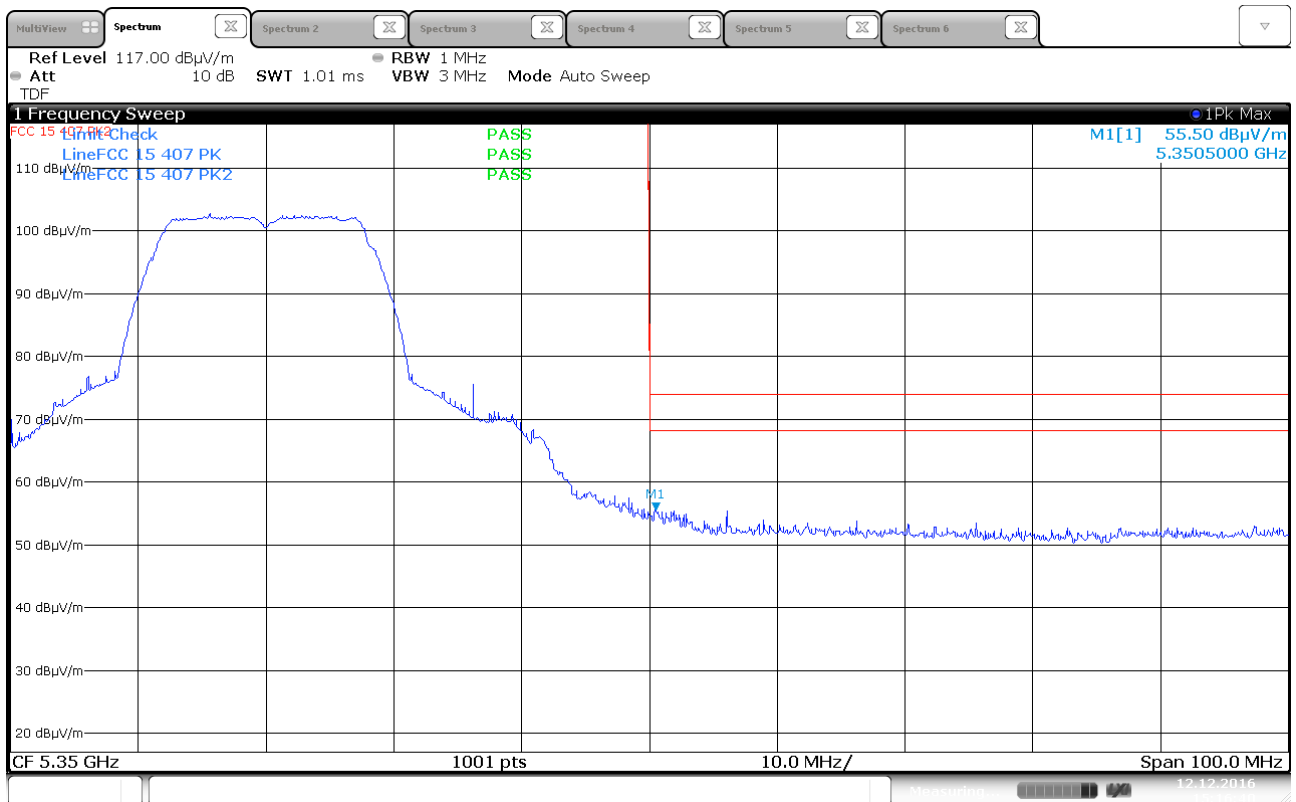




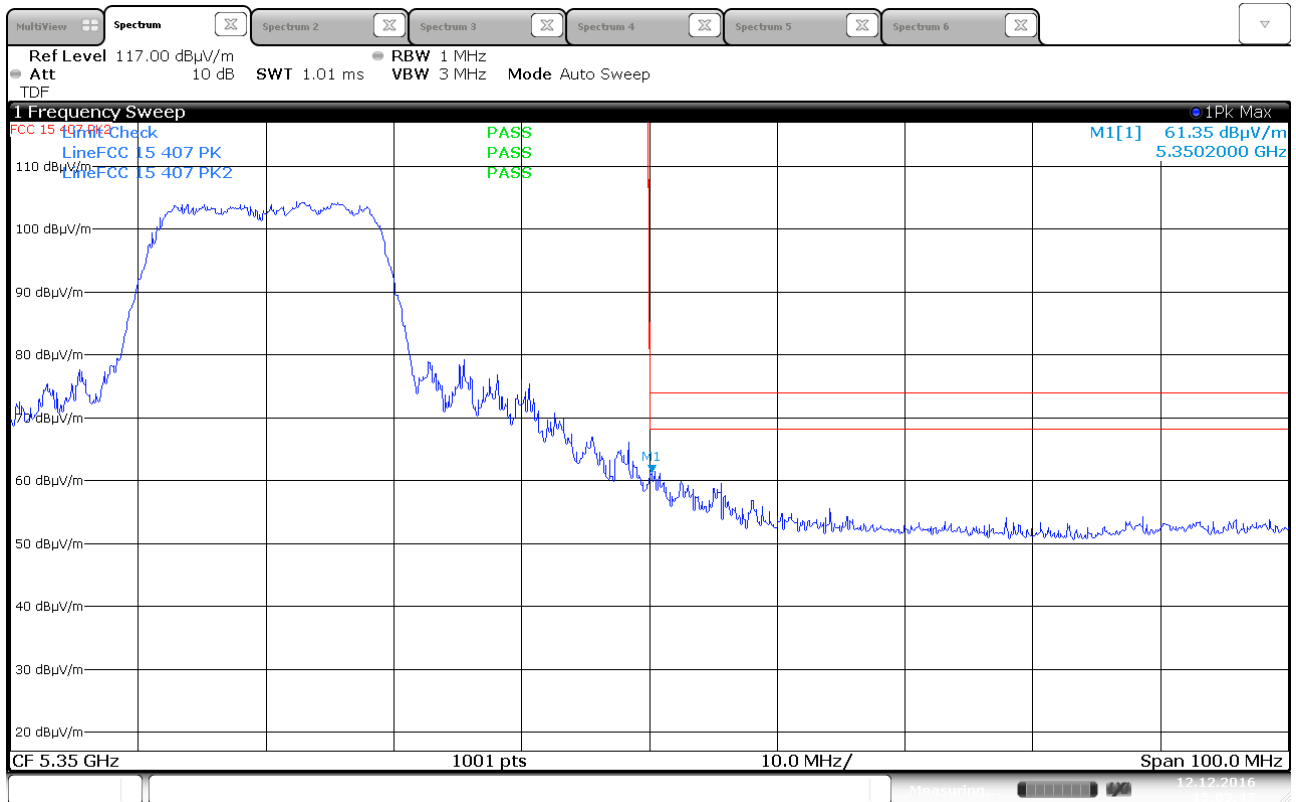
Unwanted Emissions, Band Edge, 5150MHz, ch42, 802.11n MCS0 HT80, MIMO



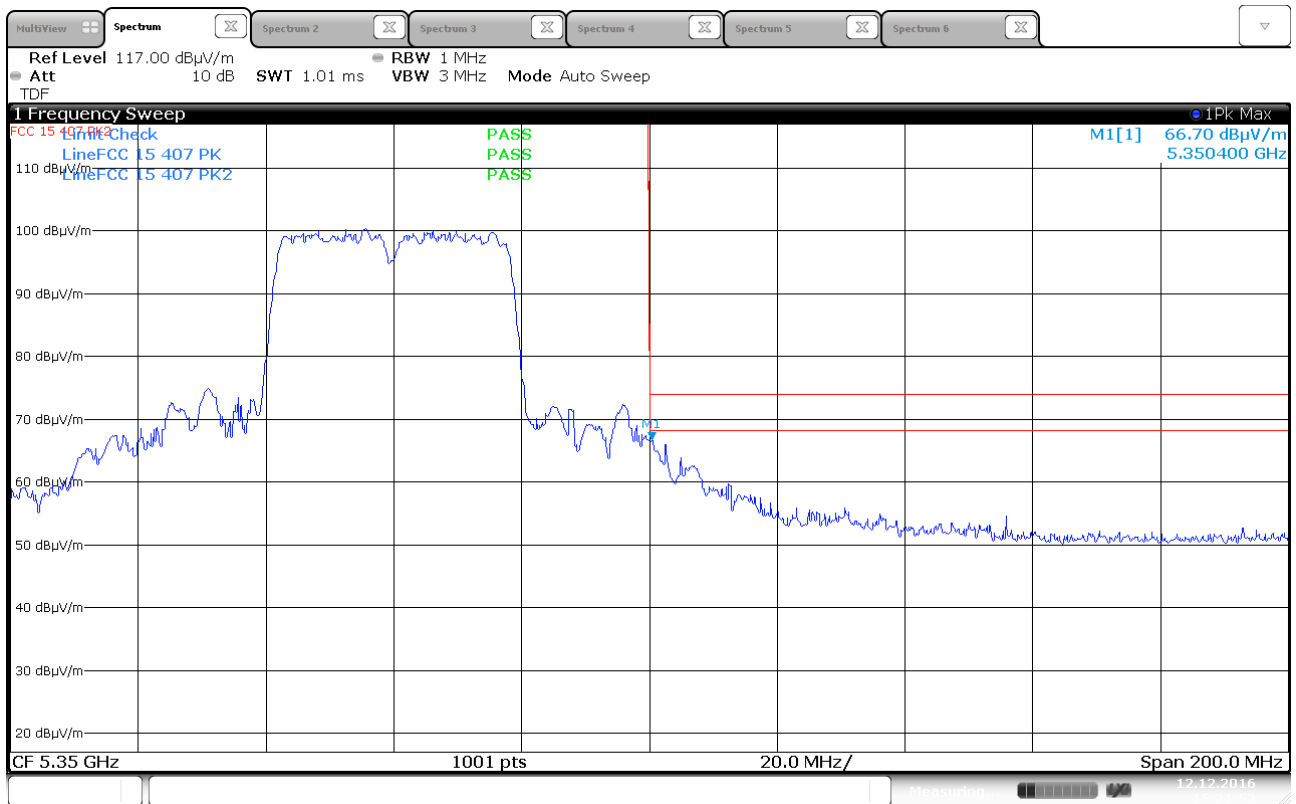
Unwanted Emissions, Band Edge, 5350MHz, ch64, 802.11a 6M, ant 0



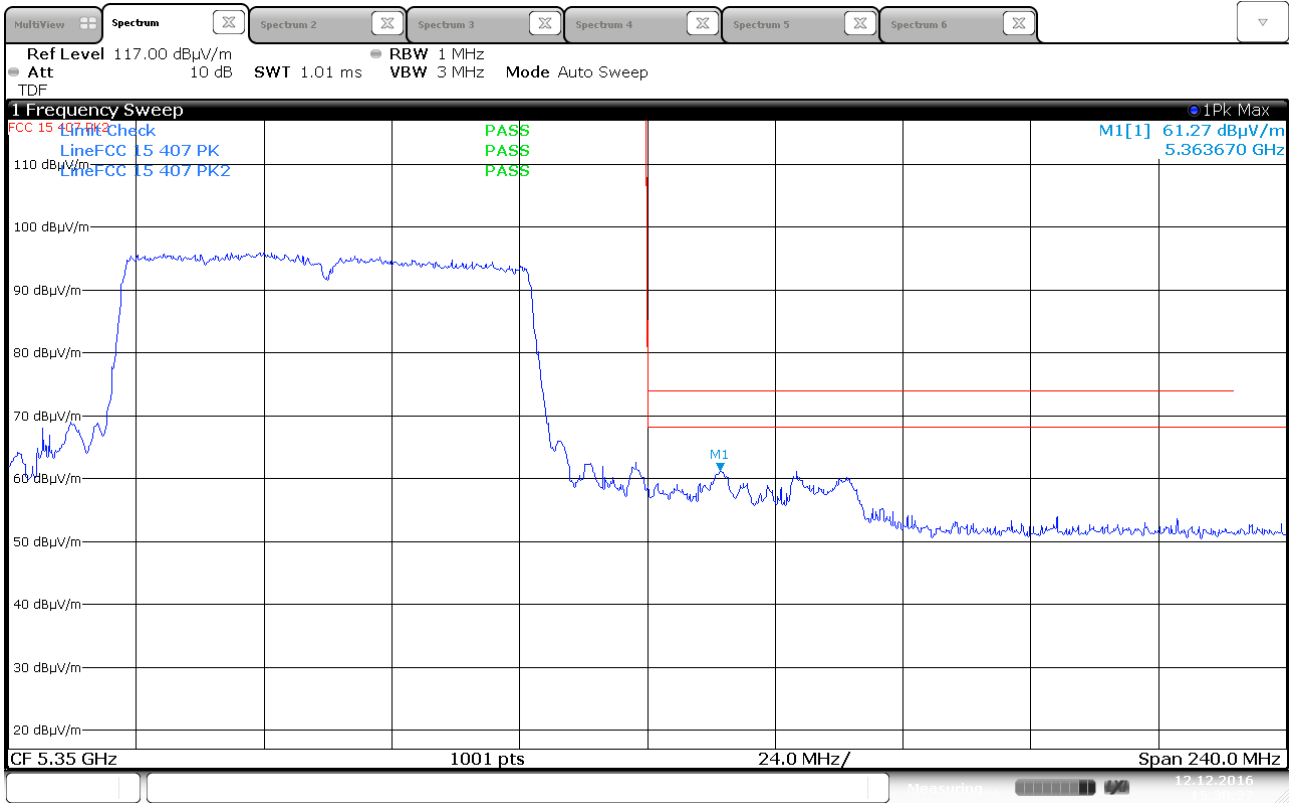
Unwanted Emissions, Band Edge, 5350MHz, ch64, 802.11a 6M, ant 1



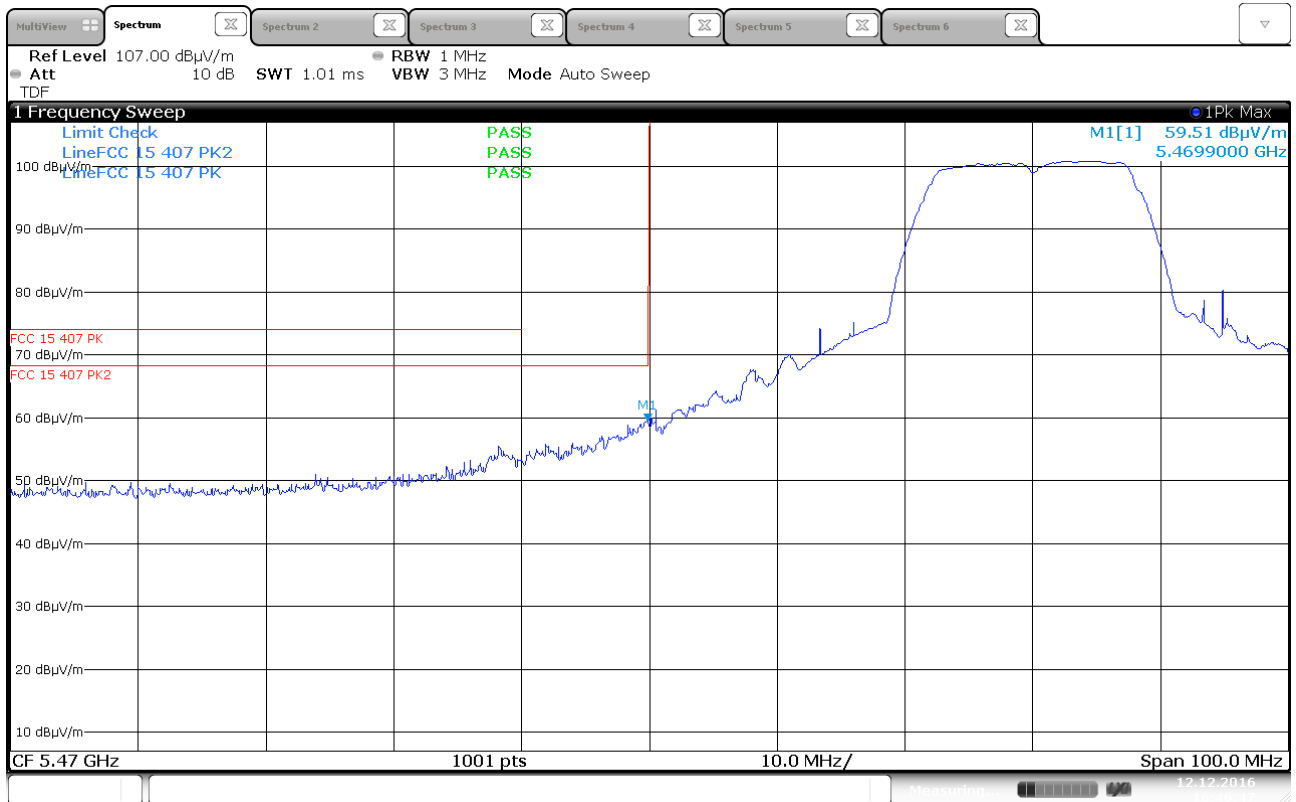
Unwanted Emissions, Band Edge, 5350MHz, ch64, 802.11n MCS0 HT20, MIMO



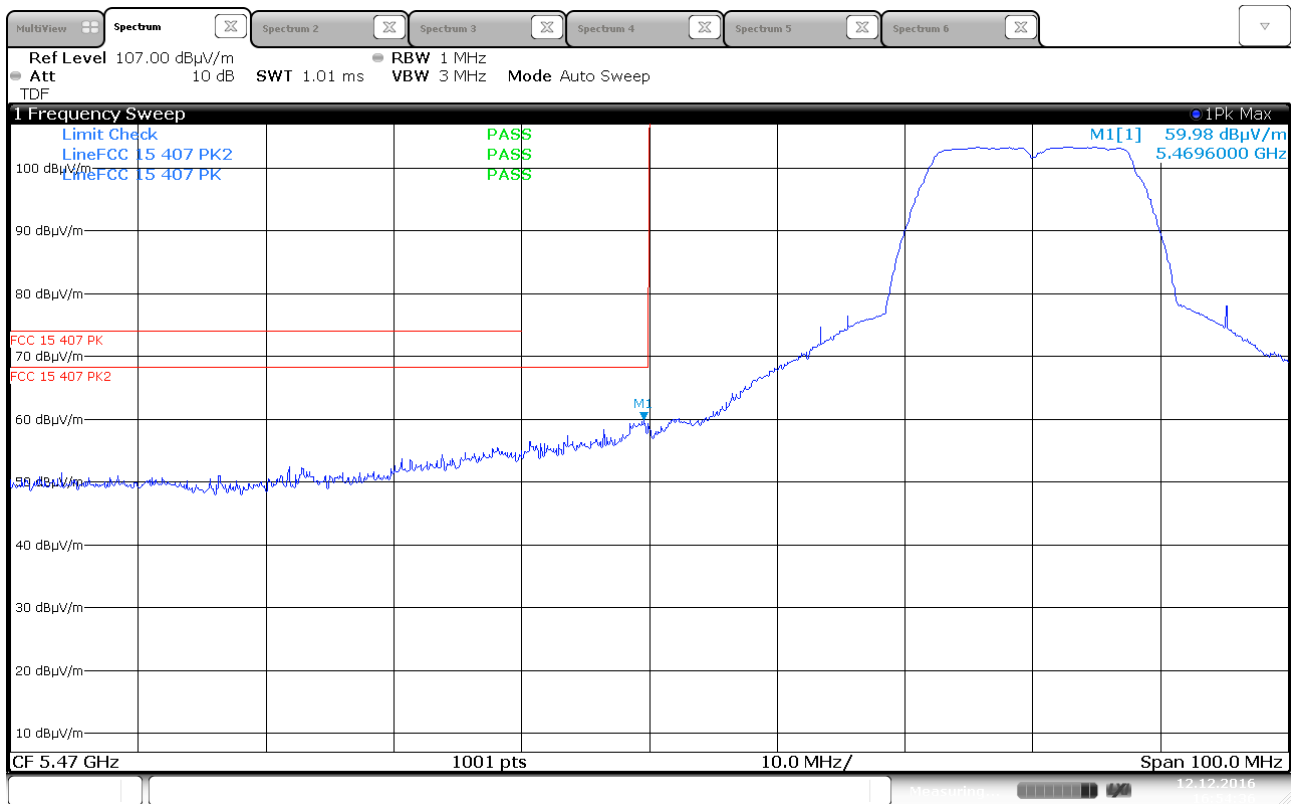
Unwanted Emissions, Band Edge, 5350MHz, ch62, 802.11n MCS0 HT40, MIMO



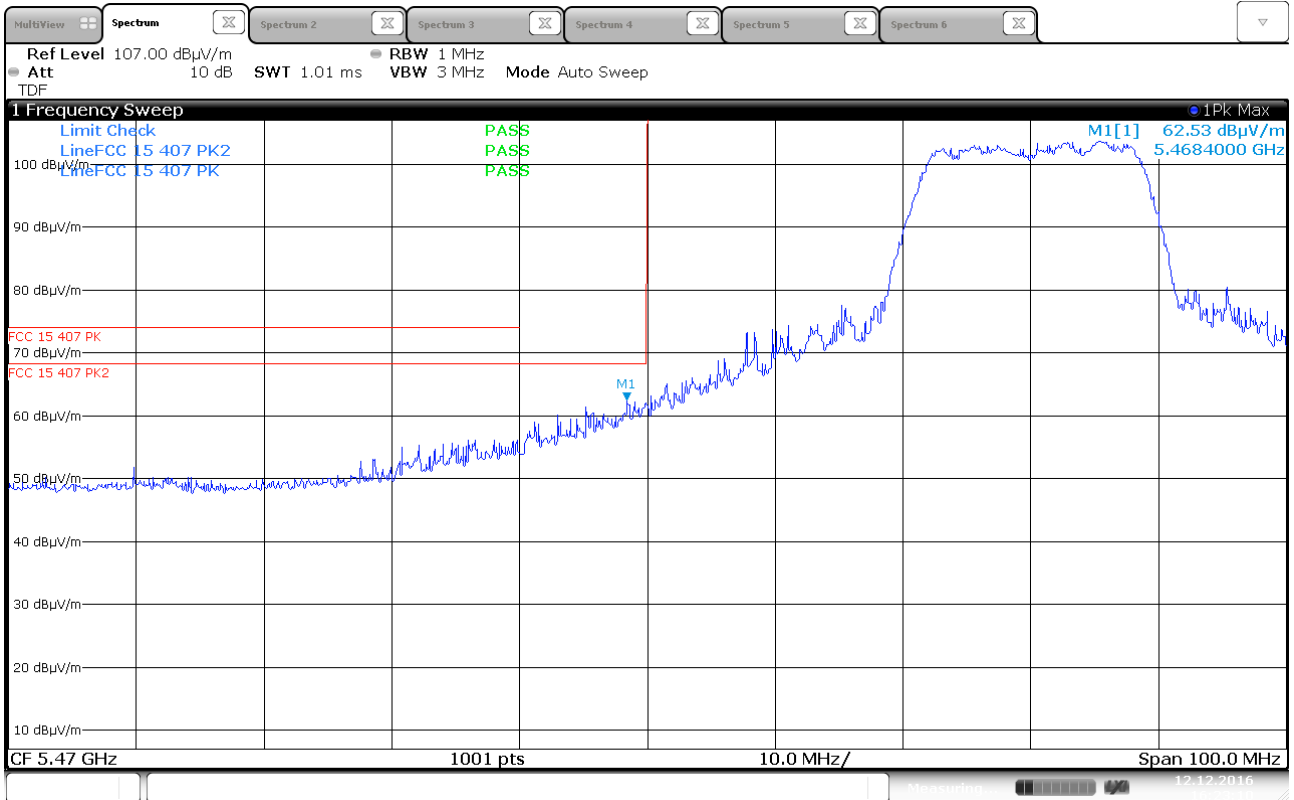
Unwanted Emissions, Band Edge, 5350MHz, ch58, 802.11n MCS0 HT80, MIMO



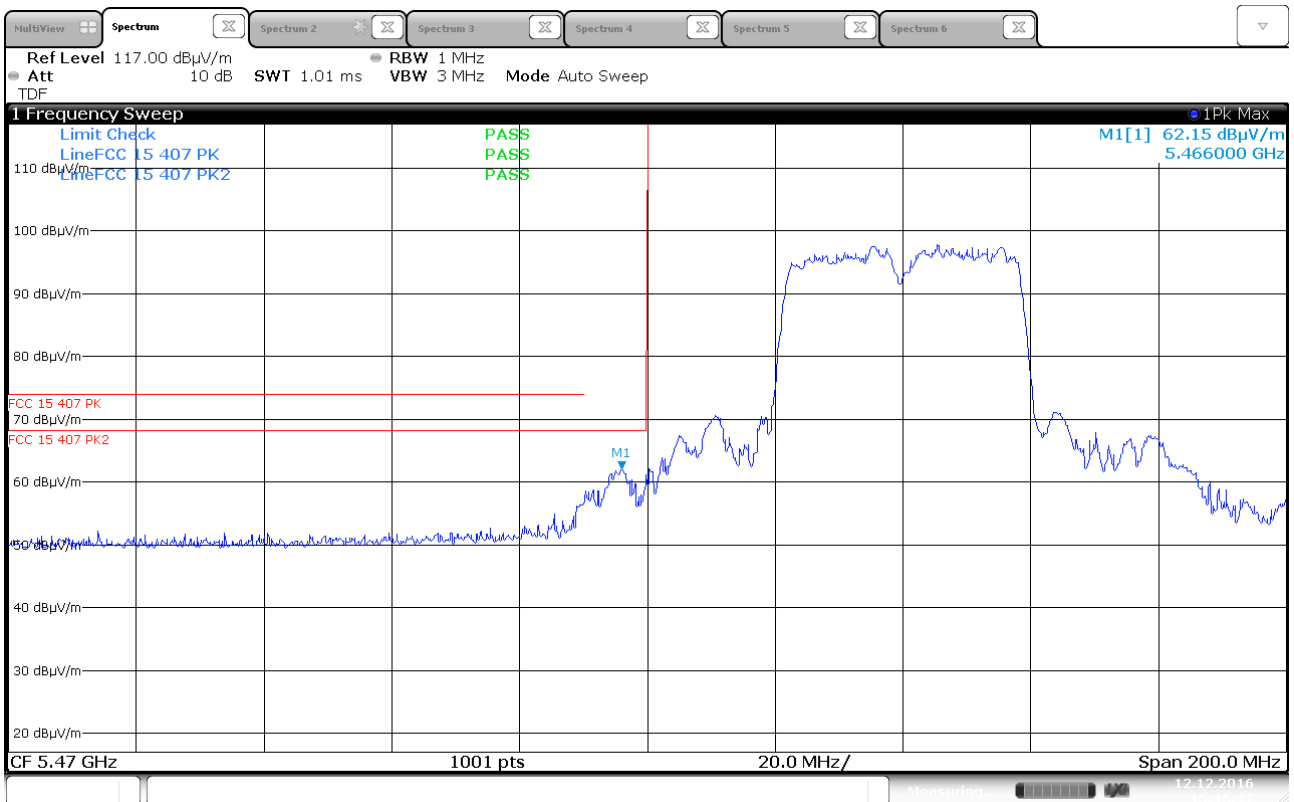
Unwanted Emissions, Band Edge, 5470MHz, ch100, 802.11a 6M, ant 0



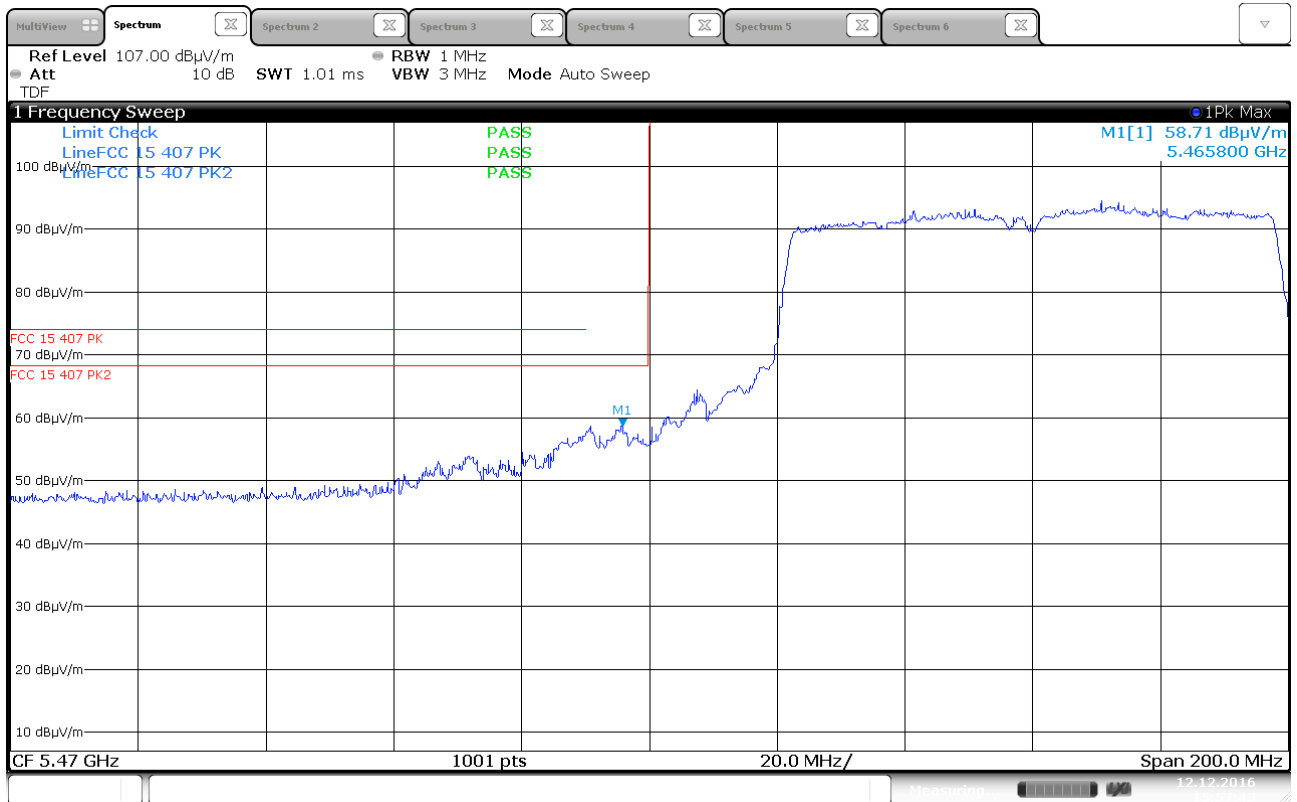
Unwanted Emissions, Band Edge, 5470MHz, ch100, 802.11a 6M, ant 1



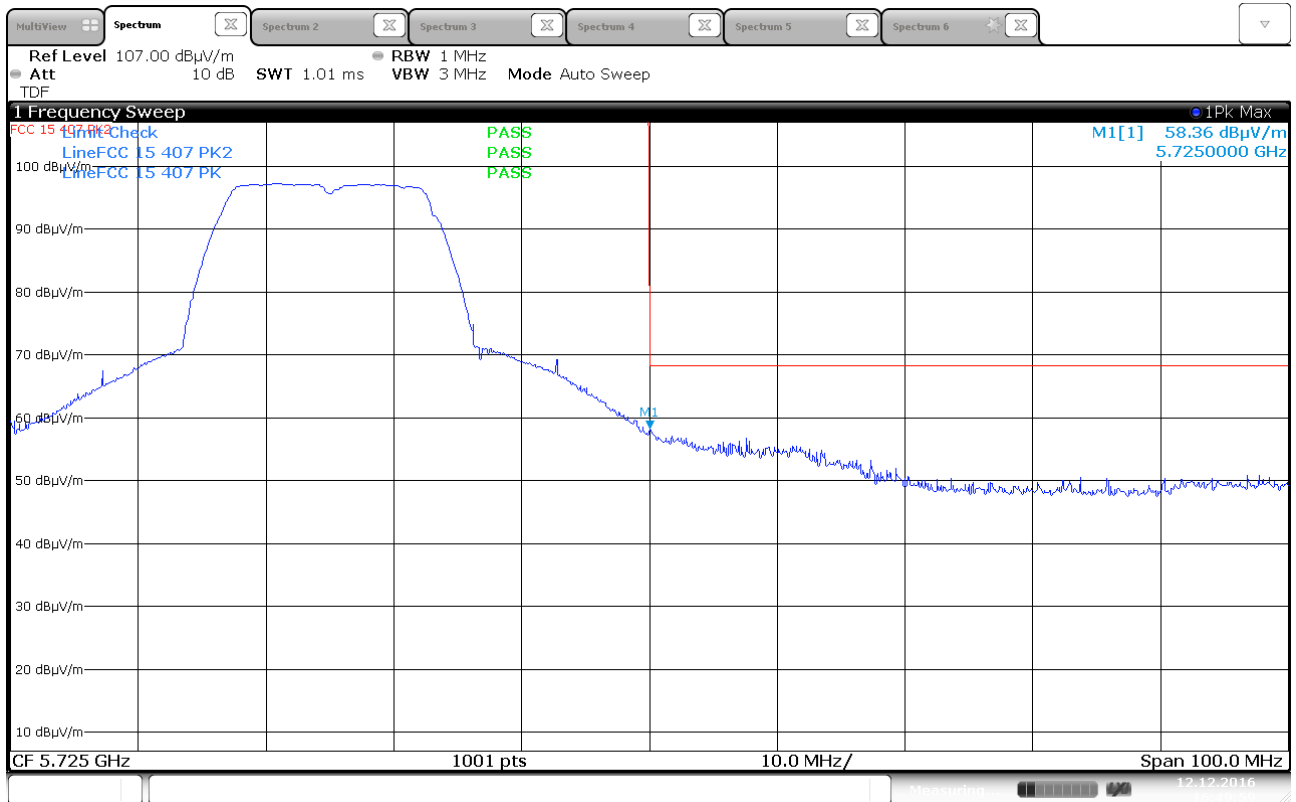
Unwanted Emissions, Band Edge, 5470MHz, ch100, 802.11n MCS0 HT20, MIMO



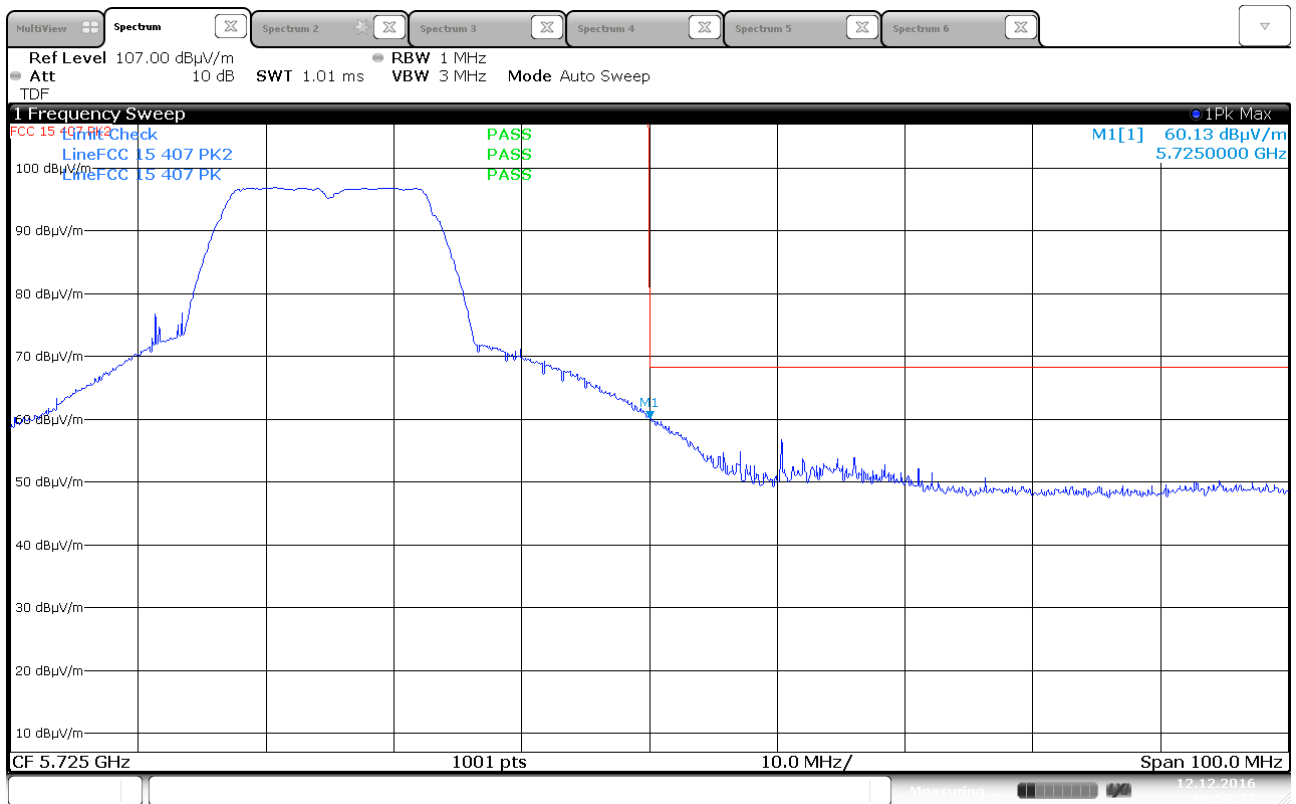
Unwanted Emissions, Band Edge, 5470MHz, ch102, 802.11n MCS0 HT40, MIMO



