



RF - TEST REPORT

- FCC Part 15.247, RSS-247 -

Model Name : Wireless Gateway GW900-4G-US

Product Description : Open Thread Gateway

Applicant : I-care SRL

Address : Rue Descartes 18

Mons, Province de Hainaut 7000, Belgium

Manufacturer : I-care SRL

Address : Rue Descartes 18

Mons, Province de Hainaut 7000, Belgium

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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Test Report No. :	80218491-00 Rev_1	16. April 2025
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ATTACHMENTs A, B as separate supplements

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (March 2025)

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 (March 2025)	
Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

ANSI C63.10: 2020

Testing Unlicensed Wireless Devices

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.

ISED Canada Rules and Regulations

RSS-Gen, issue 6	General Requirements for Compliance of Radio Apparatus
RSS-247, Issue 3	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10: 2020	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 his/her instructions.

2.3 General remarks

None

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

2.5 Equipment type

Thread device

2.6 Short description of the equipment under test (EUT)

The Wireless Gateway GW900-4G-US is networking hardware for fixed installations designed to receive data via the OpenThread wireless protocol from compatible measurement devices and transmit it over a cellular network.

Number of tested samples: 1 (radiated sample) 1 (conducted sample)

Serial number: WGBE24xxT7 WGBE24xxT9

FCC ID: 2AIV8AG02-02 2AIV8AG02-02

IC ID: 33597-AG0202 33597-AG0202

Items	Description
chipset type	Thread
	STM32WB55CGU6U
Modulation	DSSS-OQPSK
Frequency range	2400 MHz to 2483.5 MHz
Channel numbers	40
Data rate (kbps)	250
Power setting	-3 dBm
Antenna type	PIFA

2.7 Variants of the EUT

There are three variants of the EuT:

- WG150161-02 (tested)
- WG150161H-02 (not tested)
- WG150161L-02 (not tested)

According to the manufacturer the WG150161-02 is the worst case variant.

PC24_BBA_AG02_001

Document ID

Overview of differences Wireless Gateway GW900-4G-xx

Title

Mod#	4G cellular module		Fuse	240V AC side (F2)	Overtemperature protection (not active in normal operation)		
	EG915UEUAB (U4)	EG91NAXDGA (U4)			(P1)	(P2)	(P4)
	WG150161-02	-	x	SIBA 160000.3.15 (3.15 A), 160000.0.8 (0.8 A) OR Littelfuse 0453.800MR (0.8 A)	SCHURTER 3403.0279.23 (3.15 A) OR 3403.0273.23 (0.8 A)	-	-
WG150161H-02	-	x	SIBA 160000.0.8 OR Littelfuse 0453.800MR (0.8 A)	SCHURTER 3403.0273.23 (0.8 A)	2 resettable thermal switches in series [Note 5]	2 resettable thermal switches in series [Note 5]	Non-resettable with 72 °C rating max. [Note 6]
WG150161L-02	-	x	SIBA 160000.0.8 OR Littelfuse 0453.800MR (0.8 A)	SCHURTER 3403.0273.23 (0.8 A)	2 resettable thermal switches in series [Note 5]	2 resettable thermal switches in series [Note 5]	Non-resettable with 72 °C rating max. [Note 6]

Ex protection (EN/IEC/UL 60079-0 /-11 /-18)

Mechanical / IP

Heat management			Power cable applied to AC (encapsulated)	Power cable applied to DC (encapsulated)	Power cable HazLoc applied to AC (encapsulated)	Power cable HazLoc applied to DC (encapsulated)	Encapsulation / Coating	Cable Gland			
Thermal pad below PCBA	Clamping of P1 between P4 and AC power supply	Glue connection of P2 on PCB at P3	RZ1-K2X1,5-CCA B 1000 OR H07RN-F LS0H	LAPP ÖLFLEX® POWER MULTI 611603	Bectron SK 75V2-35 / SH 79V5-35 1:1	PROTEC EPN 250 M 20 N	Lapp SKINTOP ST-M 20x1,5	SKINTOP® K-M / KR-M ATEX plus 54115225 or 54115220	PFLITSCH Lex 220ms HTS + strain relief and grounding		
-	-	-	-	-	-	-	-	x [Note 1]	-	-	
x	x	x	-	-	x	-	x	-	-	x [Note 8]	
x	x	x	-	-	-	x	x	-	-	x [Note 8]	

2.8 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

Note: the marked frequencies are determined for final testing.
According to the customer, CH 26 is deactivated

2.9 Transmit operating modes

The EUT uses DSSS-OQPSK modulation and may provide following data rates:

- 250 kbps (kbps = kilobits per second)

2.10 Antenna

The following antenna was used with the EUT:

Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)
PIFA	PCB antenna	-	2.4 – 2.4835	-4.04

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 120V AC 60Hz
Power supply voltage, $V_{\text{alt.}}$: 24V DC

2.12 Peripheral devices and interface cables

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

- Power Supply Model : EA-PS 3032-10B (02-02/50-10-013)

2.13 Determination of worst-case conditions for final measurement

Preliminary tests are performed in all three orthogonal axes of the EUT to locate at which position and at what setting of the EUT produce the maximum of the emissions.

