3.9 Radiated Emissions, above 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 5, Clause 8.9

Test Results: Complies

Measurement Data:

Radiated Emissions, 1-40 GHz

Measuring distance 3m up to 18 GHz, 1m above 18 GHz

A prescan at approx. 10cm was performed from 18 – 40 GHz

Peak Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBµV/m @3m)	Limit (dBµV/m @3m)	Margin (dB)
Any (except Band Edge)	**Any**	**Any**	**< 50**	**68.2**	**>18**

Band Edge values with Peak Detector are reported in clause 2.8

Field Strength limit is calculated from EIRP limit using the method described in KDB 412172 D01 Determining ERP and EIRP v01r01.

Average Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBµV/m @3m)	Limit (dBµV/m @3m)	Margin (dB)
5180	**5150**	**802.11a 6Mbps**	**37.0**	**54**	**17.0**
5180	**5150**	**802.11n MCS0**	**37.6**	**54**	**16.4**
5320	**5350**	**802.11a 6Mbps**	**32.3**	**54**	**21.7**
5320	**5350**	**802.11n MCS0**	**33.7**	**54**	**20.3**
5500	**5460**	**802.11a 6Mbps**	**30.2**	**54**	**23.8**
5500	**5460**	**802.11n MCS0**	**30.3**	**54**	**23.7**
Any	**Any**	**Any**	**< 44**	**54**	**>10**

Measured results are for 802.11a 6 Mbps and 802.11n MCS0, it was checked that other modulations and/or bitrates did not produce higher emissions.

A High Pass Filter was used for measurements from 6 to 18 GHz.

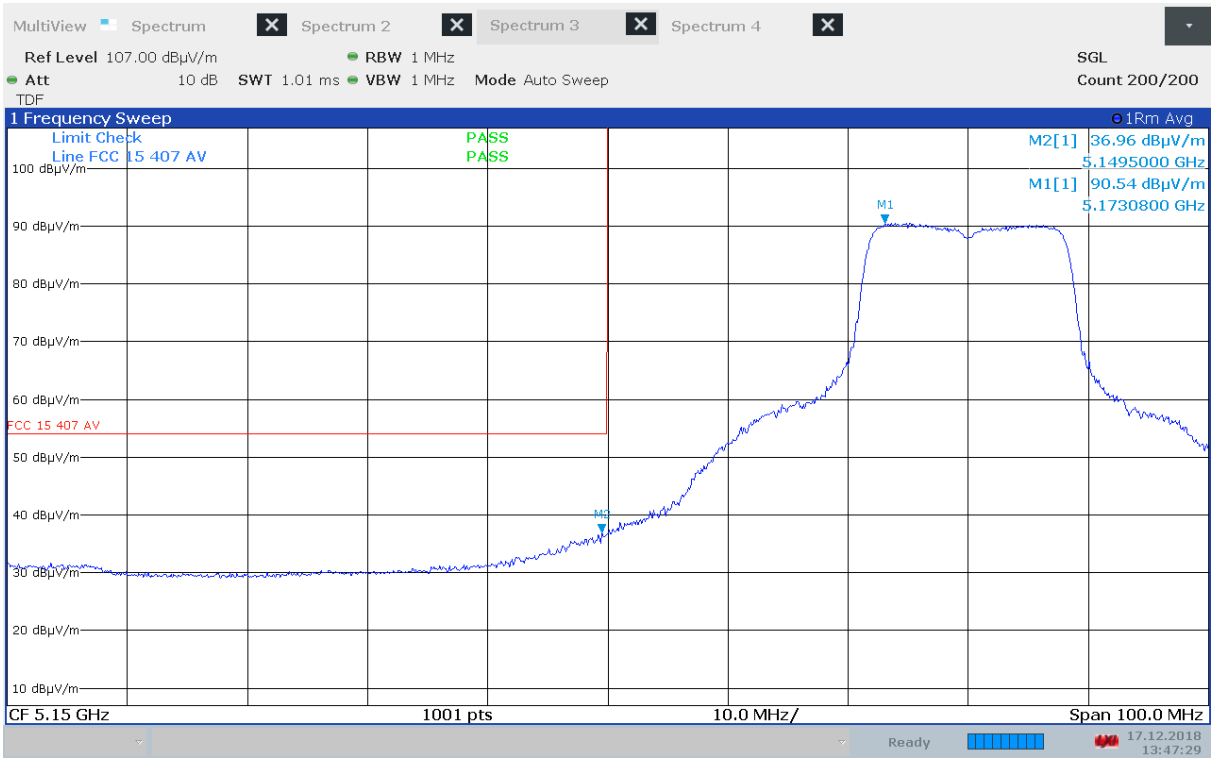
Only harmonics that fall in the restricted bands (ref. §15.205) have been measured.

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

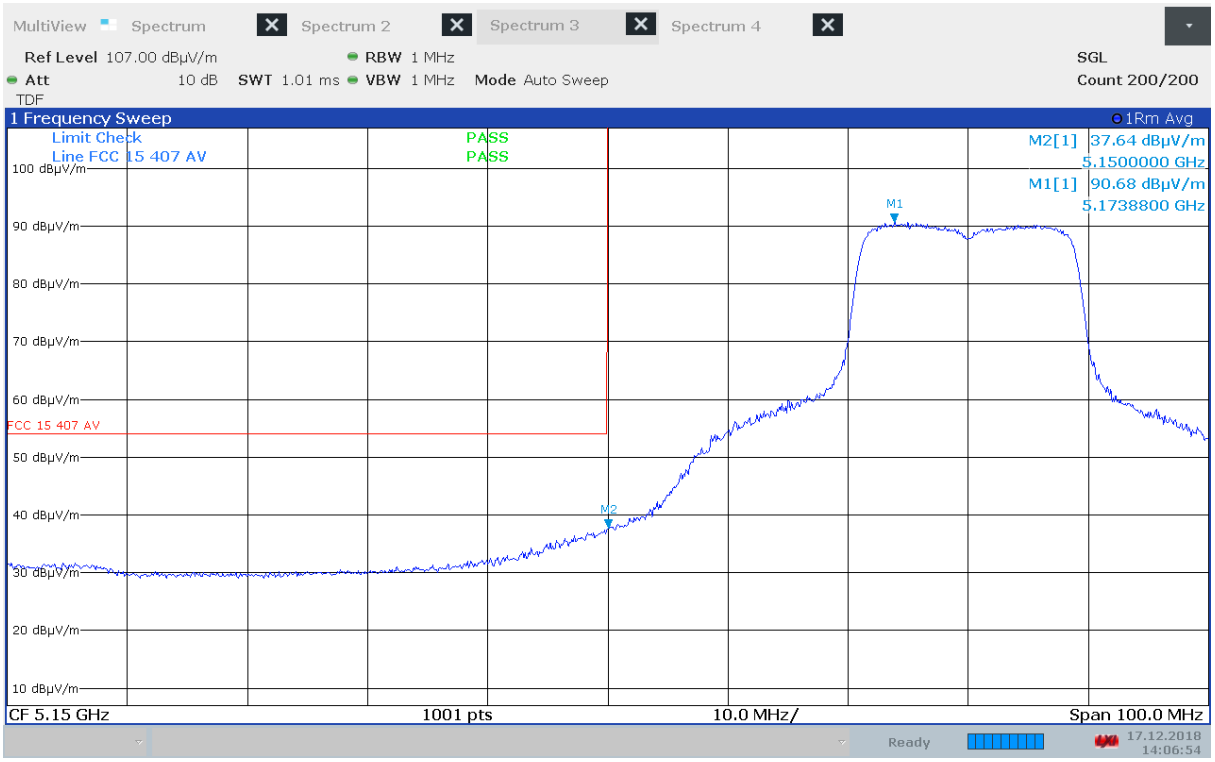
See attached plots.

Requirements/Limit

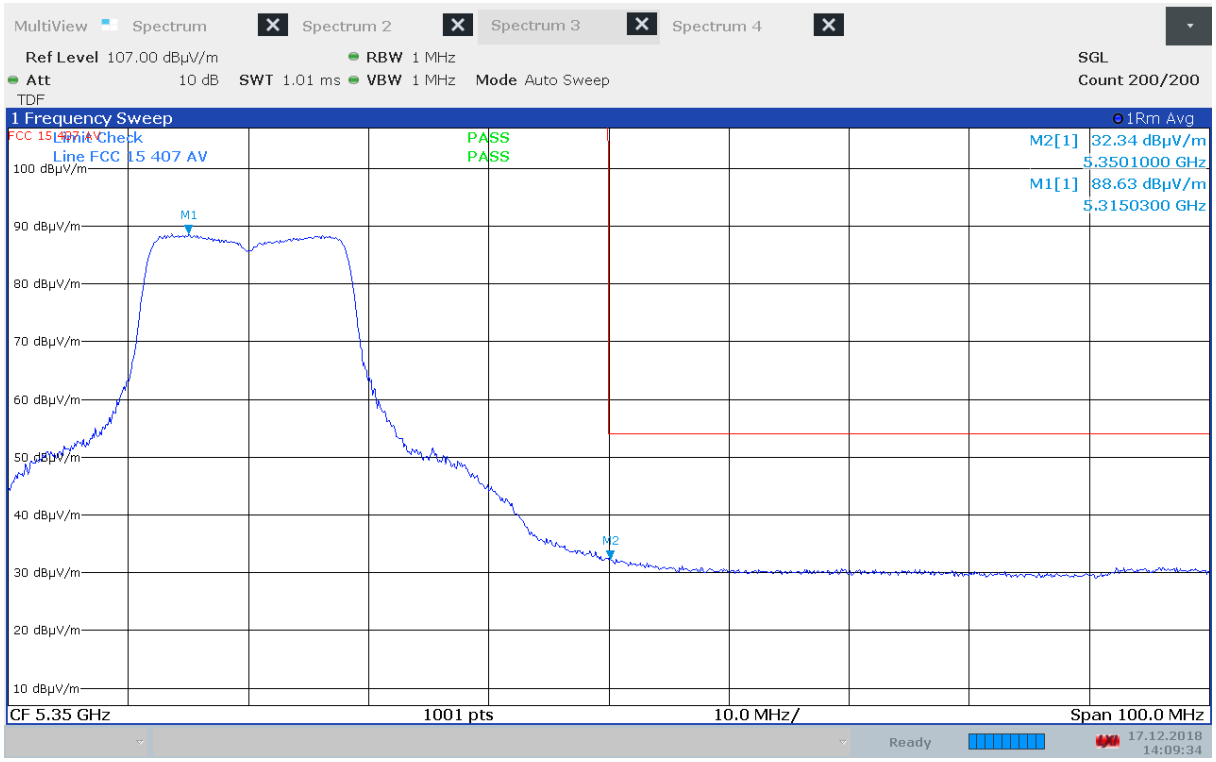
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency (MHz)	AV (dBµV/m)	Peak (dBµV/m)
Above 1 GHz	54.0	74.0



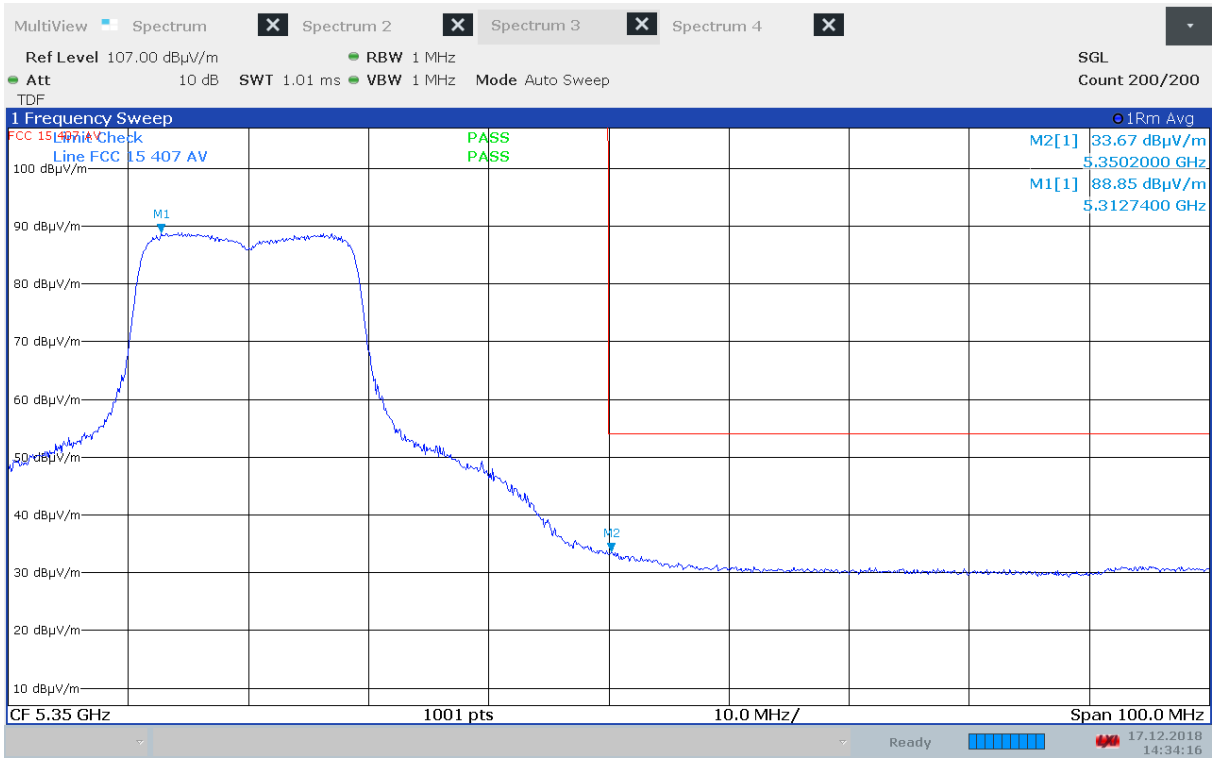
Band Edge, 5150 MHz, Ch064, 802.11a 6Mbps, EUT V (Max: VP), Average