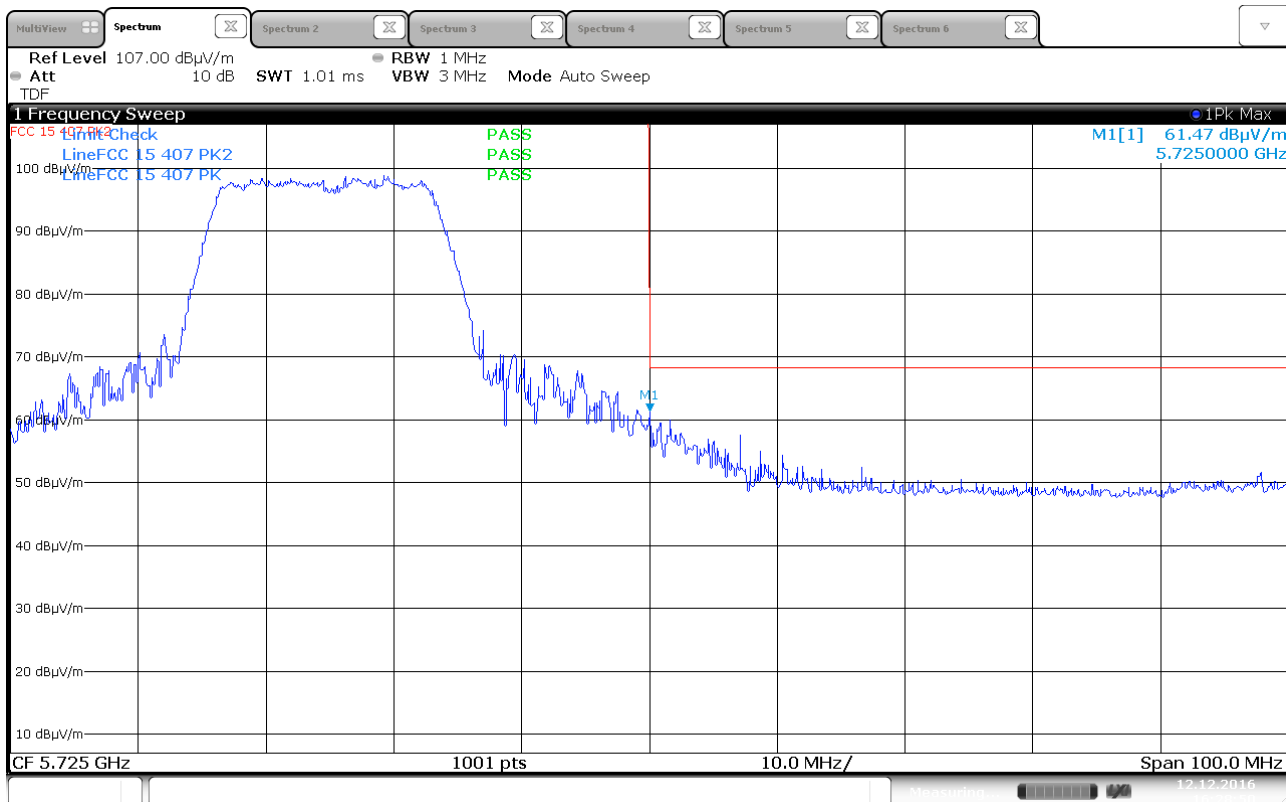
Unwanted Emissions, Band Edge, 5470MHz, ch106, 802.11n MCS0 HT80, MIMO



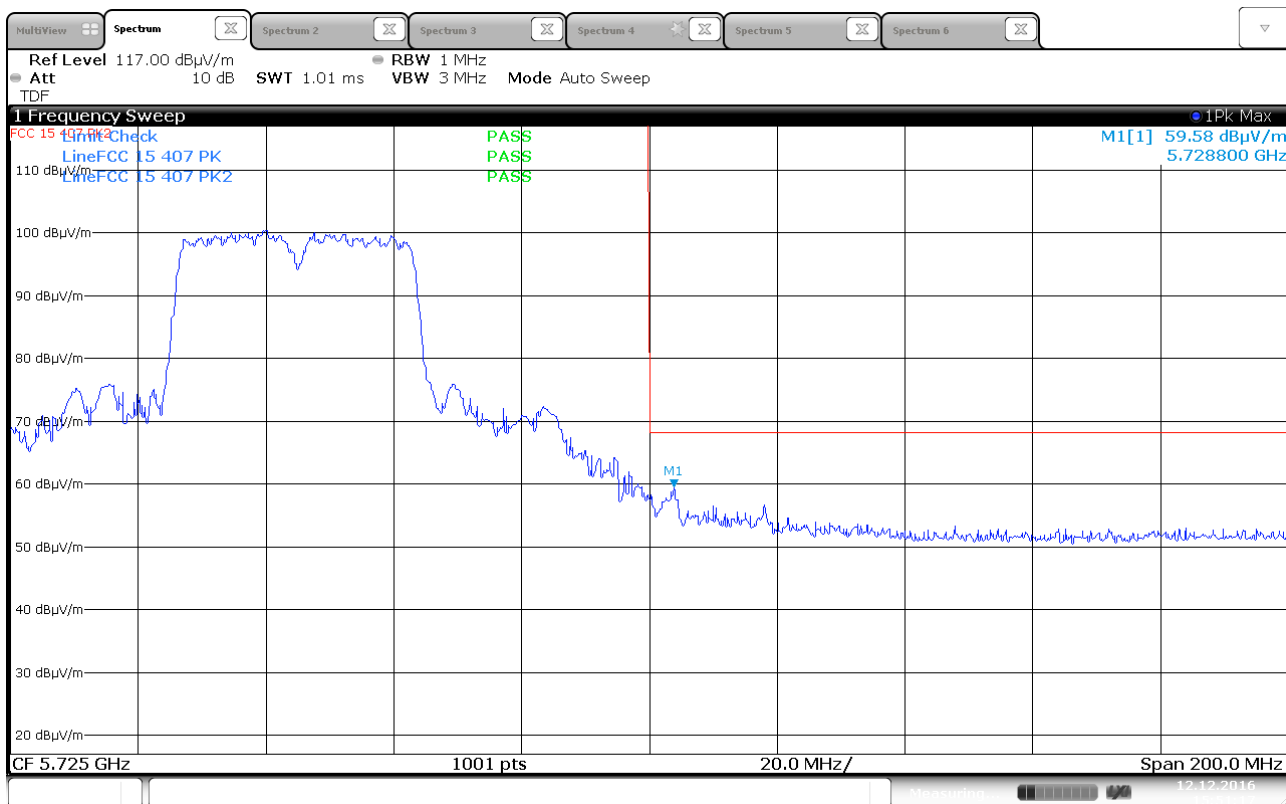
Unwanted Emissions, Band Edge, 5725MHz, ch140, 802.11a 6M, ant 0



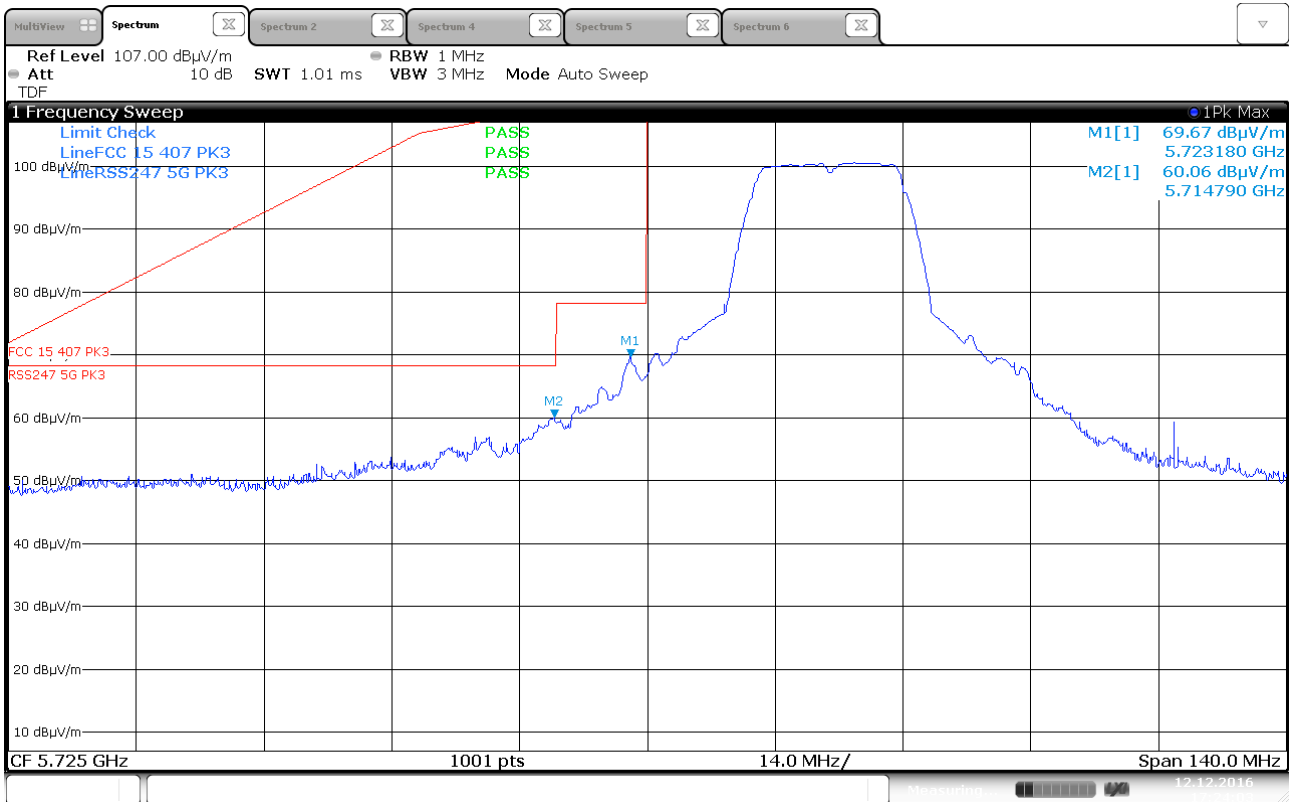
Unwanted Emissions, Band Edge, 5725MHz, ch140, 802.11a 6M, ant 1



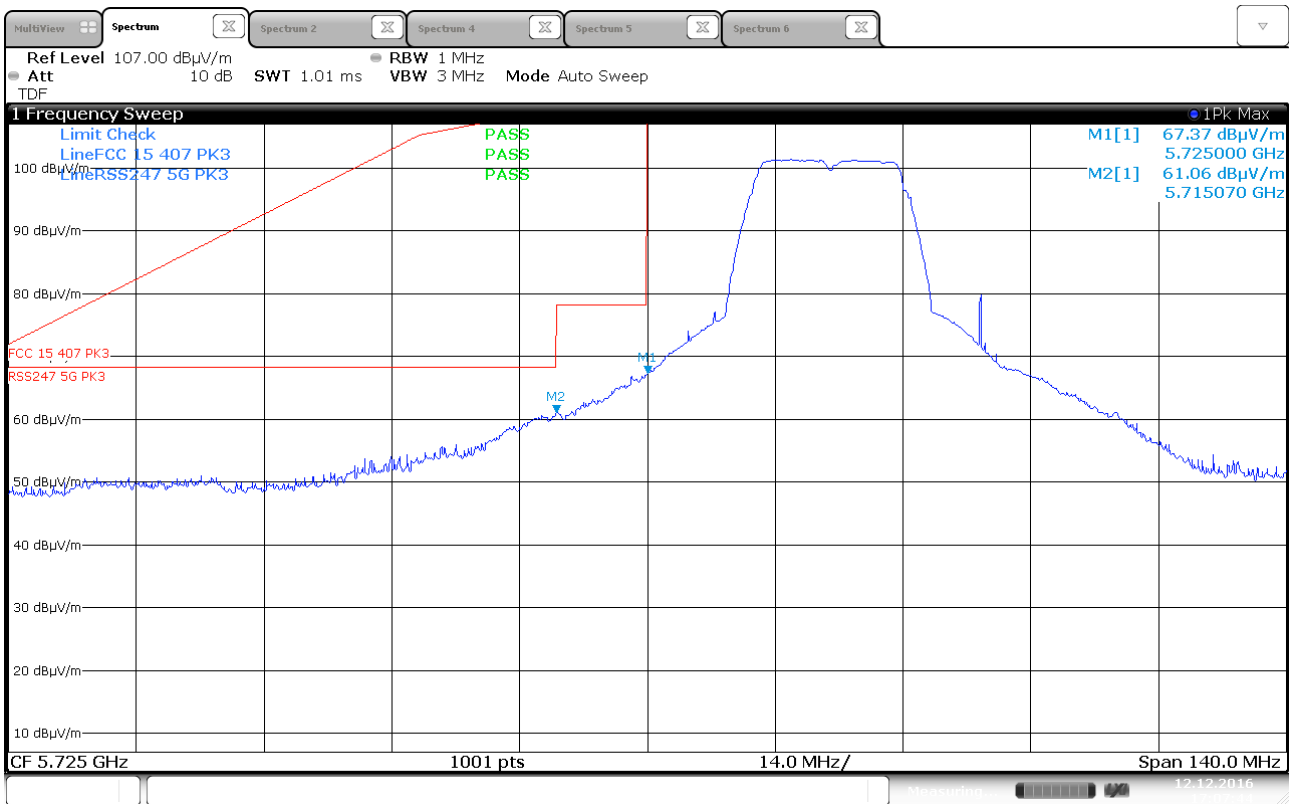
Unwanted Emissions, Band Edge, 5725MHz, ch140, 802.11n MCS0 HT20, MIMO



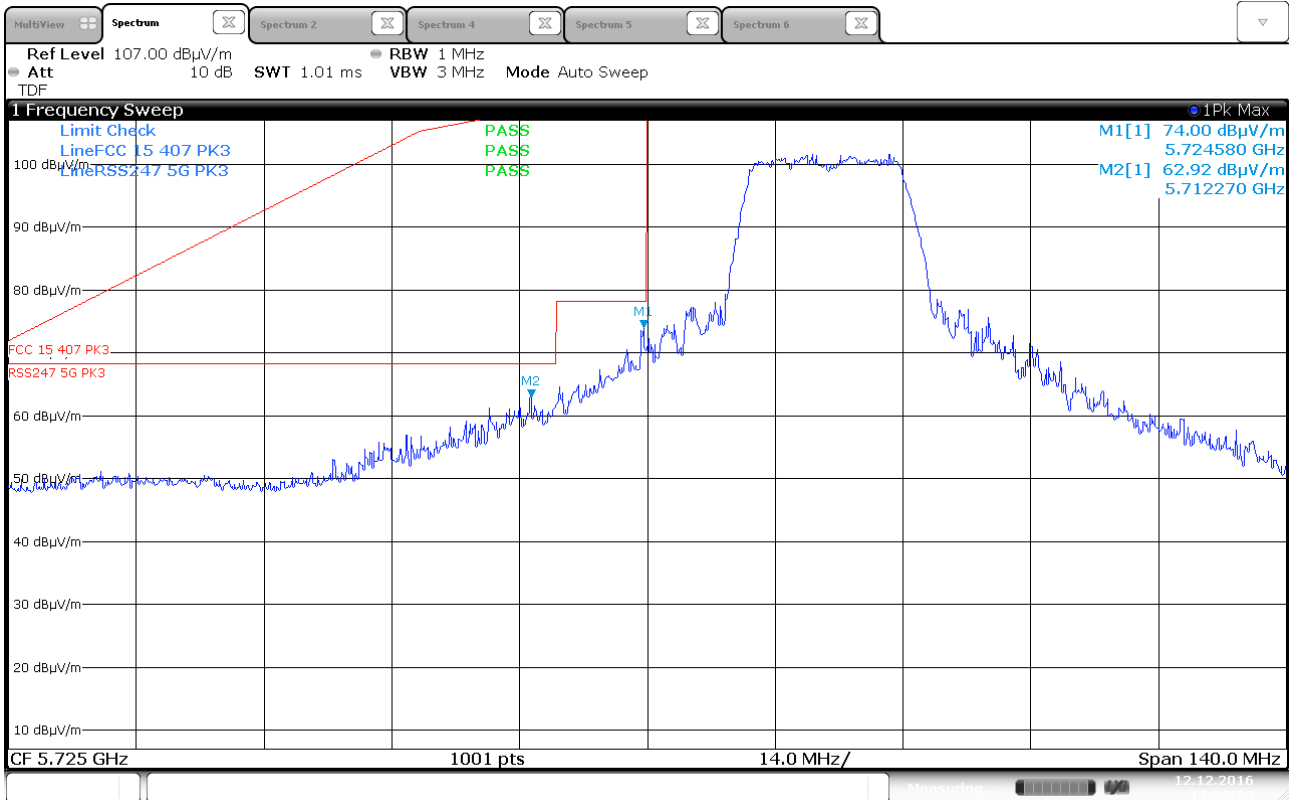
Unwanted Emissions, Band Edge, 5725MHz, ch134, 802.11n MCS0 HT40, MIMO



Unwanted Emissions, Band Edge, 5725MHz, ch149, 802.11a 6M, ant 0



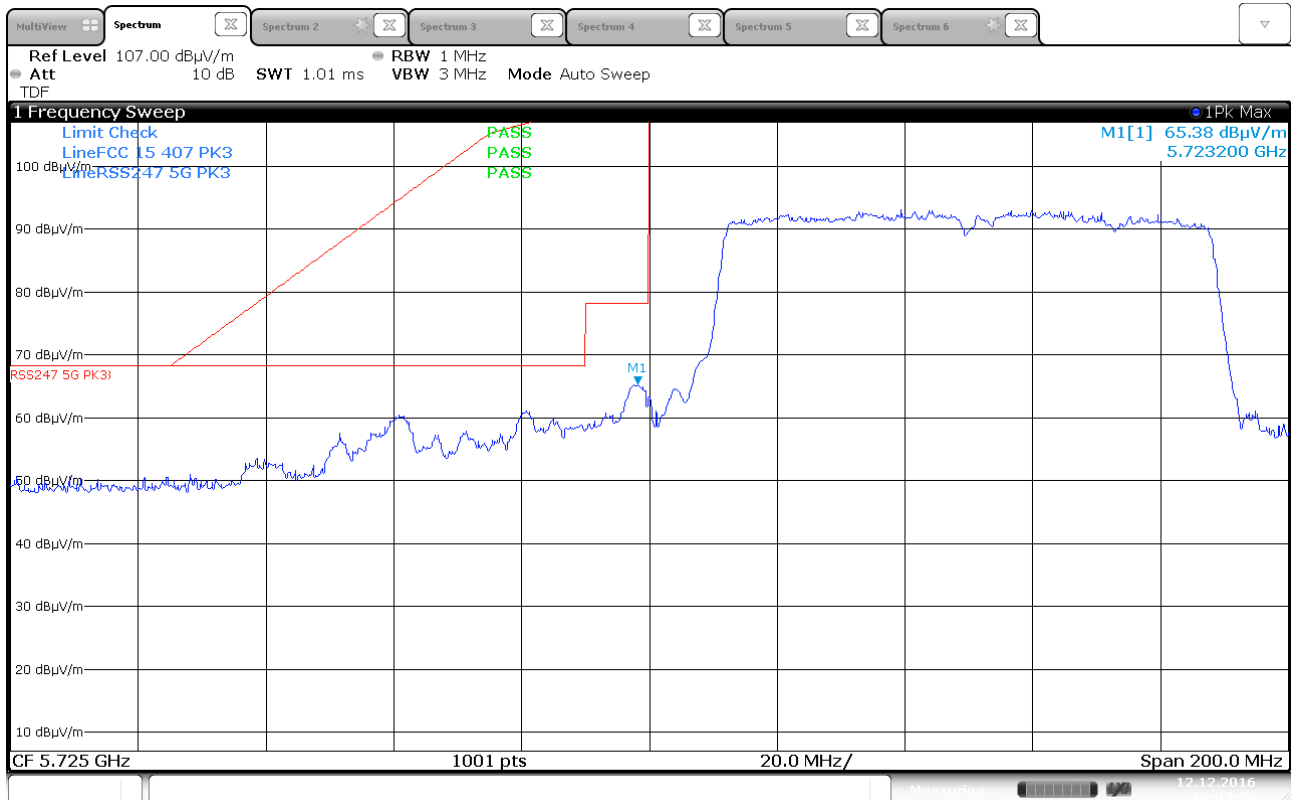
Unwanted Emissions, Band Edge, 5725MHz, ch149, 802.11a 6M, ant 1



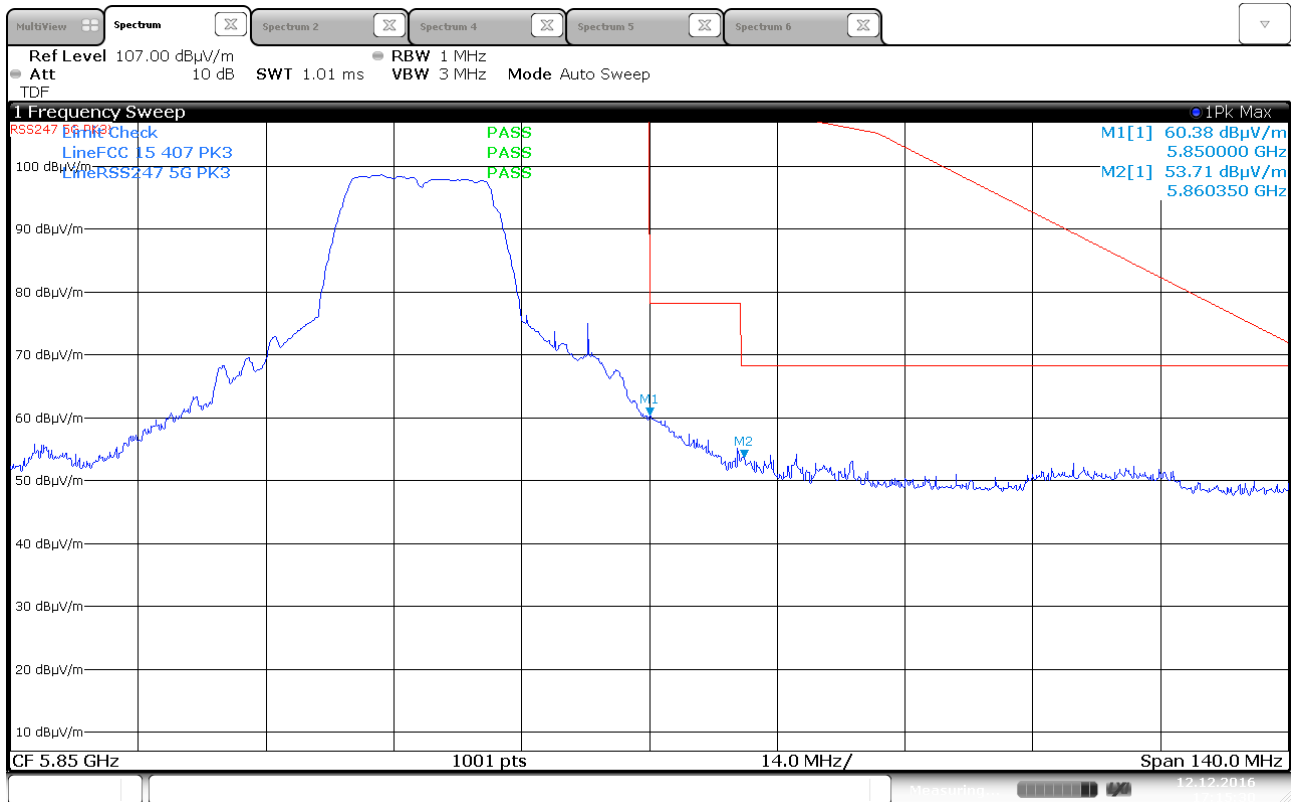
Unwanted Emissions, Band Edge, 5725MHz, ch149, 802.11n MCS0 HT20, MIMO



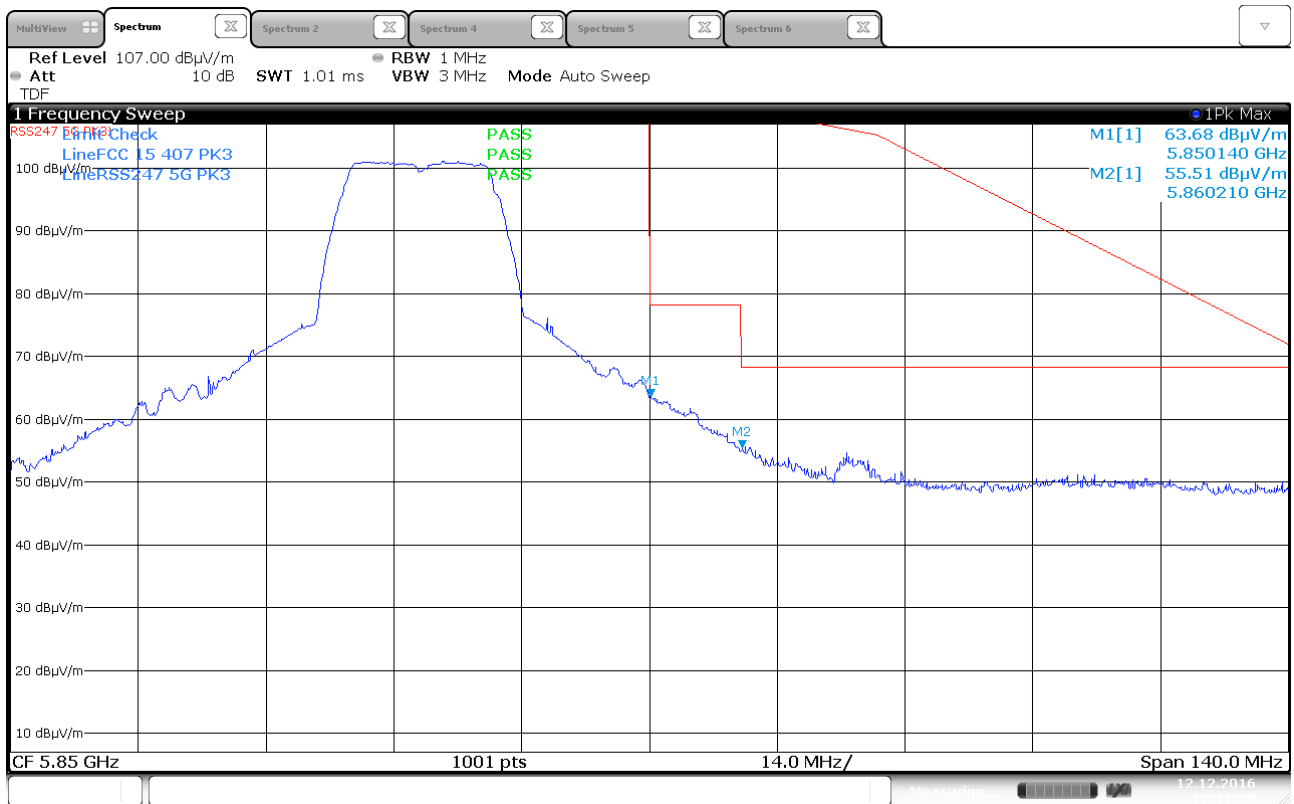
Unwanted Emissions, Band Edge, 5725MHz, ch151, 802.11n MCS0 HT40, MIMO



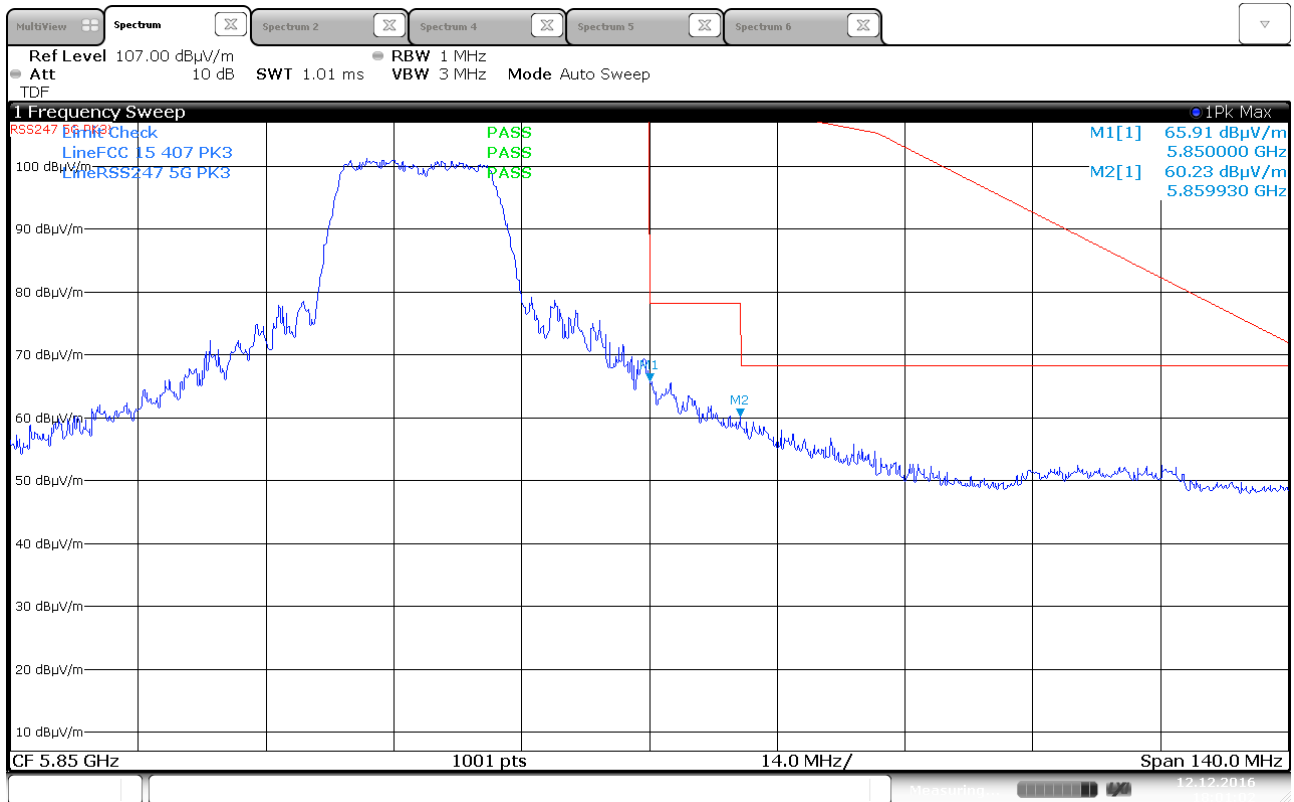
Unwanted Emissions, Band Edge, 5725MHz, ch155, 802.11n MCS0 HT80, MIMO



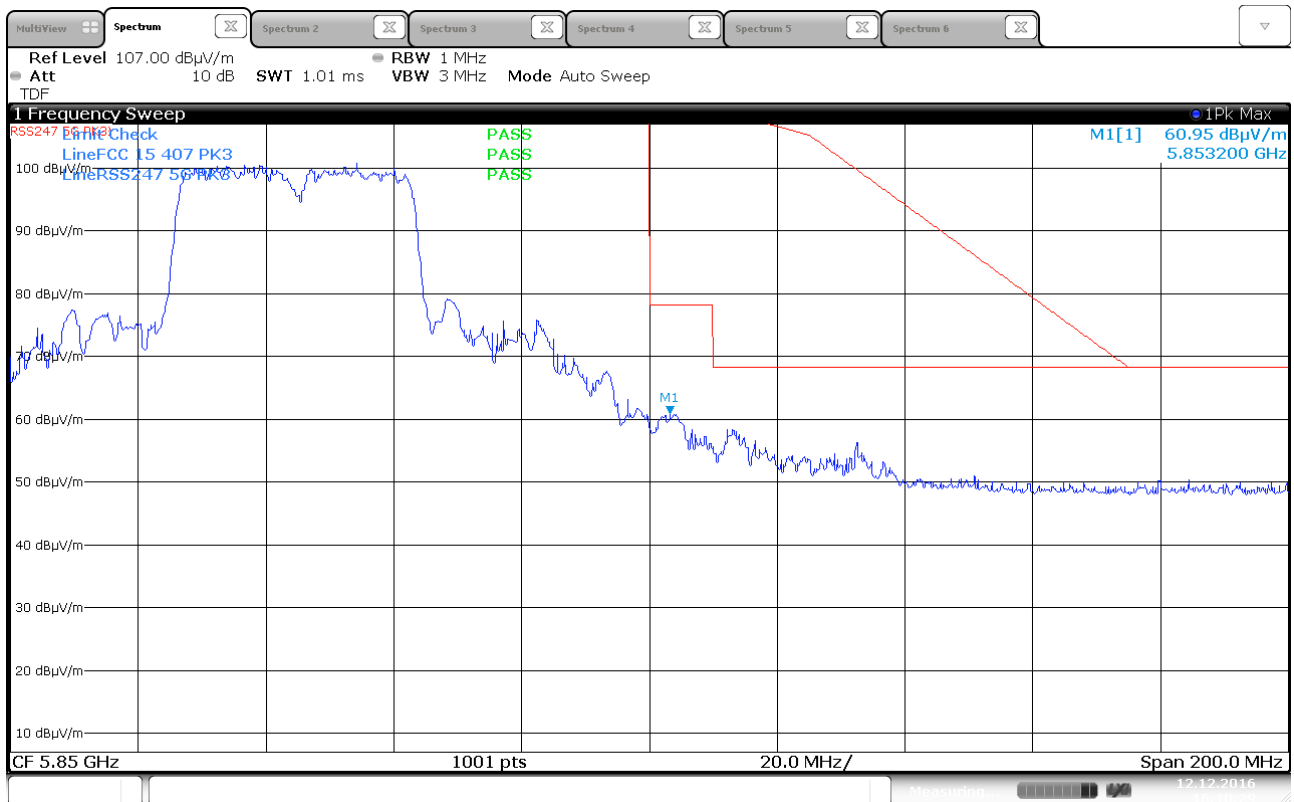
Unwanted Emissions, Band Edge, 5850MHz, ch165, 802.11a 6M, ant 0



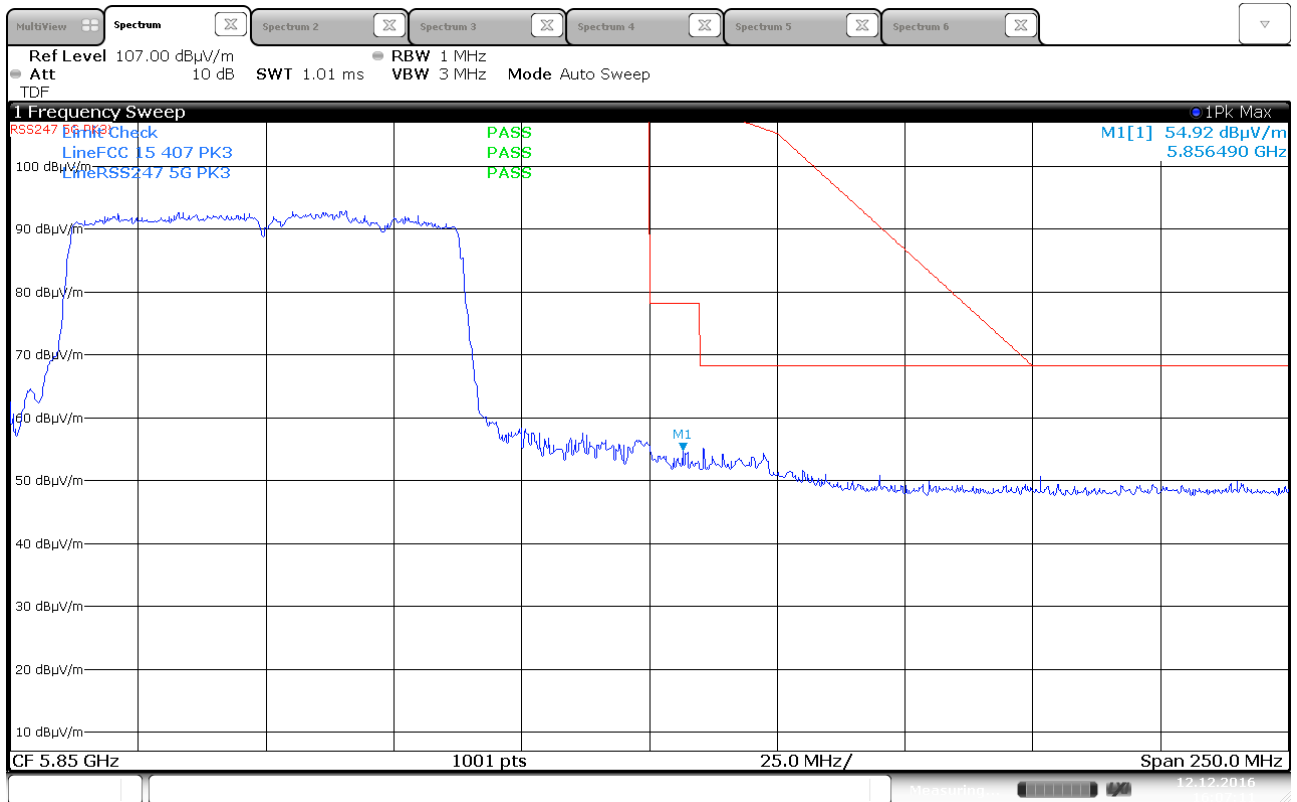
Unwanted Emissions, Band Edge, 5850MHz, ch165, 802.11a 6M, ant 1



Unwanted Emissions, Band Edge, 5850MHz, ch165, 802.11n MCS0 HT20, MIMO



Unwanted Emissions, Band Edge, 5850MHz, ch159, 802.11n MCS0 HT40, MIMO



Unwanted Emissions, Band Edge, 5850MHz, ch155, 802.11n MCS0 HT80, MIMO

3.6 Restricted Bands of operation

Restricted Bands of operation for FCC and ISSED are defined in FCC Part 15.205 and ISSED RSS-GEN, Issue 4 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 4, clause 8.9.

FCC (MHz)	ISSED (MHz)	FCC (GHz)	ISSED (GHz)
0.090-0.110		0.96-1.24 1.3-1.427	0.96-1.427
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		2.69-2.9	2.655-2.9
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		3.6-4.4	3.5-4.4
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 123-138	108-138	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISSED, all other frequencies are common.

3.7 Radiated Emissions, below 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 4, Clause 8.9

Test Results: Complies

Measurement Data:

Radiated emission 30 – 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3m

Tested with all connections active

Frequency	Antenna Polarization	Field strength @3m	Measuring distance	Limit FCC15.209	Margin
MHz		dBμV/m	metres	dBμV/m	dB
30.34	VP	32.0	3	40	8.0
49.229	VP	34.3	3	40	5.7
61.731	HP	25.4	3	40	14.6
62.818	VP	33.0	3	40	7.0
75.592	HP	25.1	3	40	14.9
103.86	HP	32.8	3	43.5	10.7
408.153	VP	30.7	3	46	15.3
424.78	VP	29.3	3	46	16.7
445.24	VP/HP	24.9	3	46	21.1
482.33	VP	30.1	3	46	15.9
552.0	HP	28.9	3	46	17.1
556.0	VP	34.7	3	46	11.3
594.245	VP	30.9	3	46	15.1
603.197	VP	35.3	3	46	10.7
999.68	VP	17.8	3	54	36.2

See attached plots.

