



EMI – TEST REPORT

- FCC Part 15.247, RSS-247 -

Type / Model Name : SPB209A

Product Description : WLAN module

Applicant : MSC Technologies GmbH

Address : Ludwig-Erhard-Str. 10c

85375 NEUFABRN, GERMANY

Manufacturer : H&D Wireless AB

Address : Färögatan 33

164 51 KISTA, SWEDEN

Test Result according to the standards
listed in clause 1 test standards:

POSITIVE

Test Report No. : **T46090-02-00FX**

17. June 2020

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

FCC ID: XO2SPB209A

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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2019)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September 2019)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2
KDB 558074 D01 v05	Guidance for compliance measurements on DTS; FHSS and hybrid system devices operating under Section 15.247 of the FCC rules, April 2, 2019.

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2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according to his/her instructions.

2.3 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.4 General remarks

The EUT is a communication module consist of a fully tested and approved WLAN-Module according to FCC 15247 with a manufacturer designed host and PCB antennas. This test report shows the further compliance to the FCC 15247 with a new antenna (C2PC) after integration. Therefore, the re-test is partly done to the following requirements, only.

- Transmitter unwanted emissions, radiated

2.5 Equipment type

WLAN - Client, mobile device

2.6 Short description of the equipment under test (EUT)

The EUT is a part 15C certificated WLAN module with a chip antenna.

Number of tested samples: 1
Serial number: 1005413903
Firmware version WLAN: 15.2.7.69

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

2.7 Variants of the EUT

There are no variants.

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2.8 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan WLAN Standard 802.11b, g, n HT 20:

Channel	Frequency (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462
12	2467
13	2472

Note: the marked frequencies are determined for final testing.
Channel plan WLAN Standard 802.11n HT 40:

Channel	Frequency (MHz)
1 up	2422
2 up	2427
3 up	2432
4 up	2437
5 up	2442
6 up	2447
7 up	2452
8 up	2457
9 up	2462

Note: The marked frequencies are determined for final testing.

2.9 Transmit operating modes

The EUT uses DSSS or OFDM modulation and may operate under operating mode 2 and provide following data rates with auto-fall-back:

- 802.11b mode	11, 5.5, 2, 1 Mbps	(Mbps = megabits per second)
- 802.11g mode	54, 48, 36, 24, 18, 12, 9, 6 Mbps	(Mbps = megabits per second)
- 802.11n HT20,	MCS 0 - 15	
- 802.11n HT40,	MCS 0 - 15	

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2.10 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)	Cable loss (dB)	Effective gain (dBi)
1	SMD	WE-MCA (7488910245)	PCB-Soldered	2.4 – 2.5	3.0	No cable	3.0

The EUT is equipped with 1 internal WLAN antenna for SISO.

2.11 Power supply system utilised

Power supply voltage, V_{nom} (module) : 3 V – 3.6 V
Power supply voltage, V_{nom} : 12 VDC

2.12 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- monitor Model : Fendt NG DM (Display) 102725
- keyboard Model : USB Keyboard Logitech Deluxe 250
- USB hub Model : Fendt NG USB Hub 61410

2.13 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in X position.

The tests are carried out in the following frequency band:

2400 MHz – 2483.5 MHz

Preliminary tests are performed to find the worst case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate.

For the final test the following channels and test modes are selected:

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.11b	1 to 13	1, 6, 11, 13	see table	DSSS	DBPSK	1 Mbps
802.11n HT20	1 to 13	1, 6, 11, 13	see table	OFDM	BPSK	MCS0
802.11n HT40	1up to 9up	1up, 4up, 7 up, 9 up	see table	OFDM	BPSK	MCS0

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Power table:

Power setting	CH 1	CH 6	CH 11	CH 13
802.11b	16	16	16	13
802.11n HT20	14	14	14	9
802.11n HT40	14	14	14	9

2.13.1 Test jig

No test jig was used.

2.13.2 Test software

The test software for the EUT provides free power setting, the special test mode TX continuous mode, modulated. The EUT was set with test modulation to transmit data during the tests with a maximum duty cycle (x) from an internal packet generator.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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3 TEST RESULT SUMMARY

WLAN device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz:

FCC Rule Part	Description	Result
15.207(a)	AC power line conducted emissions	Not tested
15.247(a)(2)	-6 dB EBW	Not tested
15.247(b)(3)	Maximum peak conducted output power	Not tested
15.247(b)(4)	Defacto limit	Not tested
15.247(d)	Unwanted emission, radiated	passed
15.247(d)	Emissions in restricted bands	passed
15.247(e)	PSD	Not tested
15.35(c)	Pulsed operation	Not tested
15.203	Antenna requirement	Not tested

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 28 May 2020

Testing concluded on : 05 June 2020

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

i.A. Lukas Scheuermann
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 °C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>86-106 kPa</u>

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 30000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Output power ERP, radiated	1000 MHz to 7000 MHz	95%	± 2.71 dB
Field strength of the fundamental	1000 MHz to 7000 MHz	95%	± 2.71 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Spurious Emissions, conducted	9 kHz to 10000 MHz	95%	± 2.15 dB
Spurious Emissions, conducted	10000 MHz to 40000 MHz	95%	± 3.47 dB
Spurious Emissions, radiated	9 kHz to 30 MHz	95%	± 3.53 dB
Spurious Emissions, radiated	30 MHz to 1000 MHz	95%	± 4.44 dB
Spurious Emissions, radiated	1000 MHz to 30000 MHz	95%	± 2.34 dB
Spurious Emissions, radiated	30000 MHz to 40000 MHz	95%	± 5.13 dB

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4.4 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

4.5 Measurement protocol for FCC and ISED

4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.5.2.2 Radiated emission (electrical field 30 MHz - 1 GHz)

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees.

The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency Delta (MHz)	Level (dBµV)	+	Factor (dB)	=	Level (dBµV/m)	-	Limit (dBµV/m)	=	
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

FCC ID: XO2SPB209A**4.5.2.3 Radiated emission (electrical field 1 GHz - 40 GHz)**

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table, 1.5 metre above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.10. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function, a resolution bandwidth 1 MHz and video bandwidth 3 MHz. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

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5 TEST CONDITIONS AND RESULTS

5.1 Unwanted emissions in restricted bands, radiated

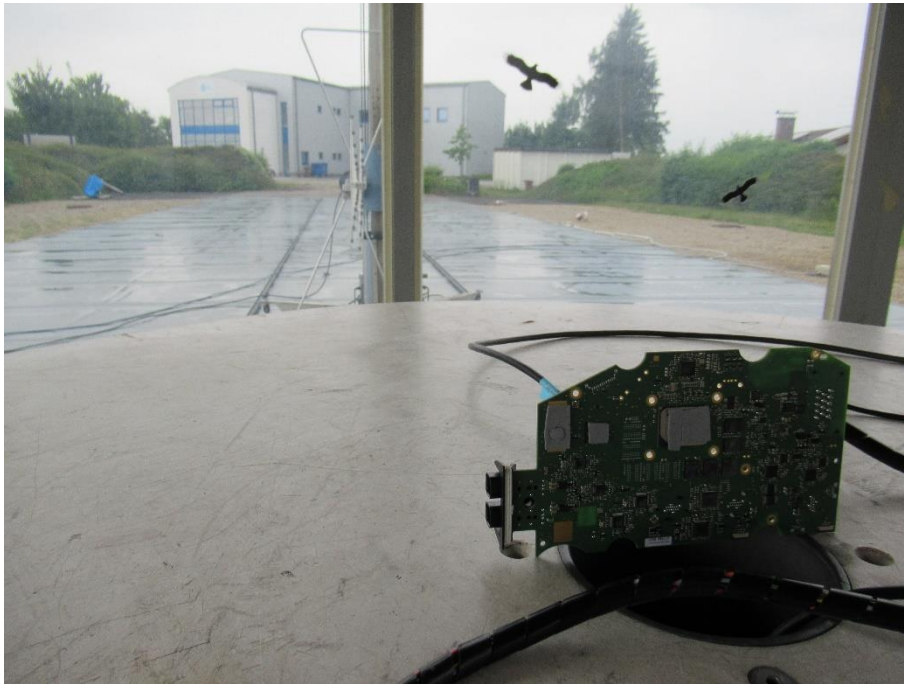
For test instruments and accessories used see section 6 Part **SER 2**, **SER 3**.

5.1.1 Description of the test location

Test location: OATS 1
 Test location: Anechoic chamber 1
 Test distance: 3 m

5.1.2 Photo documentation of the test set-up

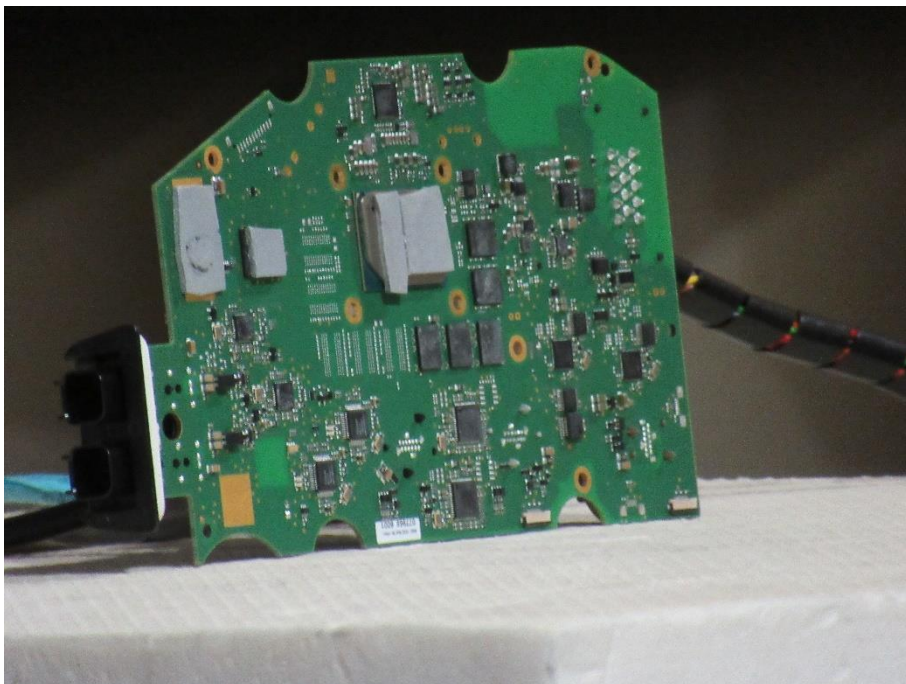
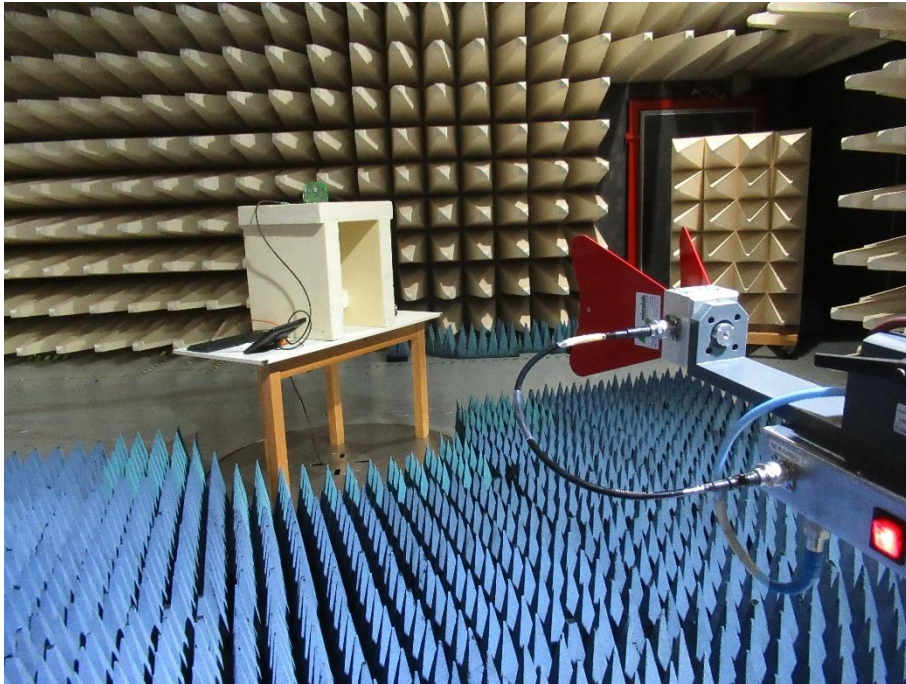
Open area test site



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

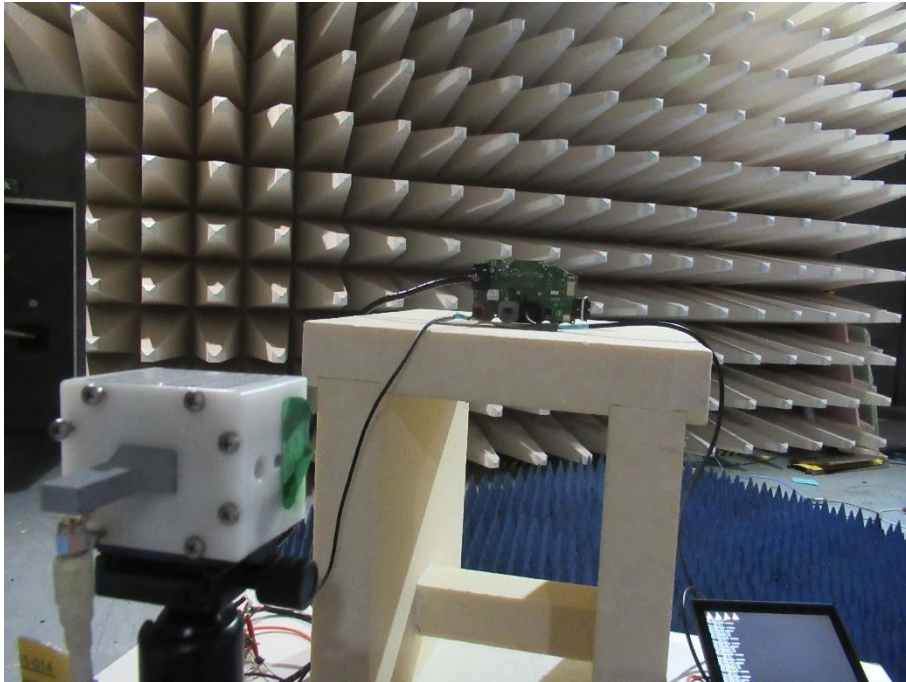
FCC ID: XO2SPB209A

Anechoic chamber



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5.1.3 Applicable standard

According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.1.4 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

Spectrum analyser settings:

30 MHz – 1000 MHz: RBW: 120 kHz

1000 MHz – 26 GHz: RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Max Peak

5.1.5 Test result

f < 1000 MHz:

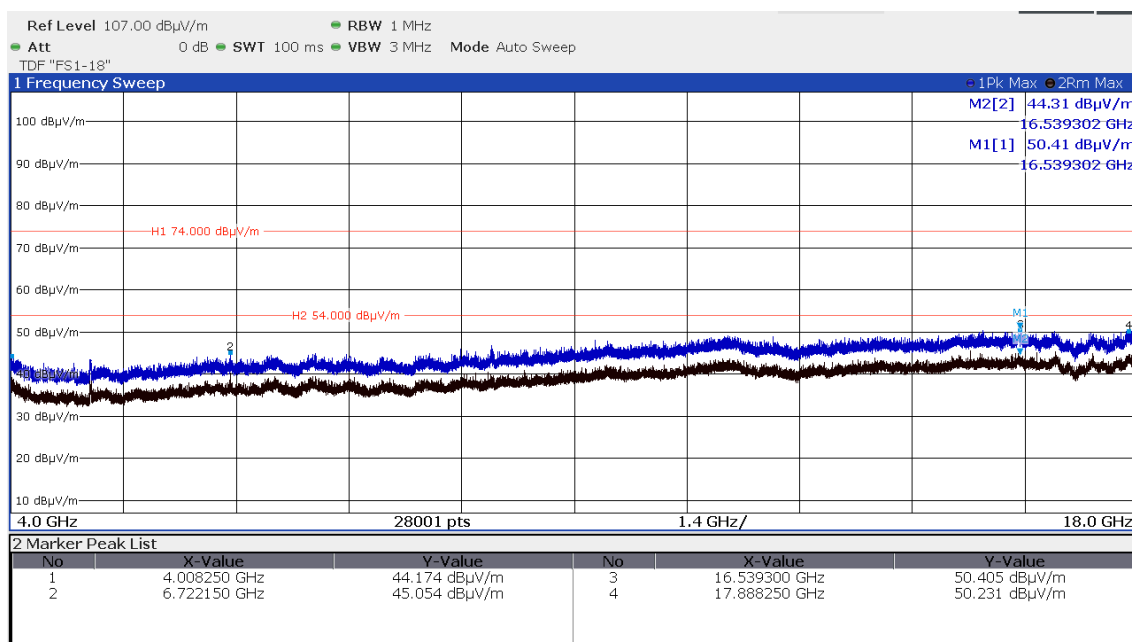
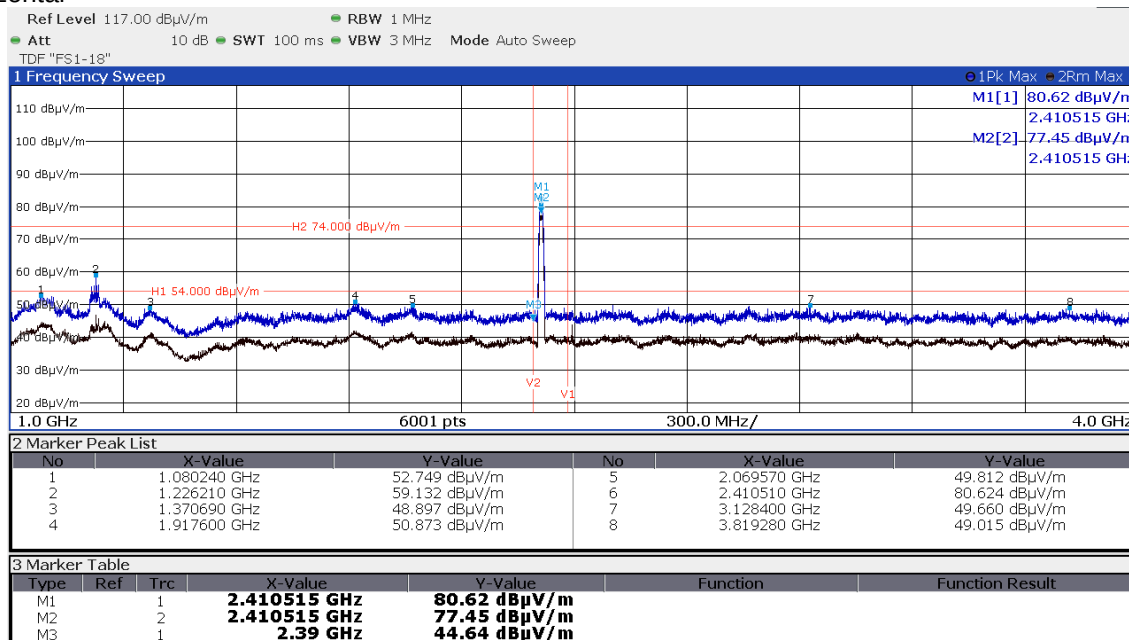
Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
65,90	6,9	9,8	14,3	13,5	21,2	23,3	40,0	-16,7
137,28	12,8	12,0	13,2	14,0	26,0	26,0	43,5	-17,5
144,00	5,6	11,3	13,6	14,4	19,2	25,7	43,5	-17,8
246,20	11,7	15,6	13,6	13,8	25,3	29,4	46,0	-16,6
297,00	8,0	9,6	16,7	16,3	24,7	25,9	46,0	-20,1
445,45	2,7	1,4	21,0	20,8	23,7	22,2	46,0	-22,3
742,51	8,9	6,3	28,1	27,5	37,0	33,8	46,0	-9,0