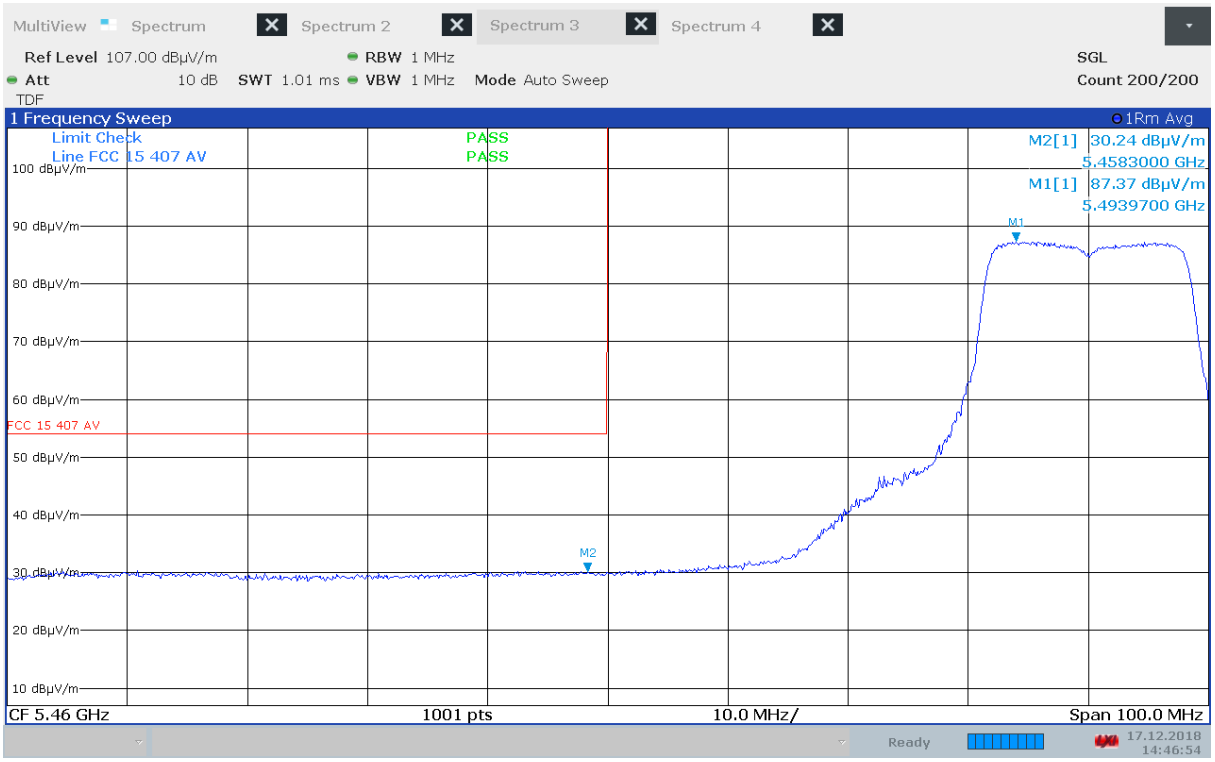
Band Edge, 5150 MHz, Ch064, 802.11n MCS0, EUT V (Max: VP), Average



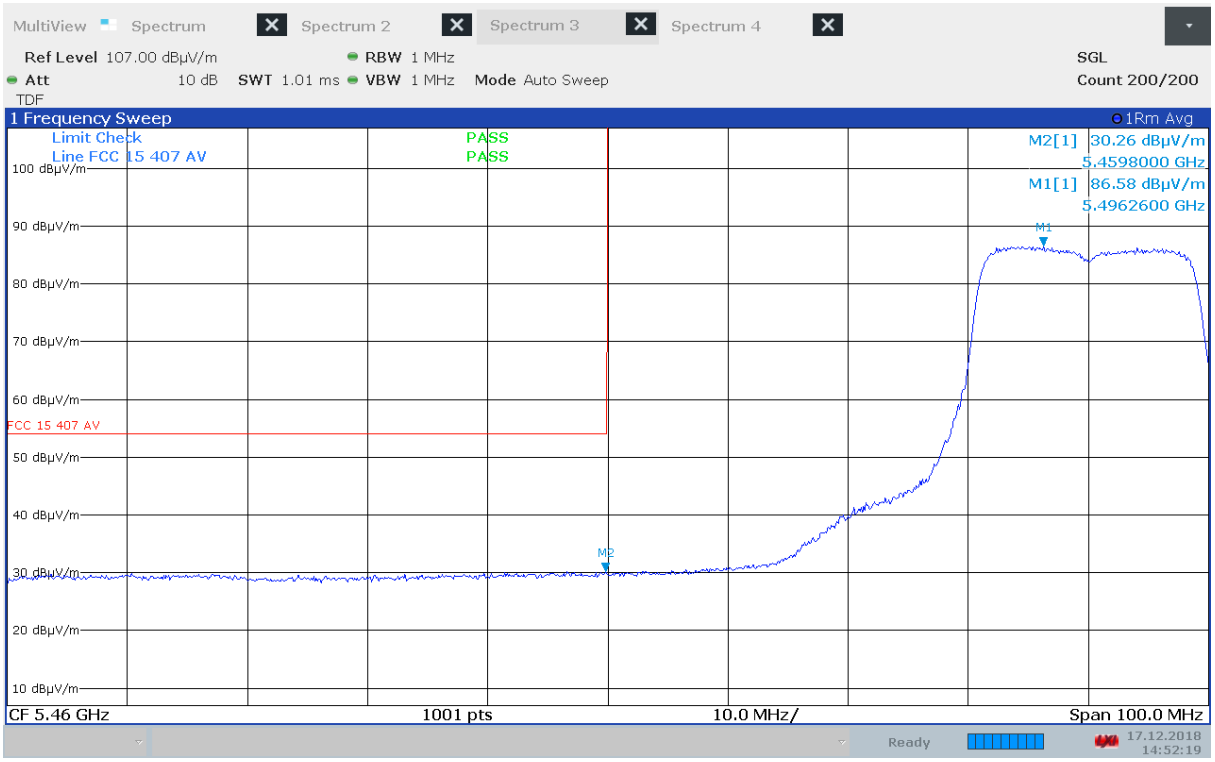
Band Edge, 5350 MHz, Ch064, 802.11a 6Mbps, EUT V (Max: VP), Average



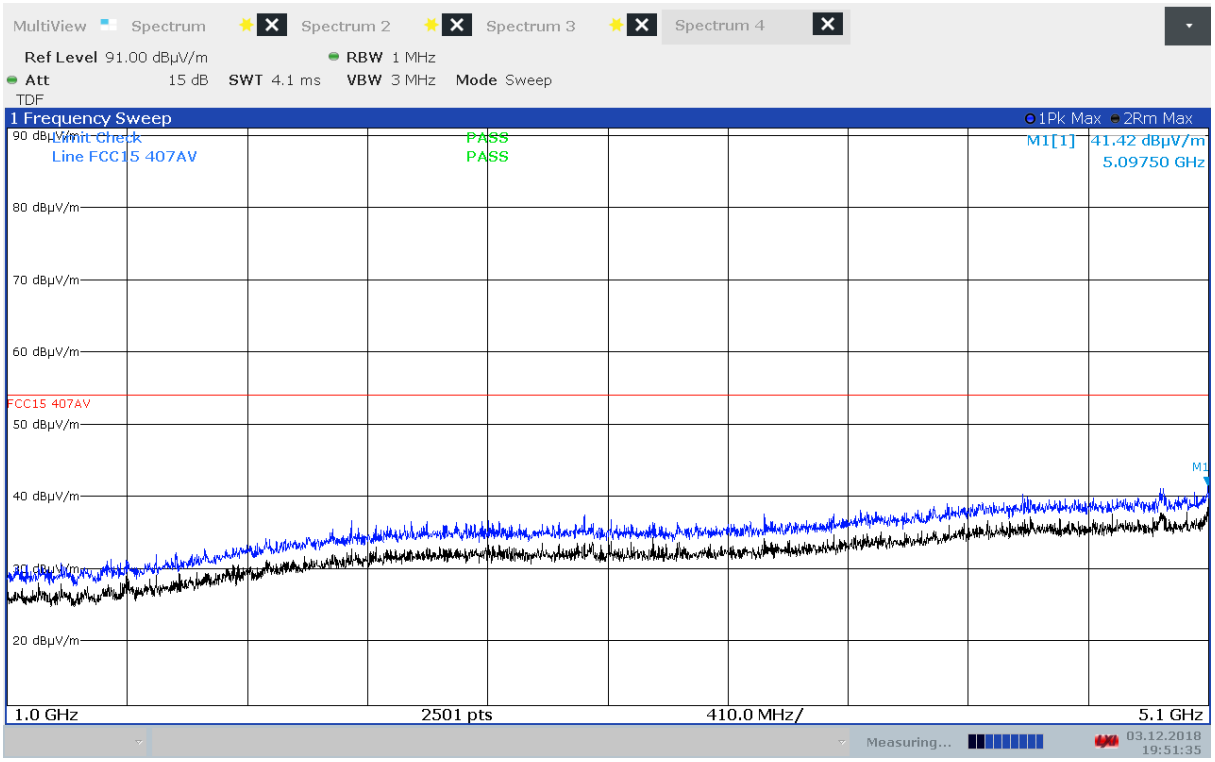
Band Edge, 5350 MHz, Ch064, 802.11n MCS0, EUT V (Max: VP), Average



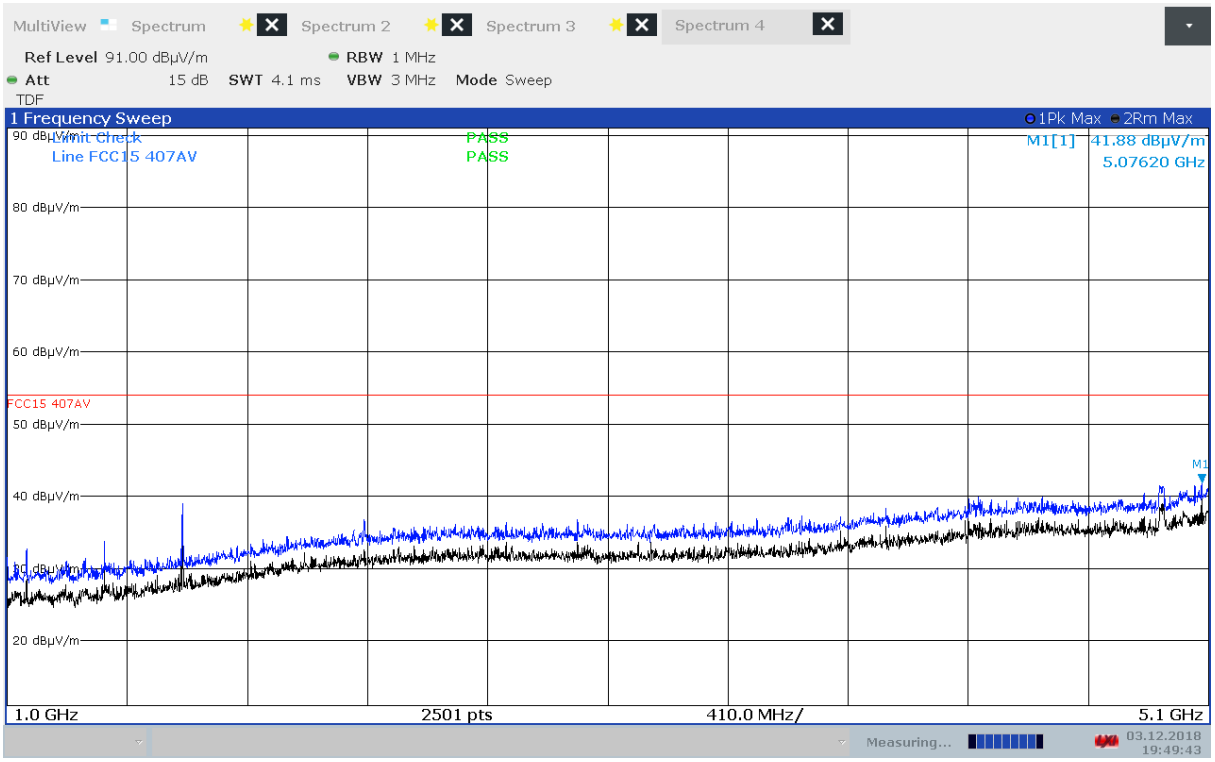
Band Edge, 5460 MHz, Ch100, 802.11a 6Mbps, EUT V (Max: VP), Average



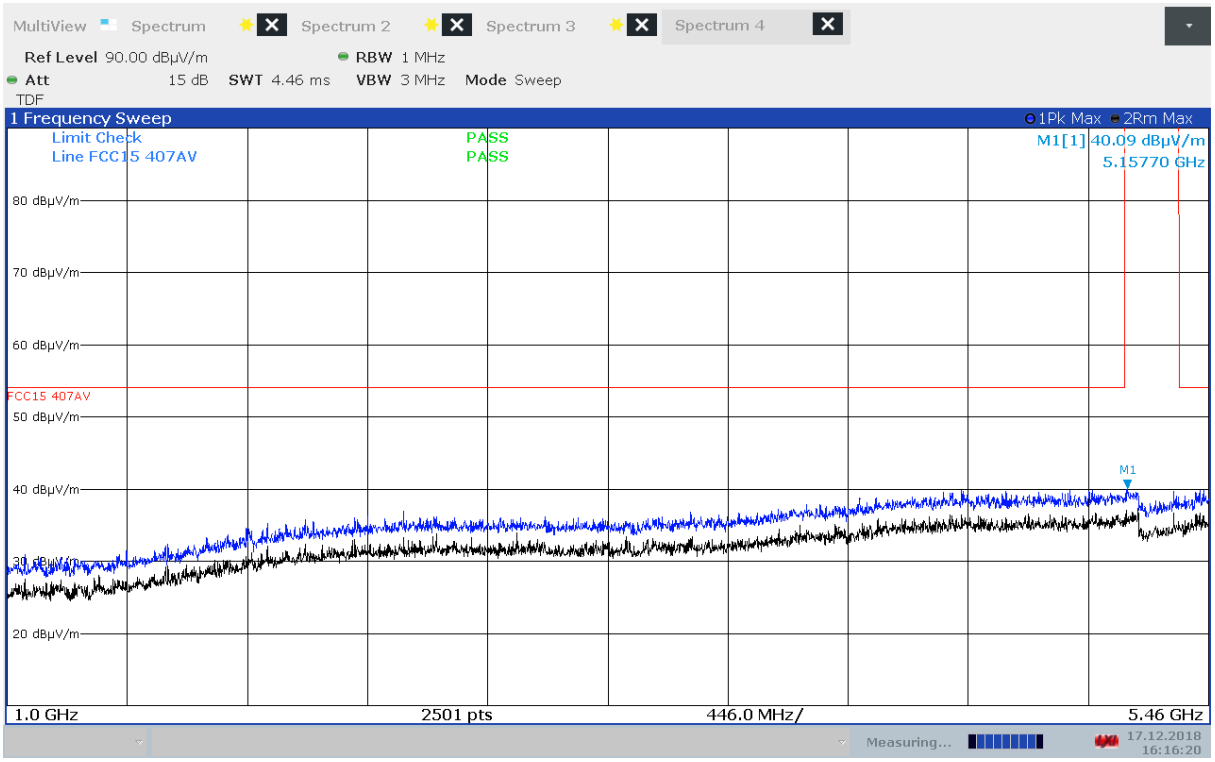
Band Edge, 5460 MHz, Ch100, 802.11n MCS0, EUT V (Max: VP), Average



