



# EMI - TEST REPORT

- FCC Part 15.225, 15.247, 15.407, RSS-210, RSS-247 -

**Type / Model Name** : Voxter

**Product Description** : Voice Terminal

**Applicant** : ACD Elektronik GmbH  
**Address** : Engelberg 2  
88480 ACHSTETTEN, GERMANY

**Manufacturer** : ACD Elektronik GmbH  
**Address** : Engelberg 2  
88480 ACHSTETTEN, GERMANY

<b>Test Result</b> according to the standards listed in clause 1 test standards:	<b>POSITIVE</b>
--	-----------------

<b>Test Report No. :</b> <b>T42973-03-00HS</b>	08. October 2020 _____ Date of issue
--	--



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

# Contents

<b>1</b>	<b><u>TEST STANDARDS</u></b>	<b><u>3</u></b>
<b>2</b>	<b><u>EQUIPMENT UNDER TEST</u></b>	<b><u>4</u></b>
2.1	Information provided by the Client	4
2.2	Sampling	4
2.3	Photo documentation of the EUT – Detailed photos see ATTACHMENT A	4
2.5	Equipment type	4
2.6	Short description of the equipment under test (EUT)	4
2.7	Variants of the EUT	4
2.8	Operation frequency and channel plan	5
2.9	Transmit operating modes	8
2.10	Antenna	8
2.11	Power supply system utilised	8
2.12	Peripheral devices and interface cables	8
2.13	Determination of worst-case conditions for final measurement	9
<b>3</b>	<b><u>TEST RESULT SUMMARY</u></b>	<b><u>12</u></b>
3.1	Test results	12
3.2	Final assessment	12
<b>4</b>	<b><u>TEST ENVIRONMENT</u></b>	<b><u>13</u></b>
4.1	Address of the test laboratory	13
4.2	Environmental conditions	13
4.3	Statement of the measurement uncertainty	13
4.4	Conformity Decision Rule	14
4.5	Measurement protocol for FCC and ISED	14
<b>5</b>	<b><u>TEST CONDITIONS AND RESULTS</u></b>	<b><u>17</u></b>
5.1	AC power line conducted emissions	17
5.2	Maximum conducted output power	21
5.4	Unwanted emissions in restricted bands, radiated	25
5.5	Antenna application	59
<b>6</b>	<b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>	<b><u>60</u></b>

Attachment\_A as separate supplement

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 2020)**

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 2020)**

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 15.225	Operation within the band 13.110 - 14.010 MHz
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

**FCC Rules and Regulations Part 15, Subpart E – Unlicensed National Information Infrastructure Devices (September 2020)**

Part 15, Subpart E, Section 15.407	Operation within the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.85 GHz
------------------------------------	--

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.
--------------------	---

KDB 789033 D02 v02r01	Guidelines for compliance testing of UNII-Devices Part 15, Subpart E, December 14, 2017.
-----------------------	--

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.

## **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 his/her instructions.

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

### **2.4 General remarks**

The EUT is a voice terminal, it includes a WLAN module (FCC ID: XO2-SPB228D) a Bluetooth module (FCC ID: XO2-SPB228D) as well as a RFID module. As accessory, a docking station, Voxter® Elite Charger, is available for the device. In the docking station, the Voxter® Elite+ and an additional battery can be charged. While charging in the docking station, all modules can transmit simultaneously.

To show further compliance of the device, AC power line conducted emissions, spurious emissions from 30 MHz – 40 GHz, the radiated output power of the WLAN module and the radiated power of the Bluetooth module have been remeasured. During the measurements, all radio modules are active and simultaneously transmitting in a typical use of the device.

### **2.5 Equipment type**

WLAN - Client, BLE device, BT device, RFID device

### **2.6 Short description of the equipment under test (EUT)**

The EUT is a mobile body worn Voice Terminal. A combi-module (FCC ID: XO2-SPB228D) for WLAN, Bluetooth and BLE as well as an RFID module are integrated into the device. It can be charged and operated in a docking station (Voxter® Elite Charger), which is available as accessory. While in the docking station, all radios can transmit simultaneously.

Number of tested samples: 1 pc Voxter  
Serial number: 20VT50100010

**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.

## 2.8 Operation frequency and channel plan

WLAN:

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

Note: the marked frequencies are determined for final testing.

Channel	Frequency (MHz)
36	5180
40	5200
44	5220
48	5240

Channel	Frequency (MHz)
52	5260
56	5280
60	5300
64	5320

Channel	Frequency (MHz)
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700
144	5720

Channel	Frequency (MHz)
149	5745
153	5765
157	5785
161	5805
165	5825

Channel plan WLAN Standard 802.11n HT 40, ac VT40:

Channel, HT40 up	Channel, HT40 down	Frequency (MHz)
1 up	5 down	2422
2 up	6 down	2427
3 up	7 down	2432
4 up	8 down	2437
5 up	9 down	2442
6 up	10 down	2447
7 up	11 down	2452

Channel	Frequency (MHz)	Channel	Frequency (MHz)
36up	5190	40down	5190
44up	5230	48down	5230

Channel	Frequency (MHz)	Channel	Frequency (MHz)
52up	5270	56down	5270
60up	5310	64down	5310

Channel	Frequency (MHz)	Channel	Frequency (MHz)
100up	5510	104down	5510
116up	5580	120down	5580
132up	5670	136down	5670
140up	5710	142down	5710

Channel	Frequency (MHz)	Channel	Frequency (MHz)
149up	5755	153down	5755
161up	5815	165down	5815

Channel plan WLAN Standard 802.11ac VT80:

Channel	Frequency (MHz)
42	5210

Channel	Frequency (MHz)
56	5210

Channel	Frequency (MHz)
106	5530
122	5610
138	5690

Channel	Frequency (MHz)
155	5775

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.

BT 2.1+EDR

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402	28	2429	55	2456
2	2403	29	2430	56	2457
3	2404	30	2431	57	2458
4	2405	31	2432	58	2459
5	2406	32	2433	59	2460
6	2407	33	2434	60	2461
7	2408	34	2435	61	2462
8	2409	35	2436	62	2463
9	2410	36	2437	63	2464
10	2411	37	2438	64	2465
11	2412	38	2439	65	2466
12	2413	39	2440	66	2467
13	2414	40	2441	67	2468
14	2415	41	2442	68	2469
15	2416	42	2443	69	2470
16	2417	43	2444	70	2471
17	2418	44	2445	71	2472
18	2419	45	2446	72	2473
19	2420	46	2447	73	2474
20	2421	47	2448	74	2475
21	2422	48	2449	75	2476
22	2423	49	2450	76	2477
23	2424	50	2451	77	2478
24	2425	51	2452	78	2479
25	2426	52	2453	79	2480
26	2427	53	2454		
27	2428	54	2455		

BLE:

Channel	Frequency	Channel	Frequency
37	2402	18	2442
0	2404	19	2444
1	2406	20	2446
2	2408	21	2448
3	2410	22	2450
4	2412	23	2452
5	2414	24	2454
6	2416	25	2456
7	2418	26	2458
8	2420	27	2460
9	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

BLE was measured in real mode, all channels were used.

RFID:

There is only one channel at 13.56 MHz for testing which is used.

## 2.9 Transmit operating modes

WLAN:

Connection to an AP and transmission to an echo sever at 2.4 GHz.  
Test software for setup in 5 GHz range.

BT:

Test software for setup in 2.4 GHz range.

BLE:

For testing a 100 MB File is transmitted using all channels.

RFID:

Is already on. No tag is used.

## 2.10 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (MHz)	Gain (dBi)	Cable loss (dB)	Effective gain (dBi)
1	Omni	Ethertronics, 1001932PT	-	2400	2.5	0	2.5
2	Omni	Ethertronics, 1001932PT	-	5000	4.4	0	4.4
	NFC antenna	Coil, Molex 1462360001	-	13.56	-	0	45 * 55 mm

The EUT is equipped with 2 internal WLAN antennas for MIMO.

## 2.11 Power supply system utilised

Power supply voltage,  $V_{nom}$  : 3.7 VDC (lithium ion battery)  
Alternative power supply : Charger 115VAC, 47-63 Hz, 15 VDC

## 2.12 Peripheral devices and interface cables

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

- WLAN AP (companion device) Model : Cisco Aironet 1260
- Notebook Model : Dell Latitude E6400
- Docking Station Model : Voxter® Elite Charger
- AC/DC power supply Model : Adapter Tech., Model STD-12016E
- USB BLE Stick (companion device) Model : Self made



## 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 (recumbent).

The worst case of EUT means to transmit WLAN, BLE and RFID the same time.

First scenario on real transmission at WLAN CH1 to an AP, a real transmission of BLE to a companion and RFID TX on is set.

Second scenario on real transmission at WLAN CH36 to an AP, a real transmission of BLE to a companion and RFID TX on is set.

Third scenario check the 5 GHz range of WLAN near restricted bands and BT with test software for compliance.

### 2.13.1 Test jig

No test jig is 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.

Test software commands:

**WLAN:**

\*\*\*802.11n, ch36, MCS7, HT20, 14dBm Path A only\*\*\*

25 0  
10 1 1  
30 1  
112 0  
22 0 36 14 2 0  
25 1 22

\*\*\*802.11n, ch64, MCS7, HT20, 14dBm Path A only\*\*\*

25 0  
10 1 1  
30 1  
112 0  
22 0 64 14 2 1  
25 1 22

\*\*\*802.11n, ch100, MCS7, HT20, 14dBm Path A only\*\*\*

25 0  
10 1 1  
30 1  
112 0  
22 0 100 14 2 0  
25 1 22

\*\*\*802.11n, ch149, MCS7, HT20, 14dBm Path A only\*\*\*

25 0  
10 1 1  
30 1  
112 0  
22 0 149 14 2 0  
25 1 22

\*\*\*802.11n, ch 36+40,fc=5190, MCS7, HT40, 9dBm Path A only\*\*\*

25 0  
10 1 1  
30 1

112 1  
22 0 36 9 2 0  
25 1 22  
\*\*\*802.11n, ch 60+64,fc=5310, MCS7, HT40, 9dBm Path A only\*\*\*  
25  
10 1 1  
30 1  
112 1  
22 0 60 9 2 0  
25 1 22  
\*\*\*802.11n, ch 100+104,fc=5510MHz, MCS7, HT40, 14dBm, Path A only\*\*\*  
25 0  
10 1 1  
30 1  
112 1  
22 0 100 14 2 0  
25 1 22  
\*\*\*802.11ac, ch 36+40+44+48, fc=5210MHz, VHT SS1 MCS9, 6dBm Path A only\*\*\*  
25 0  
10 1 1  
30 1  
112 4  
22 0 36 6 2 0  
25 1 110  
\*\*\*802.11ac, ch 52+56+60+64, fc=5290MHz, VHT SS1 MCS9, 6dBm Path B only\*\*\*  
25 0  
10 2 2  
30 1  
112 4  
22 1 52 6 2 0  
25 1 110  
\*\*\*802.11ac, ch 100+104+108+112, fc=5530MHz, VHT SS1 MCS9, 6dBm Path A only\*\*\*  
25 0  
10 1 1  
30 1  
112 4  
22 0 100 6 2 0  
25 1 110  
\*\*\*802.11ac, ch 149+153+157+161, fc=5775MHz, VHT SS1 MCS9, 6dBm Path A only\*\*\*  
25 0  
10 1 1  
30 1  
112 4  
22 0 149 6 2 0  
25 1 110

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.

**BT+EDR:**

\*\*\*BT Tx 1Mbps, DH5, ch 0\*\*\*

80

225 0

234

116 1

114 1

16 6.5

12 0

225 1 15 2 -1 0

\*\*\*BT Tx 1Mbps, DH5, ch 39\*\*\*

80

225 0

234

116 1

114 1

16 6.5

12 39

225 1 15 2 -1 0

\*\*\*BT Tx 1Mbps, DH5, ch 78\*\*\*

80

225 0

234

116 1

114 1

16 6.5

12 78

225 1 15 2 -1 0

### 3 TEST RESULT SUMMARY

#### 3.1 Test results

Operating at 13.56 MHz, 2400 MHz – 2483.5 MHz, 5150 MHz – 5350 MHz and 5470 MHz – 5850 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	passed
15.247(b)(3) 15.407(a1iv)(a2)(a3)	RSS-247, 5.4(d)	Maximum output power	passed
15.247(b)(4) 15.407(a1iv)(a2)(a3)	RSS-247, 5.4(d)	Defacto limit	not applicable
15.247(d) 15.407(b)	RSS-247, 5.5, 6.2.1.2, 6.2.4.2	Unwanted emission, radiated	passed
15.247(d) 15.407(b9)	RSS-Gen, 8.10	Emissions in restricted bands	passed
15.203	-	Antenna requirement	passed
15.225	RSS-210, B6	Unwanted emission, radiated	passed

The mentioned RSS Rule Parts in the above table are related to:  
 RSS-Gen, Issue 5, March 2019, Amendment1  
 RSS-247, Issue 2, February 2017  
 RSS-210, Issue 10, December 2019

#### 3.2 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 : 26 June 2020

Testing concluded on : 06 October 2020

Checked by:

Tested by:

\_\_\_\_\_  
 Klaus Gegenfurtner  
 Teamleader Radio

\_\_\_\_\_  
 Hermann Smetana  
 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: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

### 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%	$\pm 3.29$ 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%	$\pm 2.71$ dB
Field strength of the fundamental	1000 MHz to 7000 MHz	95%	$\pm 2.71$ dB
Power spectral density	2400 MHz to 3000 MHz	95%	$\pm 0.62$ dB
Spurious Emissions, conducted	9 kHz to 10000 MHz	95%	$\pm 2.15$ dB
Spurious Emissions, conducted	10000 MHz to 40000 MHz	95%	$\pm 3.47$ dB
Spurious Emissions, radiated	9 kHz to 30 MHz	95%	$\pm 3.53$ dB
Spurious Emissions, radiated	30 MHz to 1000 MHz	95%	$\pm 4.44$ dB
Spurious Emissions, radiated	1000 MHz to 30000 MHz	95%	$\pm 2.34$ dB
Spurious Emissions, radiated	30000 MHz to 40000 MHz	95%	$\pm 5.13$ dB

#### 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".

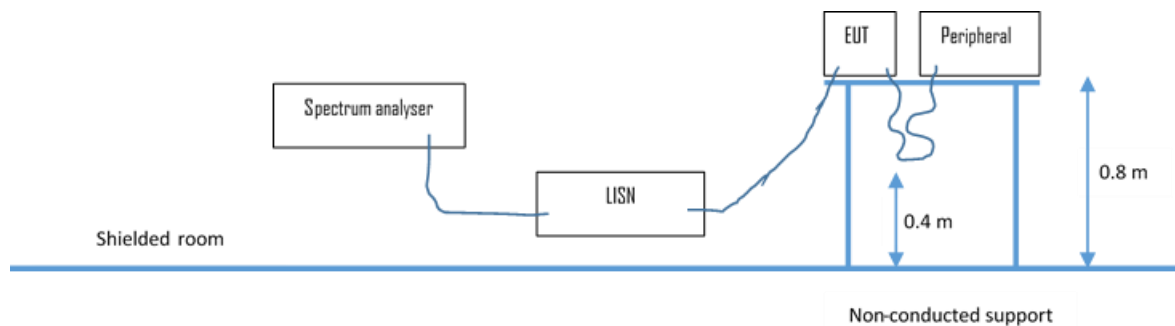
##### 4.5.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

##### 4.5.3 Details of test procedures

##### 4.5.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dB $\mu$ V, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

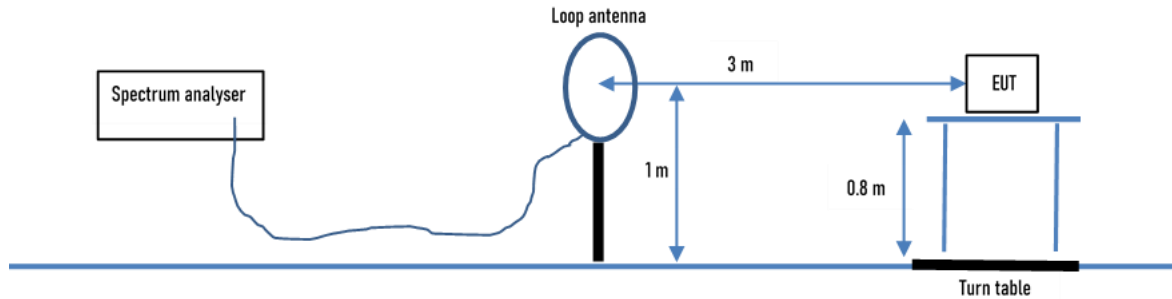
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50  $\Omega$  / 50  $\mu$ H (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

### 4.5.3.2 Radiated emission

#### 4.5.3.2.1 OATS1 test site (9 kHz - 30 MHz):

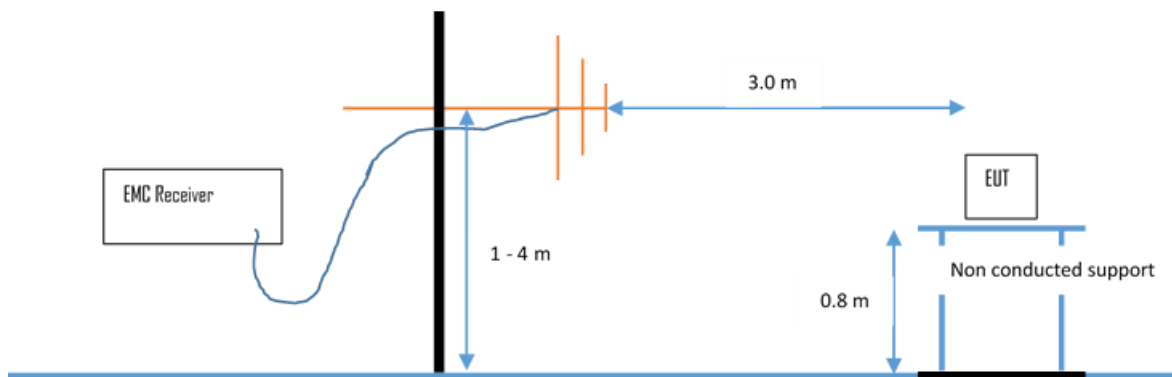
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center 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 along the site axis and the EUT is rotated 360 degrees.

#### 4.5.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



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. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. 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:

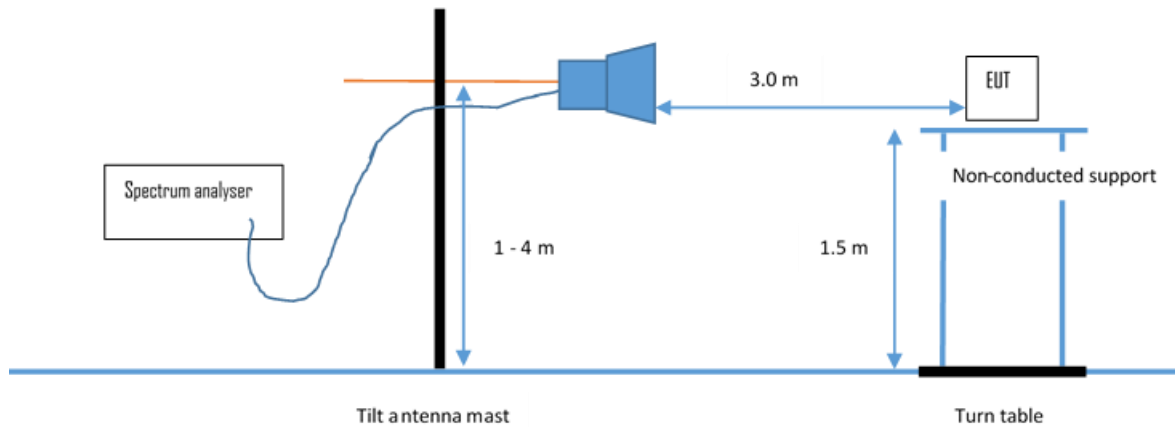
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

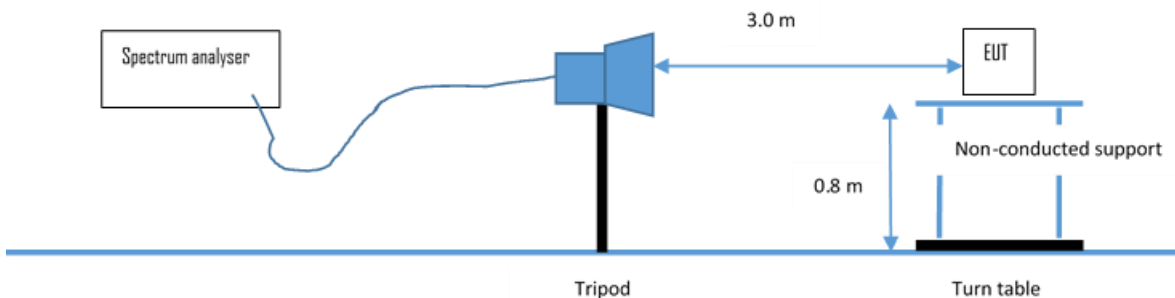
**4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)**

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz 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 non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

**4.5.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)**



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz 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 non-conducting table, 0.8 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit are adopted.

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.



## 5 TEST CONDITIONS AND RESULTS

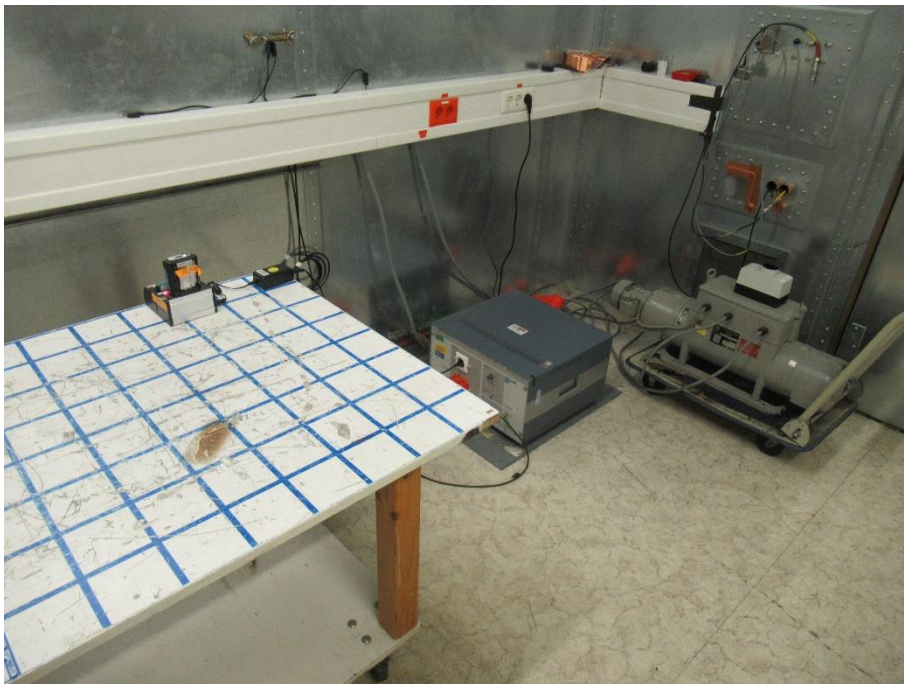
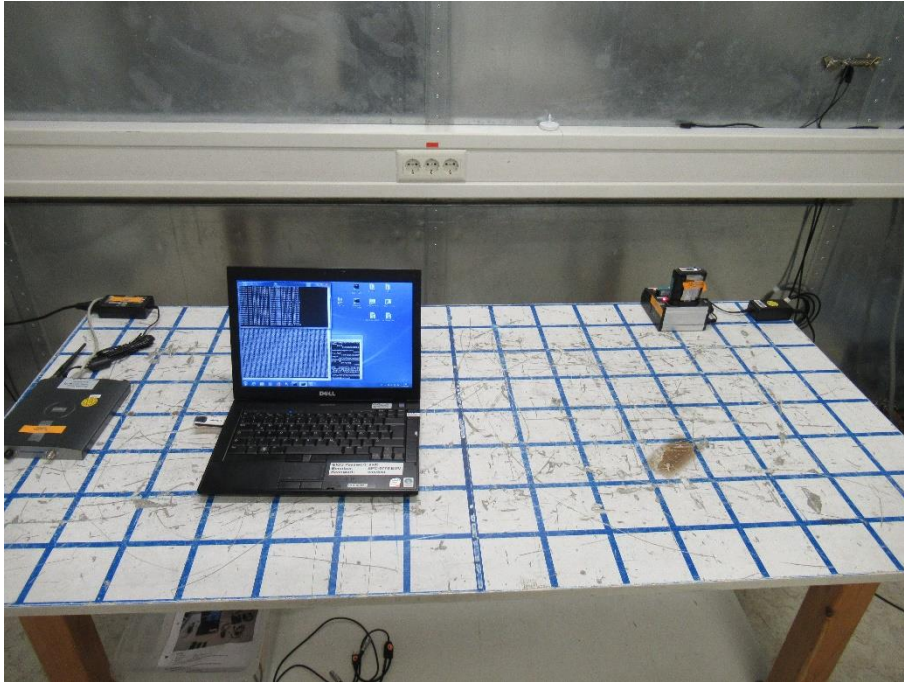
### 5.1 AC power line conducted emissions

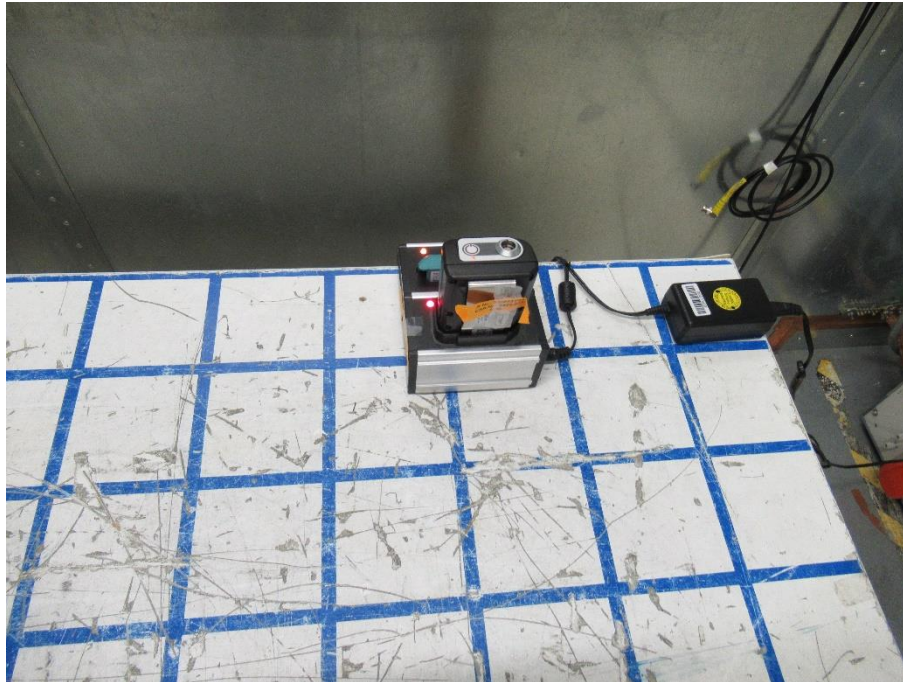
For test instruments and accessories used see section 6 Part A 4.