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

Thread	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.15.4	11-25	11, 18, 25	-3 dBm	DSSS	OQPSK	250 kbps

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.

3 TEST RESULT SUMMARY

Thread device using digital modulation and operates in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	passed
15.247(a)(2)	RSS-247, 5.2(a)	-6 dB EBW	passed
15.247(b)(3) 15.247(b)(4)	RSS-247, 5.4(d)	Maximum peak output power	passed
15.247(d) 15.209	RSS-247, 5.5 RSS-Gen, 8.9	Spurious emissions	passed
15.247(e)	RSS-247, 5.2(b)	PSD	passed
15.35(c)	RSS-Gen, 8.2	Pulsed operation	passed
15.203		Antenna requirement	passed
-	RSS-Gen, 6.7	99 % Bandwidth	passed

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80218491-00	0	18 March 2025	Initial test report
80218491-00	1	16 April 2025	Corrected 5.3.4 Description of Measurement, Dates of measurements added in the comments

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 : 15 November 2024

Testing concluded on : 14 February 2025

Checked by: Tested by:

Klaus Gegenfurtner
Teamleader Radio

Laurin Roth
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Straubinger Straße 100
94447 PLATTLING
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 Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EUT	95%	$\pm 2.5 \times 10^{-7}$
99% Occupied Bandwidth	Center frequency of EUT	95%	$\pm 2.5 \times 10^{-7}$
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
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 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".

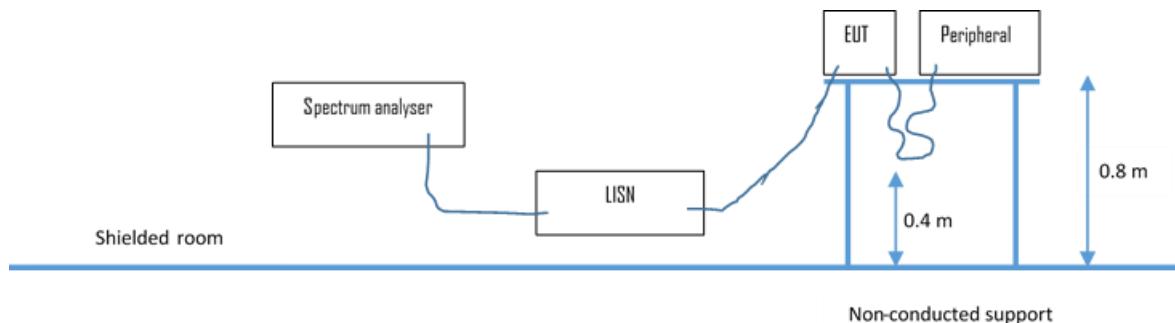
4.5.2.1 Justification

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.

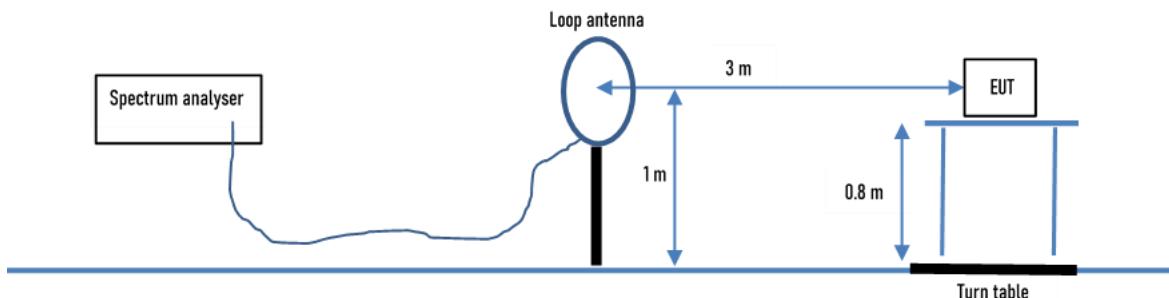
To convert between $\text{dB}\mu\text{V}$ and μV , the following conversions apply:

$$\begin{aligned}\text{dB}\mu\text{V} &= 20(\log \mu\text{V}) \\ \mu\text{V} &= \text{Inverse log}(\text{dB}\mu\text{V}/20)\end{aligned}$$

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.