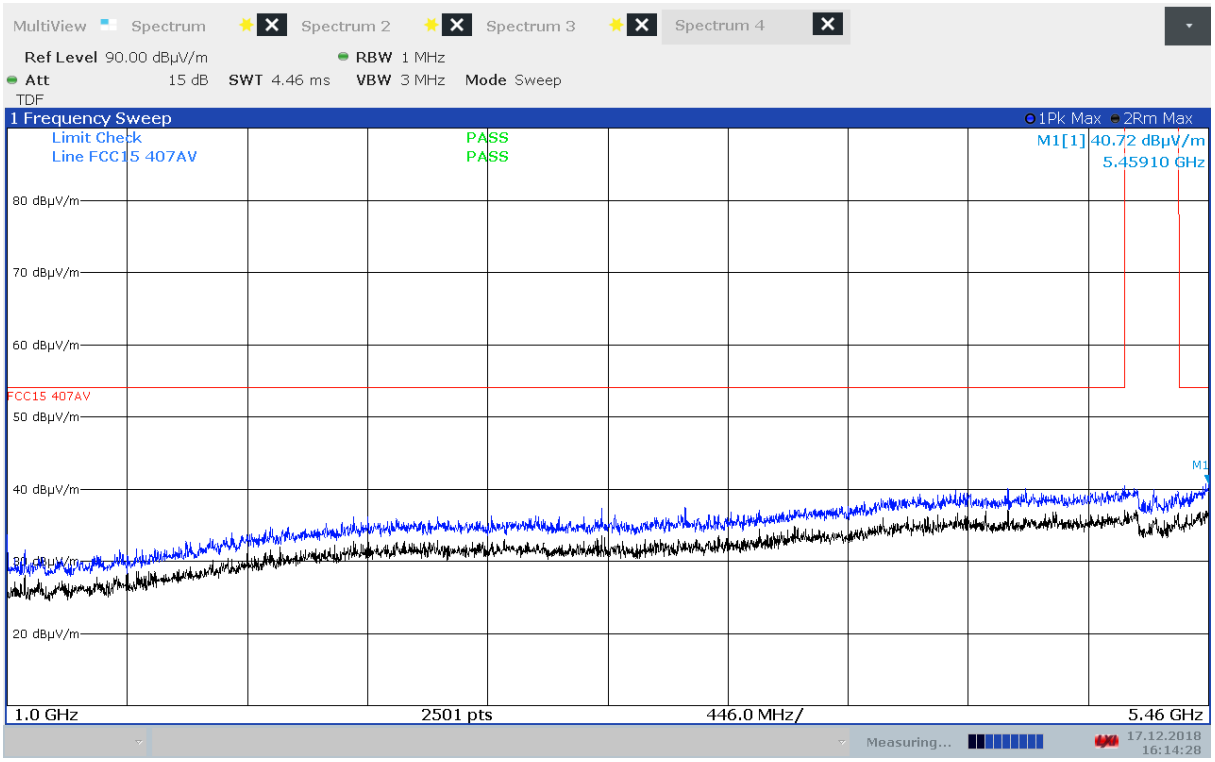
Radiated Emissions, 1000 - 5100 MHz, 5180 MHz, 802.11a 6Mbps, EUT V, HP



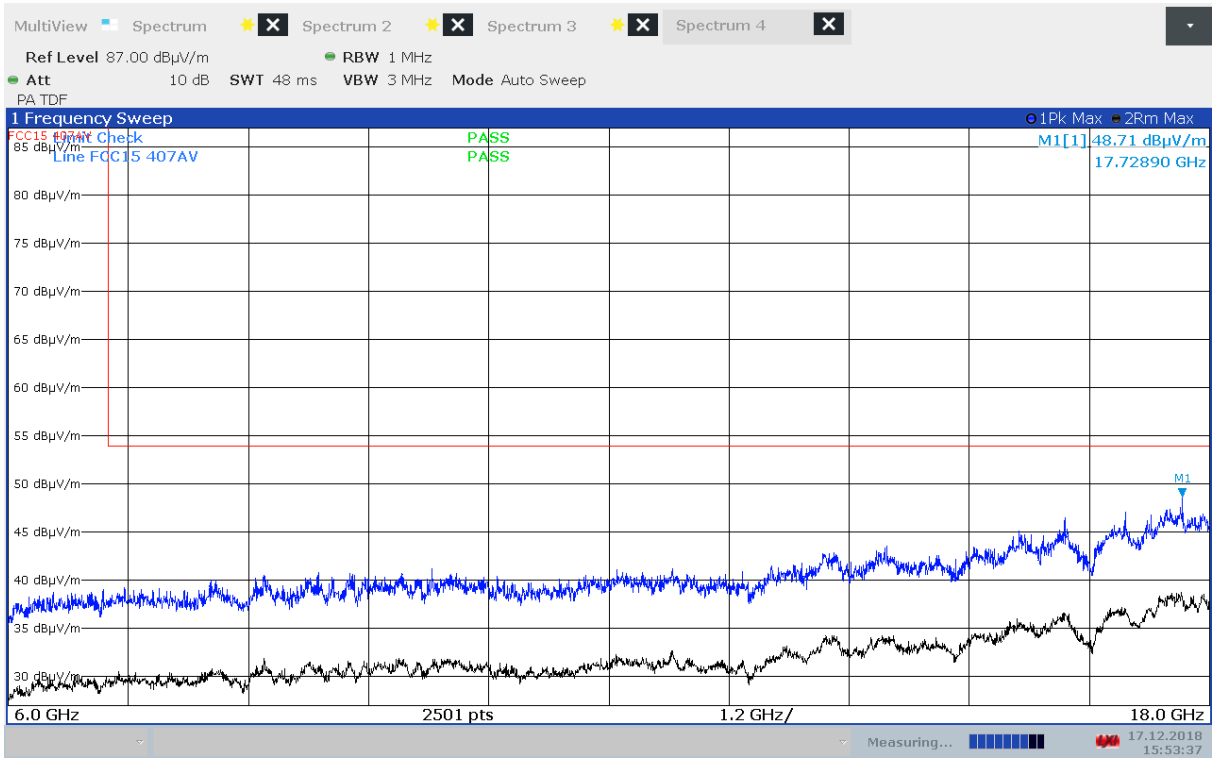
Radiated Emissions, 1000 - 5100 MHz, 5180 MHz, 802.11a 6Mbps, EUT V, VP



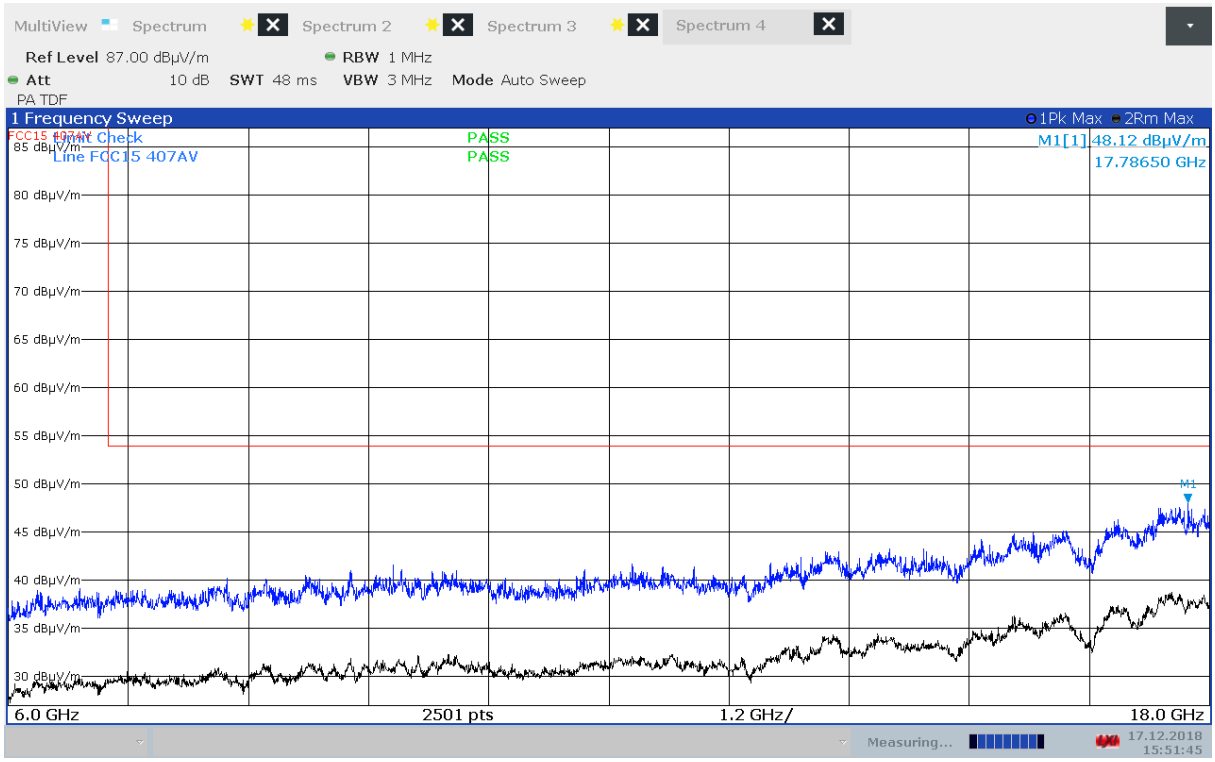
Radiated Emissions, 1000 - 5460 MHz, 5500 MHz, 802.11a 6Mbps, EUT V, HP



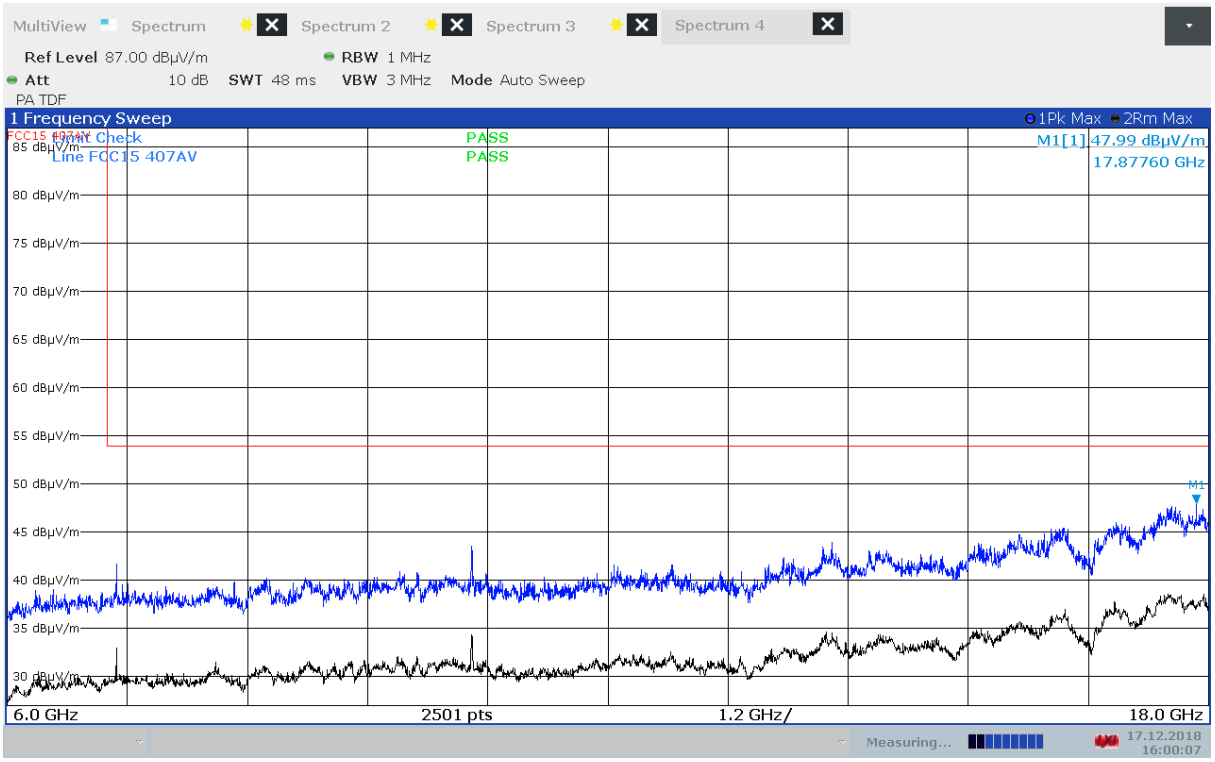
Radiated Emissions, 1000 - 5460 MHz, 5500 MHz, 802.11a 6Mbps, EUT V, VP