Requirements/Limit

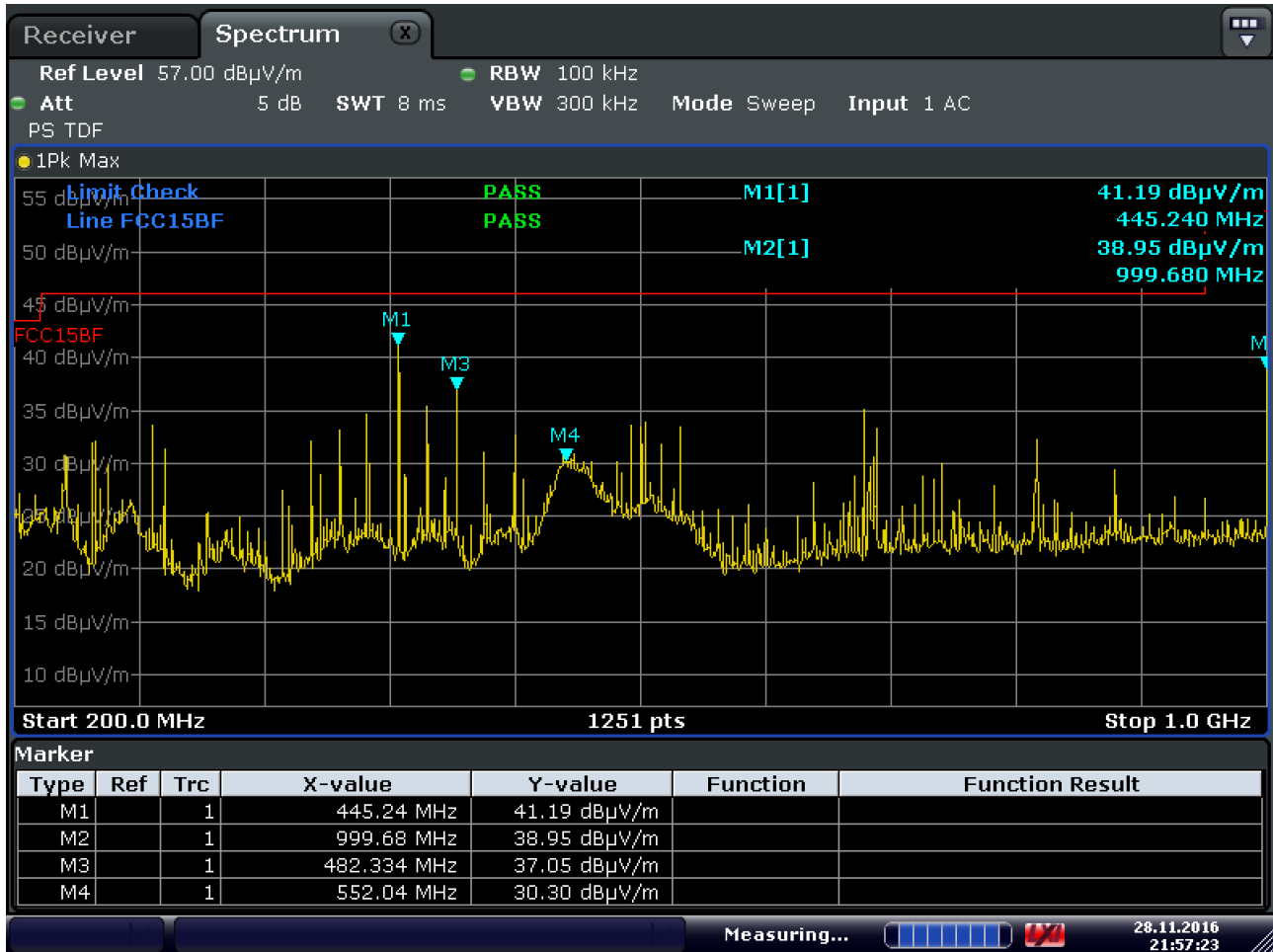
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 4, Clause 8.9 @ frequencies defined in 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	Quasi Peak (μV/m)	Quasi Peak (dBμV/m)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0



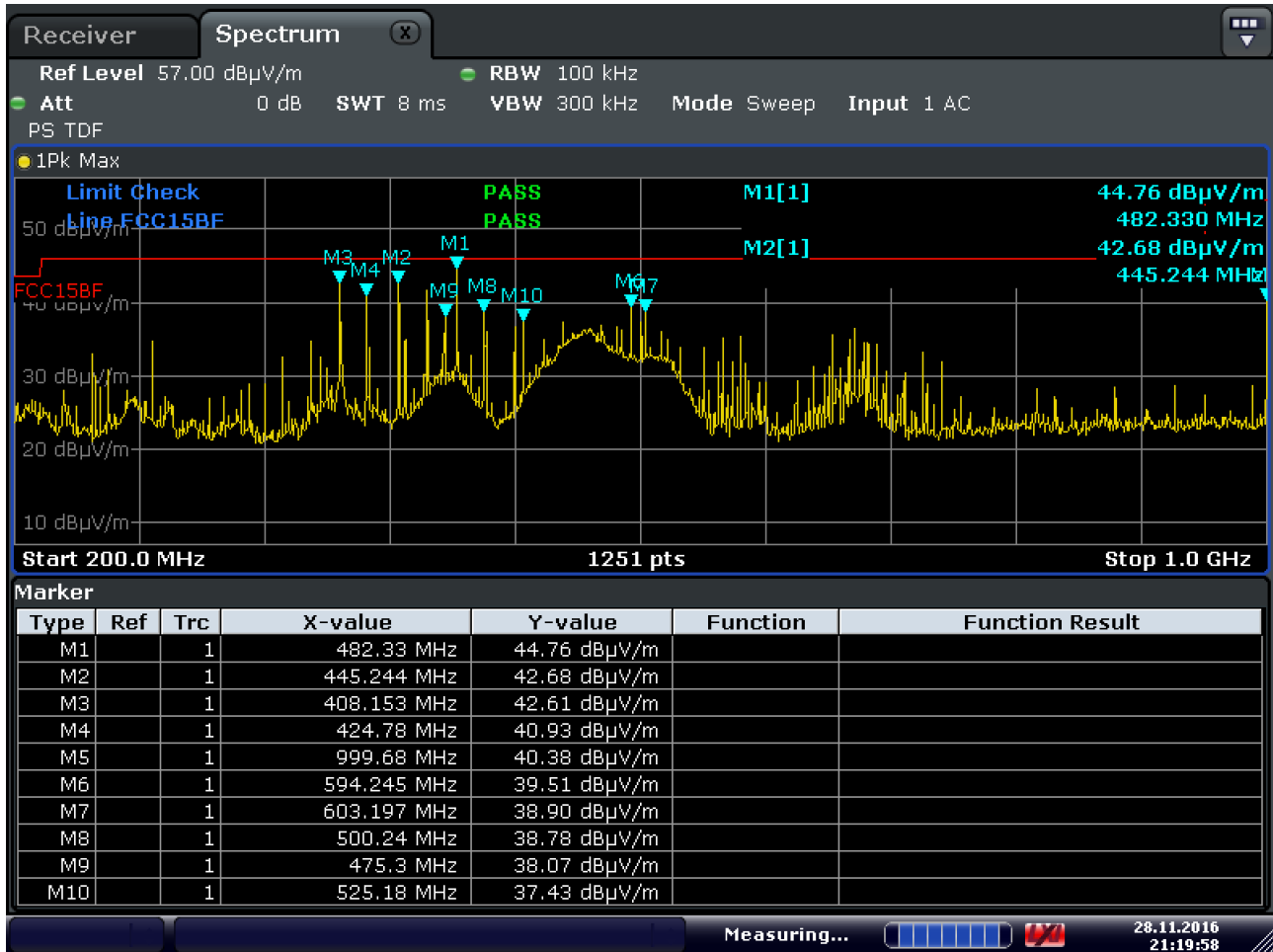
Radiated Emissions, 30 -200MHz, HP



Radiated Emissions, 30 -200MHz, VP



Radiated Emissions, 200 -1000MHz, HP



Radiated Emissions, 200 -1000MHz, VP

3.8 Radiated Emissions, above 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 4, Clause 8.9

Test Results: Complies

Measurement Data:

Radiated Emissions, 1-40 GHz

Measuring distance: 3m 1.0 to 8.5 GHz; 1m 8.0 – 40.0 GHz.

Band Edge Emissions, Restricted Bands, 5150MHz						
Carrier Modulation	Ch. No.	Carrier Freq MHz	Measured value AV dBµV/m @3m	Measured value Peak dBµV/m @3m	Limit (dBµV/m)	Verdict
802.11a, Ant 0	36	5180	42.2	58.9	54/74	Complies
802.11a, Ant 1	36	5180	42.5	56.6	54/74	Complies
802.11n, HT20, MIMO	36	5180	42.0	54.0	54/74	Complies
802.11n, HT40, MIMO	38	5190	49.9	64.9	54/74	Complies
802.11n, HT80, MIMO	42	5210	50.1	61.6	54/74	Complies

Band Edge Emissions, Restricted Bands, 5350MHz						
Carrier Modulation	Ch. No.	Carrier Freq MHz	Measured value AV dBµV/m @3m	Measured value Peak dBµV/m @3m	Limit (dBµV/m)	Verdict
802.11a, Ant 0	64	5320	42.6	57.7	54/74	Complies
802.11a, Ant 1	64	5320	42.8	55.5	54/74	Complies
802.11n, HT20, MIMO	64	5320	43.9	61.4	54/74	Complies
802.11n, HT40, MIMO	62	5310	50.6	66.7	54/74	Complies
802.11n, HT80, MIMO	58	5290	48.7	61.3	54/74	Complies

Band Edge Emissions, Restricted Bands, 5460MHz						
Carrier Modulation	Ch. No.	Carrier Freq MHz	Measured value AV dBµV/m @3m	Measured value Peak dBµV/m @3m	Limit (dBµV/m)	Verdict
802.11a, Ant 0	100	5500	40.2	< 59.5	54/74	Complies
802.11a, Ant 1	100	5500	41.4	< 60.0	54/74	Complies
802.11n, HT20, MIMO	100	5500	41.3	< 62.5	54/74	Complies
802.11n, HT40, MIMO	102	5510	43.9	< 62.2	54/74	Complies
802.11n, HT80, MIMO	106	5530	44.1	< 58.7	54/74	Complies

Radiated Emissions, Restricted Bands						
Carrier Modulation	Carrier Freq MHz	Measured Freq GHz	Measured value AV dBµV/m @3m	Measured value Peak dBµV/m @3m	Limit (dBµV/m)	Verdict
802.11a, Ant 0	5745	11490	46.0	59.4	54/74	Complies
802.11n, HT40, MIMO	5270	15810	40.2	< 64	54/74	Complies
All others	/	/	< 44	<64	54/74	Complies

Average Detector values are corrected for Duty Cycle as measured in UL report no. 15U21878-E4V2. Calculated Duty Cycle Factor ($-20 \times \log(DC)$) is added to the measured values.

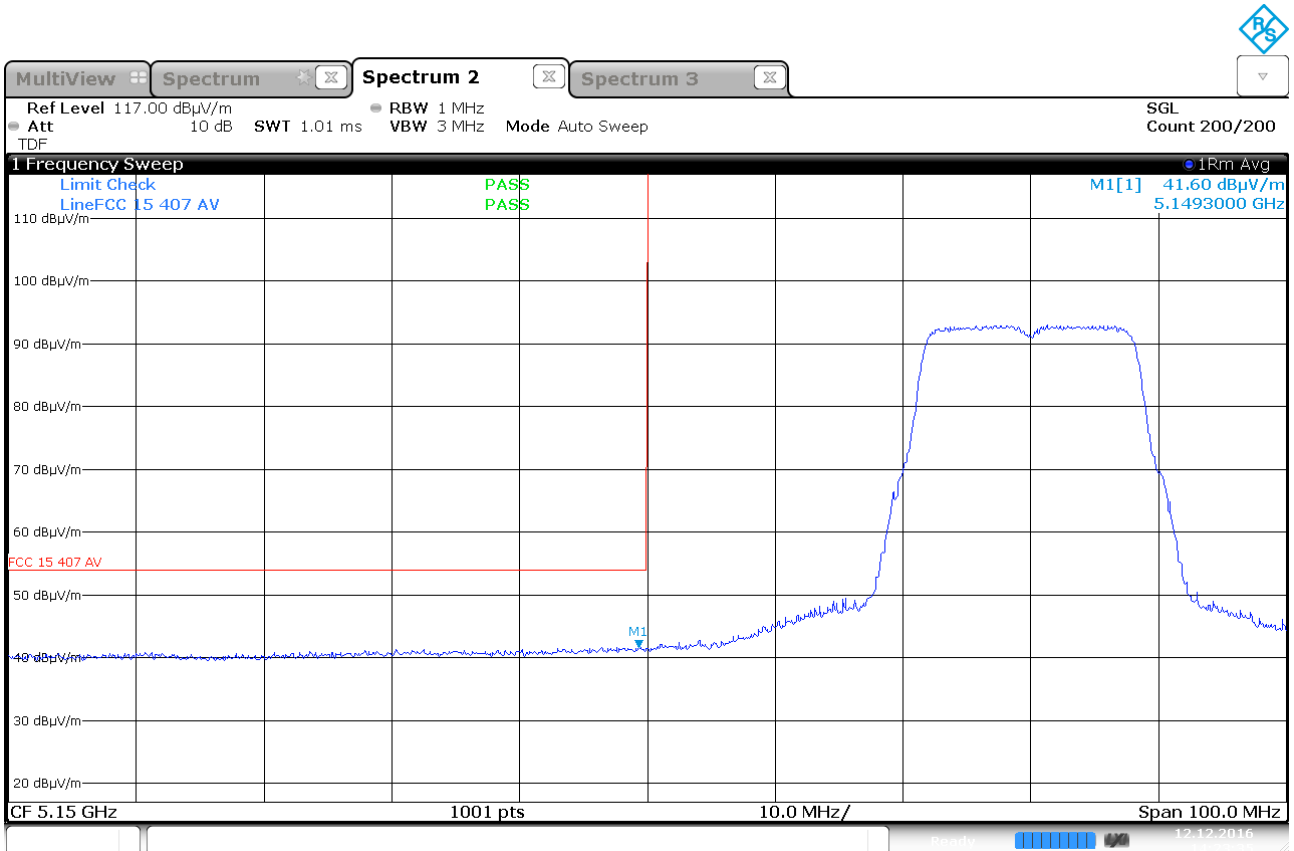
Only harmonics that fall in the restricted bands (ref. §15.205) have been checked.

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer "Transducer factor".

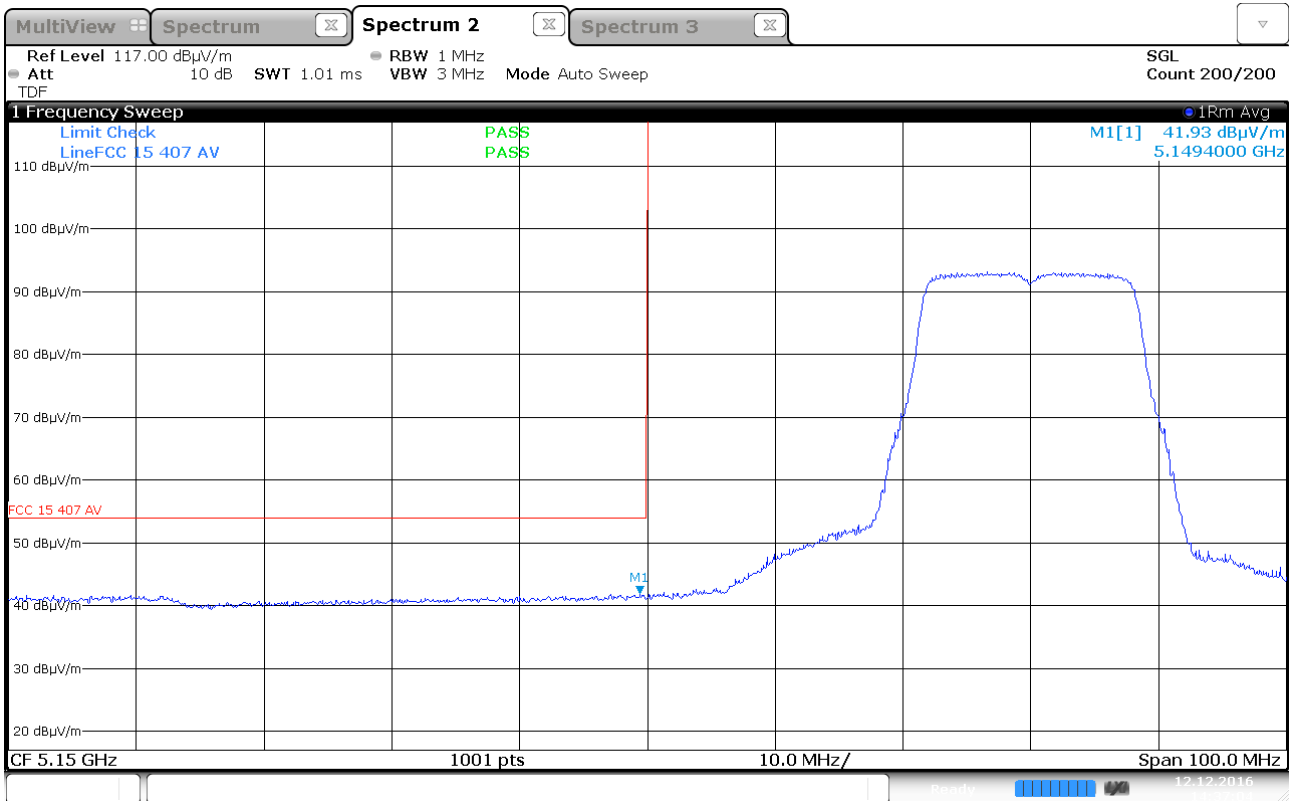
See attached plots.

Limits

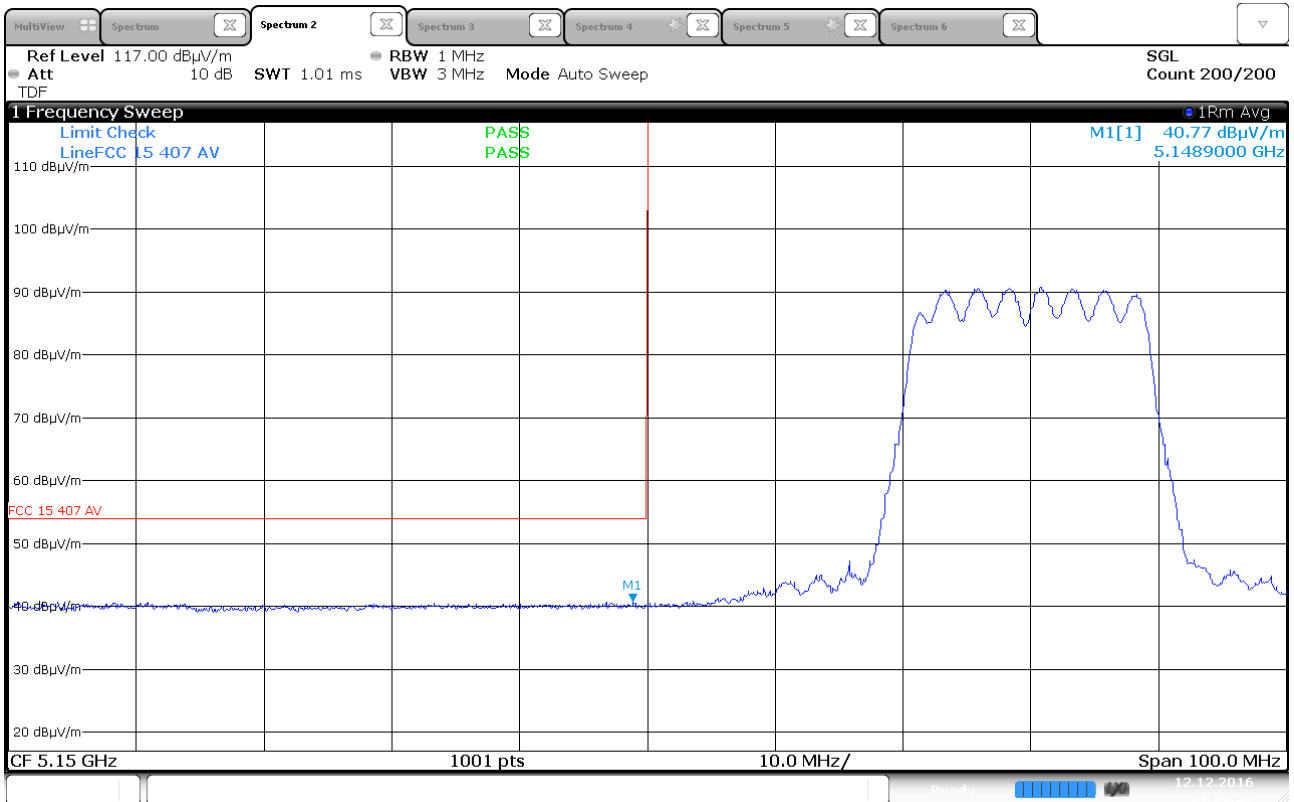
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 4, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	AV (dBµV/m)	Peak (dBµV/m)
Above 1 GHz	54.0	74.0



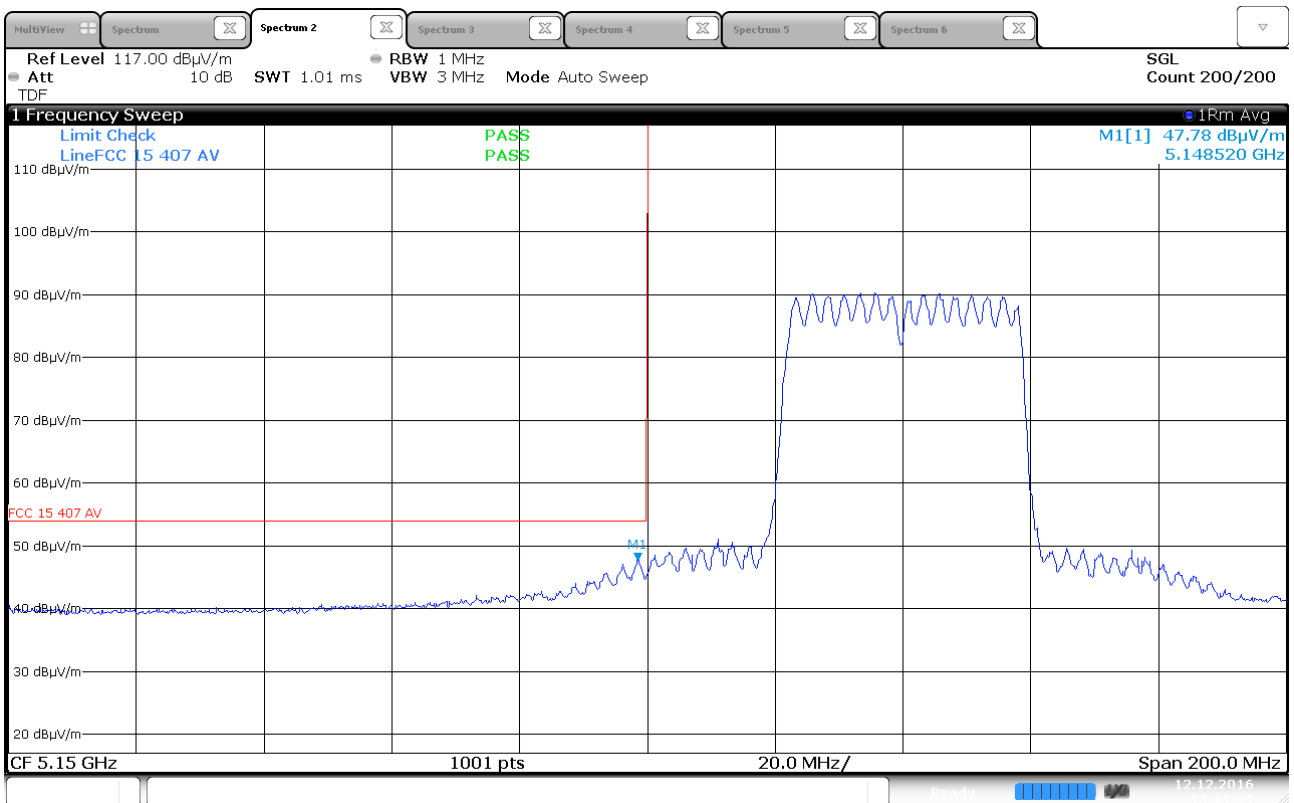
Band Edge RMS, < 5150MHz, 5180MHz, 802.11a 6Mb, Ant 0



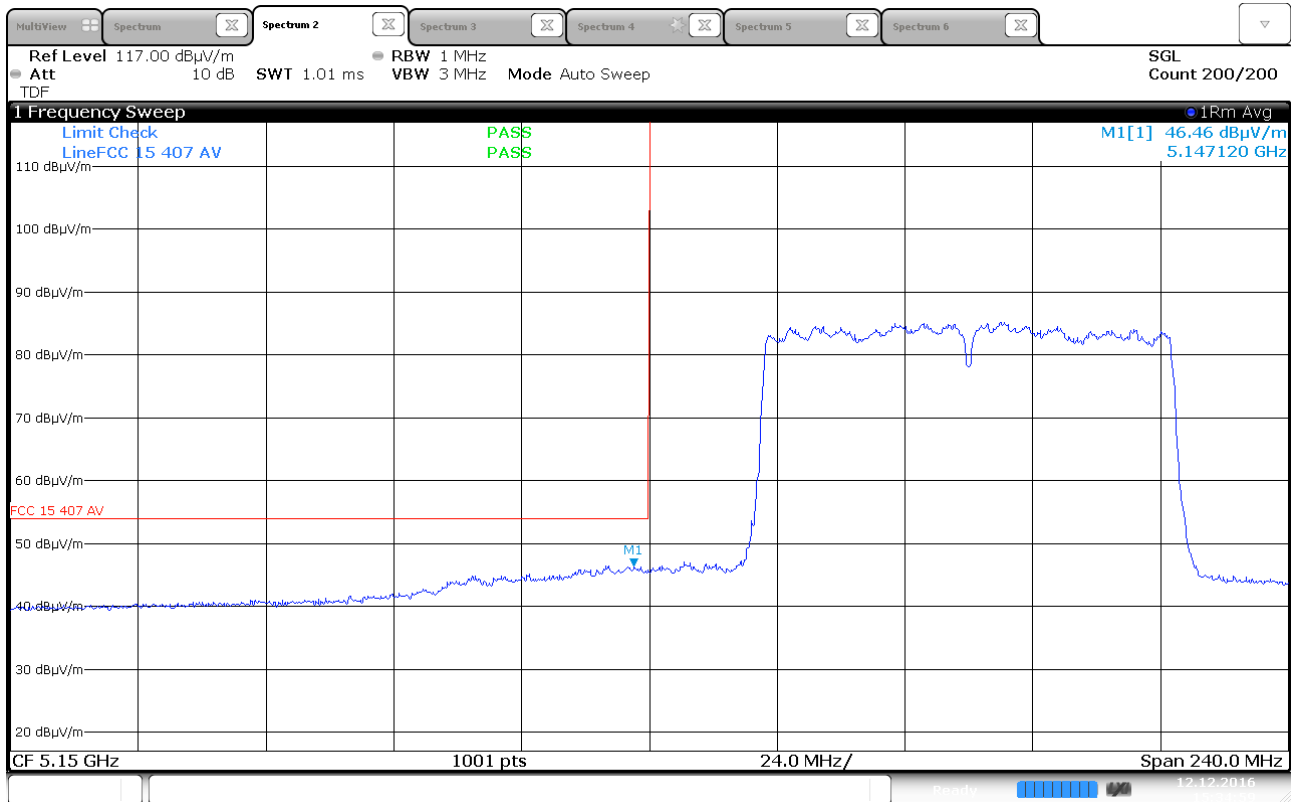
Band Edge RMS, < 5150MHz, 5180MHz, 802.11a 6Mb, Ant 1

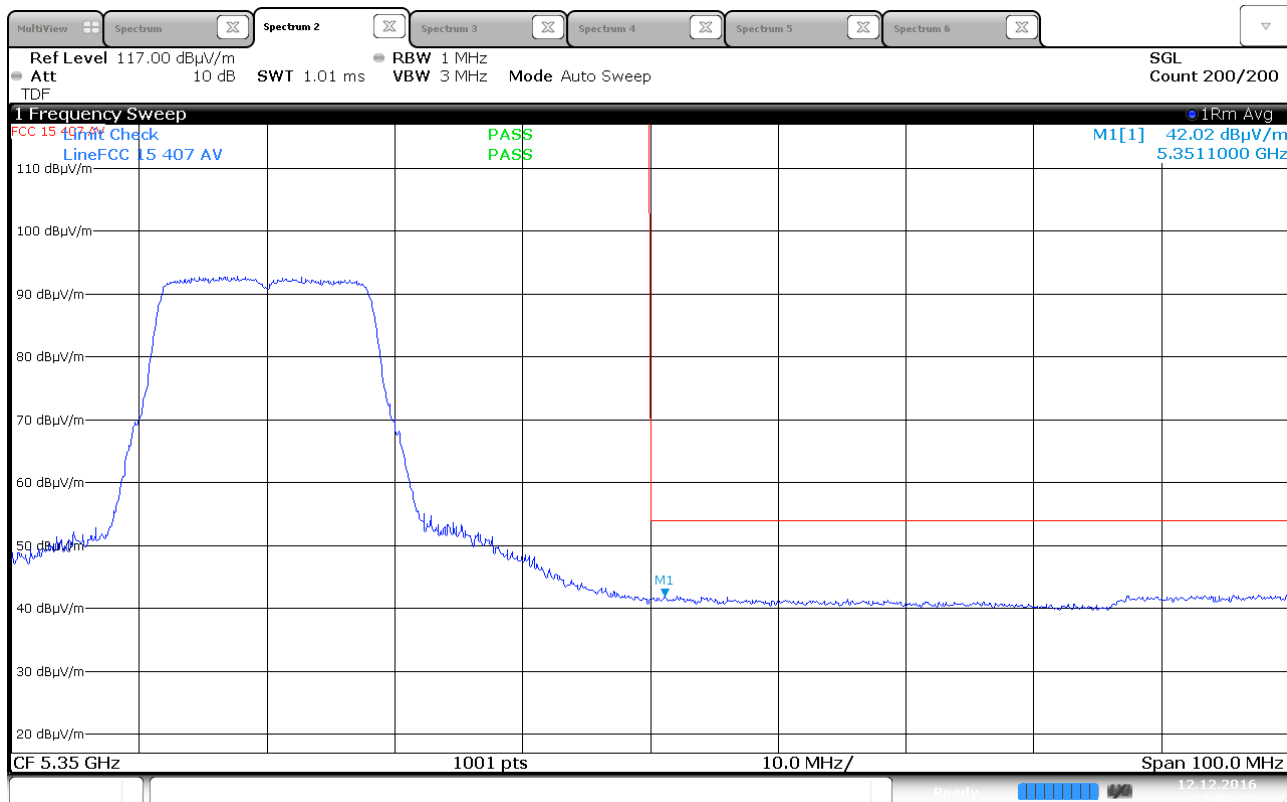


Band Edge RMS, < 5150MHz, 5180MHz, 802.11n HT20, MIMO

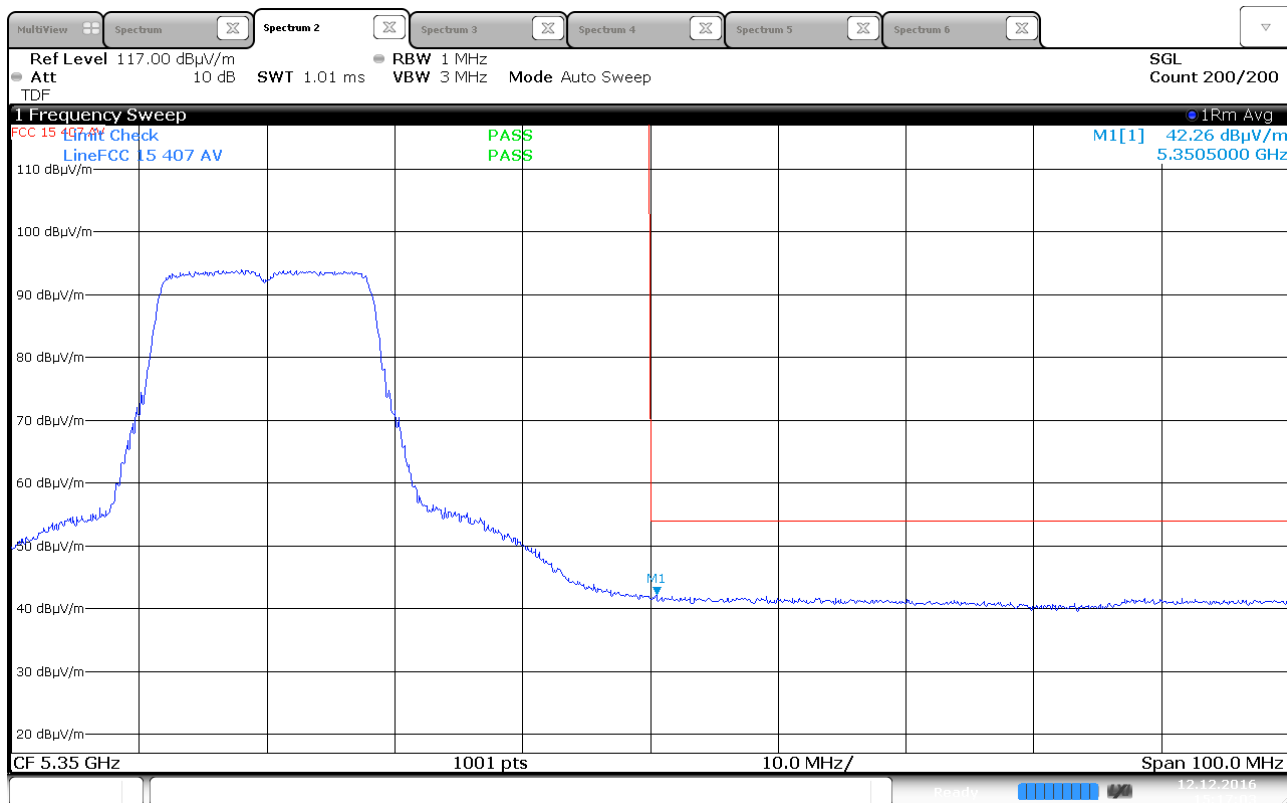


Band Edge RMS, < 5150MHz, 5190MHz, 802.11n HT40, MIMO

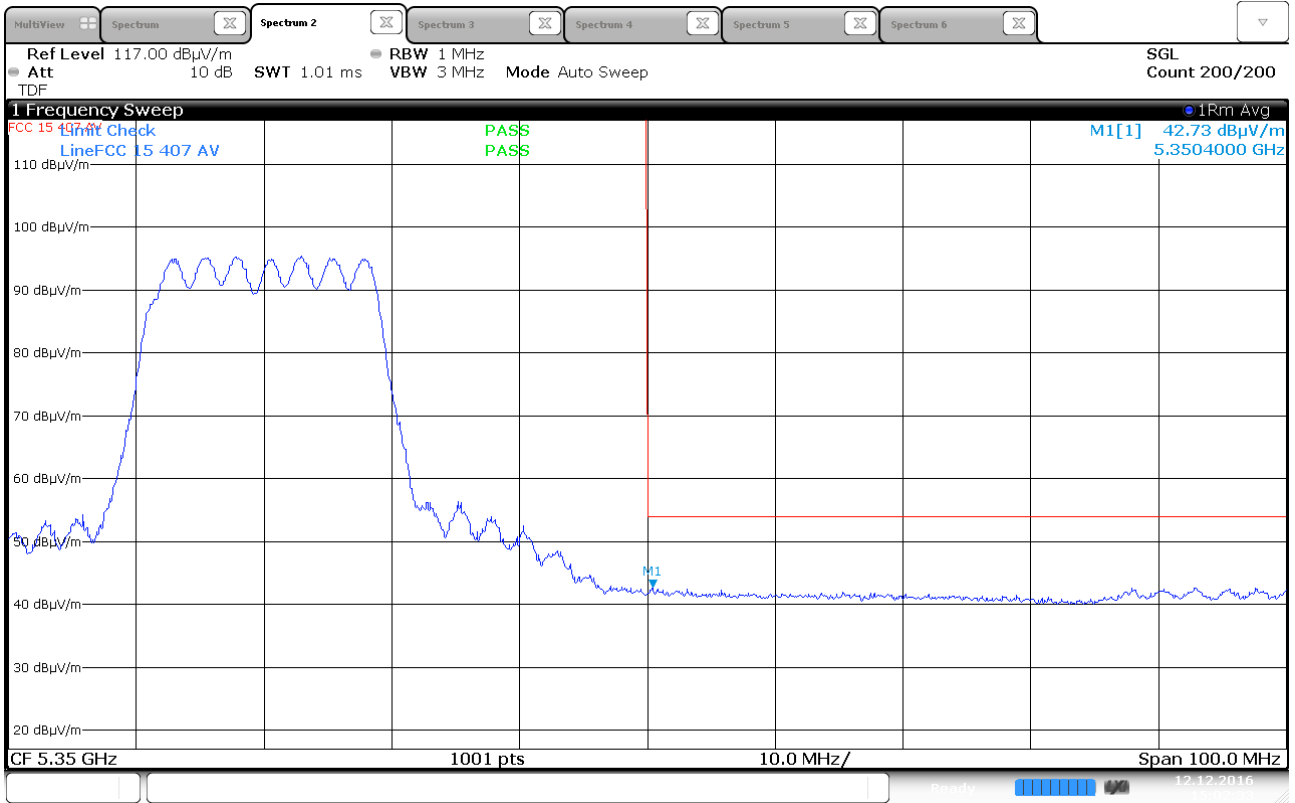




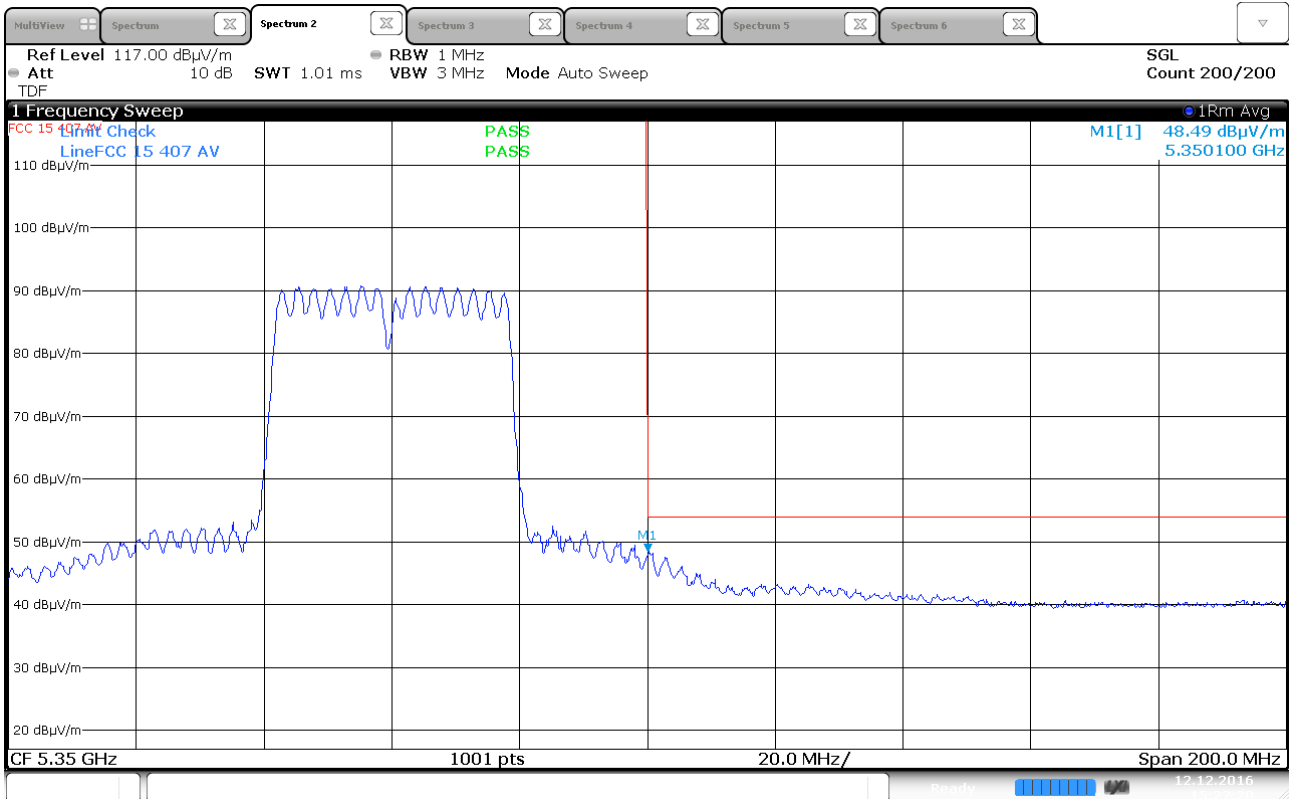
Band Edge RMS, > 5350MHz, 5320MHz, 802.11a 6Mb, Ant 0