#### 5.1.1 Description of the test location

Test location:                   Shielded Room S2

#### 5.1.2 Photo documentation of the test set-up





**5.1.3 Applicable standard**

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits under FCC 15.207(a).

**5.1.4 Description of Measurement**

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

**5.1.5 Test result**

Frequency range: 0.15 MHz - 30 MHz  
 Min. limit margin -16.8 dB at 0.191 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

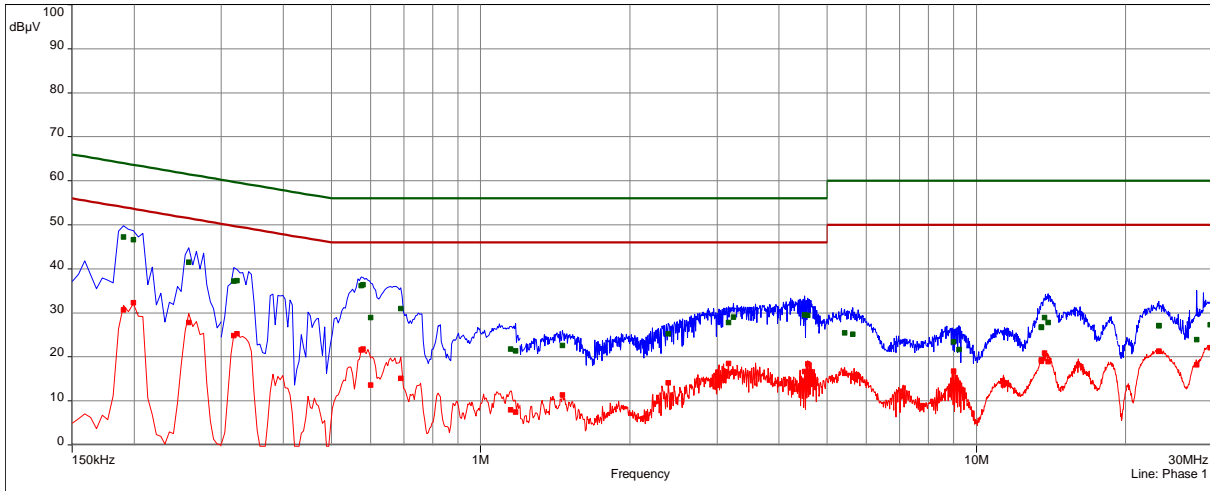
**Remarks:** For detailed test result please refer to following test protocols

### 5.1.6 Test protocol

Test point: L1  
 Operation mode: Transmission WLAN 2.4 GHz, BLE, RFID, charging  
 Remarks:

Result: passed

- FCC/FCC Part 15C (15.207) B - Average/
- FCC/FCC Part 15C (15.207) B - QPeak/
- Meas Peak (Phase 1)
- Mes. CISPR AVG (Phase 1)
- QuasiPeak (Finals) (Phase 1)
- CISPR AV (Finals) (Phase 1)



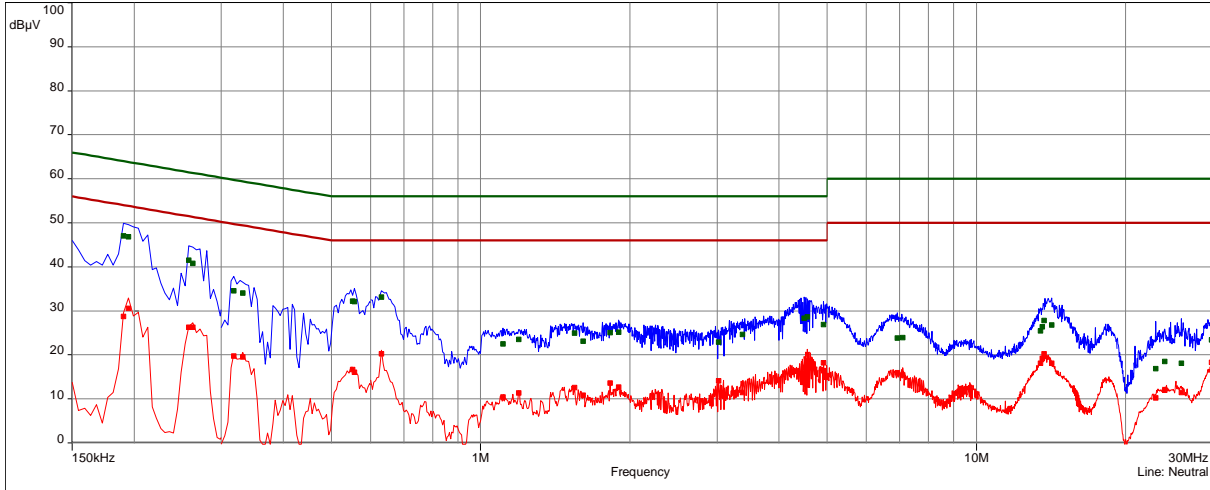
FCC/FCC Part 15C (15.207)B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.191	1	47.3	-16.8	64.0	30.7	-23.3	54.0	Phase 1	10.1
0.200	1	46.6	-17.1	63.6	32.3	-21.3	53.6	Phase 1	10.1
0.258	1	41.5	-20.0	61.5	27.8	-23.7	51.5	Phase 1	10.1
0.318	2	37.2	-22.5	59.8	24.8	-24.9	49.8	Phase 1	10.1
0.323	2	37.3	-22.3	59.6	25.3	-24.3	49.6	Phase 1	10.1
0.575	2	36.2	-19.8	56.0	21.6	-24.4	46.0	Phase 1	10.2
0.579	2	36.4	-19.6	56.0	21.8	-24.2	46.0	Phase 1	10.2
0.600	3	29.0	-27.0	56.0	13.7	-32.4	46.0	Phase 1	10.2
0.690	3	31.0	-25.0	56.0	15.1	-30.9	46.0	Phase 1	10.2
1.149	3	21.8	-34.2	56.0	8.0	-38.0	46.0	Phase 1	10.2
1.176	3	21.4	-34.6	56.0	7.5	-38.5	46.0	Phase 1	10.2
1.461	4	22.6	-33.4	56.0	11.3	-34.7	46.0	Phase 1	10.3
2.393	4	25.2	-30.8	56.0	14.1	-31.9	46.0	Phase 1	10.3
3.161	5	27.9	-28.2	56.0	18.5	-27.5	46.0	Phase 1	10.4
3.237	5	29.1	-27.0	56.0	16.6	-29.4	46.0	Phase 1	10.4
4.502	5	29.5	-26.5	56.0	16.7	-29.3	46.0	Phase 1	10.4
4.574	5	29.5	-26.5	56.0	18.5	-27.5	46.0	Phase 1	10.4
5.421	6	25.4	-34.6	60.0	16.3	-33.7	50.0	Phase 1	10.5
5.633	6	25.2	-34.8	60.0	15.7	-34.3	50.0	Phase 1	10.5
9.003	6	23.4	-36.6	60.0	16.8	-33.2	50.0	Phase 1	10.7
9.219	6	21.7	-38.3	60.0	12.8	-37.2	50.0	Phase 1	10.7
13.529	7	26.8	-33.2	60.0	19.4	-30.7	50.0	Phase 1	11.0
13.533	7	26.7	-33.3	60.0	19.1	-30.9	50.0	Phase 1	11.0
13.722	7	28.9	-31.1	60.0	20.8	-29.2	50.0	Phase 1	11.0
13.965	7	27.8	-32.2	60.0	19.0	-31.1	50.0	Phase 1	11.0
23.340	8	27.1	-32.9	60.0	21.3	-28.7	50.0	Phase 1	11.4
23.349	8	27.1	-32.9	60.0	21.3	-28.7	50.0	Phase 1	11.4
27.822	8	23.9	-36.1	60.0	18.3	-31.8	50.0	Phase 1	11.4
29.631	8	27.3	-32.7	60.0	22.1	-27.9	50.0	Phase 1	11.4

Test point: N  
 Operation mode: Transmission WLAN 2.4 GHz, BLE, RFID, charging  
 Remarks:

Result: passed

- FCC/FCC Part 15C (15.207) B - Average/
- FCC/FCC Part 15C (15.207) B - QPeak/
- Meas.Peak (Neutral)
- Mes. CISPR AVG (Neutral)
- QuasiPeak (Finals) (Neutral)
- CISPR AV (Finals) (Neutral)



FCC/FCC Part 15C (15.207)B

freq	SR	QP	margin	limit	AV	margin	limit	line	corr
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.191	9	47.1	-17.0	64.0	28.7	-25.3	54.0	Neutral	10.1
0.195	9	46.8	-17.0	63.8	30.6	-23.2	53.8	Neutral	10.1
0.258	9	41.5	-20.0	61.5	26.3	-25.2	51.5	Neutral	10.1
0.263	9	40.8	-20.6	61.4	26.3	-25.0	51.4	Neutral	10.1
0.318	10	34.6	-25.2	59.8	19.8	-30.0	49.8	Neutral	10.2
0.332	10	34.1	-25.4	59.4	19.6	-29.8	49.4	Neutral	10.2
0.552	10	32.2	-23.8	56.0	16.6	-29.4	46.0	Neutral	10.2
0.557	10	32.1	-23.9	56.0	16.1	-29.9	46.0	Neutral	10.2
0.632	11	33.1	-22.9	56.0	20.2	-25.8	46.0	Neutral	10.2
1.109	11	22.5	-33.5	56.0	10.4	-35.6	46.0	Neutral	10.2
1.194	11	23.5	-32.5	56.0	11.4	-34.6	46.0	Neutral	10.2
1.547	12	25.0	-31.0	56.0	12.6	-33.4	46.0	Neutral	10.3
1.610	12	23.1	-32.9	56.0	10.8	-35.2	46.0	Neutral	10.3
1.826	12	25.1	-30.9	56.0	13.7	-32.3	46.0	Neutral	10.3
1.898	12	25.2	-30.8	56.0	12.7	-33.4	46.0	Neutral	10.3
3.021	13	22.9	-33.1	56.0	14.1	-31.9	46.0	Neutral	10.4
3.372	13	24.6	-31.4	56.0	11.5	-34.5	46.0	Neutral	10.4
4.497	13	28.4	-27.6	56.0	17.2	-28.8	46.0	Neutral	10.4
4.565	13	28.6	-27.4	56.0	18.6	-27.4	46.0	Neutral	10.4
4.922	14	26.9	-29.1	56.0	18.2	-27.8	46.0	Neutral	10.4
6.929	14	23.8	-36.2	60.0	16.0	-34.0	50.0	Neutral	10.6
7.104	14	24.0	-36.1	60.0	15.5	-34.5	50.0	Neutral	10.6
13.484	15	25.4	-34.6	60.0	18.1	-31.9	50.0	Neutral	11.0
13.569	15	26.4	-33.6	60.0	19.2	-30.8	50.0	Neutral	11.0
13.700	15	27.8	-32.2	60.0	20.3	-29.7	50.0	Neutral	11.0
14.186	15	26.8	-33.2	60.0	18.1	-31.9	50.0	Neutral	11.0
22.989	16	16.9	-43.1	60.0	10.3	-39.7	50.0	Neutral	11.4
24.002	16	18.5	-41.5	60.0	12.0	-38.0	50.0	Neutral	11.4
25.896	16	18.1	-41.9	60.0	11.5	-38.5	50.0	Neutral	11.3
29.829	16	23.4	-36.6	60.0	18.3	-31.7	50.0	Neutral	11.2

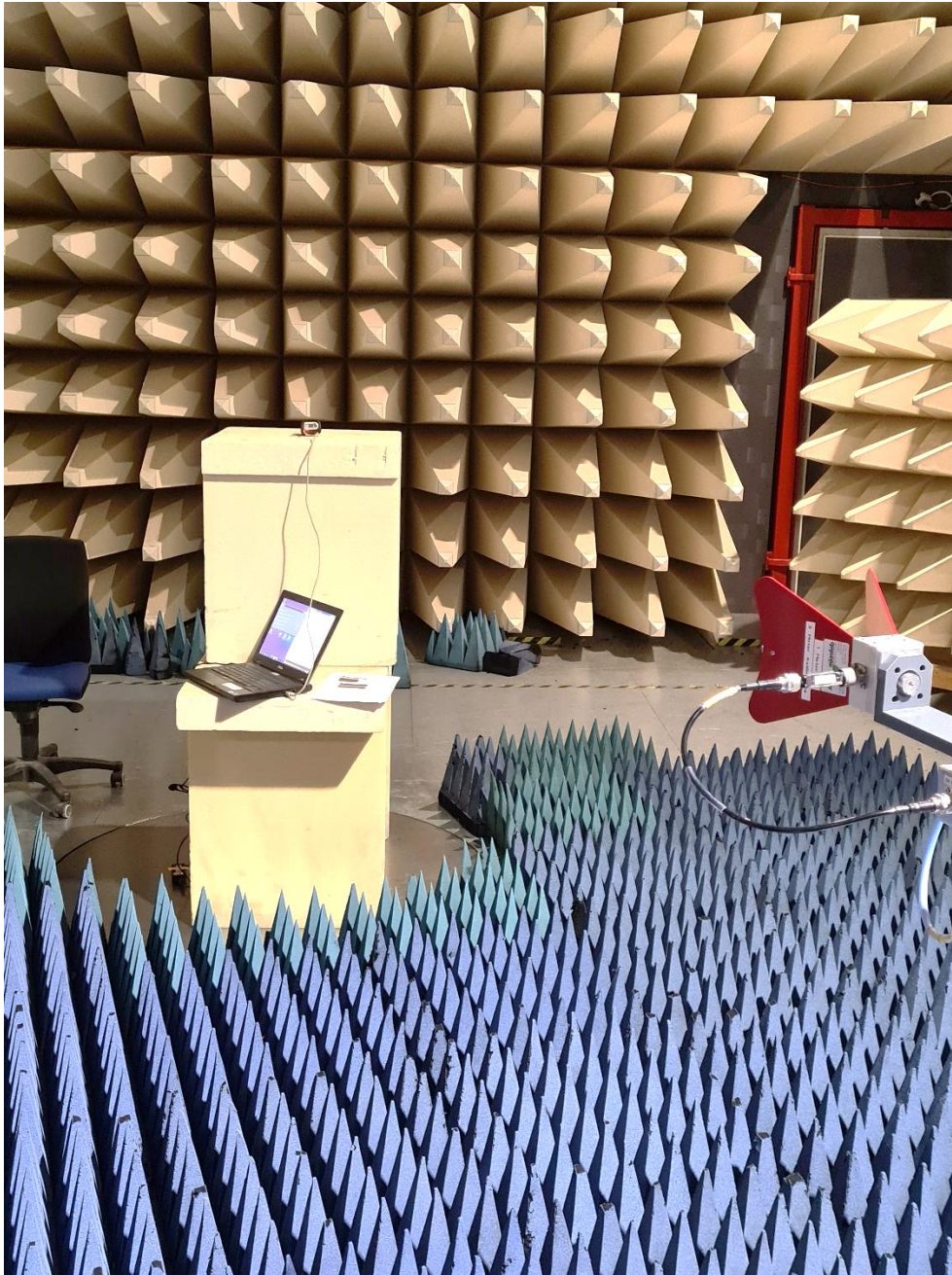
## 5.2 Maximum conducted output power

For test instruments and accessories used see section 6 Part **CPR 3**.

### 5.2.1 Description of the test location

Test location: Anechoic chamber 1  
Test distance: 3 m

### 5.2.2 Photo documentation of the test set-up



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.



**5.2.3 Applicable standard**

According to FCC Part 15, Section 15.247 (b)(3), Section 15.407 (a1iv)(a2)(a3) and Section 15.225(a)

**5.2.4 Description of Measurement**

The maximum peak conducted output power is measured using a spectrum analyser following the procedure set out in ANSI C63-10, item 11.9.2.2.2. The EUT is set in TX continuous mode while measuring.

**5.2.5 Test result**

Measurement of the radiated output power

<b>WLAN 2.4 GHz</b>	<b>Test results radiated</b>			
	FS (dBµV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
<b>Chain 1+2</b>				
CH1	108.2	12.9	36.0	-23.1

<b>802.11n HT20, MCS7, 2 TX</b>	<b>Test results radiated</b>			
Duty cycle: 99%	FS (dBµV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
<b>Chain 1</b>				
CH36, P14	111.8	16.5	30.0	81.8
CH64, P14	111.7	16.4	30.0	81.7
CH100, P14	108.9	13.6	30.0	78.9
CH149, P14	111.4	16.1	36.0	75.4

802.11n HT40, MCS7, 2 TX		Test results radiated			
Duty cycle: 99%					
Chain 1	FS (dBμV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH36up, P9	105.7	10.4	30.0	75.7	
CH60up, P9	105.6	10.3	30.0	75.6	
CH100up, P14	109.1	13.8	30.0	79.1	
CH149up, P14	110.6	15.3	36.0	74.6	

802.11ac VT80, MCS0, 2 TX		Test results radiated			
Duty cycle: 99%					
Chain 1	FS (dBμV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH42, P6	101.3	6.0	30.0	71.3	
CH56, P6, Chain2	101.3	6.0	30.0	71.3	
CH106, P6	100.2	4.9	30.0	70.2	
CH155, P6	101.7	6.4	36.0	65.7	

BT, DH5		Test results radiated			
Chain 1	FS (dBμV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH0	92.9	-2.4	36.0	-38.4	
CH40	92.7	-2.6	36.0	-38.6	
CH79	94.8	-0.5	36.0	-36.5	

BLE		Test results radiated			
Chain 1+2	FS (dBμV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH34	106.3	11.0	36.0	-25.0	

RFID:

Frequency (MHz)	Level (dBμV)	Ant. factor (dB 1/m)	Field strength dB(μV/m)	Limit dB(μV/m)	Delta (dB)
13.56	14.0	20.0	34.0	84.0	-50.0

Note: The measured output power represents the the power of one chain. If two chain are active the power setting is reduced by 3 dB so that the total output power is the same as for one chain. For example, Ch36n HT20, P14 used by one chain, are two chains used the power setting is P11.

#### Calculated peak conducted output power:

Antenna gain: 2.5 dBi at 2.4 GHZ and 4.4 dBi at 5 GHz.

For calculation the following formula is used:  $A = P - G$ ;

Where:

A is peak conducted output power

P is the out put power as EIRP

G is the antenna gain

WLAN 2.4 GHz		Test results radiated			
Chain 1+2	FS (dBμV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH1	12.9	10.4	30.0	-19.6	

802.11n HT20, MCS7, 2 TX		Test results conducted			
Duty cycle: 99%					
Chain 1	FS (dB $\mu$ V/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH36, P14	16.5	12.1	24.0	-7.5	
CH64, P14	16.4	12.0	24.0	-7.6	
CH100, P14	13.6	9.2	24.0	-10.4	
CH149, P14	16.1	11.7	30.0	-13.9	

802.11n HT40, MCS7, 2 TX		Test results conducted			
Duty cycle: 99%					
Chain 1	FS (dB $\mu$ V/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH36up, P9	10.4	6.0	24.0	-13.6	
CH60up, P9	10.3	5.9	24.0	-13.7	
CH100up, P14	13.8	9.4	24.0	-10.2	
CH149up, P14	15.3	10.9	30.0	-14.7	

802.11ac VT80, MCS0, 2 TX		Test results conducted			
Duty cycle: 99%					
Chain 1	FS (dB $\mu$ V/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)	
CH42, P6	6.0	1.6	24.0	-18.0	
CH56, P6	6.0	1.6	24.0	-18.0	
CH106, P6	4.9	0.5	24.0	-19.1	
CH155, P6	6.4	2.0	30.0	-23.7	

BT, DH5		Test results conducted			
Chain 1	P [EIRP] (dBm)	A (dBm)	Limit (dBm)	Margin (dB)	
CH0	-2.4	-4.9	30.0	-34.9	
CH40	-2.6	-5.1	30.0	-35.1	
CH79	-0.5	-3.0	30.0	-33.0	

BLE		Test results conducted			
Chain 1+2	P [EIRP] (dBm)	A (dBm)	Limit (dBm)	Margin (dB)	
CH34	11.0	8.5	30.0	-21.5	

Peak Power Limit according to FCC Part 15, Section 15.247 (b)(3), Section 15.407 (a1iv)(a2)(a3):

Frequency (MHz)	Conducted Power Limit		Radiated limit (EIRP)	
	(dBm)	(Watt)	(dBm)	(Watt)
2400-2483.5	30	1.0	36	4
5150-5350	24	0.25	30	1
5470-5725	24	0.25	30	1
5725-5850	30	1.0	36	4

The requirements are **FULFILLED**.

Remarks:

---



---



## 5.4 Unwanted emissions in restricted bands, radiated

For test instruments and accessories used see section 6 Part **SER1, SER 2, SER 3.**

### 5.4.1 Description of the test location

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

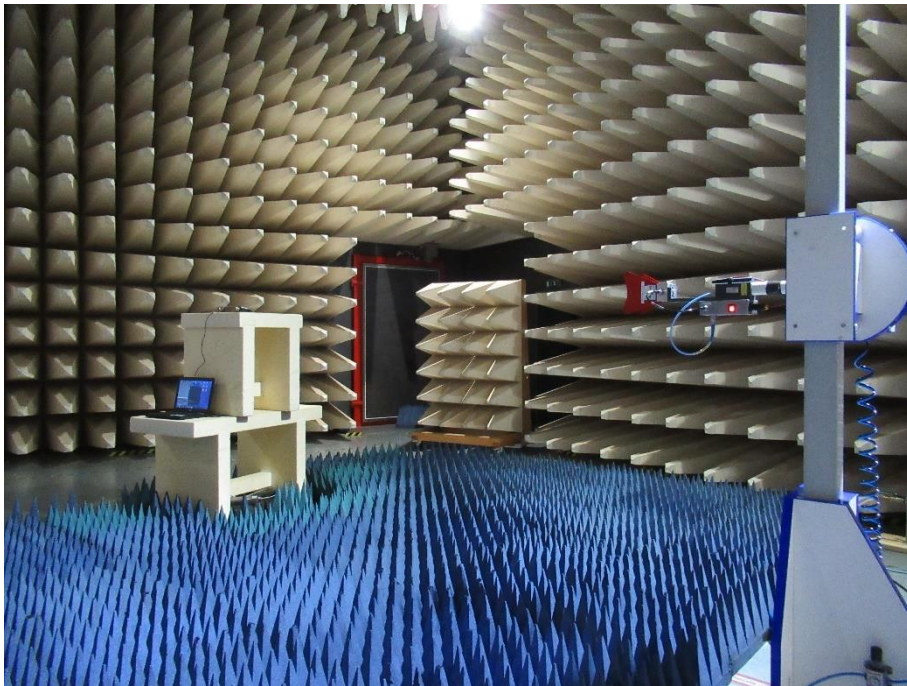
### 5.4.2 Photo documentation of the test set-up

Open area test site





Anechoic chamber



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.