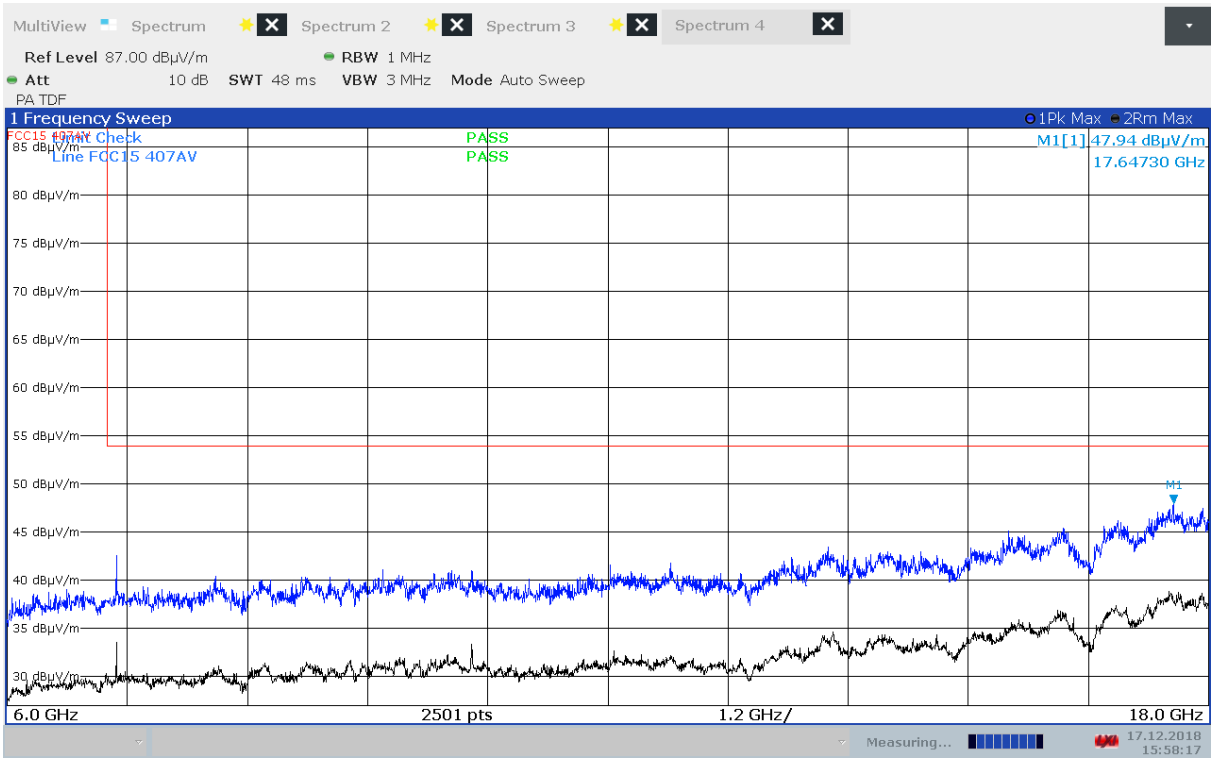
Radiated Emissions, 6000 - 18000 MHz, 5180 MHz, 802.11a 6Mbps, EUT V, HP



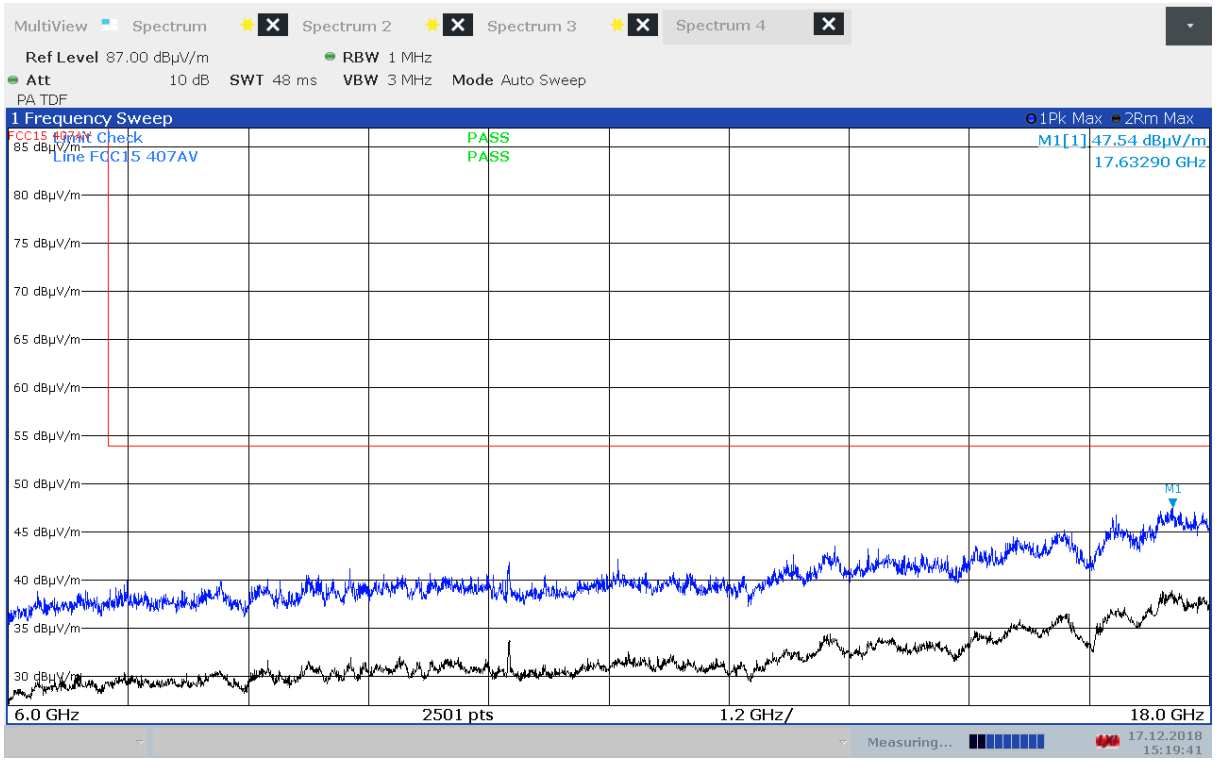
Radiated Emissions, 6000 - 18000 MHz, 5180 MHz, 802. 11a 6Mbps, EUT V, VP



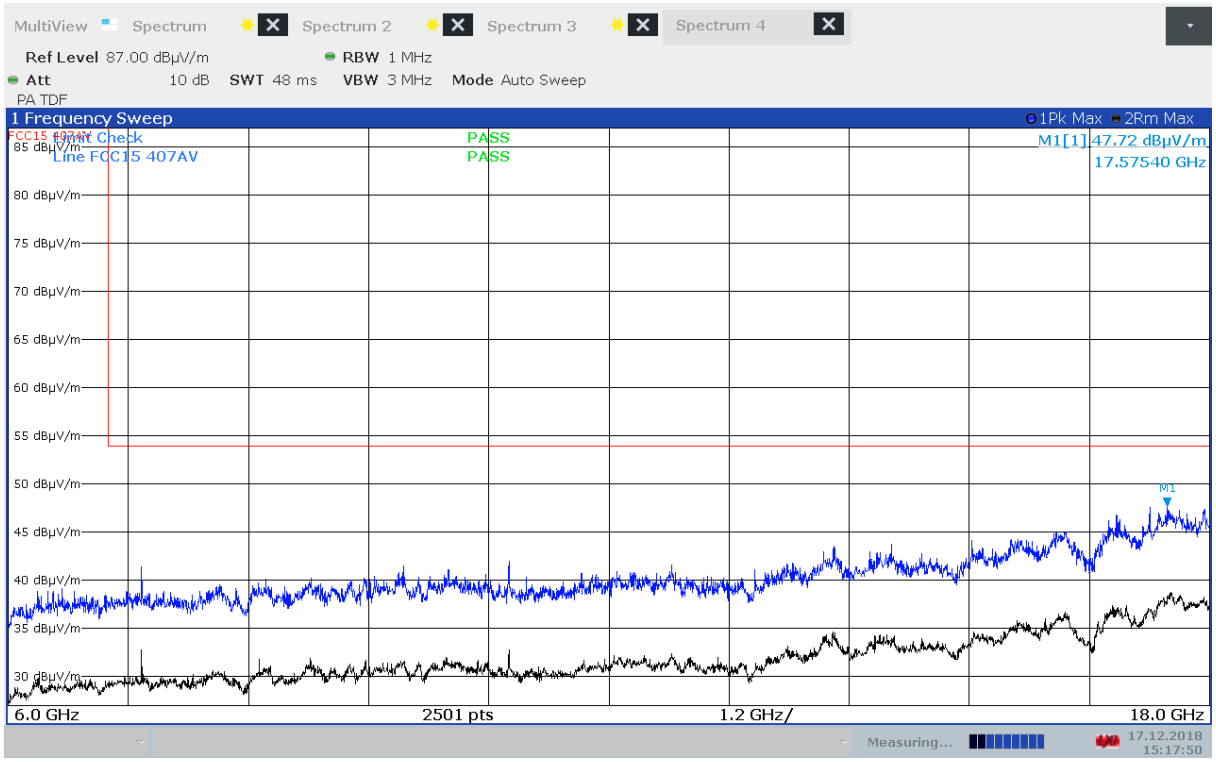
Radiated Emissions, 6000 - 18000 MHz, 5320 MHz, 802.11a 6Mbps, EUT V, HP



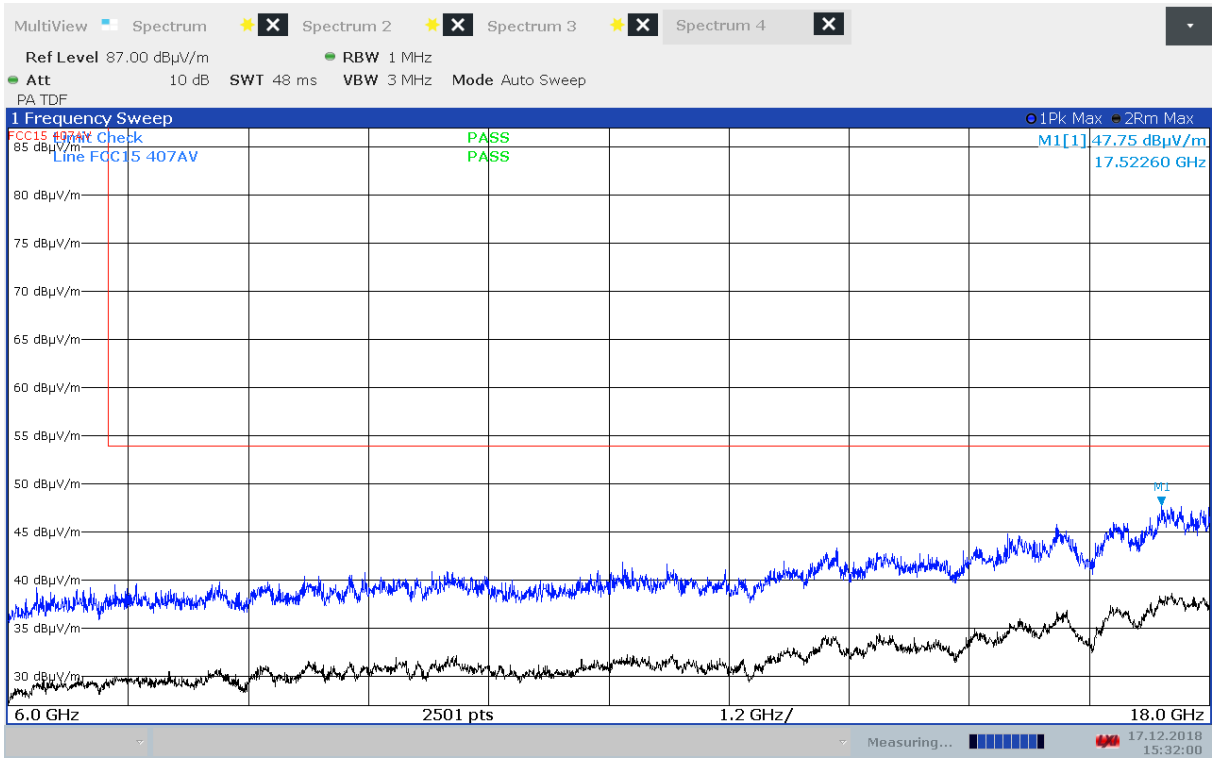
Radiated Emissions, 6000 - 18000 MHz, 5320 MHz, 802. 11a 6Mbps, EUT V, VP



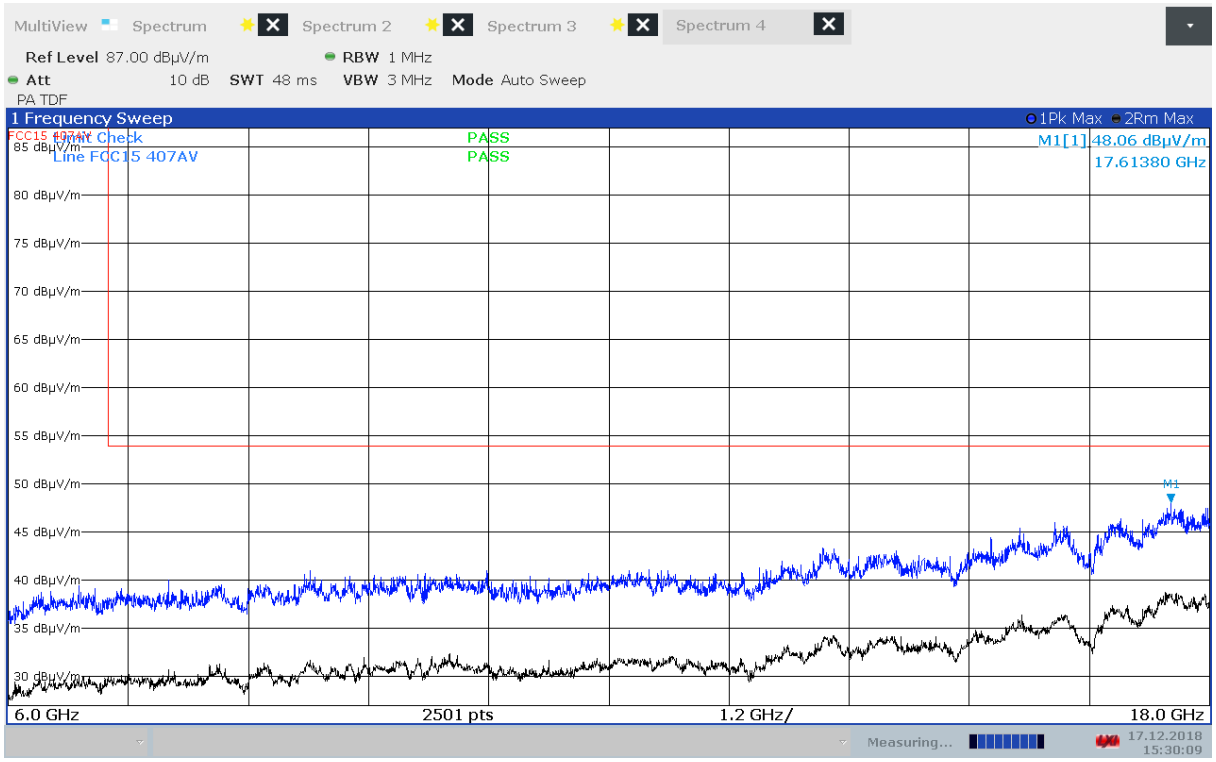
Radiated Emissions, 6000 - 18000 MHz, 5500 MHz, 802.11a 6Mbps, EUT V, HP