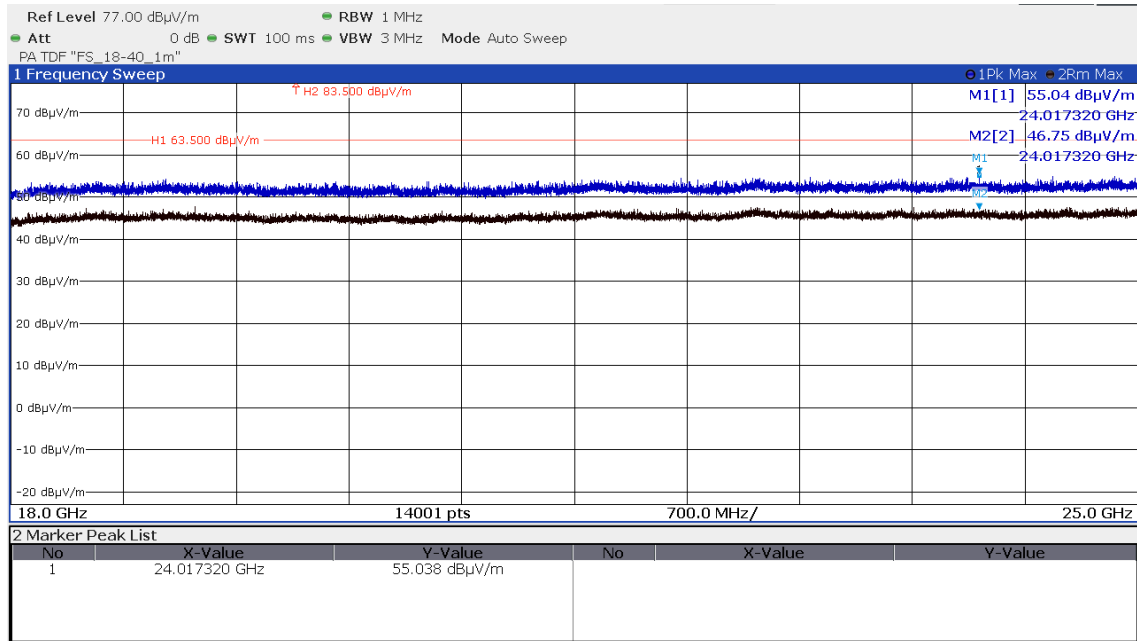
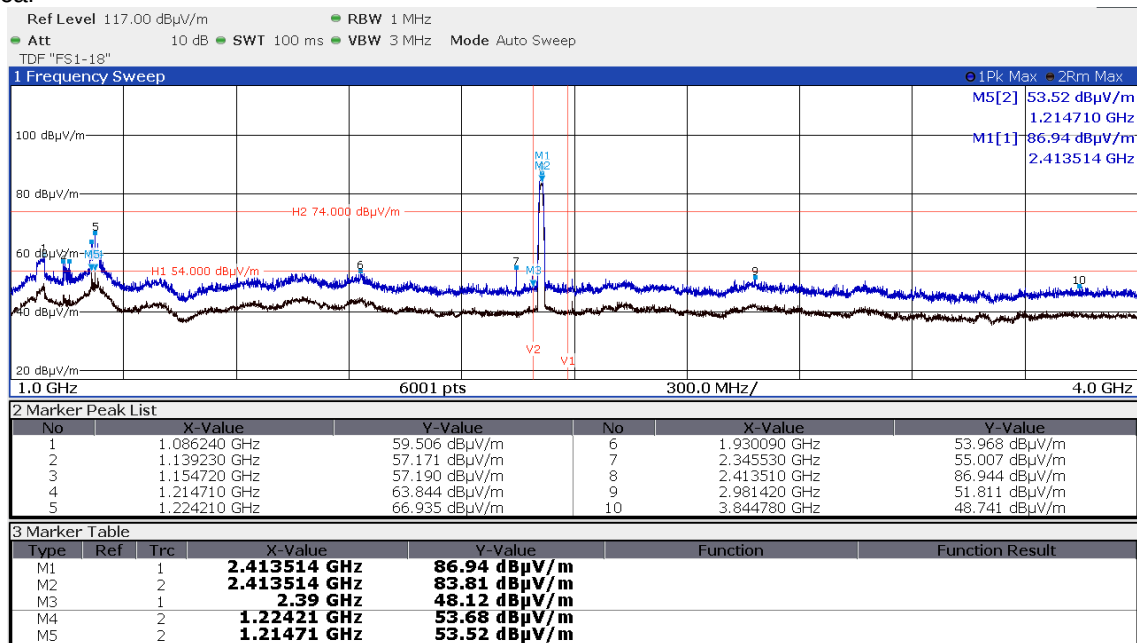
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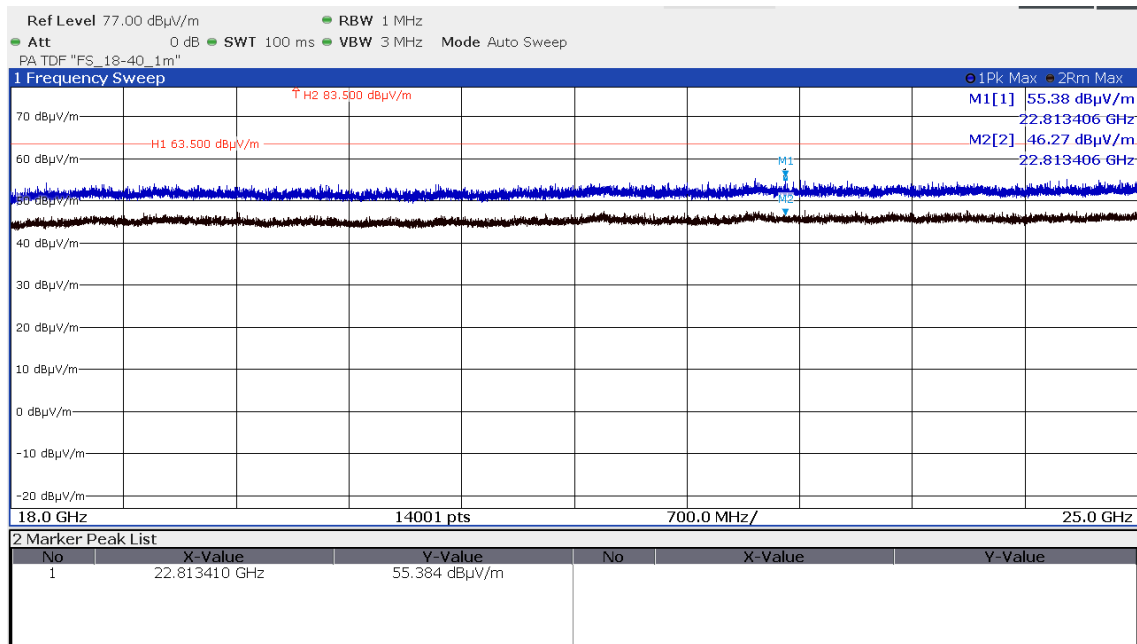
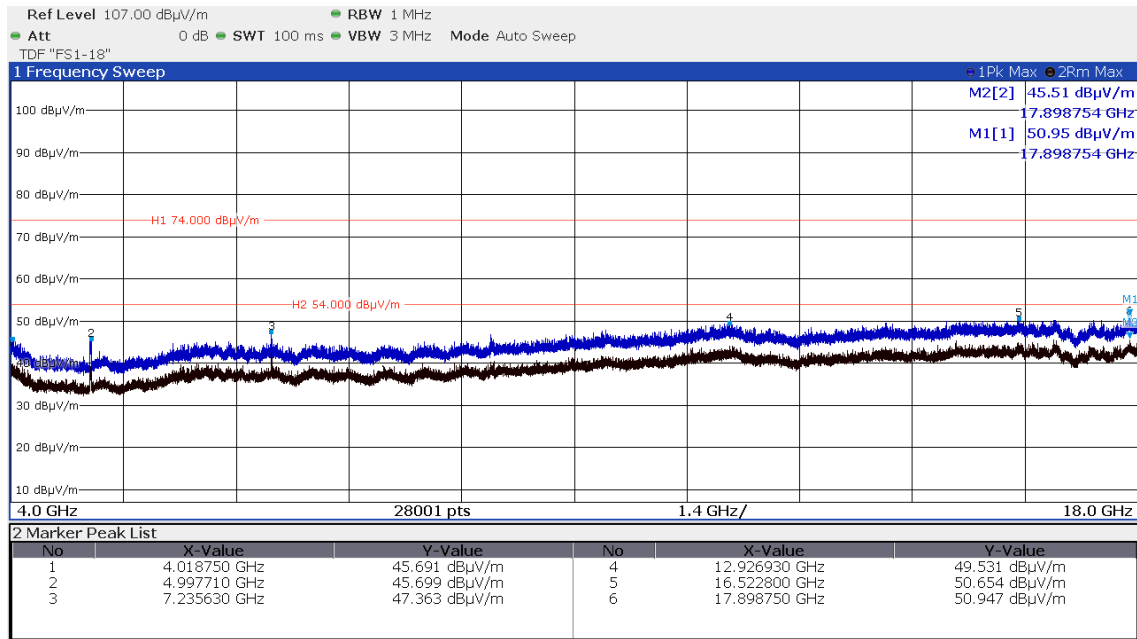
f > 1000 MHz:

5.1.5.1 WLAN Standard 802.11b

CH1 horizontal

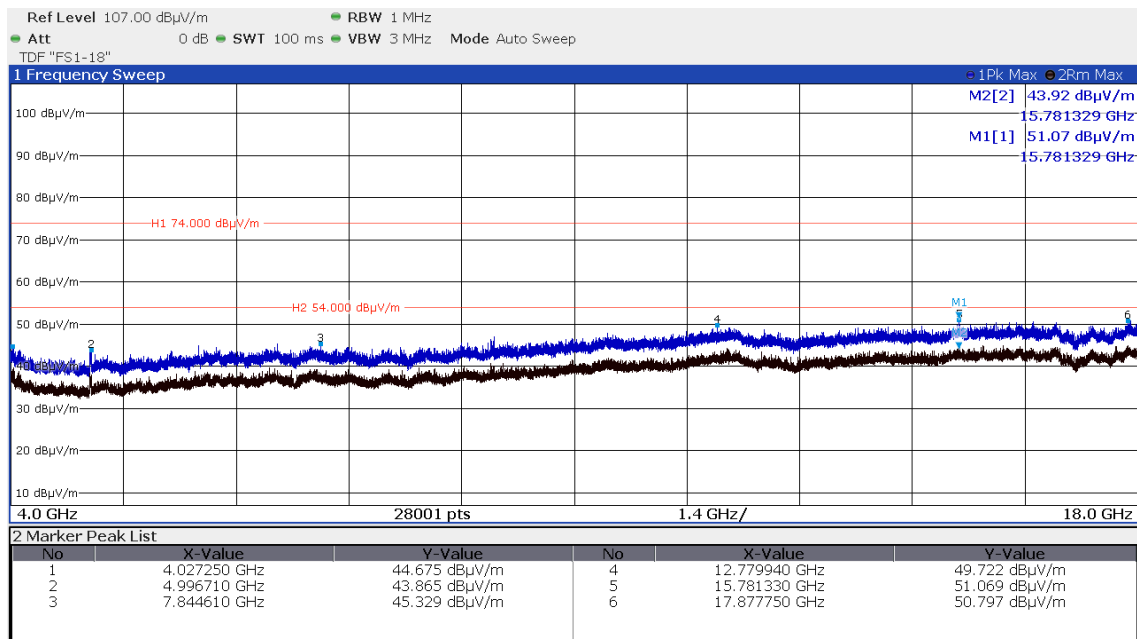
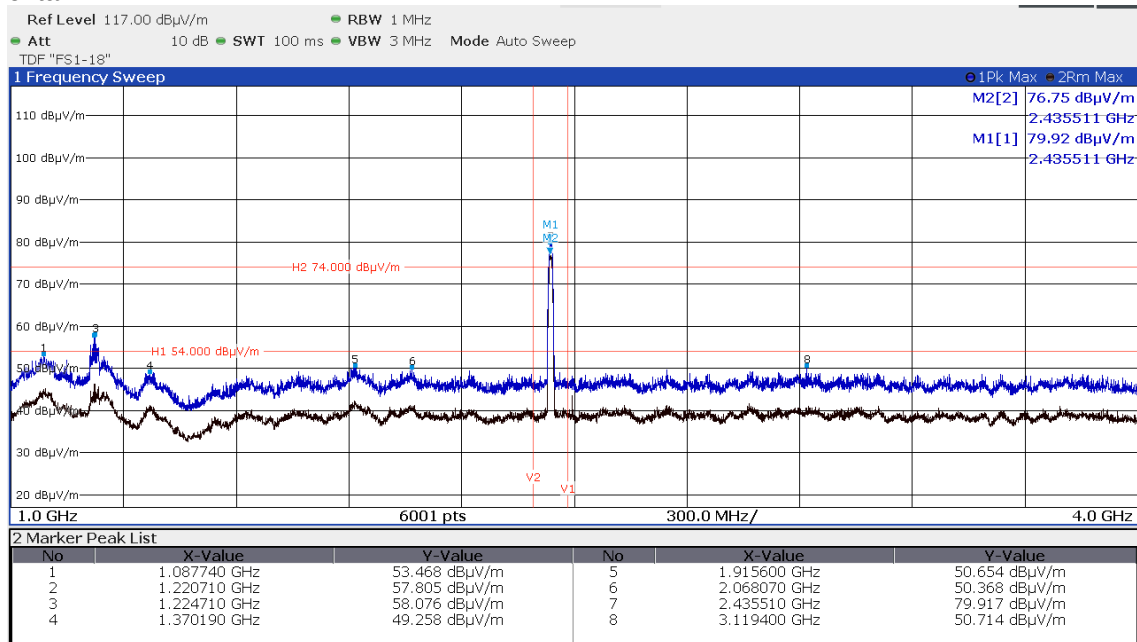


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CH1 vertical


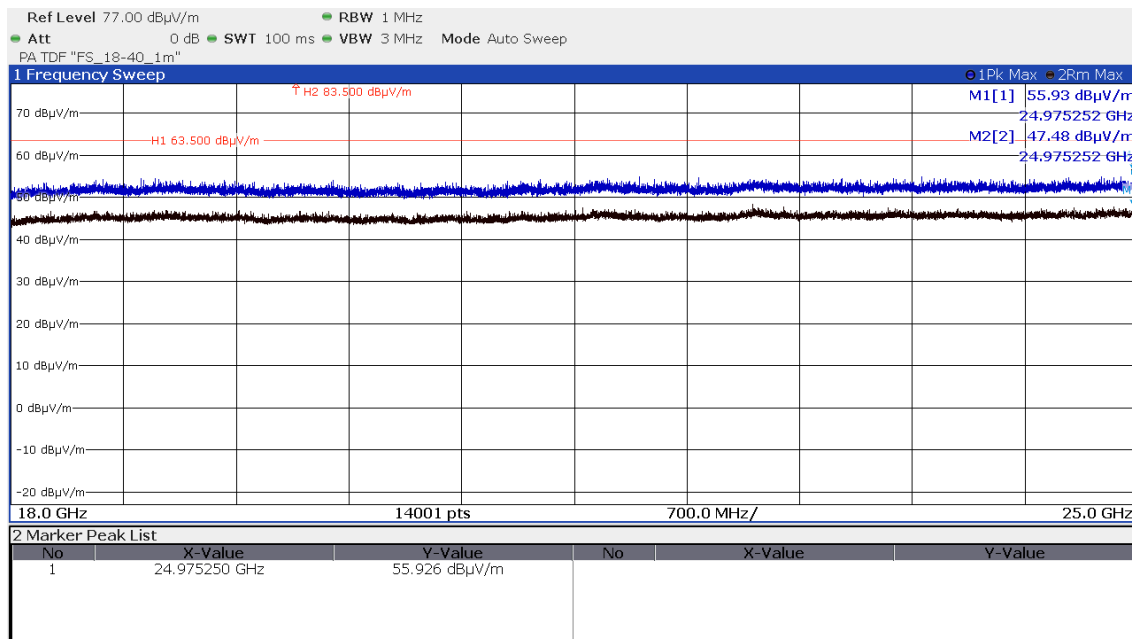
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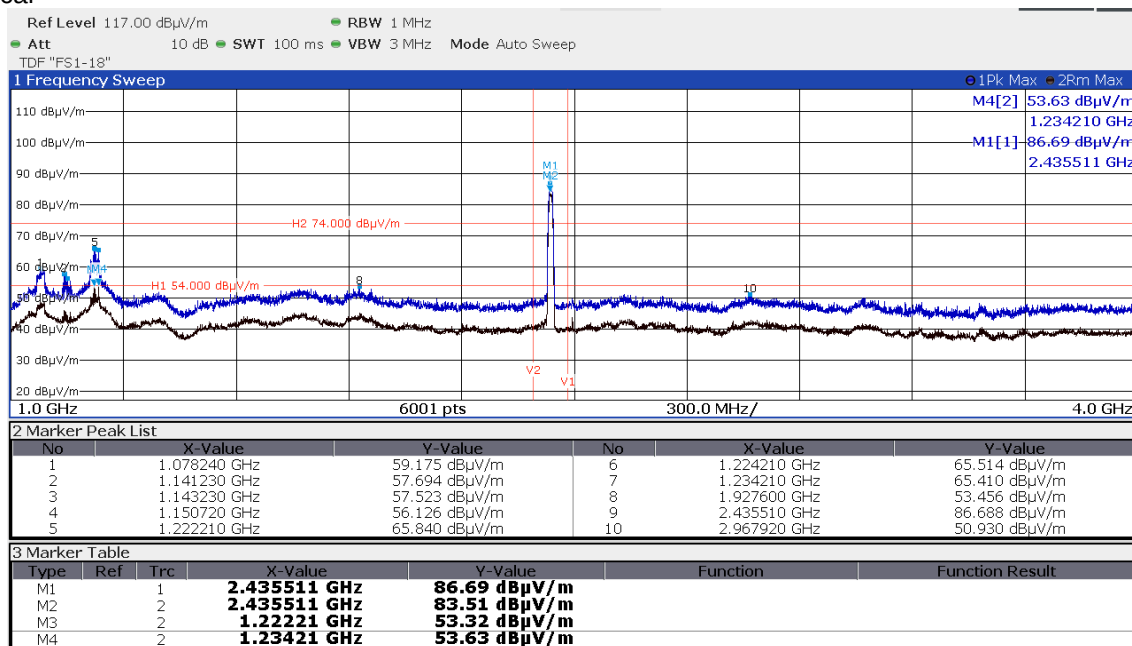
CH6 horizontal

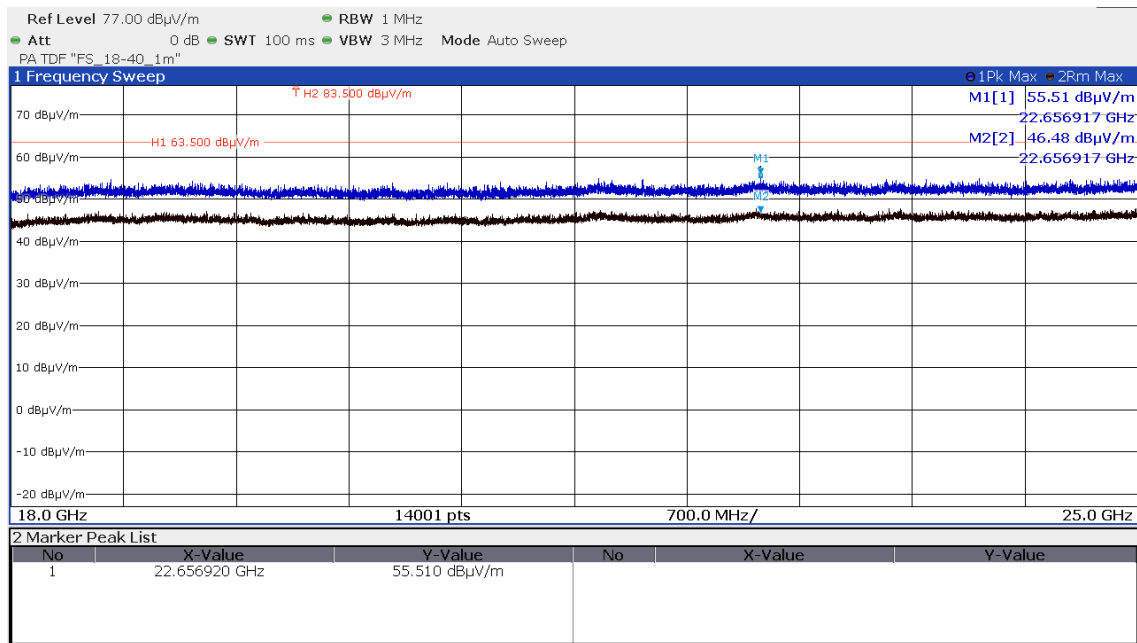
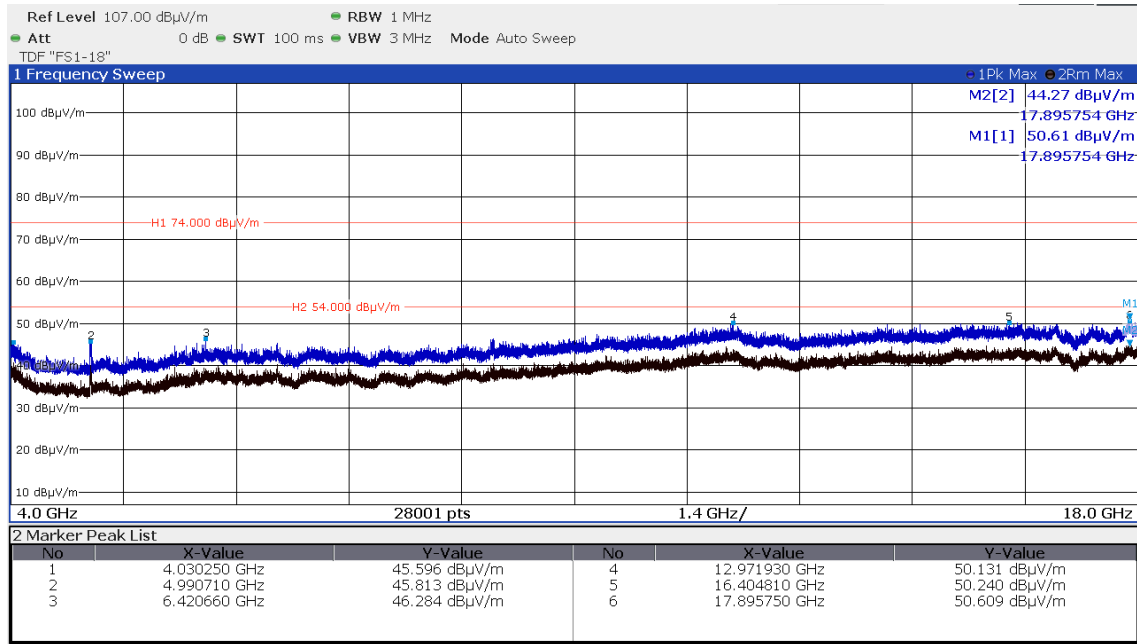


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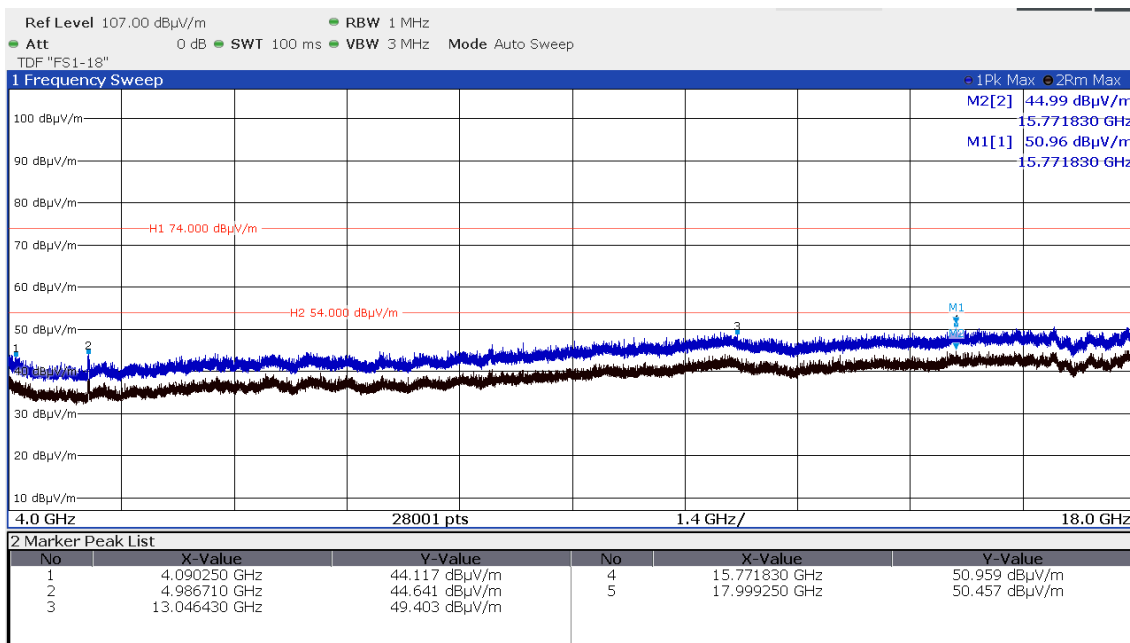
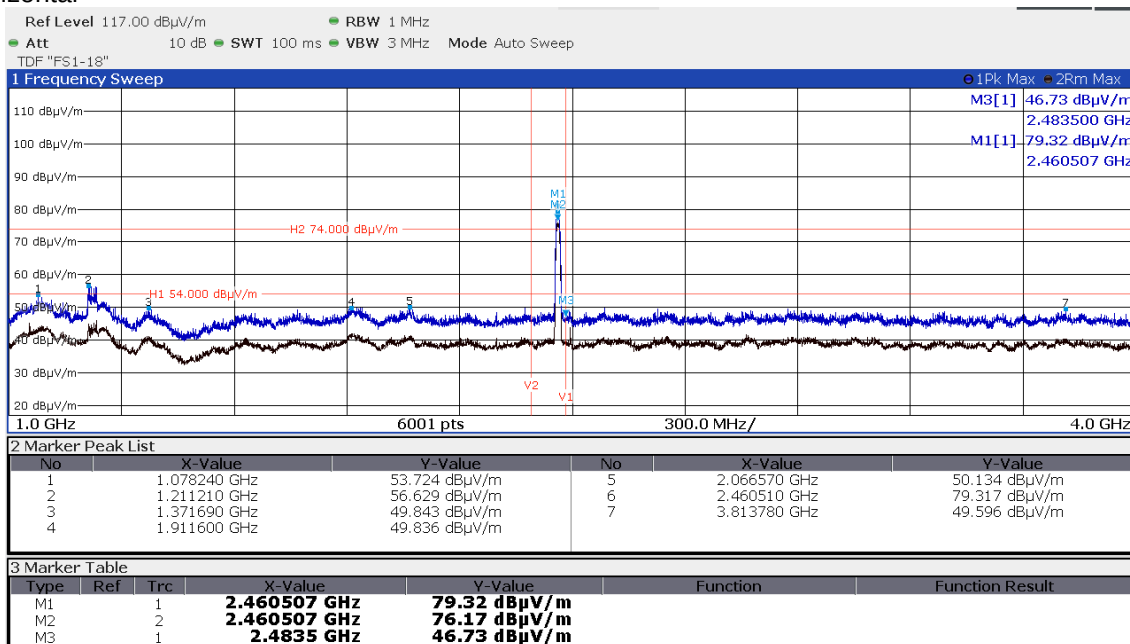
CH6 vertical