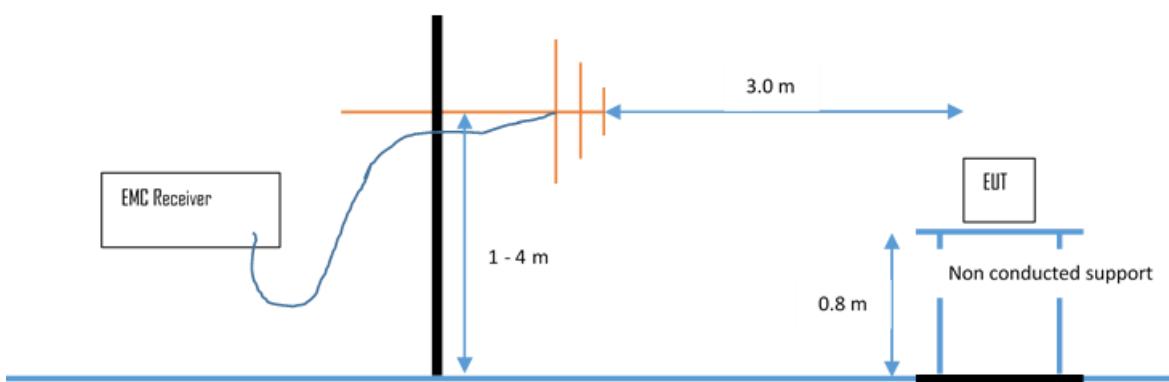
4.5.3.2 Radiated emission

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 centre of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied 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 centre 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 dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) 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:

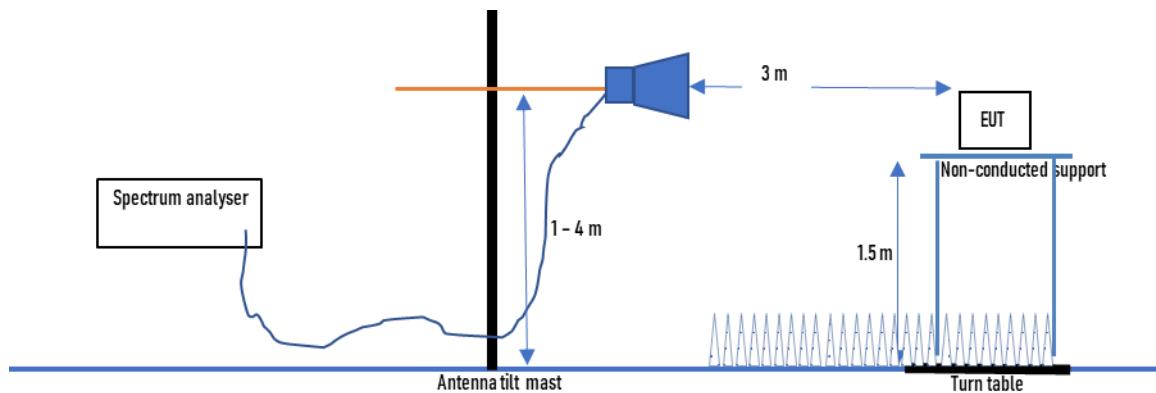
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

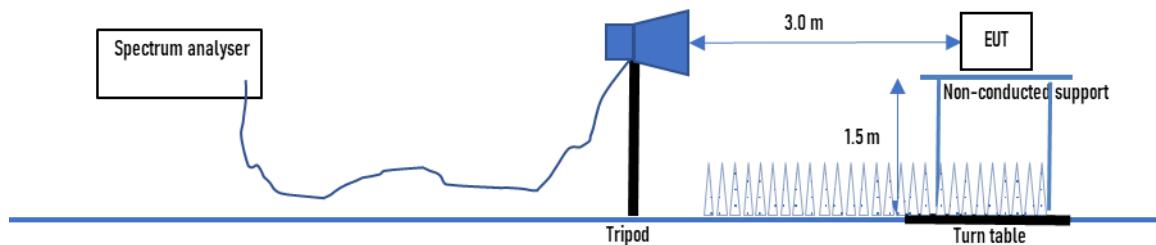
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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 centre, 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 centre, 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 is adopted.

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 SR 3

5.1.2 Photo documentation of the test set-up – Detailed photos see ATTACHMENT A

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 given limits.

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 8.831 dB at 0.156.503 MHz

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

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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