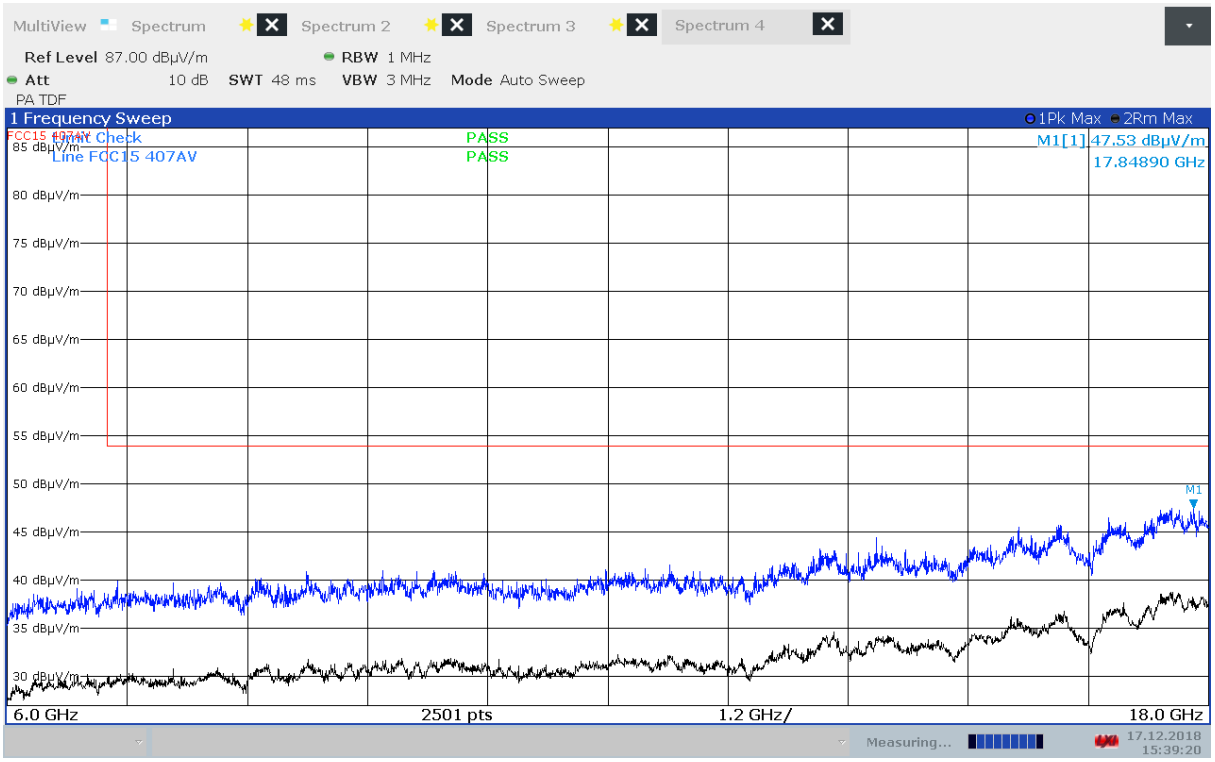
Radiated Emissions, 6000 - 18000 MHz, 5500 MHz, 802. 11a 6Mbps, EUT V, VP



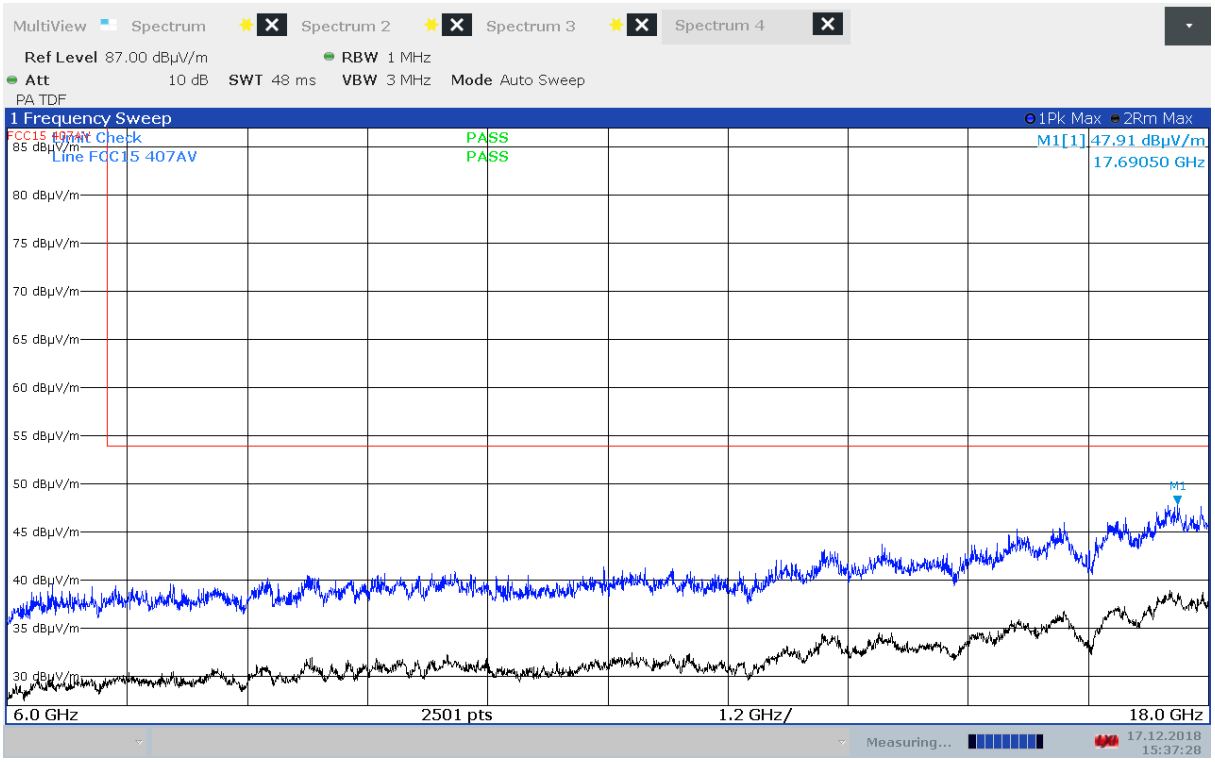
Radiated Emissions, 6000 - 18000 MHz, 5700 MHz, 802.11a 6Mbps, EUT V, HP



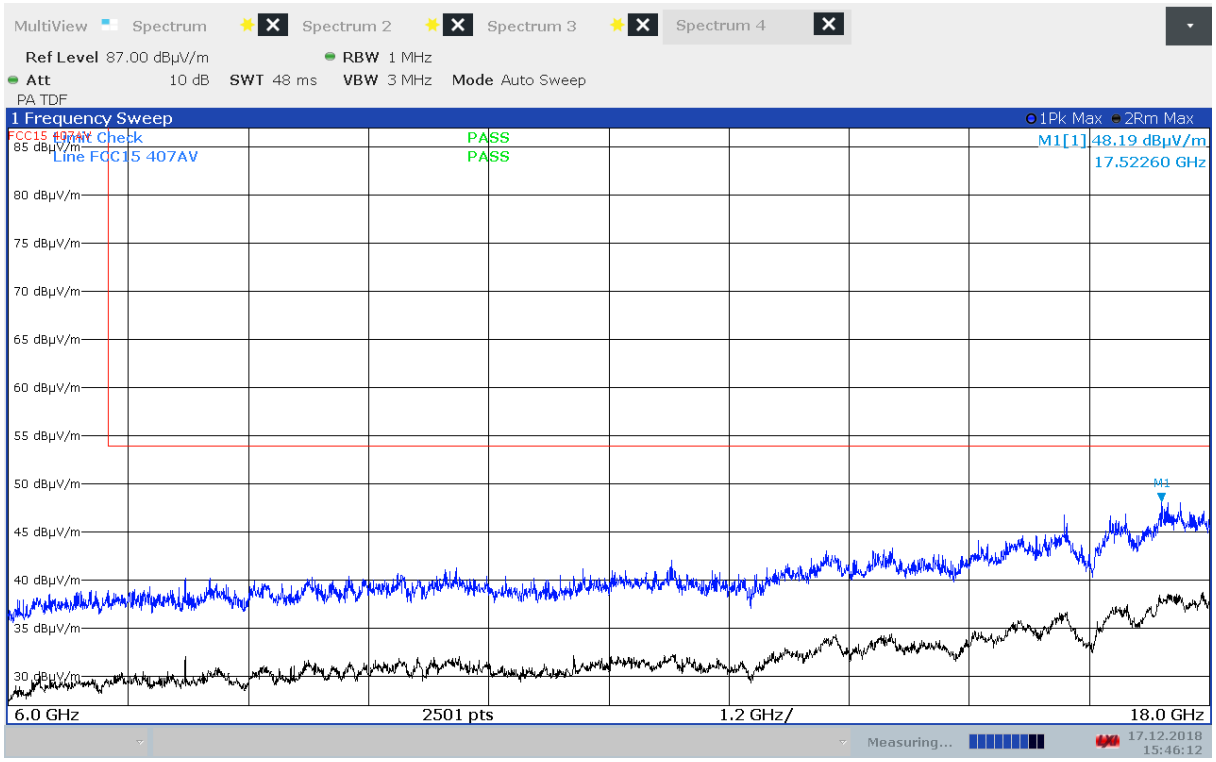
Radiated Emissions, 6000 - 18000 MHz, 5700 MHz, 802. 11a 6Mbps, EUT V, VP



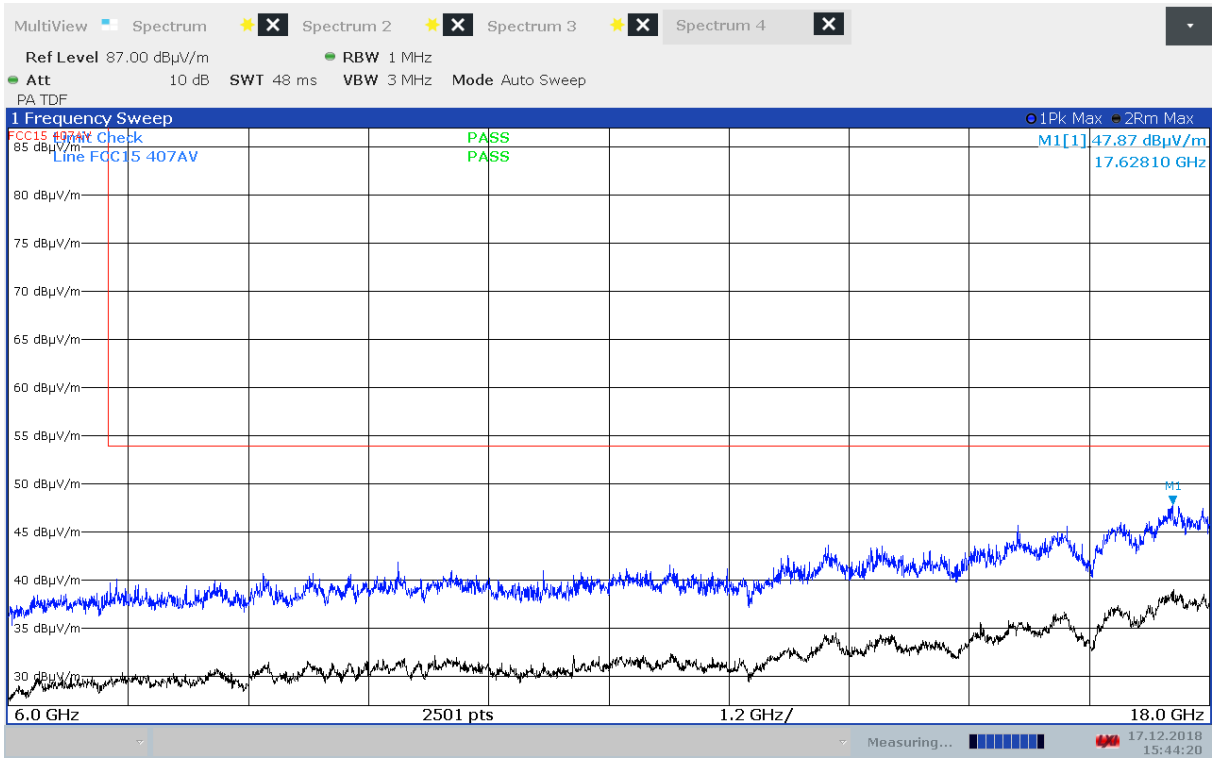
Radiated Emissions, 6000 - 18000 MHz, 5745 MHz, 802.11a 6Mbps, EUT V, HP