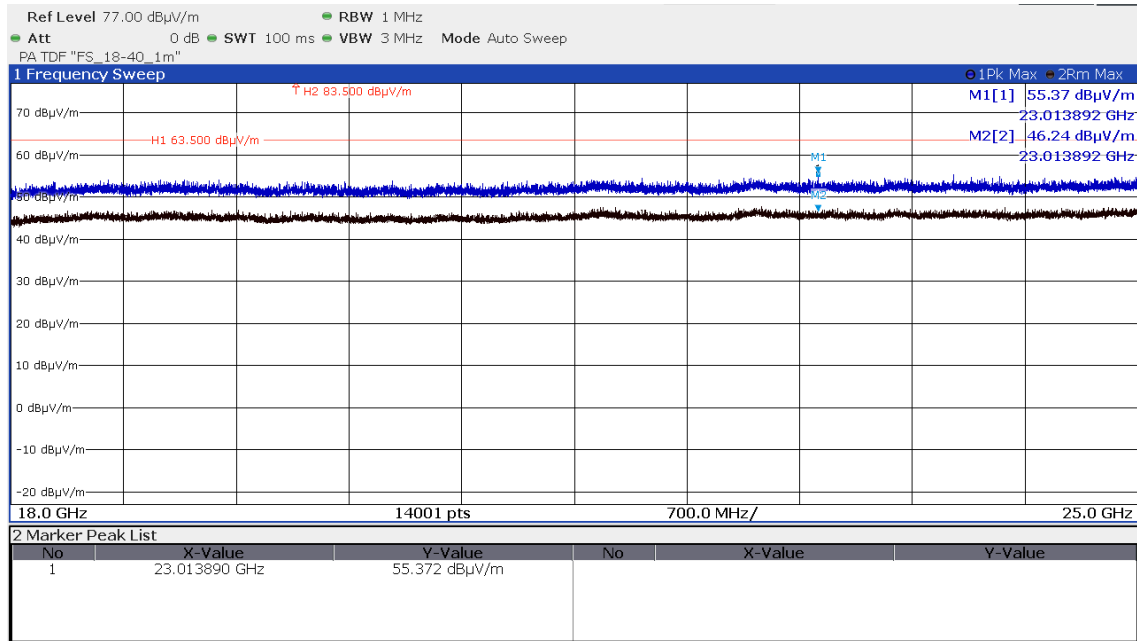
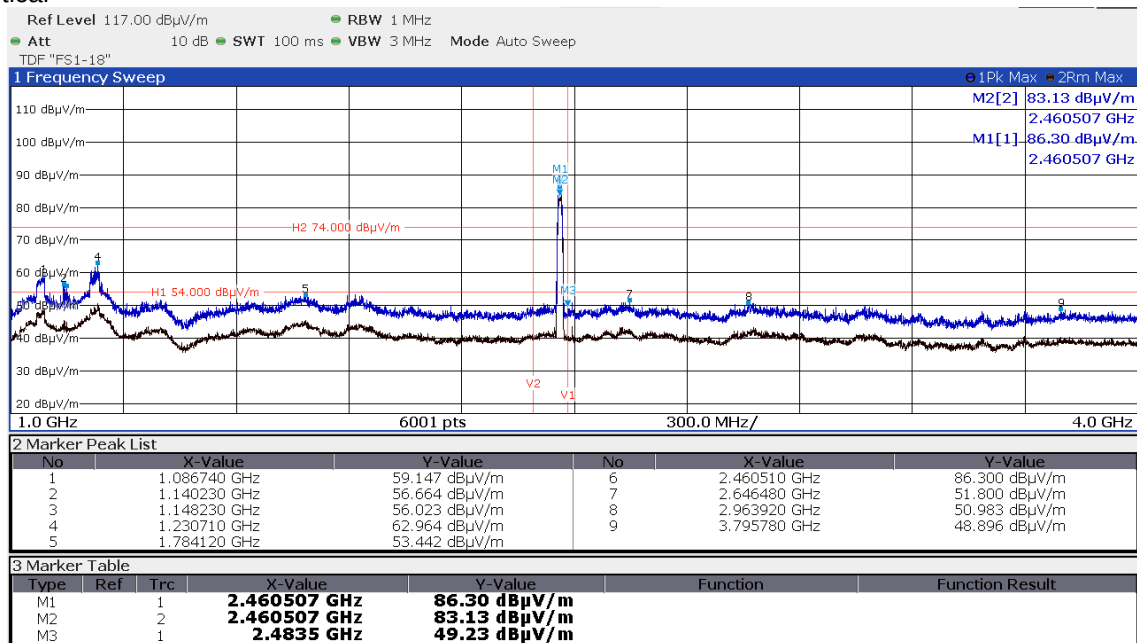


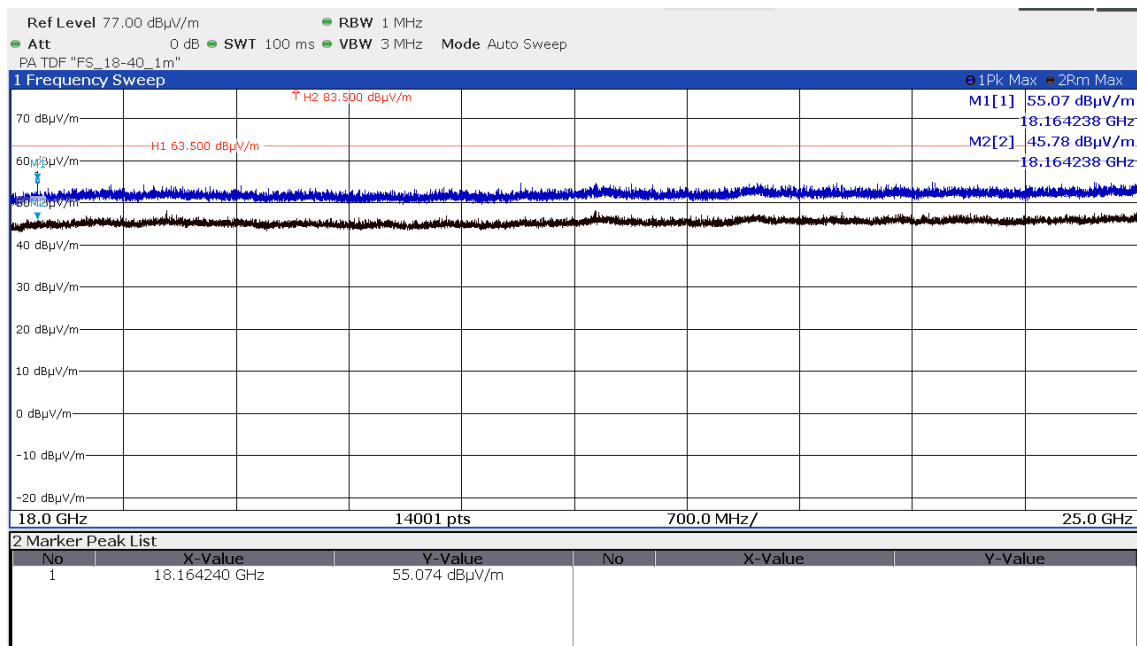
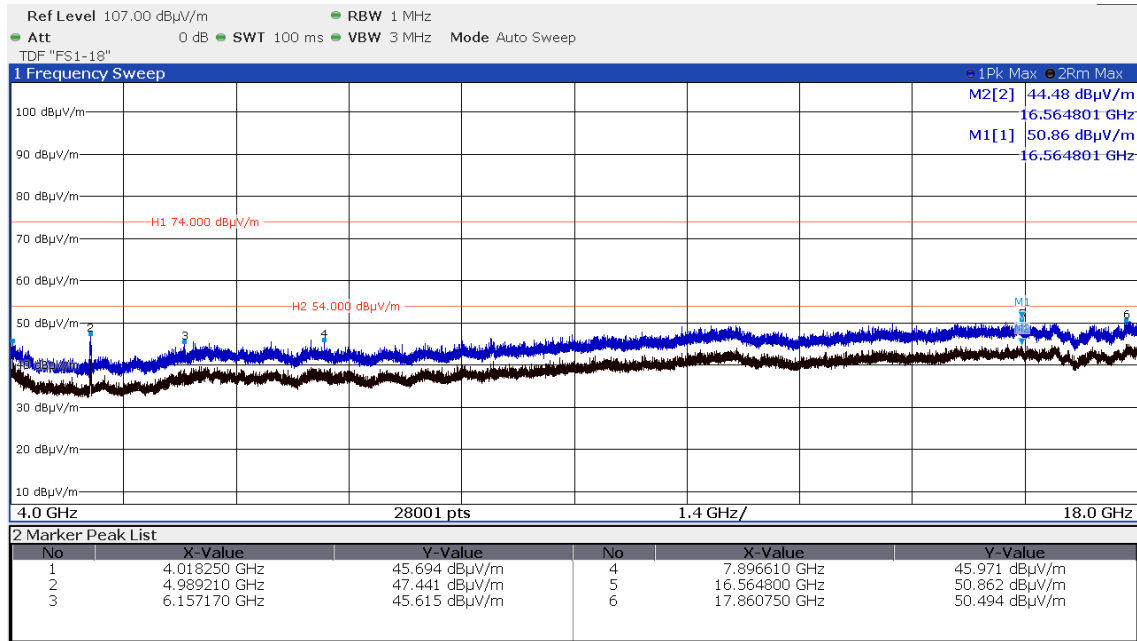
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CH11 horizontal

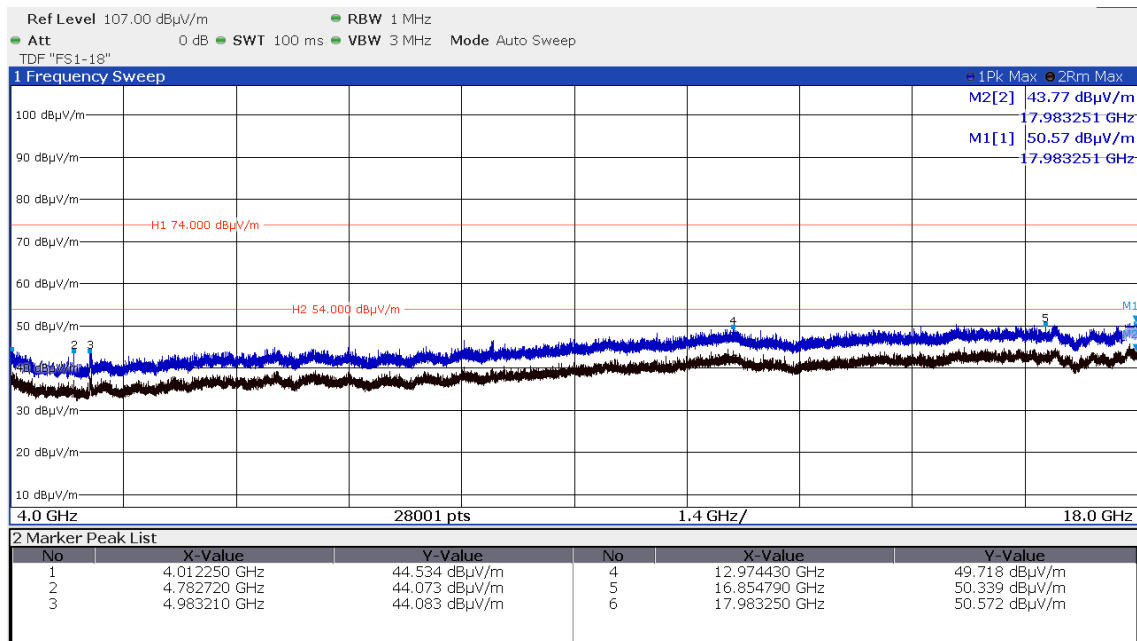
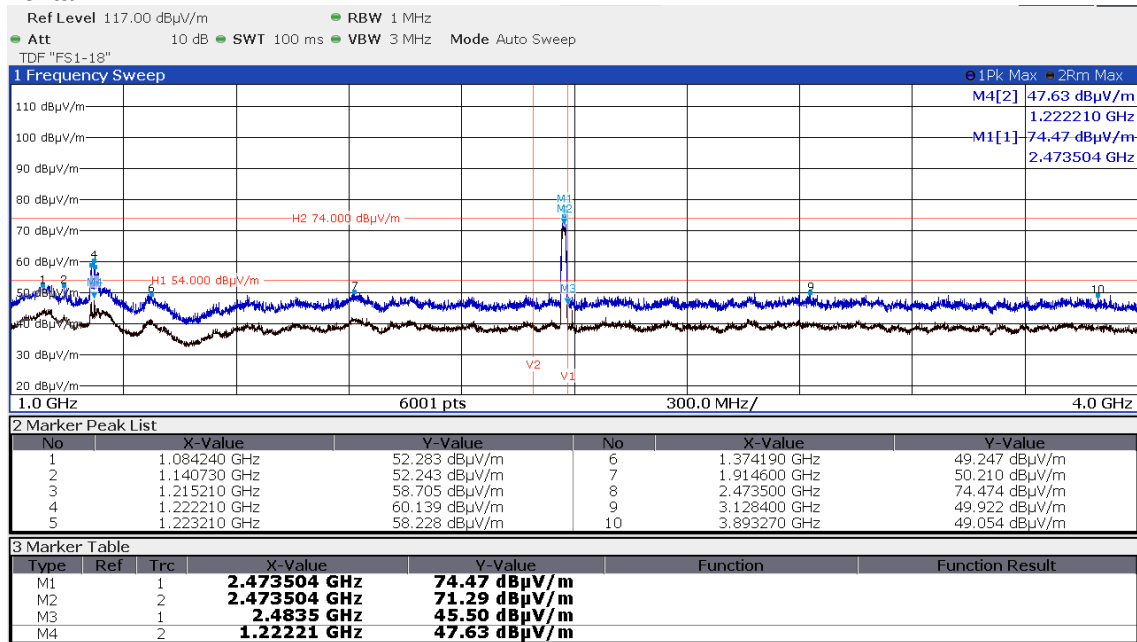


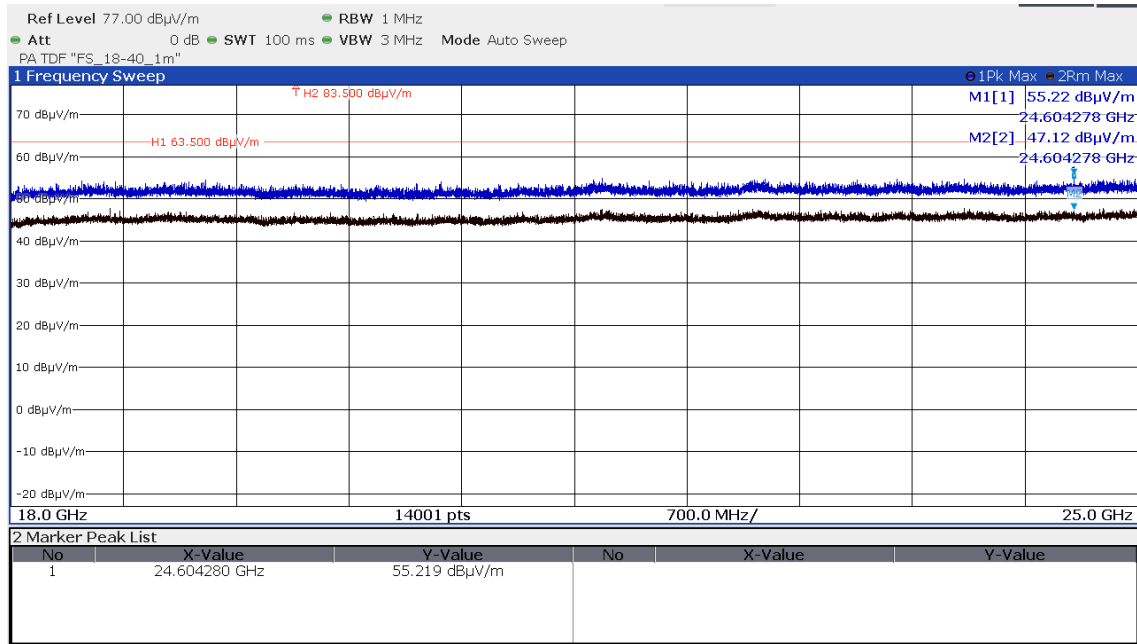
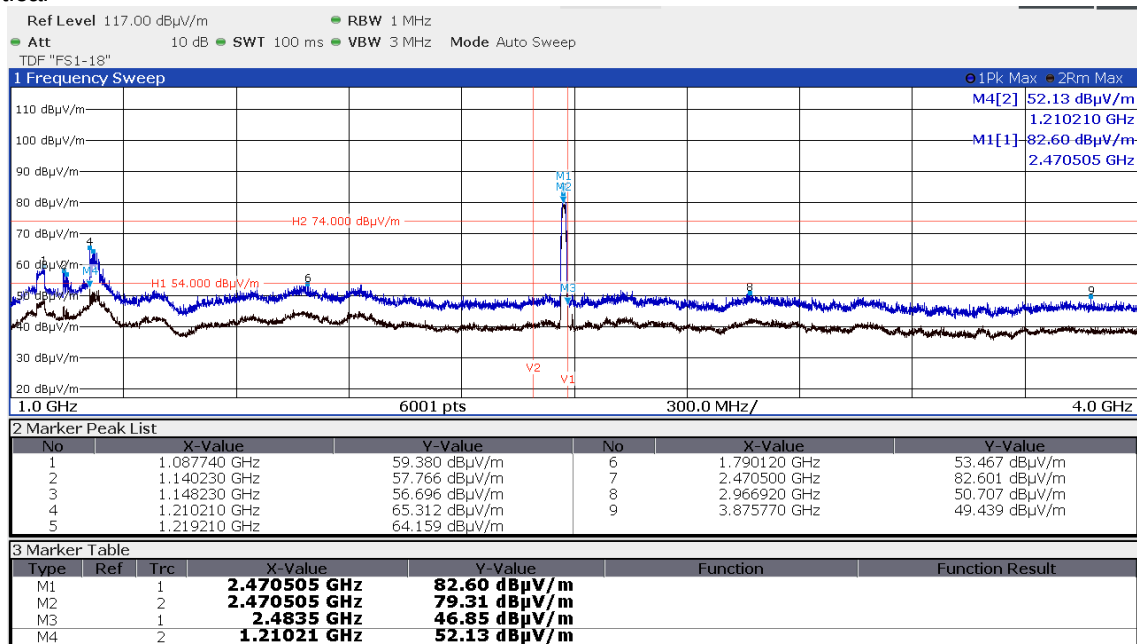
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CH11 vertical


FCC ID: XO2SPB209A


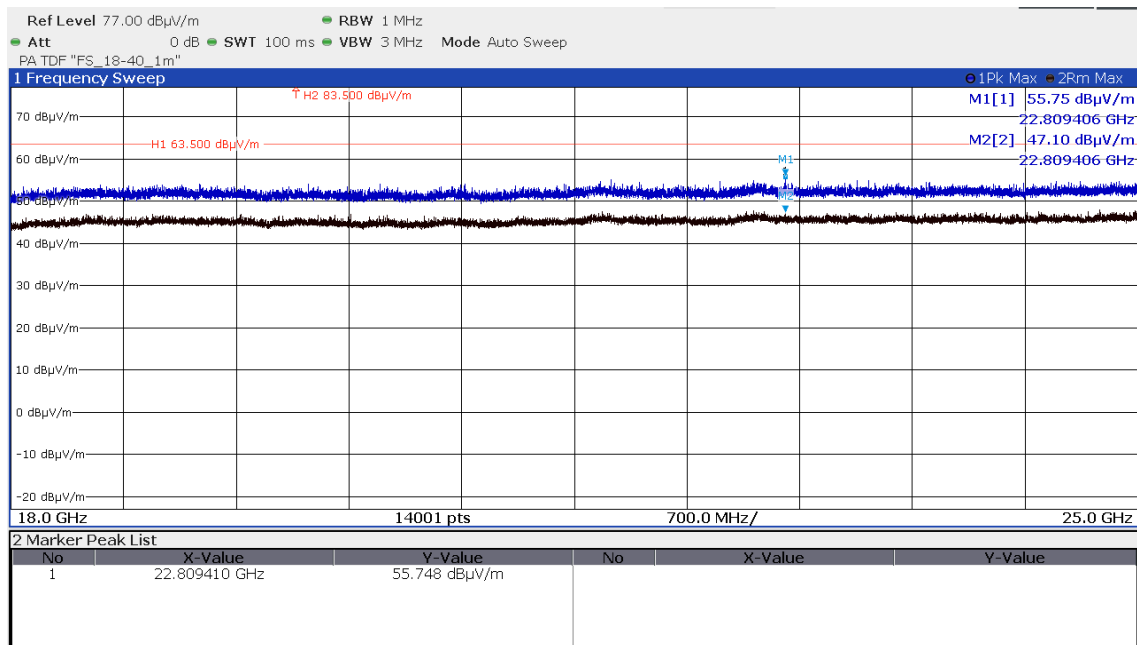
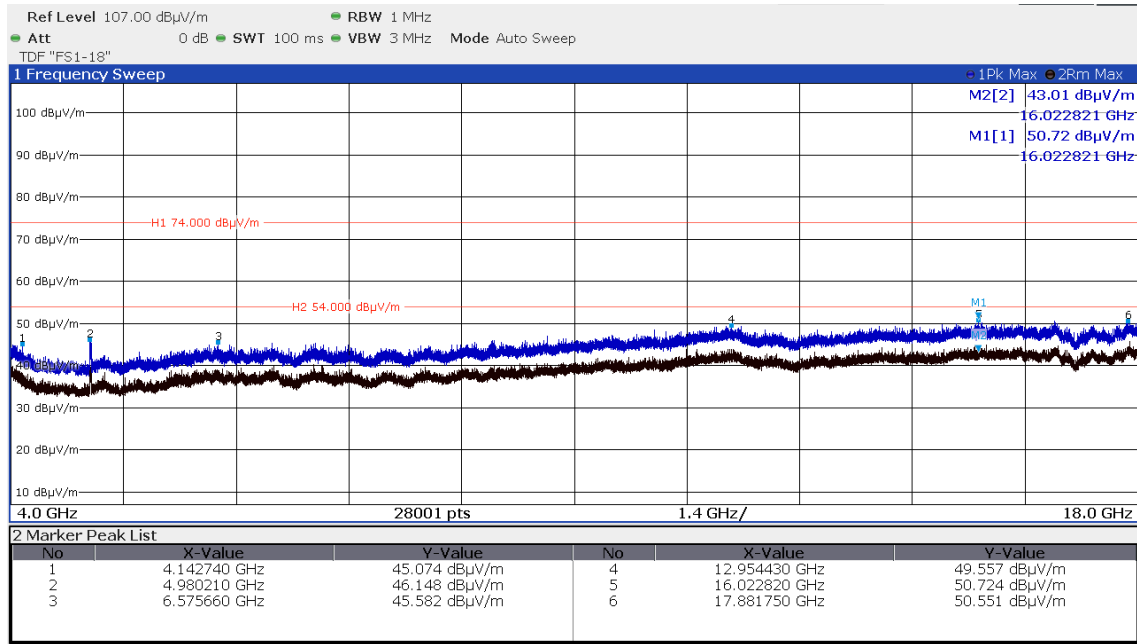
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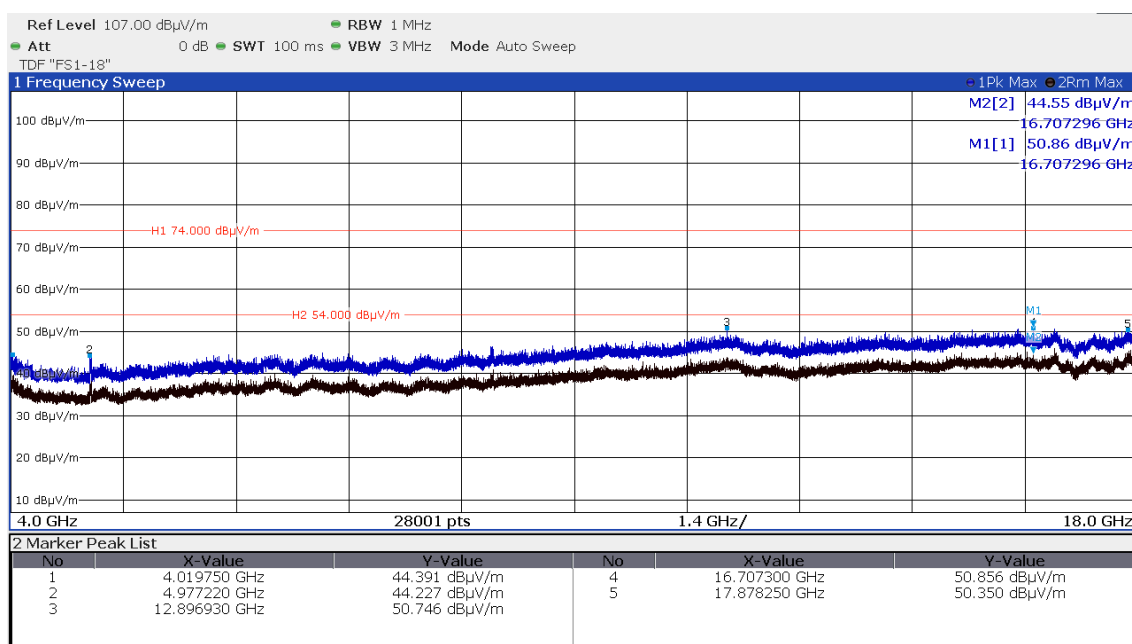
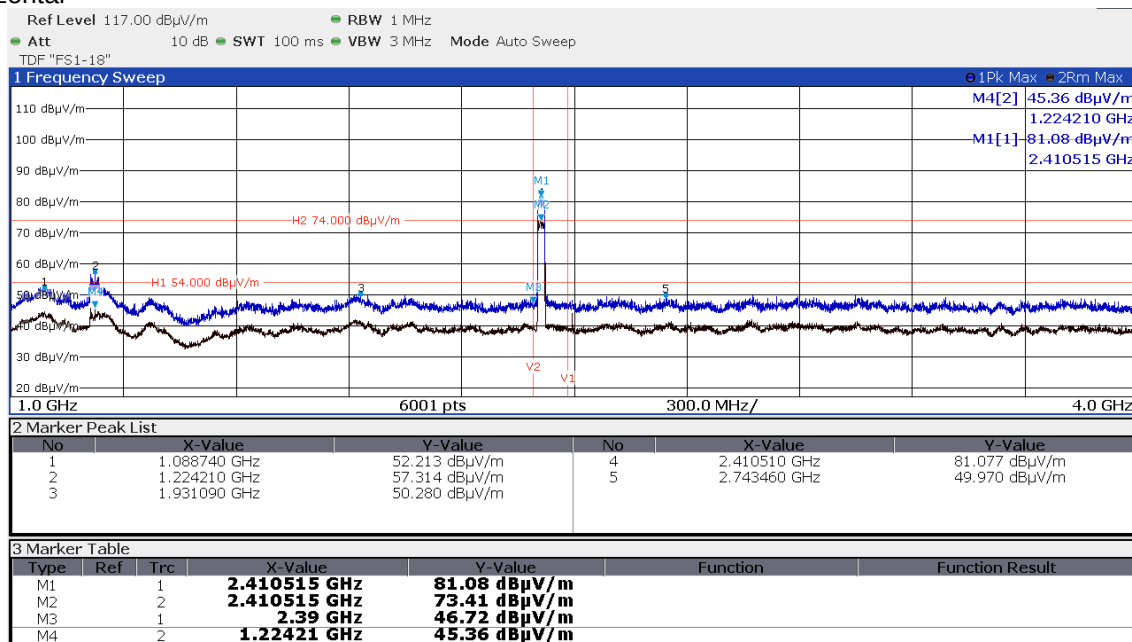
CH13 horizontal