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.

### 5.4.3 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).

### 5.4.4 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.

Spectrum analyser settings:

9 kHz – 30 MHz: RBW: 9 kHz  
 30 MHz – 1000 MHz: RBW: 120 kHz  
 1000 MHz – 40 GHz: RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Max Peak

### 5.4.1 Test result

**f < 30 MHz:**

Results at a measurement distance of 3m

Frequency [kHz]	Read QP [dBµV]	Read AV [dBµV]	Bandwidth [kHz]	Correct. [dB]	Level: QP [dBµV/m]	Level: AV [dBµV/m]	Limit [dBµV/m]	Delta [dB]
552	30.9	-	9.0	20	50.9	-	72.8	-21.9
6020	28.4	-	9.0	20	48.4	-	69.5	-21.1
27120	17.3	-	9.0	20	37.3	-	69.5	-32.2

Note: Limit adopted to 3 m distance

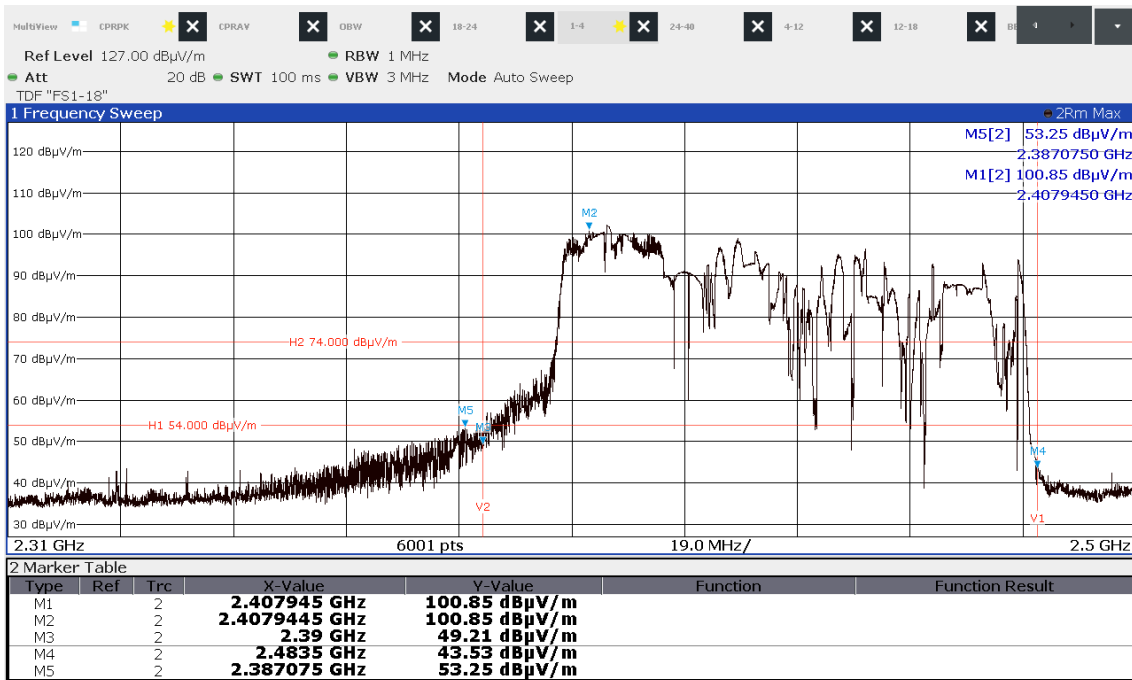
**f 30 MHz - 1000 MHz:**

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)
54.68	13.2	15.1	13.5	14.6	26.7	29.7	40.0	-10.3
76.56	18.1	19.1	11.1	11.5	29.2	30.6	40.0	-9.4
131.30	16.3	19.7	14.7	14.1	31.0	33.8	43.5	-9.7
236.10	27.4	26.9	14.5	14.2	41.9	41.1	46.0	-4.1
358.60	6.6	7.9	18.2	18.5	24.8	26.4	46.0	-19.6
447.80	-0.7	-1.6	20.6	20.9	19.9	19.3	46.0	-26.1
836.70	0.8	-1.4	27.6	28.3	28.4	26.9	46.0	-17.6

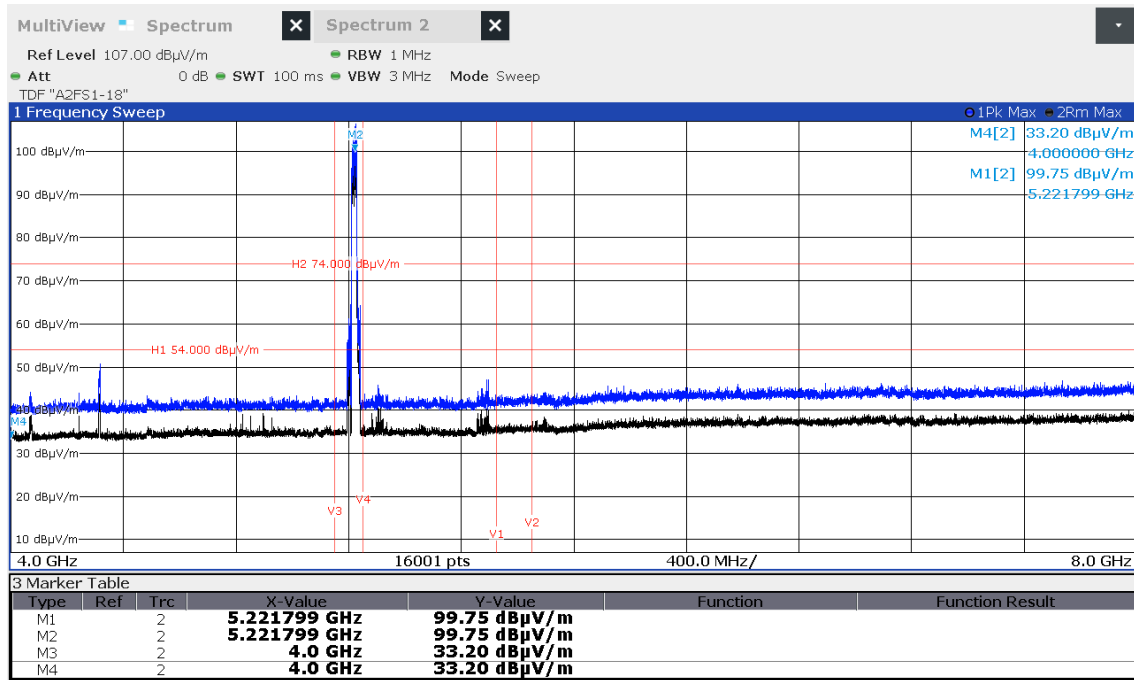
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

f > 1000 MHz:

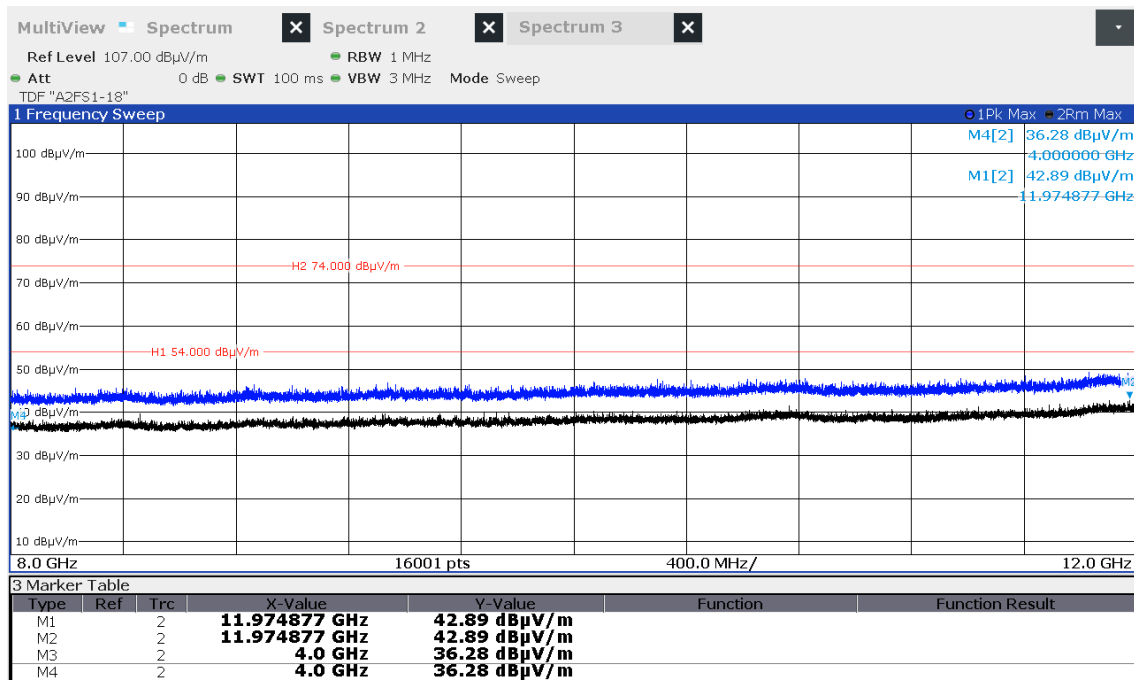
5.4.1.1 WLAN Ch1, BLE active, RFID active



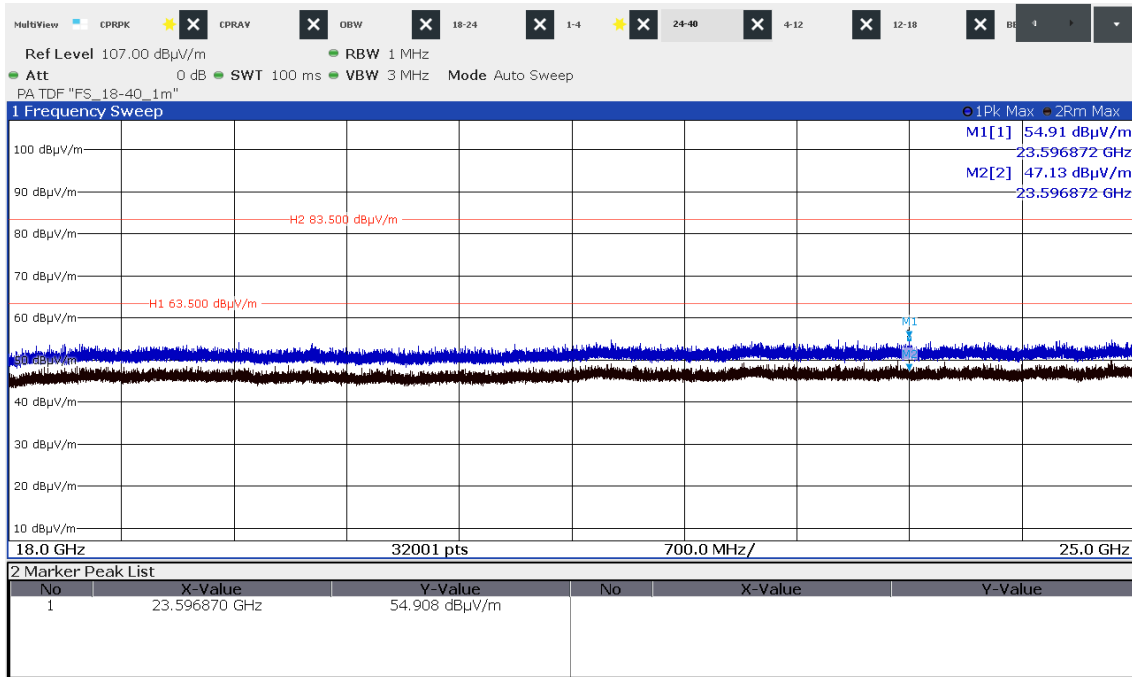
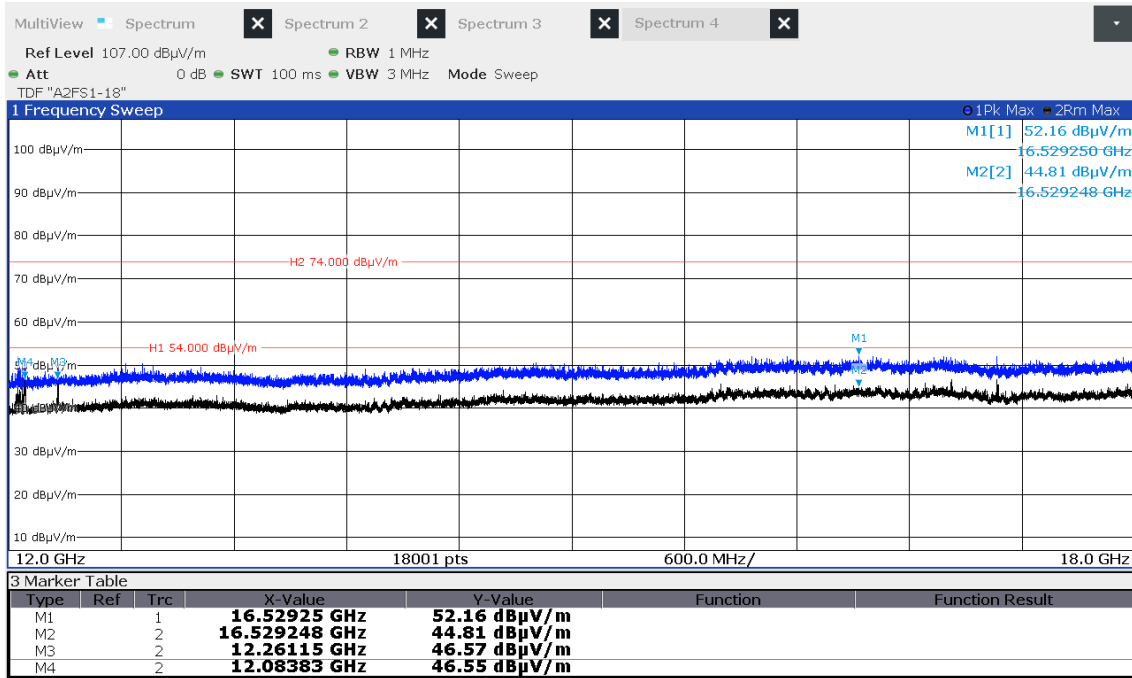
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



Due to a real transmission to an AP beaconing in the range 5150 - 5250 and 5725 - 5850 MHz may be recognised while transmitting in the 2.4 GHz range.

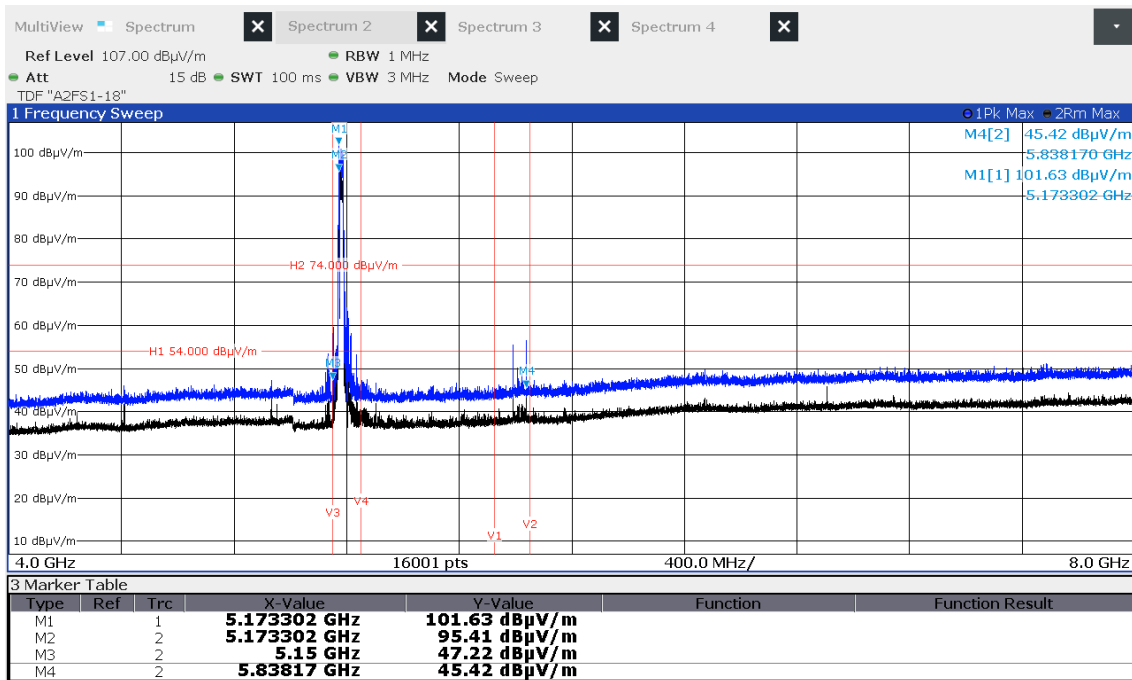
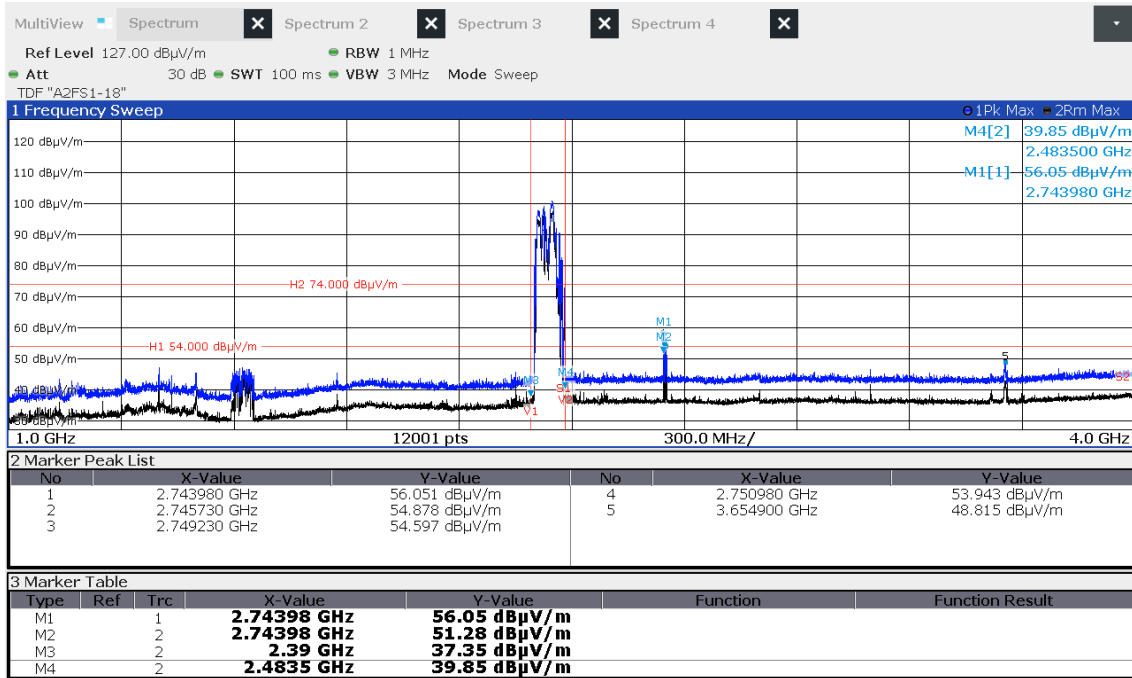


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



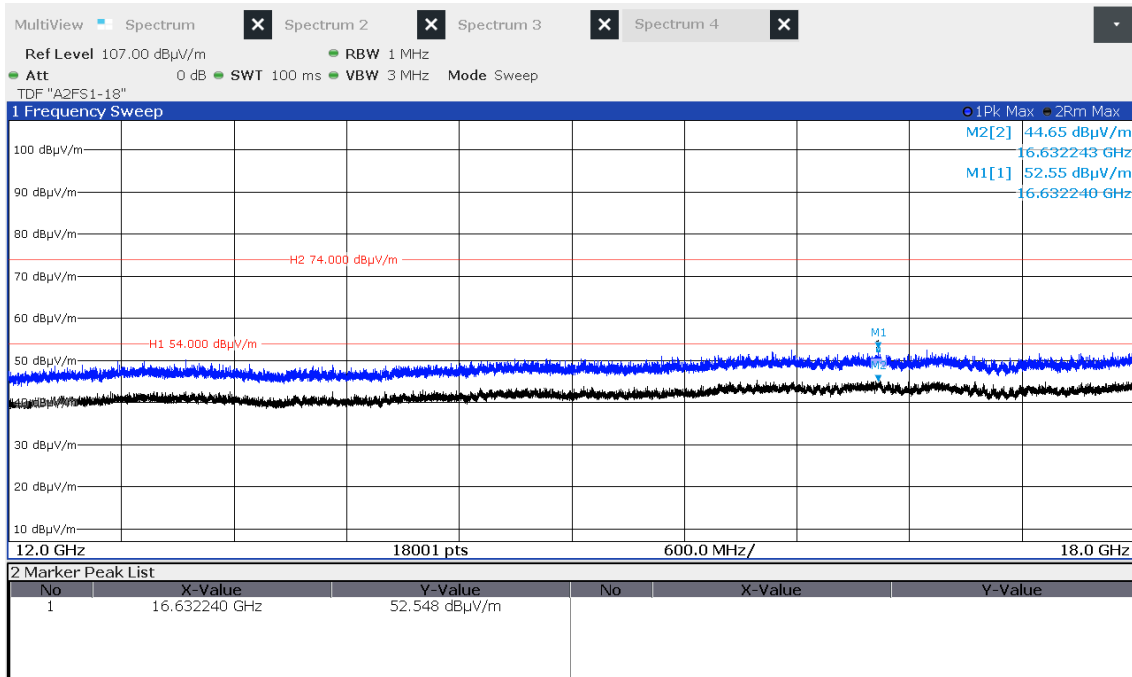
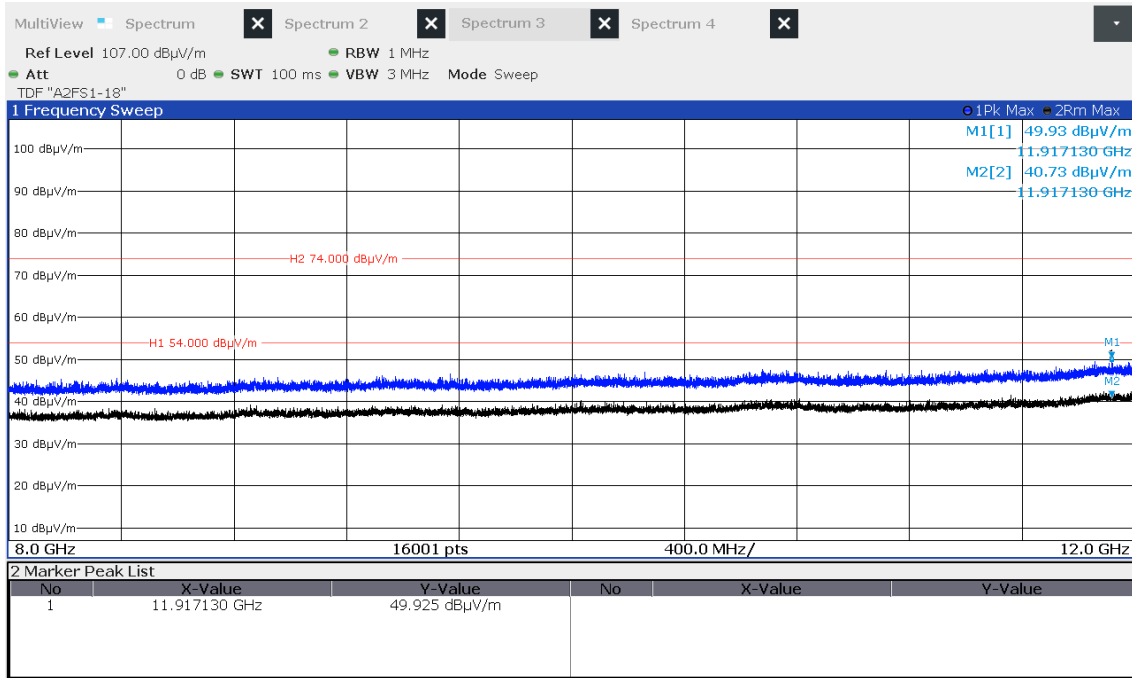
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.4.1.2 WLAN Ch36, BLE active, RFID active