Measurement performed on the 29.11.2025

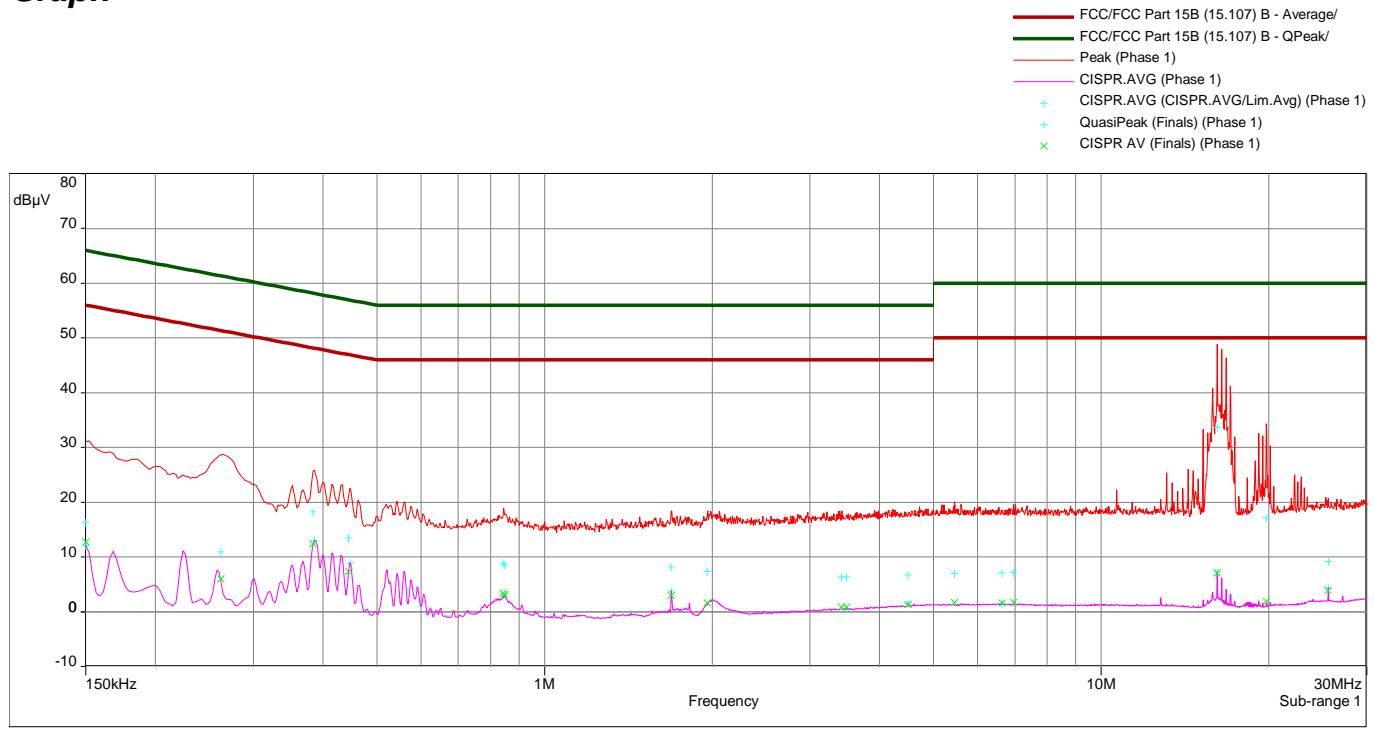
5.1.6 Test protocol

Position	Phase 1	Class	B
Limit	FCC/FCC Part 15C (15.207)		

Finals

Frequency (Hz)	QuasiPeak (dB μ V)	QP Margin	QP Limit (dB μ V)	CISPR AV (dB μ V)	CISPR AV Margin	AV Limit (dB μ V)	RBW (Hz)	Meas. Time (s)	Correction (dB)
150.0036 k	16.336	-49.664	66	12.729	-43.271	56	9000	1	10.332
262.2536 k	10.928	-50.424	61.352	6.033	-45.319	51.352	9000	1	10.315
383.7536 k	18.23	-39.962	58.192	12.419	-35.773	48.192	9000	1	10.33
444.5036 k	13.467	-43.506	56.973	7.355	-39.618	46.973	9000	1	10.337
842.7536 k	8.956	-47.044	56	3.318	-42.682	46	9000	1	10.382
847.2536 k	8.534	-47.466	56	3.101	-42.899	46	9000	1	10.382
1.6887536 M	8.179	-47.821	56	2.982	-43.018	46	9000	1	10.445
1.9610036 M	7.368	-48.632	56	1.652	-44.348	46	9000	1	10.462
3.4167536 M	6.368	-49.632	56	0.899	-45.101	46	9000	1	10.529
3.4887536 M	6.387	-49.613	56	0.851	-45.149	46	9000	1	10.53
4.4945036 M	6.77	-49.23	56	1.362	-44.638	46	9000	1	10.53
5.4530036 M	6.997	-53.003	60	1.66	-48.34	50	9000	1	10.499
6.6320036 M	7.07	-52.93	60	1.632	-48.368	50	9000	1	10.451
6.9582536 M	7.199	-52.801	60	1.689	-48.311	50	9000	1	10.44
16.1495036 M	33.718	-26.282	60	7.048	-42.952	50	9000	1	10.698
19.8080036 M	17.12	-42.88	60	1.887	-48.113	50	9000	1	10.889
25.5972536 M	9.181	-50.819	60	3.864	-46.136	50	9000	1	11.003

