



RF - TEST REPORT

- FCC Part 15.247, RSS-247 -

Type / Model Name : WCM9116

Product Description : Wi-Fi module

Applicant : Draeger Medical Systems, Inc.

Address : 6 Tech Drive

ANDOVER, MA 01810, USA

Manufacturer : Silicon Laboratories Finland Oy

Address : Alberga Business Park, Bertel Jungin aukio 3

ESPOO, 02600, FINLAND

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

POSITIVE

Test Report No. : 80175389-08 Rev_0

12. December 2024

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00

Contents

1	<u>TEST STANDARDS</u>	<u>3</u>
2	<u>EQUIPMENT UNDER TEST</u>	<u>4</u>
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
2.4	General remarks	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	5
2.10	Antenna	5
2.11	Power supply system utilised	5
2.12	Peripheral devices and interface cables	5
2.13	Determination of worst-case conditions for final measurement	6
3	<u>TEST RESULT SUMMARY</u>	<u>7</u>
3.1	Revision history of test report	7
3.2	Final assessment	7
4	<u>TEST ENVIRONMENT</u>	<u>8</u>
4.1	Address of the test laboratory	8
4.2	Environmental conditions	8
4.3	Statement of the measurement uncertainty	8
4.4	Conformity Decision Rule	9
4.5	Measurement protocol for FCC and ISCED	9
5	<u>TEST CONDITIONS AND RESULTS</u>	<u>12</u>
5.1	Maximum peak output power	12
5.2	Spurious emissions radiated	16
5.3	Antenna application	27
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	<u>28</u>

ATTACHMENTS A, B as separate supplement

1 TEST STANDARDS

The tests were performed **partly** according to following standards:

FCC Rules and Regulations (December 2024)

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
KDB 558074 D01 v05r02	Guidance for compliance measurements on DTS; FHSS and hybrid system devices operating under Section 15.247 of the FCC rules, April 2, 2019.

ISED Canada Rules and Regulations

RSS-Gen, Issue 5 + Amendment 1 + 2	General Requirements for Compliance of Radio Apparatus
RSS-247, Issue 3	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices

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

This report covers the emissions of the module "WCM9116" with FCC ID: URA-MS40251 and IC: 5895B-MS40251 in combination with the host device Infinity M540 V2.

Performed tests:

- RF output power, radiated
- Transmitter unwanted emissions, radiated

2.5 Equipment type

WLAN - Client

2.6 Short description of the equipment under test (EUT)

The EUT is a WLAN/BT module integrated in a vital signs patient monitor with local alarm functionality 'Infinity M540 V2'. It supports both wired and wireless data transmission. When used on transport the wireless mode is enabled, using an embedded WLAN client. WLAN disabled when in docking station.

The EUT is compatible with 802.11b, g, a, n HT20 Standard. It supports the 2.4 GHz and 5 GHz frequency band. In the host device the Bluetooth and WLAN nHT40 is deactivated by firmware.

Number of tested samples:	1
Serial number:	DSRA-0678 (Wi-Fi module), 5615561776 (patient monitor)
Firmware version:	2.7
HVIN:	MS40251
FCC ID:	URA-MS40251
IC ID:	5895B-MS40251

2.7 Variants of the EUT

There are no variants.

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 HT20:

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: Bluetooth and WLAN nHT40 are deactivated in the host by firmware.

2.9 Transmit operating modes

The EUT use DSSS or OFDM modulation and provides 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 - 7

2.10 Antenna

The following PCB antenna is used in the EUT:

Number	Characteristic	Plug	Name	Frequency band	Gain
1	Omni	U.FI	Antenova CU5006-2	2.4 – 2.5 GHz	3.1 dBi

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 7.2 V/DC (lithium-ion battery)

2.12 Peripheral devices and interface cables

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

- Laptop Model : DELL (Dräger 25204)
- _____ Model : _____

2.13 Determination of worst-case conditions for final measurement

Preliminary tests in all three orthogonal axes are performed to find the worst case mode from all possible combinations between available modulations and data rates. the settings of the EUT are changed to locate at which position and at what setting of the EUT the maximum of the emissions is generated. For the further measurement the EUT is set in X position. The maximum output power depends on used data rate.

The tests are carried out in the following frequency band:

2400 MHz – 2483.5 MHz

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 11	1	P14	OFDM	BPSK	1 Mbps
802.11b	1 to 11	6	P14	OFDM	BPSK	1 Mbps
802.11b	1 to 11	11	P13	OFDM	BPSK	1 Mbps
802.11n HT20	1 to 11	1	P8	OFDM	BPSK	MCS0
802.11n HT20	1 to 11	6	P18	OFDM	BPSK	MCS0
802.11n HT20	1 to 11	11	P9	OFDM	BPSK	MCS0

2.13.1 Test jig

No test jig is used.

2.13.2 Test software

Special test software provided by customer is used.

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	N/A
15.247(a)(2)	RSS-247, 5.2(a)	-6 dB EBW	NT
15.247(b)(3)	RSS-247, 5.4(d)	Maximum peak output power	passed
15.247(d)	RSS-247, 5.5	Unwanted emission, radiated	passed
15.247(d)	RSS-Gen, 8.10	Emissions in restricted bands	passed
15.247(e)	RSS-247, 5.2(b)	Power Spectral Density	NT
15.35(c)	RSS-Gen, 6.10	Pulsed operation	NT
15.203	-	Antenna requirement	passed
	RSS-Gen, 6.11	Transmitter frequency stability	NT
	RSS-Gen, 6.6	99 % Bandwidth	NT

Note: A4 not applicable, EUT is battery powered, WLAN disabled when in docking station.

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80175389-00	0	28 November 2023	Initial test report
80175389-08	0	12 December 2024	2.6 FCC ID, IC ID, HVIN added; 2.10 Antenna gain value corrected; 2.13 power setting specified; 5.1.5 Output power measurement conducted added

The test report with the highest revision number replaces the previous test reports.

3.2 Final assessment

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

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

Testing commenced on : 07 August 2023

Testing concluded on : 15 September 2023

Checked by:

Tested by:

Jürgen Pessinger
Radio Team

Christopher Thaller
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 on basis of the ETSI Technical Report TR 100 028 Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1 and Part 2. The results are documented in the quality system acc. to DIN EN ISO/IEC 17025. 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 3000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule ($w = 0$).

Details can be found in the procedure CSA_B_V50_29.

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".