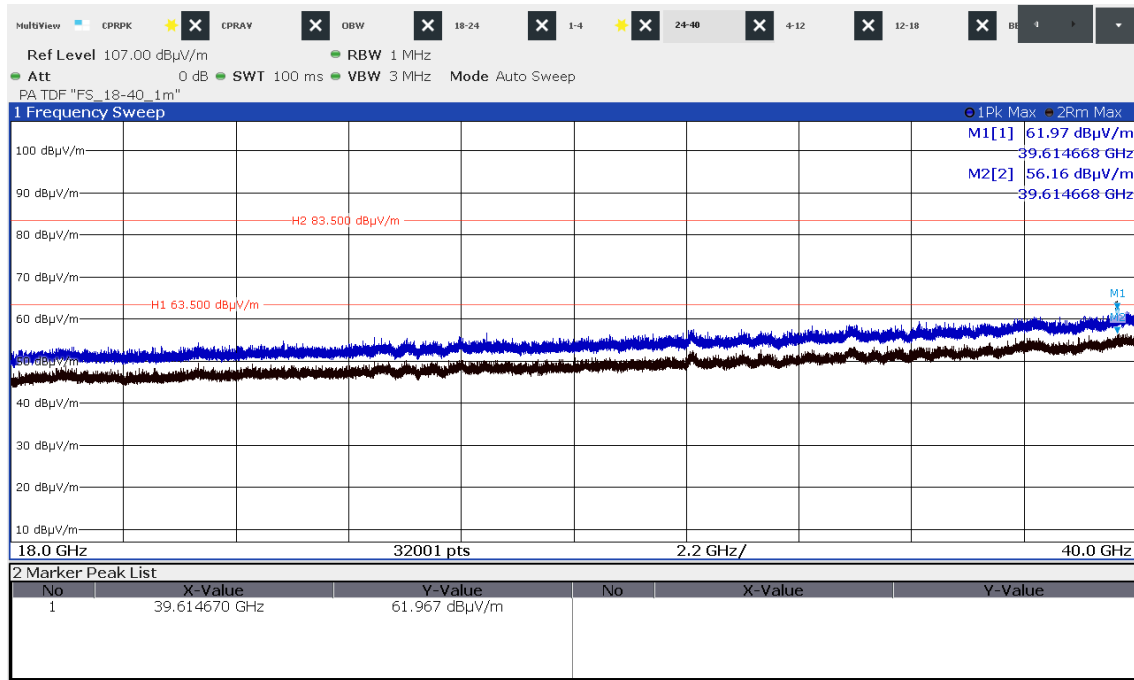


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

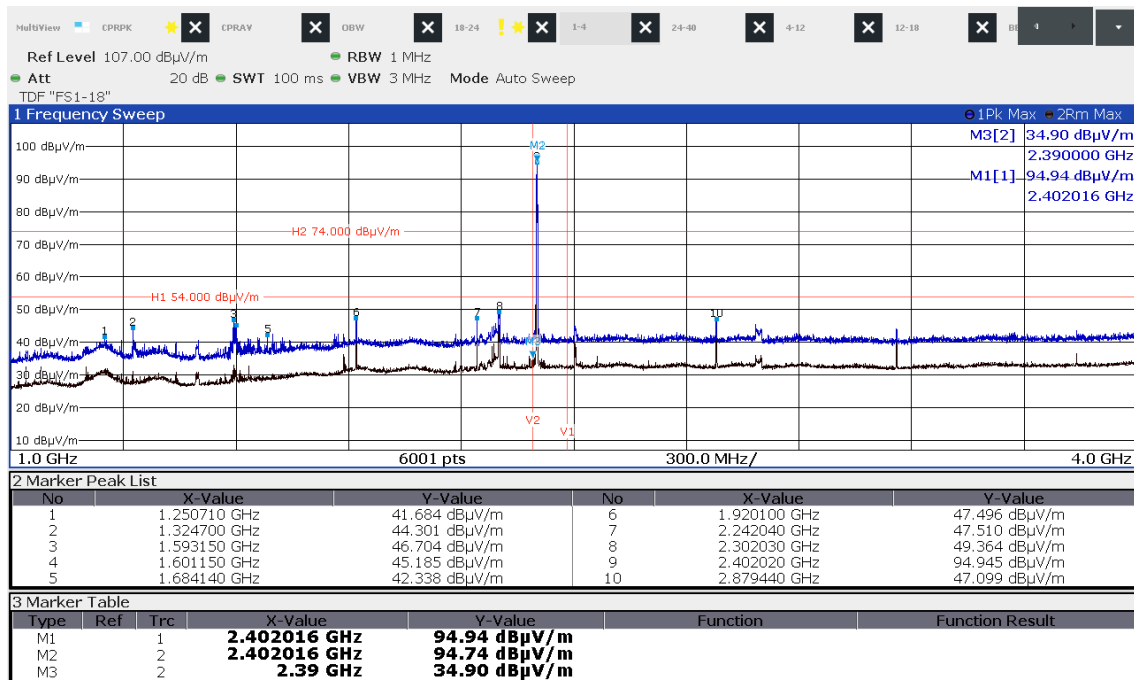




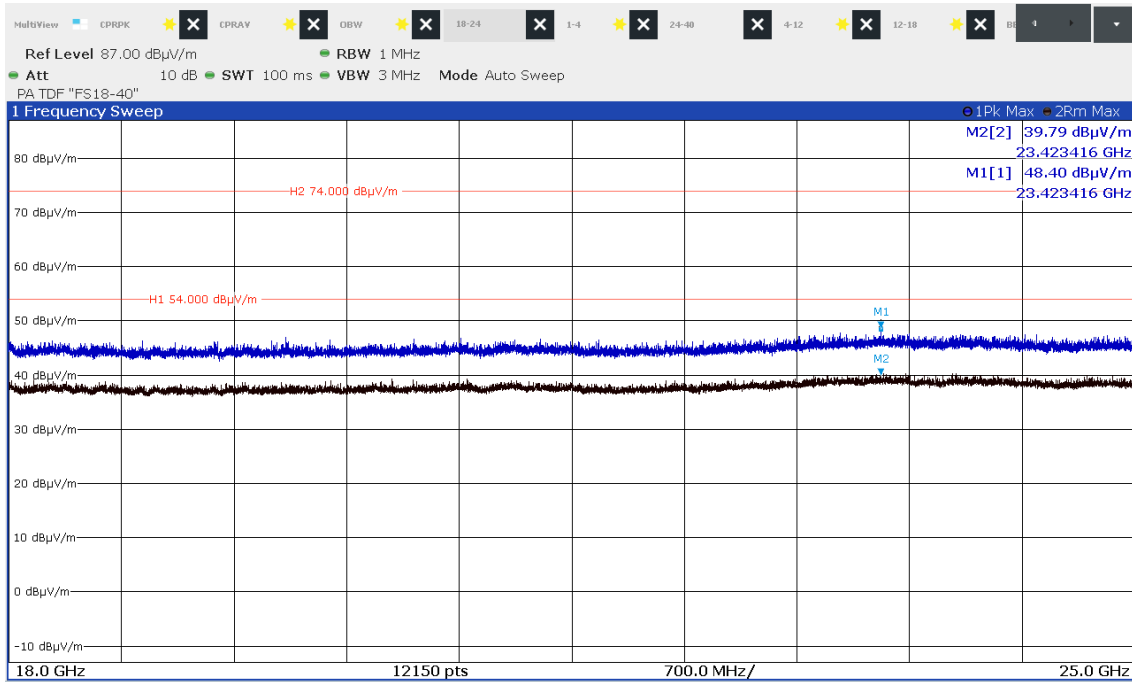
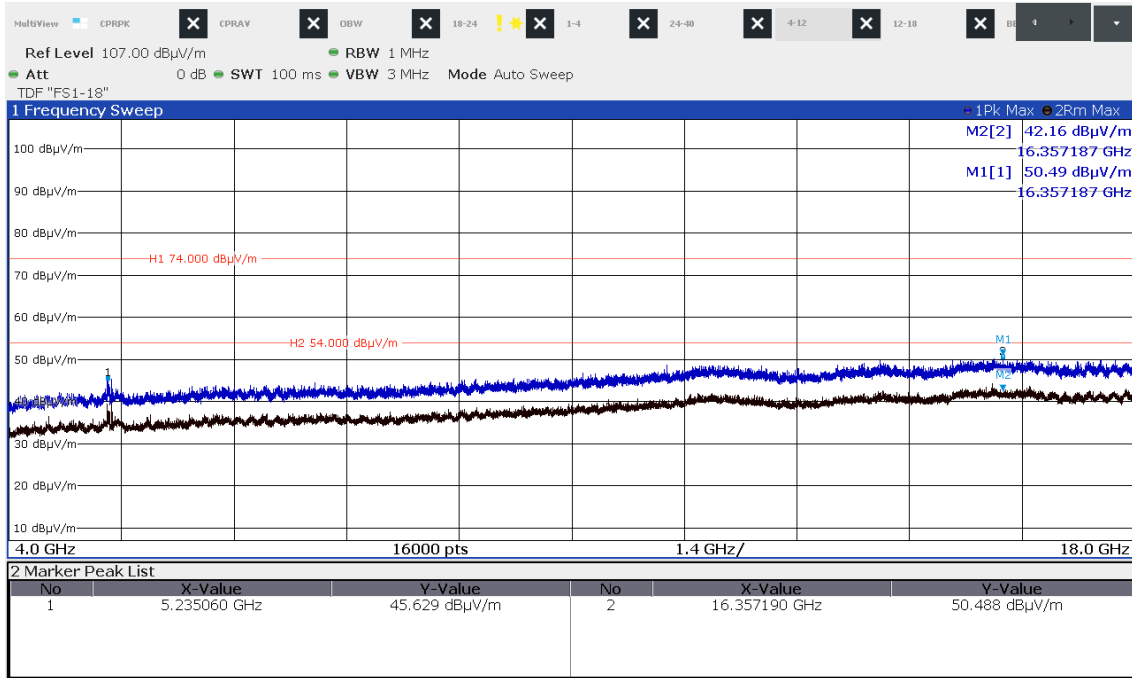
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



5.4.1.3 BT +EDR, setup by test software  
CH0

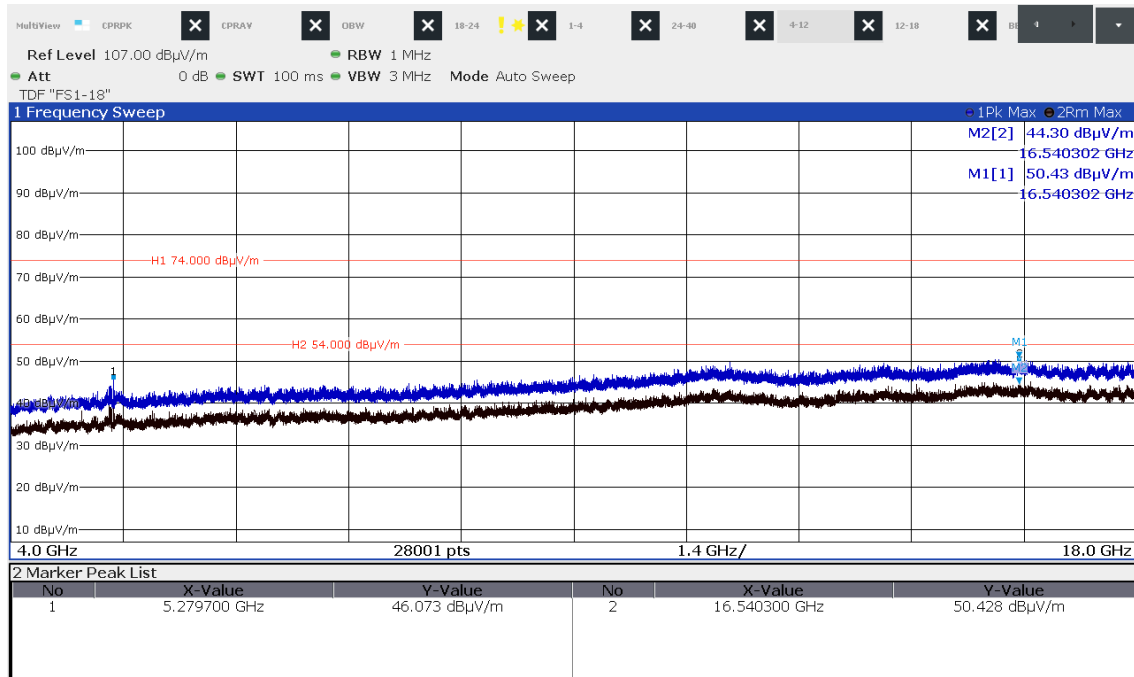
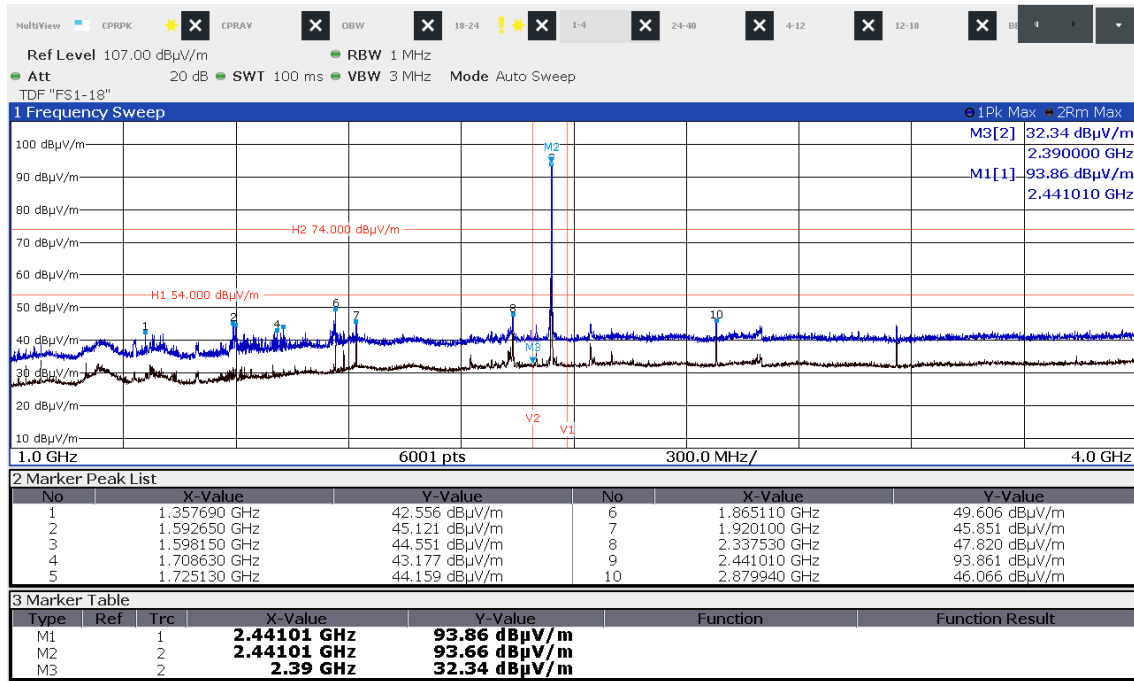


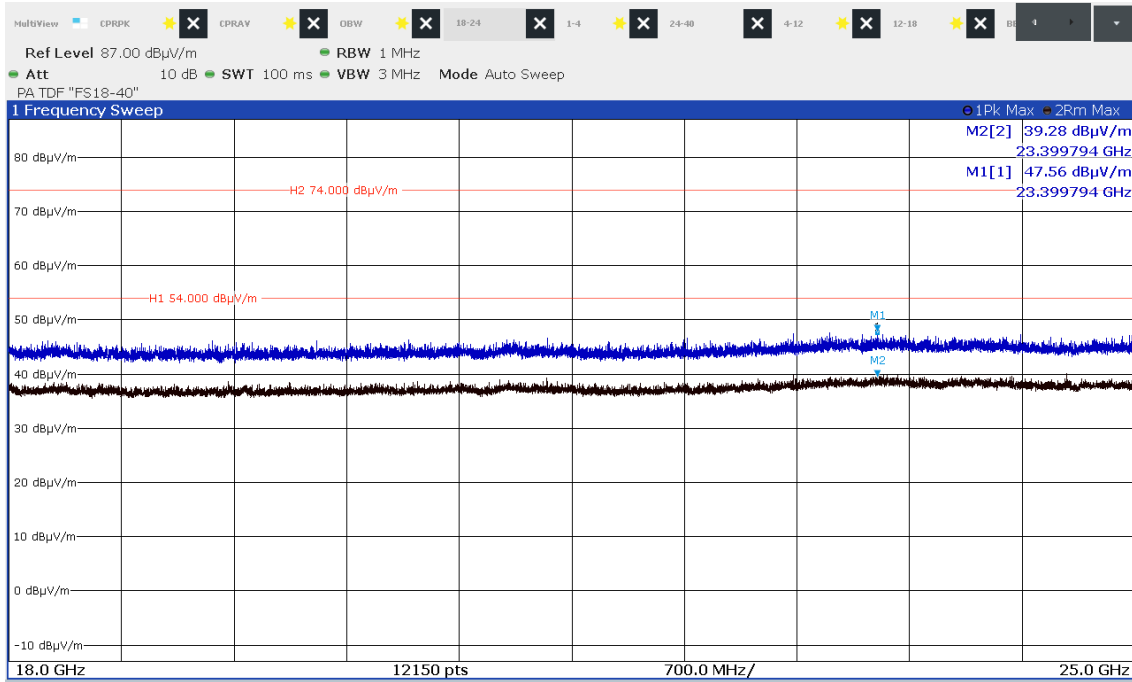
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



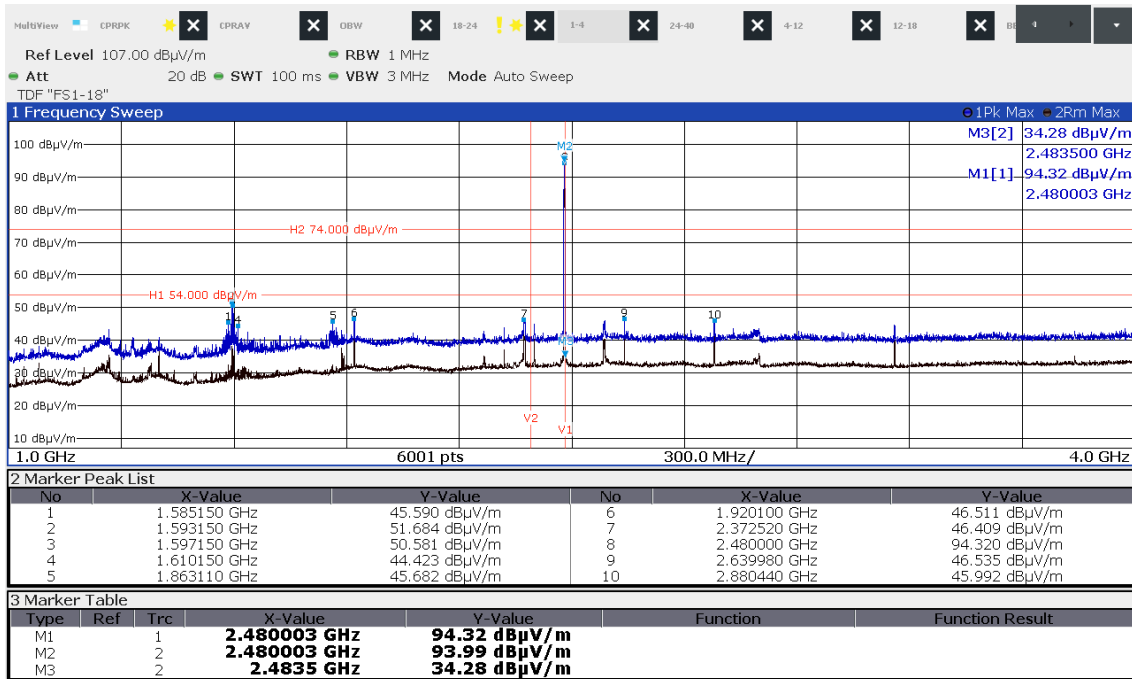
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

CH40

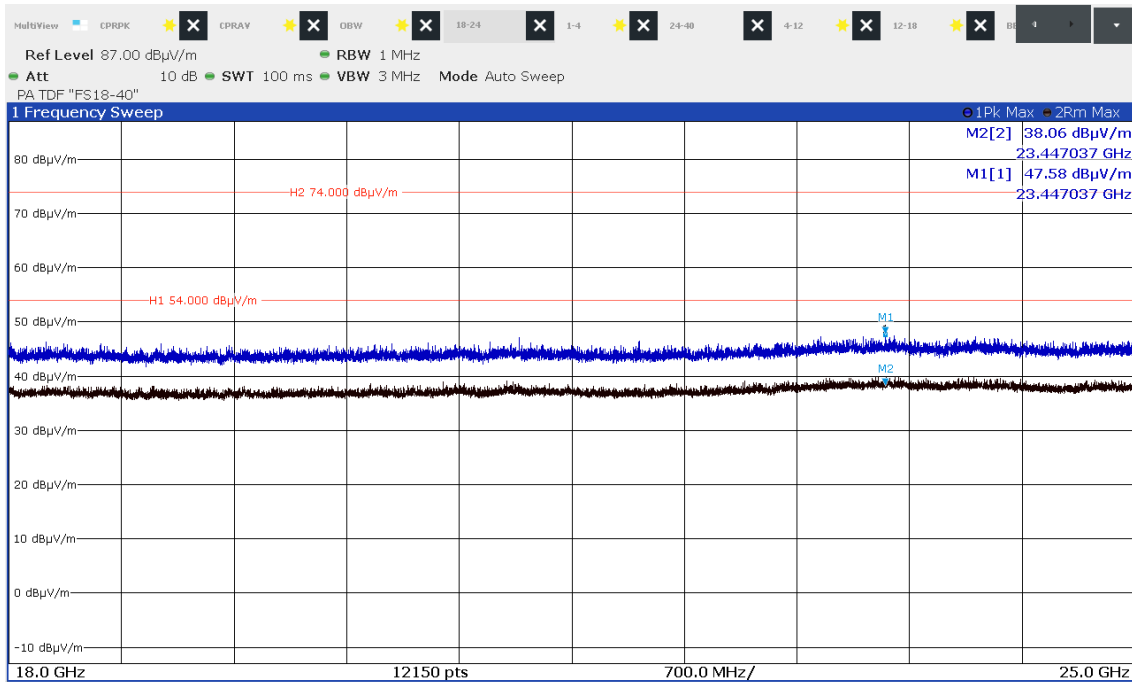
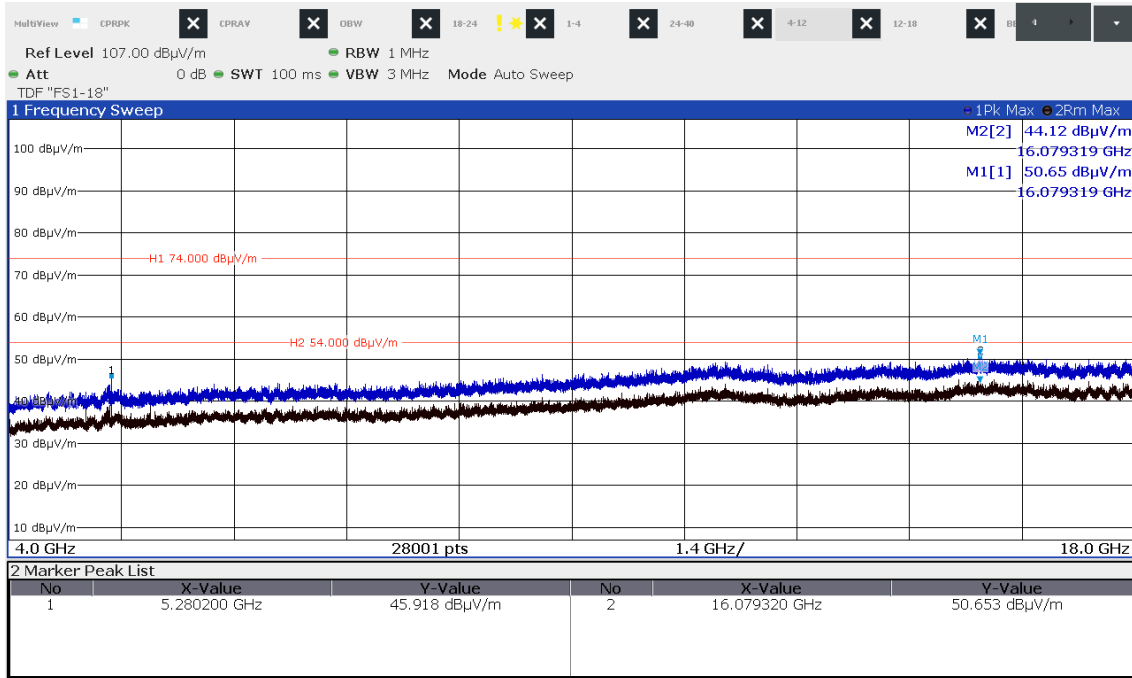