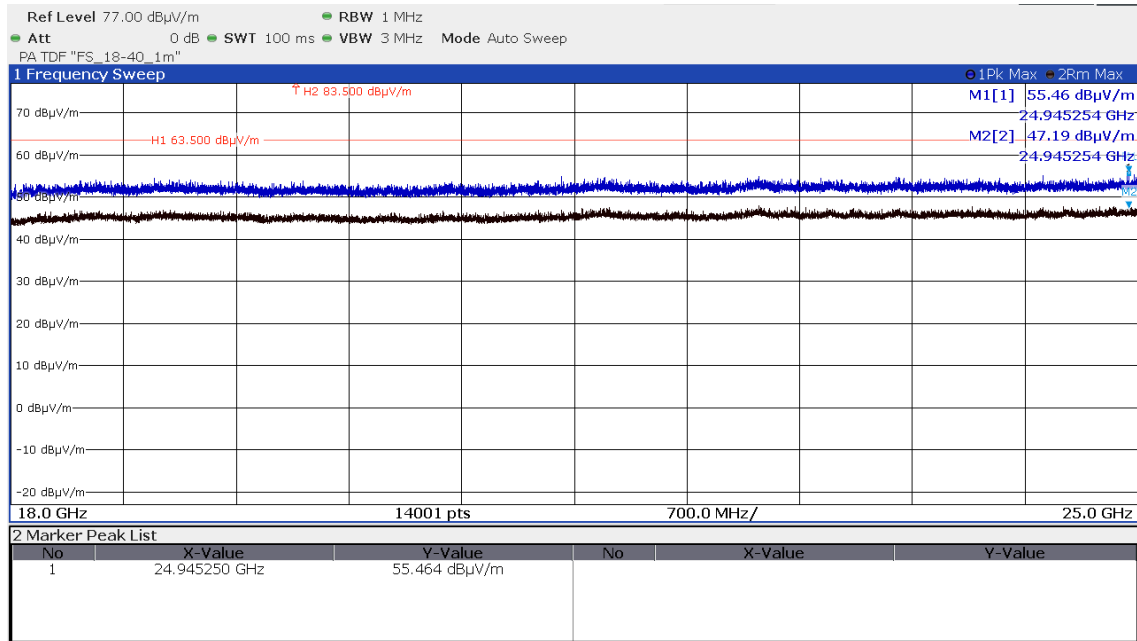
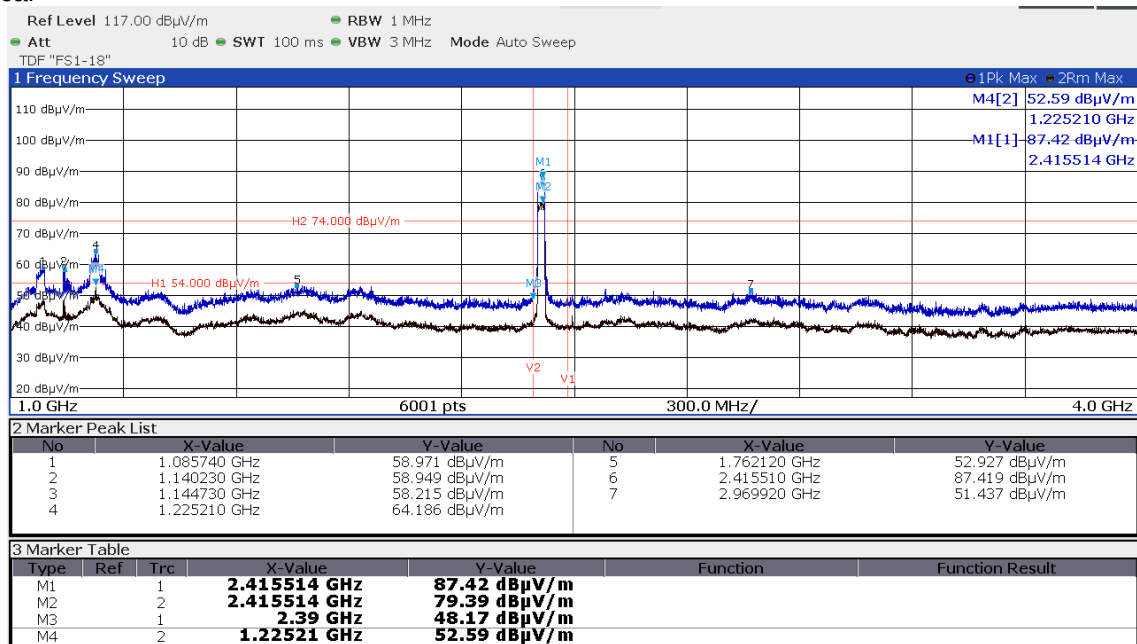


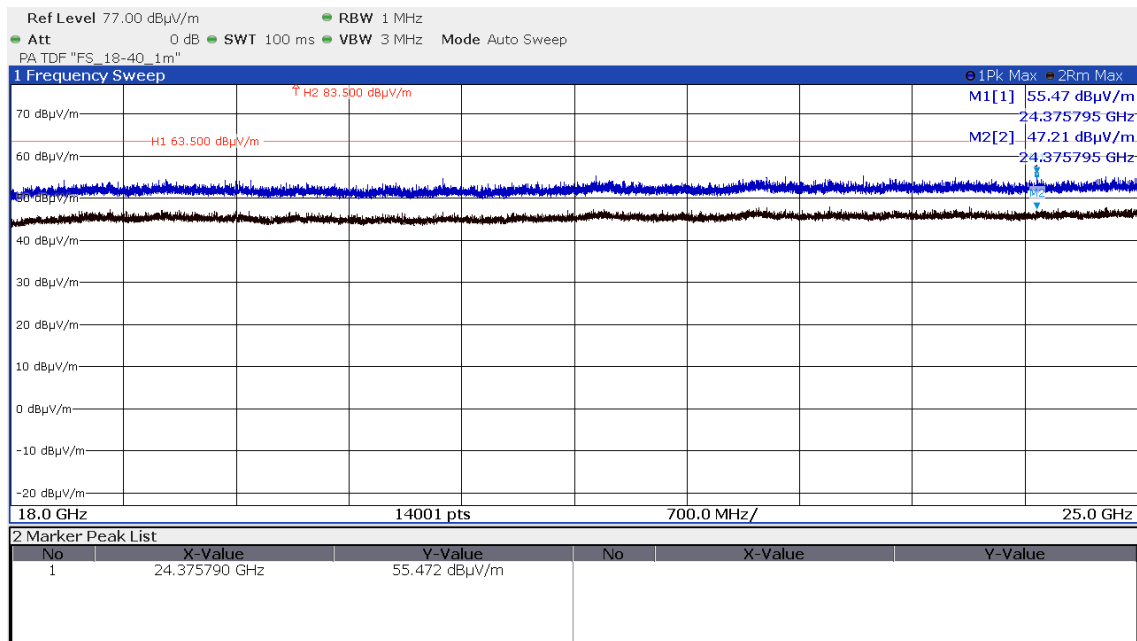
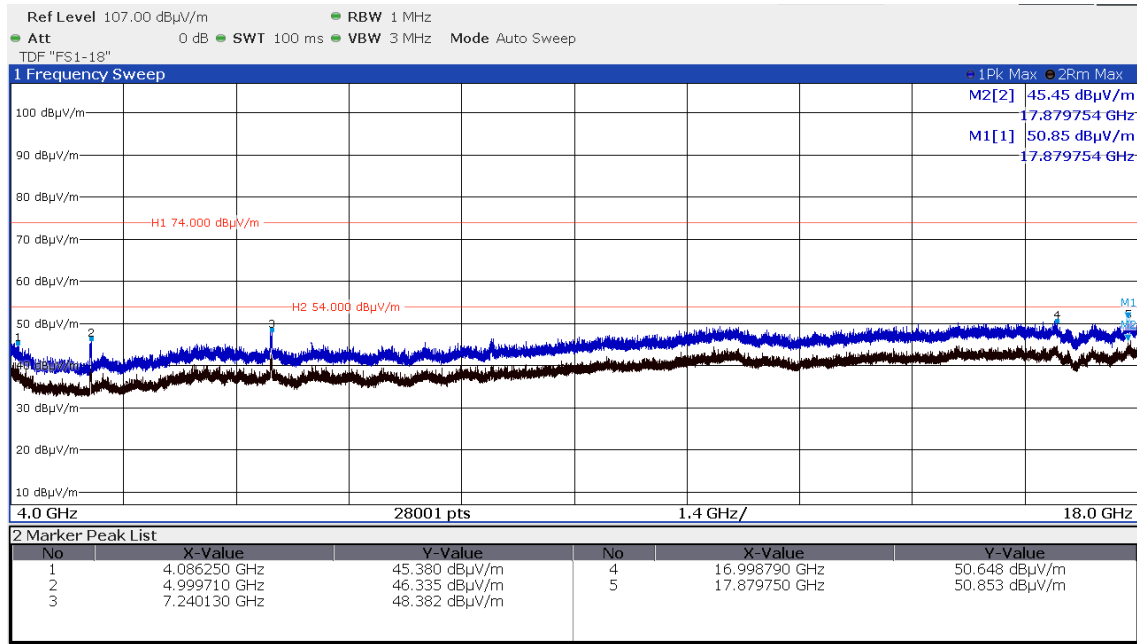
FCC ID: XO2SPB209A

CH13 vertical


FCC ID: XO2SPB209A



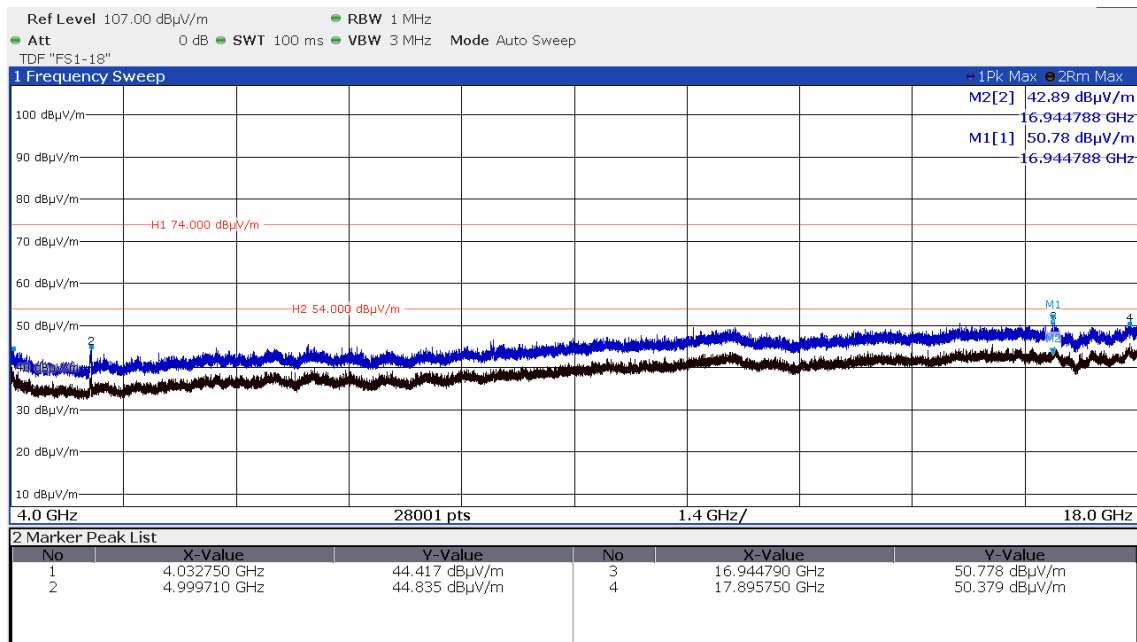
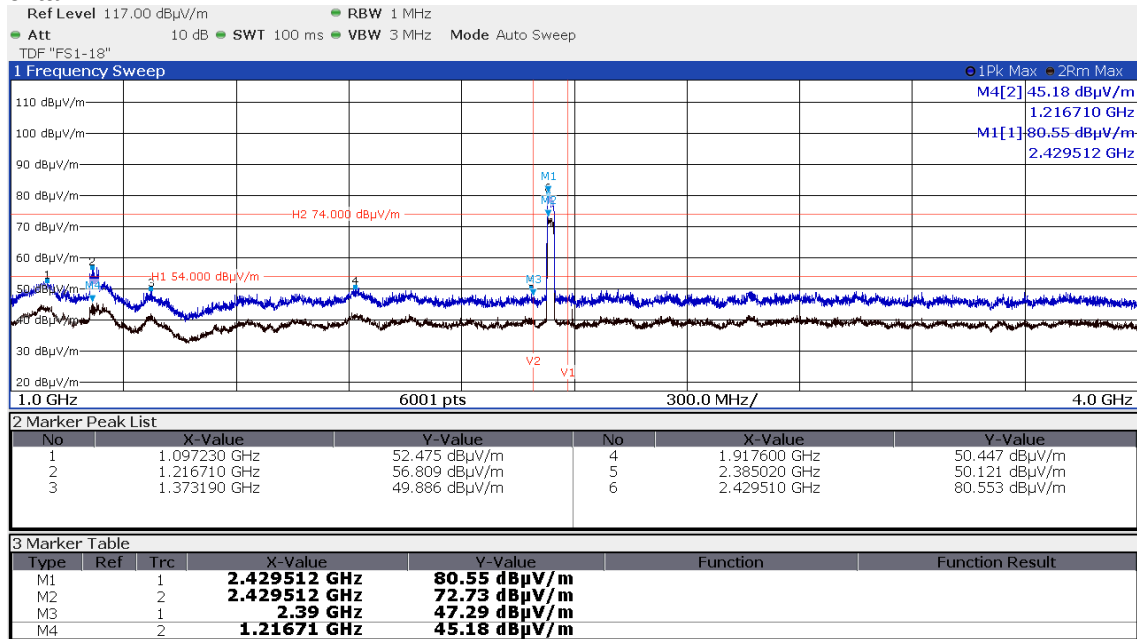
FCC ID: XO2SPB209A
5.1.5.2 WLAN Standard 802.11n HT20
CH1 horizontal


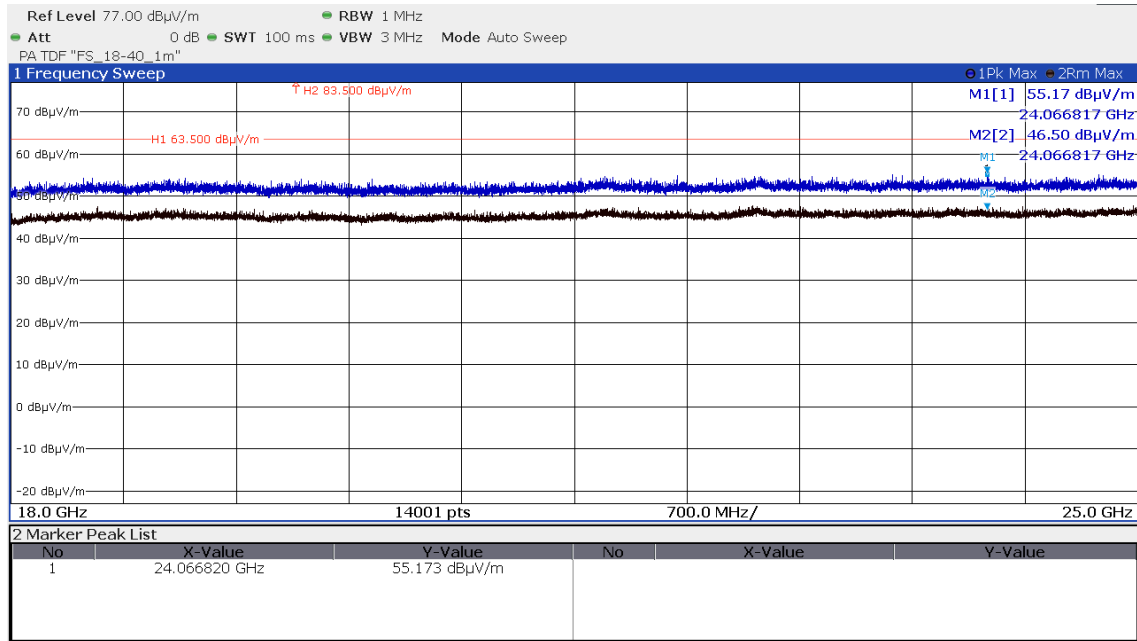
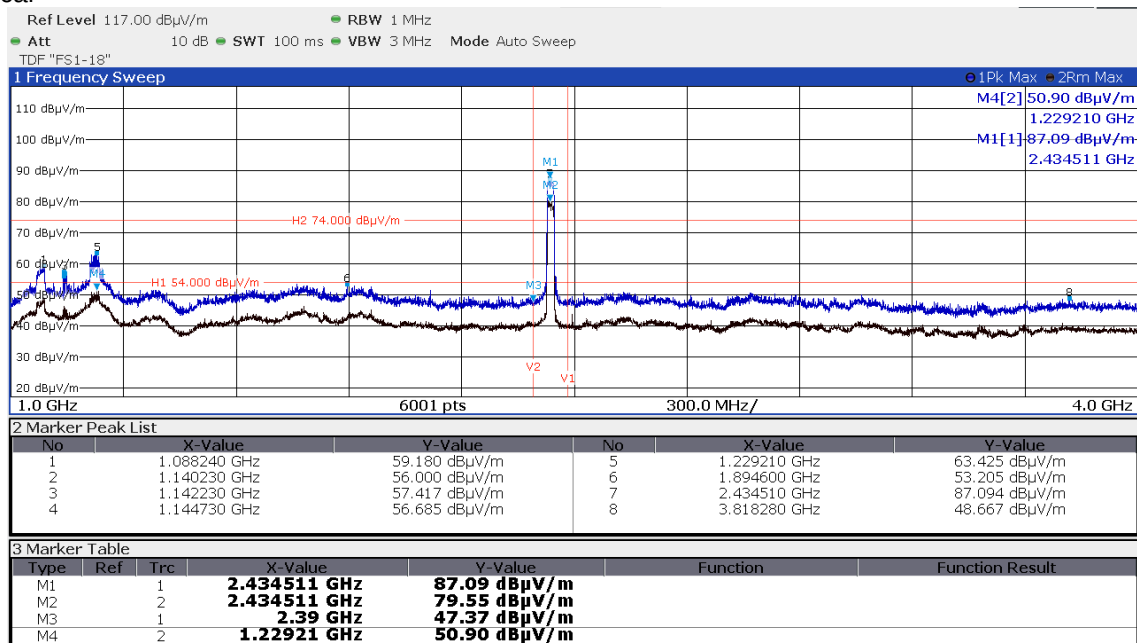
FCC ID: XO2SPB209A