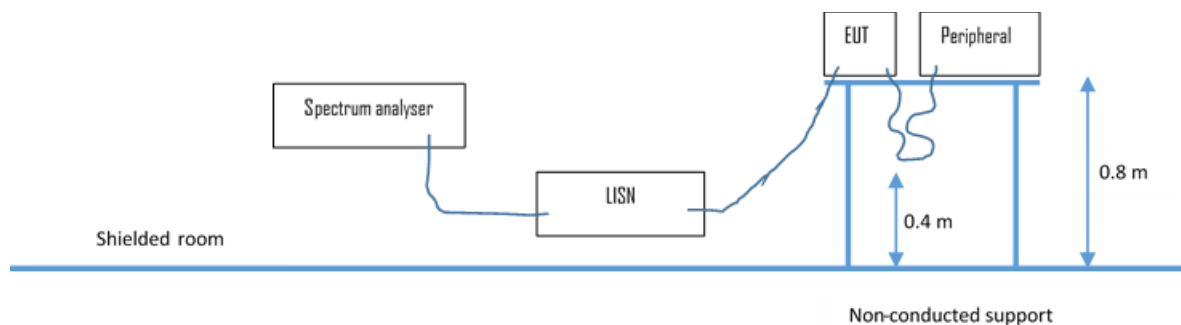
4.5.2.1 Justification

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 $\text{dB}\mu\text{V}$, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between $\text{dB}\mu\text{V}$ and μV , the following conversions apply:

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

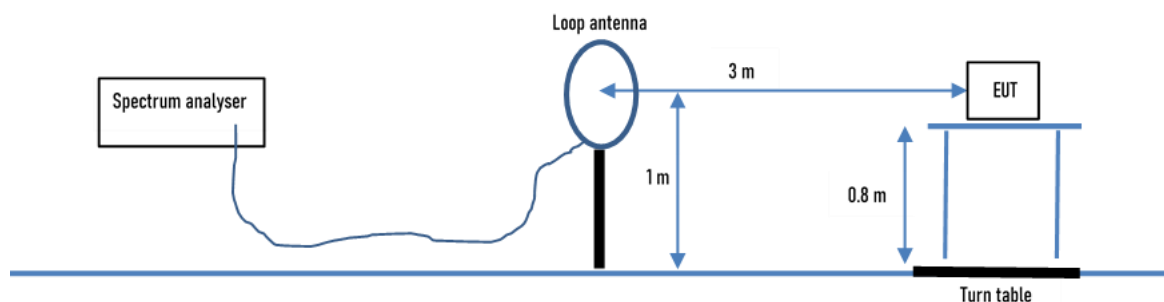
$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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 $50 \Omega / 50 \mu\text{H}$ (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):

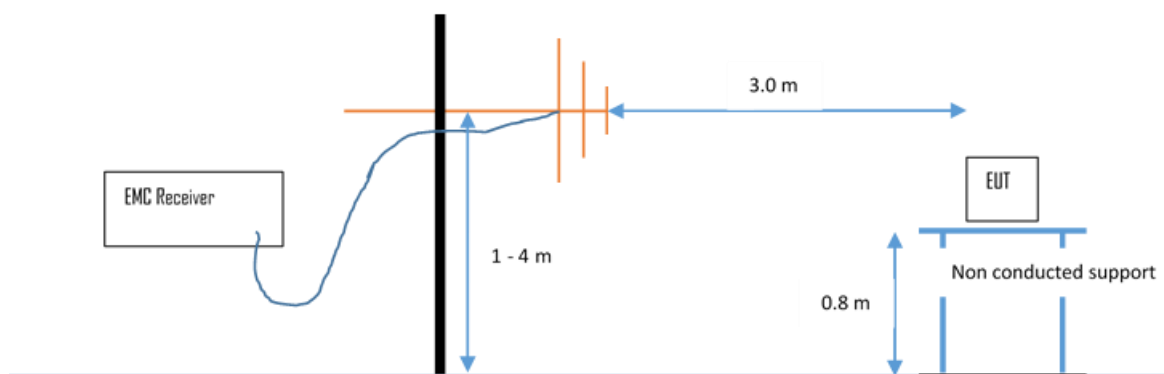
Test setup according ANSI C63.10



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:

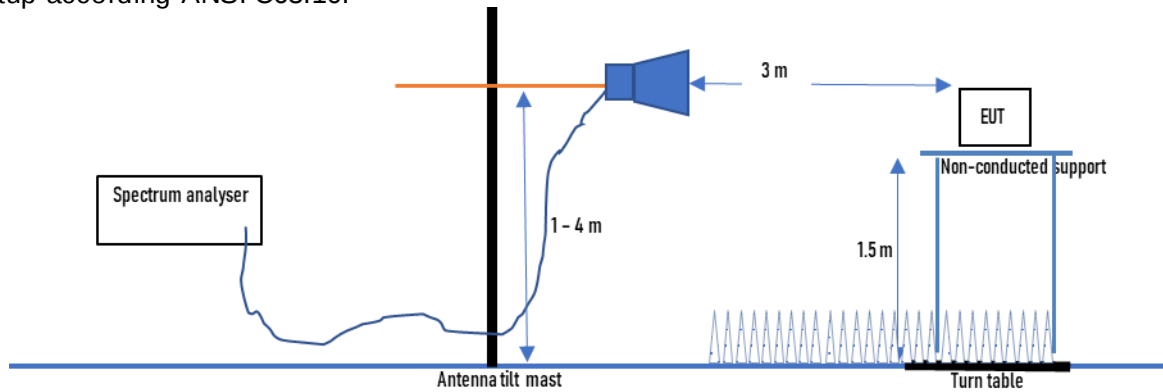
30 MHz – 1000 MHz: RBW: 120 kHz

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

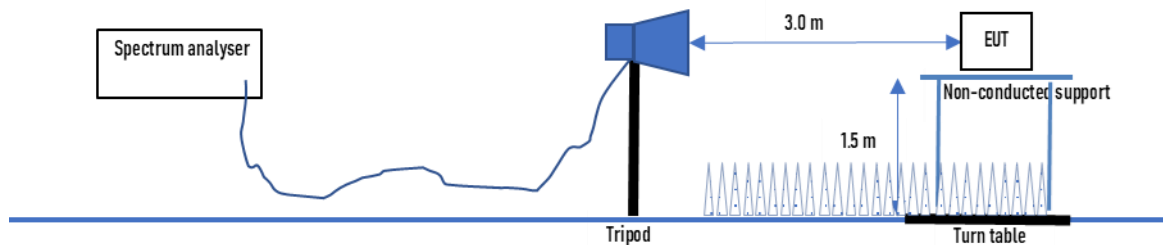
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according to 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, 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. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit are adopted.

5 TEST CONDITIONS AND RESULTS

5.1 Maximum peak output power

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

5.1.1 Description of the test location

Test location: Shielded Room S6

5.1.2 Photo documentation of the test set-up – see Attachment B

5.1.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

According to RSS-247 5.4(d):

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

5.1.4 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 11.9.1.1. The EUT is set in TX continuous mode while measuring.

5.1.5 Test result

Conducted Measurement					
FCC §15.247 (b)(3) RSS-247 5.4 (d)					
Modulation	Channel	Frequency	Measured Conducted TX Power	Conducted Tx-Power Limit	Margin
		MHz	dBm	dBm	dB
802.11b DSSS 1 Mbps	CH1	2412	18.9	30.0	-11.1
	CH6	2437	18.9	30.0	-11.1
	CH11	2462	17.8	30.0	-12.2
802.11n, HT20, MCS0	CH1	2412	21.3	30.0	-8.7
	CH6	2437	25.7	30.0	-4.3
	CH11	2462	22.7	30.0	-7.3

RSS-247 5.4 (d)							
Modulation	Channel	Frequency	Measured Conducted TX Power	Antenna gain	Calculated EIRP	EIRP Limit	Margin
		MHz	dBm	dB	dBm	dBm	dB
802.11b DSSS 1 Mbps	CH1	2412	18.9	3.1	22.0	36	-14.0
	CH6	2437	18.9	3.1	22.0	36	-14.0
	CH11	2462	17.8	3.1	20.9	36	-15.1
802.11n, HT20, MCS0	CH1	2412	21.3	3.1	24.4	36	-11.6
	CH6	2437	25.7	3.1	28.8	36	-7.2
	CH11	2462	22.7	3.1	25.8	36	-10.2