CH79

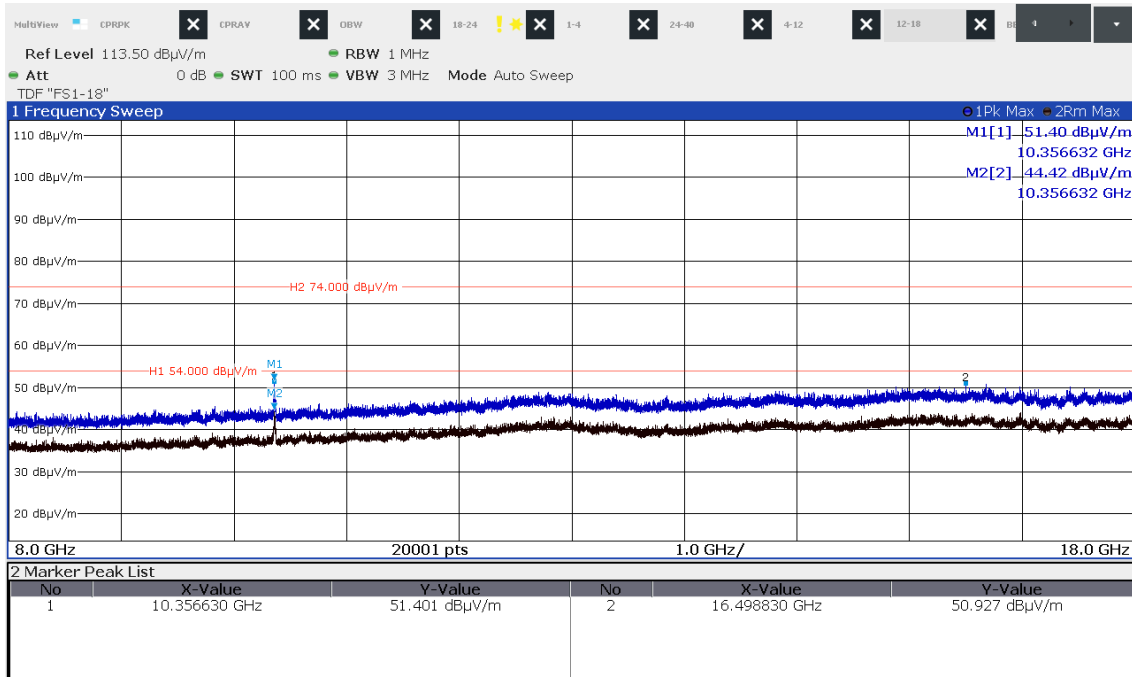
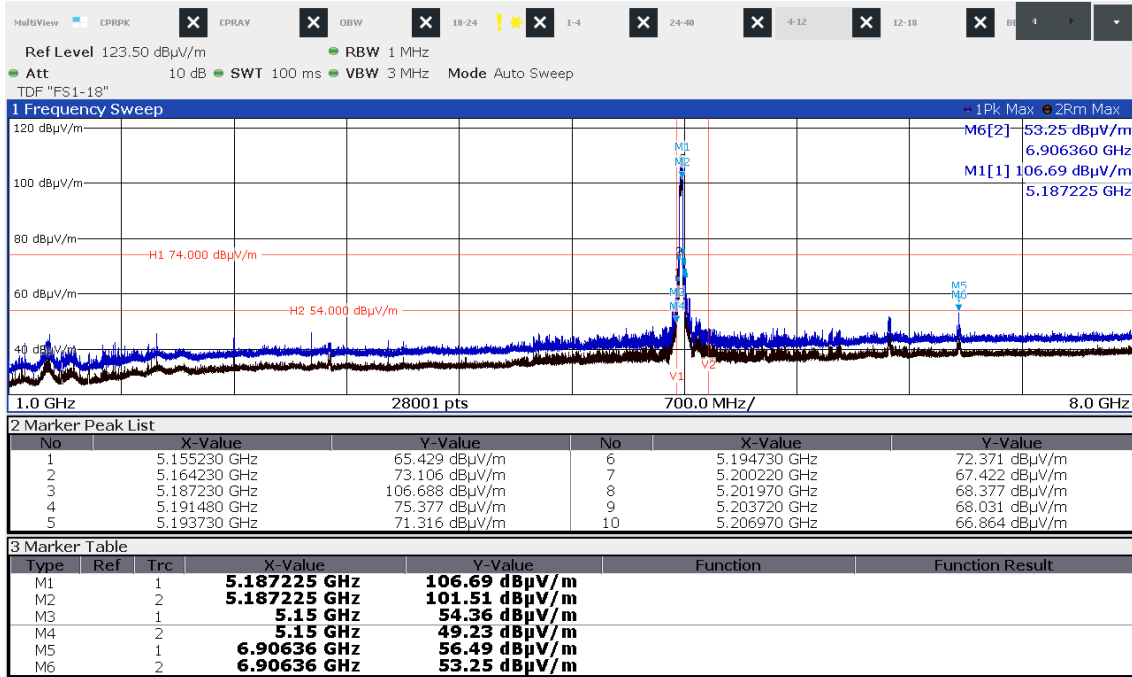


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

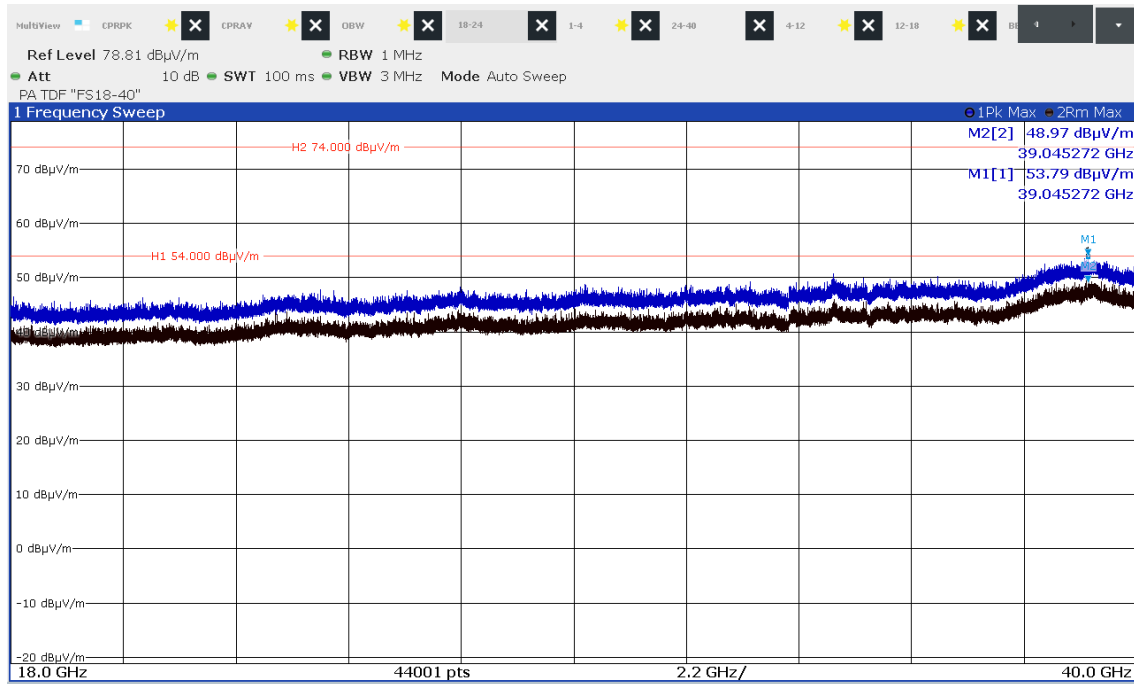


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

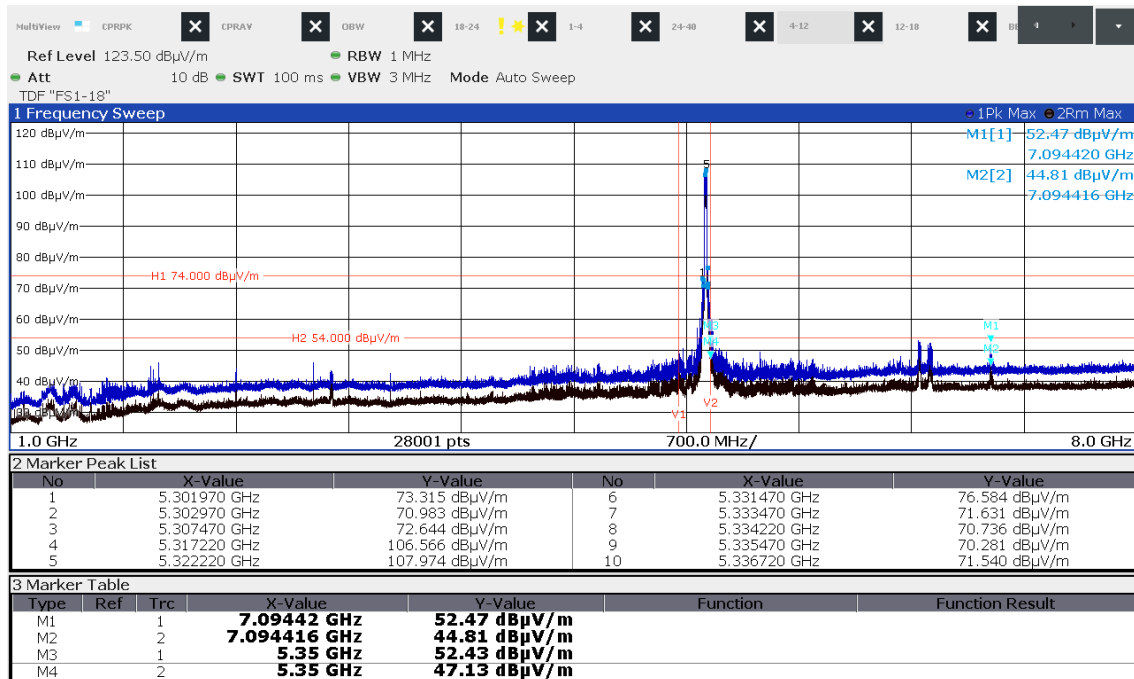
5.4.1.4 WLAN 5 GHz, n HT20, setup by test software  
CH36n HT20



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.

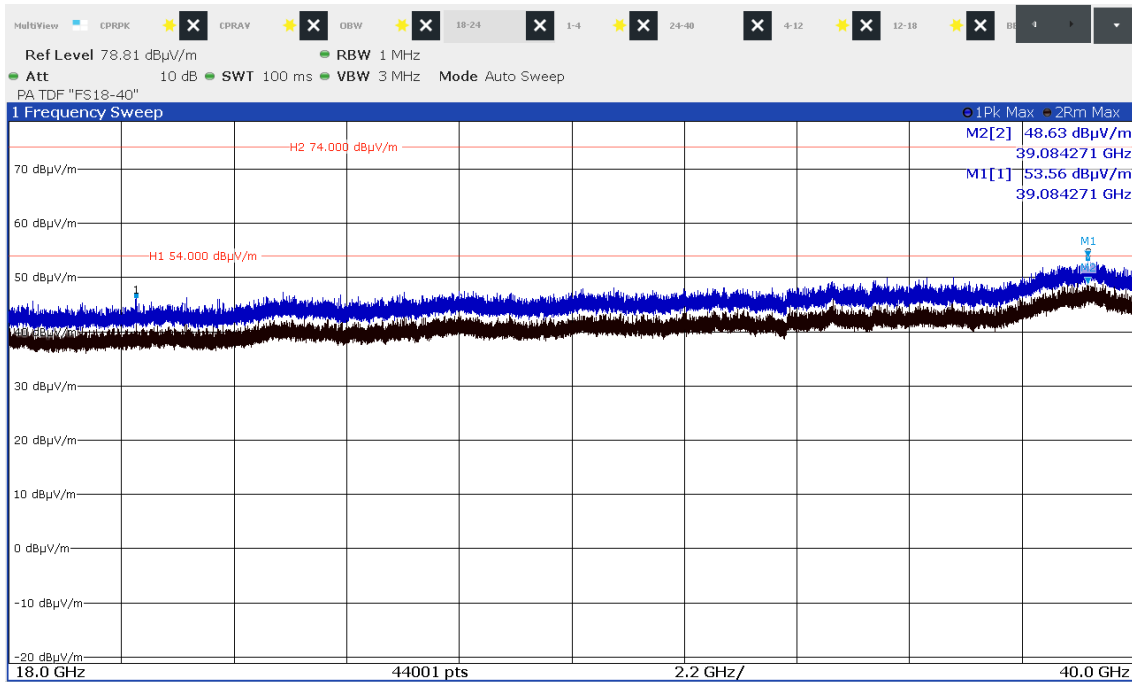
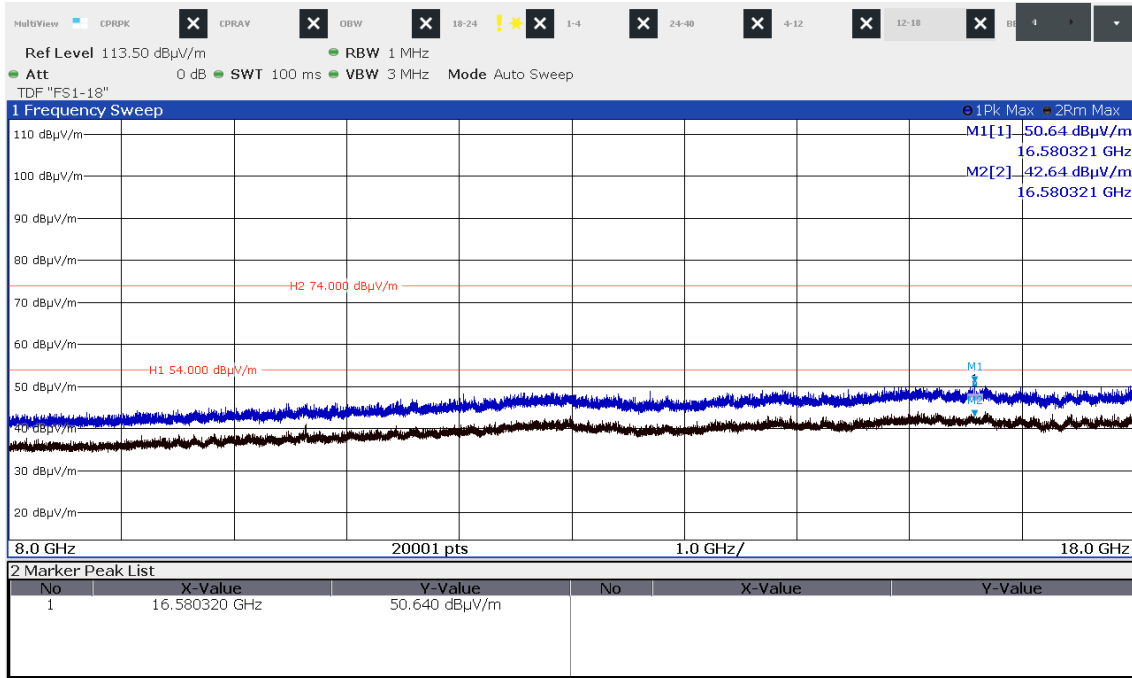


CH64n HT20

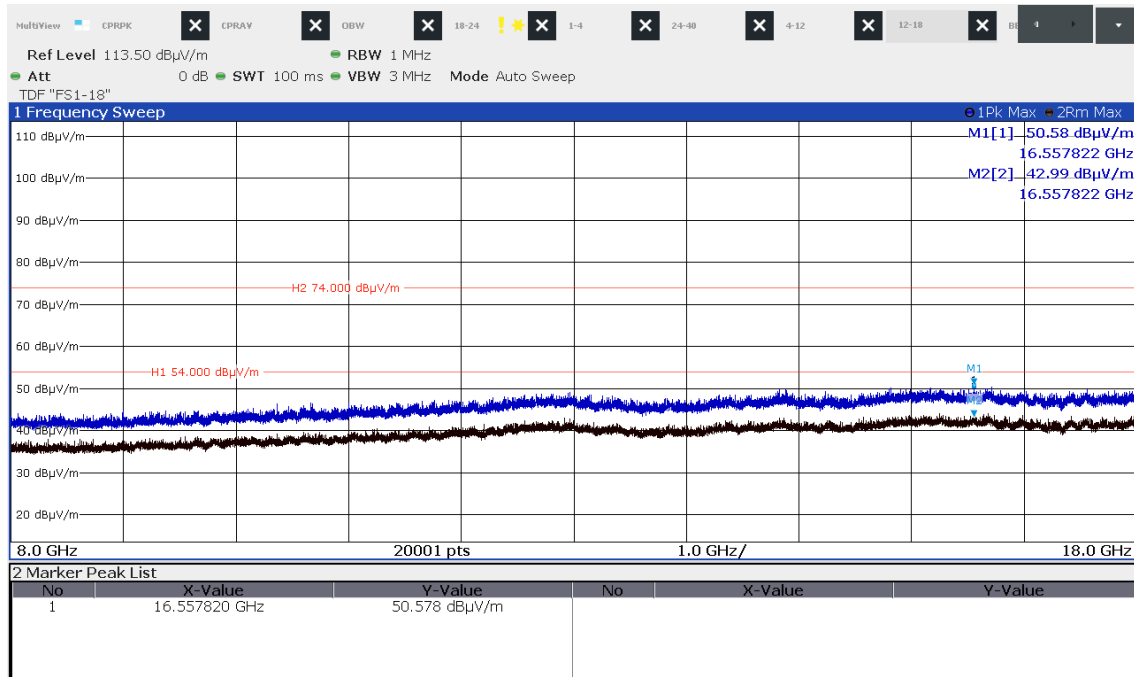
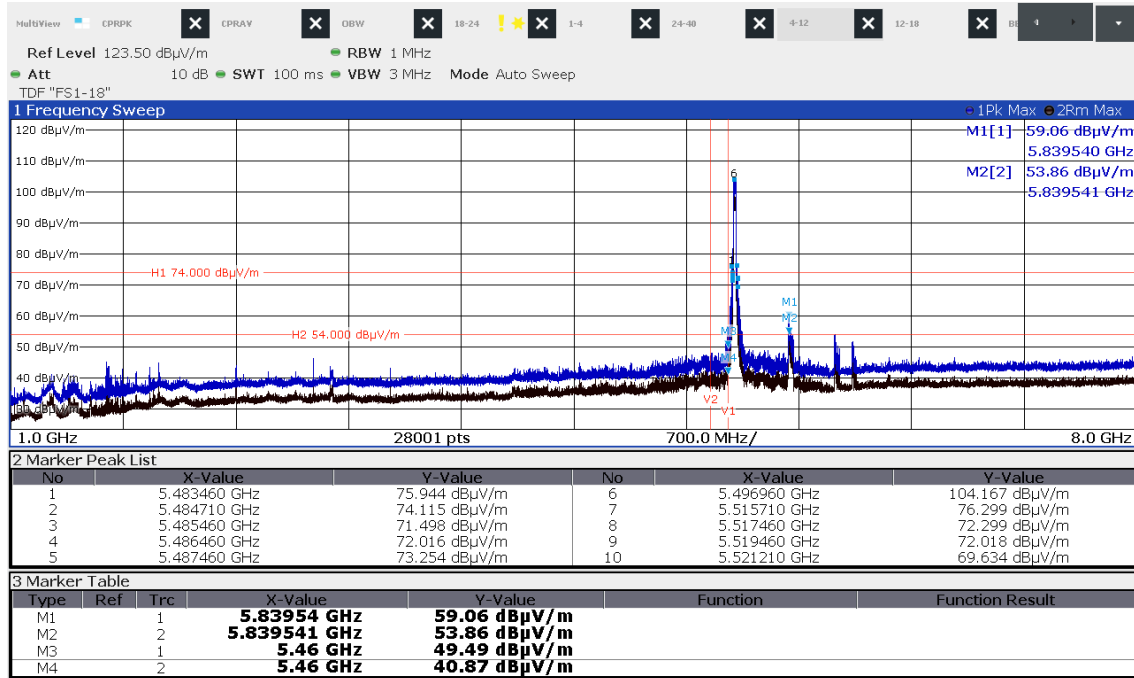