Graph



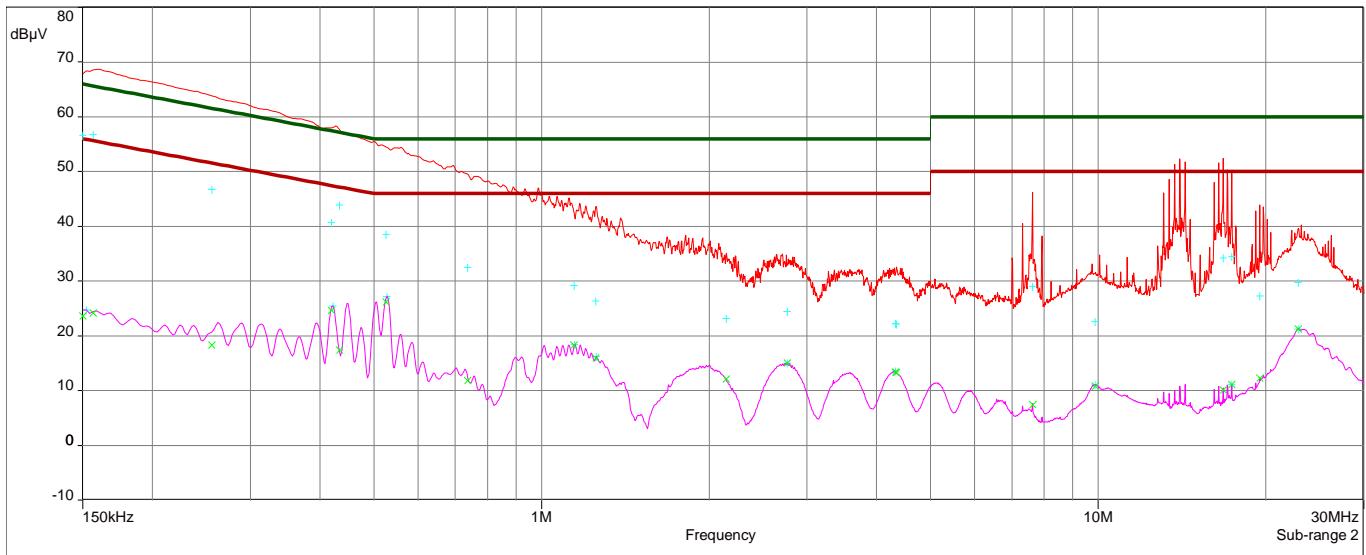
Position	Neutral
Limit	FCC/FCC Part 15C (15.207)

Finals

Frequency (Hz)	QuasiPeak (dB μ V)	QP Margin	QP Limit (dB μ V)	CISPR AV (dB μ V)	CISPR AV Margin	AV Limit (dB μ V)	RBW (Hz)	Meas. Time (s)	Correction (dB)
150.0036 k	56.632	-9.368	66	23.63	-32.37	56	9000	1	10.322
156.5036 k	56.803	-8.831	65.634	24.168	-31.466	55.634	9000	1	10.323
255.5036 k	46.755	-14.813	61.568	18.286	-33.282	51.568	9000	1	10.323
419.7536 k	40.679	-16.769	57.448	24.664	-22.784	47.448	9000	1	10.342
433.2536 k	43.953	-13.233	57.185	17.444	-29.741	47.185	9000	1	10.345
525.5036 k	38.543	-17.457	56	26.208	-19.792	46	9000	1	10.357
737.0036 k	32.455	-23.545	56	11.845	-34.155	46	9000	1	10.372
1.1442536 M	29.248	-26.752	56	18.358	-27.642	46	9000	1	10.397
1.2522536 M	26.37	-29.63	56	15.919	-30.081	46	9000	1	10.405
2.1455036 M	23.177	-32.823	56	12.127	-33.873	46	9000	1	10.471
2.7620036 M	24.467	-31.533	56	14.998	-31.002	46	9000	1	10.518
4.3212536 M	22.245	-33.755	56	13.431	-32.569	46	9000	1	10.54
4.3415036 M	22.175	-33.825	56	13.316	-32.684	46	9000	1	10.54
7.6175036 M	29.033	-30.967	60	7.466	-42.534	50	9000	1	10.437
9.8810036 M	22.644	-37.356	60	10.812	-39.188	50	9000	1	10.456
16.7592536 M	34.243	-25.757	60	10.121	-39.879	50	9000	1	10.681
17.3712536 M	34.467	-25.533	60	11.142	-38.858	50	9000	1	10.7
19.5020036 M	27.259	-32.741	60	12.29	-37.71	50	9000	1	10.764
22.8882536 M	29.786	-30.214	60	21.27	-28.73	50	9000	1	10.822

Graph

— FCC/FCC Part 15B (15.107) B - Average/
— FCC/FCC Part 15B (15.107) B - QPeak/
— Peak (Neutral)
— CISPR.AVG (Neutral)
+ CISPR.AVG (CISPR.AVG/Lim.Avg) (Neutral)
+ quasipeak (finals) (phase 1) (Neutral)
x cispr av (finals) (phase 1) (Neutral)



FCC/FCC Part 15B (15.107)B

5.2 EBW and OBW

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

5.2.1 Description of the test location

Test location: Shielded Room SR6

5.2.2 Photo documentation of the test set-up

See Attachment B for detailed photo documentation of the test set-up.

5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

According to RSS-247 5.2(a):

DTSS include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to the bands 902-928 MHz and 2400-2483.5 MHz: The minimum 6 dB bandwidth shall be 500 kHz.

5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser.