CH1 vertical


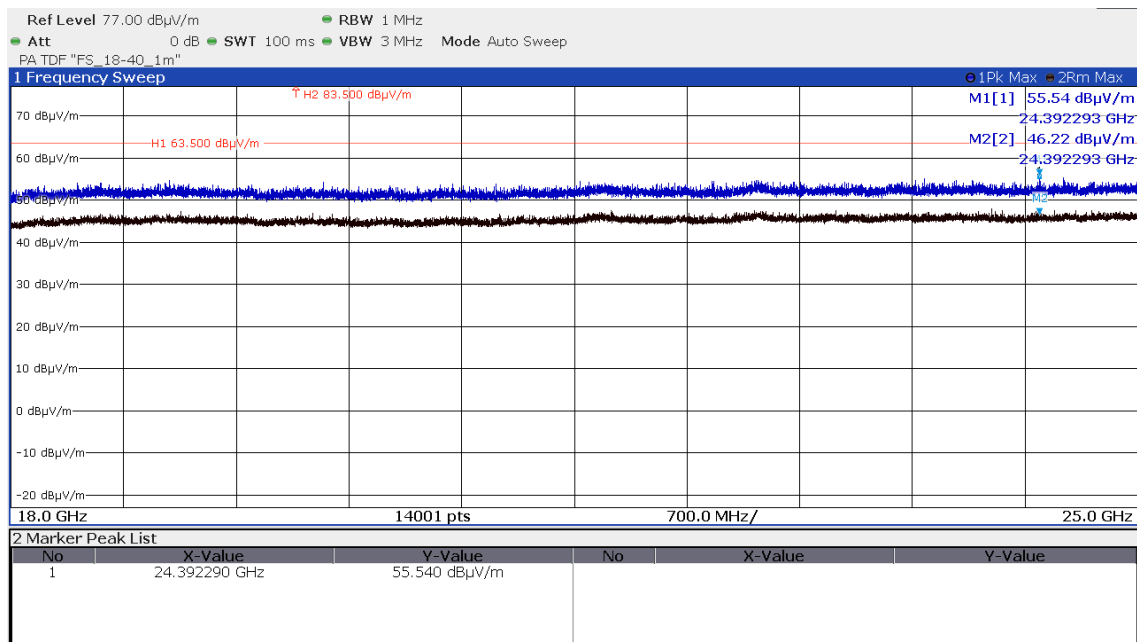
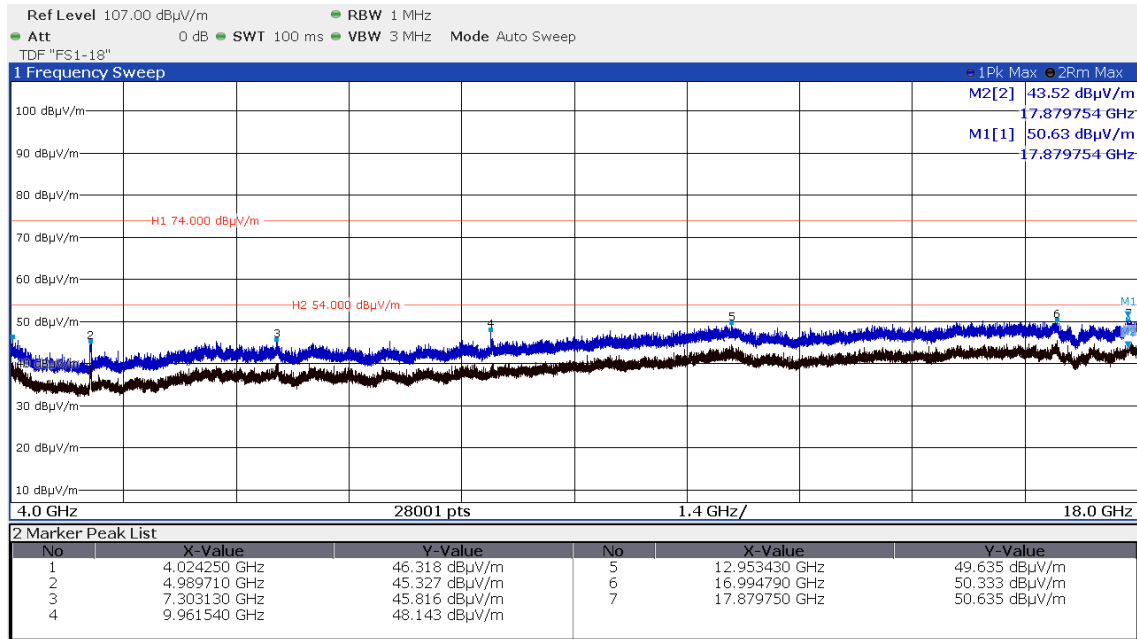
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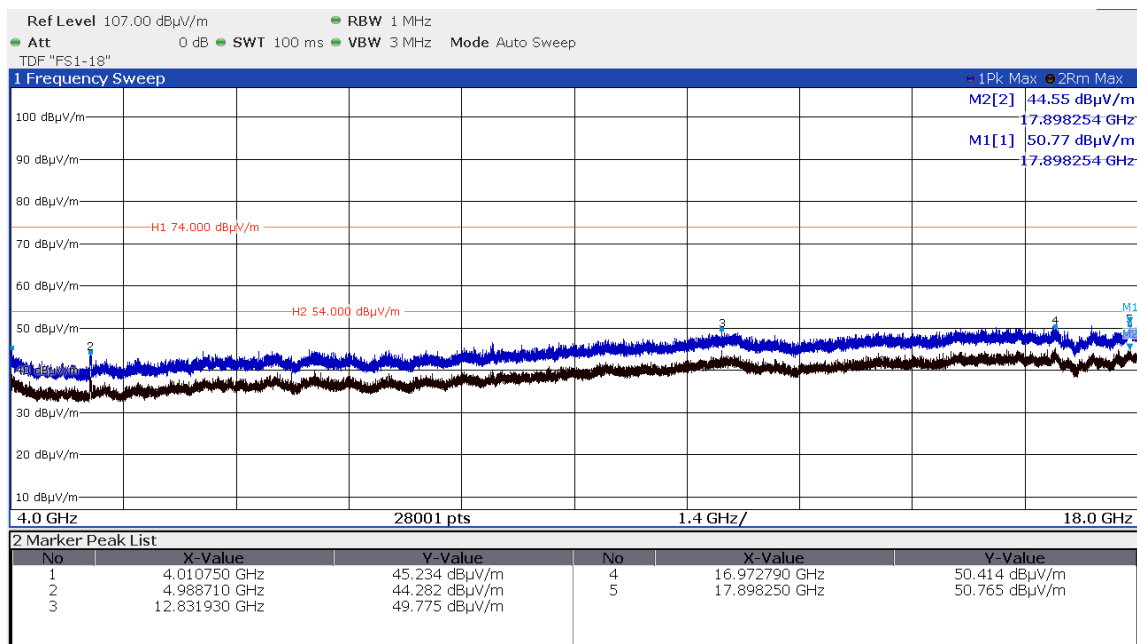
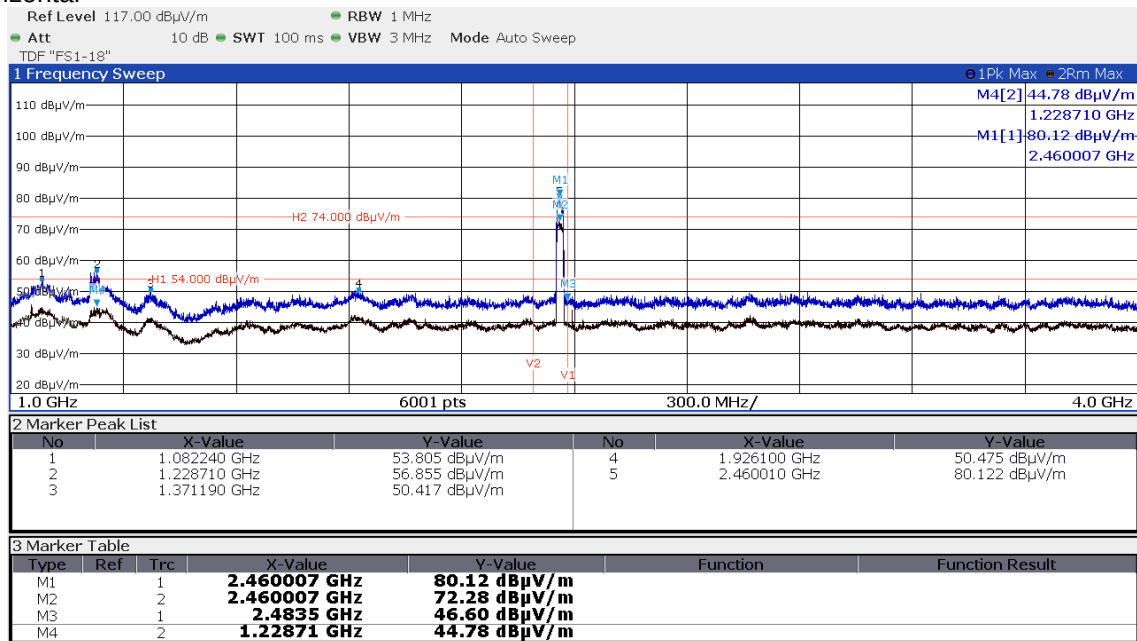
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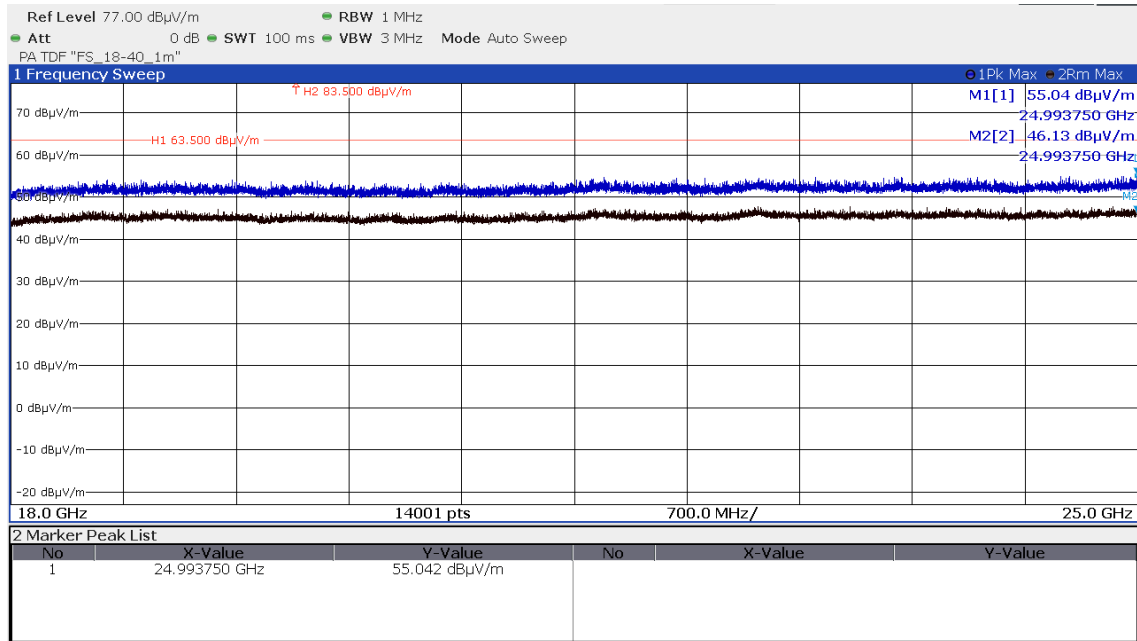
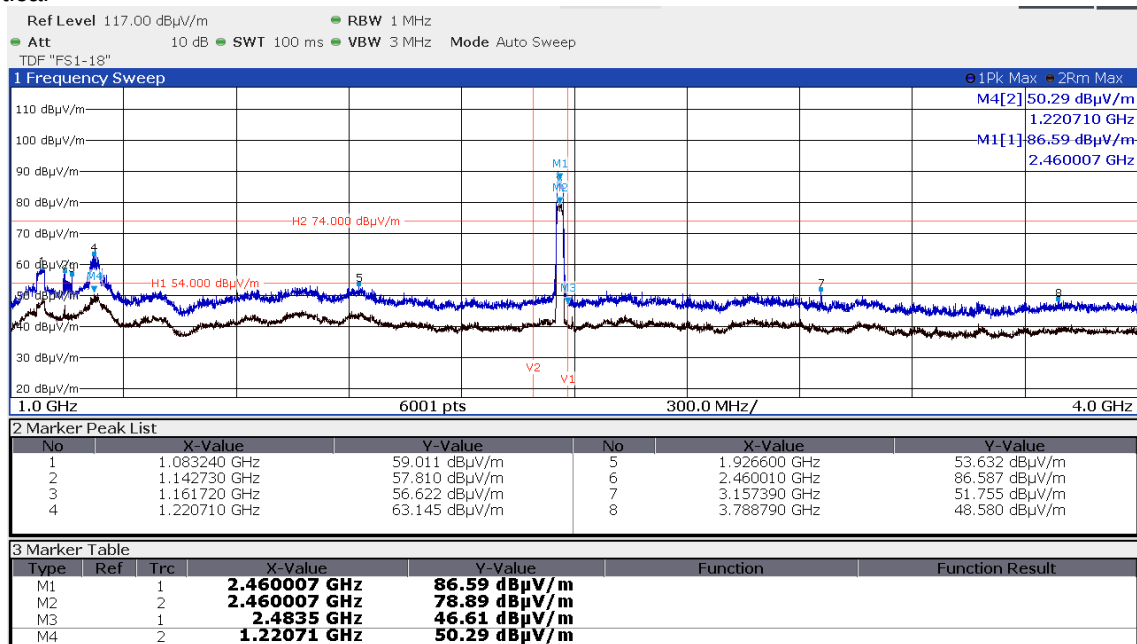
CH6 horizontal



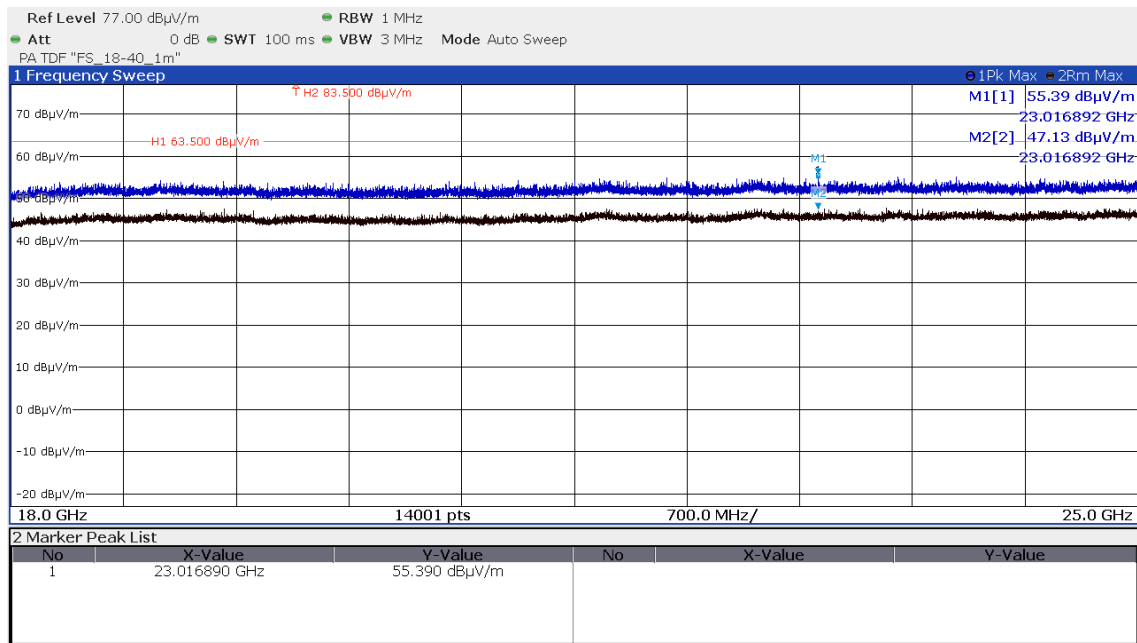
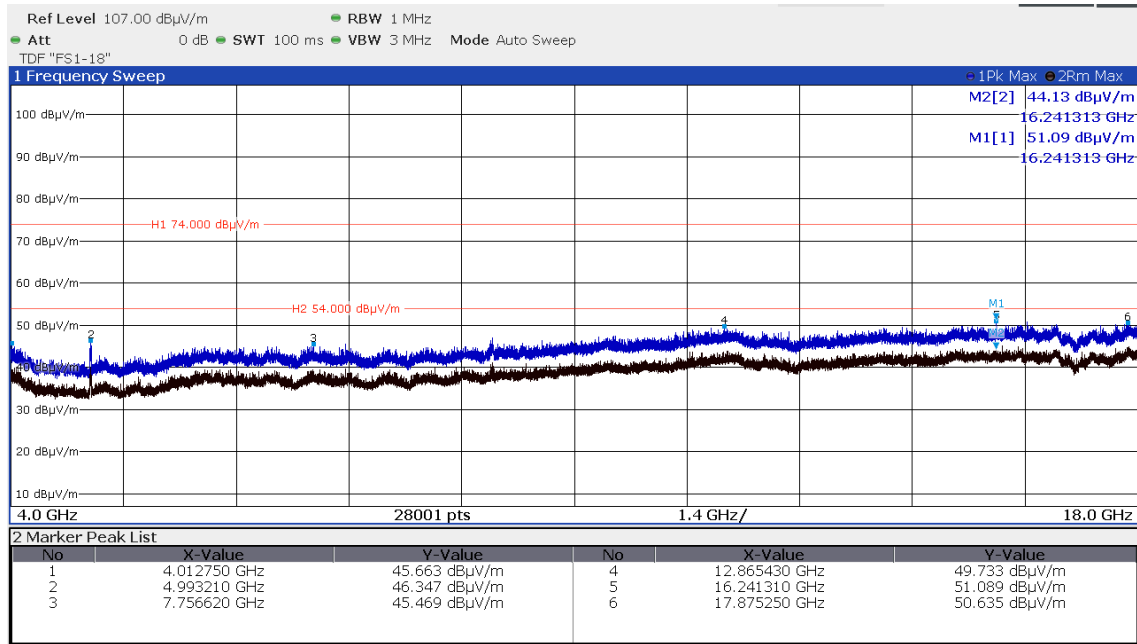
FCC ID: XO2SPB209A

CH6 vertical


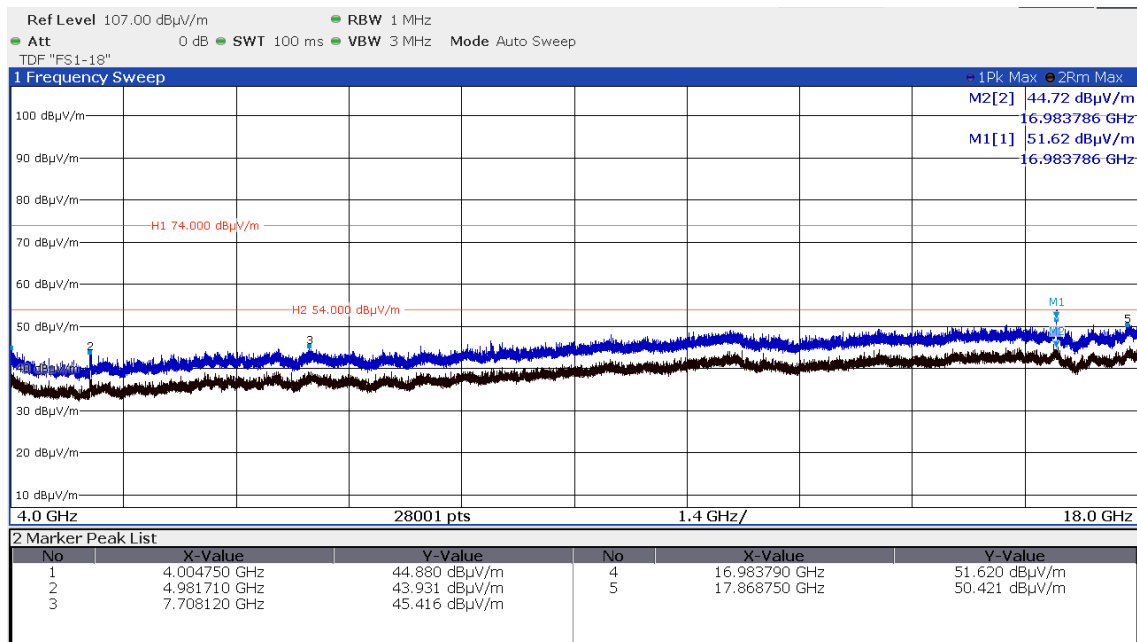
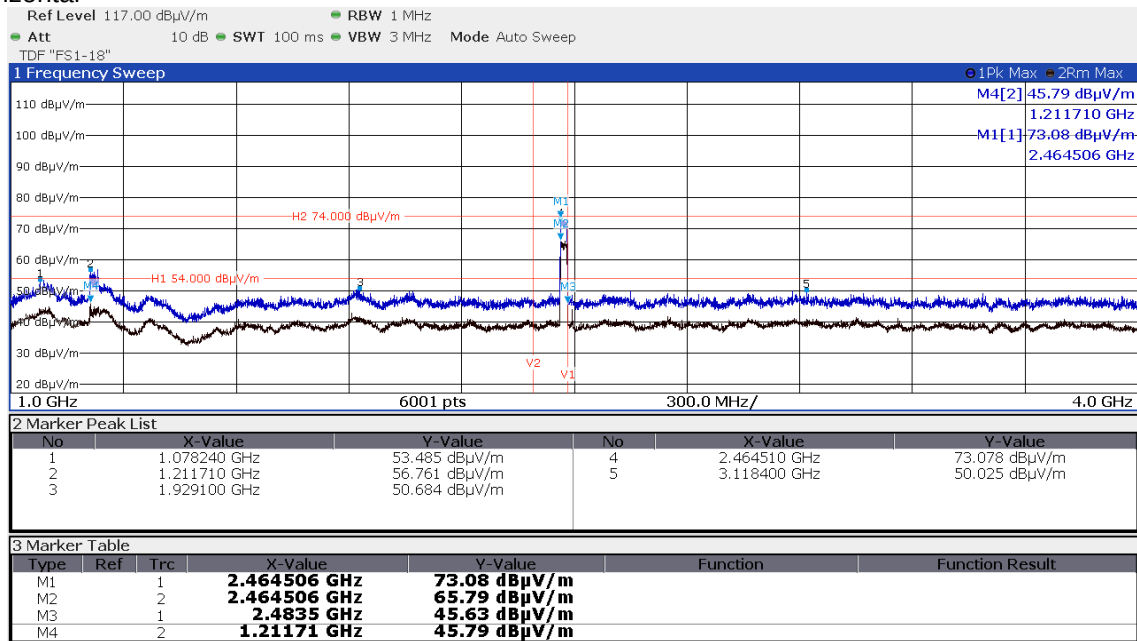
FCC ID: XO2SPB209A