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

Frequency (MHz)	Peak Power Limit	
	(dBm)	(W)
902-928	30	1.0
2400-2483.5	30	1.0
5725-5850	30	1.0

Peak output power limit according to RSS-247 5.4(d):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(W)
902-928	30	1.0
2400-2483.5	30	1.0

Frequency (MHz)	EIRP Limit	
	(dBm)	(W)
902-928	36	4.0
2400-2483.5	36	4.0

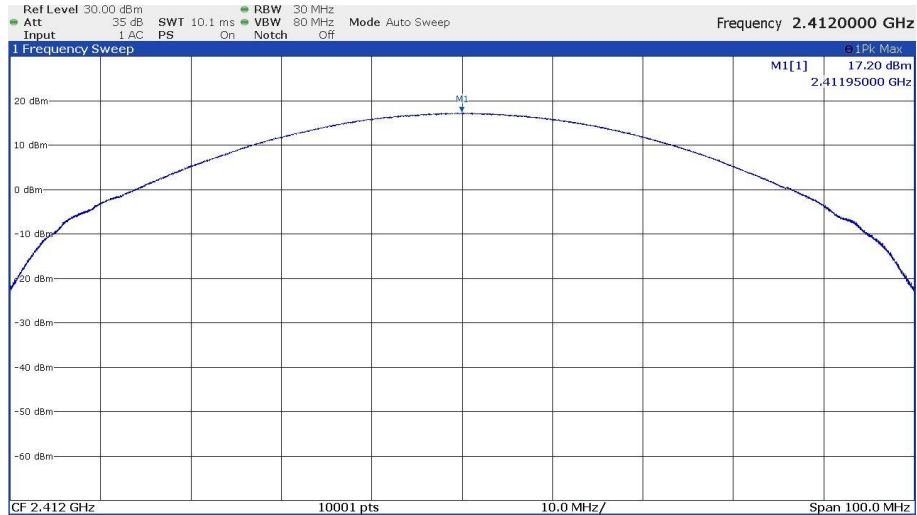
The requirements are **FULFILLED**.

Remarks: For more details of the measurements please refer to following test plots.
Conducted measurements are corrected with 1.69 dB cable attenuation.