Spectrum analyser settings for EBW:

RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Sweep time: 5 s, Span: 2 EBW;

Spectrum analyser settings for OBW:

RBW: 1-5% OBW, VBW: 3 RBW, Detector: Max peak, Sweep time: 5 s, Span: 2 OBW;

5.2.5 Test result

6dB bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2405.000000	1.584158	0.500000	---	2404.247525	2405.831683
2440.000000	1.504950	0.500000	---	2439.247525	2440.752475
2475.000000	1.465346	0.500000	---	2474.287129	2475.752475

99% bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2405.000000	1.855000	---	---	2404.107500	2405.962500
2440.000000	1.855000	---	---	2439.107500	2440.962500
2475.000000	1.855000	---	---	2474.107500	2475.962500

Emission bandwidth limit according to FCC Part 15, Section 15.247(a)(2):

Frequency (MHz)	6dB EBW Limit
902-928	> 500 kHz
2400-2483.5	> 500 kHz
5725-5850	> 500 kHz

Emission bandwidth limit according to RSS-247 5.2(a):

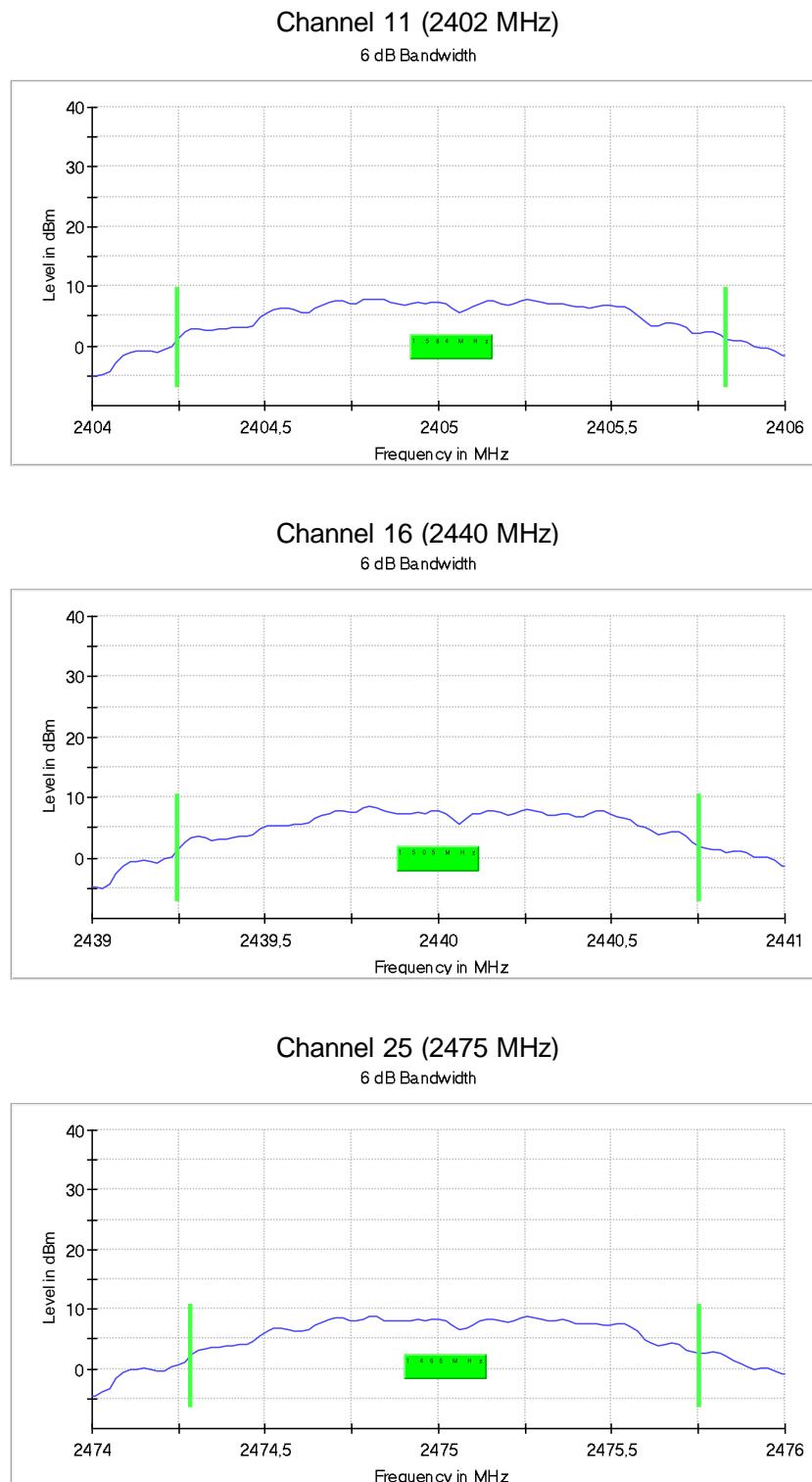
Frequency (MHz)	6dB EBW Limit
902-928	> 500 kHz
2400-2483.5	> 500 kHz

The requirements are **FULFILLED**.