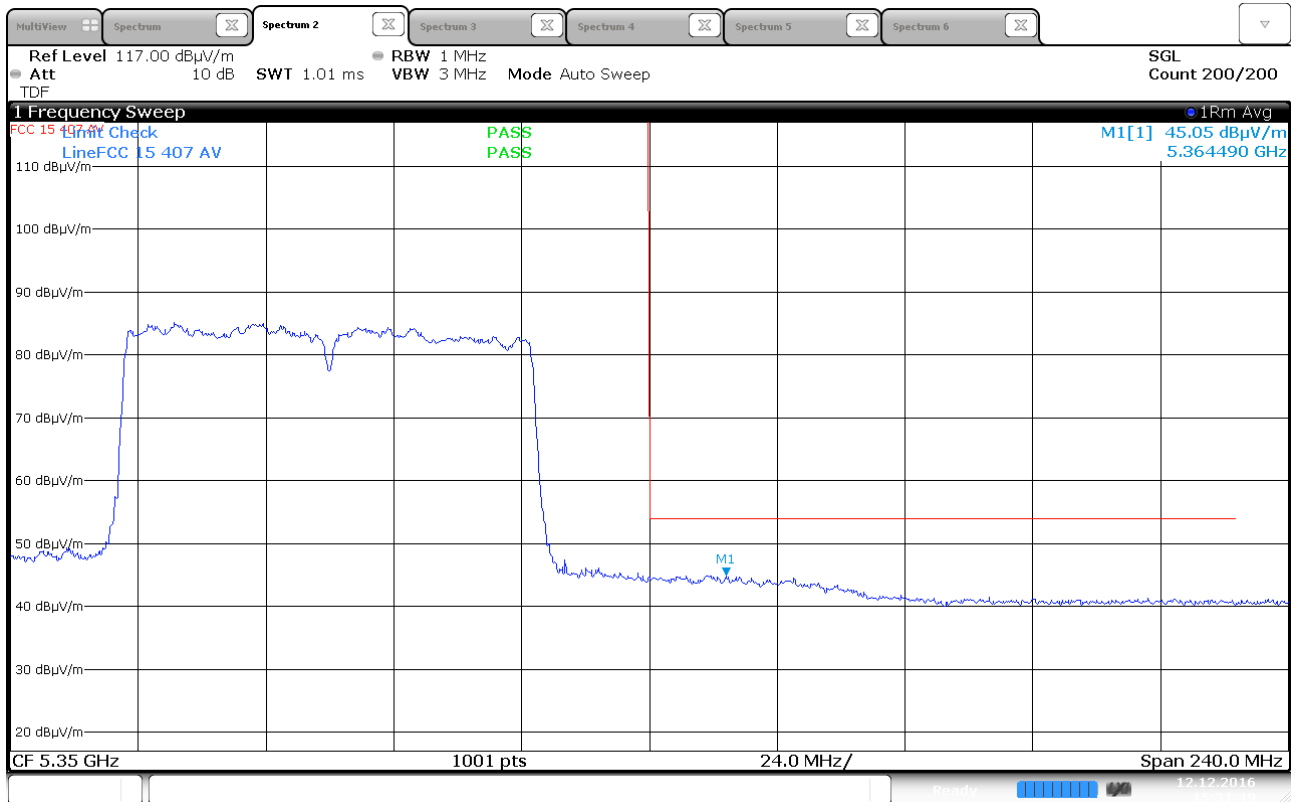
Band Edge RMS, > 5350MHz, 5320MHz, 802.11a 6Mb, Ant 1



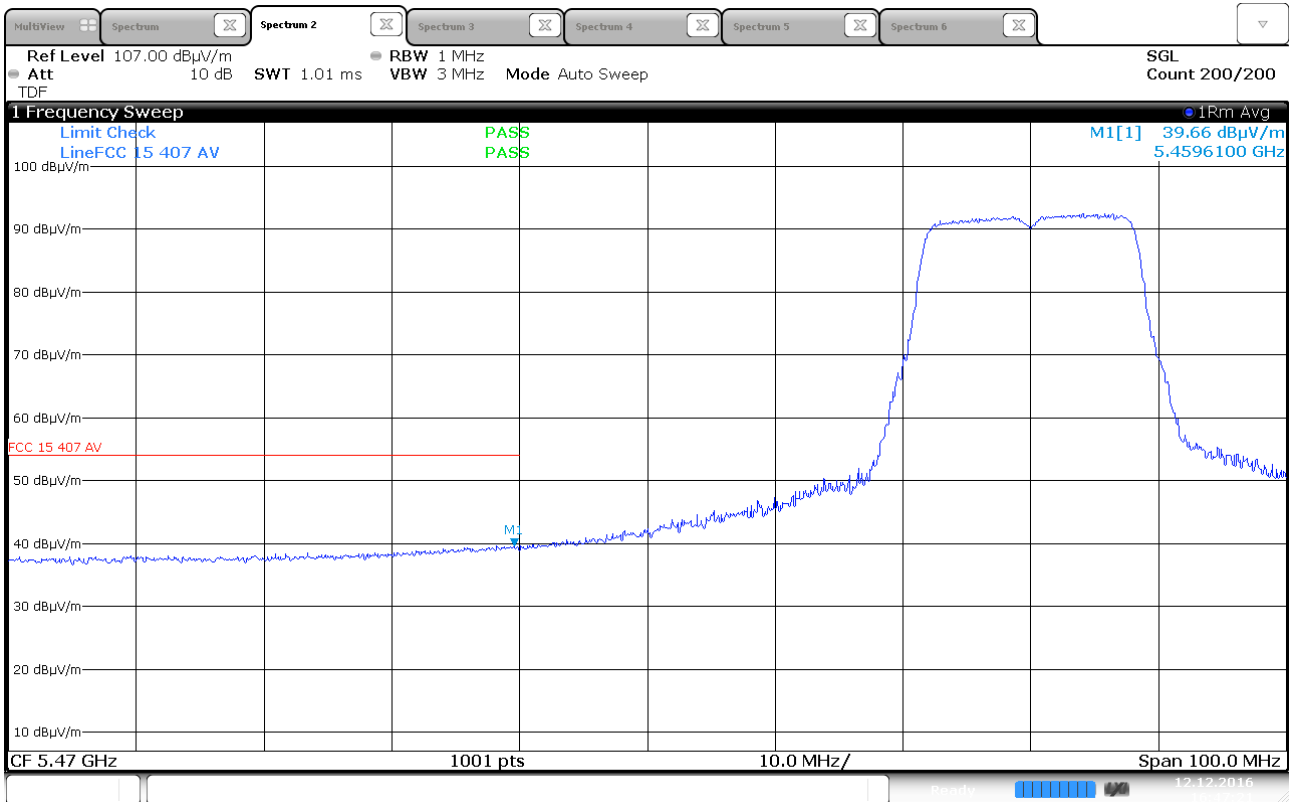
Band Edge RMS, > 5350MHz, 5320MHz, 802.11n HT20, MIMO



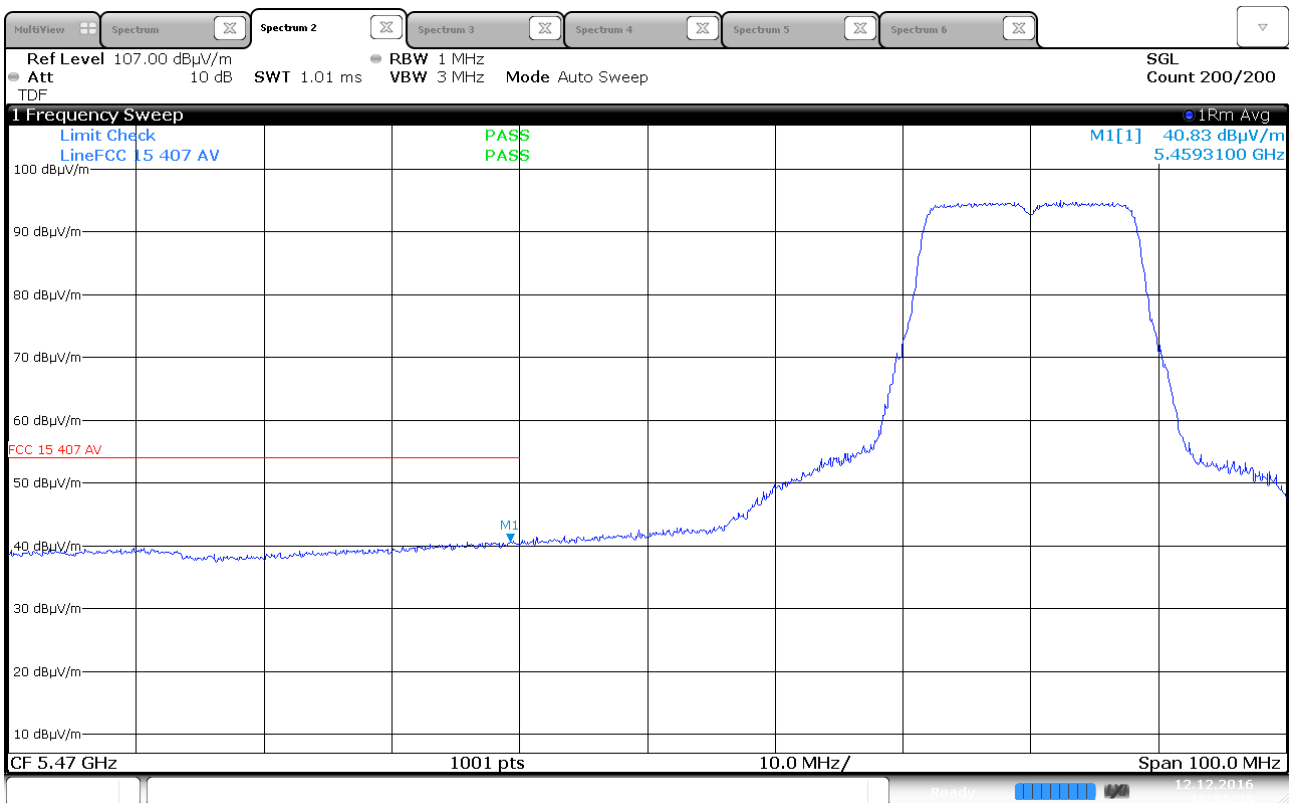
Band Edge RMS, > 5350MHz, 5310MHz, 802.11n HT40, MIMO



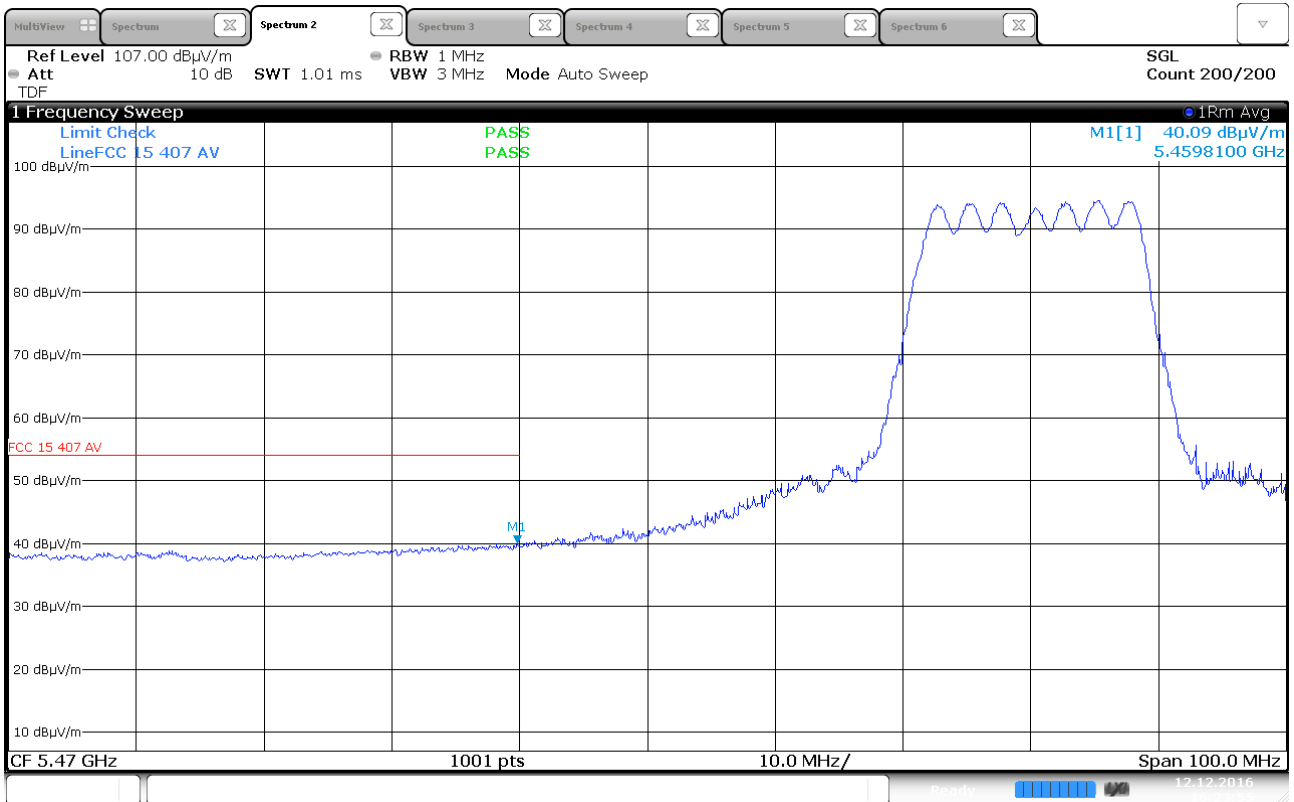
Band Edge RMS, > 5350MHz, 5290MHz, 802.11n HT80, MIMO



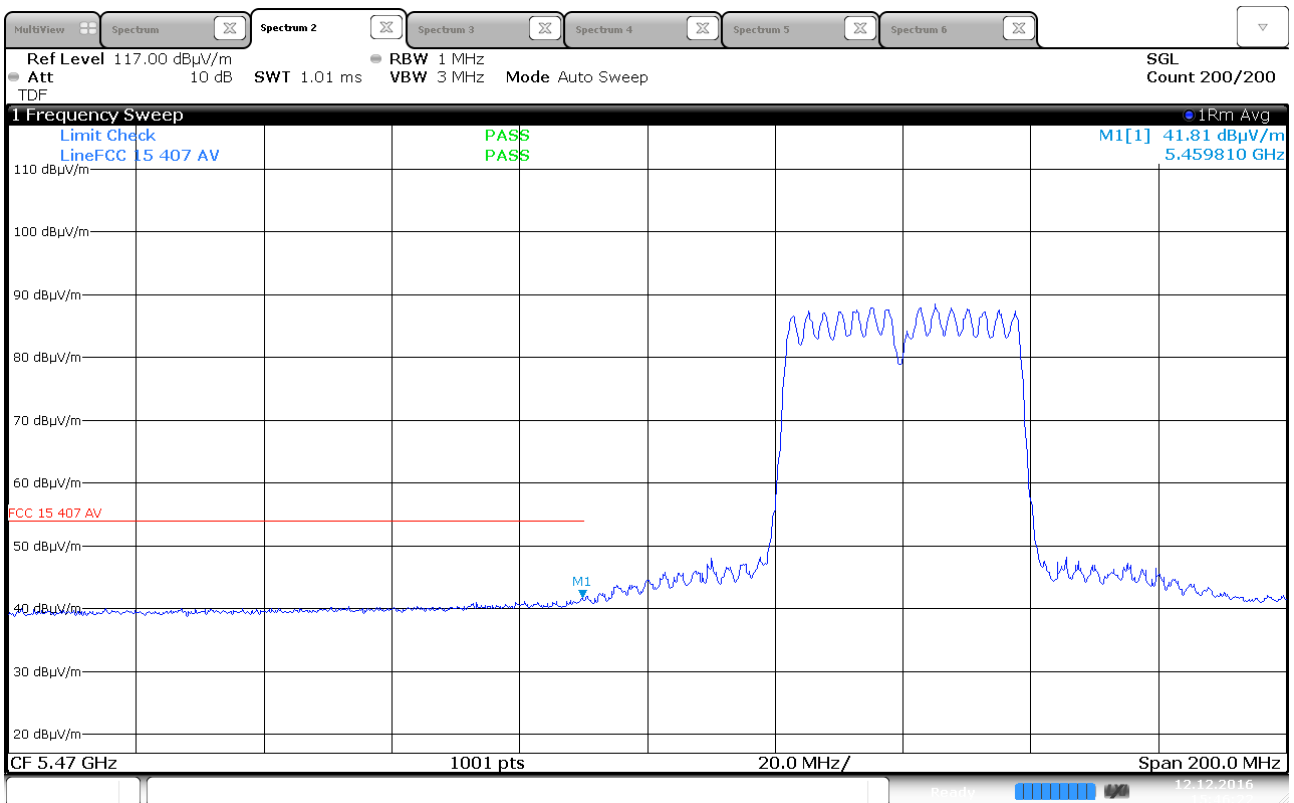
Band Edge RMS, < 5460MHz, 5500MHz, 802.11a 6Mb, Ant 0



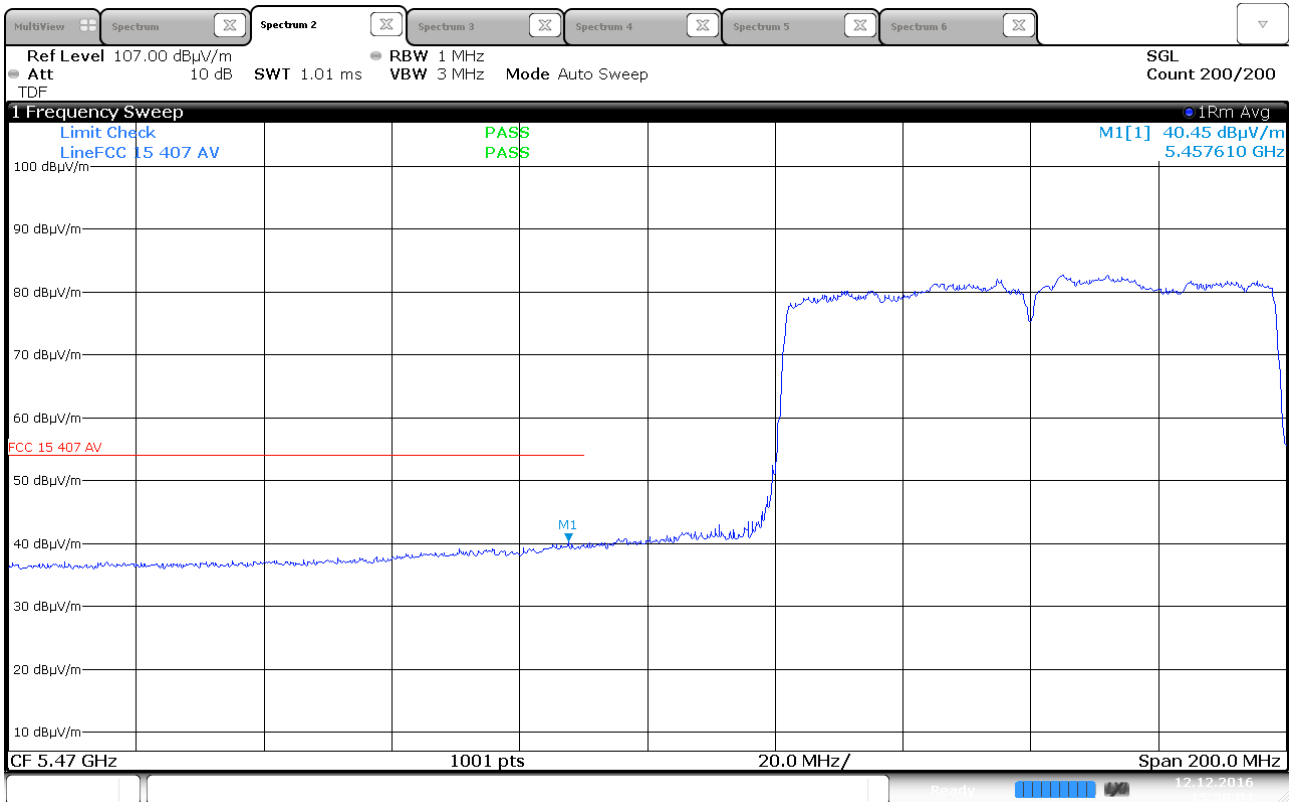
Band Edge RMS, < 5460MHz, 5500MHz, 802.11a 6Mb, Ant 1



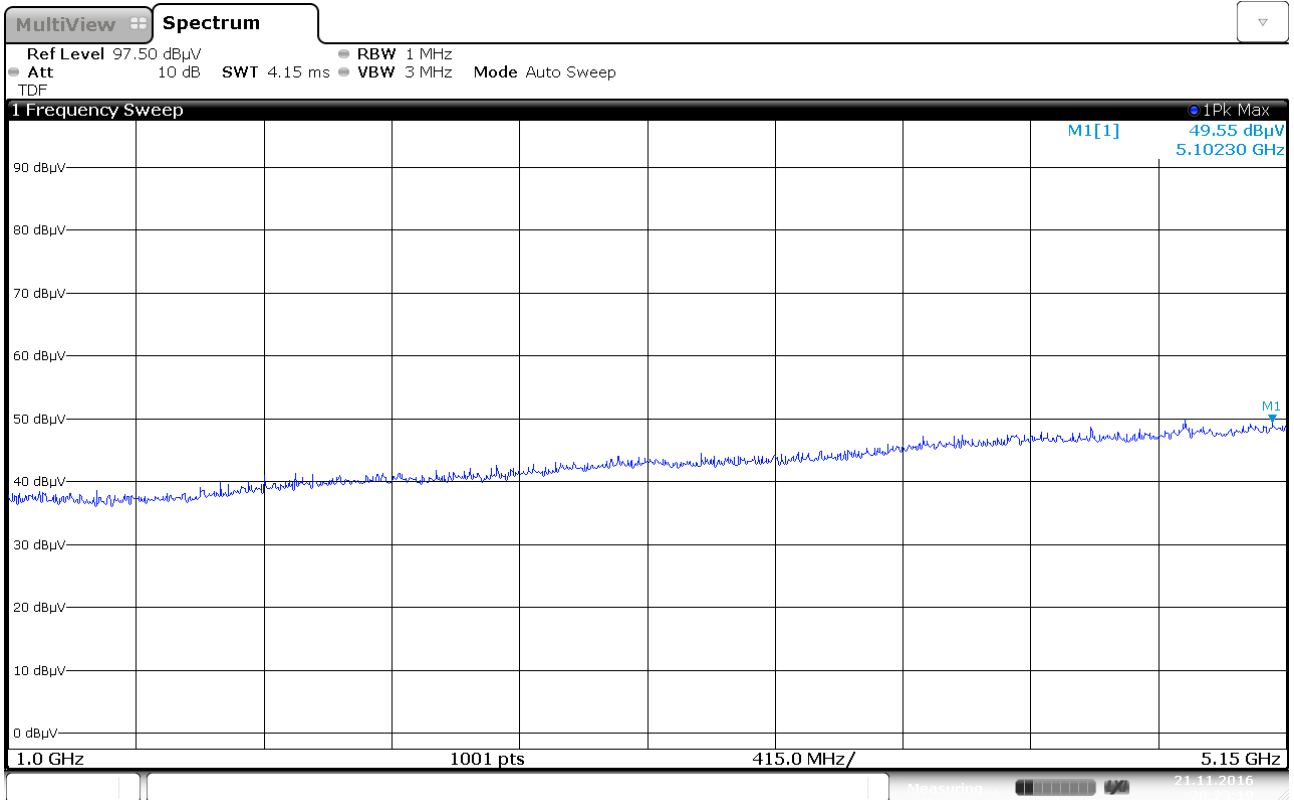
Band Edge RMS, < 5460MHz, 5500MHz, 802.11n HT20, MIMO



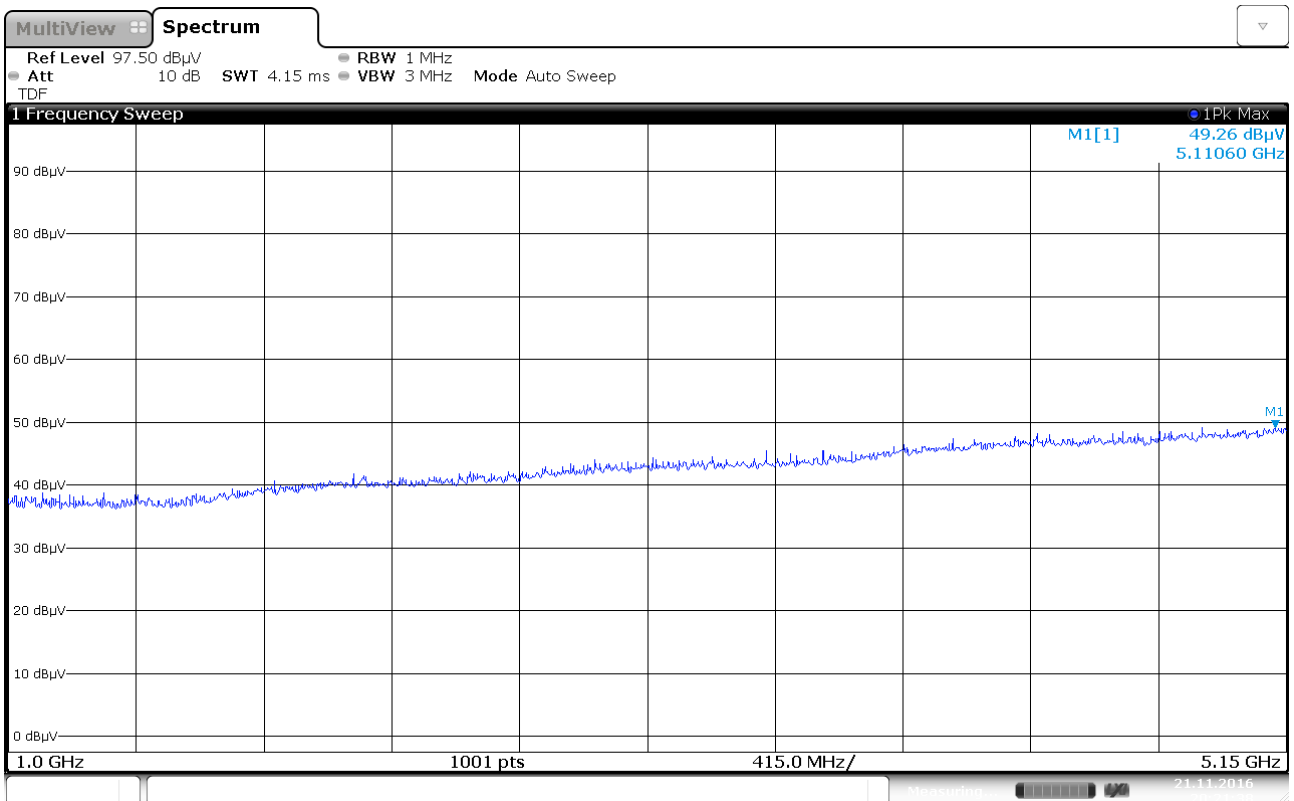
Band Edge RMS, < 5460MHz, 5510MHz, 802.11n HT40, MIMO



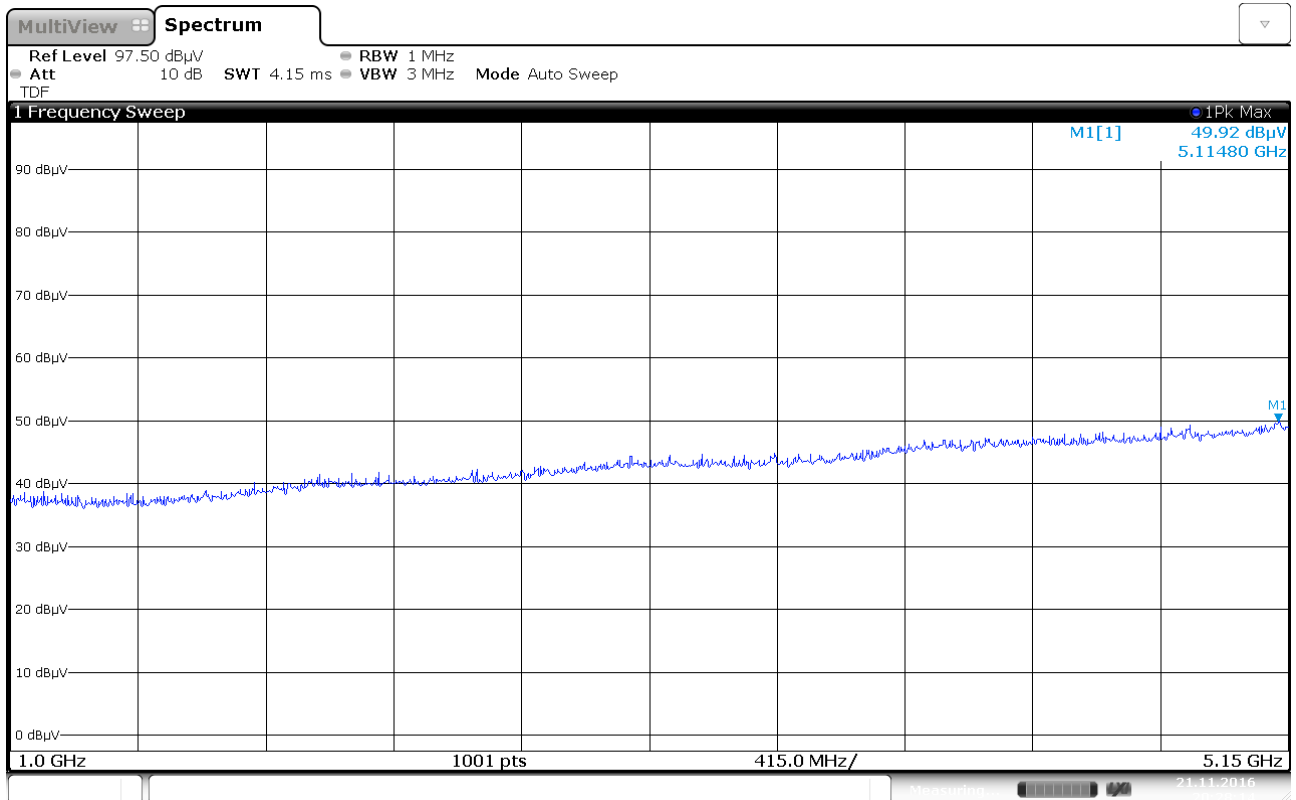
Band Edge RMS, < 5460MHz, 5530MHz, 802.11n HT80, MIMO



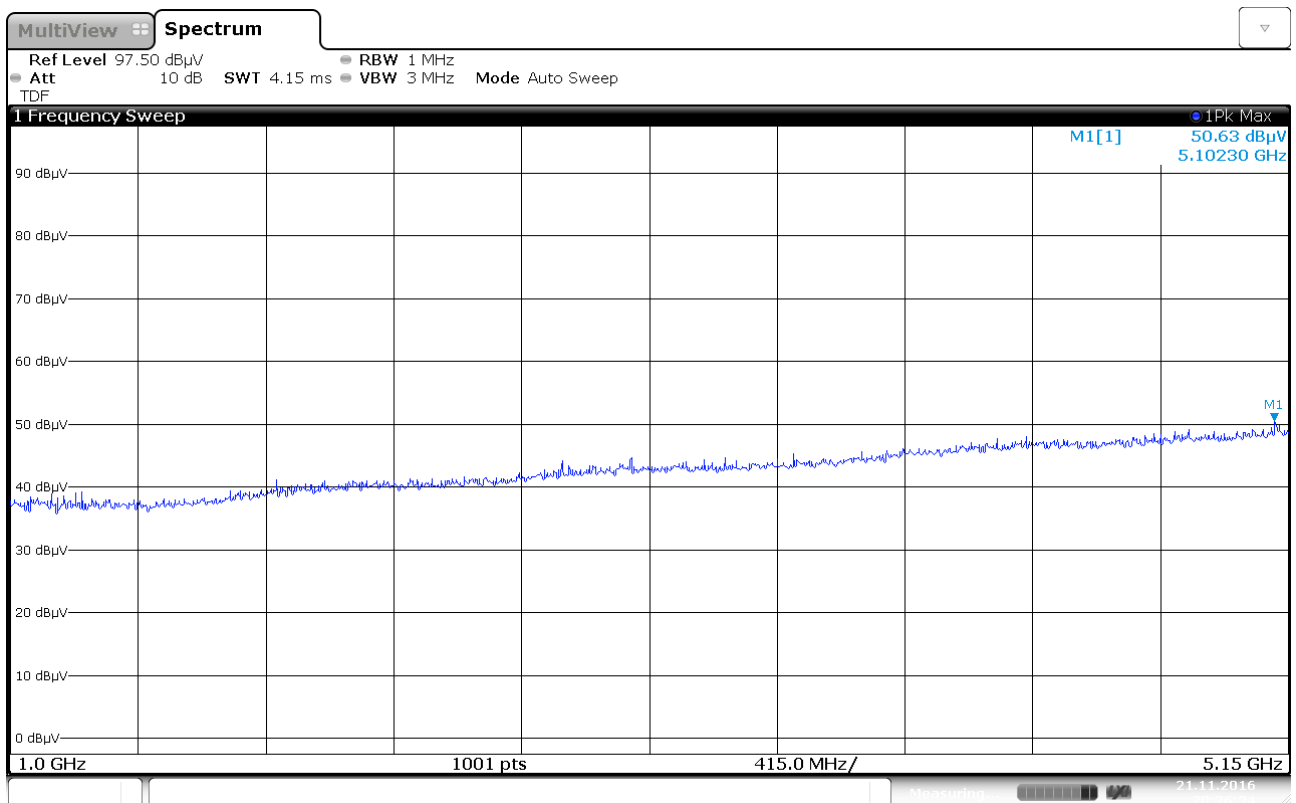
Radiated Emissions, 1.0 – 5.15 GHz, 5260 MHz, 802.11a 6M, Ant 0, HP



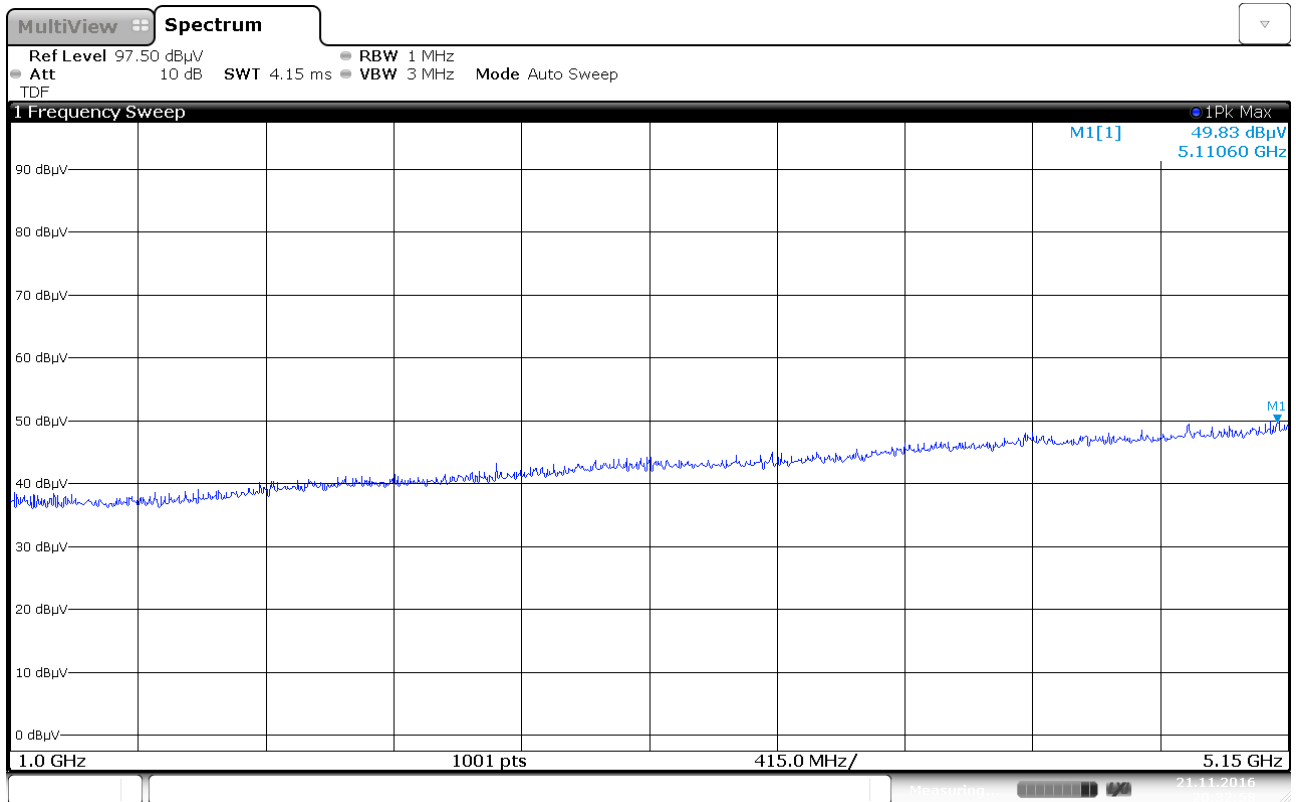
Radiated Emissions, 1.0 – 5.15 GHz, 5260 MHz, 802.11a 6M, Ant 0, VP