FCC ID: XO2SPB209A
CH11 horizontal


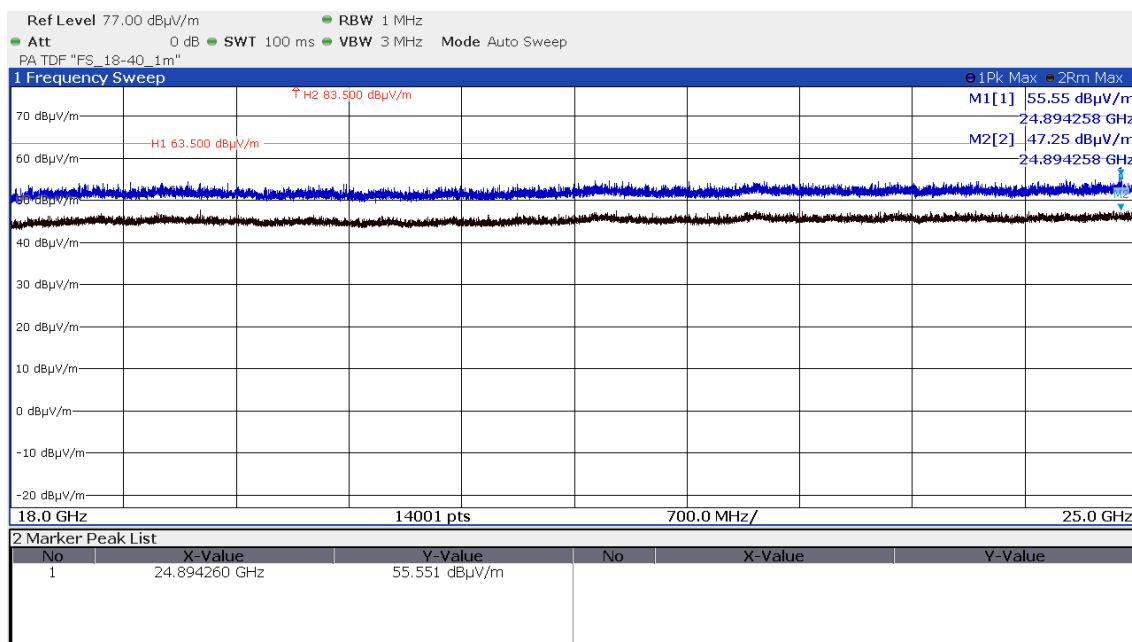
FCC ID: XO2SPB209A

CH11 vertical


FCC ID: XO2SPB209A

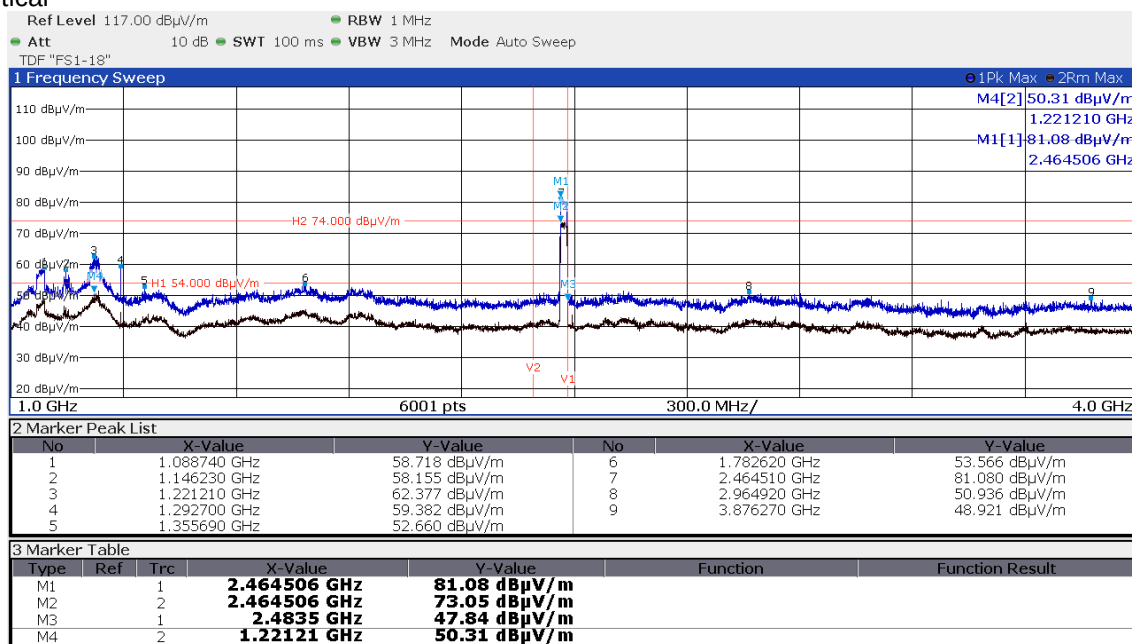


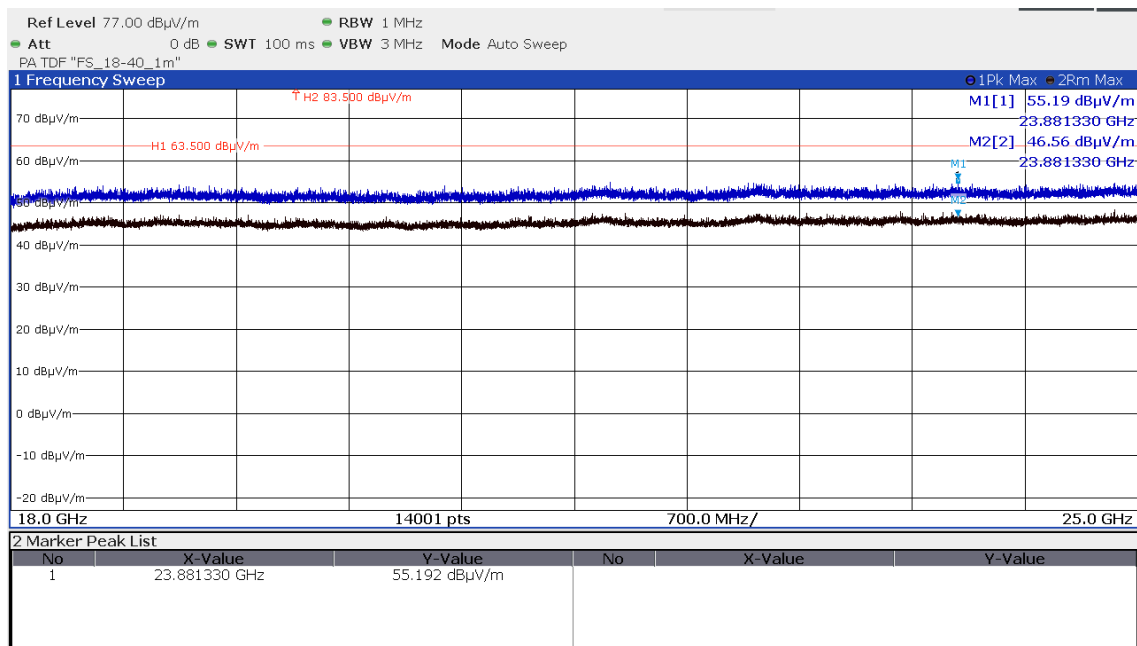
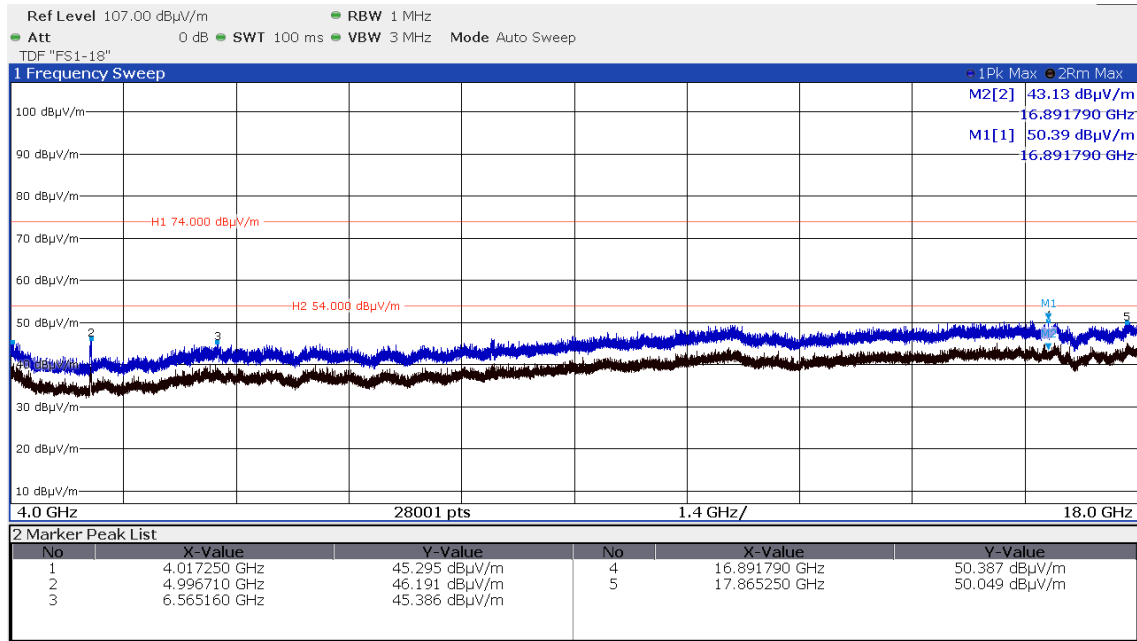
FCC ID: XO2SPB209A
CH13 horizontal


FCC ID: XO2SPB209A



CH13 vertical

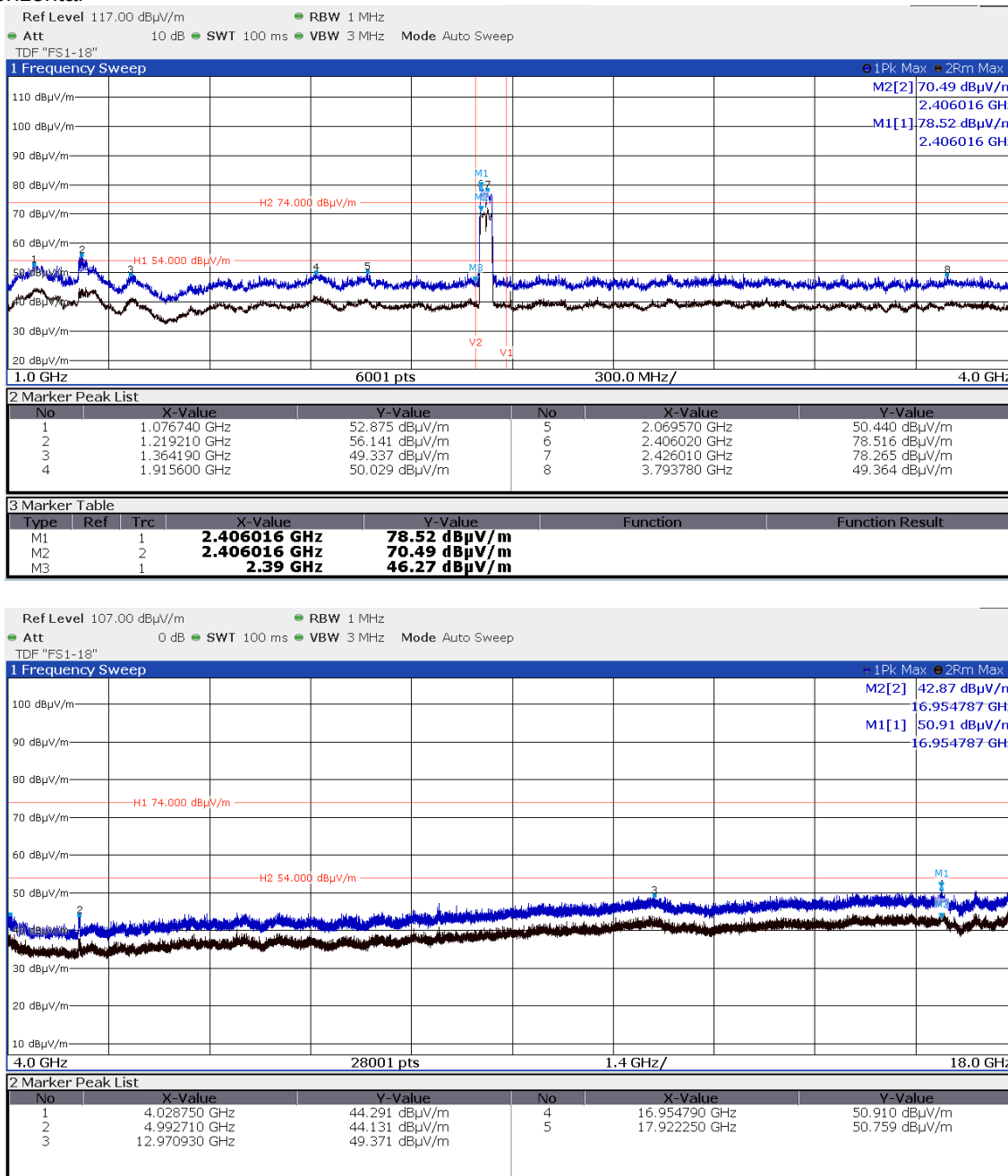


FCC ID: XO2SPB209A


FCC ID: XO2SPB209A

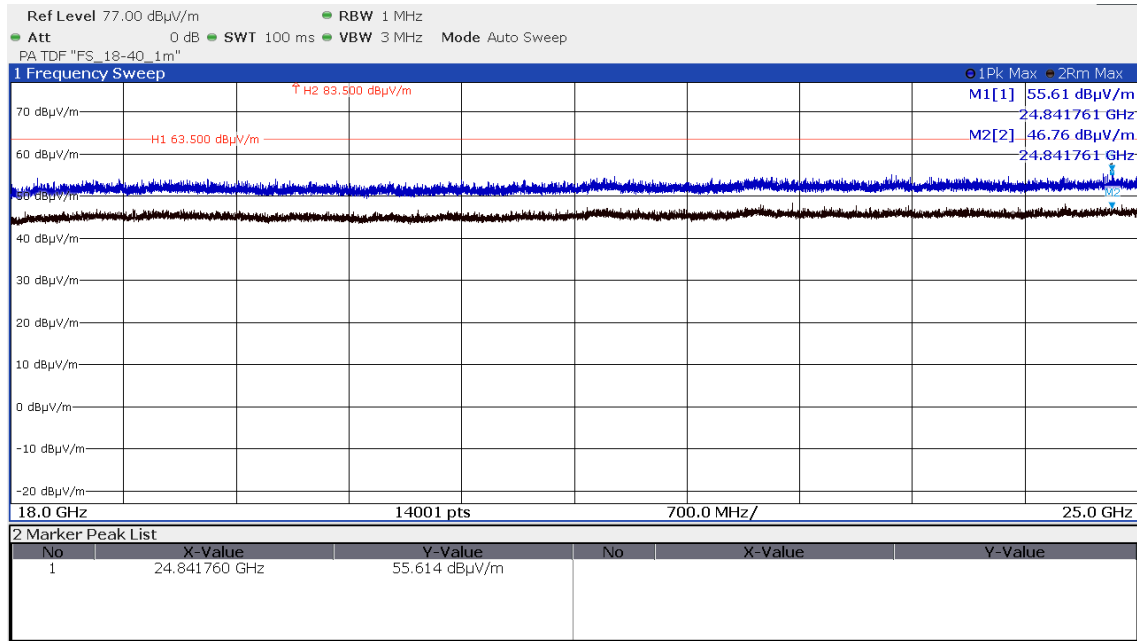
5.1.5.3 WLAN Standard 802.11n HT40

CH1up horizontal

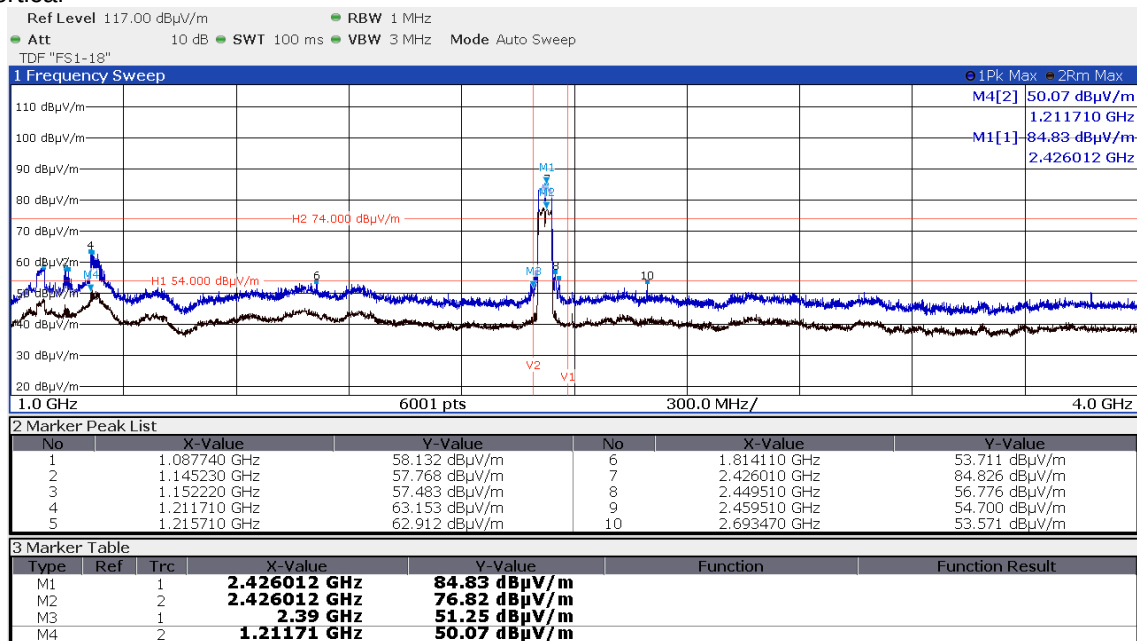


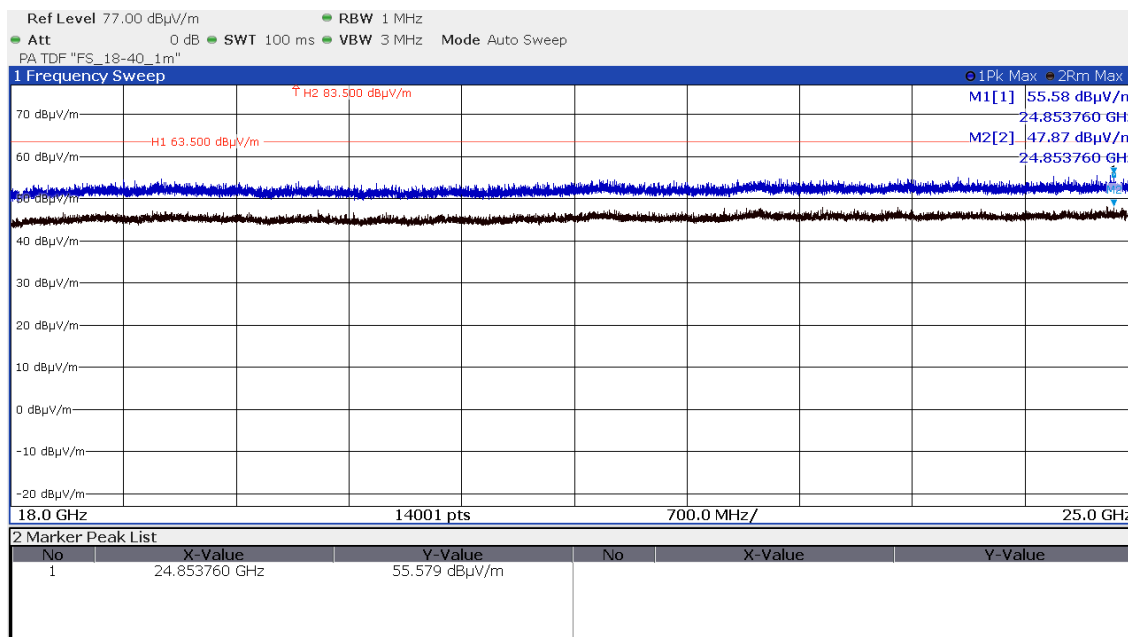
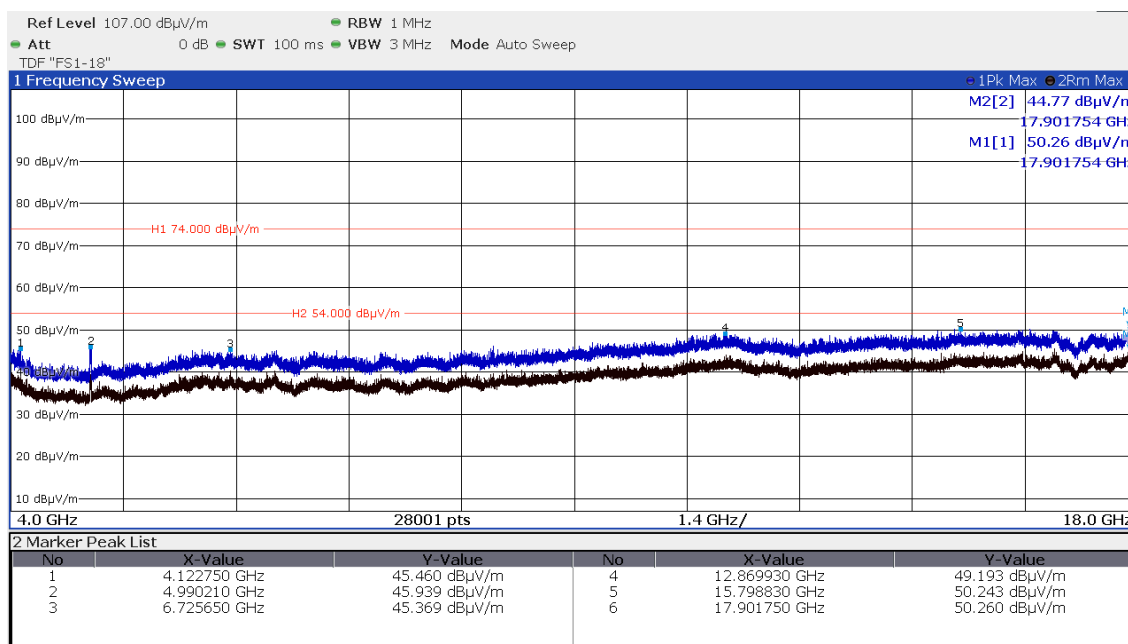
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: XO2SPB209A

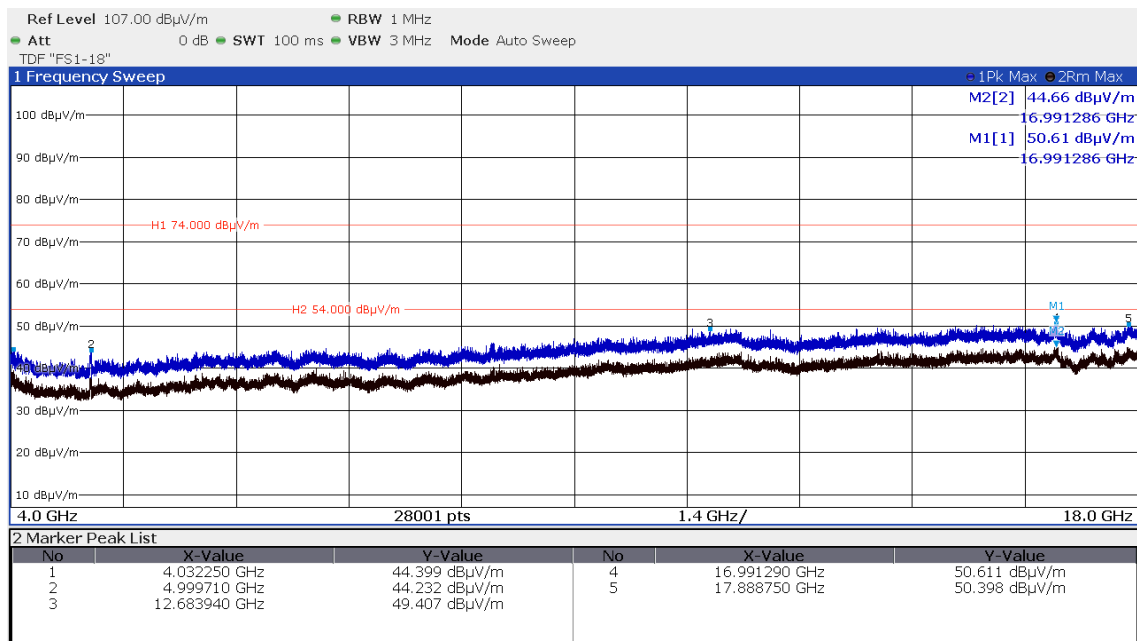
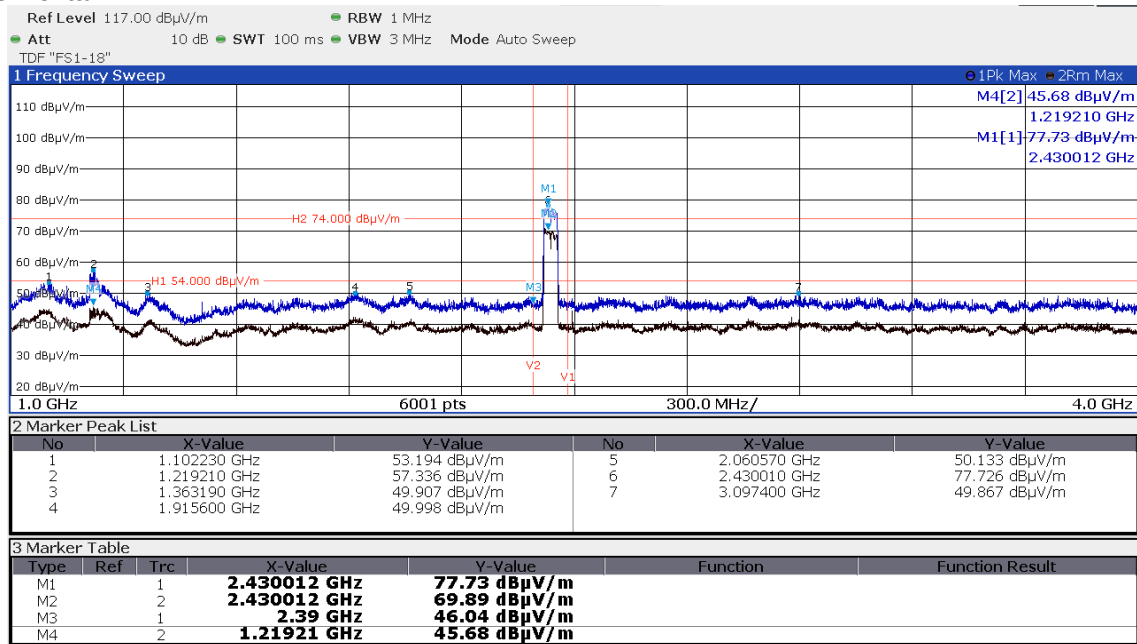