Remarks: For detailed test result please see the following test protocols.

Measurements performed on the 15.11.2024 and 10.02.2025.

5.2.6 Test protocols EBW



5.2.7 Test protocols OBW



5.3 Maximum peak output power

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

5.3.1 Description of the test location

Test location: Shielded Room SR6

5.3.2 Photo documentation of the test set-up

See Attachment B for detailed photo documentation of the test set-up.

5.3.3 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).

5.3.4 Description of Measurement

The maximum peak radiated 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.

5.3.5 Test result

Maximum peak conducted output power:

802.15.4, 250 kbps, TX	Test results		
	P (dBm)	EIRP Limit (dBm)	Margin (dB)
Lowest frequency: CH11			
T_{nom}	11,6	30,0	-18,4
Middle frequency: CH18			
T_{nom}	11,9	30,0	-18,1
Highest frequency: CH25			
T_{nom}	12,6	30,0	-17,4

Maximum peak EIRP calculated:

802.15.4, 250 kbps, TX	Test results conducted				
	P (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Lowest frequency: CH11					
T_{nom}	V_{nom}	11,6	-4,04	7,6	36,0
Middle frequency: CH18					
T_{nom}	V_{nom}	11,9	-4,04	7,9	36,0
Highest frequency: CH25					
T_{nom}	V_{nom}	12,6	-4,04	8,6	36,0
					-27,4

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**.

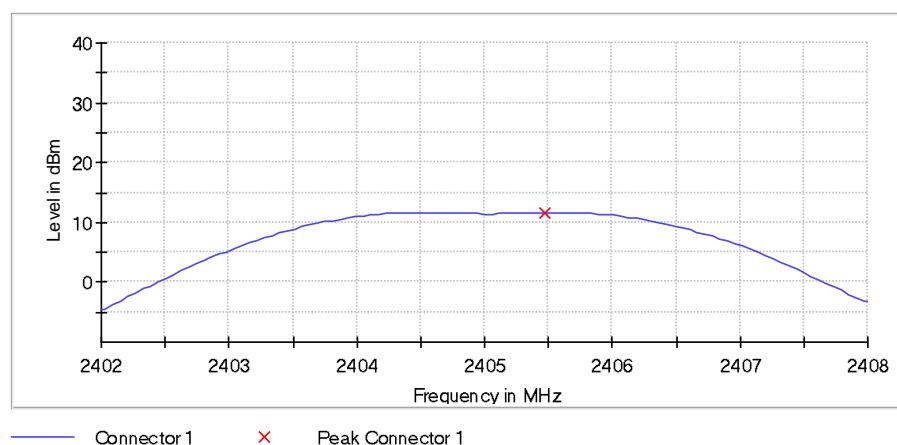
Remarks: For detailed test result please see the following test protocols.

Measurements performed on the 05.12.2024 and 09.01.2025.

5.3.6 Test protocols

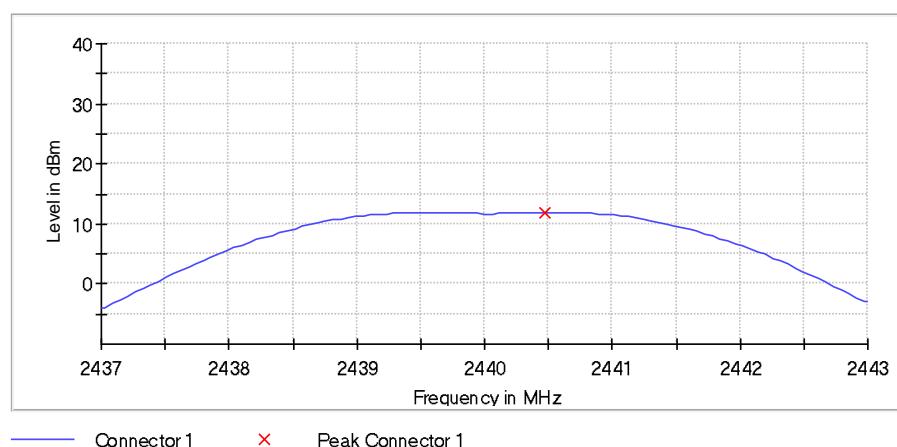
Channel 11 (2405 MHz)