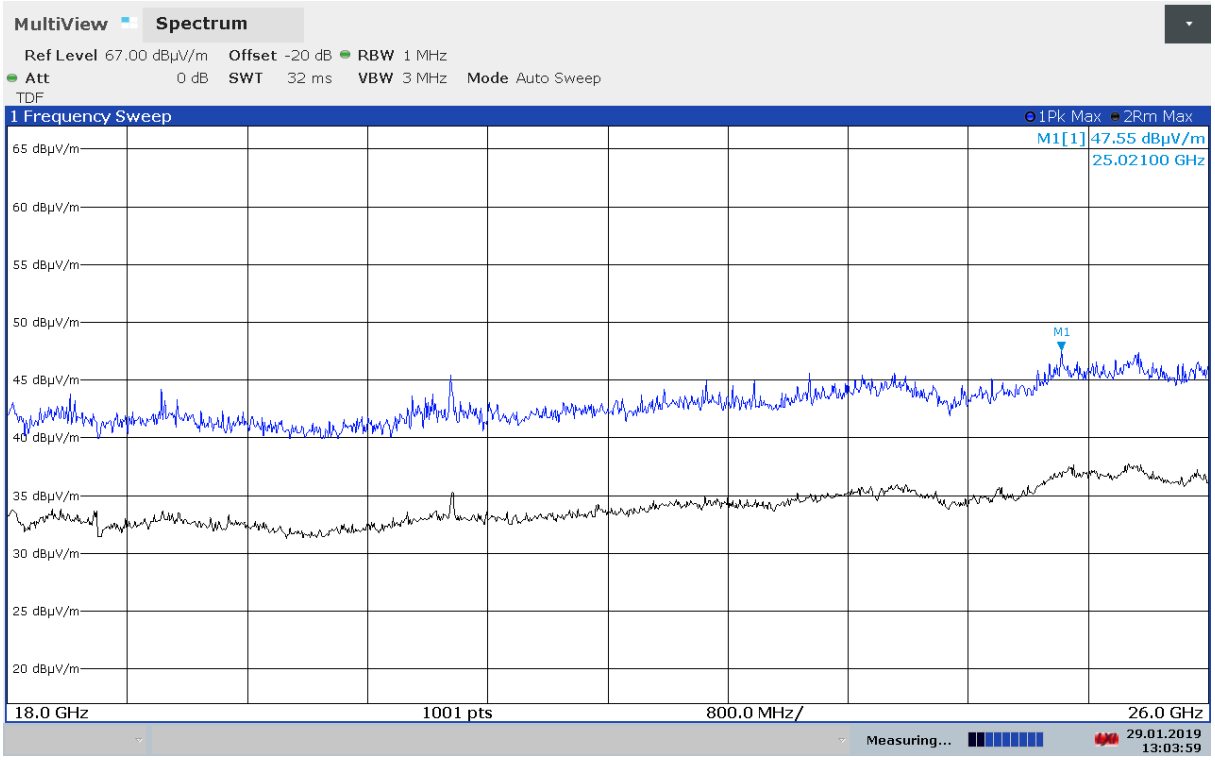
Radiated Emissions, 6000 - 18000 MHz, 5745 MHz, 802.11a 6Mbps, EUT V, VP



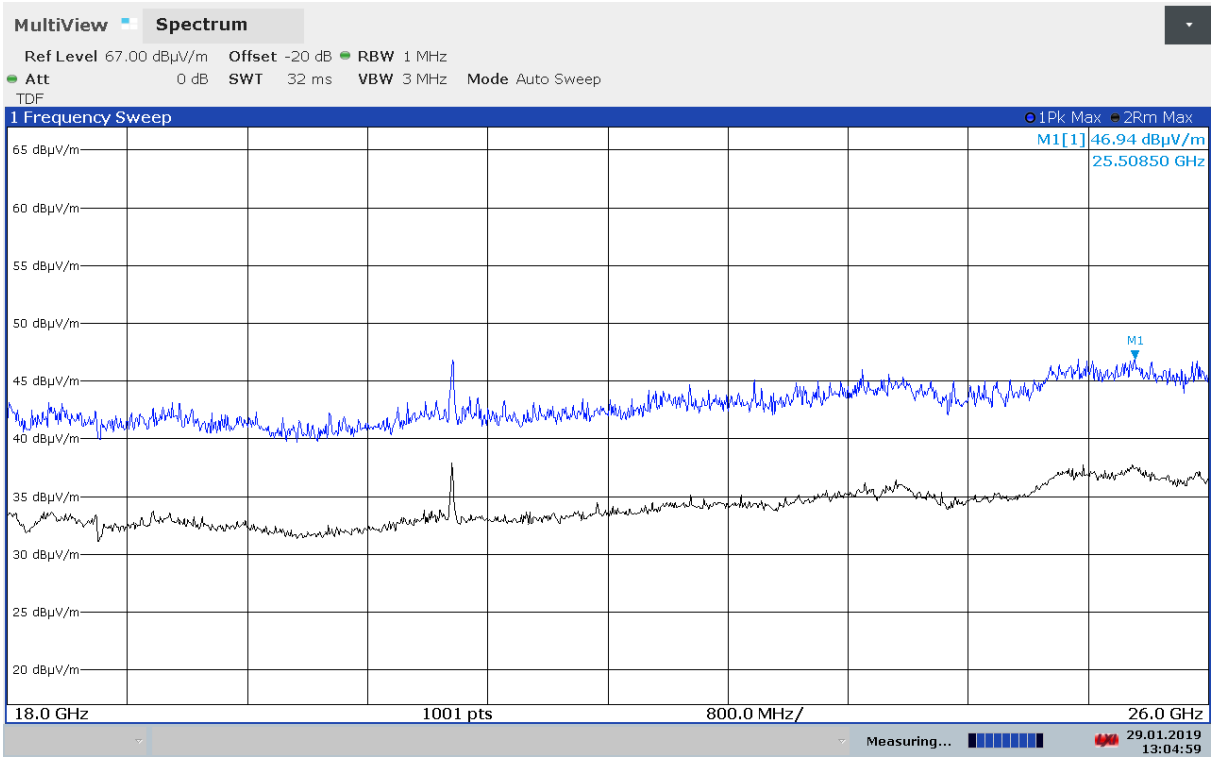
Radiated Emissions, 6000 - 18000 MHz, 5825 MHz, 802.11a 6Mbps, EUT V, HP



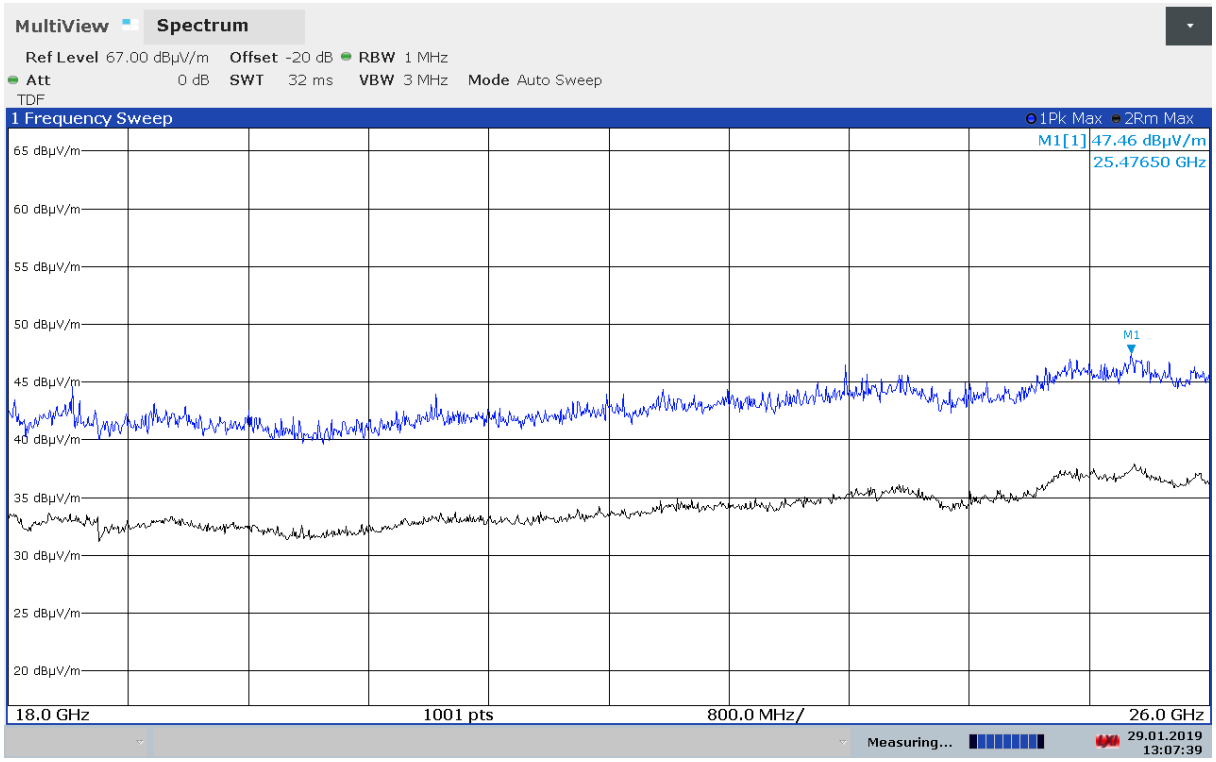
Radiated Emissions, 6000 - 18000 MHz, 5825 MHz, 802.11a 6Mbps, EUT V, VP



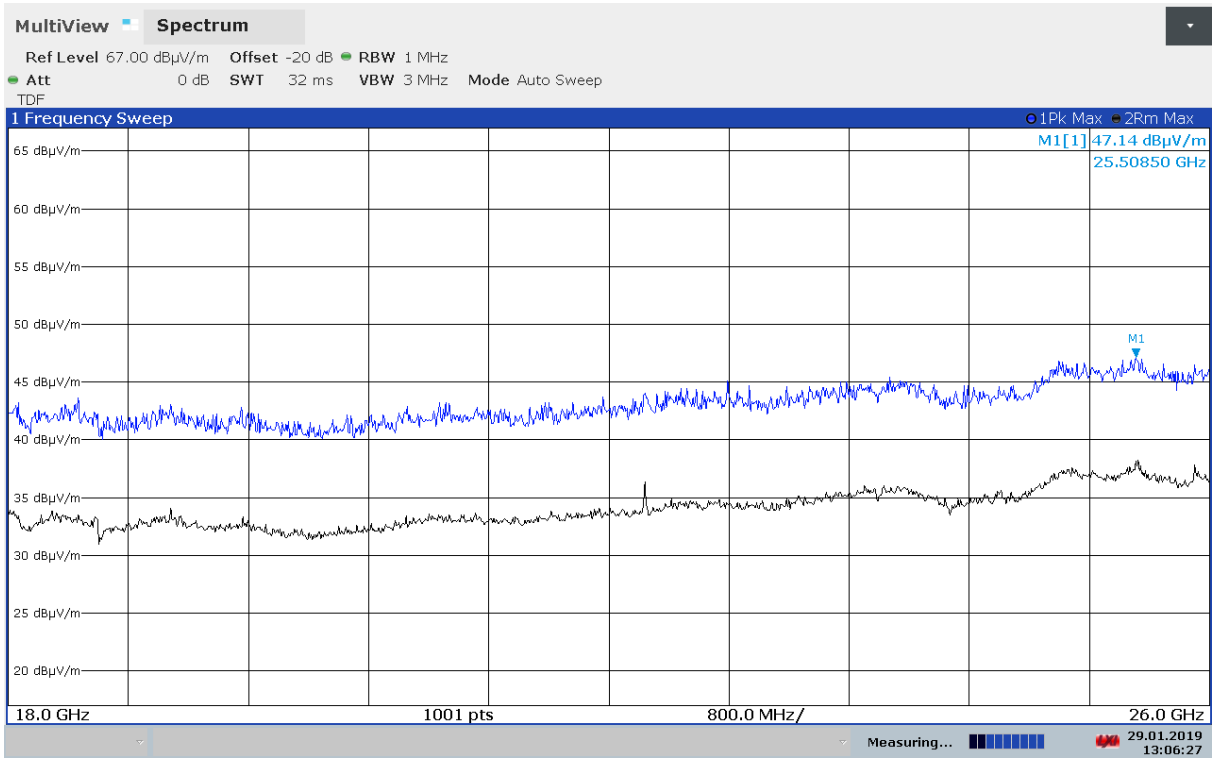
Prescan, 18 – 26 GHz, Ch048, 802.11a 6Mbps, approx. 10 cm



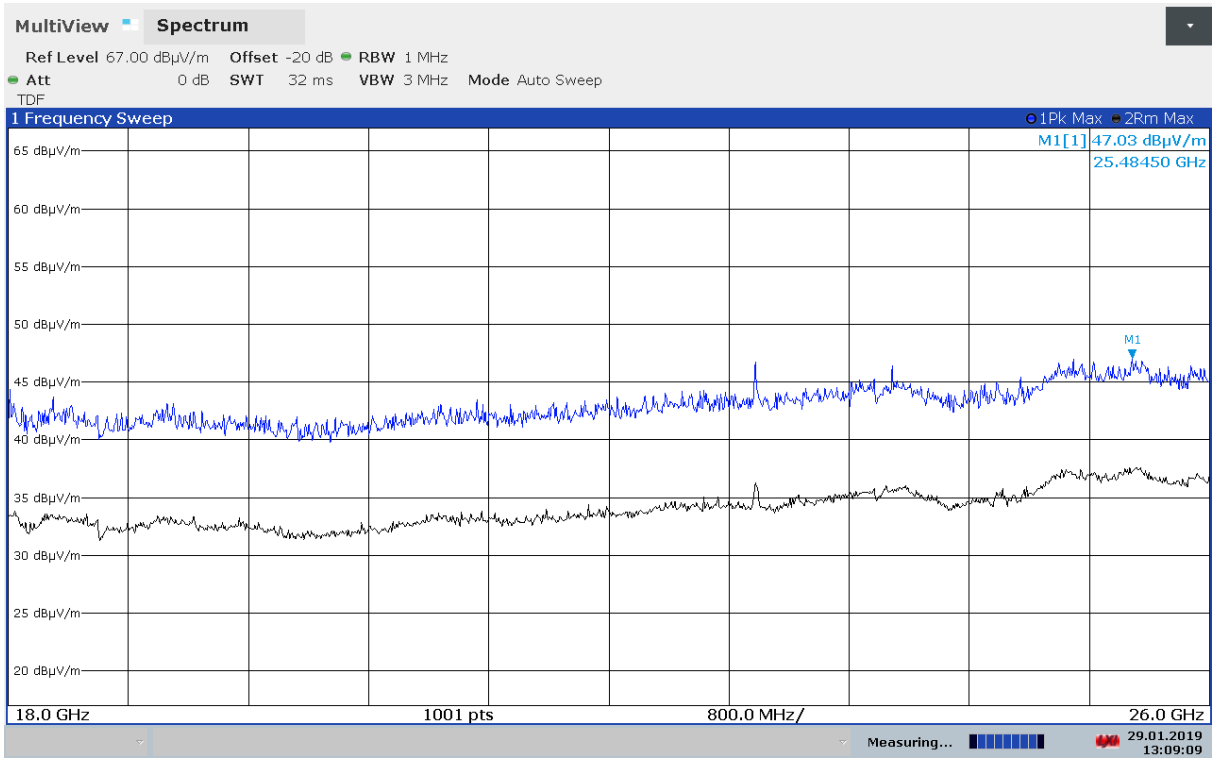
Prescan, 18 – 26 GHz, Ch048, 802.11n MCS0, approx. 10 cm