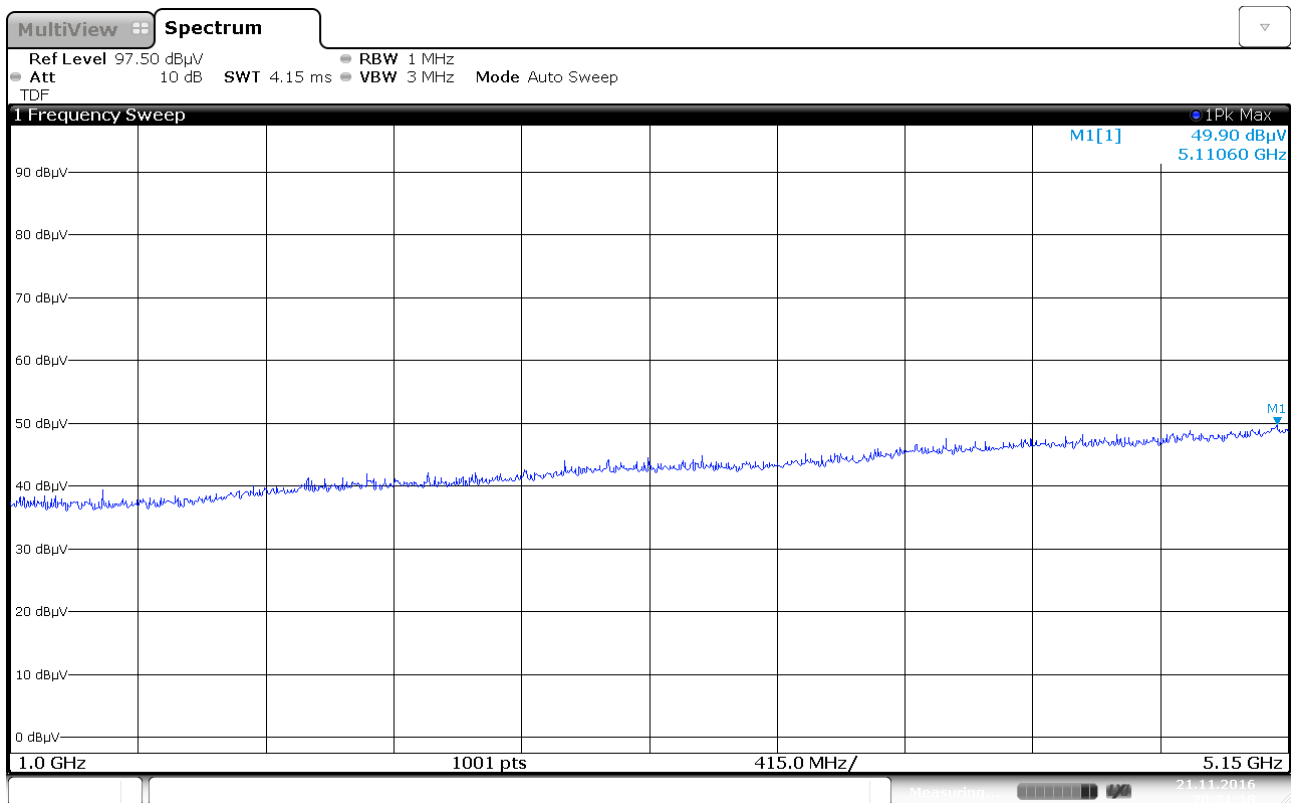
Radiated Emissions, 1.0 – 5.15 GHz, 5260 MHz, 802.11a 6M, Ant 1, HP



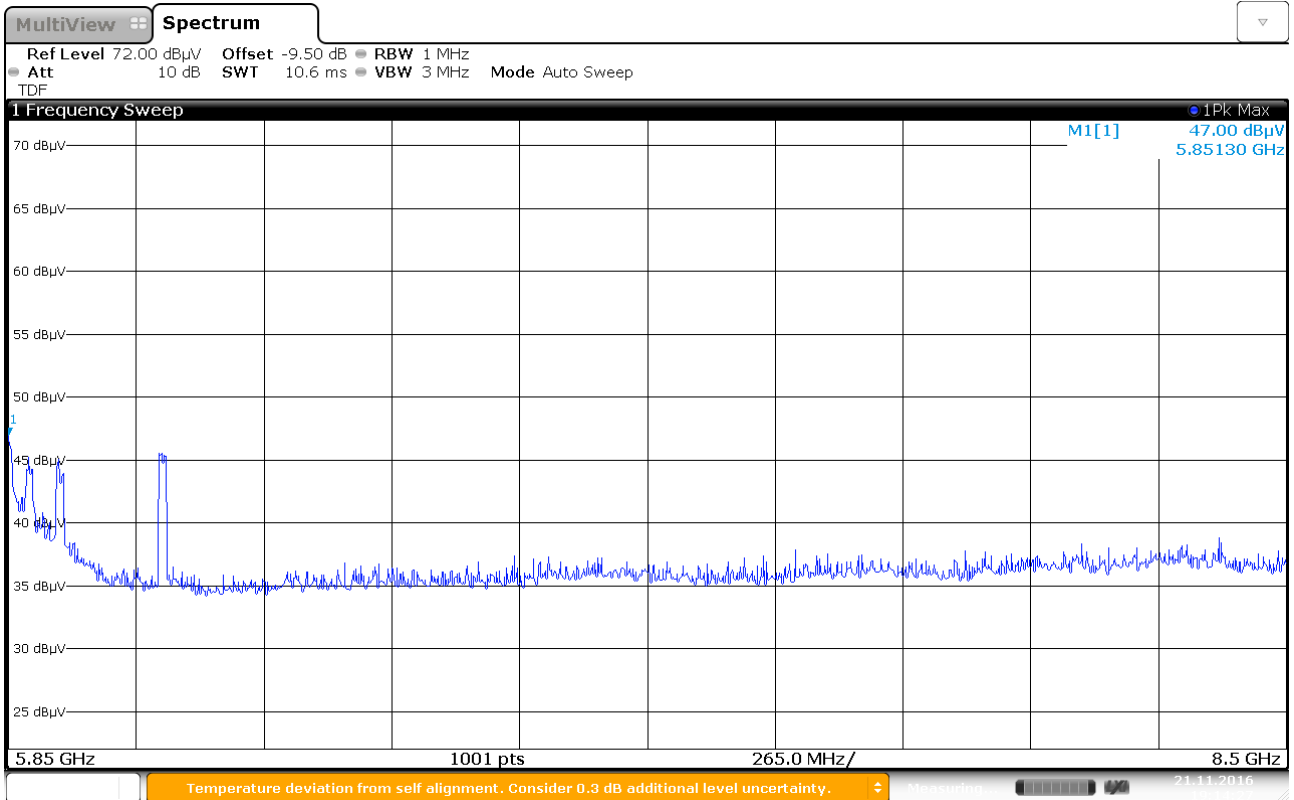
Radiated Emissions, 1.0 – 5.15 GHz, 5260 MHz, 802.11a 6M, Ant 1, VP



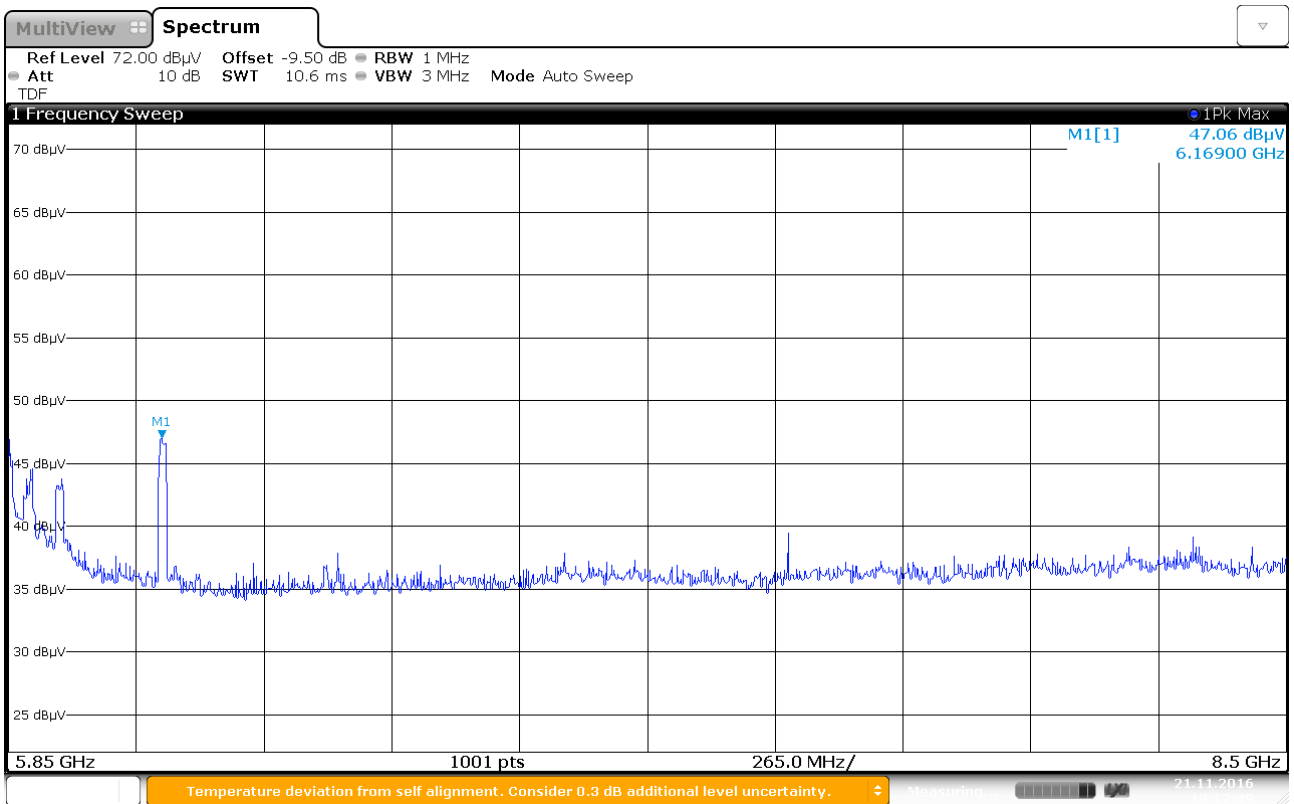
Radiated Emissions, 1.0 – 5.15 GHz, 5260 MHz, 802.11n HT20, MIMO, HP



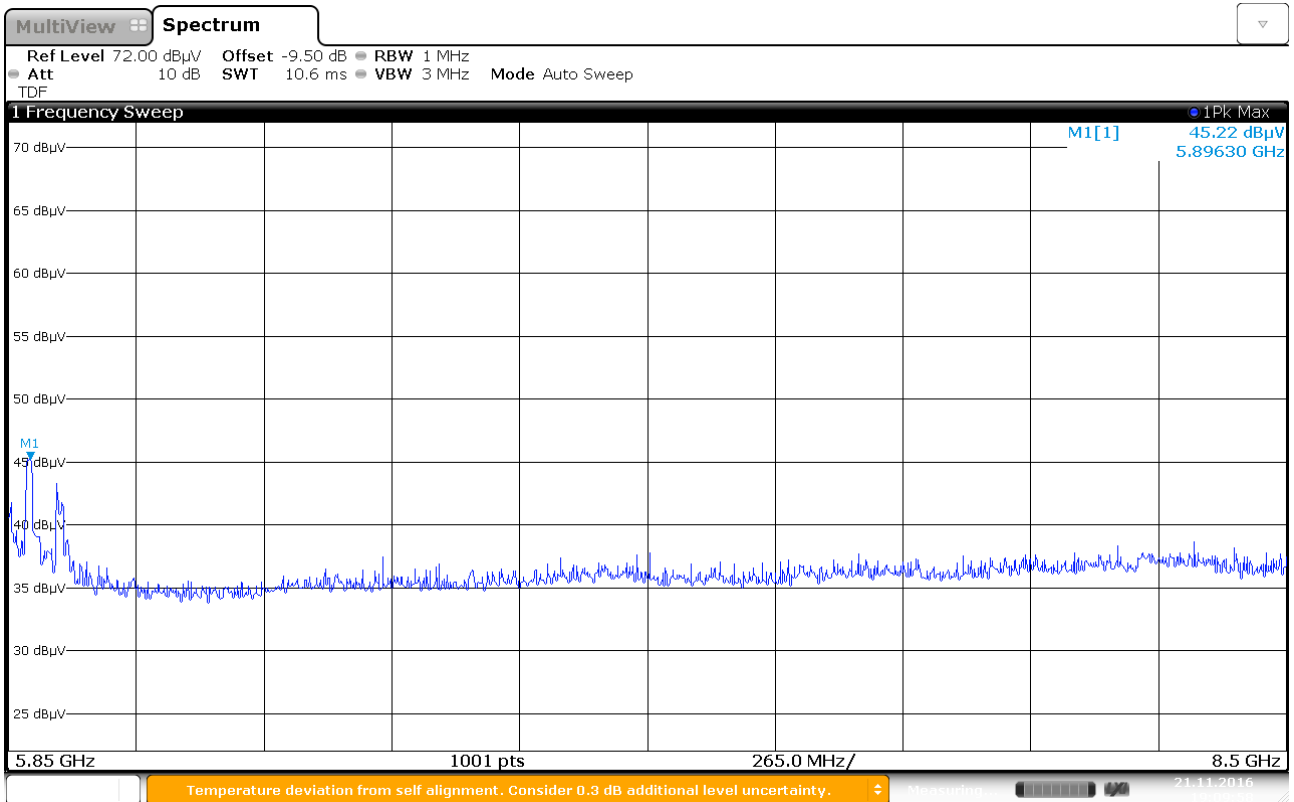
Radiated Emissions, 1.0 – 5.15 GHz, 5260 MHz, 802.11n HT20, MIMO, VP



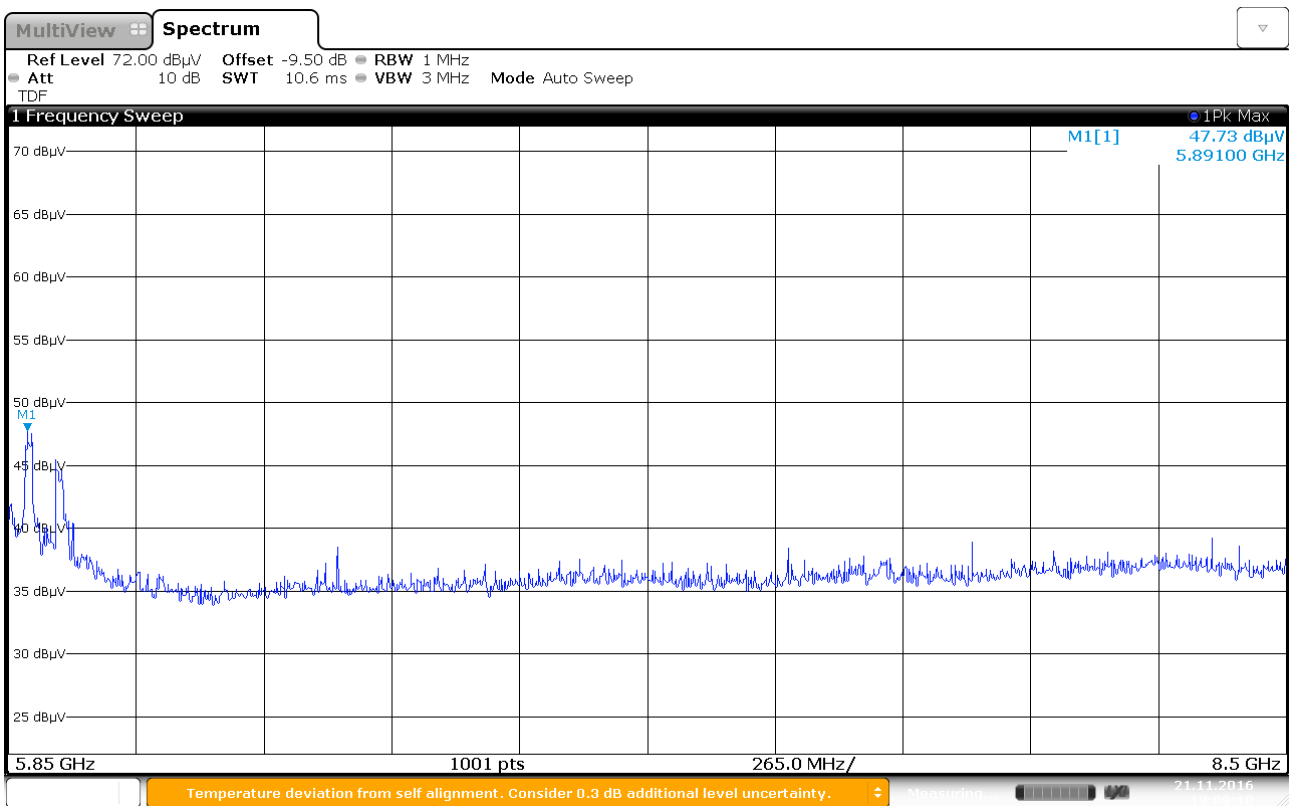
Radiated Emissions, 5.85 – 8.5 GHz, 5745 MHz, 802.11a 6M, Ant 0, HP



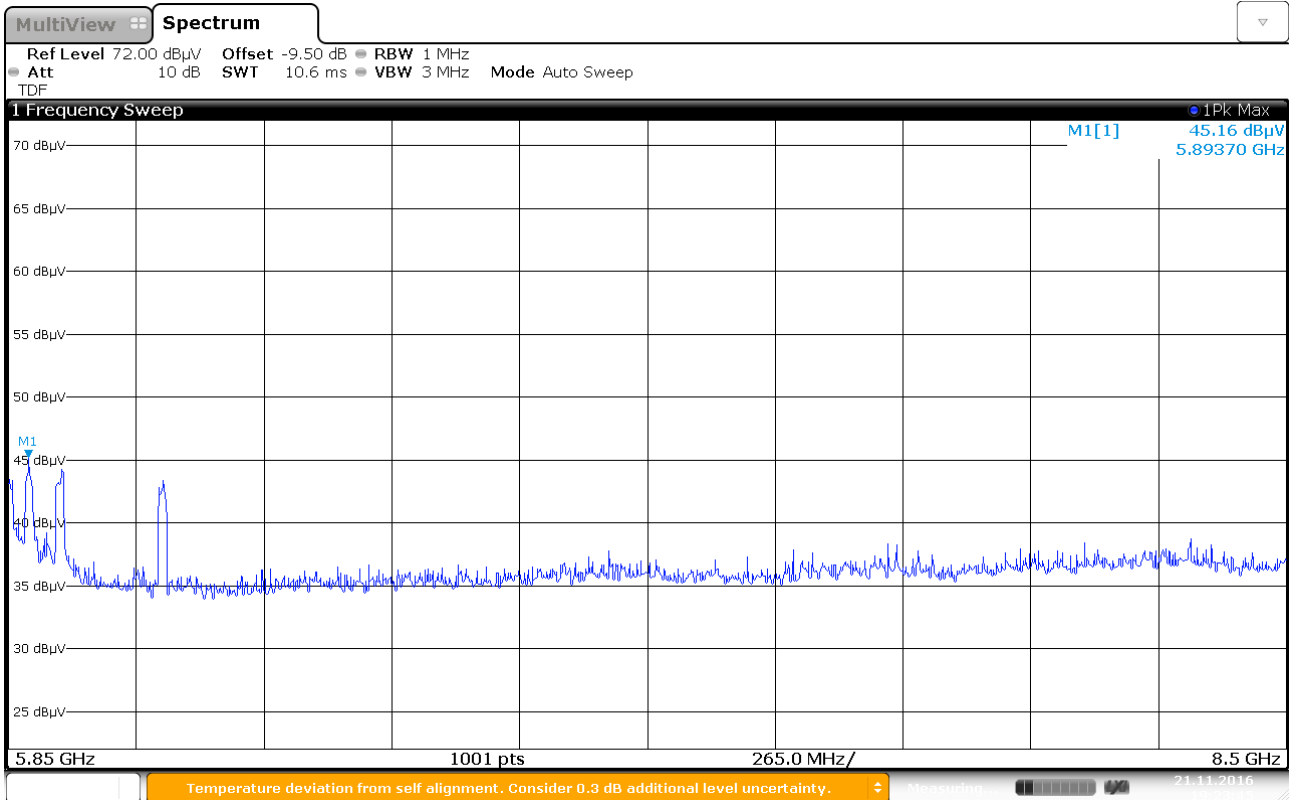
Radiated Emissions, 5.85 – 8.5 GHz, 5745 MHz, 802.11a 6M, Ant 0, VP



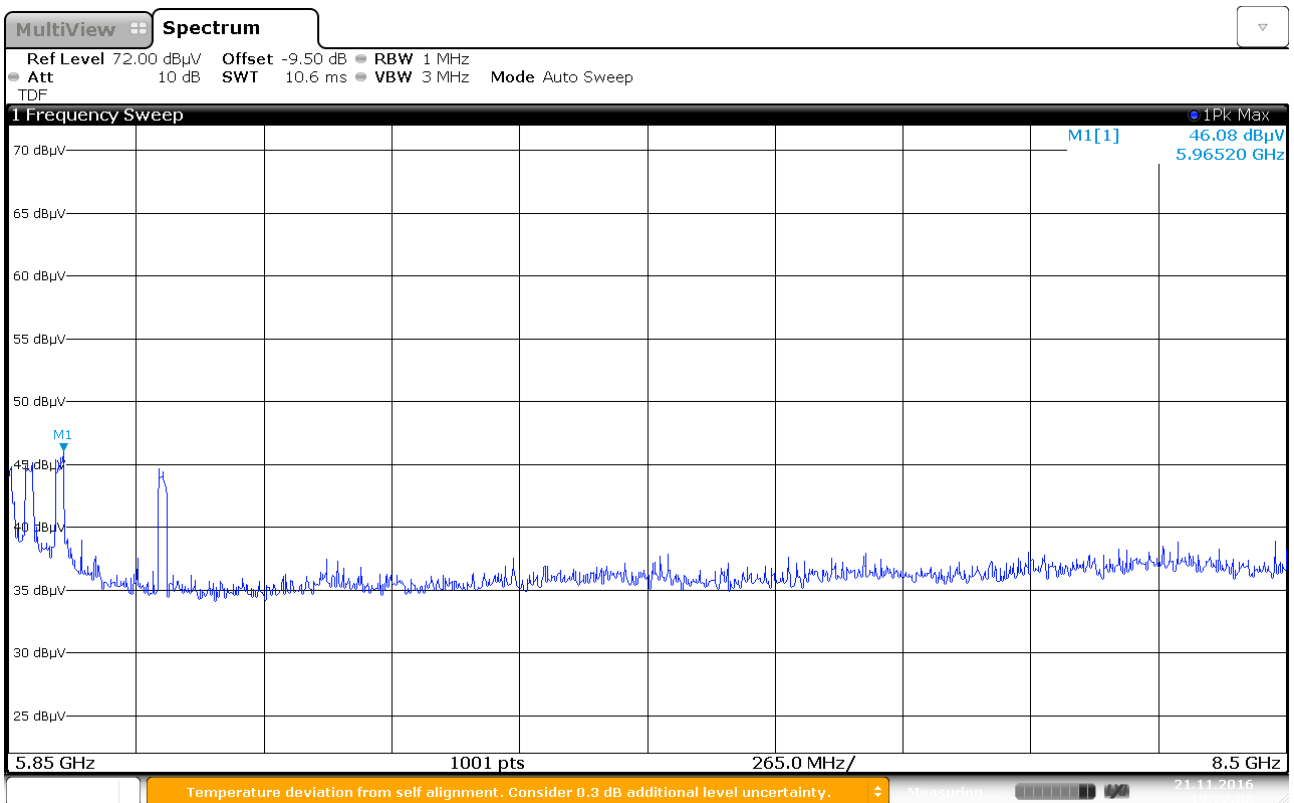
Radiated Emissions, 5.85 – 8.5 GHz, 5745 MHz, 802.11a 6M, Ant 1, HP



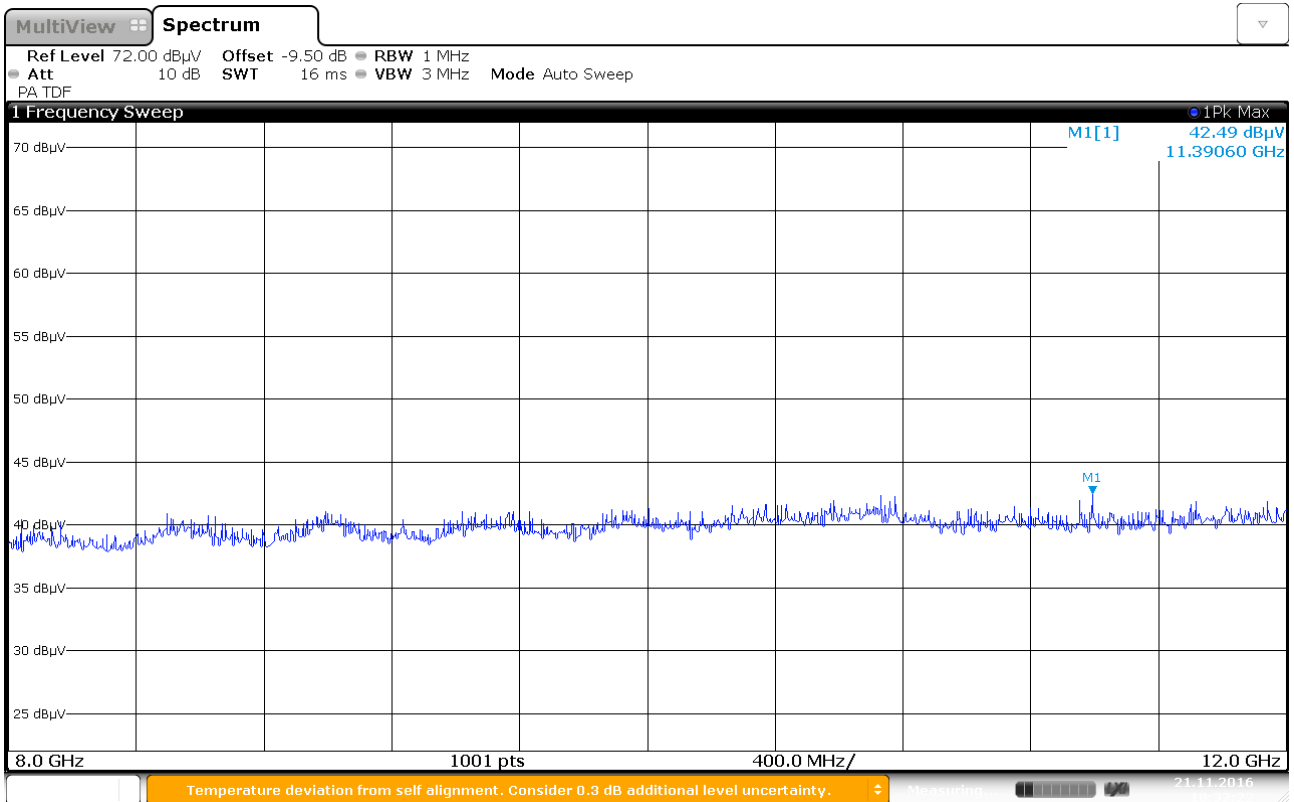
Radiated Emissions, 5.85 – 8.5 GHz, 5745 MHz, 802.11a 6M, Ant 1, VP



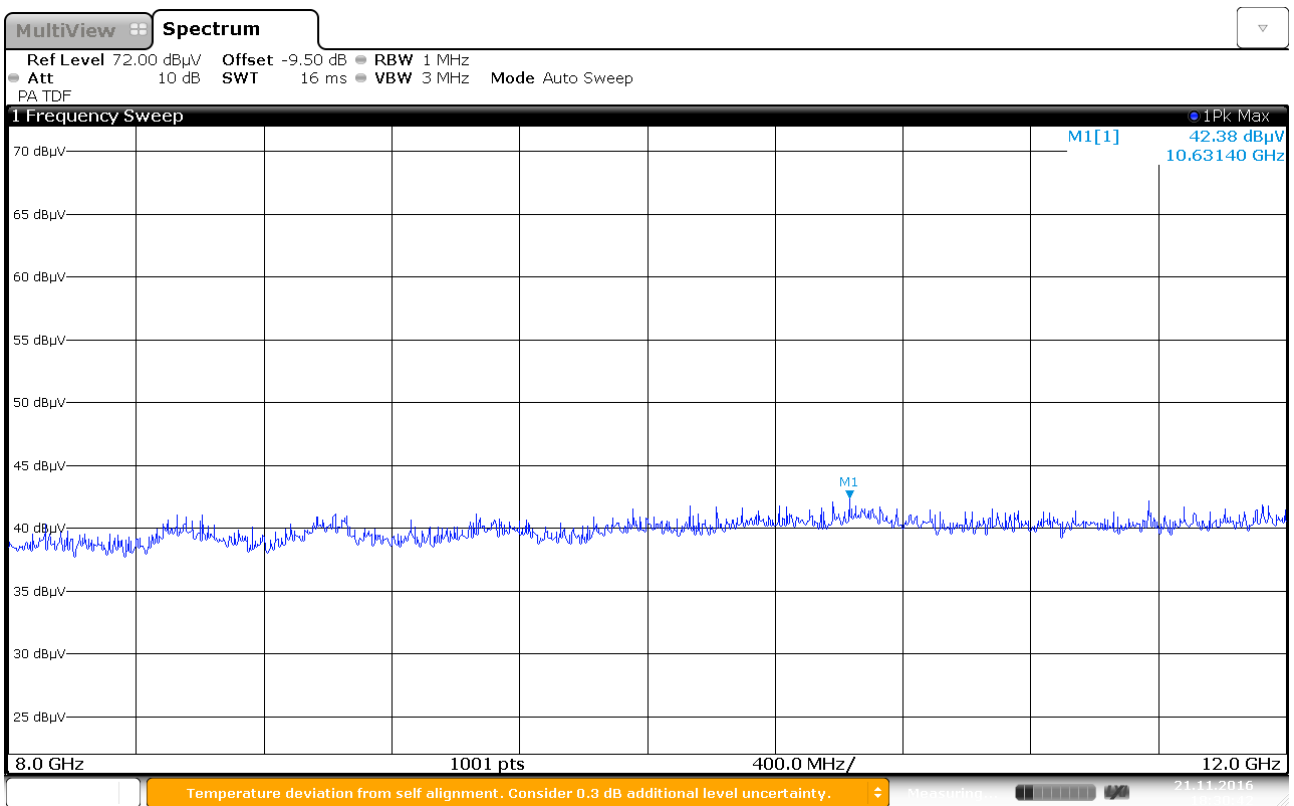
Radiated Emissions, 5.85 – 8.5 GHz, 5745 MHz, 802.11n HT20, MIMO, HP



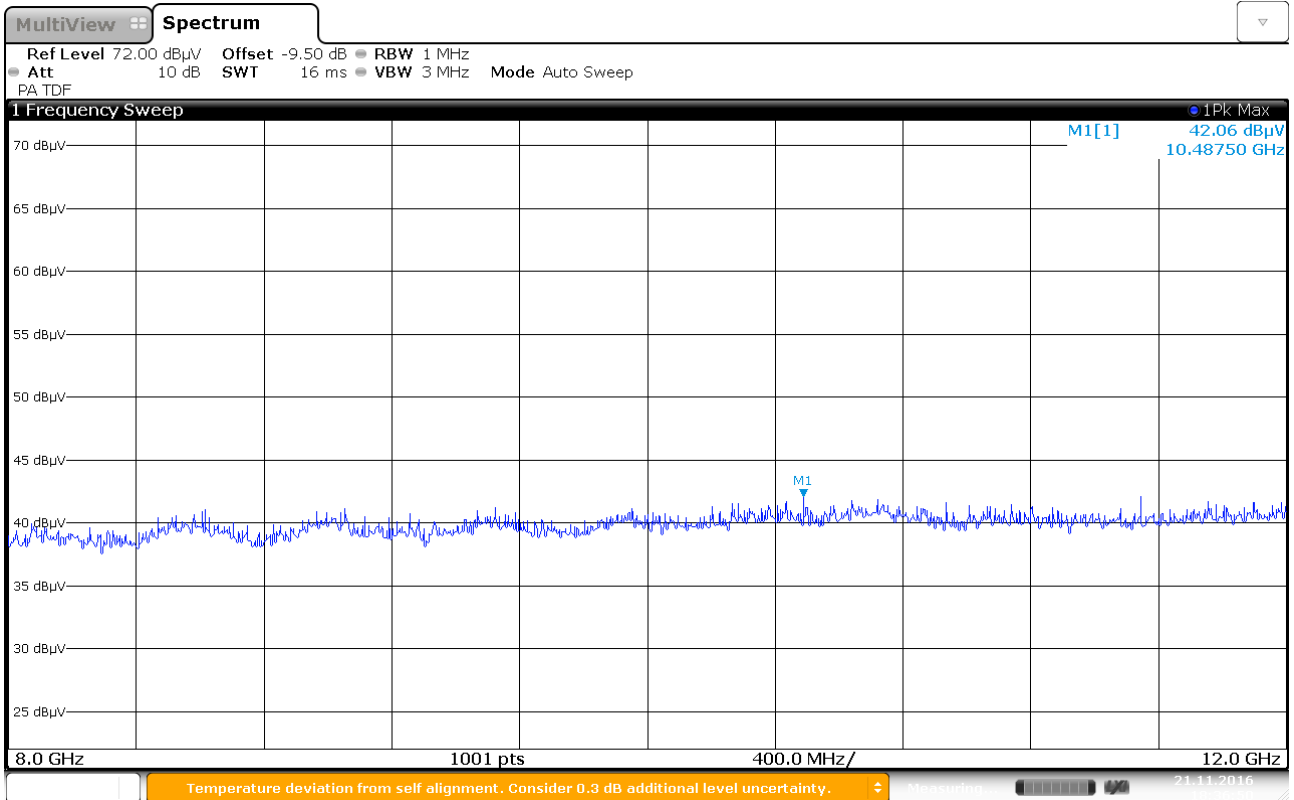
Radiated Emissions, 5.85 – 8.5 GHz, 5745 MHz, 802.11n HT20, MIMO, VP



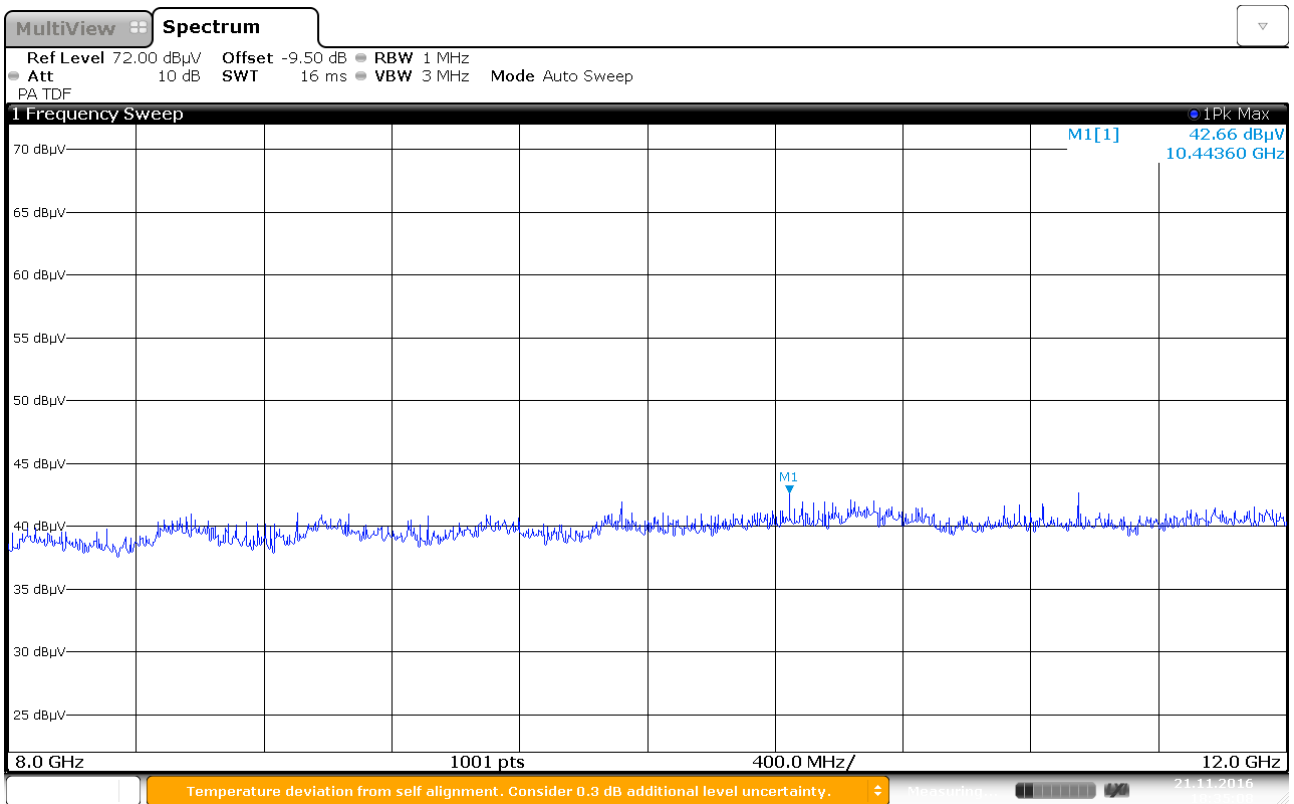
Radiated Emissions, 8.0 – 12.0 GHz, 5320 MHz, 802.11a 6M, Ant 0, HP



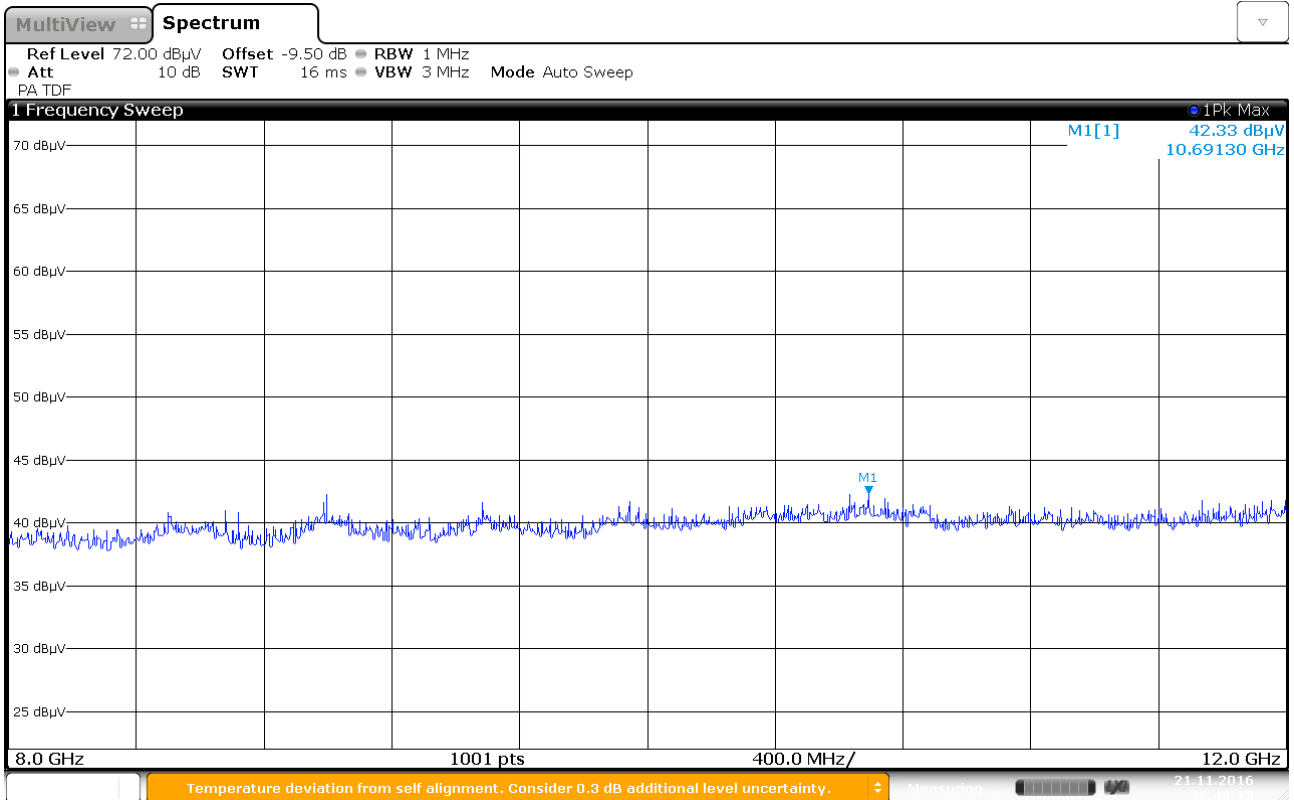
Radiated Emissions, 8.0 – 12.0 GHz, 5320 MHz, 802.11a 6M, Ant 0, VP