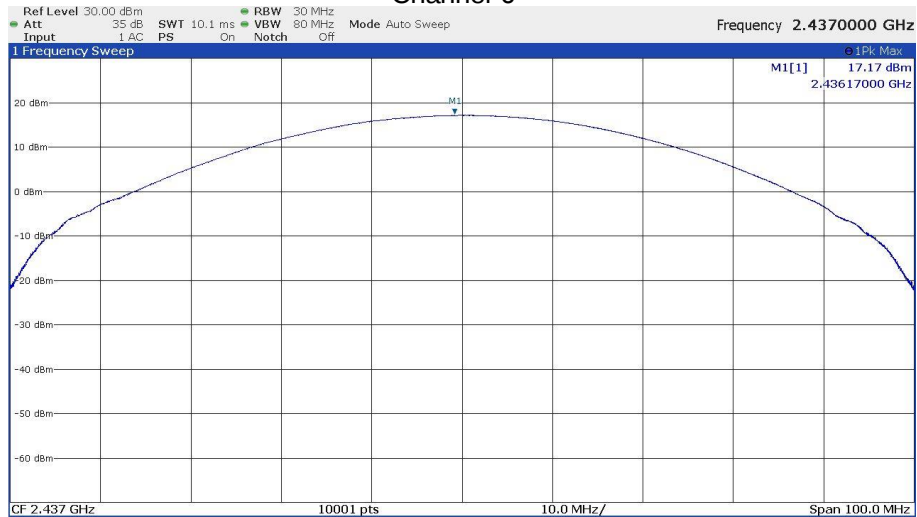
5.1.6 Test protocol CPC

802.11b 1Mbps

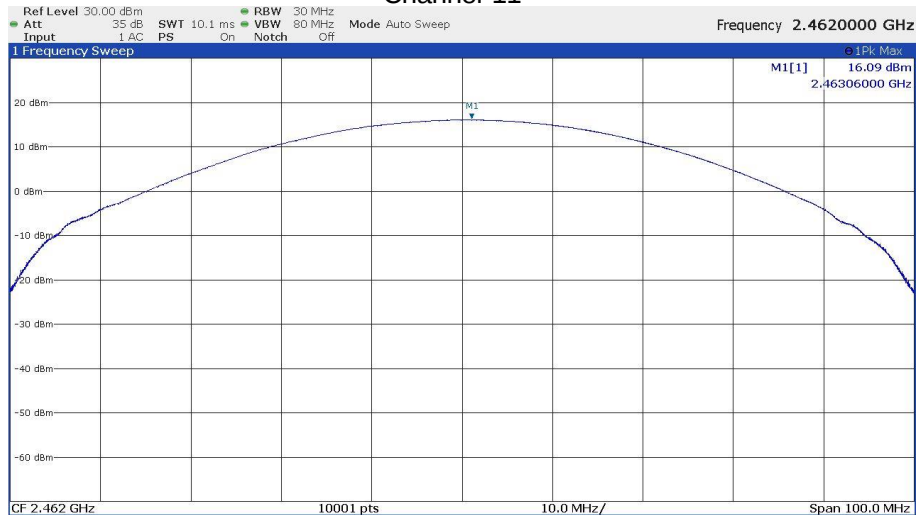
Channel 1



Channel 6

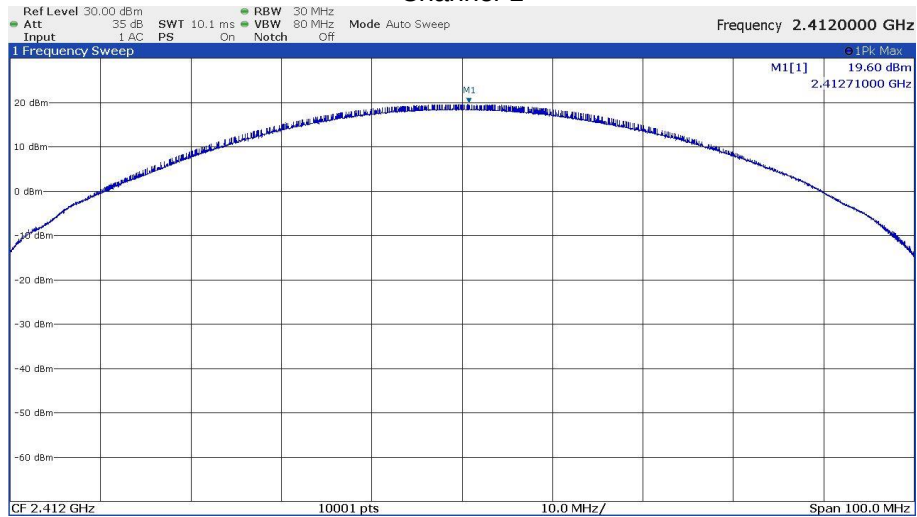


Channel 11

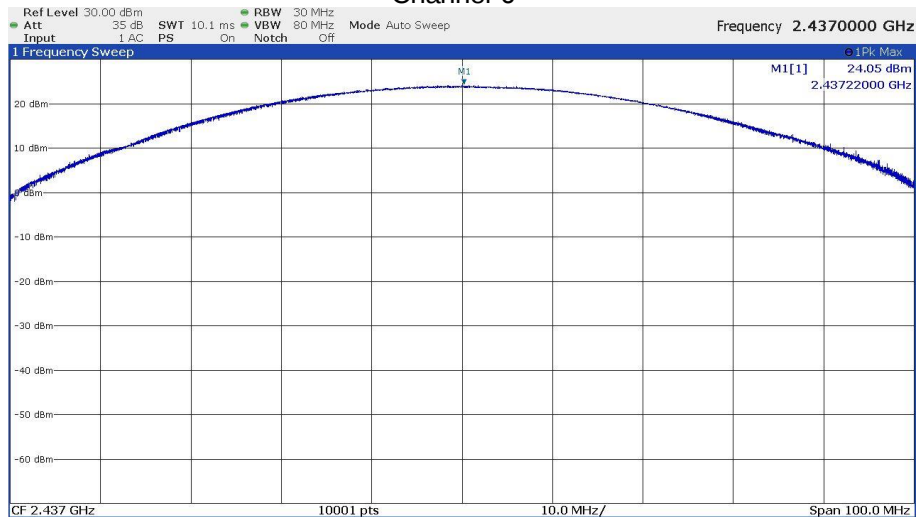


802.11n HT20 MCS-0

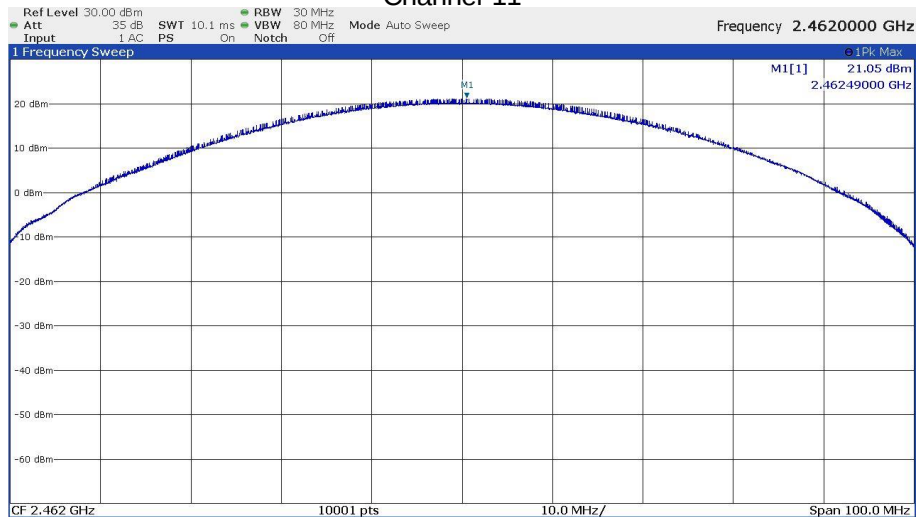
Channel 1



Channel 6



Channel 11



5.2 Spurious emissions radiated

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

5.2.1 Description of the test location

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

5.2.2 Photo documentation of the test set-up – see Attachment B

5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

According to RSS-247 5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

5.2.4 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.

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

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.

Measurements are performed in following order:

1) Measurement of emissions according to General Limit specified in section 15.209(a):

Test receiver settings for SER2:

30MHz-1GHz RBW: 120 MHz Detector: Quasi peak Meas. Time: 1 s,

Spectrum analyser settings for SER3:

1GHz-26GHz RBW: 1 MHz Detector: Max. peak Trace: Max. hold Sweep: Auto

2) If emissions outside the Restricted Bands are above General Limit additional measurements of emissions according to Spurious Emissions Limit specified in section 15.247(d) are performed:

Spectrum analyser settings:

RBW: 100 kHz VBW: 300 kHz Detector: Max. peak Trace: Max. hold Sweep: Auto

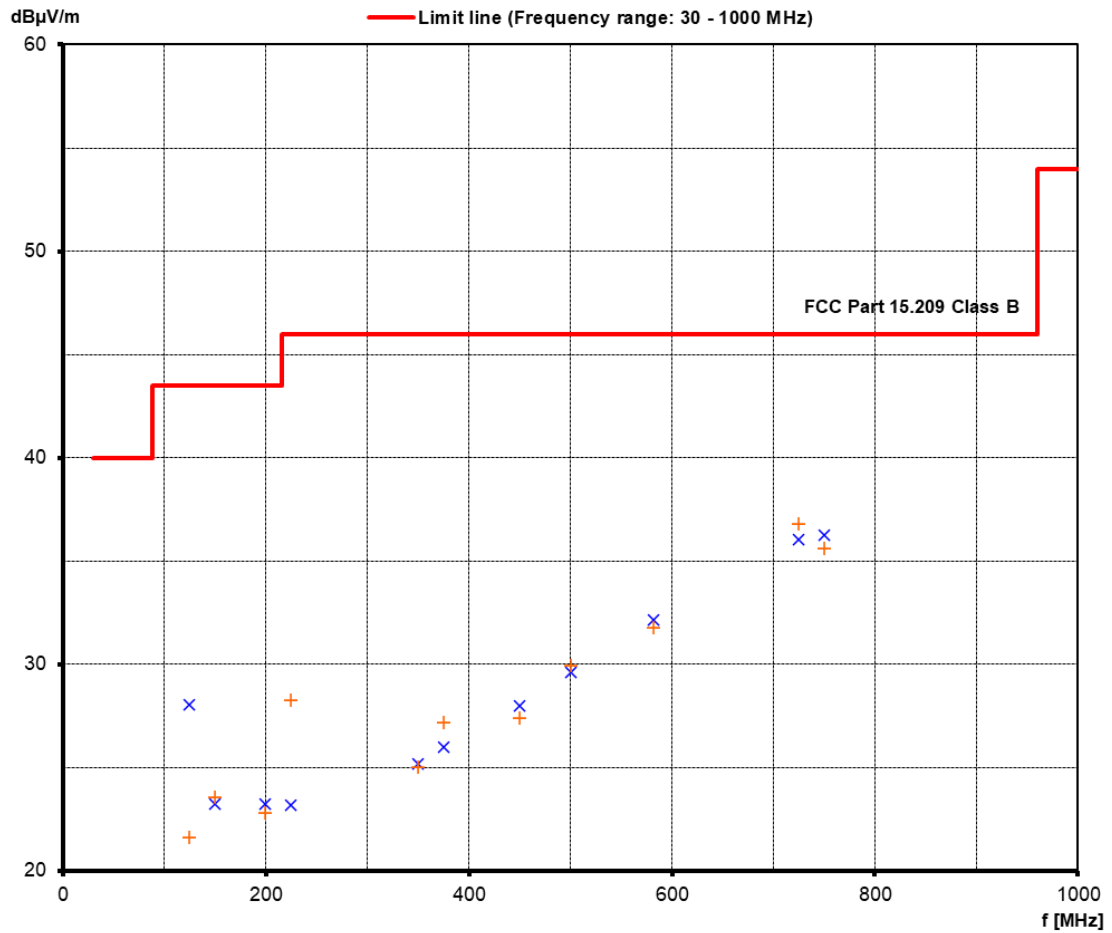
5.2.5 Test result

f < 1000 MHz:

FCC Part 15.109 Radiated emission limits; general requirements (< 30 MHz)								
Frequency (kHz)	PK reading (dBµV)	QP reading (dBµV)	Ant. factor (dB)	Distance corr. (dB)	corr. AV level (dBµV/m)	QP level (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
30.0	73.2	59.3	18.0	-80.0	11.2	-2.7	38.1	-26.9
61.4	66.6	64.2	16.9	-80.0	3.5	1.1	31.8	-28.3
268.0	47.8	33.9	18.5	-80.0	-13.7	-27.6	19.0	-32.7
724.5	36.7	30.3	18.2	-40.0	14.9	8.5	30.4	-21.9
2181.9	36.3	22.8	17.6	-40.0	13.9	0.4	29.5	-29.1
28967.9	19.7	12.4	18.0	-40.0	-2.3	-9.6	29.5	-39.1

RSS-Gen 8.9 Radiated emission limits; general requirements (< 30 MHz)							
Frequency (kHz)	QP reading (dBµV)	QP calc. (dBµA)	Ant. factor (dB)	Distance corr. (dB)	Corr. QP level (dBµA/m)	Limit (dBµA/m)	Dlimit (dB)
30.0	59.3	7.8	20.0	-80.0	-52.2	6.5	-58.7
61.4	64.2	12.7	16.9	-80.0	-50.4	0.3	-50.7
268.0	33.9	-17.6	18.5	-80.0	-79.1	-12.5	-66.6
724.5	30.3	-21.2	18.2	-40.0	-43.0	-21.1	-21.9
2181.9	22.8	-28.7	17.6	-40.0	-51.1	-21.9	-29.2
28967.9	12.4	-39.1	18.0	-40.0	-61.1	-21.9	-39.2

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)
124.77	15.4	8.4	12.6	13.2	28.0	21.6	43.5	-15.5
149.71	9.3	8.8	13.9	14.8	23.2	23.6	43.5	-19.9
199.31	11.9	10.8	11.3	12.0	23.2	22.8	43.5	-20.3
224.61	10.7	15.3	12.5	13.0	23.2	28.3	46.0	-17.7
349.95	6.8	7.0	18.4	18.0	25.2	25.0	46.0	-20.8
375.00	6.9	8.4	19.1	18.8	26.0	27.2	46.0	-18.8
450.00	6.8	6.5	21.2	20.9	28.0	27.4	46.0	-18.0
500.00	7.1	7.7	22.5	22.3	29.6	30.0	46.0	-16.0
582.09	7.2	7.0	24.9	24.7	32.1	31.7	46.0	-13.9
724.98	8.4	9.7	27.6	27.1	36.0	36.8	46.0	-9.2
749.93	8.0	7.9	28.2	27.7	36.2	35.6	46.0	-9.8

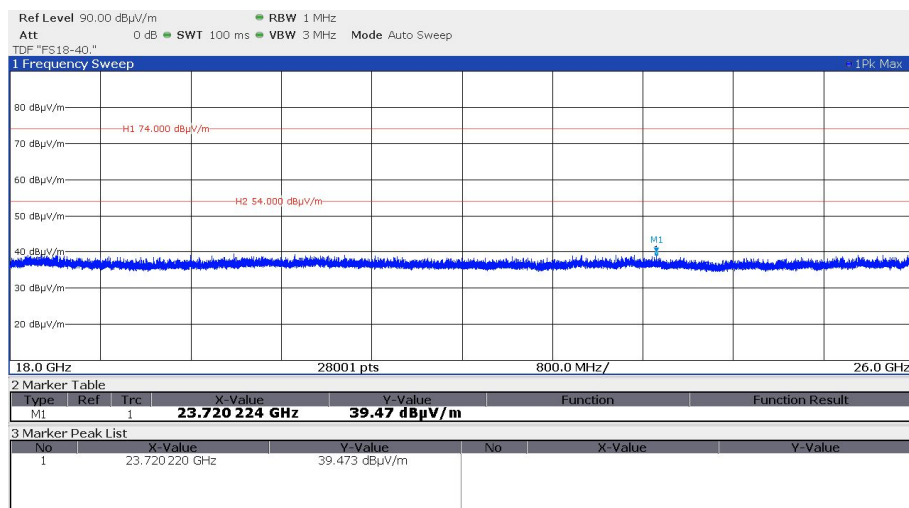
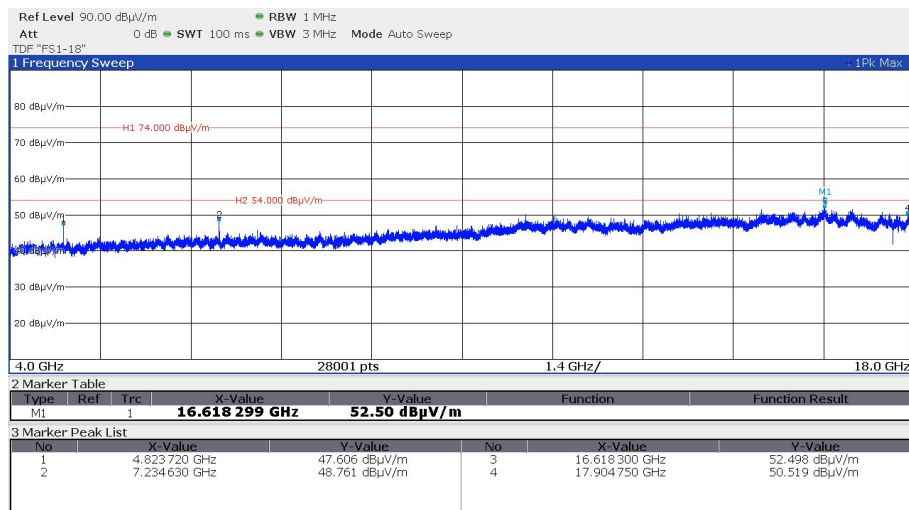
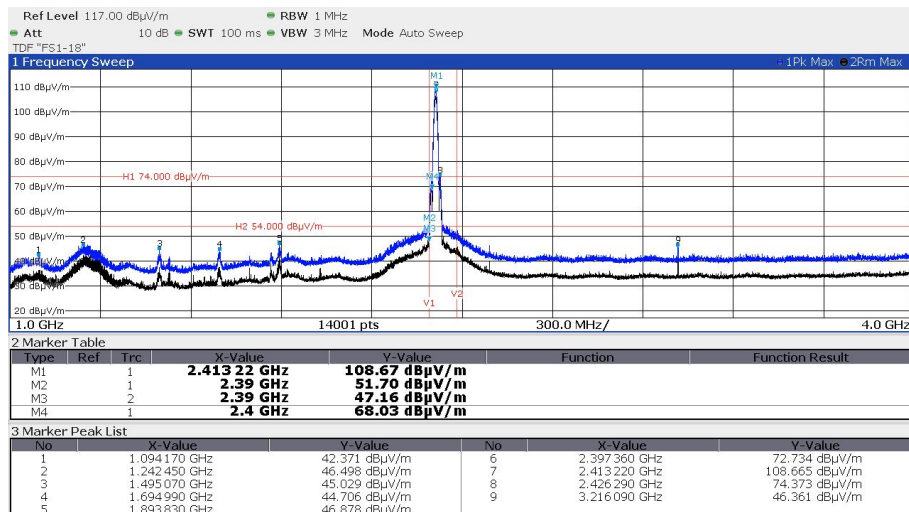


f > 1000 MHz:

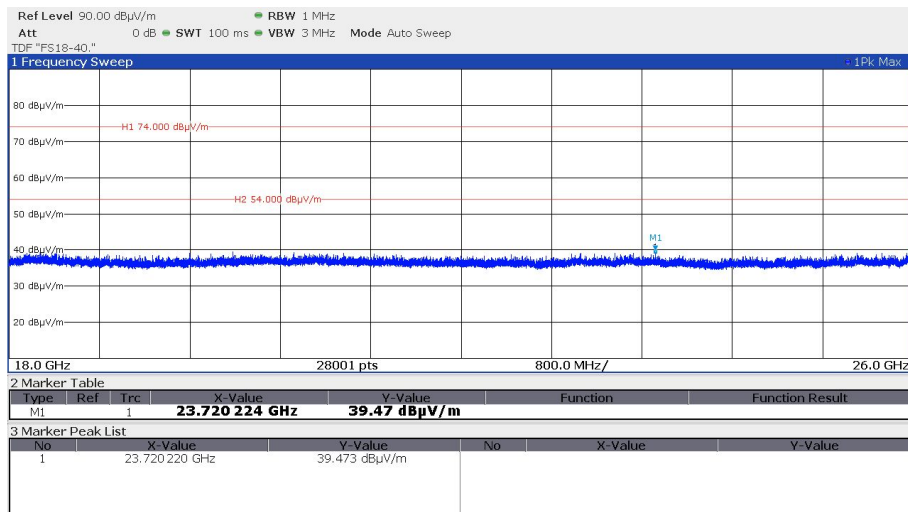
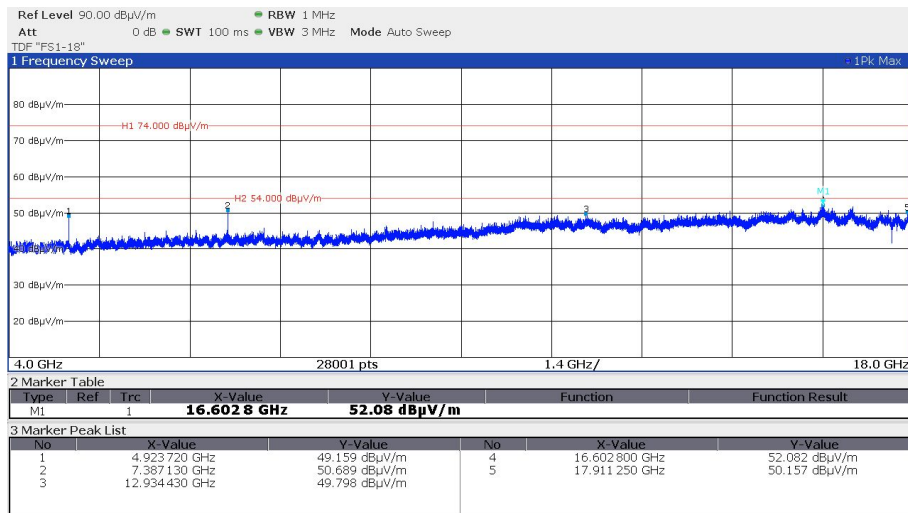
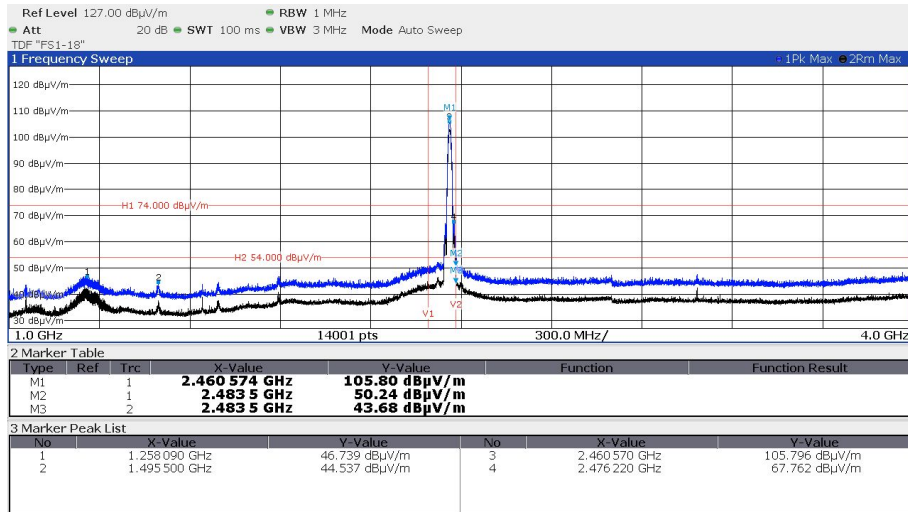
Measurement of emissions according to General Limit specified in section 15.209(a) / RSS-Gen 8.9:

5.2.5.1 WLAN Standard 802.11b, 1 Mbps

CH1

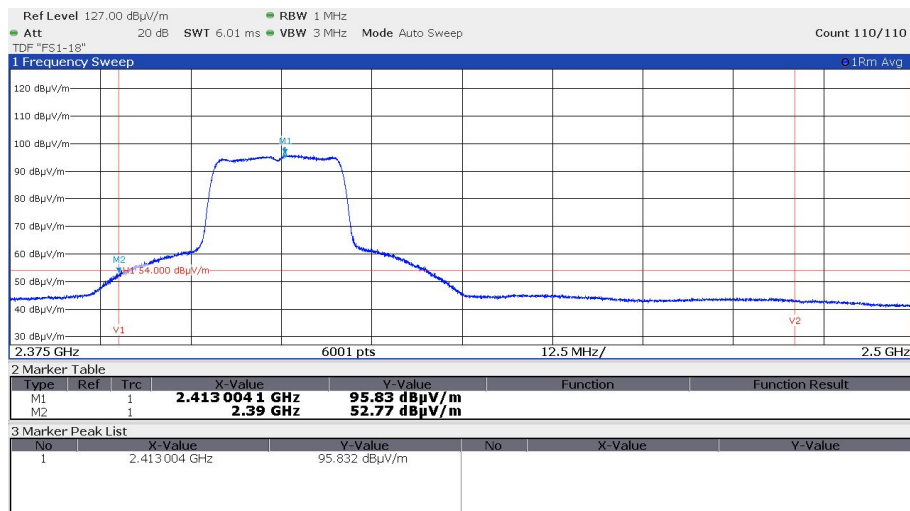
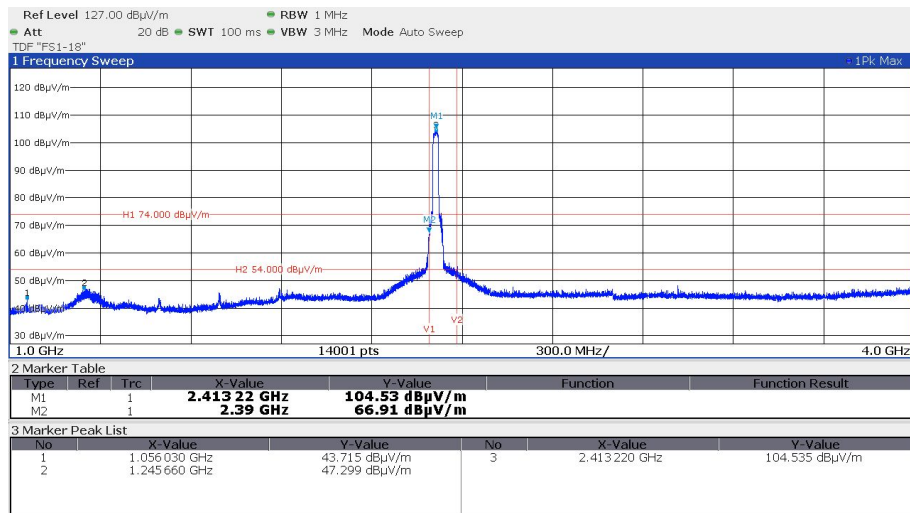