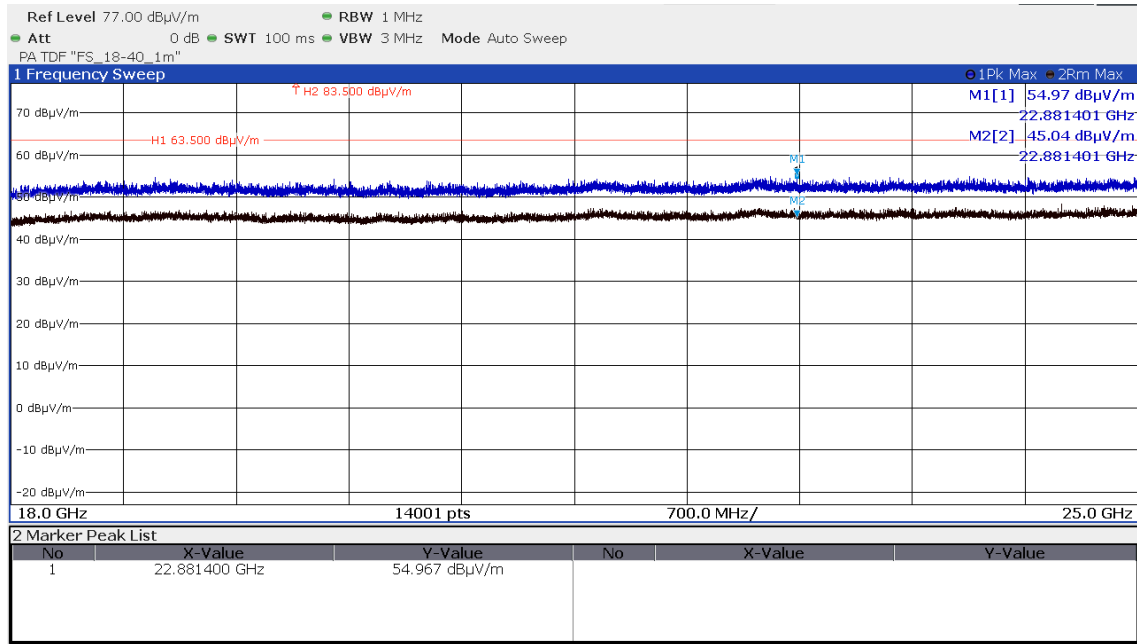
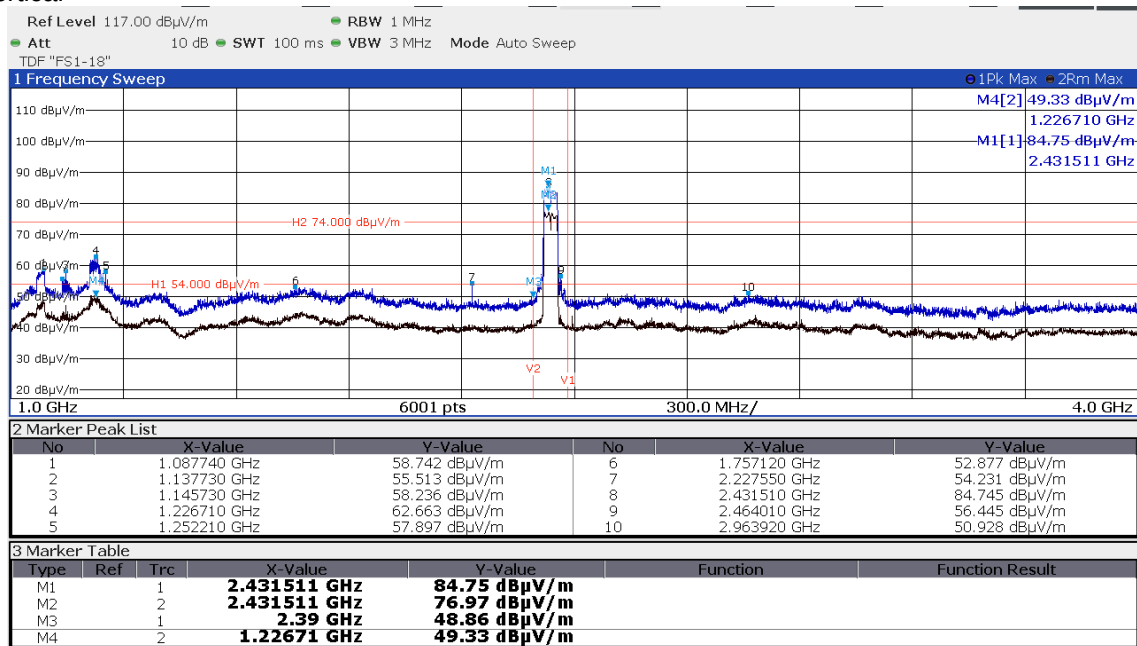
CH1up vertical

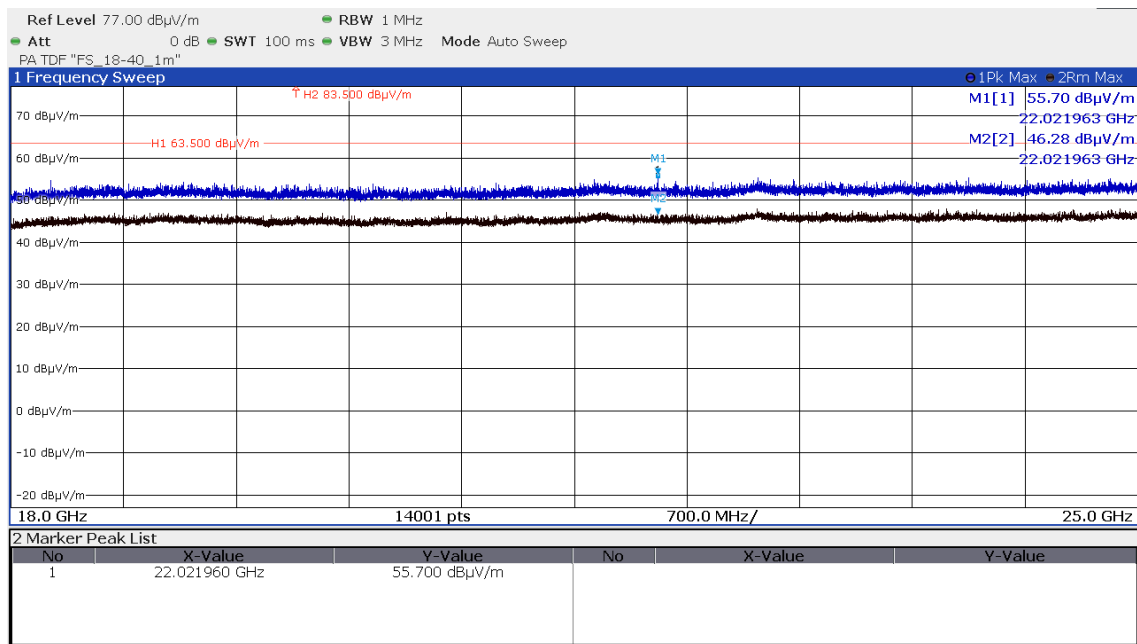
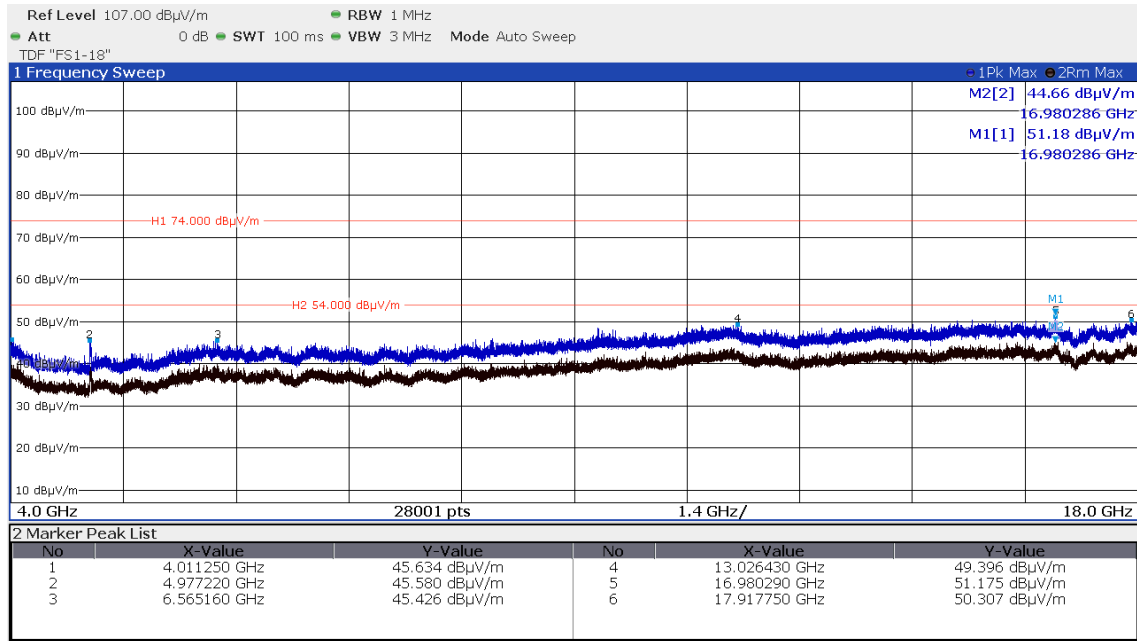


FCC ID: XO2SPB209A


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

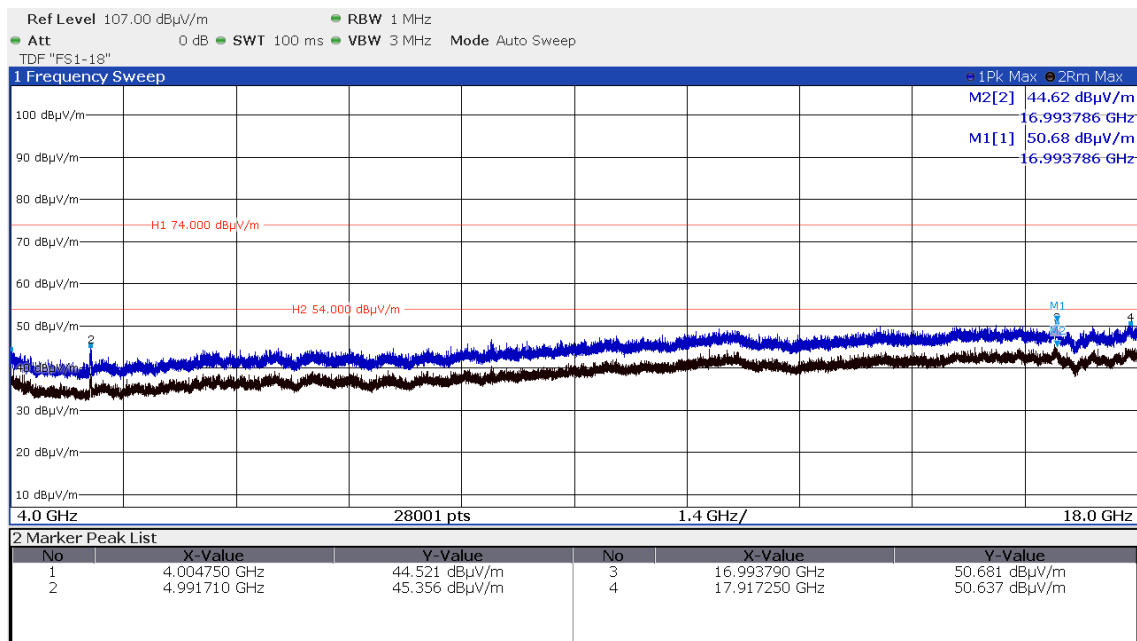
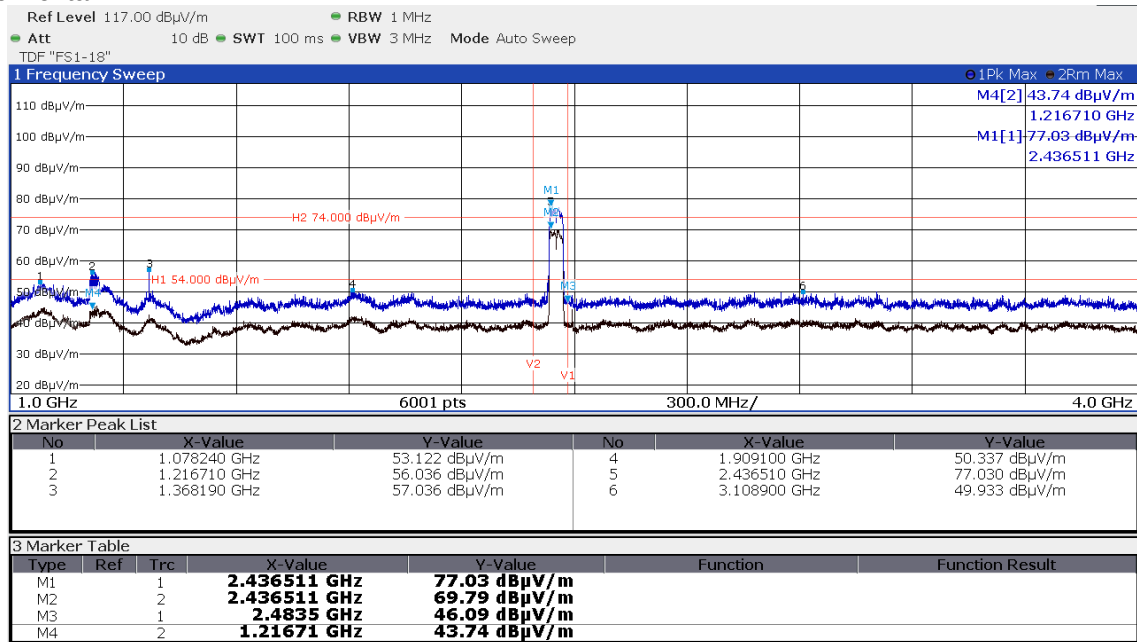
FCC ID: XO2SPB209A
CH4up horizontal


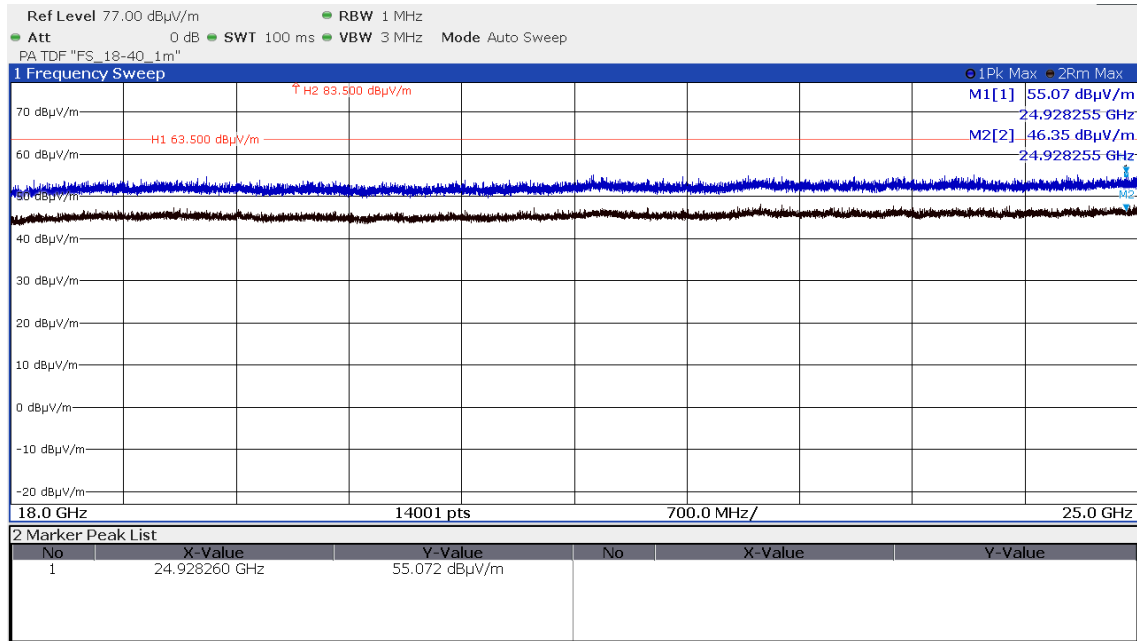
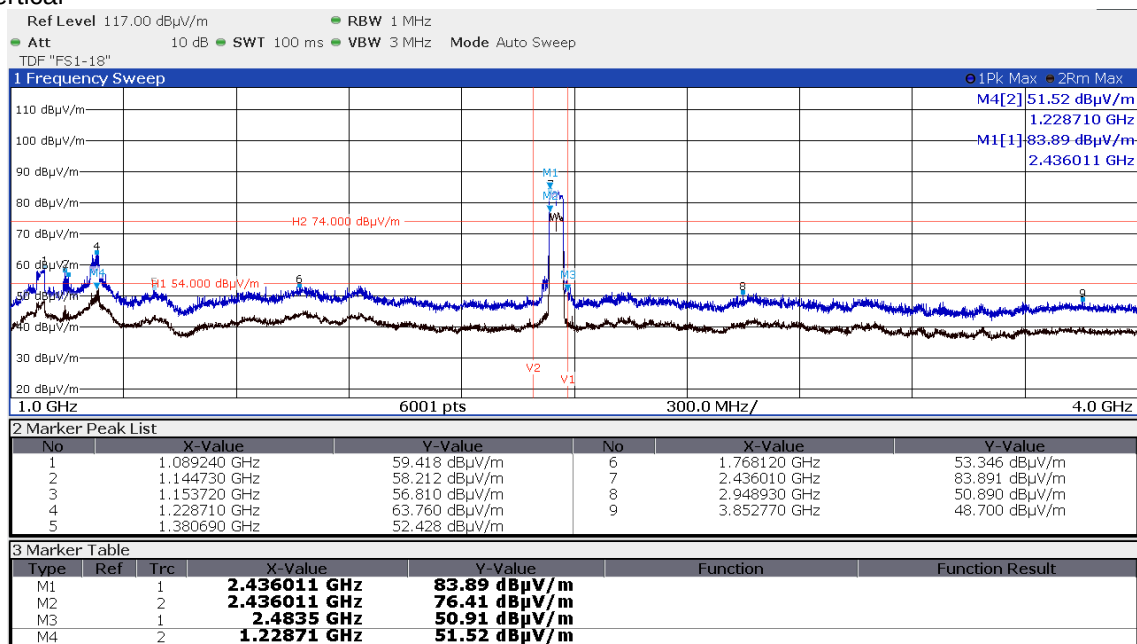
FCC ID: XO2SPB209A

CH4up vertical


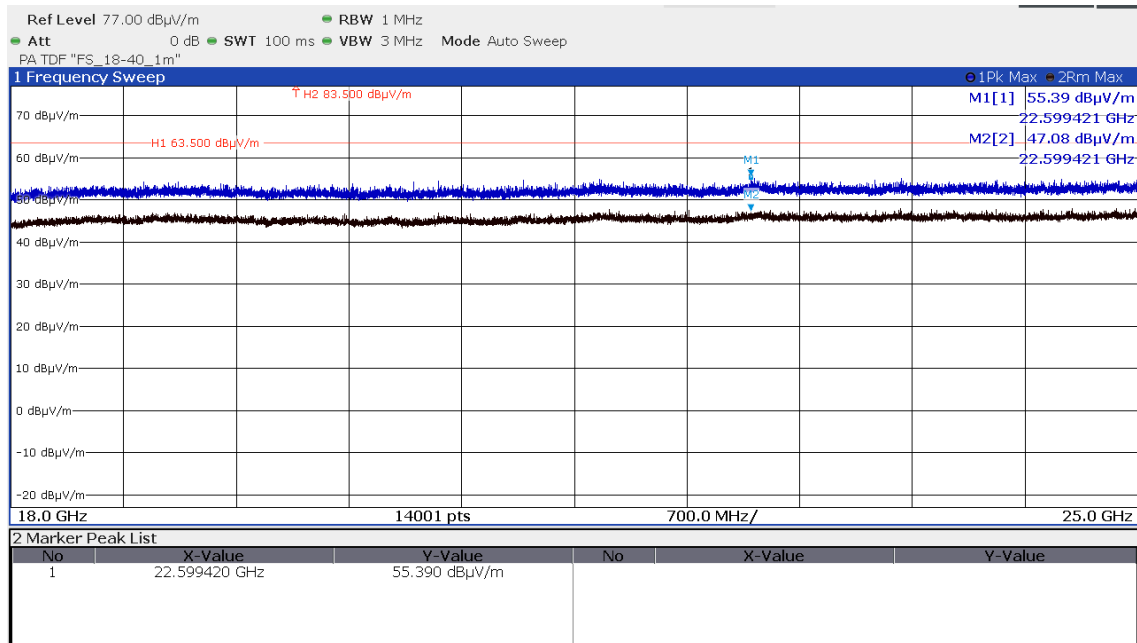
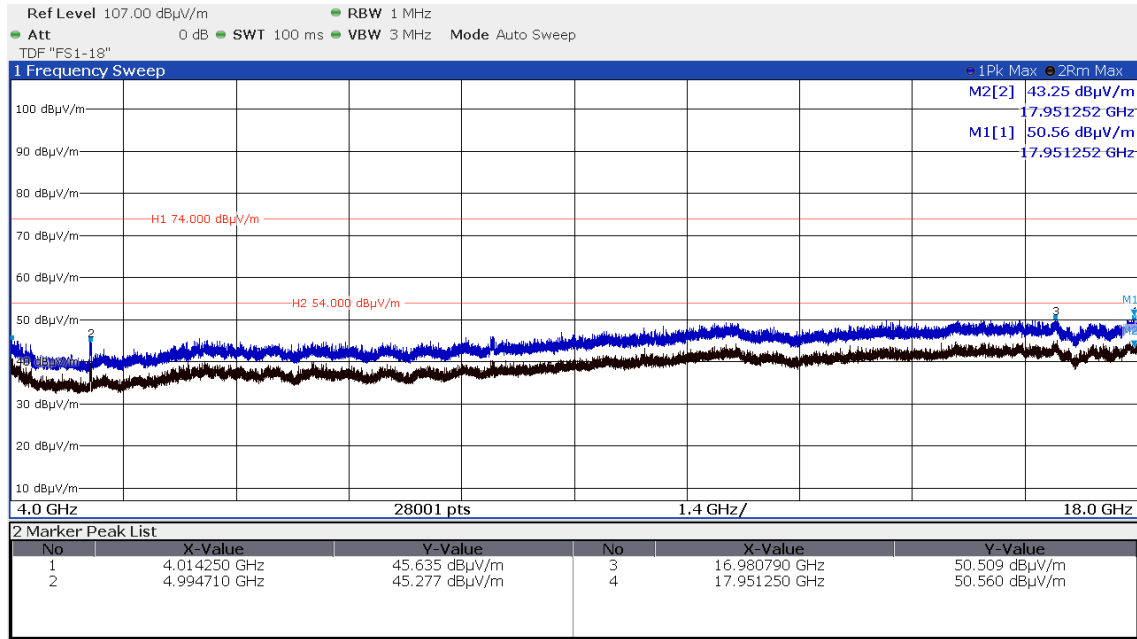
FCC ID: XO2SPB209A