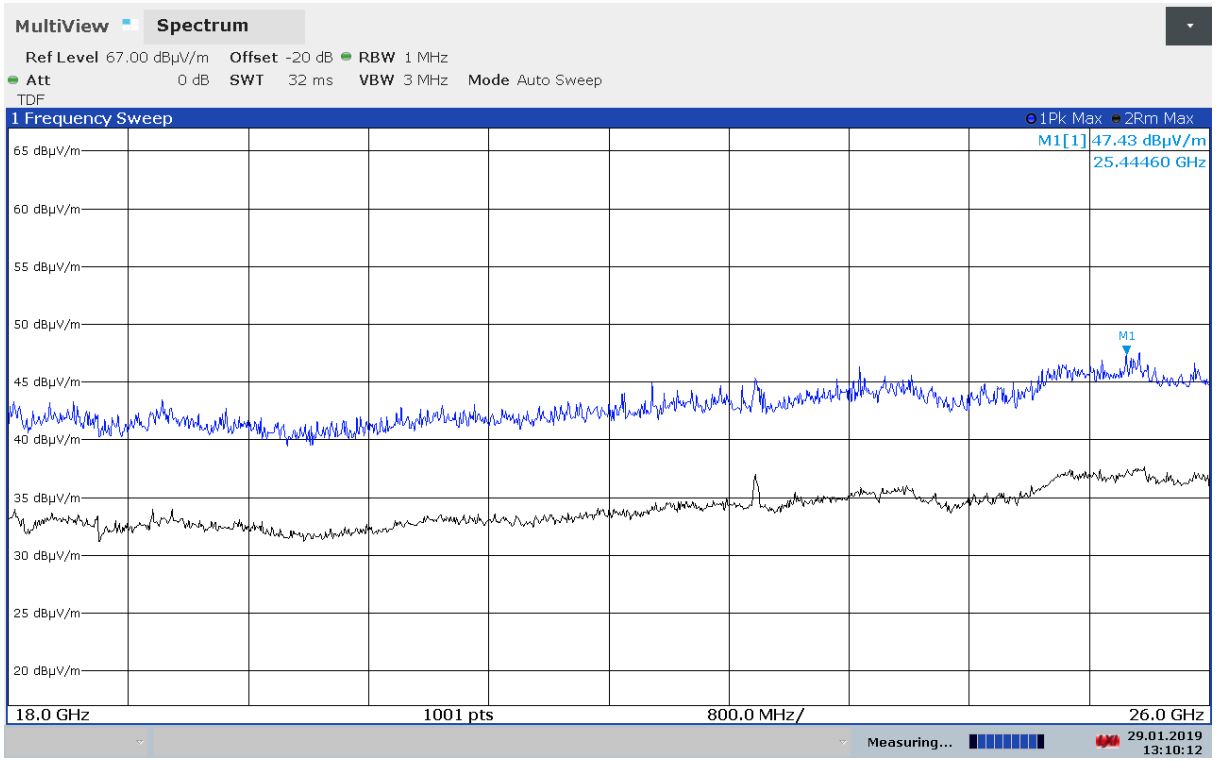
Prescan, 18 – 26 GHz, Ch100, 802.11a 6Mbps, approx. 10 cm



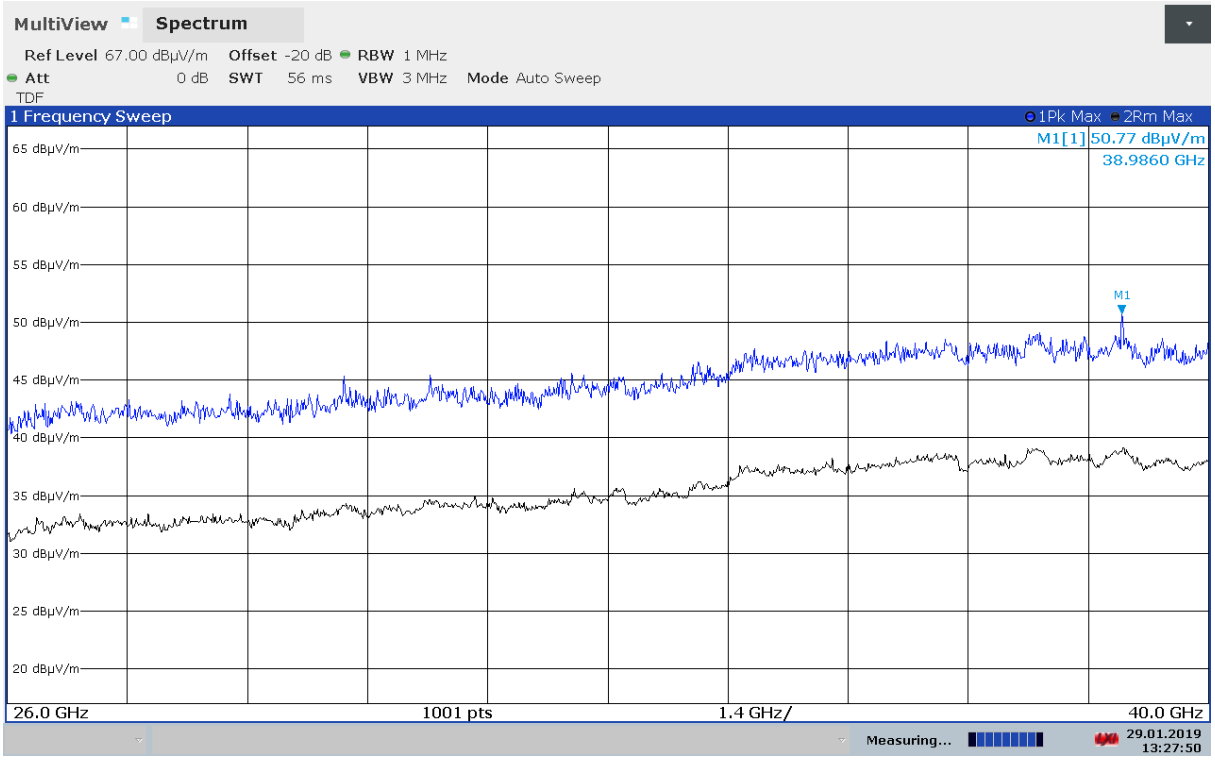
Prescan, 18 – 26 GHz, Ch112, 802.11n MCS0, approx. 10 cm



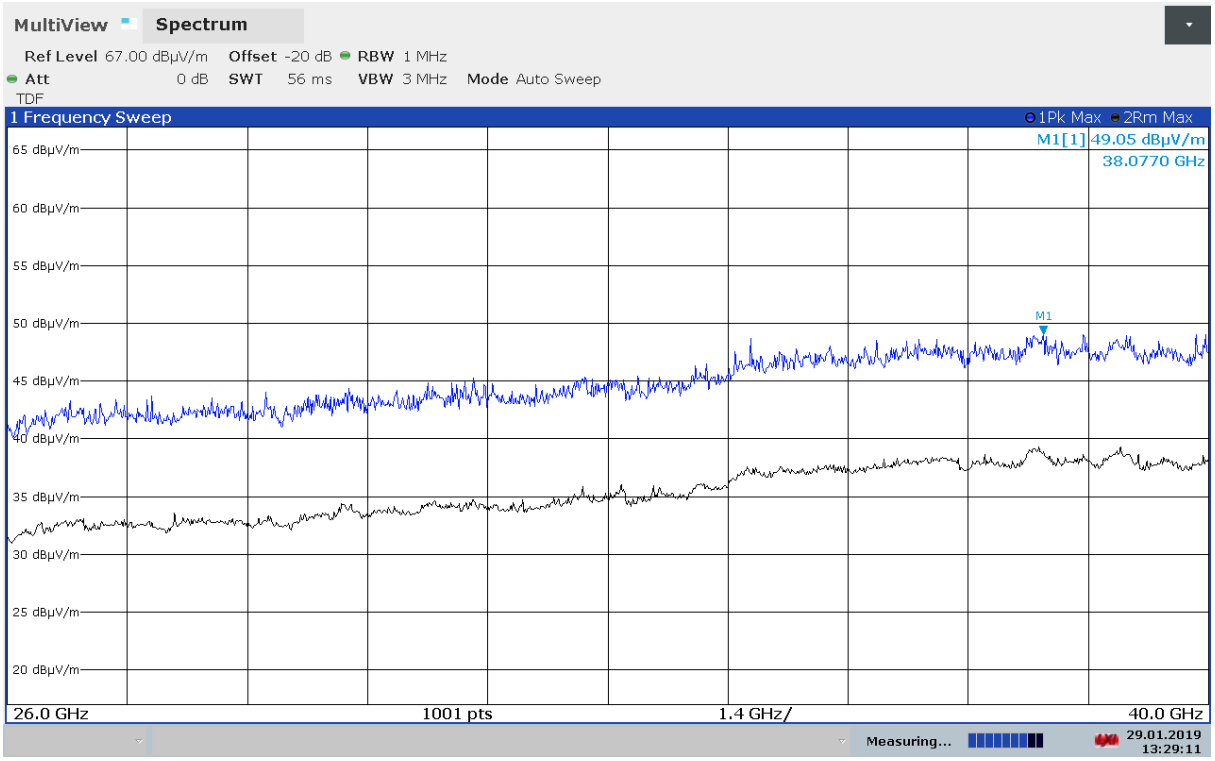
Prescan, 18 – 26 GHz, Ch149, 802.11a 6Mbps, approx. 10 cm



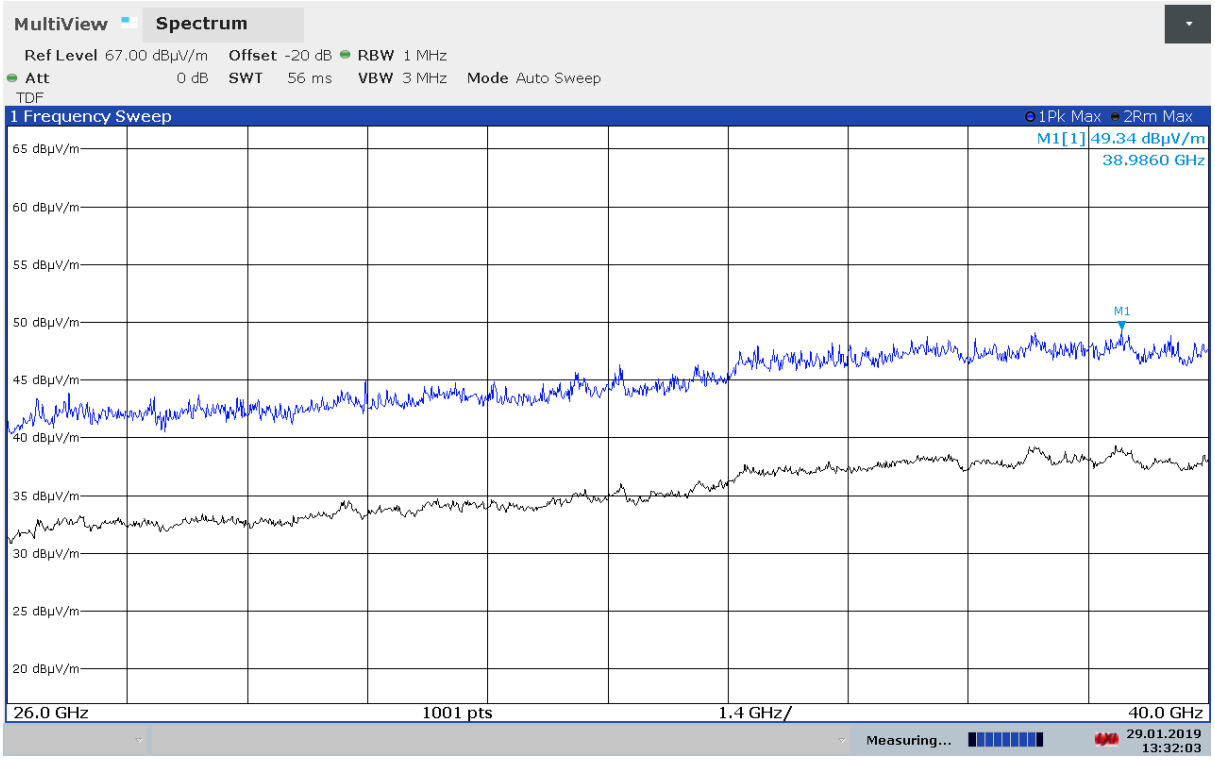
Prescan, 18 – 26 GHz, Ch149, 802.11n MCS0, approx. 10 cm