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

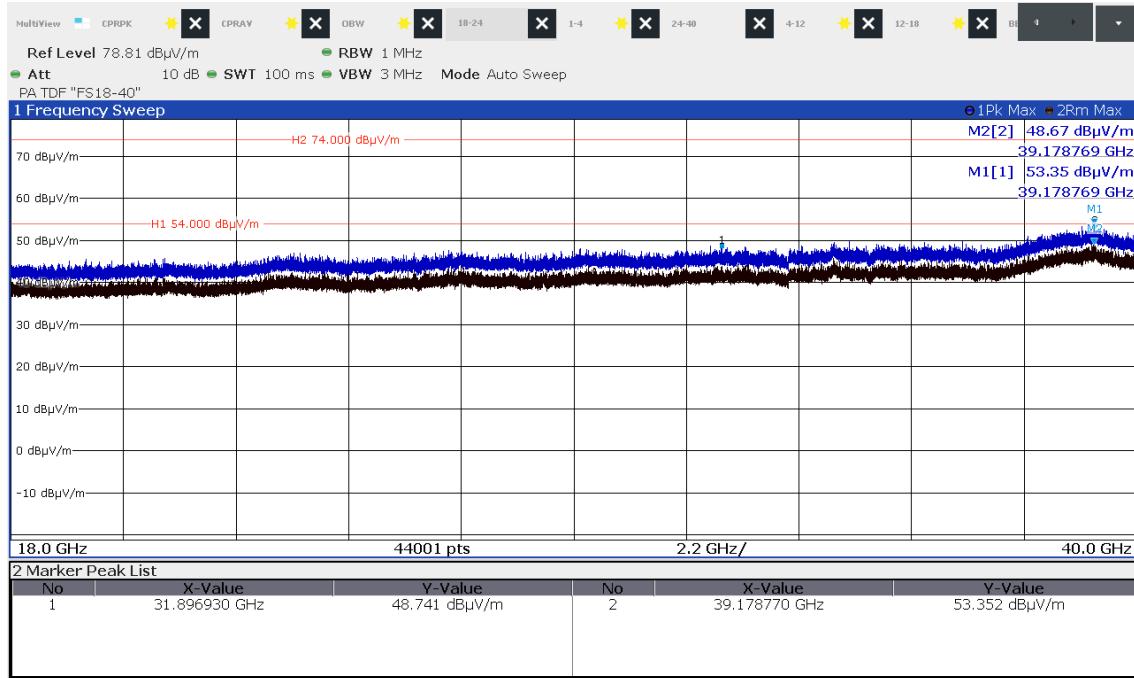




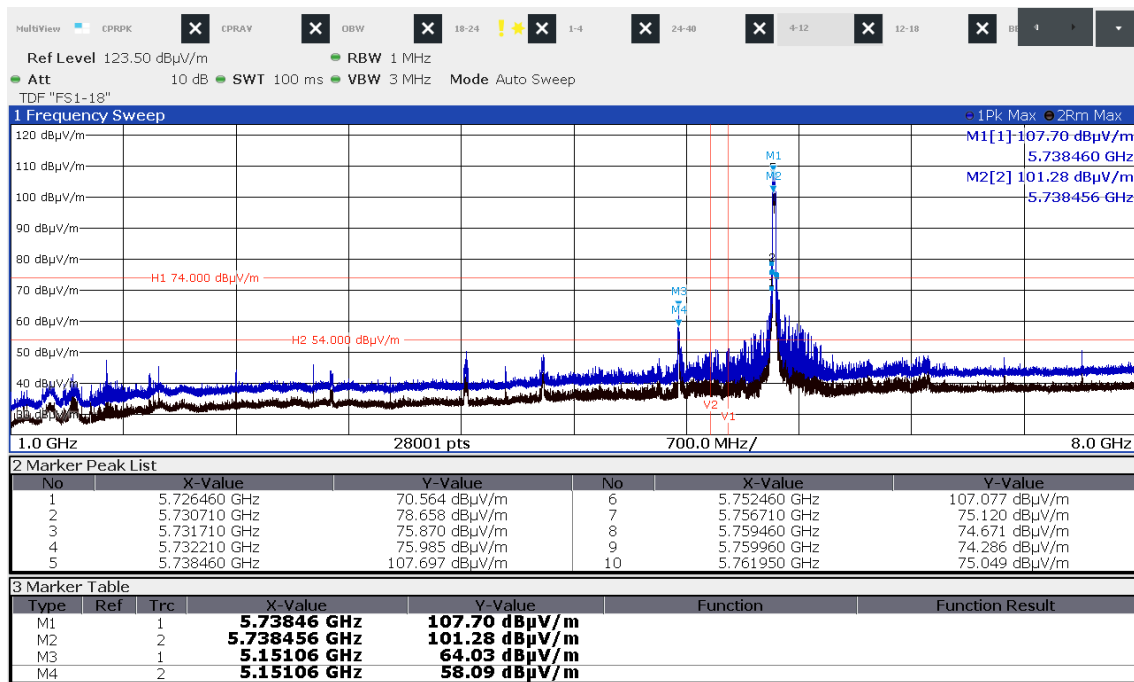
CH100n HT20



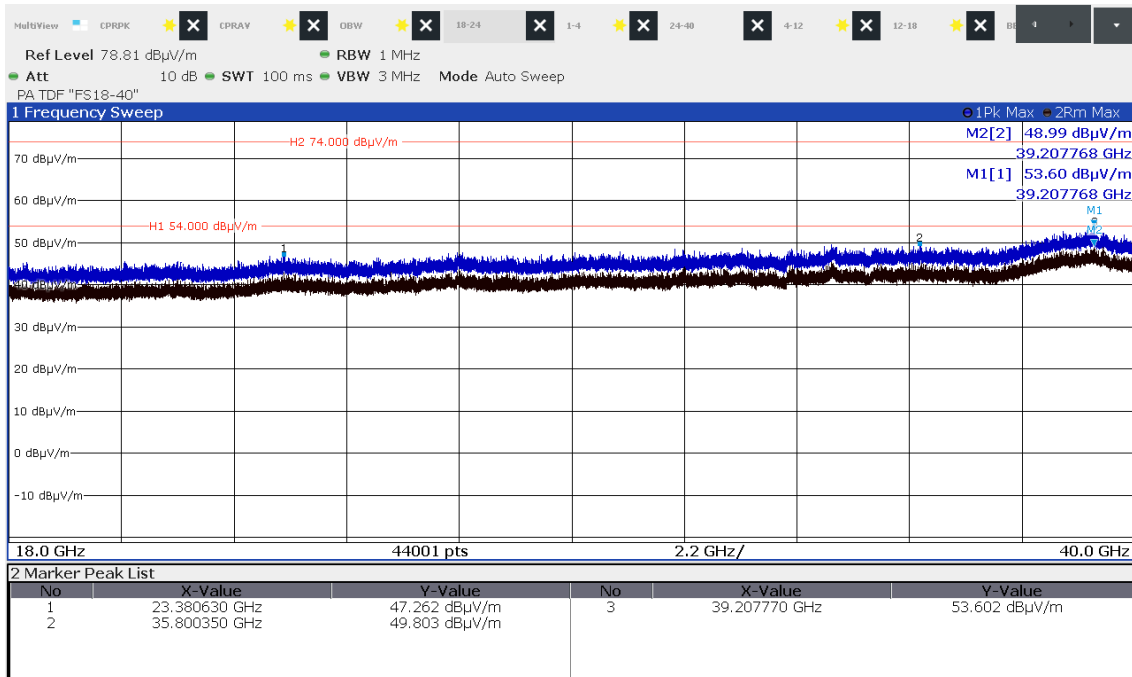
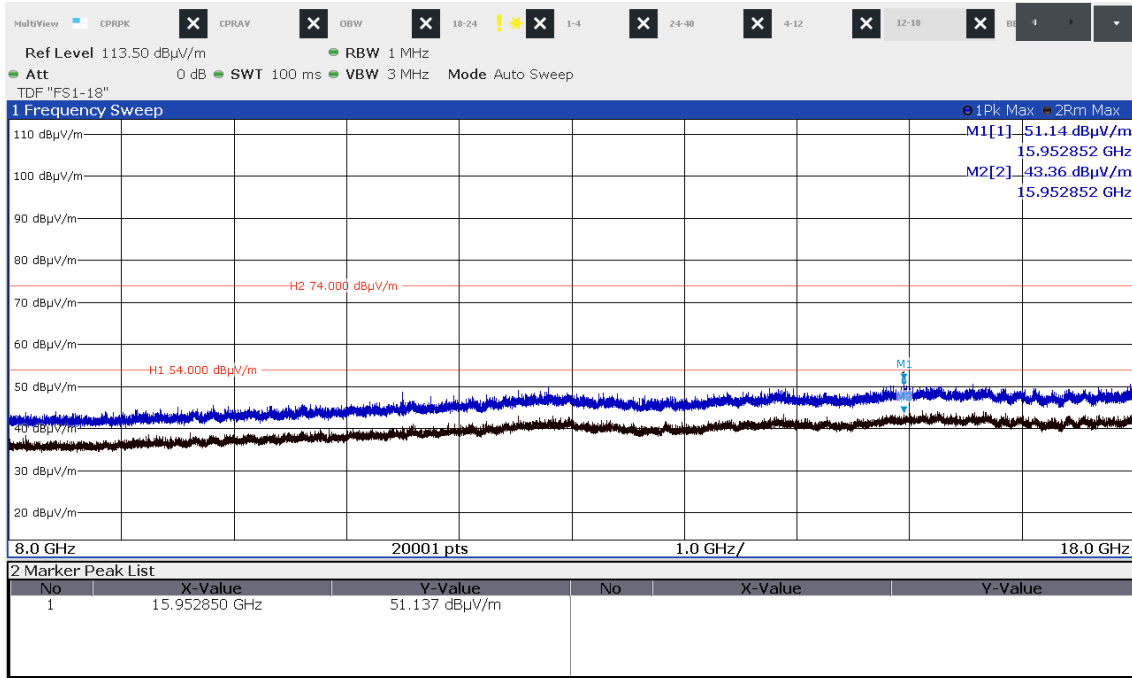
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



CH149n HT20

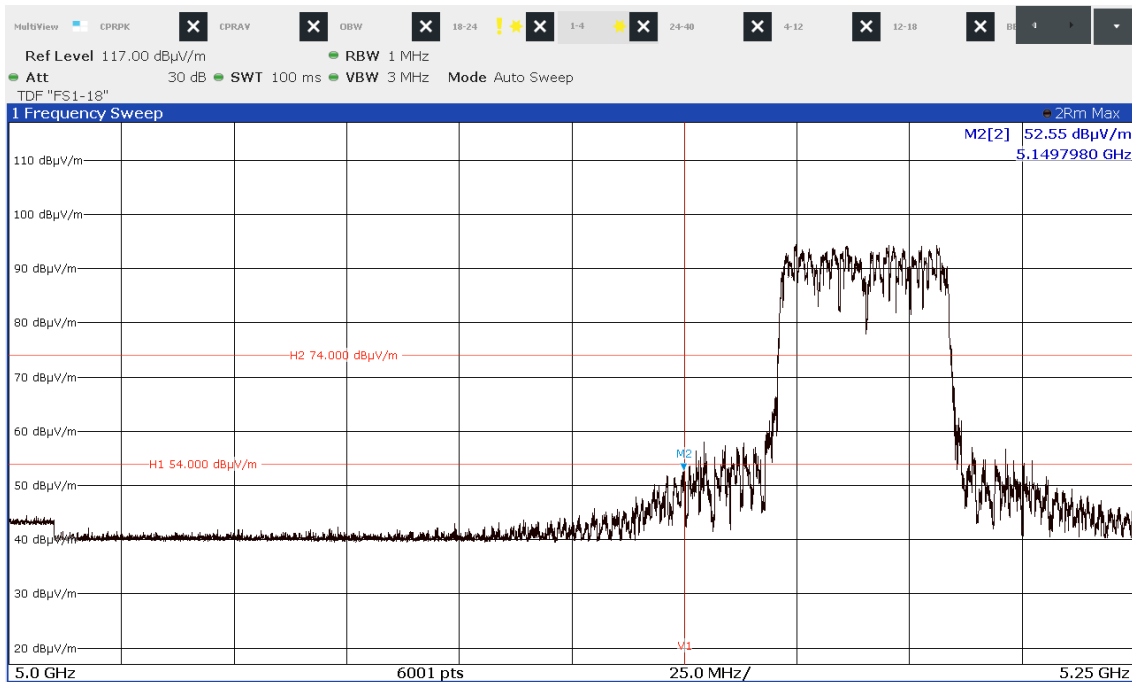
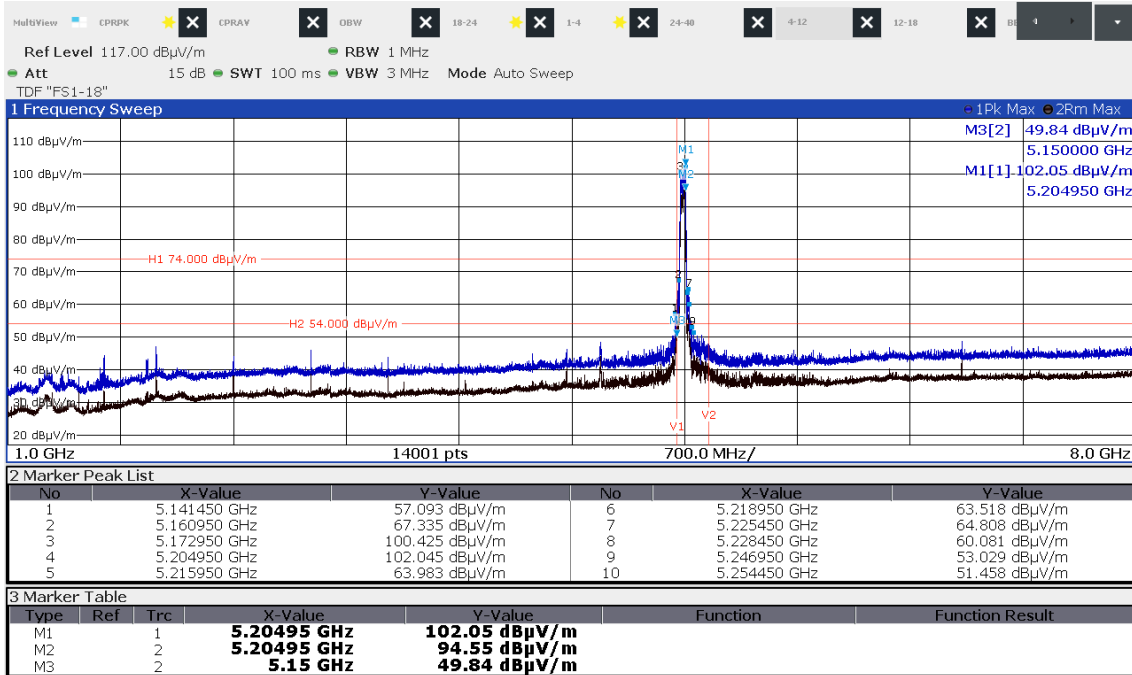


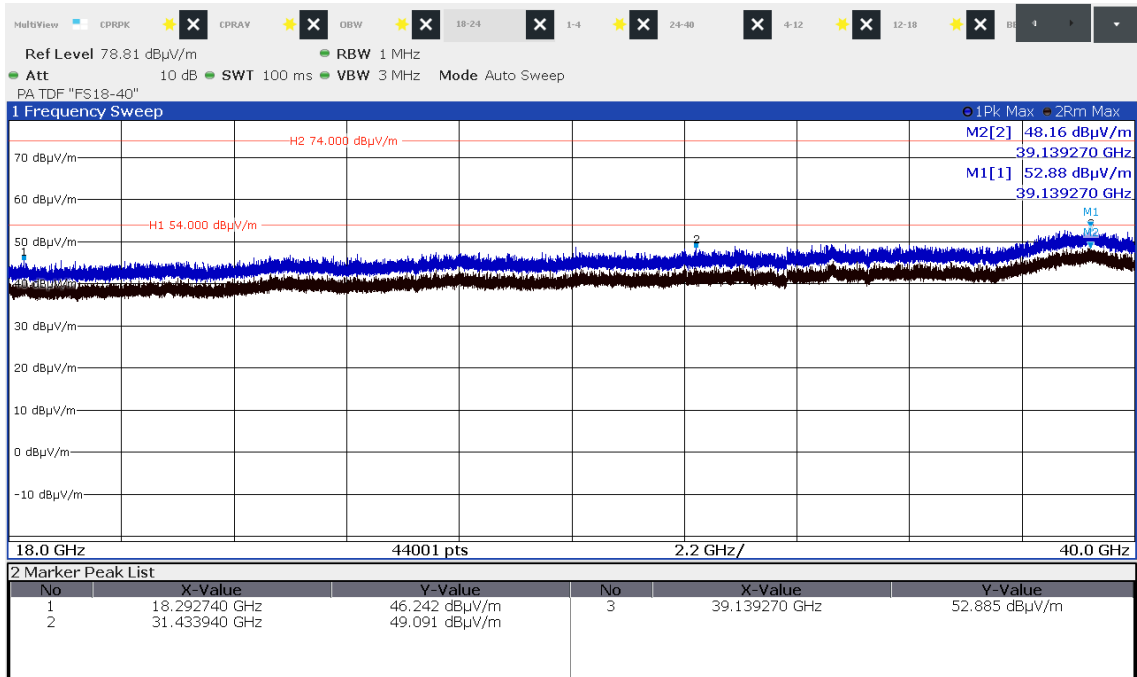
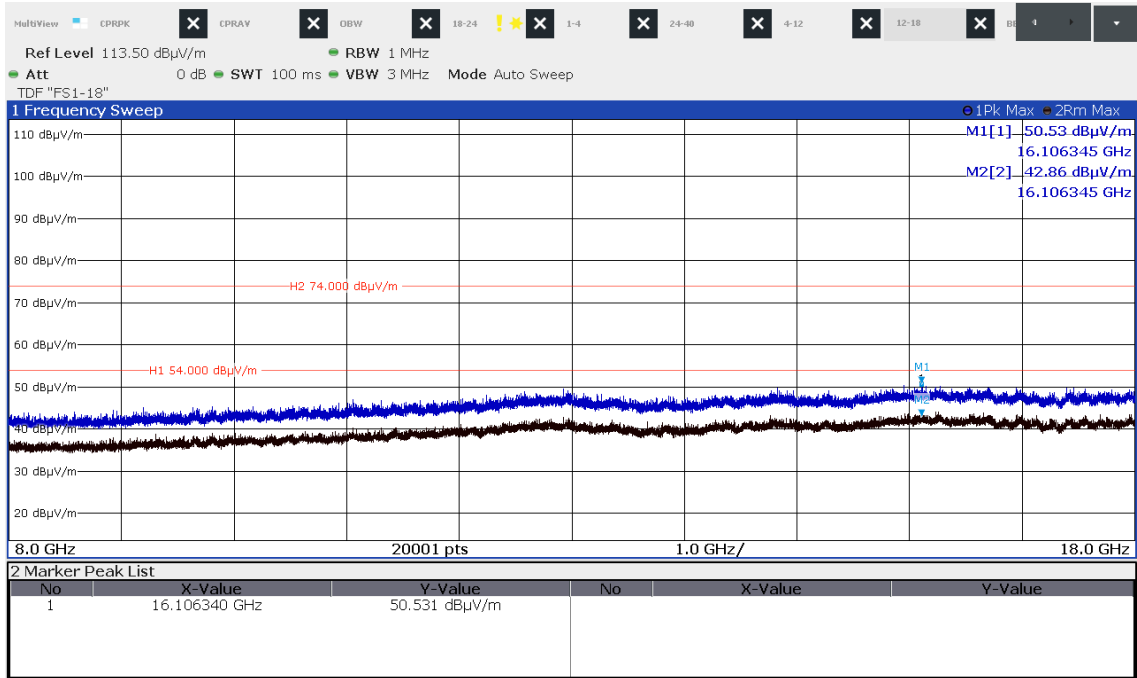
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



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.

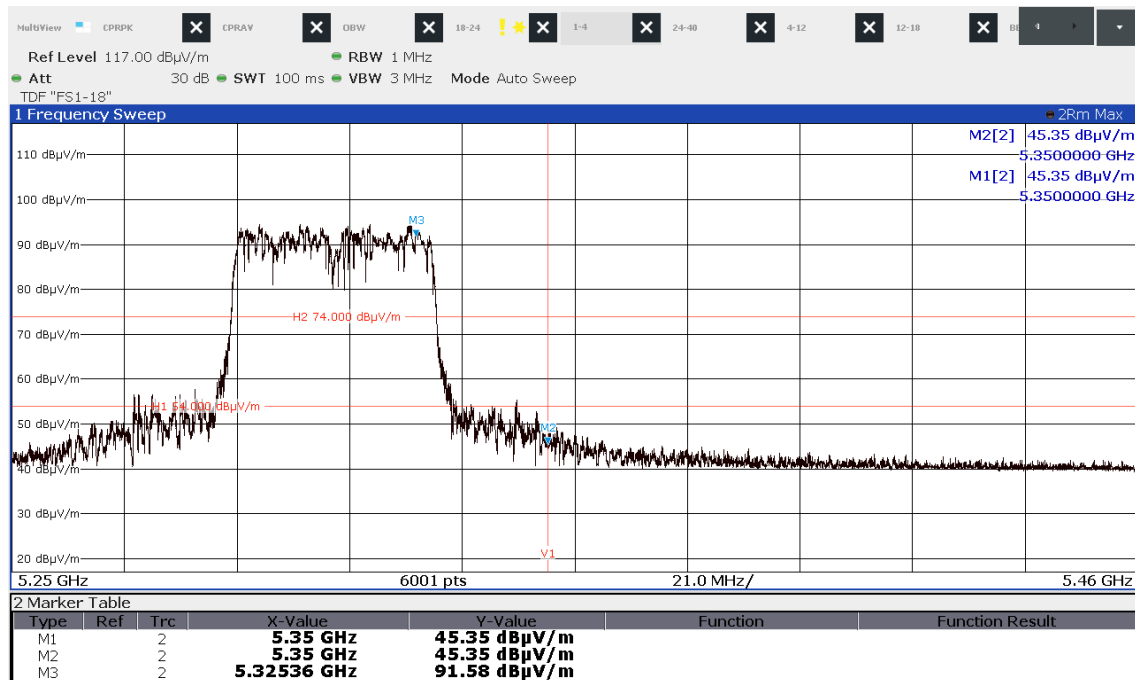
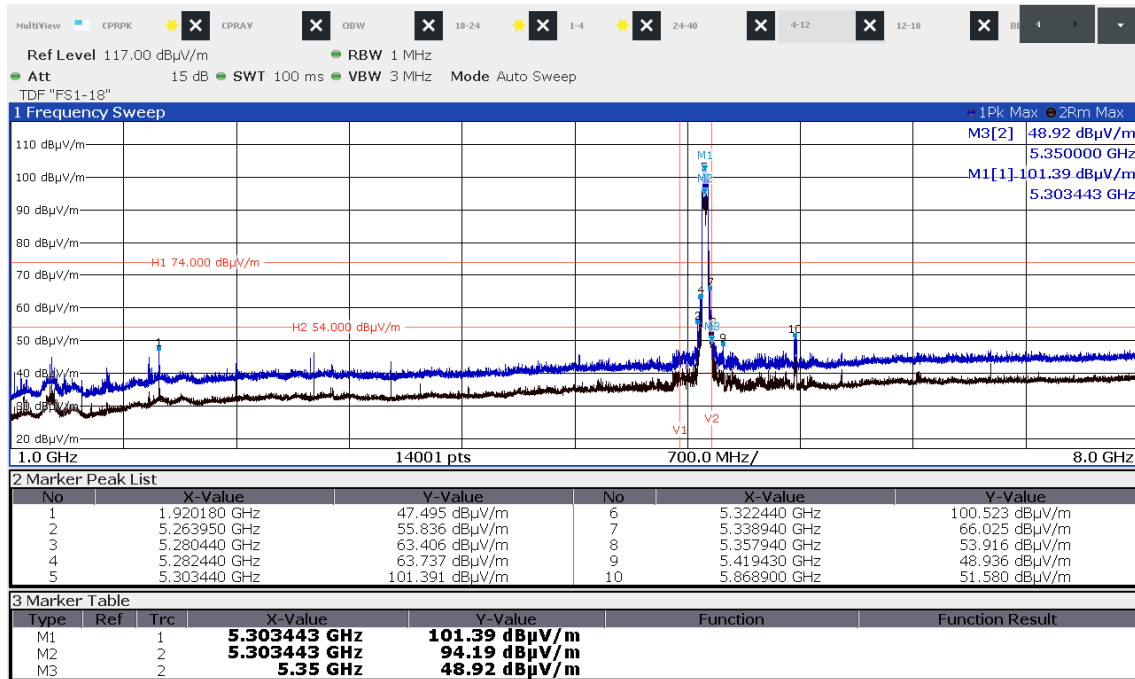
5.4.1.5 WLAN 5 GHz, n HT40, setup by test software  
CH36up, P9