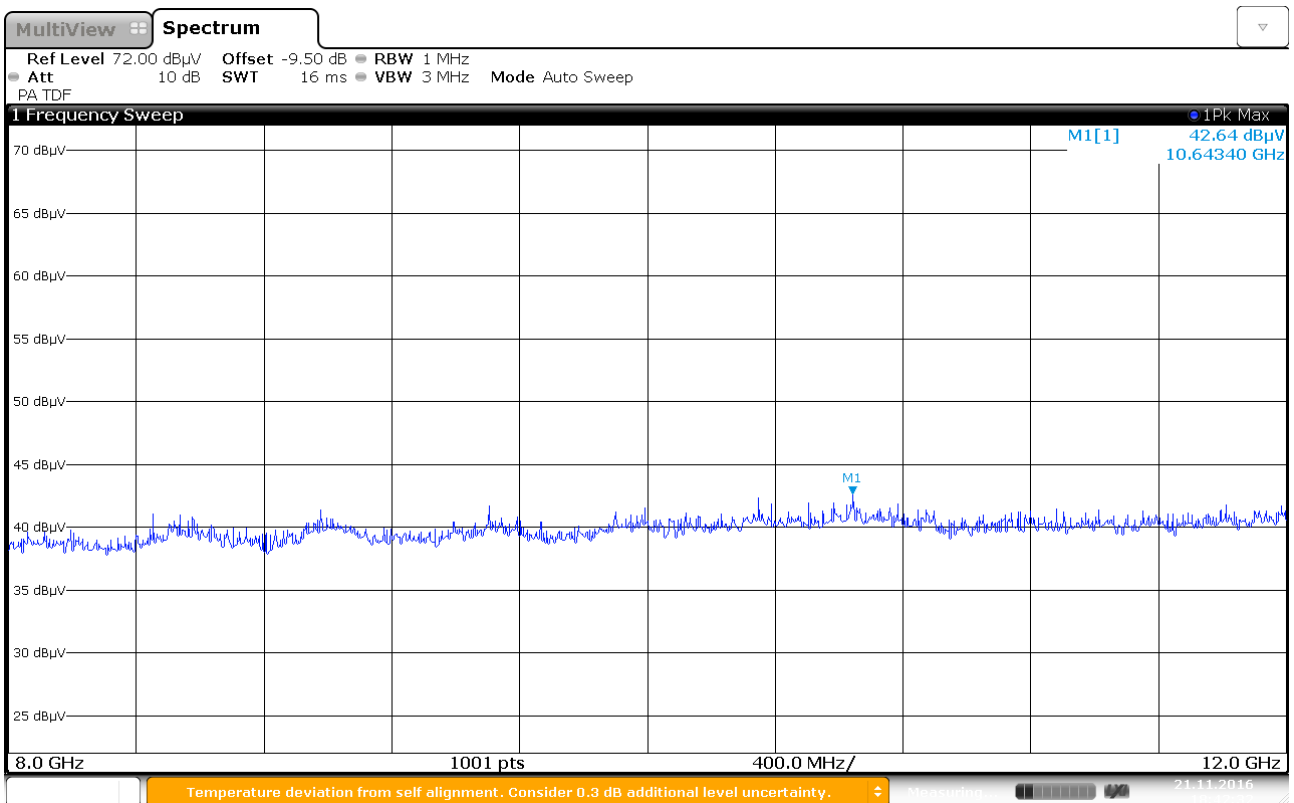
Radiated Emissions, 8.0 – 12.0 GHz, 5320 MHz, 802.11a 6M, Ant 1, HP



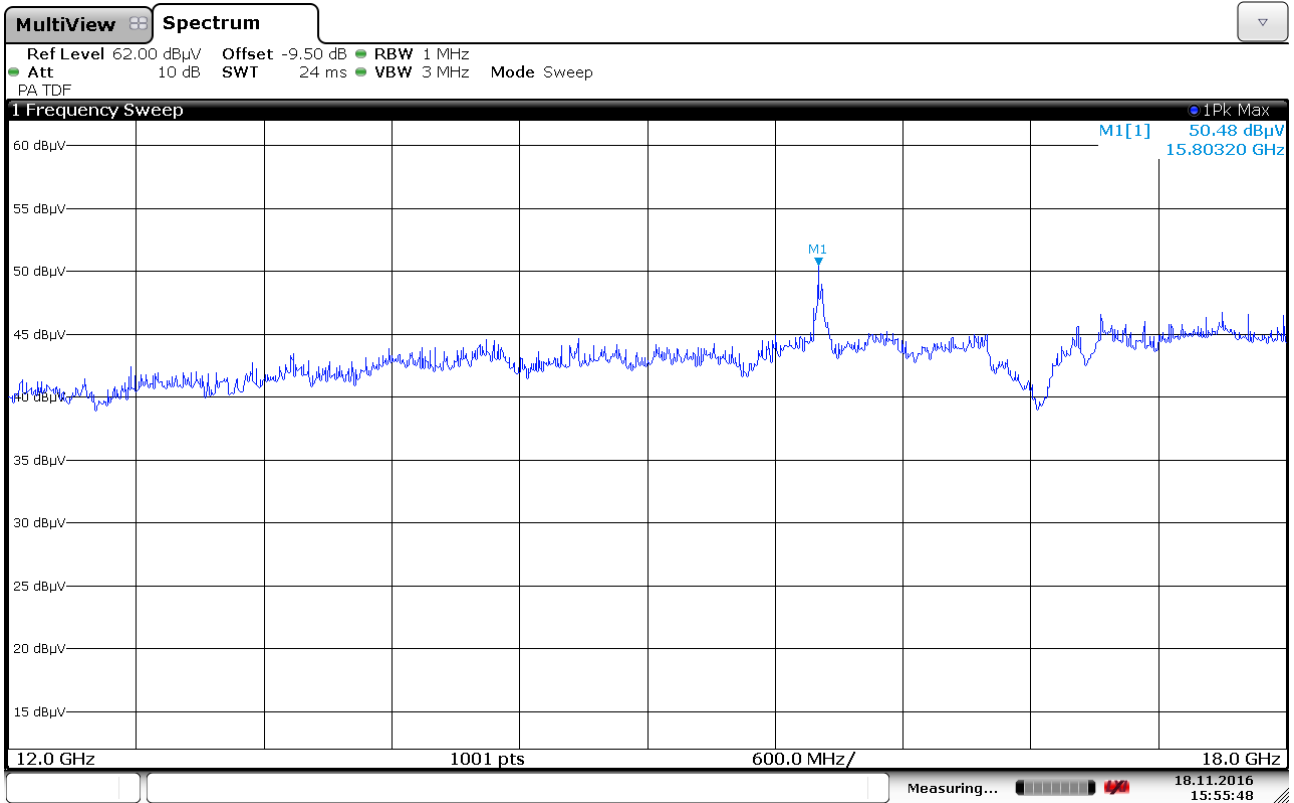
Radiated Emissions, 8.0 – 12.0 GHz, 5320 MHz, 802.11a 6M, Ant 1, VP



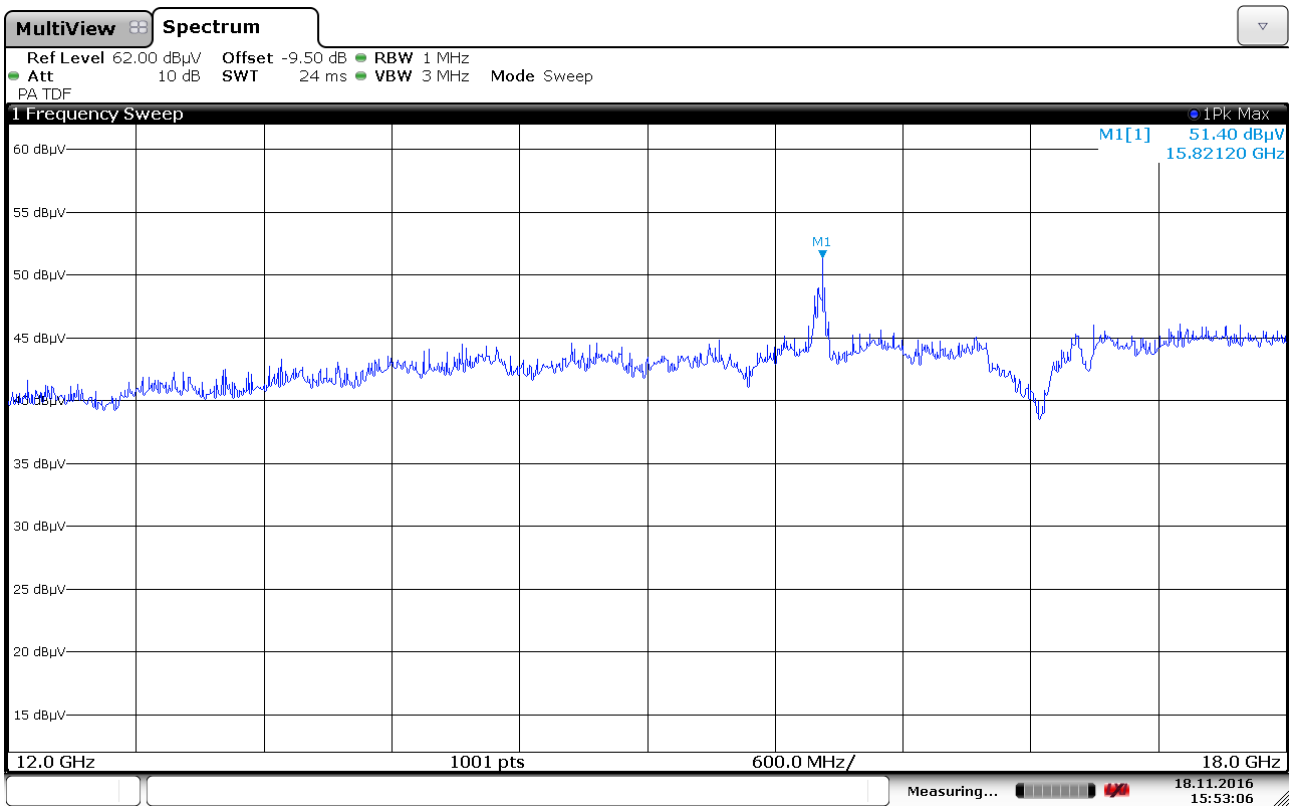
Radiated Emissions, 8.0 – 12.0 GHz, 5320 MHz, 802.11n HT20, MIMO, HP



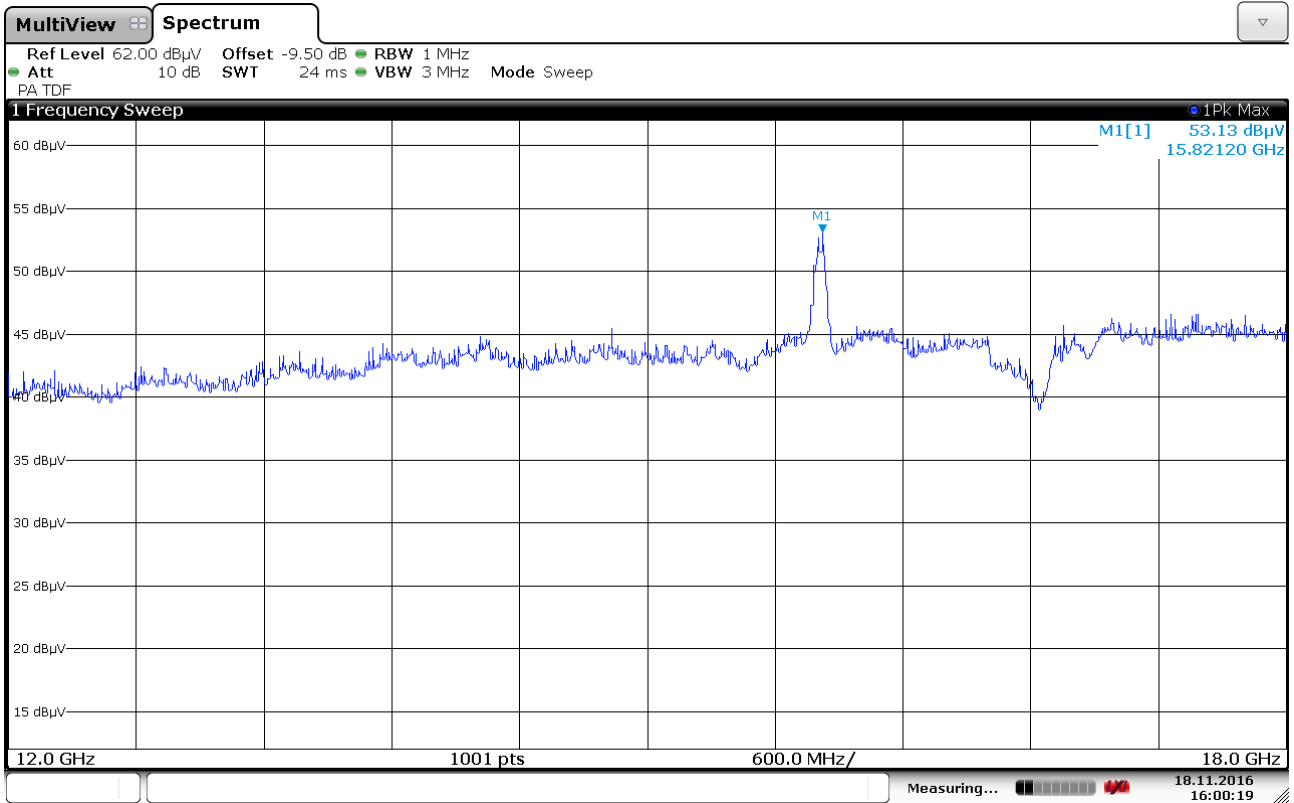
Radiated Emissions, 8.0 – 12.0 GHz, 5320 MHz, 802.11n HT20, MIMO, VP



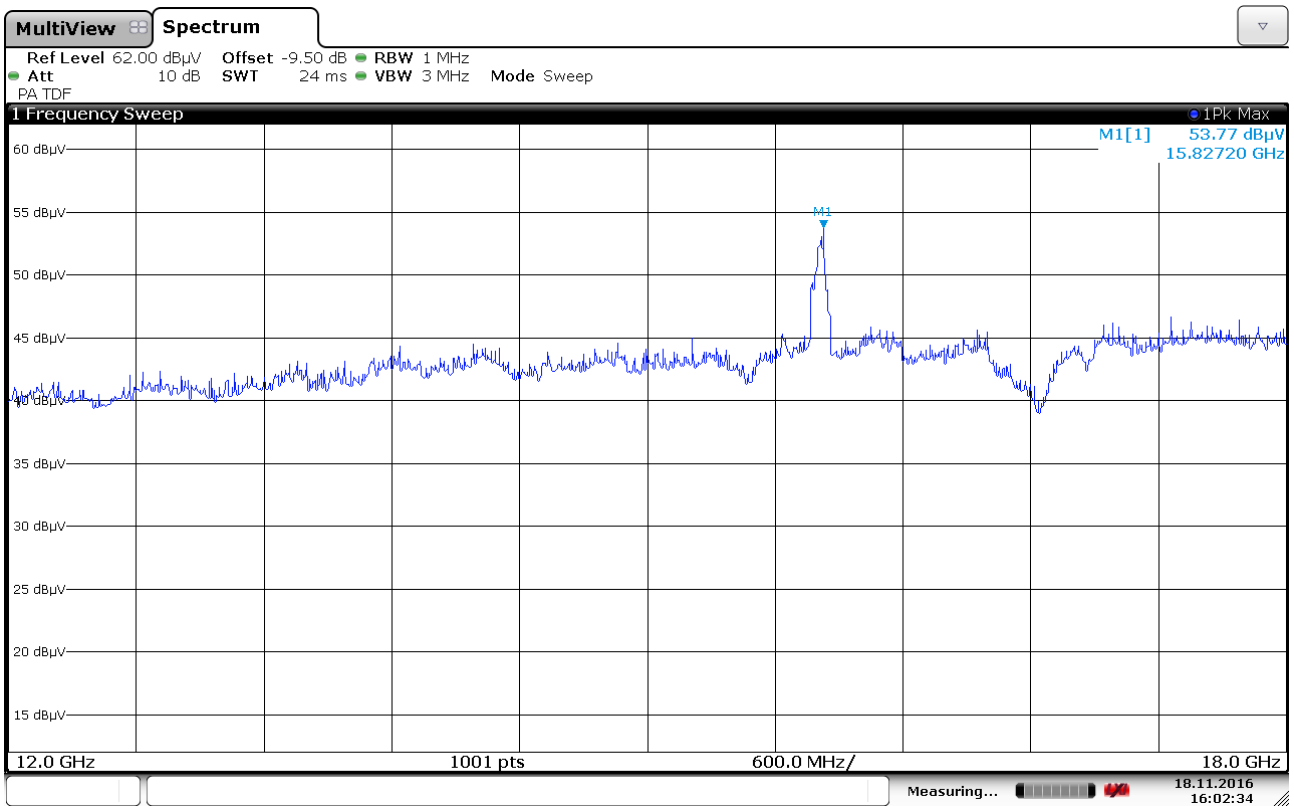
Radiated Emissions, 12.0 – 18.0 GHz, 5270 MHz, 802.11n HT40, Ant 0, HP



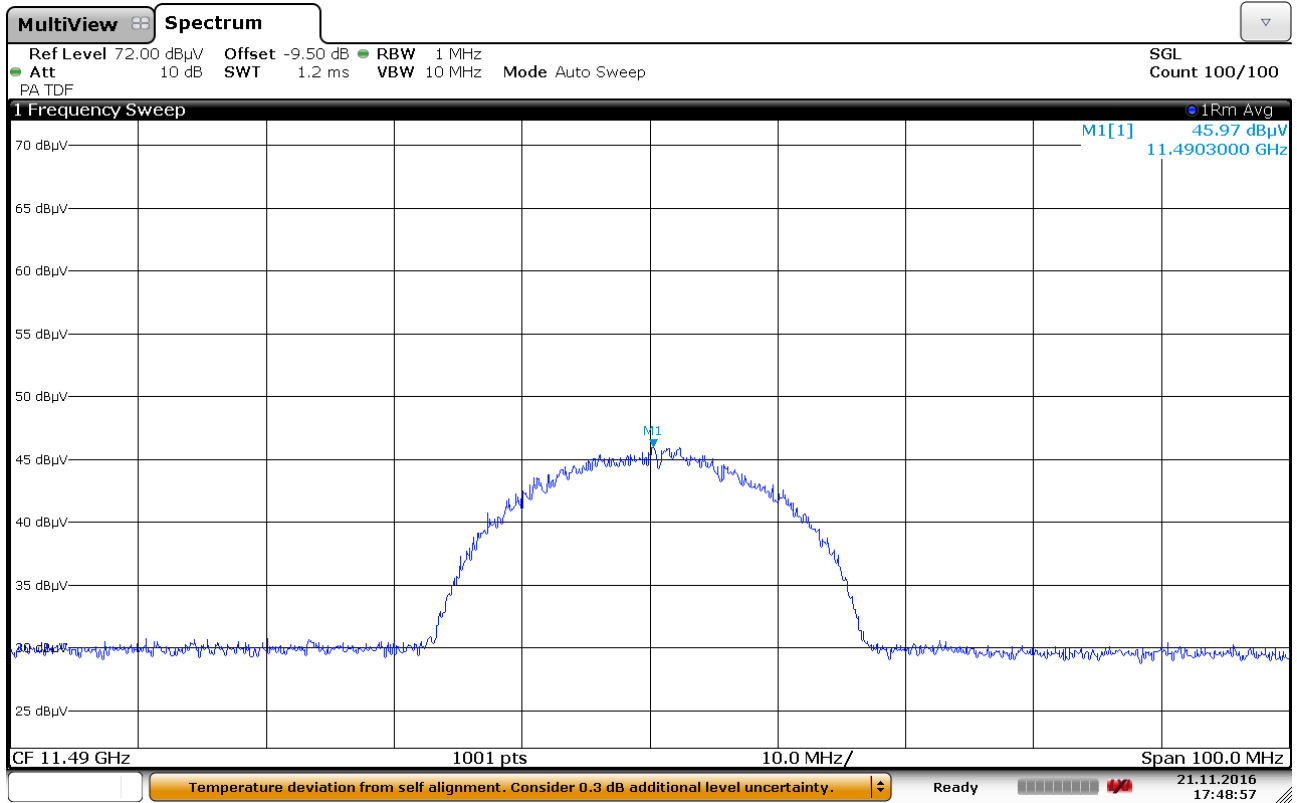
Radiated Emissions, 12.0 – 18.0 GHz, 5270 MHz, 802.11n HT40, Ant 0, VP



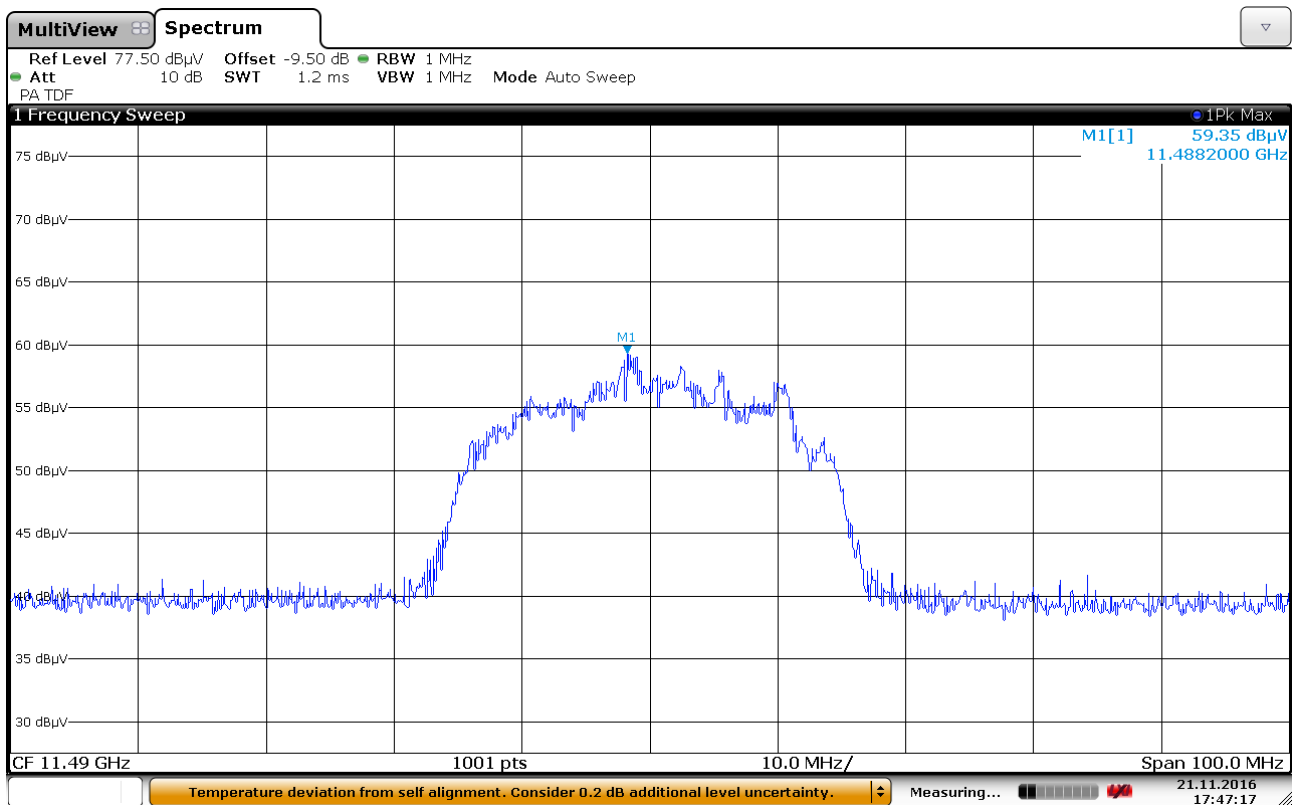
Radiated Emissions, 12.0 – 18.0 GHz, 5270 MHz, 802.11n HT40, Ant 1, HP



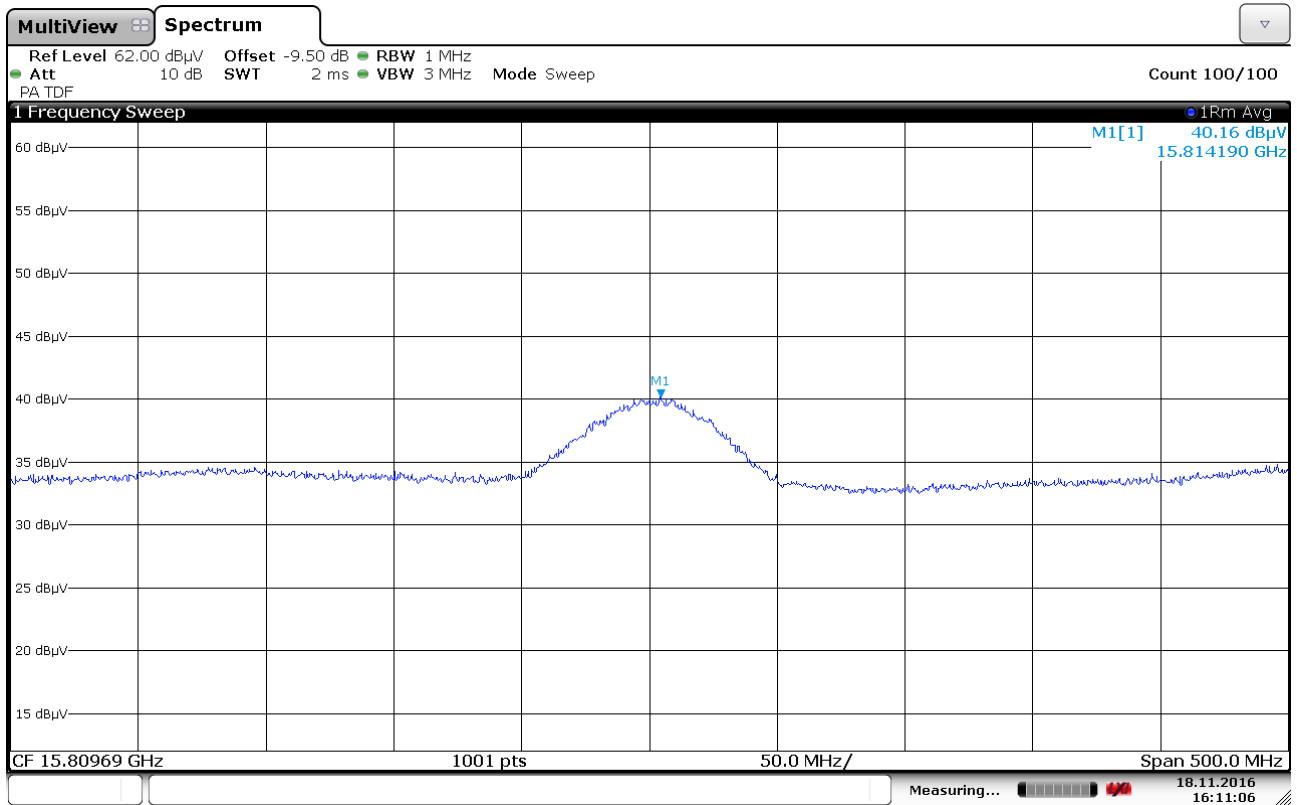
Radiated Emissions, 12.0 – 18.0 GHz, 5270 MHz, 802.11n HT40, Ant 1, VP



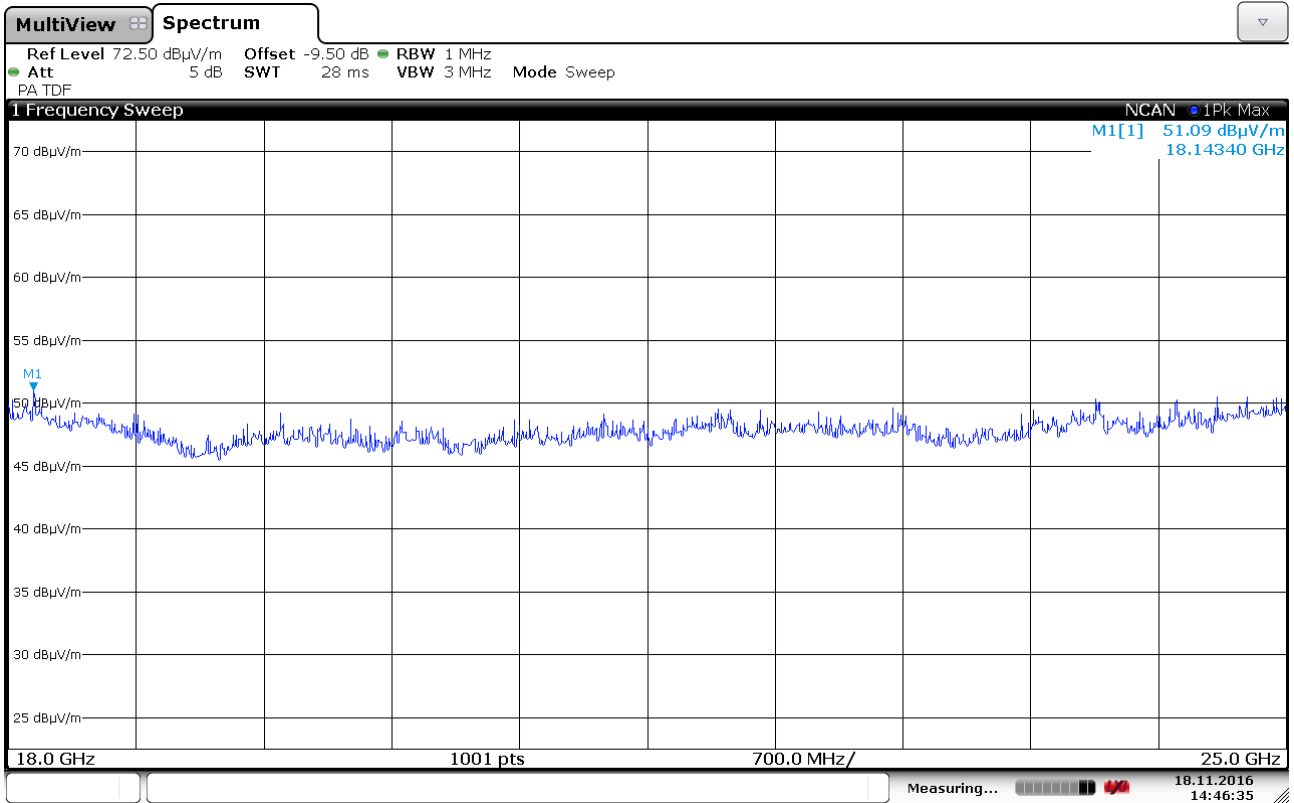
Radiated Emissions Av, 11.49.81 GHz, 5745 MHz, 802.11a 6M, Ant 0, VP



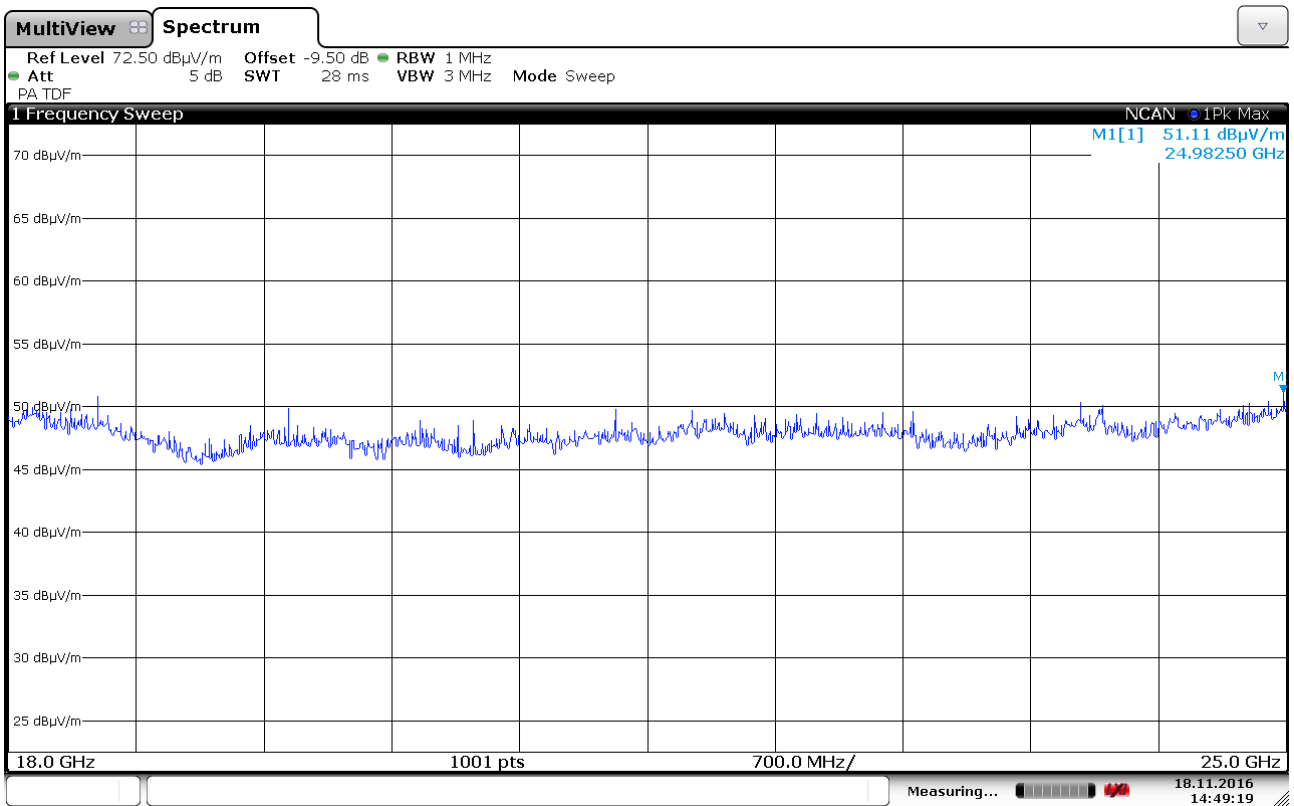
Radiated Emissions Pk, 11.49.81 GHz, 5745 MHz, 802.11a 6M, Ant 0, VP



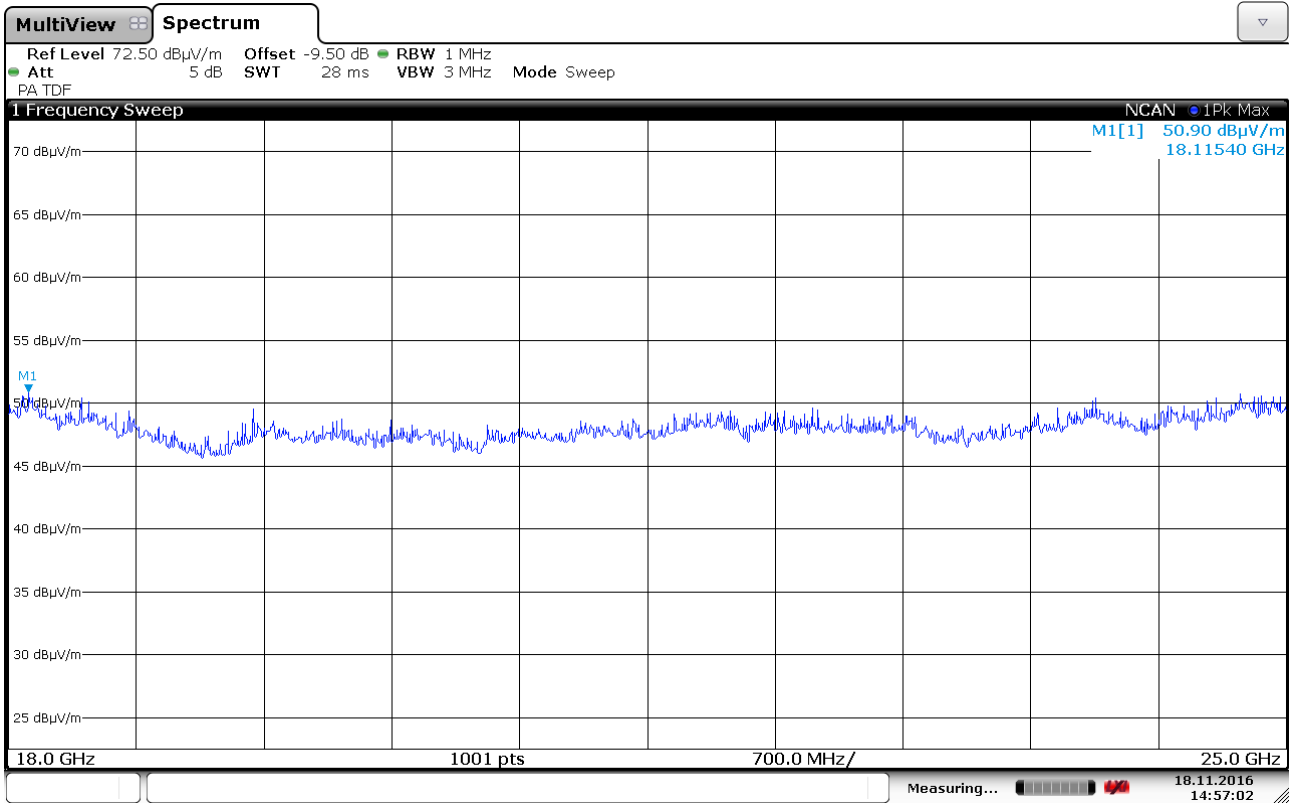
Radiated Emissions Av, 15.81 GHz, 5270 MHz, 802.11n HT40, Ant 1, VP