FCC ID: XO2SPB209A

CH7up horizontal

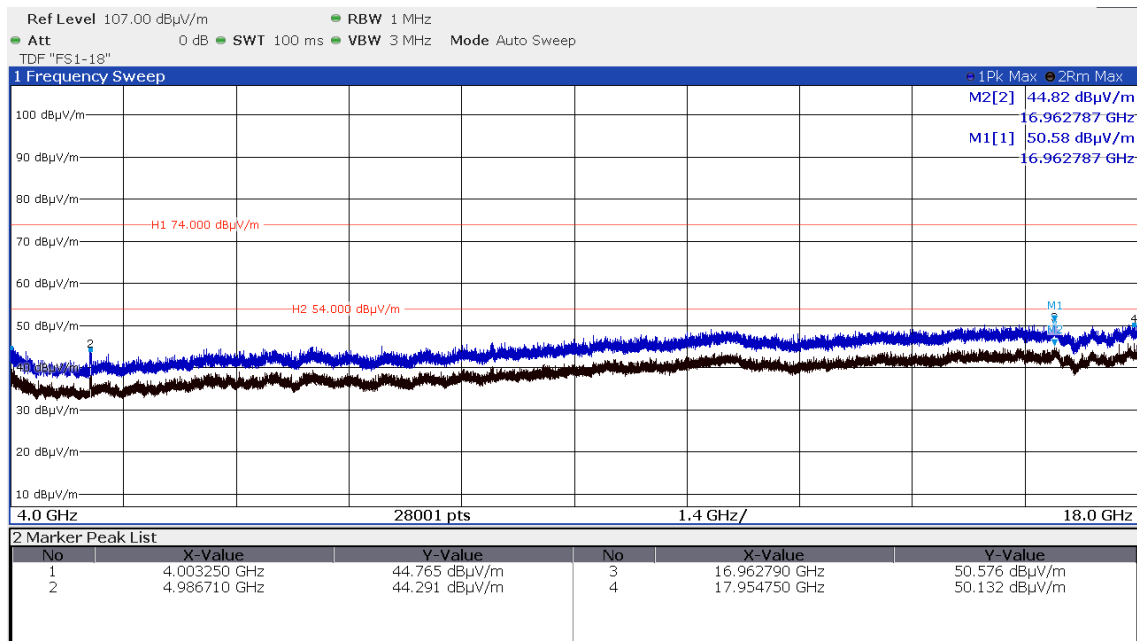
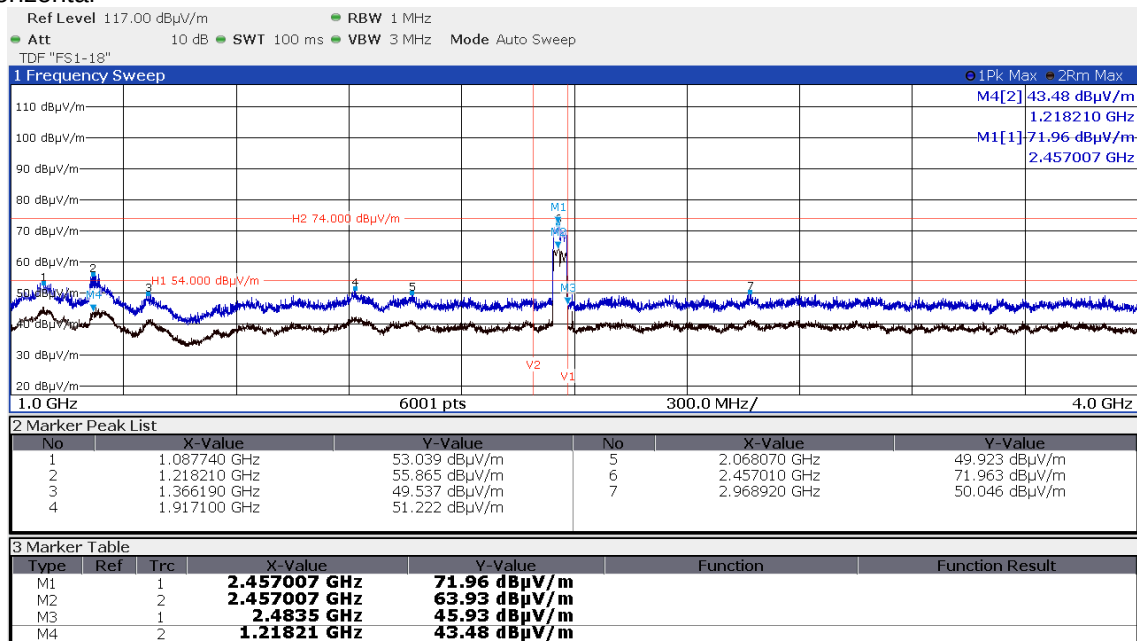


FCC ID: XO2SPB209A

CH7up vertical


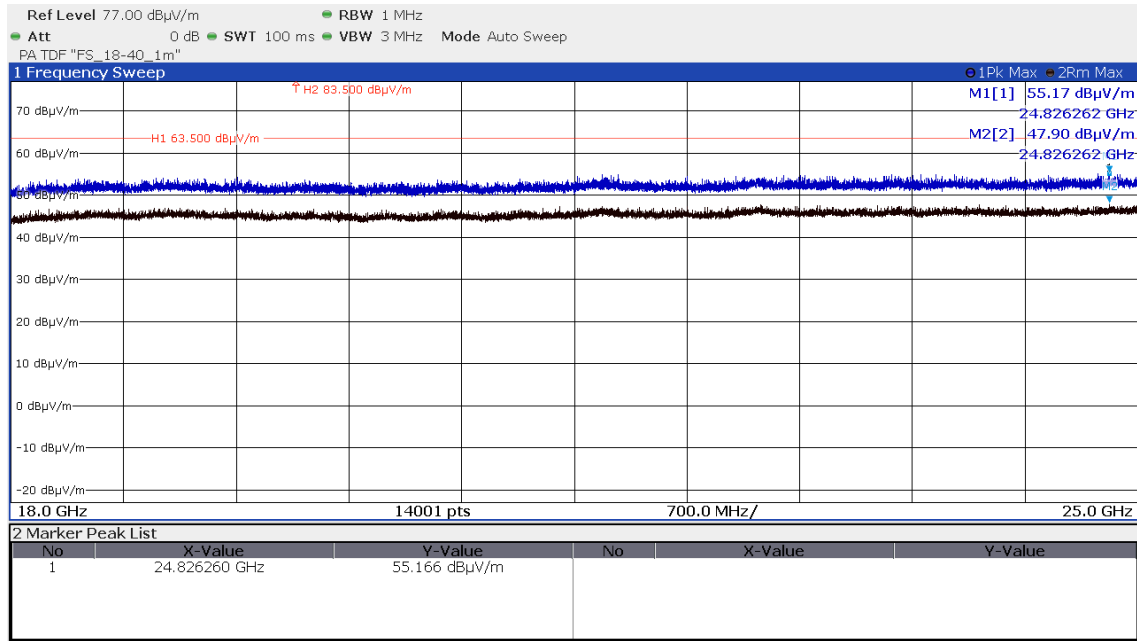
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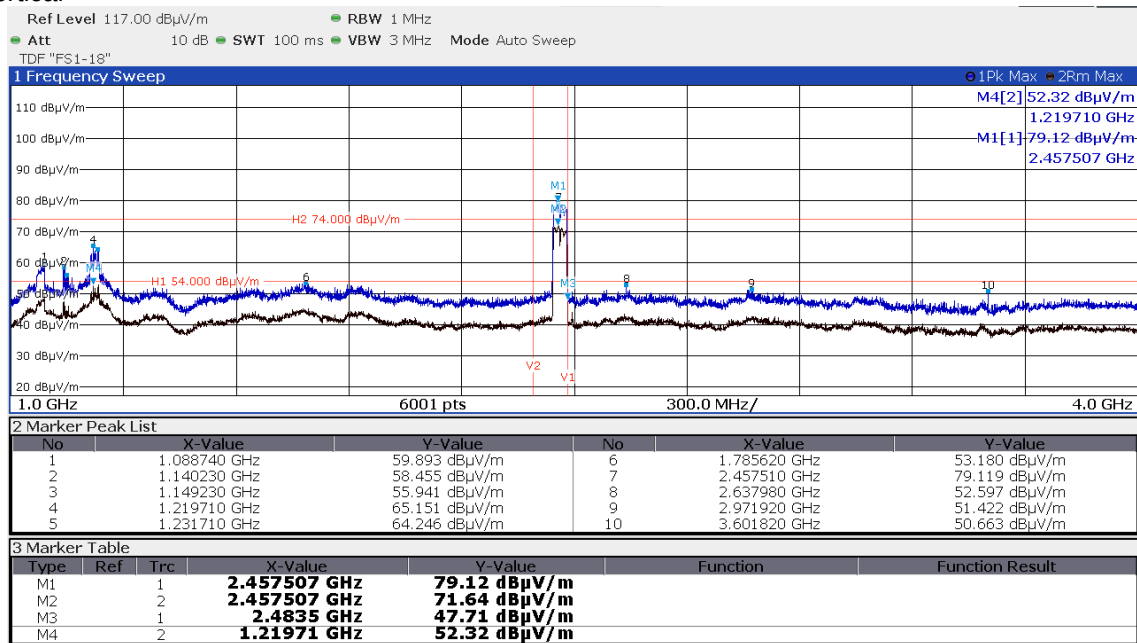
CH9up horizontal

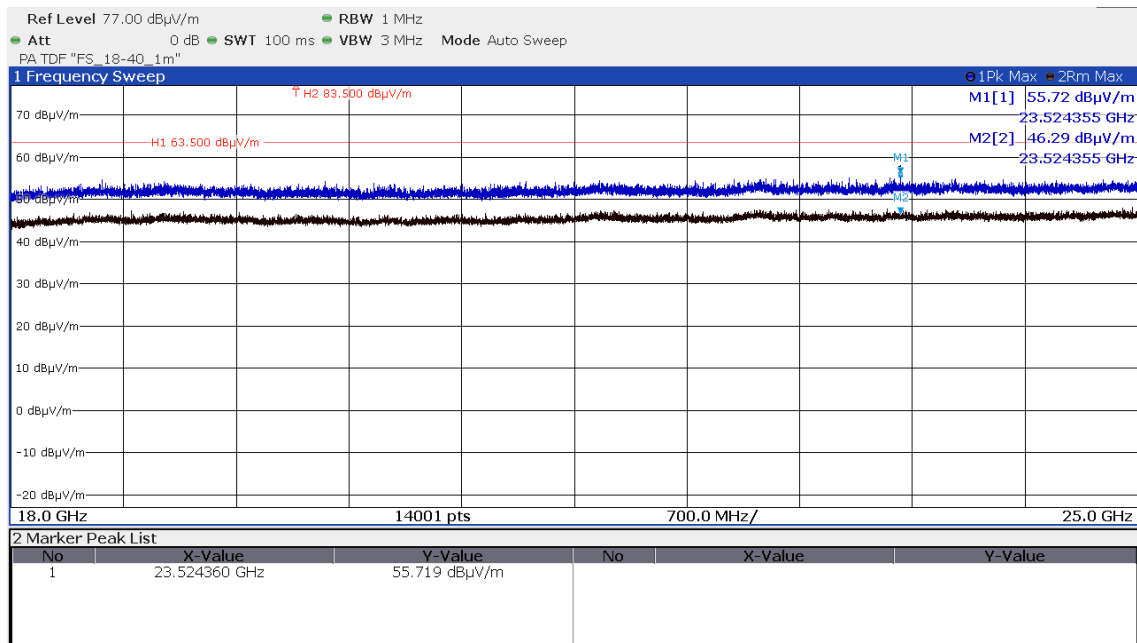
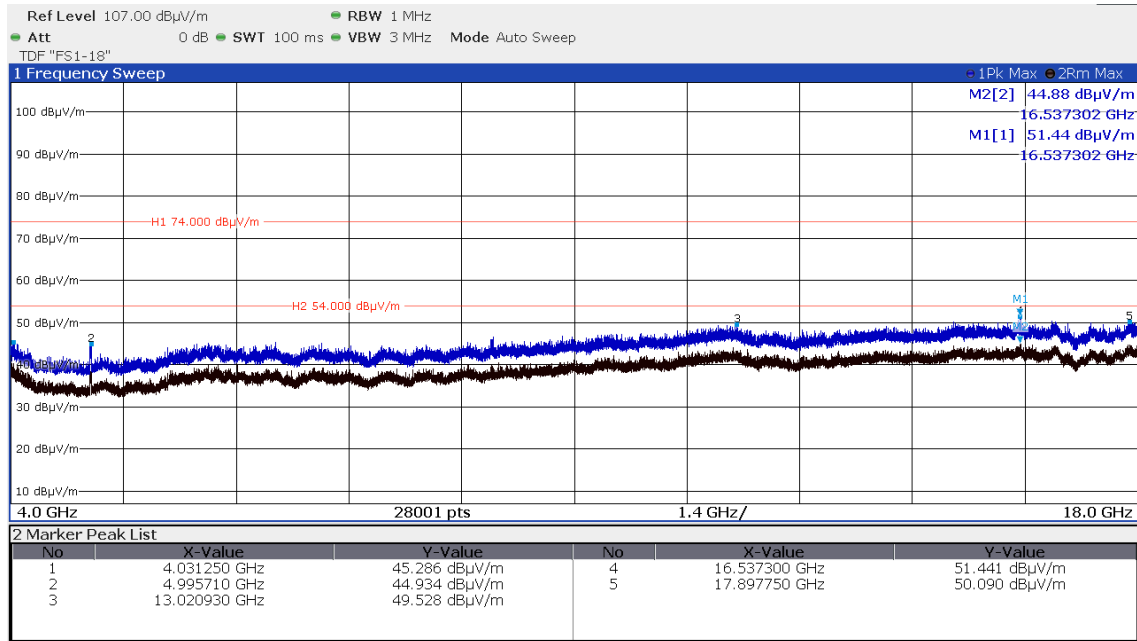


FCC ID: XO2SPB209A



CH9up vertical



FCC ID: XO2SPB209A


FCC ID: XO2SPB209A

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

FCC ID: XO2SPB209A
RSS-Gen, Table 6 – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	12.57675 - 12.57725	399.9 - 410	7.250 - 7.750
0.495 - 0.505	13.36 - 13.41	608 - 614	8.025 – 8.500
2.1735 - 2.1905	16.42 - 16.423	960 - 1427	9.0 - 9.2
3.020 - 3.026	16.69475 - 16.69525	1435 - 1626.5	9.3 - 9.5
4.125 - 4.128	16.80425 - 16.80475	1645.5 - 1646.5	10.6 - 12.7
4.17725 - 4.17775	25.5 - 25.67	1660 - 1710	13.25 - 13.4
4.20725 - 4.20775	37.5 - 38.25	1718.8 - 1722.2	14.47 - 14.5
5.677 - 5.683	73 - 74.6	2200 - 2300	15.35 - 16.2
6.215 - 6.218	74.8 - 75.2	2310 - 2390	17.7 - 21.4
6.26775 - 6.26825	108 – 138	2483.5 - 2500	22.01 - 23.12
6.31175 - 6.31225	149.9 - 150.05	2655 - 2900	23.6 - 24.0
8.291 - 8.294	156.52475 - 156.52525	3260 – 3267	31.2 - 31.8
8.362 - 8.366	156.7 - 156.9	3332 - 3339	36.43 - 36.5
8.37625 - 8.38675	162.0125 - 167.17	3345.8 - 3358	Above 38.6
8.41425 - 8.41475	167.72 - 173.2	3500 - 4400	
12.29 - 12.293	240 – 285	4500 - 5150	
12.51975 - 12.52025	322 - 335.4	5350 - 5460	

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: XO2SPB209A

5.2 Antenna application

5.2.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

5.2.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Defacto EIRP-Limit:

$$P_{out} = 30 - (G_x - 6);$$

Remarks:

FCC ID: XO2SPB209A

6 USED TEST EQUIPMENT AND ACCESSORIES

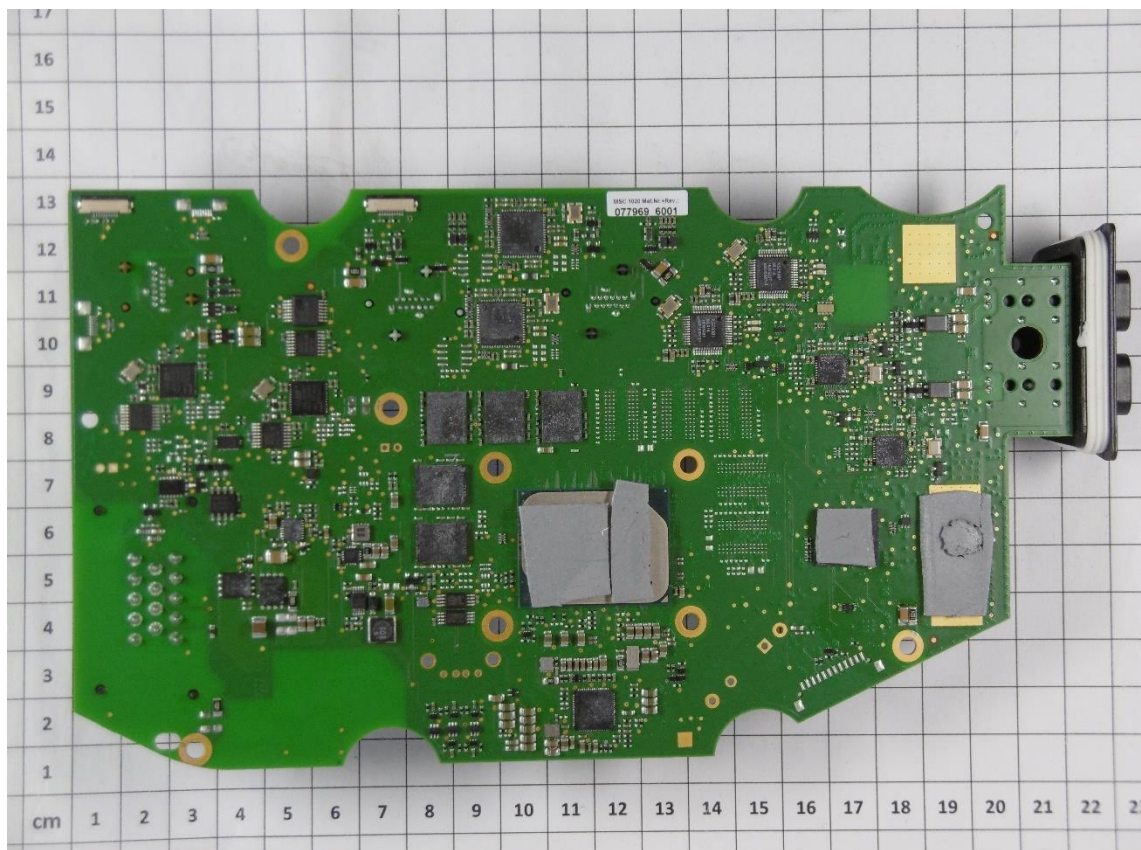
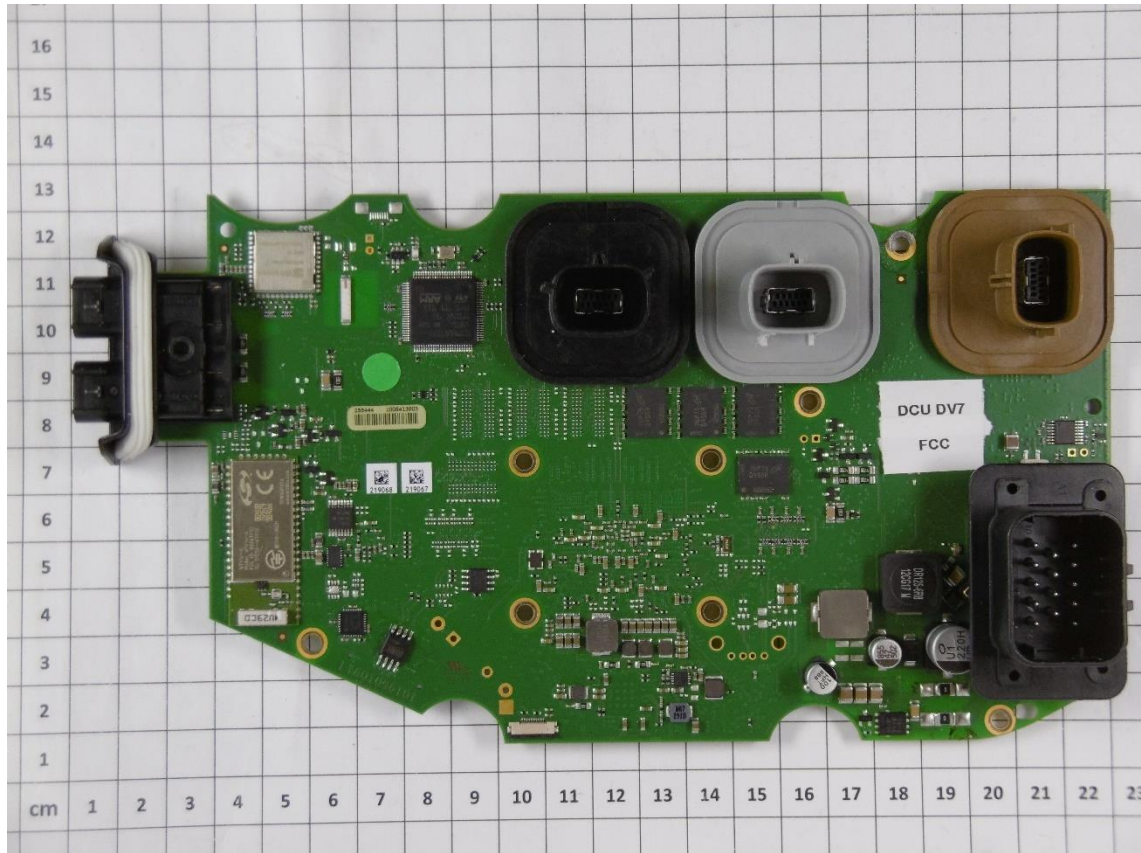
All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
SER 2	ESVS 30	02-02/03-05-006	19/08/2020	19/08/2019		
	VULB 9168	02-02/24-05-005	19/07/2020	19/07/2019		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 3	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	06/06/2020	06/06/2019		
	BBHA 9170	02-02/24-05-014	12/06/2021	12/06/2018	14/01/2021	14/01/2020
	KMS102-0.2 m	02-02/50-11-020				
	18N-20	02-02/50-17-003				
	NMS111-GL200SC01-NMS11	02-02/50-17-012				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				

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FCC ID: XO2SPB209A

ATTACHMENT A



FCC ID: XO2SPB209A



- End of attachment A -

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