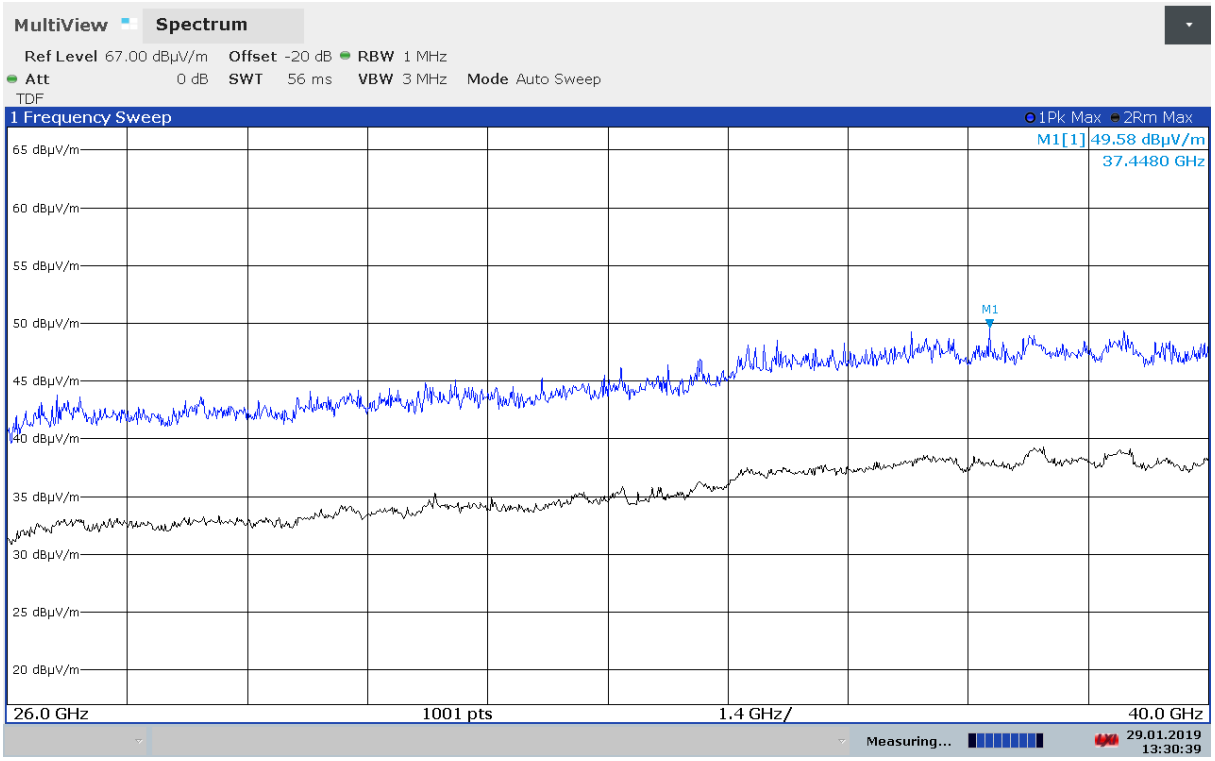
Prescan, 26 – 40 GHz, Ch048, 802.11a 6Mbps, approx. 10 cm



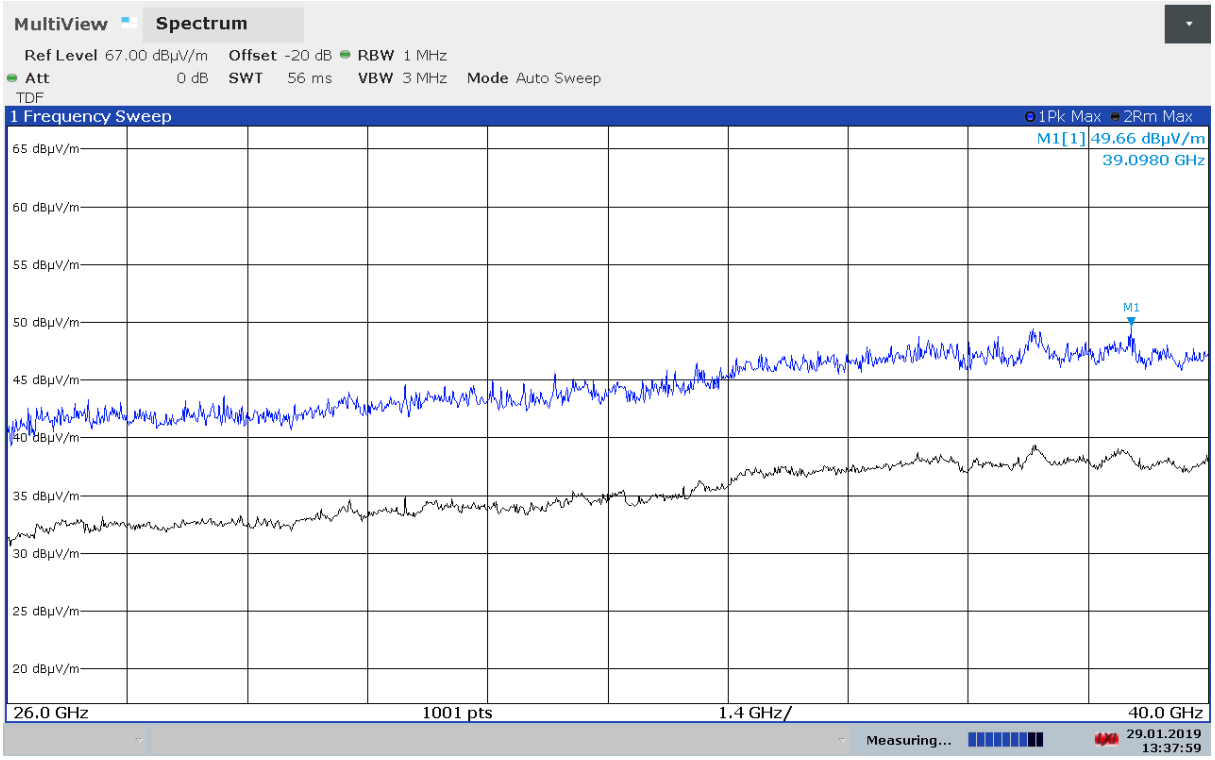
Prescan, 26 – 40 GHz, Ch048, 802.11n MCS0, approx. 10 cm



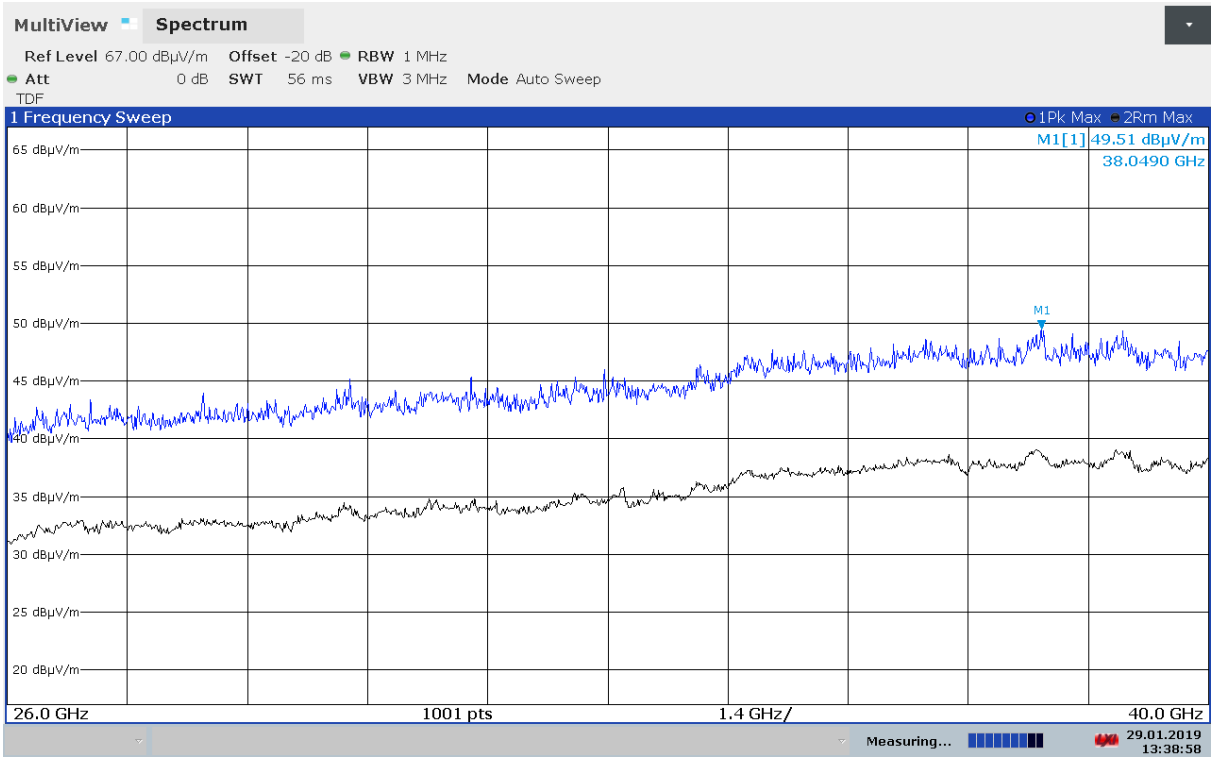
Prescan, 26 – 40 GHz, Ch100, 802.11a 6Mbps, approx. 10 cm



Prescan, 26 – 40 GHz, Ch112, 802.11n MCS0, approx. 10 cm



Prescan, 26 – 40 GHz, Ch149, 802.11a 6Mbps, approx. 10 cm



Prescan, 26 – 40 GHz, Ch149, 802.11n MCS0, approx. 10 cm

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 number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2018-01 2019-01	2019-01 2020-01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2018-03 2019-01	2019-03 2020-01
3	6810-17B	Attenuator	Suhner	LR 1669	COU	
4	WHKX6.5/18G	Highpass Filter	Wainwright Inst.	LR 1619	COU	
5	JB3	BiLog Antenna	Sunol Sciences	N-4525	2016-05	2019-05
6	317	Preamplifier	Sonoma Inst.	LR 1687	2018-07	2019-07
7	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2018-07	2019-07
8	3115	Horn Antenna	EMCO	LR 1330	2016-10	2019-12
9	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2017-12	2019-12
10	Model 638	Antenna Horn	Narda	LR 1480	2010-06	2020-06
11	Model 87 V	Multimeter	Fluke	LR 1597	2018-02	2019-02
12	6812B	AC Power Source	Agilent	LR 1515	COU	
14	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2017-11	2019-11
15	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2017-10	2019-10
16	Model V637	Horn Antenna	Narda	LR 099	N/A	
17	JS4-20004000	Preamplifier	Miteq	LR 1591	2018-07	2019-07
18	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	
19	SF102/1000MM	RF Cable	Suhner	SN 50113/2	COU	
20	SF102/2000MM	RF Cable	Suhner	SN 500100/2	COU	

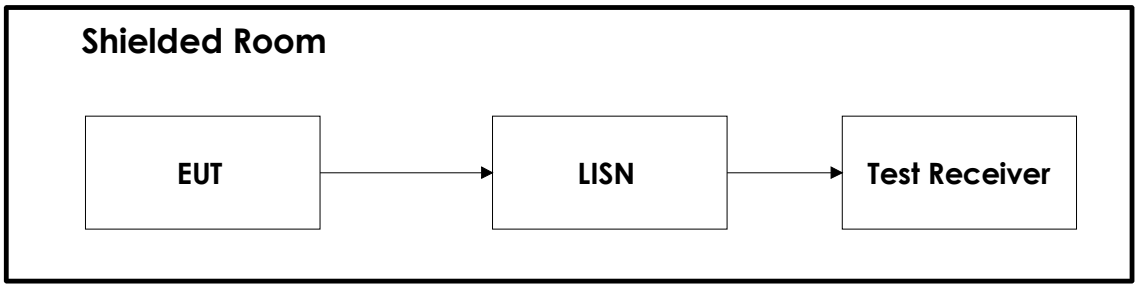
Note: COU – calibrate on use; N/A – Not Applicable

The software listed below has been used for one or more tests.

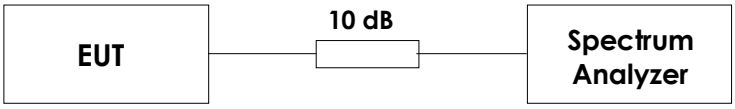
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.40.10	Power Line Conducted test software
2	Rohde & Schwarz	EMC32	10.40.10	Radiated Emission test software
3	Rohde & Schwarz	GPIBShot	2.7	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission

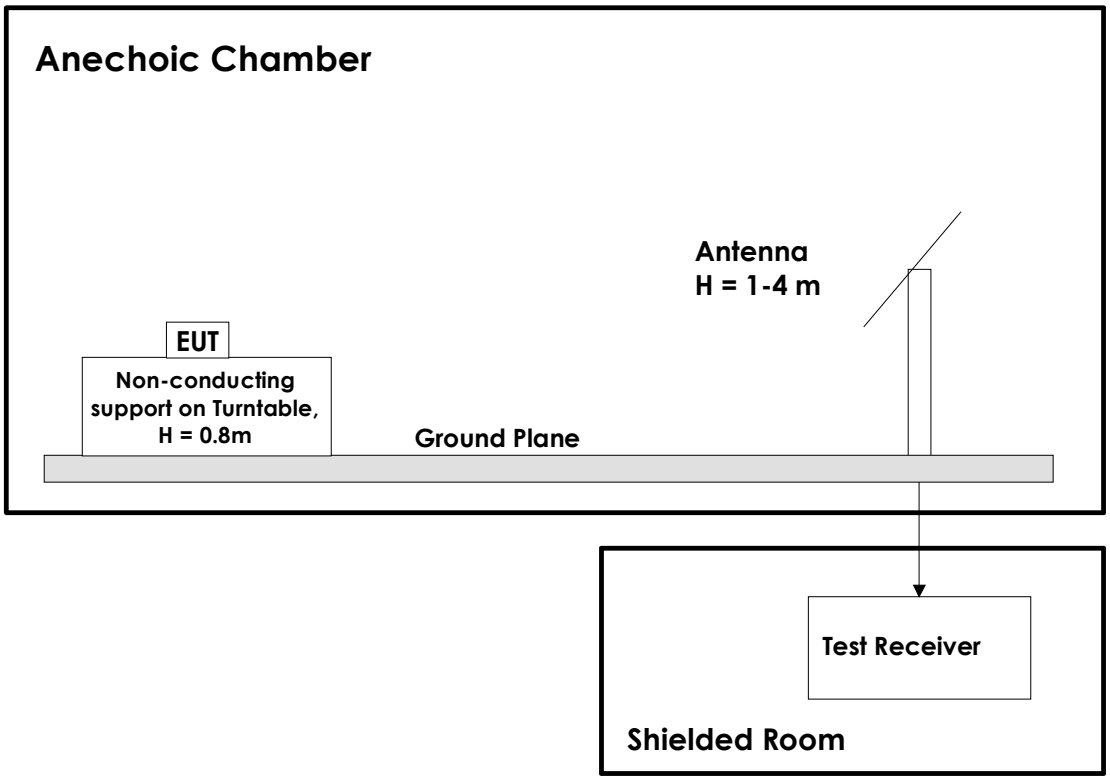


6.2 Conducted Tests



This test set-up is used for all Conducted tests.

6.3 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. Measuring distance is 3m for all frequencies.

Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna.

All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers.

A pre-amplifier is used for all measurements, and High-Pass filter is used for all harmonics.