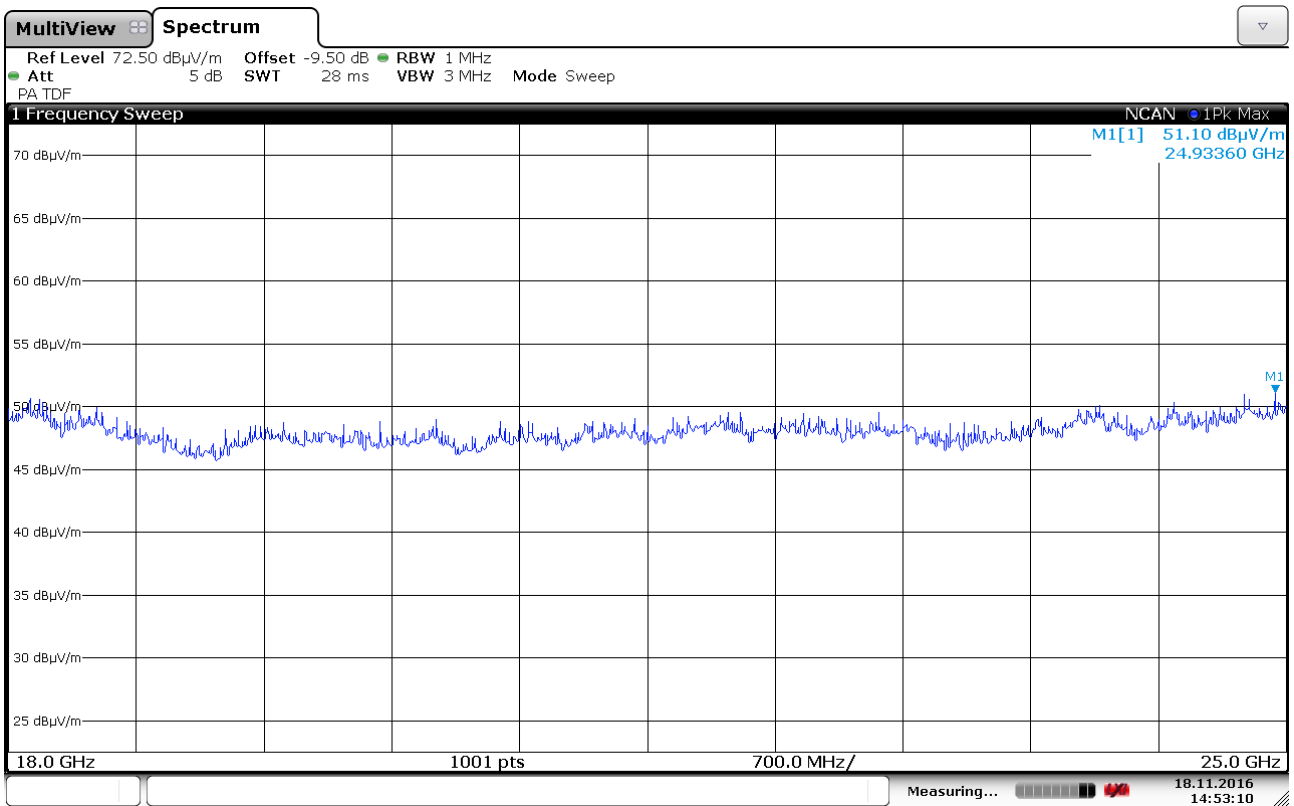
Radiated Emissions, 18.0 – 25.0 GHz, 5260 MHz, 802.11a 6M, Ant 0, HP



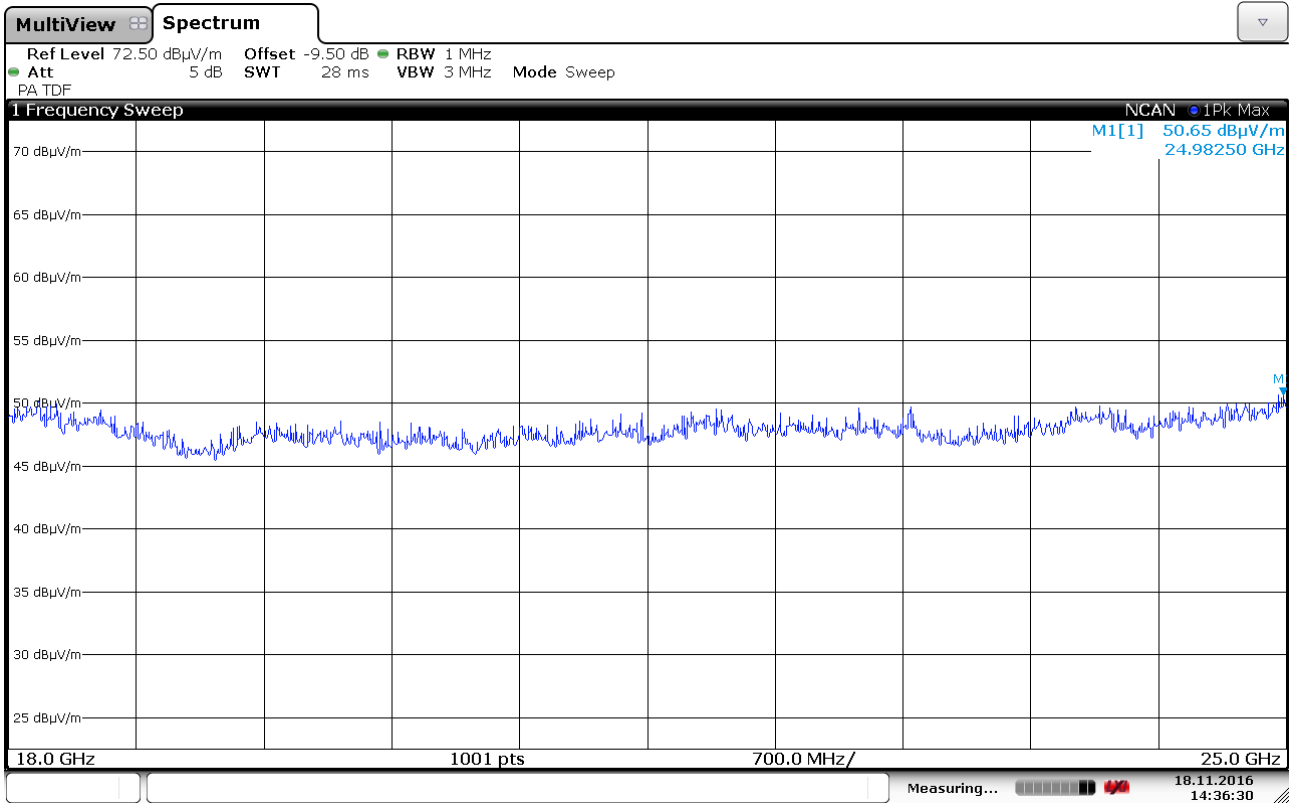
Radiated Emissions, 18.0 – 25.0 GHz, 5260 MHz, 802.11a 6M, Ant 0, VP



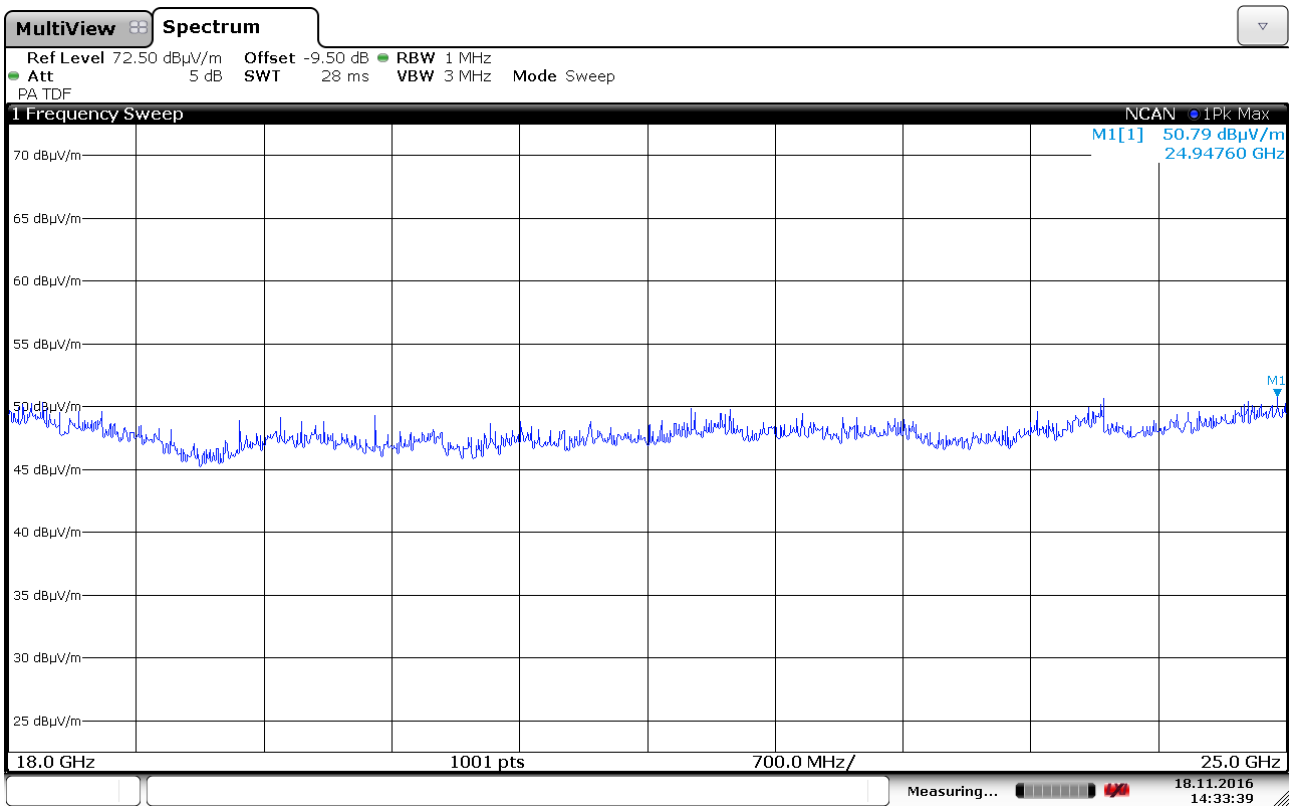
Radiated Emissions, 18.0 – 25.0 GHz, 5260 MHz, 802.11a 6M, Ant 1, HP



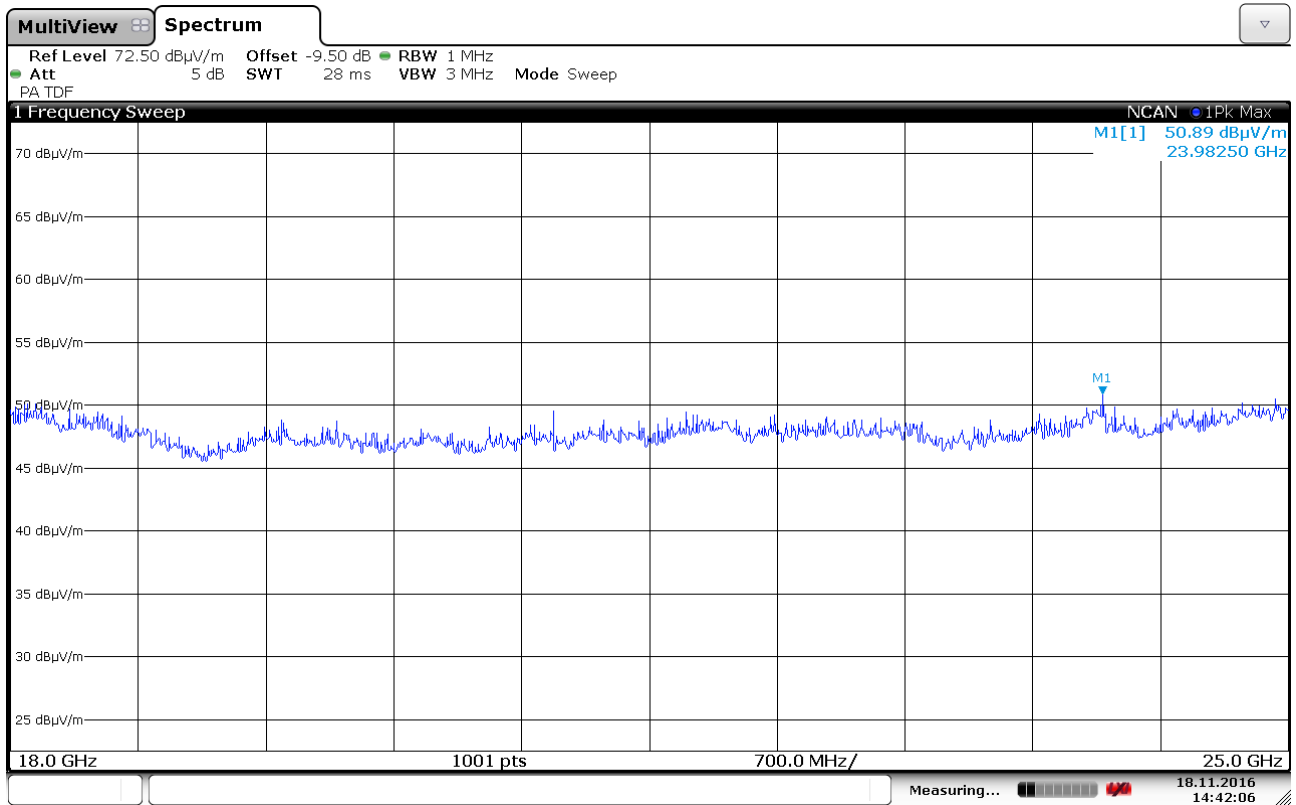
Radiated Emissions, 18.0 – 25.0 GHz, 5260 MHz, 802.11a 6M, Ant 1, VP



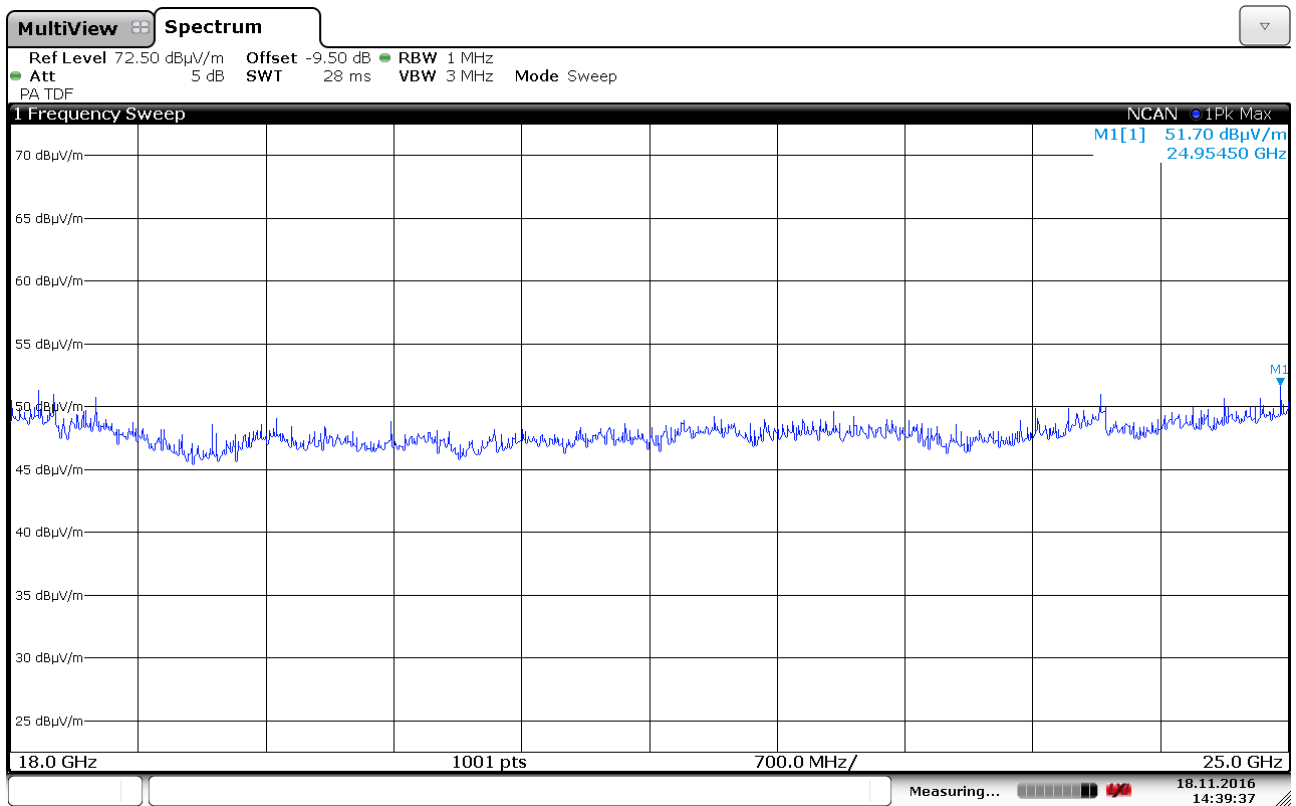
Radiated Emissions, 18.0 – 25.0 GHz, 5745 MHz, 802.11a 6M, Ant 0, HP



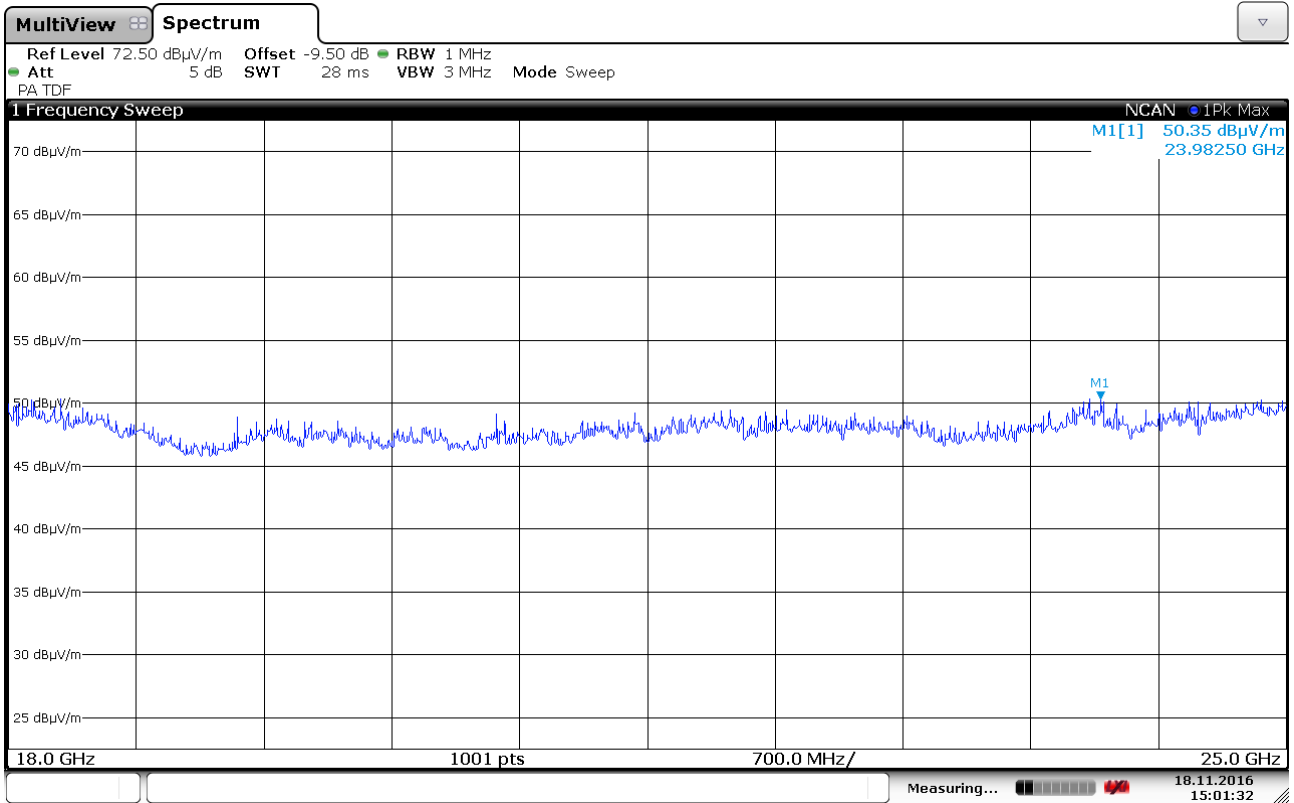
Radiated Emissions, 18.0 – 25.0 GHz, 5745 MHz, 802.11a 6M, Ant 0, VP



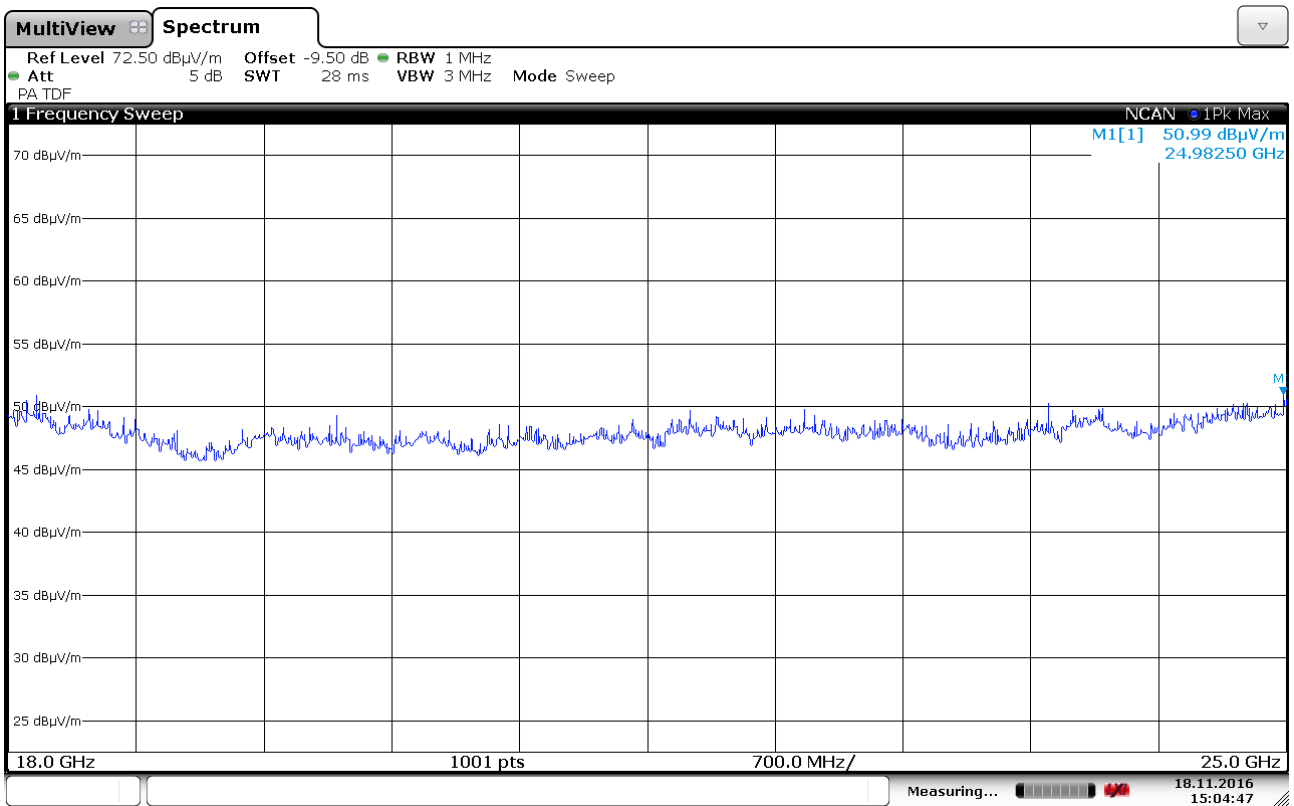
Radiated Emissions, 18.0 – 25.0 GHz, 5745 MHz, 802.11a 6M, Ant 1, HP



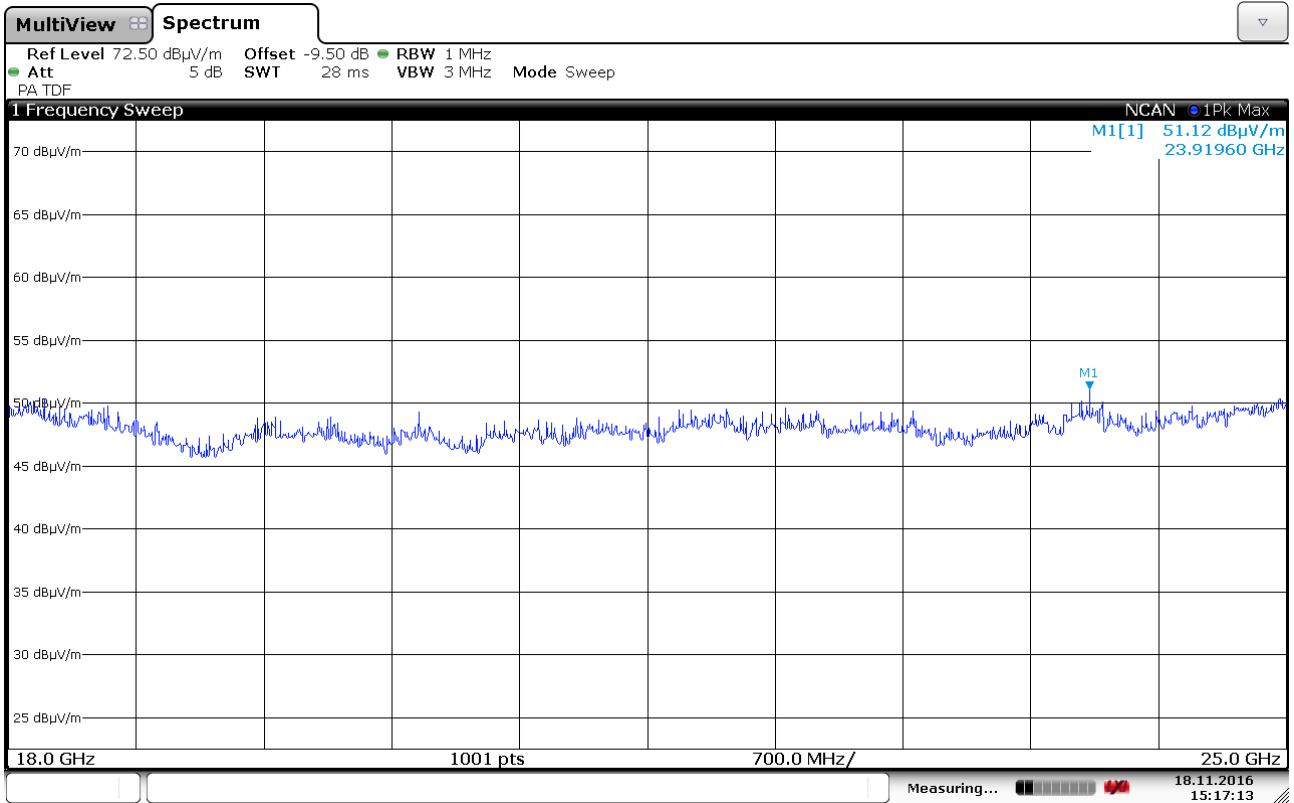
Radiated Emissions, 18.0 – 25.0 GHz, 5745 MHz, 802.11a 6M, Ant 1, VP



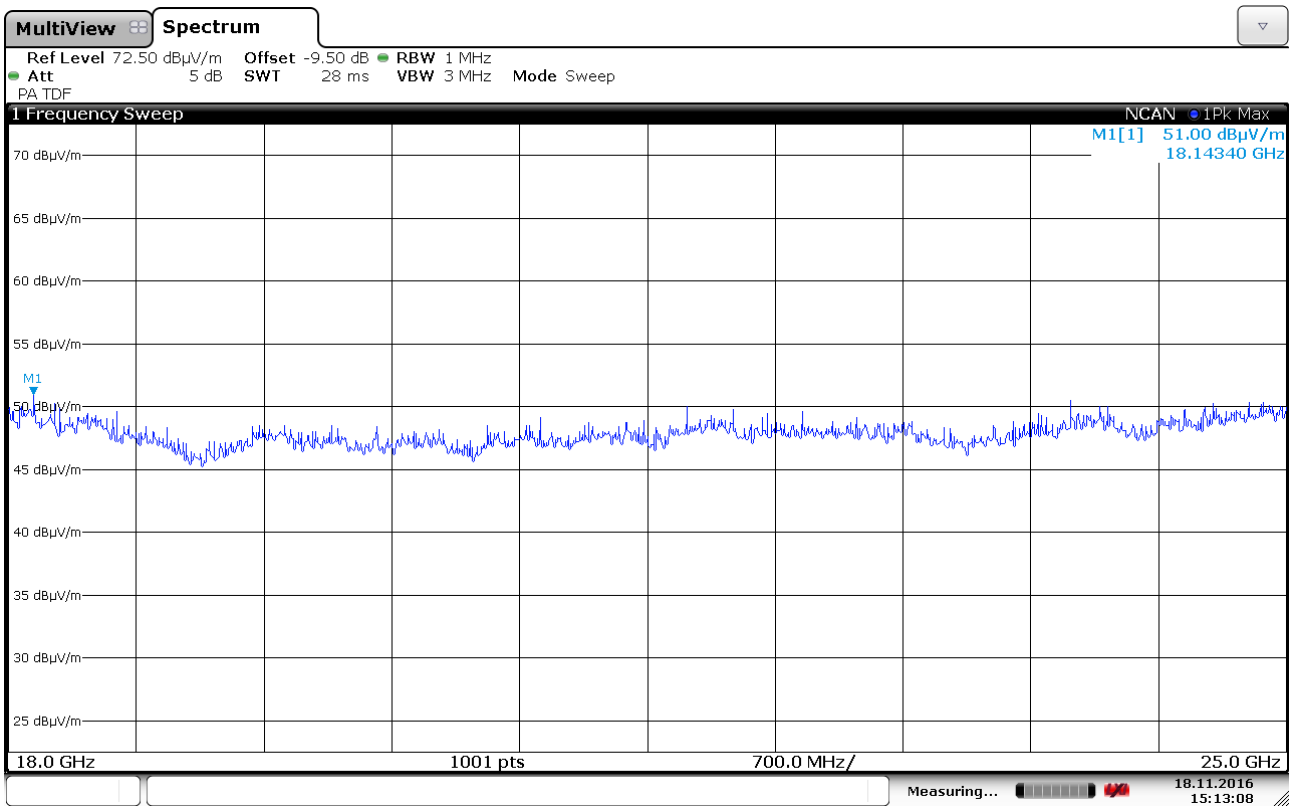
Radiated Emissions, 18.0 – 25.0 GHz, 5260 MHz, 802.11n HT20, MIMO, HP



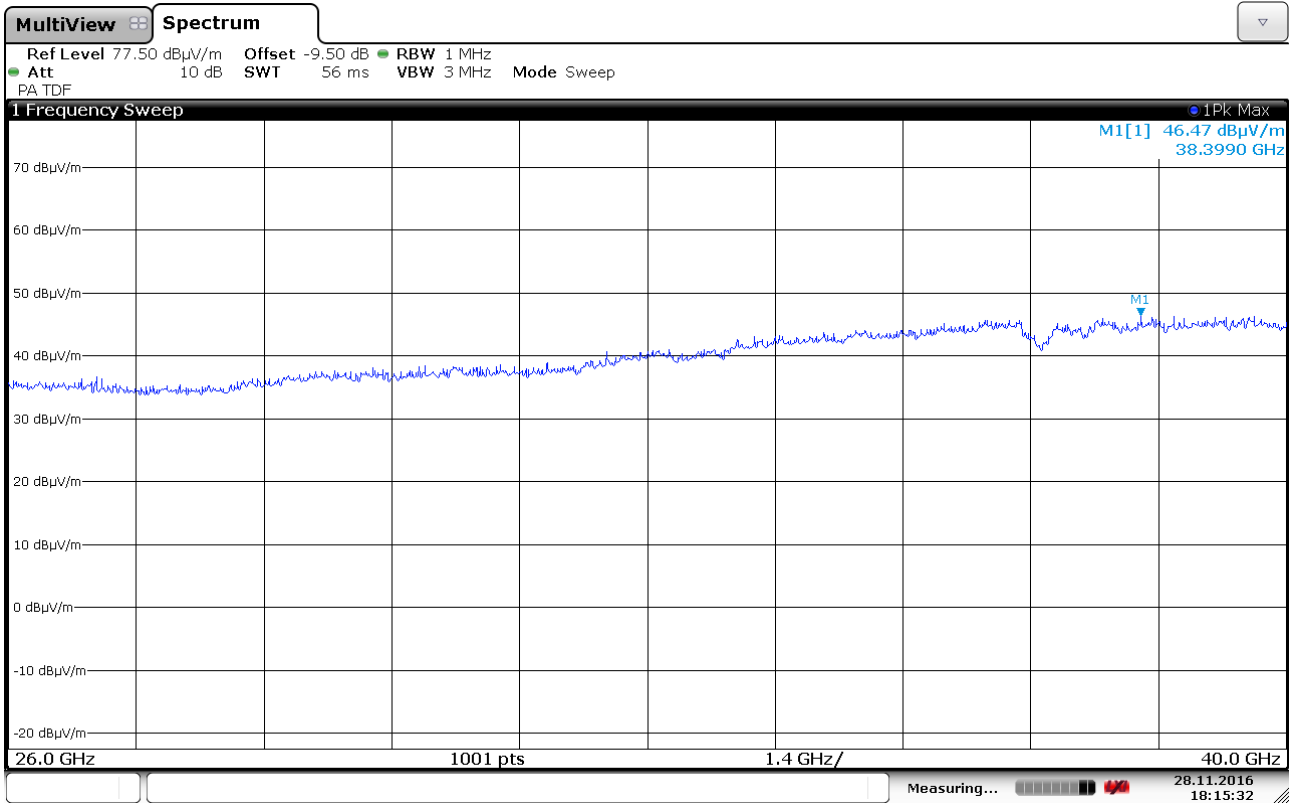
Radiated Emissions, 18.0 – 25.0 GHz, 5260 MHz, 802.11n HT20, MIMO, VP



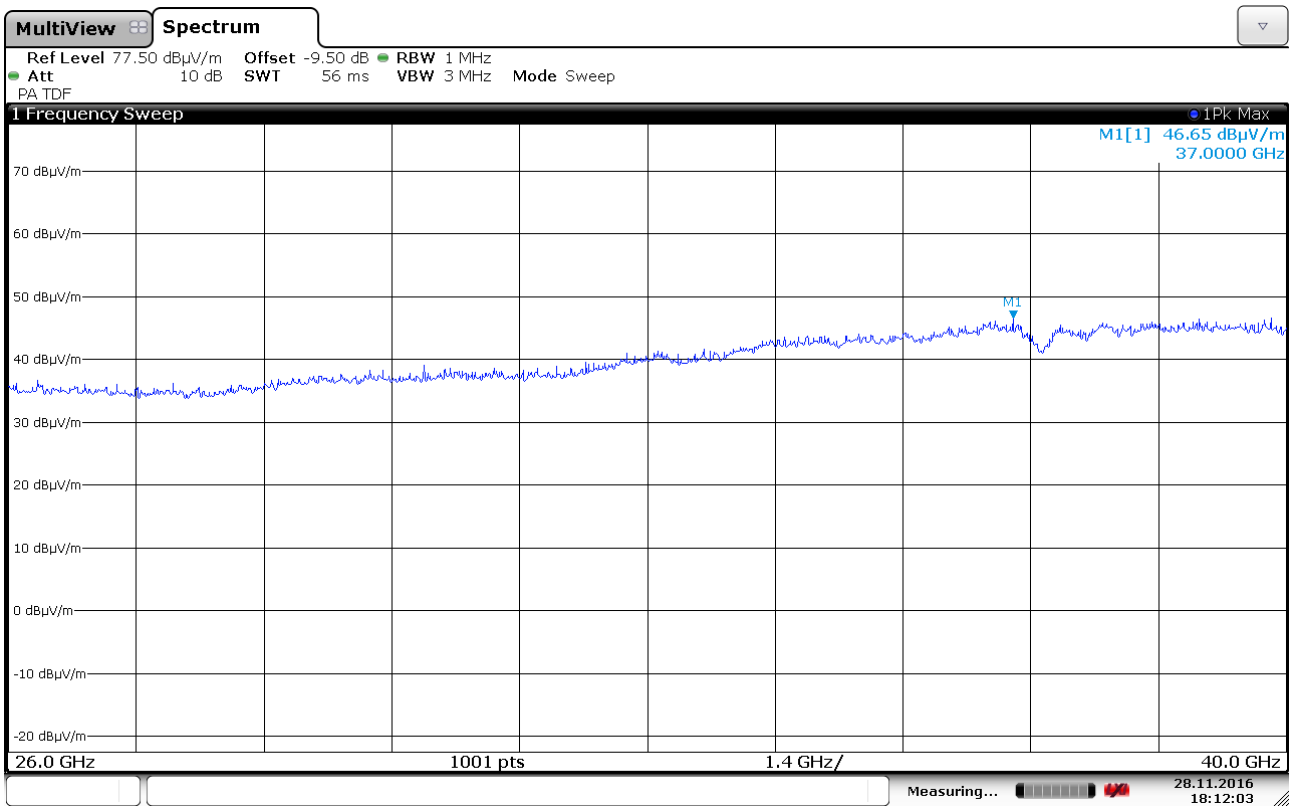
Radiated Emissions, 18.0 – 25.0 GHz, 5270 MHz, 802.11n HT40, MIMO, HP