CH11

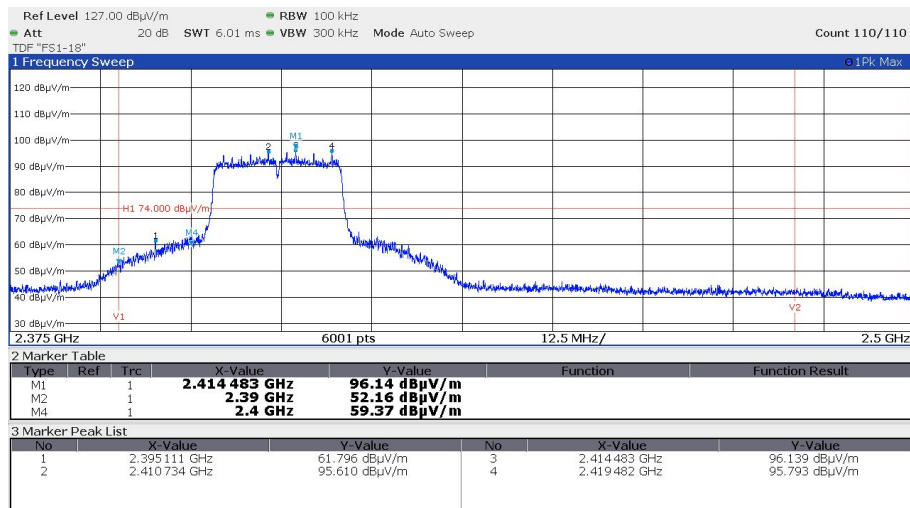


5.2.5.2 WLAN Standard 802.11n HT20, MCS0

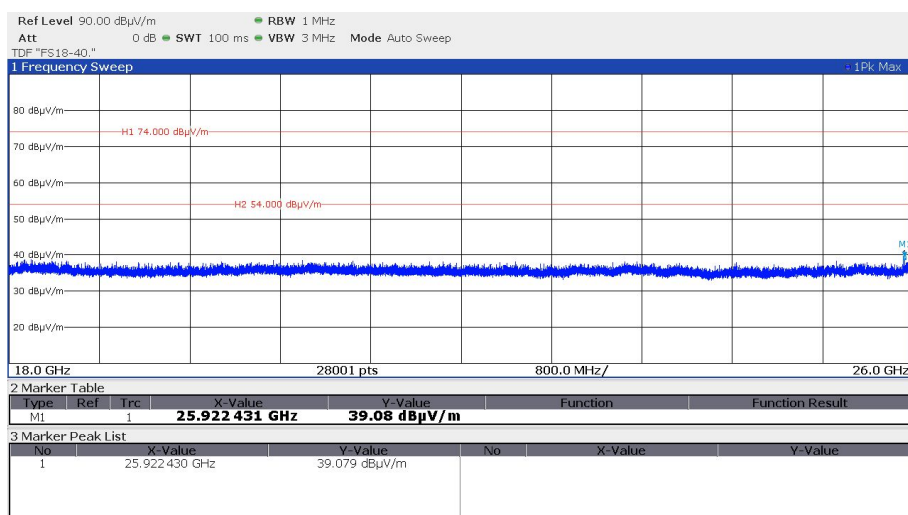
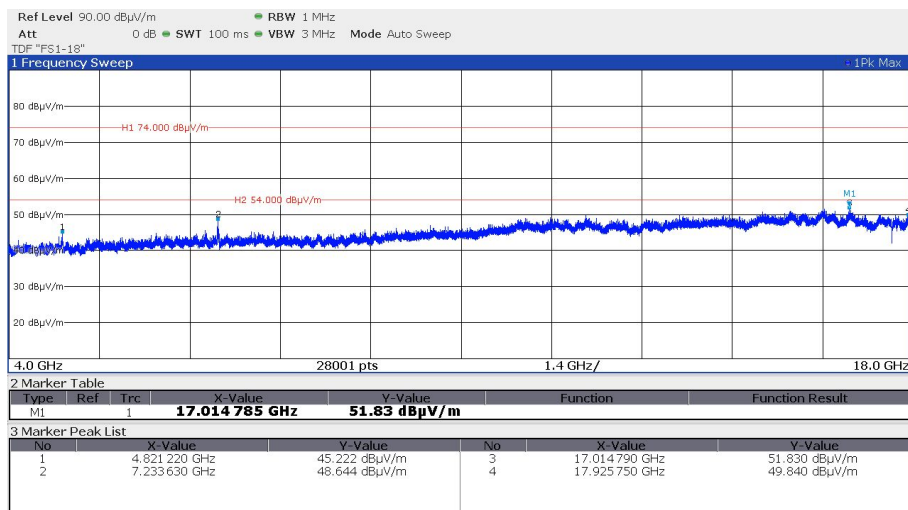
CH1



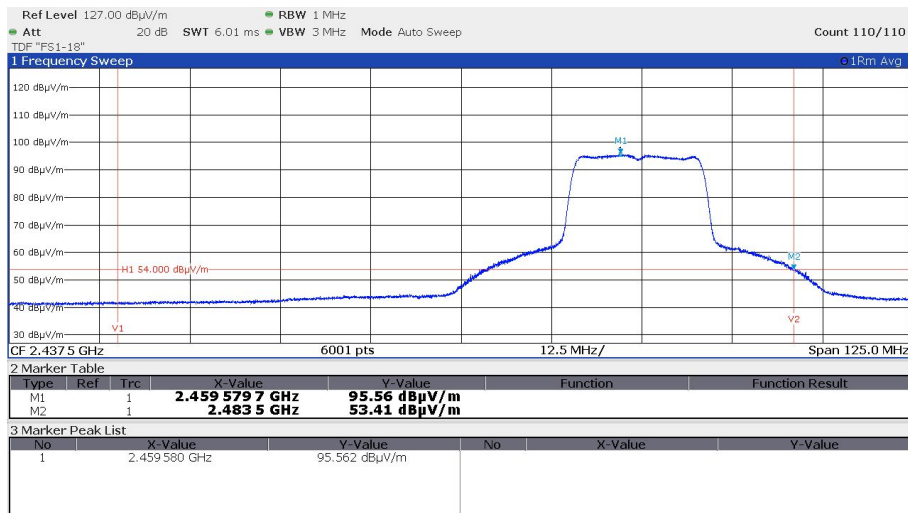
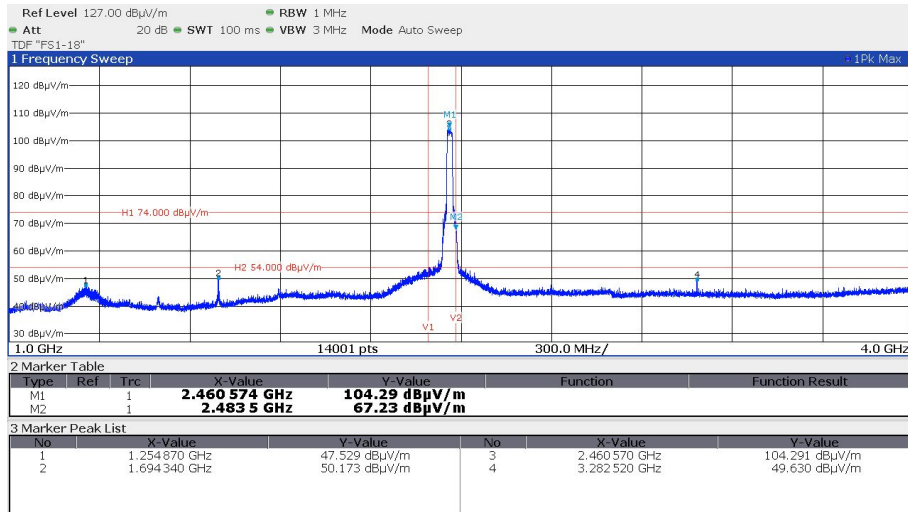
Detail: band edge low AV (according to general limit 15.209)