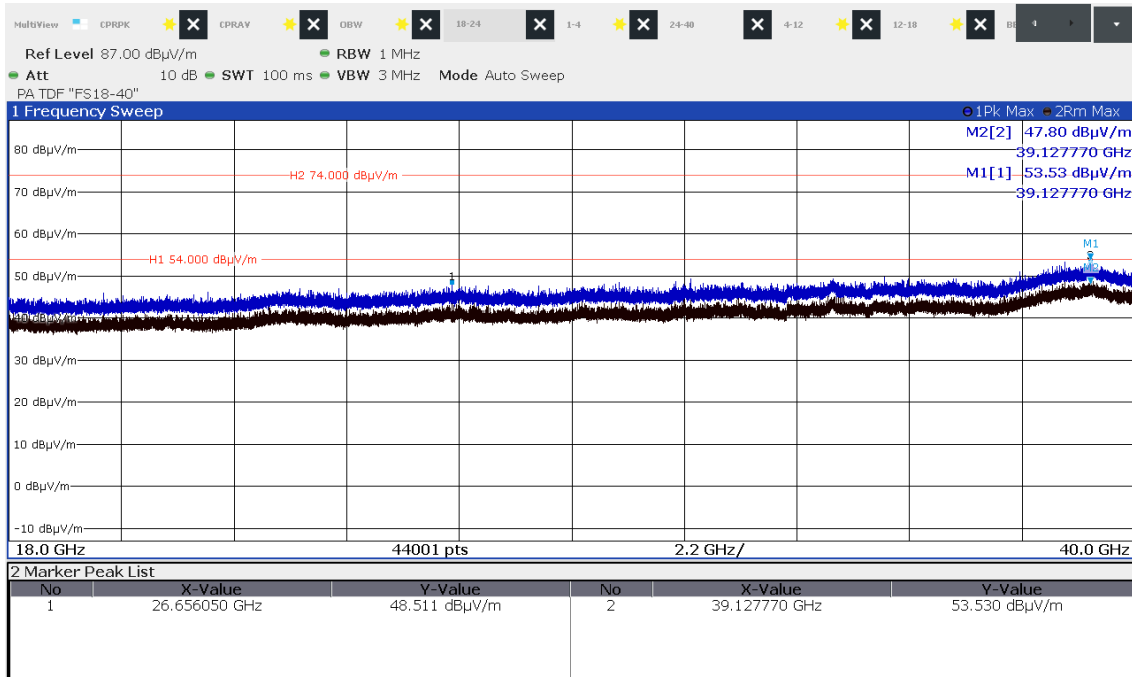
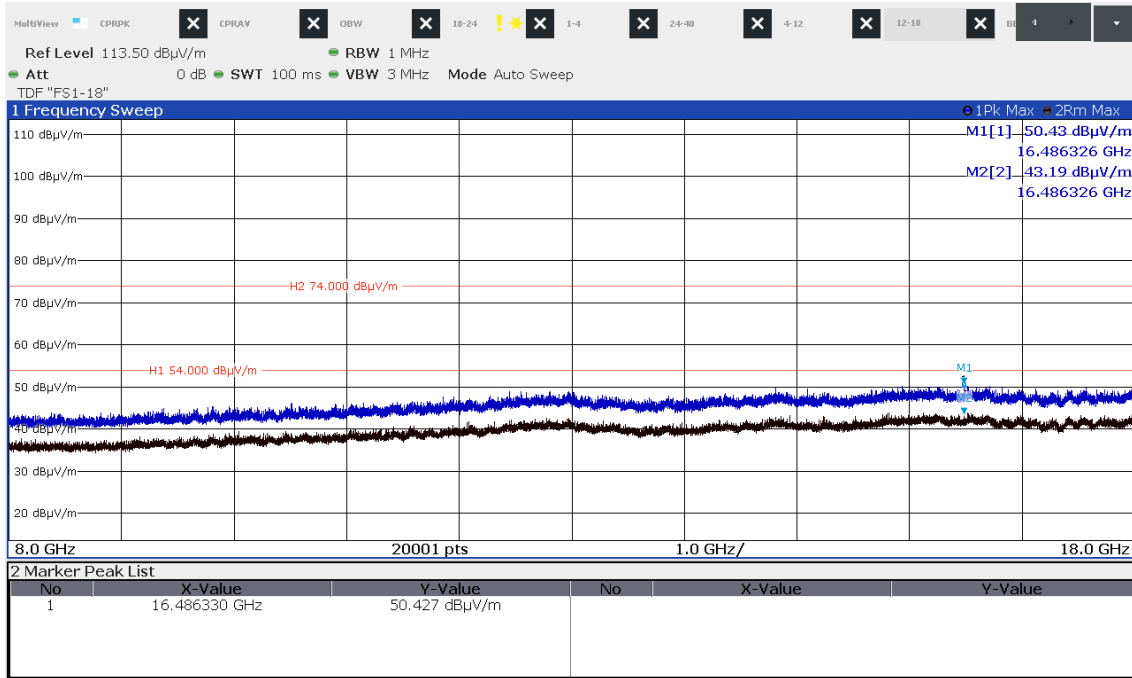


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

CH60up, P9



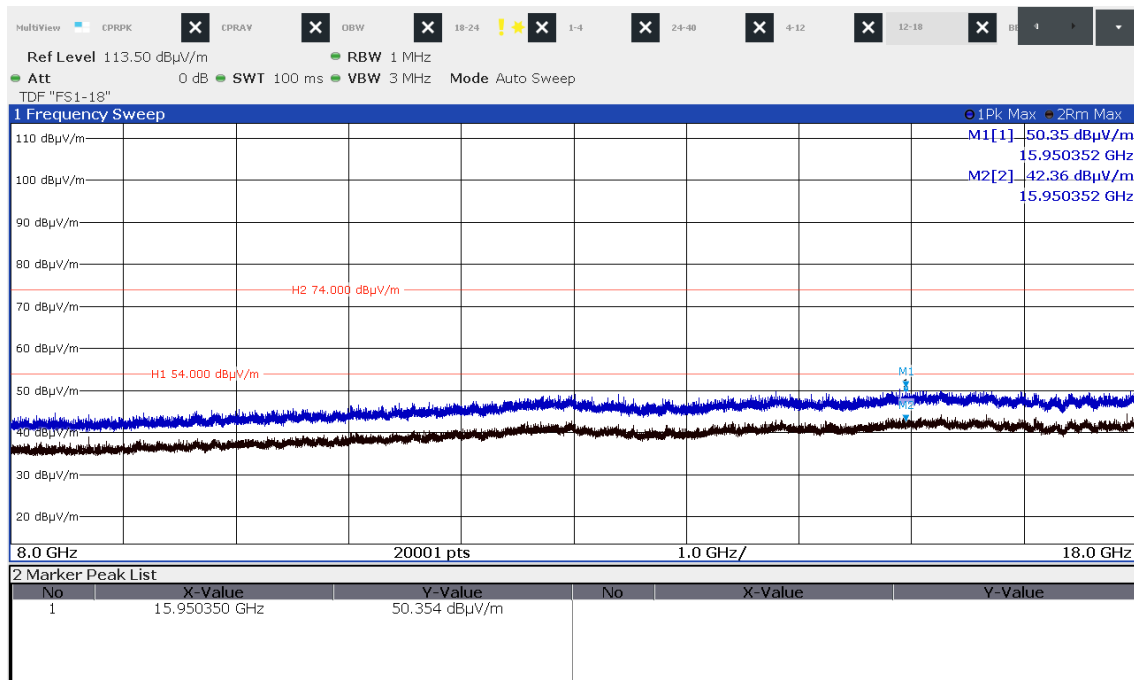
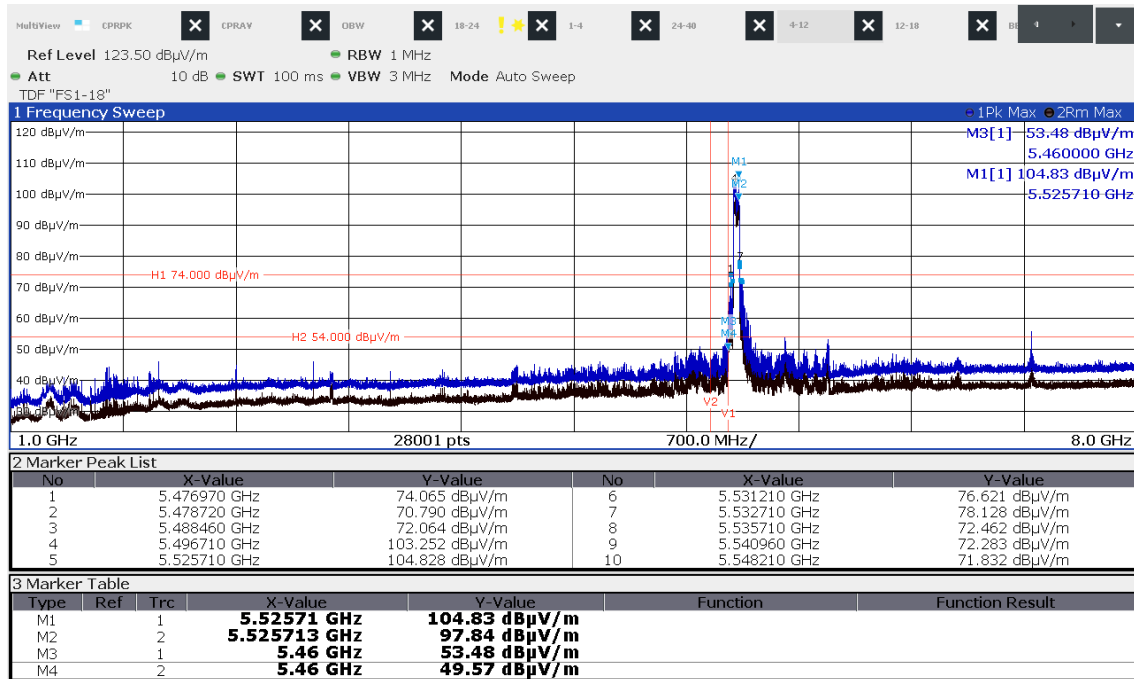
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



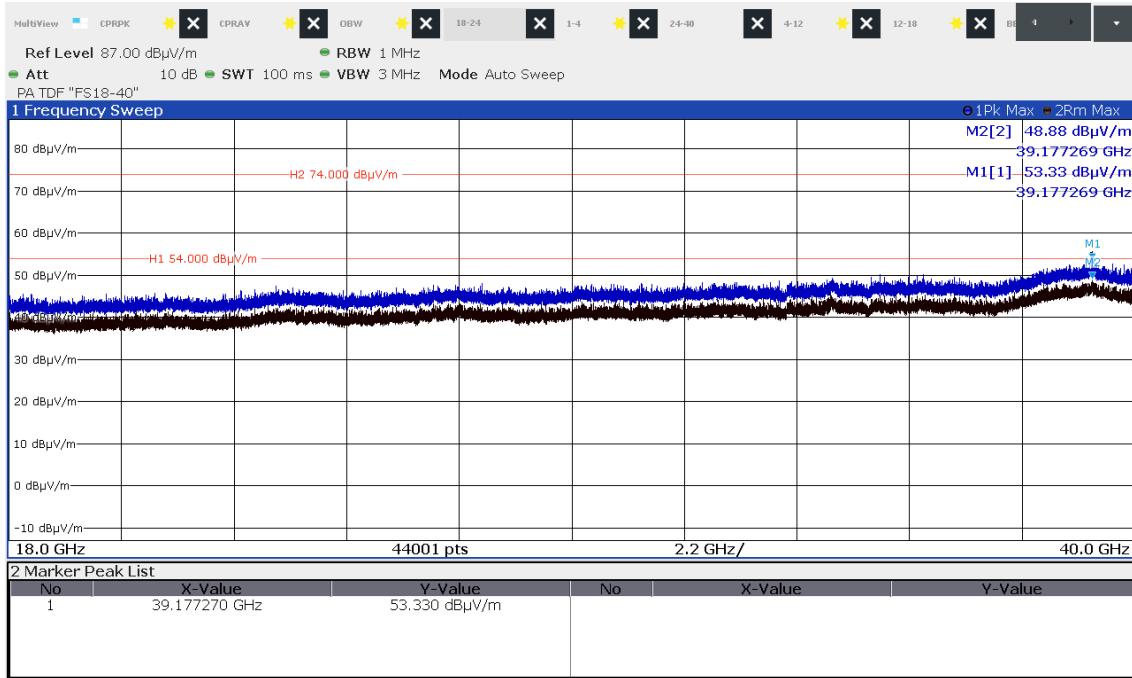
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



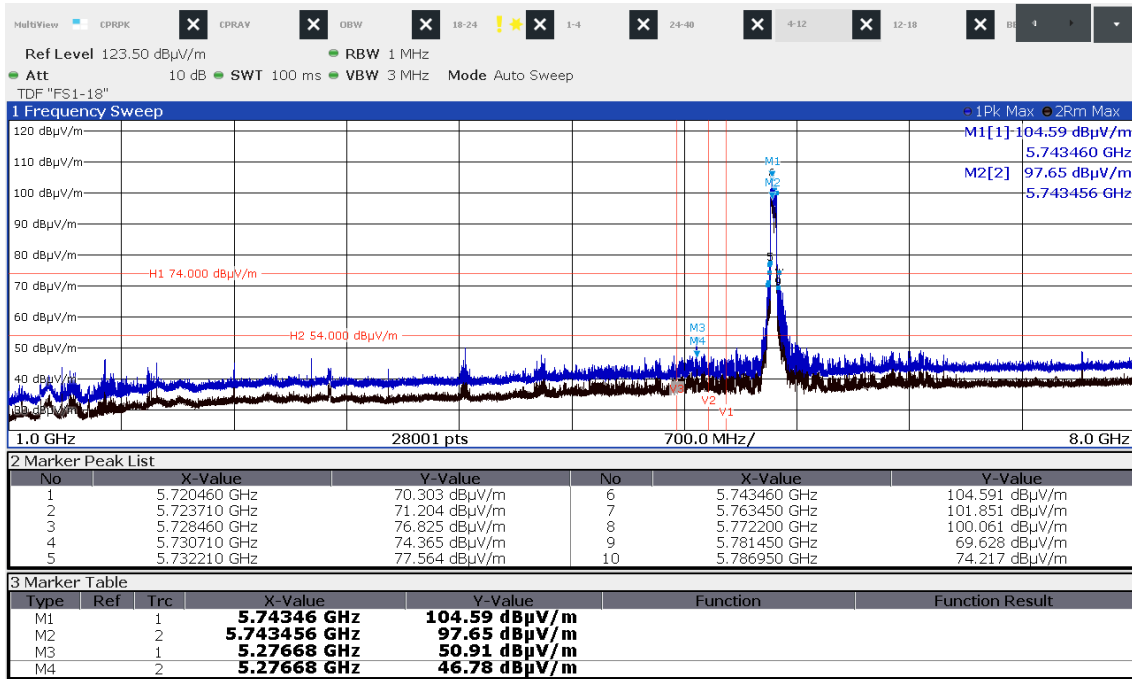
CH100up



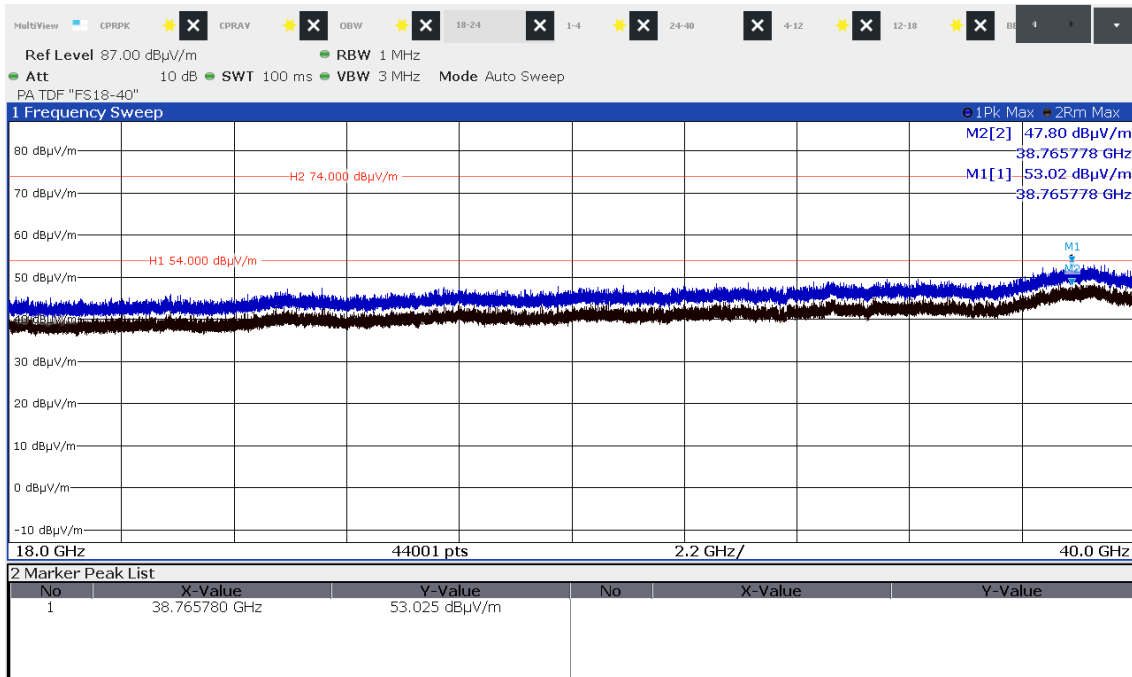
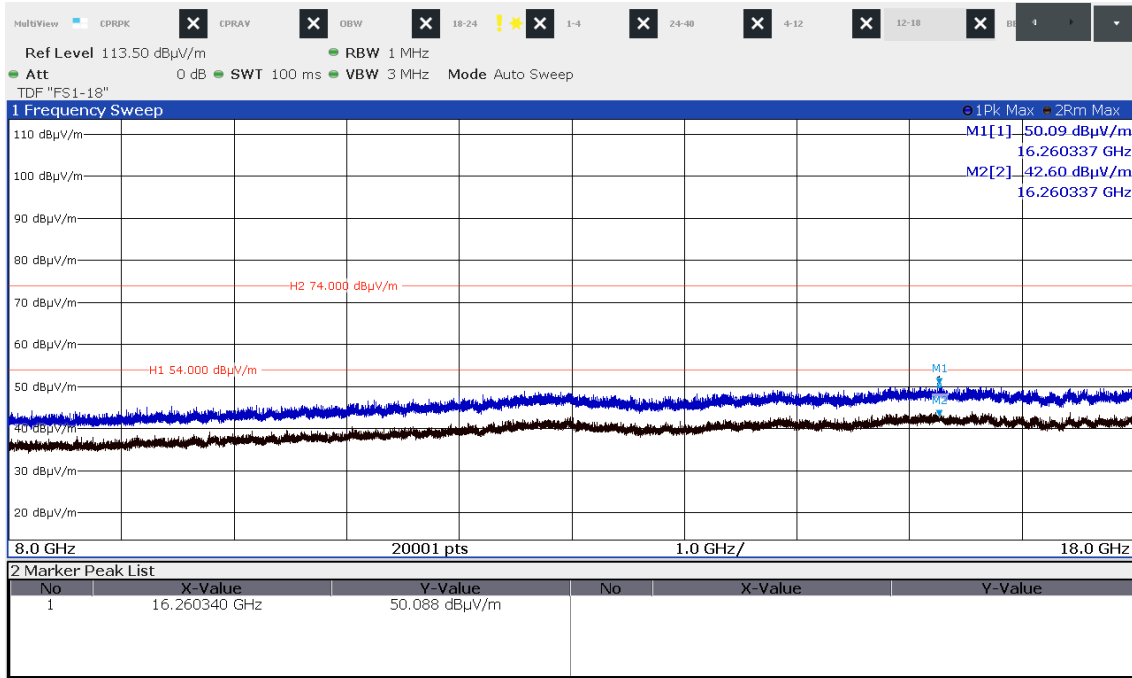
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



CH149up

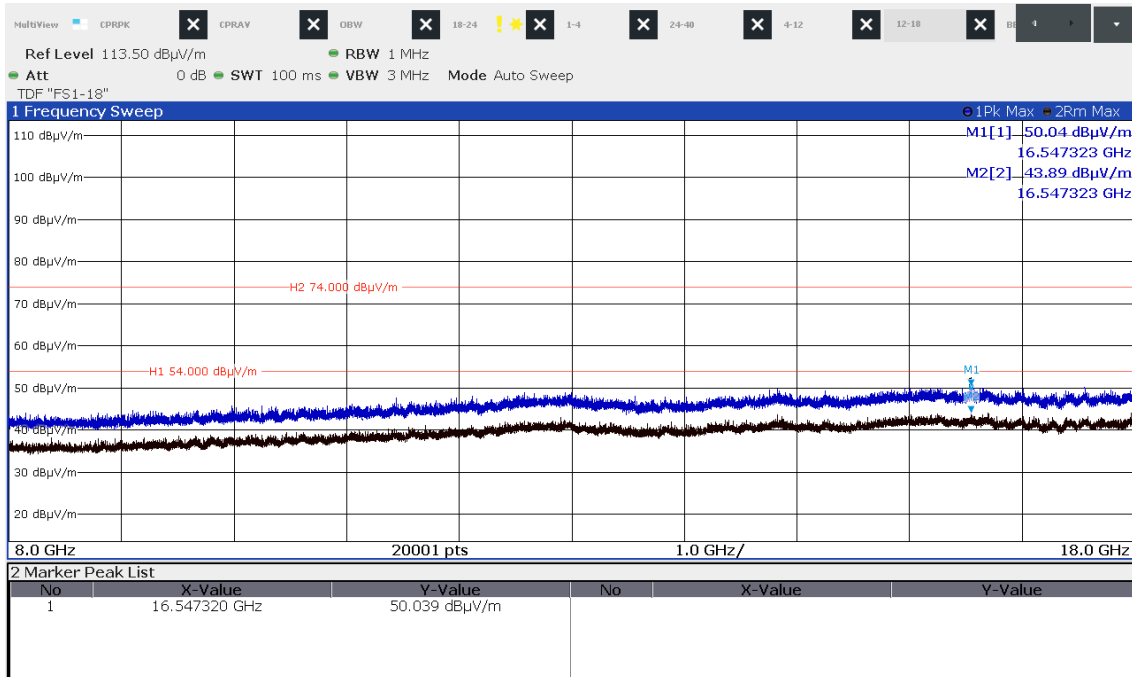
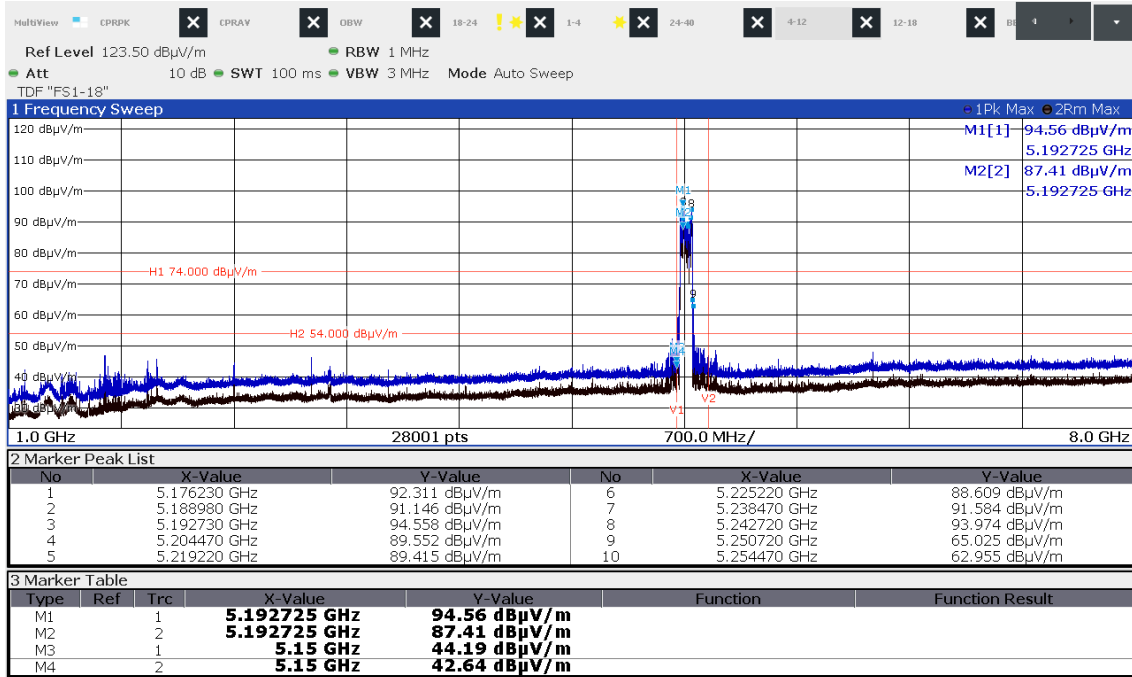


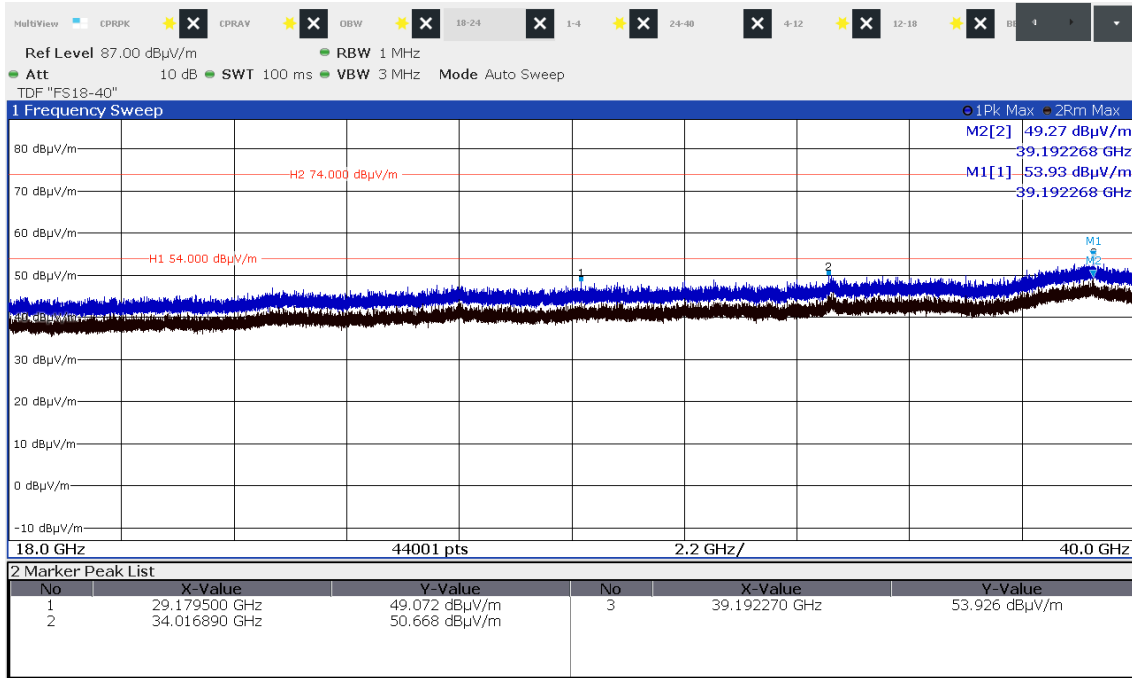
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.