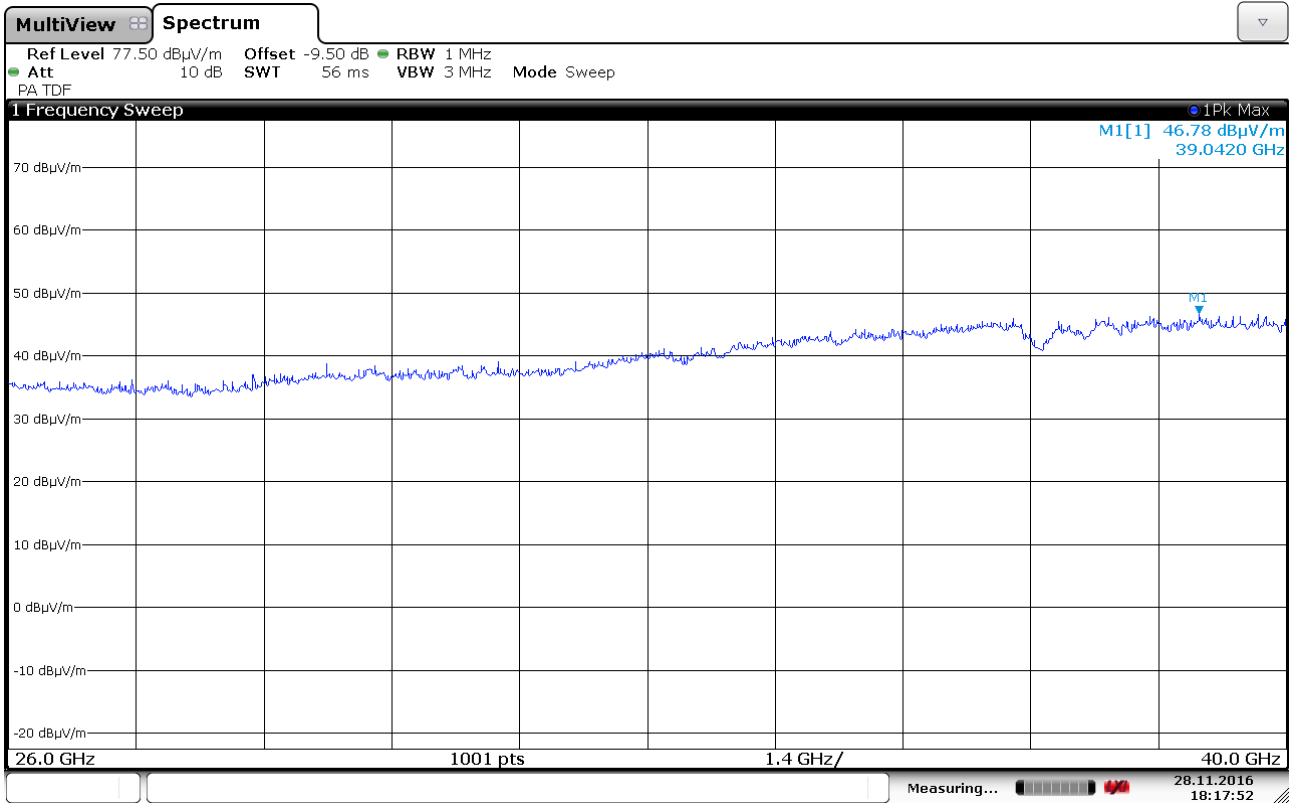
Radiated Emissions, 18.0 – 25.0 GHz, 5270 MHz, 802.11n HT40, MIMO, VP



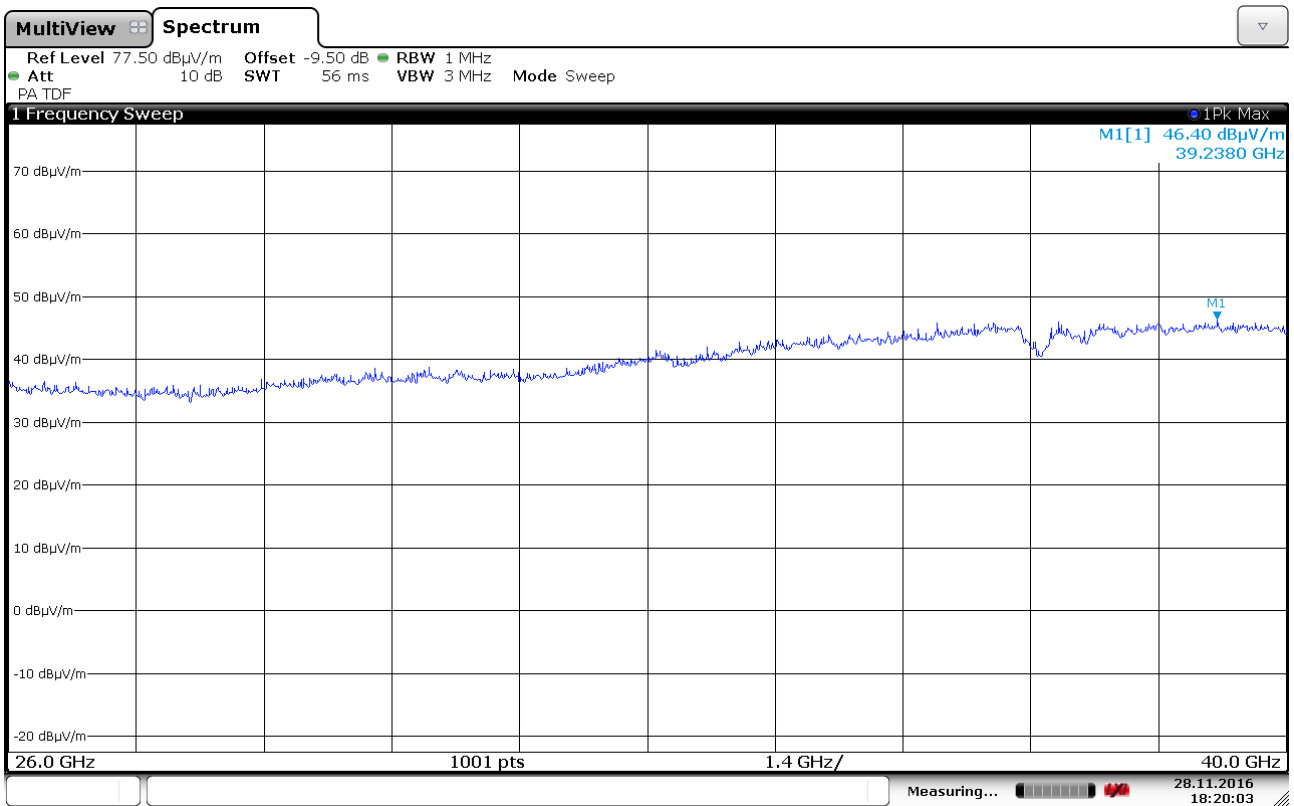
Radiated Emissions, 26.0 – 40.0 GHz, 5280 MHz, 802.11a 6M, Ant 0, HP



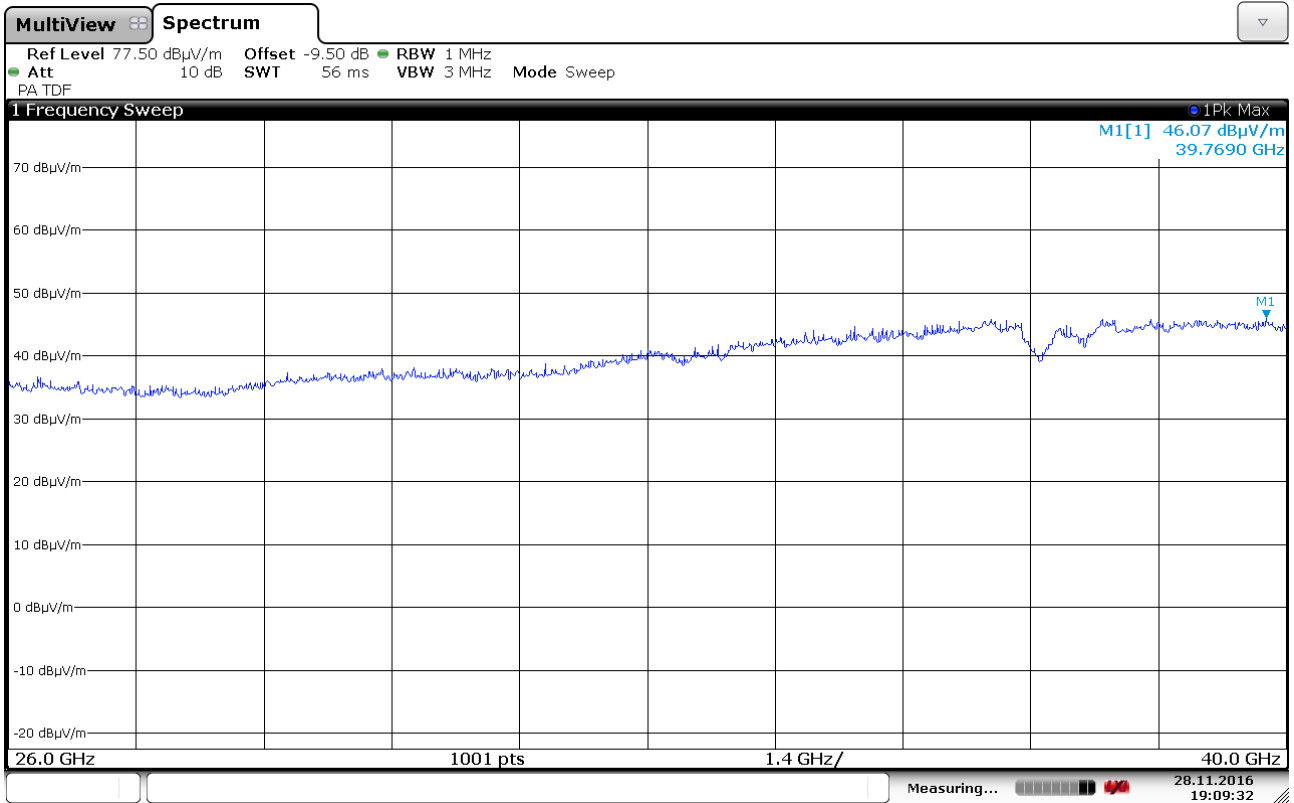
Radiated Emissions, 26.0 – 40.0 GHz, 5280 MHz, 802.11a 6M, Ant 0, VP



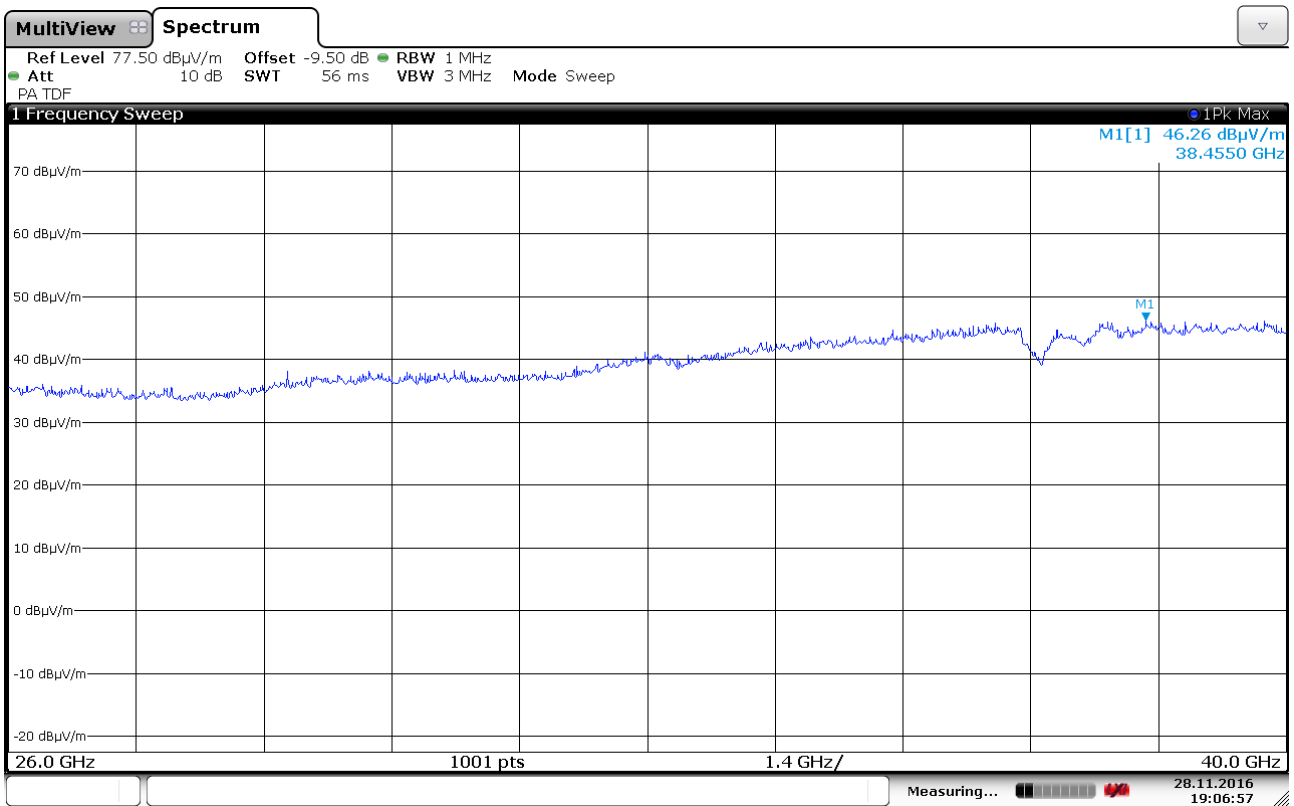
Radiated Emissions, 26.0 – 40.0 GHz, 5280 MHz, 802.11a 6M, Ant 1, HP



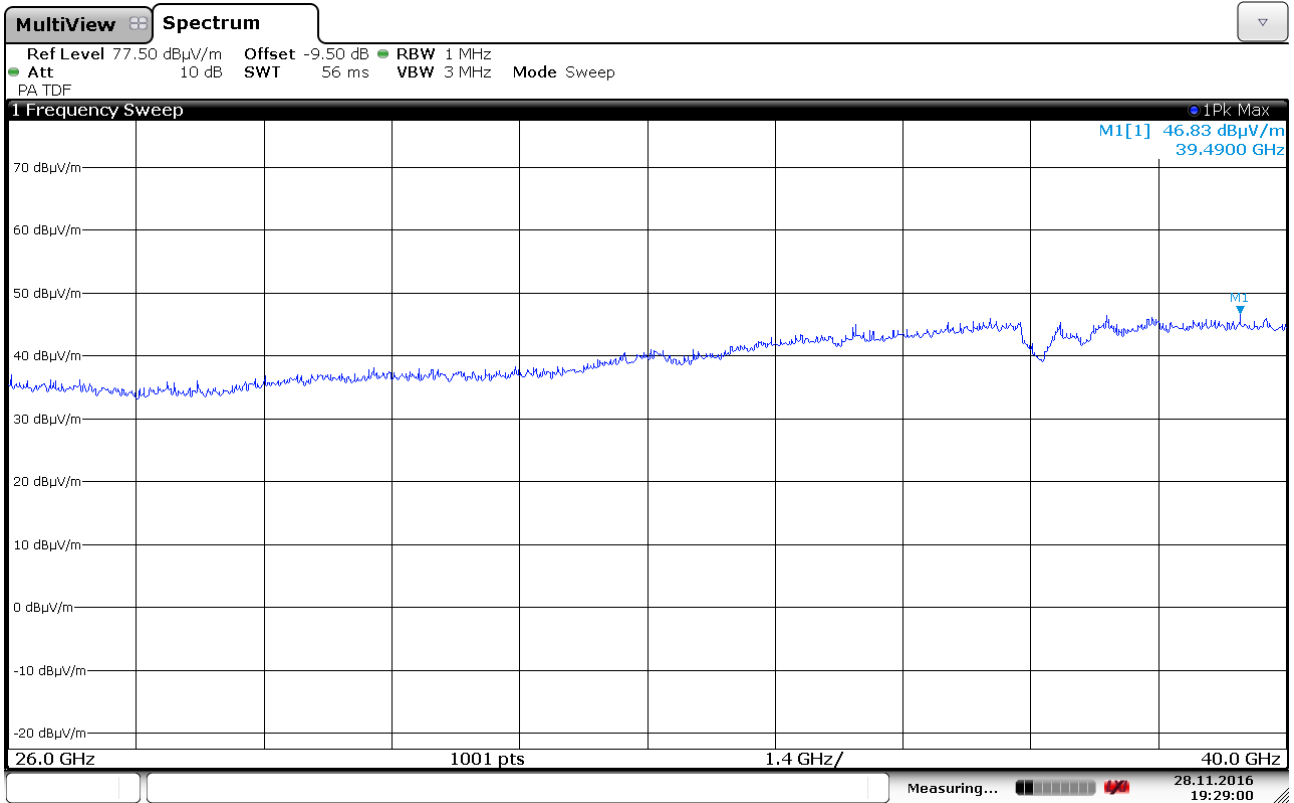
Radiated Emissions, 26.0 – 40.0 GHz, 5280 MHz, 802.11a 6M, Ant 1, VP



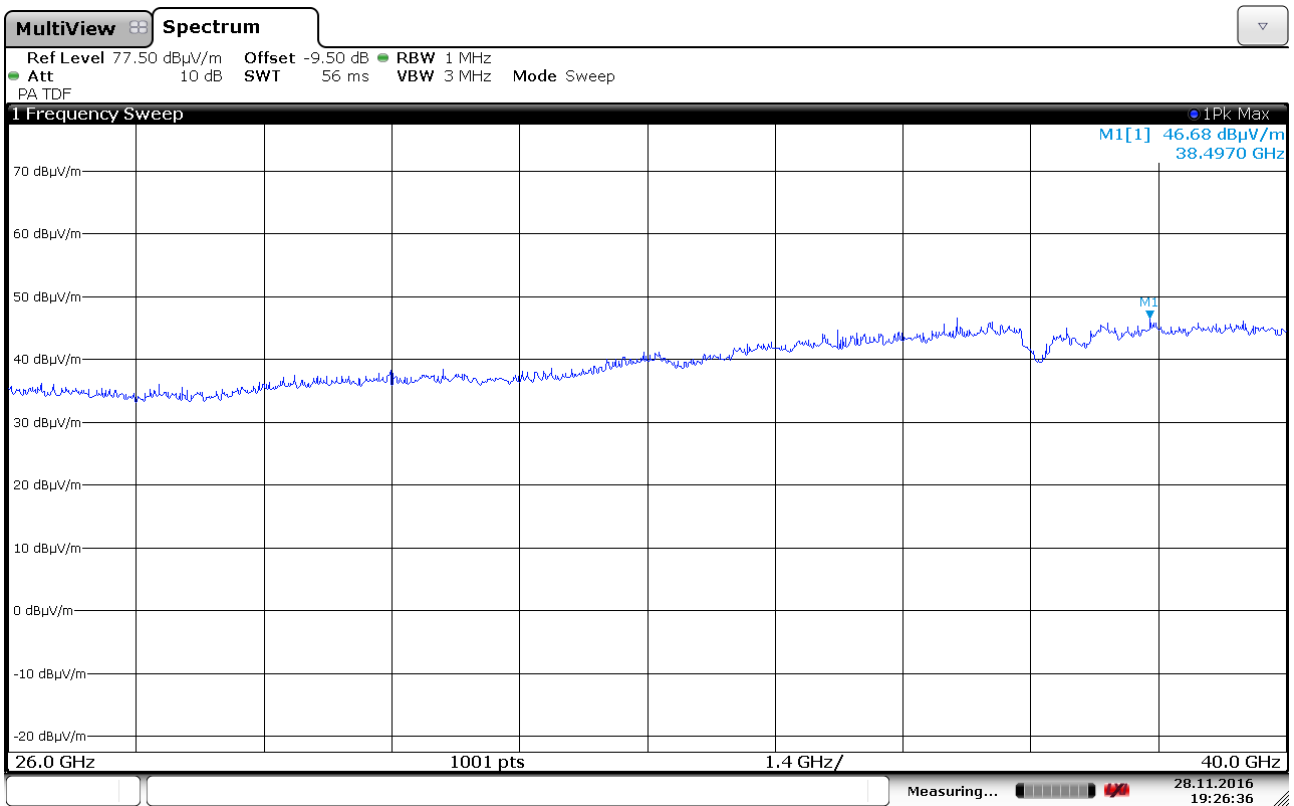
Radiated Emissions, 26.0 – 40.0 GHz, 5280 MHz, 802.11n HT20, MIMO, HP



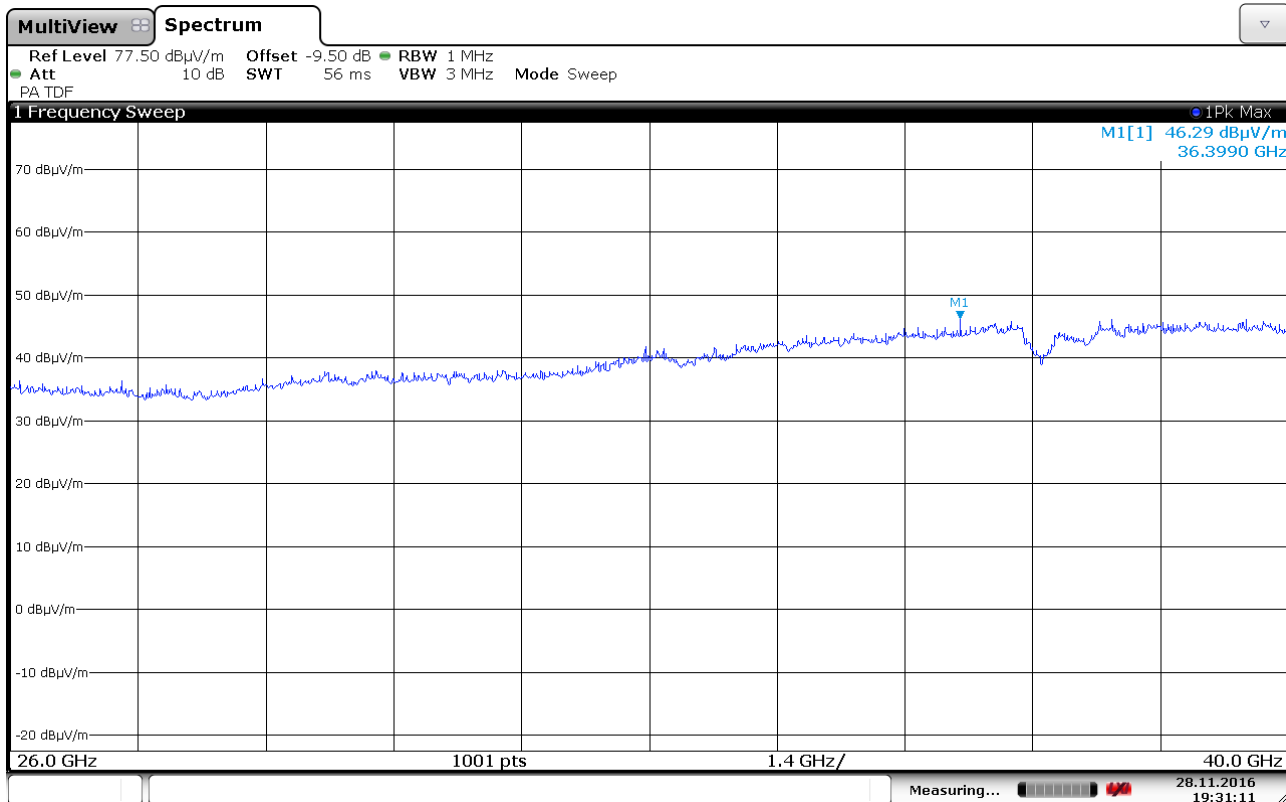
Radiated Emissions, 26.0 – 40.0 GHz, 5280 MHz, 802.11n HT20, MIMO, VP



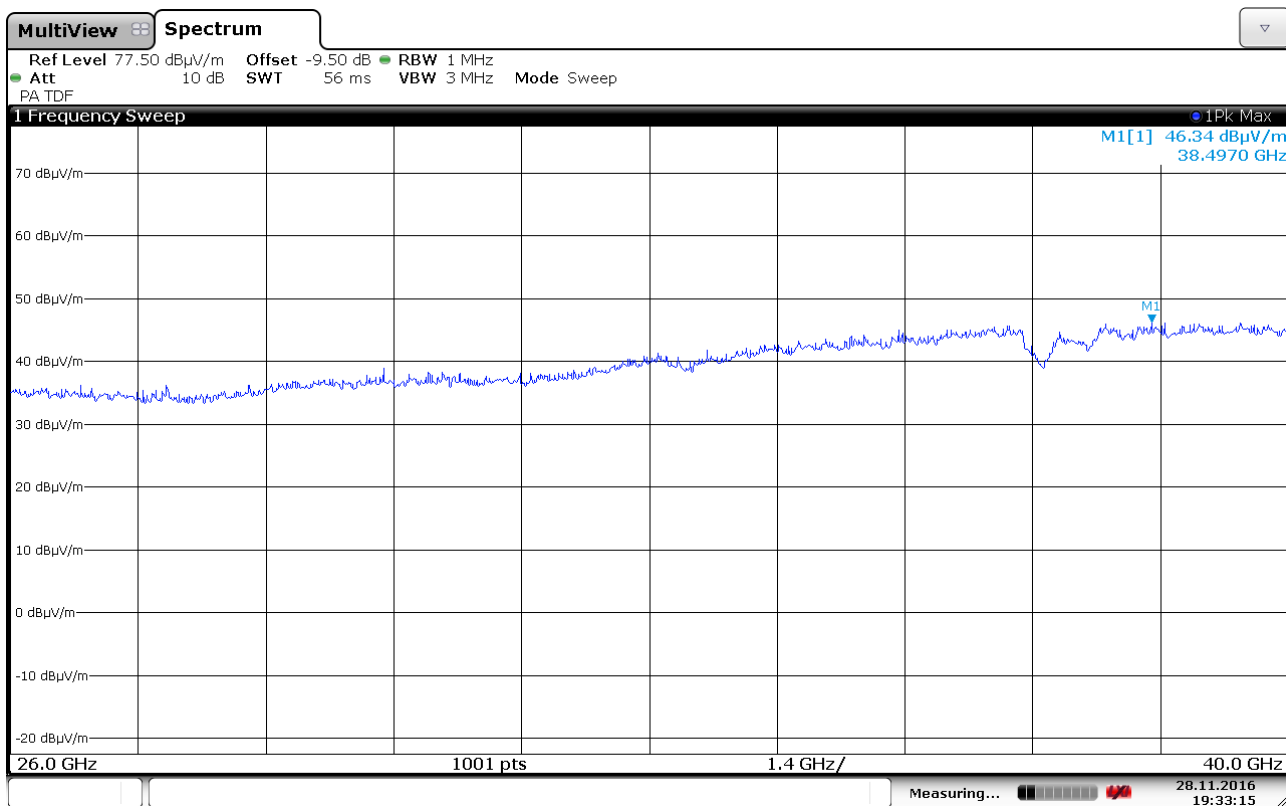
Radiated Emissions, 26.0 – 40.0 GHz, 5660 MHz, 802.11a 6M, Ant 0, HP



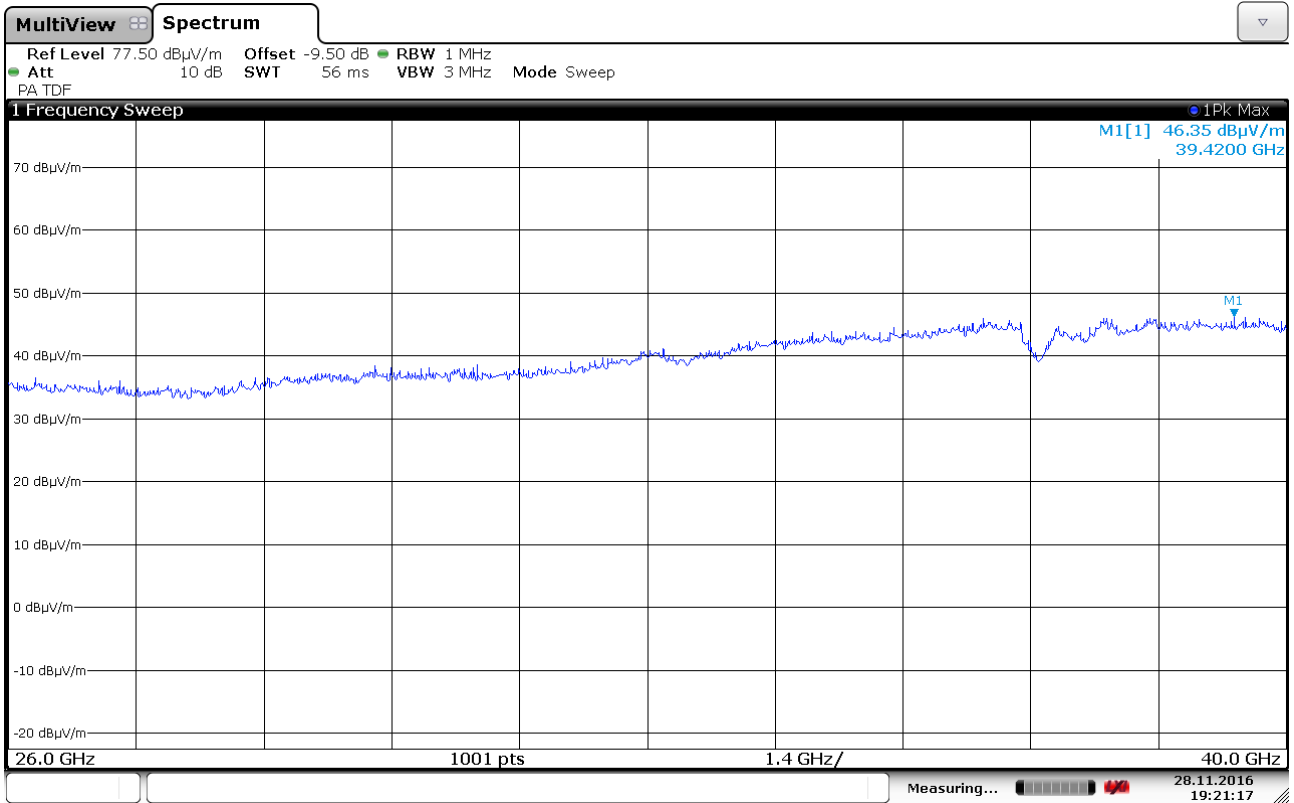
Radiated Emissions, 26.0 – 40.0 GHz, 5660 MHz, 802.11a 6M, Ant 0, VP



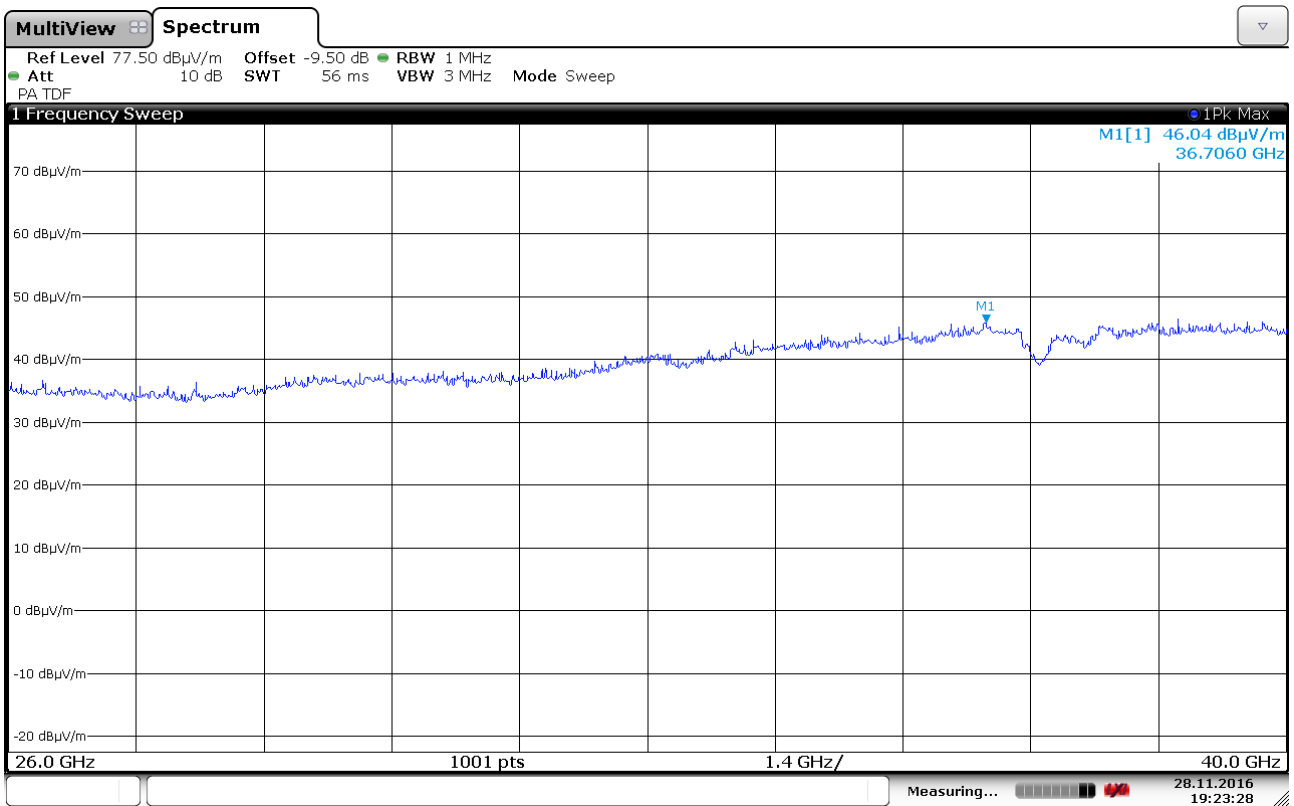
Radiated Emissions, 26.0 – 40.0 GHz, 5660 MHz, 802.11a 6M, Ant 1, HP



Radiated Emissions, 26.0 – 40.0 GHz, 5660 MHz, 802.11a 6M, Ant 1, VP



Radiated Emissions, 26.0 – 40.0 GHz, 5660 MHz, 802.11n HT20, MIMO, HP



Radiated Emissions, 26.0 – 40.0 GHz, 5660 MHz, 802.11n HT20, MIMO, VP

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

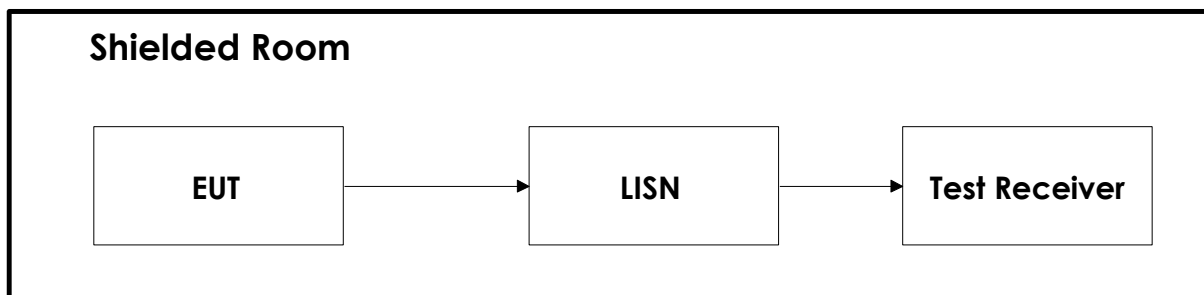
To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model	Description	Manufacturer	Asset no.	Cal. date	Cal. Due
1	FSW40	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2016.07	2017.07
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2015.11 2016.12	2016.11 2017.12
3	ESR7	Measuring Receiver	Rohde & Schwarz	LR 1675	2015.12	2016.12
4	WHKX6.5/18G-8SS	Highpass Filter	Wainwright Instruments	LR 1619	Cal b4 use	
5	317	Preamplifier	Sonoma Instrument	LR 1687	2016.05	2017.05
6	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2016.10	2017.10
7	JS4-26004000	Pre-amplifier	Miteq	LR 1591	2016.07	2017.07
8	6812B	AC Power Source	Agilent	LR1515	2015.12	2016.12
9	3115	Horn Antenna	EMCO	LR 1330	2016.10	2021.10
10	642	Antenna Horn	Narda	LR 220	2009.01	2019.01
11	PM7320X	Antenna Horn	Sivers Lab	LR 102	2009.01	2019.01
12	DBF-520-20	Antenna Horn	Systron Donner	LR 100	2009.01	2019.01
14	638	Antenna Horn	Narda	LR 1480	2010.06	2020.06
15	637	Antenna Horn	Narda	LR 099	2007.04	2017.04
16	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2018.12
17	HL223	LogPeriod Antenna	Rohde & Schwarz	LR 1261	2013.12	2018.12

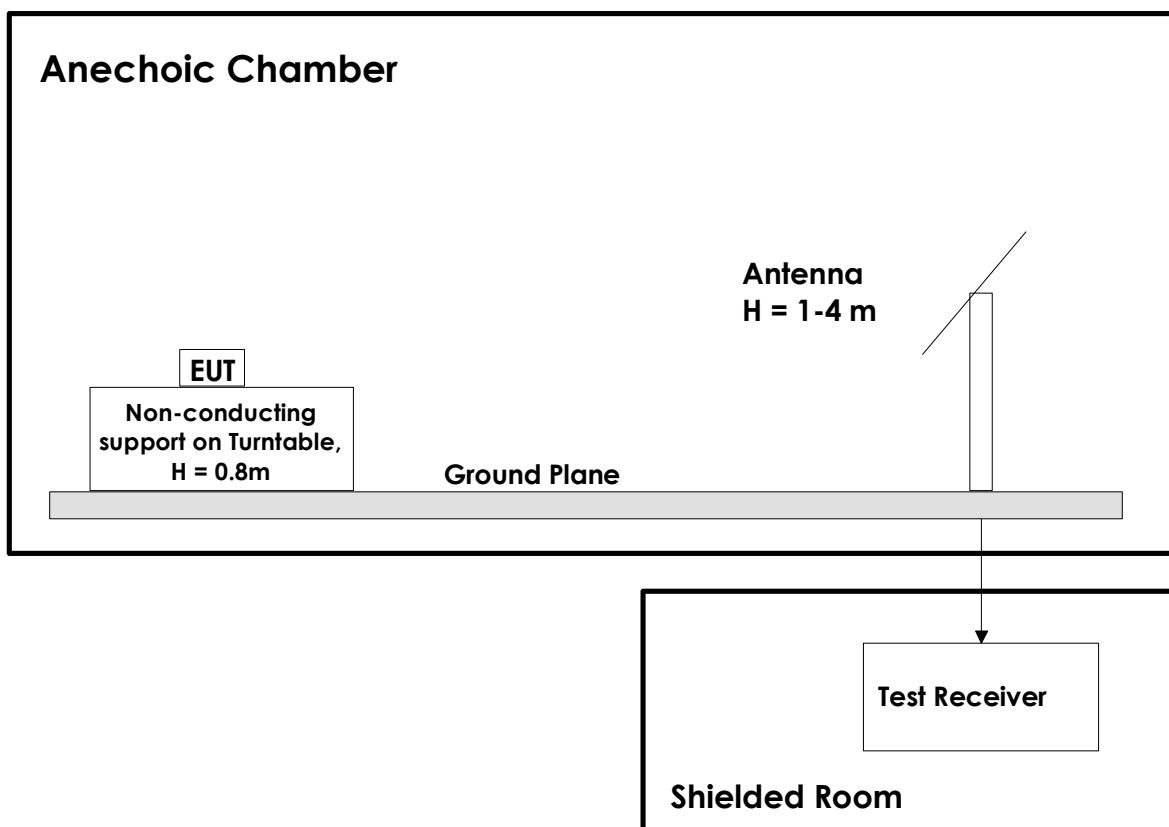
Test Software List			
Description	Manufacturer	Model	Version
EMC Software for Conducted tests	Rohde & Schwarz	EMC32	9.26.00

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



This test set-up was used for the radiated measurements. The EUT support height was 0.8m for frequencies below 1 GHz and 1.5m for frequencies above 1 GHz.

For frequencies above 1 GHz the ground plane between the EUT and the measuring antenna was covered by absorbers.

Revision history

Version	Date	Comment	Sign
1.0	2016.12.23	First edition	FS