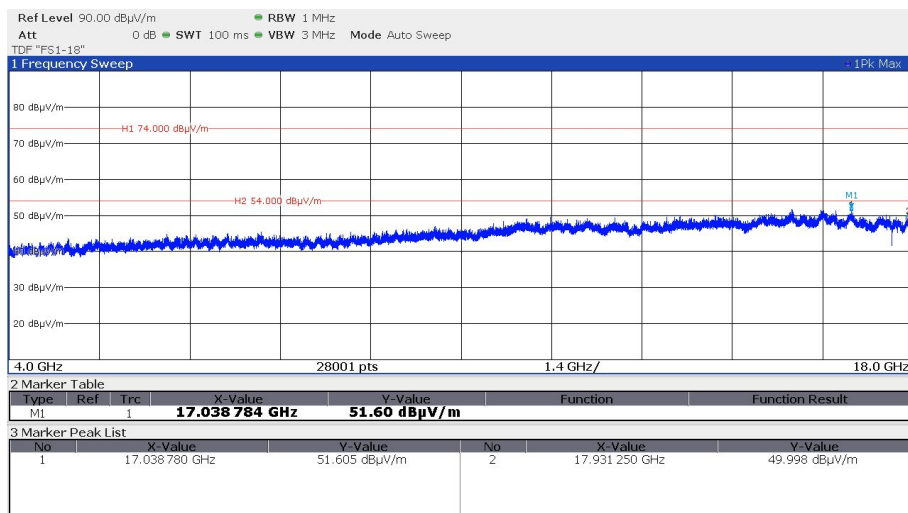
Detail: band edge low PK (according to spurious emission limit 15.247d)

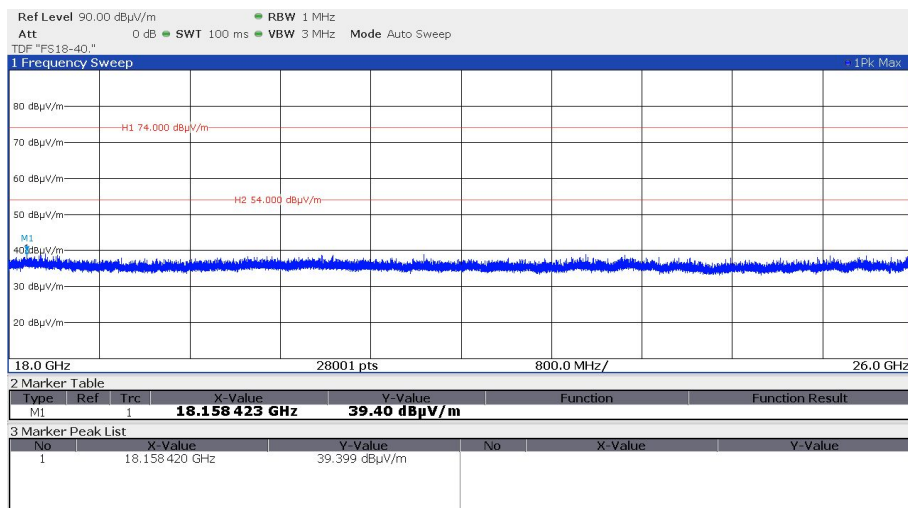


CH11



Detail: band edge high AV (according to general limit 15.209)





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

Frequency (MHz)	15.209 Limits (μV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Radiated limits according to RSS-Gen, 8.9 for spurious emissions which fall in restricted bands:

Frequency (MHz)	RSS-Gen Limits (μA/m)	Measurement distance (m)
0.009 - -0.49	63.7/f(kHz)	300
0.49 – 1.705	63.7/f(kHz)	30
1.705 – 30.0	0.08	30

Frequency (MHz)	RSS-Gen Limits (μV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Limit according to FCC Part 15, Section 15.247(d) for emissions falling not in restricted bands:

Frequency (MHz)	Spurious emission limit
Below 1000	20 dB below the highest level of the desired power
Above 1000	20 dB below the highest level of the desired power

Attenuation below the general limits specified in Section 15.209(a) is not required.

Limit according to RSS-247, 5.5 for emissions falling not in restricted bands:

Frequency (MHz)	Spurious emission limit
Below 1000	20 dB below the highest level of the desired power
Above 1000	20 dB below the highest level of the desired power

Attenuation below the general limits specified in RSS-Gen is not required.

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 10th harmonic. Only the worst-case plots are listed.

5.3 Antenna application

5.3.1 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 following PCB antenna is used in the EUT:

Number	Characteristic	Plug	Name	Frequency band	Gain
1	Omni	U.FI	Antenova CU5006-2	2.4 – 2.5 GHz	3.1 dBi

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

Remarks: None.

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.
CPC 3	FSW43	02-02/11-15-001	04/05/2024	04/05/2023		
SER 1	FMZB 1516	01-02/24-01-018	15/12/2023	15/12/2022		
	ESR 7	02-02/03-17-001	01/08/2024	01/08/2023		
SER 2	ESVS 30	02-02/03-05-006	27/07/2024	27/07/2023		
	VULB 9168	02-02/24-05-005	20/04/2024	20/04/2023	03/05/2024	03/05/2023
	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				
	50F-003 N 3 dB	02-02/50-21-010				
SER 3	FSW43	02-02/11-15-001	04/05/2024	04/05/2023		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	LNA-40-18004000-33-5P	02-02/17-20-002				
	3117	02-02/24-05-009	12/07/2024	12/07/2023		
	BBHA 9170	02-02/24-05-013	21/03/2026	21/03/2023	21/03/2024	21/03/2023
	WHK 3.0/18G-10EF	02-02/50-05-180				
	WHJS 1000-10EF	02-02/50-13-003				
	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				
	KMS116-GL140SE-KMS116	02-02/50-20-026				
	BAT-EMC 2022.0.23.0	02-02/68-13-001				