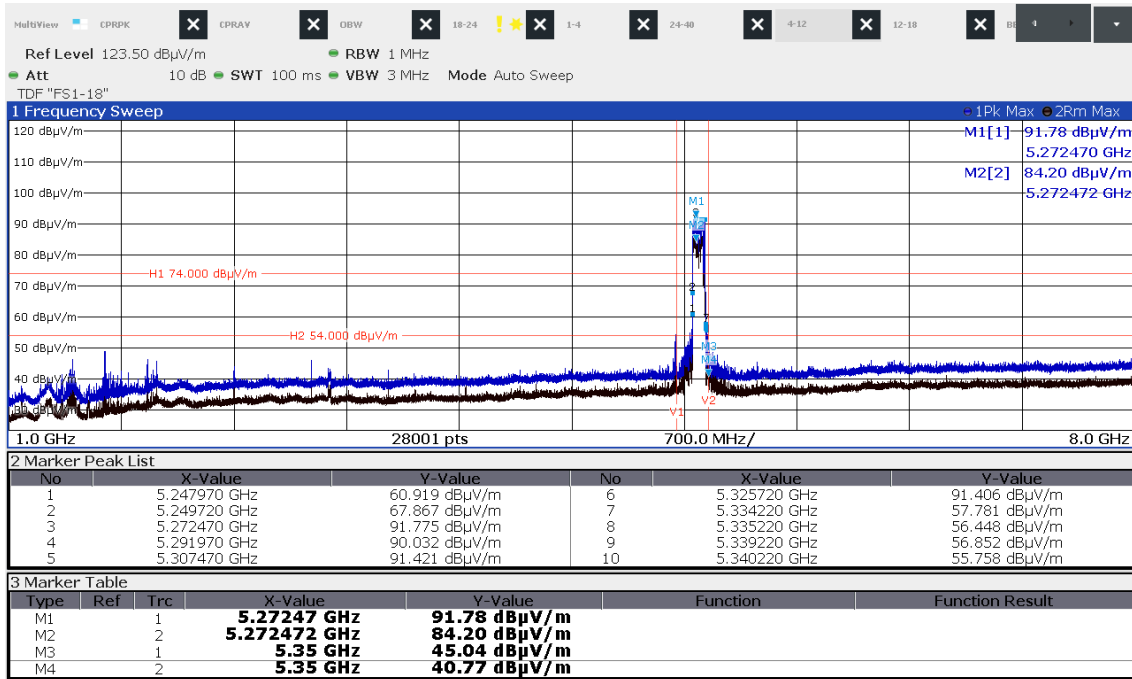
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5.4.1.6 WLAN 5 GHz, ac VT80, setup by test software  
CH36

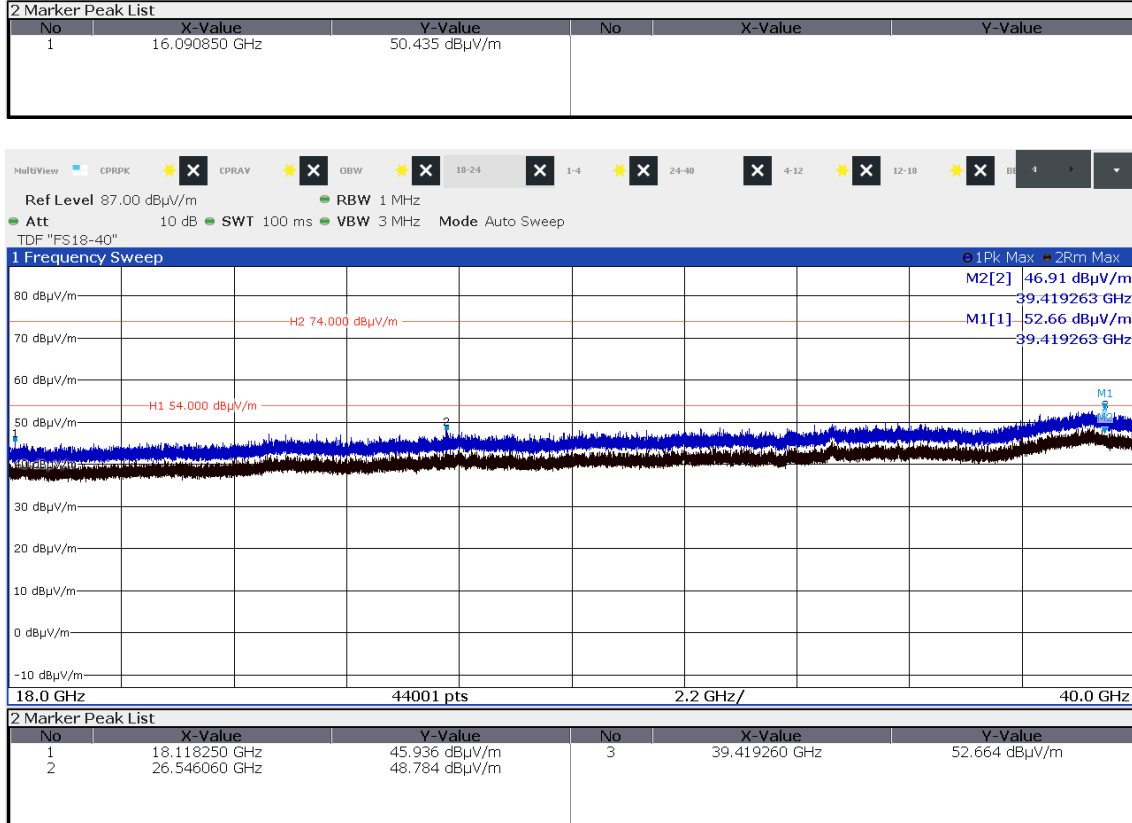
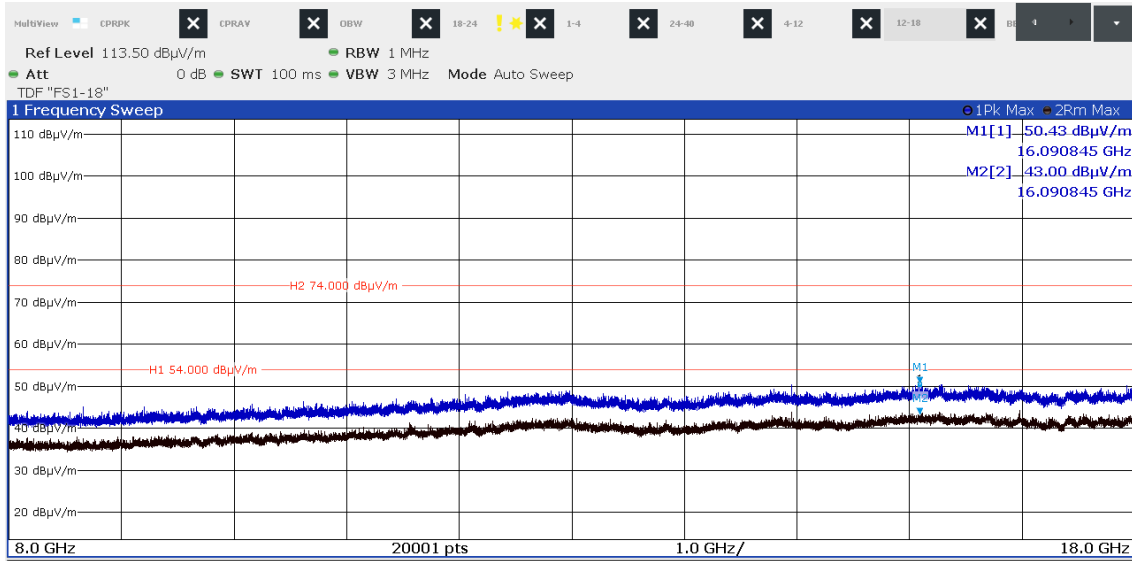




CH52

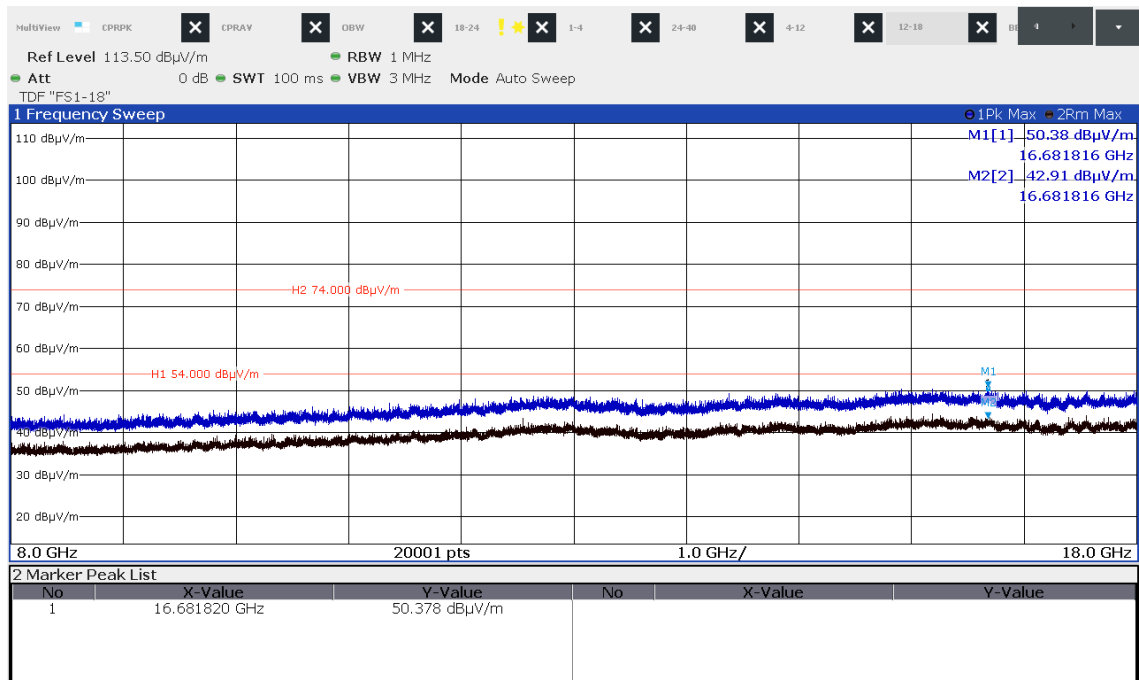
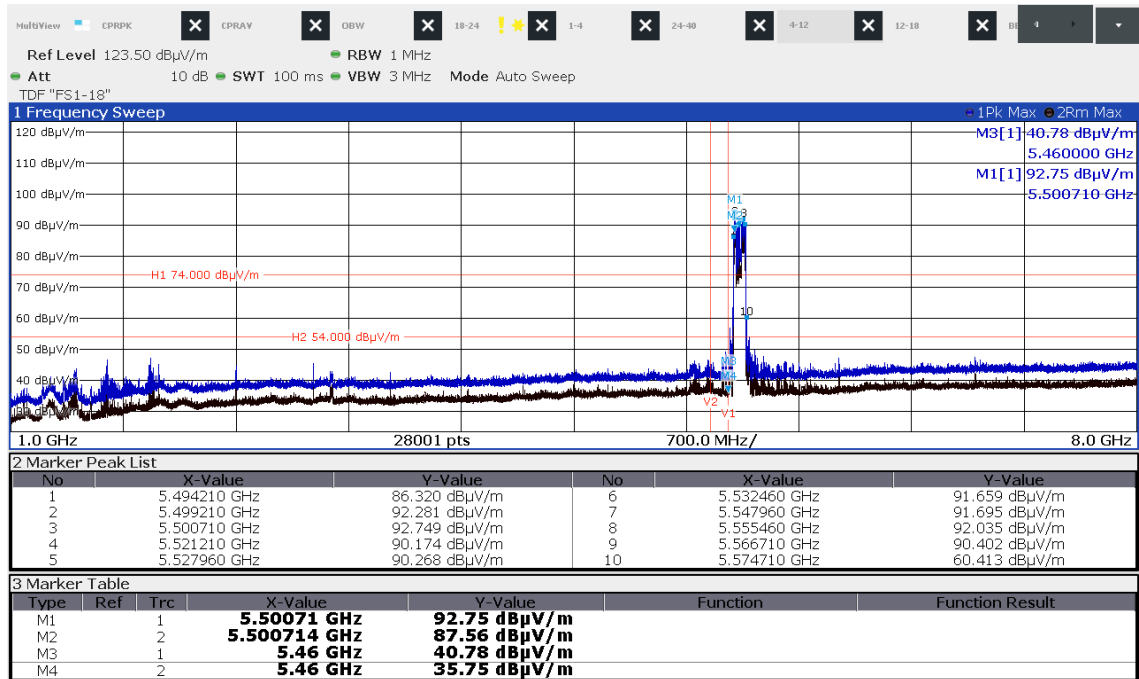


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

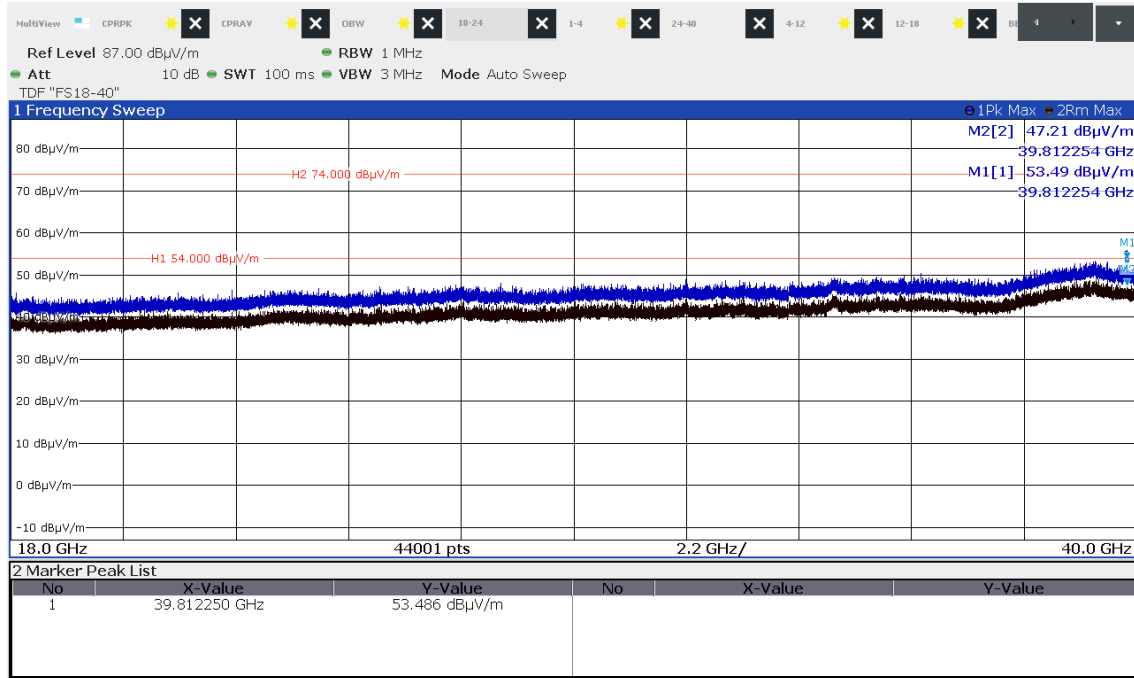


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

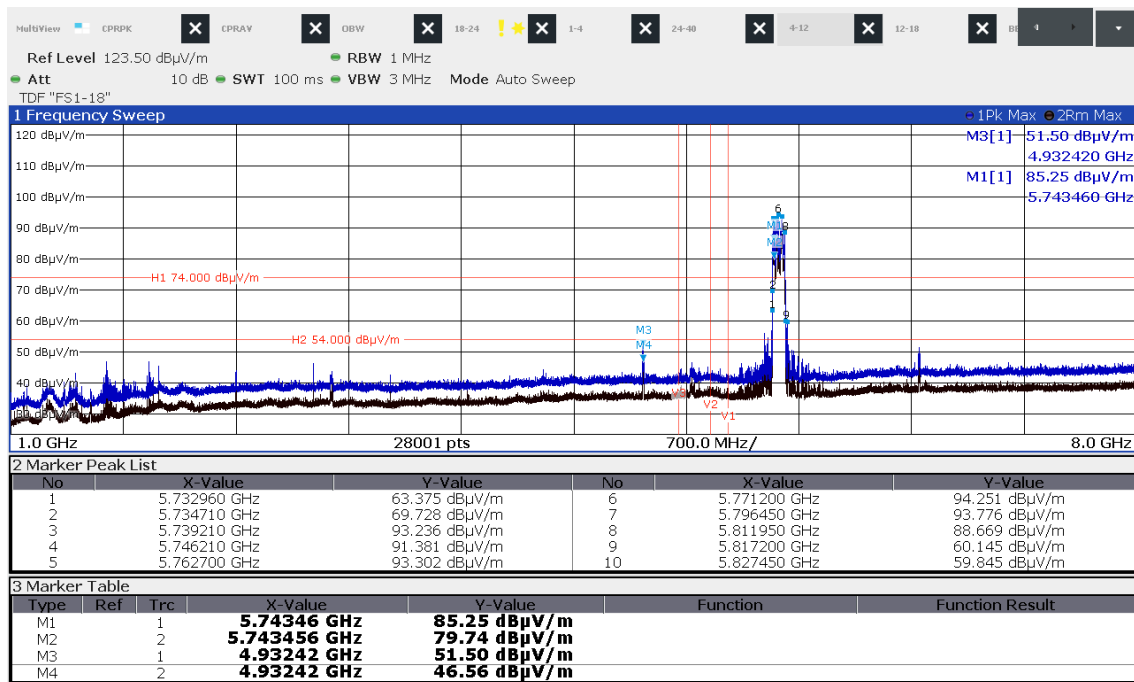
CH100



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.

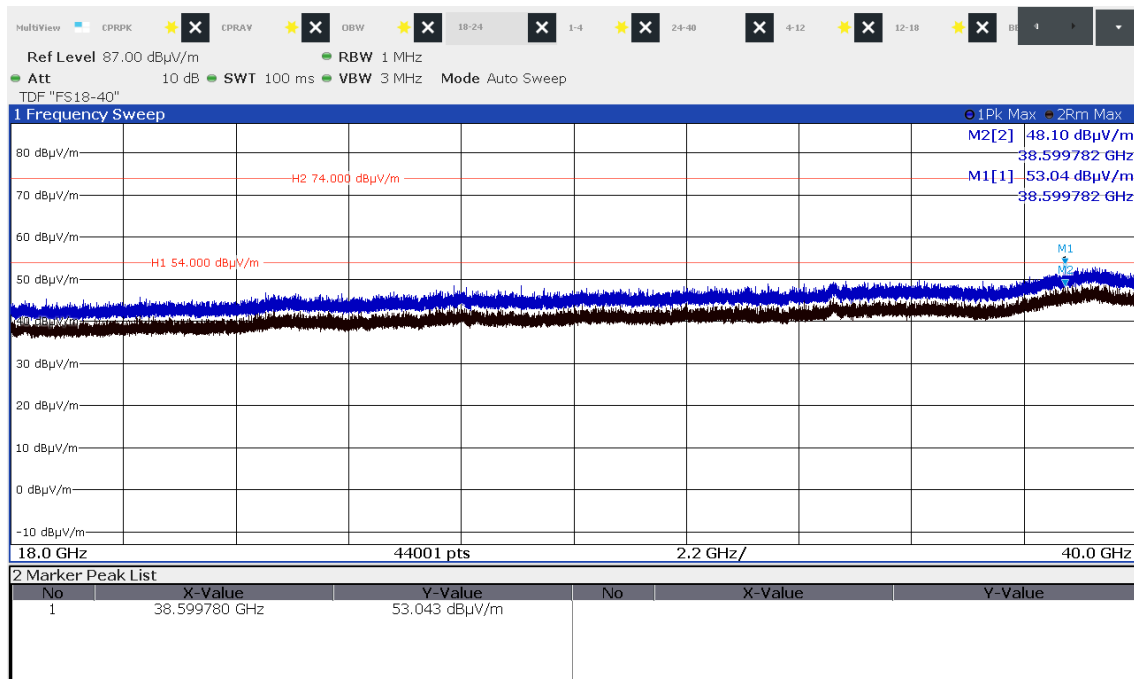
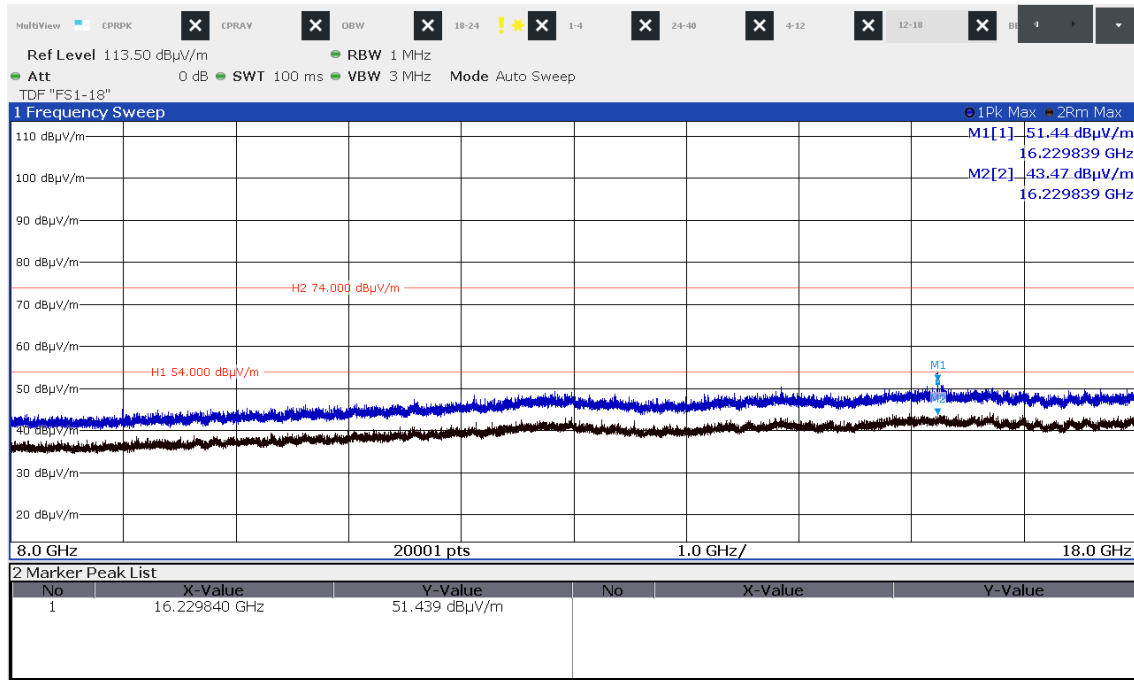


CH149



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.





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)
	(µV/m)	dB(µV/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

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 10<sup>th</sup> harmonic.

---

## 5.5 Antenna application

### 5.5.1 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.

The EUT has integrated PCB antennas and a coil. No other antennas can be used with the device.

All supplied antennas meet the requirements of part 15.203 and 15.204.

### 5.5.2 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:**

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

The EUT use antennas smaller than 6 dBi. No defacto limit results.

**Remarks:**

---

---

## 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.
A 4	BAT-EMC 3.19.1.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	24/06/2021	24/06/2020		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2021	31/10/2019	04/11/2020	04/05/2020
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	12/11/2020	12/05/2020
	SP 103 /3.5-60	02-02/50-05-182				
CPR 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	18/06/2021	18/06/2020		
	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				
	BAT-EMC 3.19.1.24	02-02/68-13-001				
SER 1	ESR 7	02-02/03-13-001	09/03/2021	09/03/2020		
	HFH 2 - Z 2	02-02/24-15-001	01/04/2021	01/04/2020		
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESVS 30	02-02/03-05-006	15/07/2021	15/07/2020		
	VULB 9168	02-02/24-05-005	19/09/2020	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	18/06/2021	18/06/2020		
	BBHA 9170	02-02/24-05-013	19/05/2023	19/05/2020	14/01/2021	14/01/2020
	KMS102-1 m	02-02/50-11-014				
	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				

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.