Peak Power



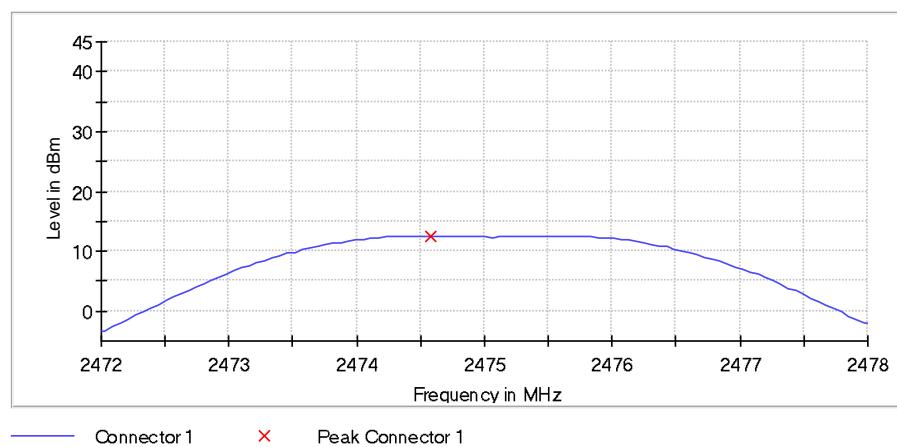
Channel 18 (2440 MHz)

Peak Power



Channel 25 (2475 MHz)

Peak Power



5.4 Power spectral density

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

5.4.1 Description of the test location

Test location: Shielded Room SR6

5.4.2 Photo documentation of the test set-up

See Attachment B for detailed photo documentation of the test set-up.

5.4.3 Applicable standard

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

For digitally modulated systems, the power spectral density radiated from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the radiated output power shall be used to determine the power spectral density.

According to RSS-247 5.2(b):

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

5.4.4 Description of Measurement

The measurement is performed using the procedure set out in 11.10 of ANSI C63.10. The power measurement was done as peak power measurement. Therefore, the PKPSD is measured. The max peak was located with the spectrum analyser and a marker set to peak.

Spectrum analyser settings:

RBW: 3 kHz, VBW: 10 kHz, Detector: Peak, Sweep time: Auto

5.4.5 Test result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2405.000000	2404.972500	0.966	8.0	PASS
2440.000000	2440.267500	2.270	8.0	PASS
2475.000000	2475.267500	2.973	8.0	PASS

Power spectral density limit according to FCC Part 15, Section 15.247(e):

Frequency (MHz)	Power spectral density limit
	(dBm/3 kHz)
902-928	8
2400 - 2483.5	8
5725-5850	8

Power spectral density limit according to RSS-247 5.2(b):

Frequency (MHz)	Power spectral density limit
	(dBm/3 kHz)
902-928	8
2400 - 2483.5	8

The requirements are **FULFILLED**.

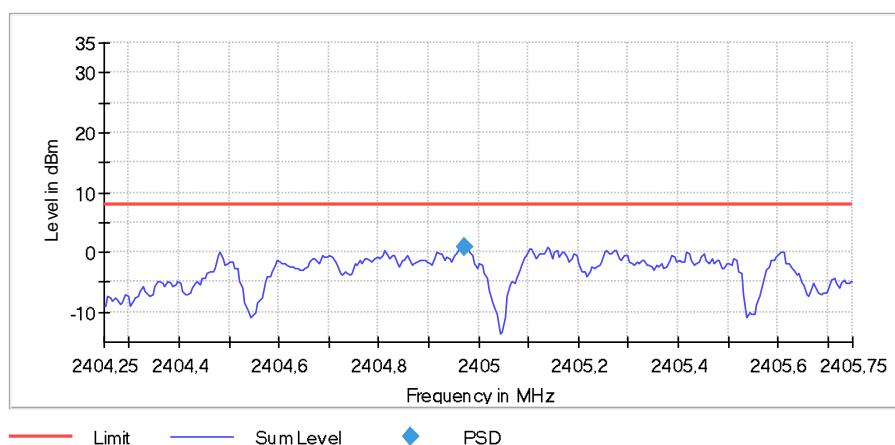
Remarks: For detailed test result please see the following test protocols.

Measurements performed on the 03.12.2024 and 14.02.2025.

5.4.6 Test protocols

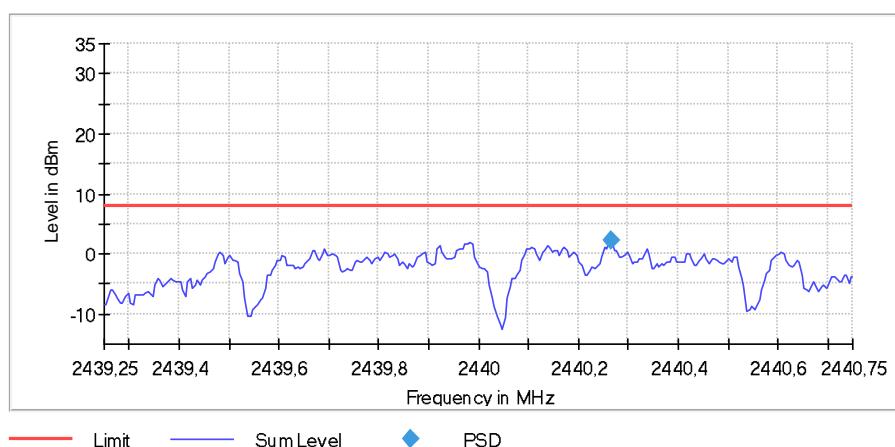
Channel 11 (2405 MHz)

Peak Power Spectral Density



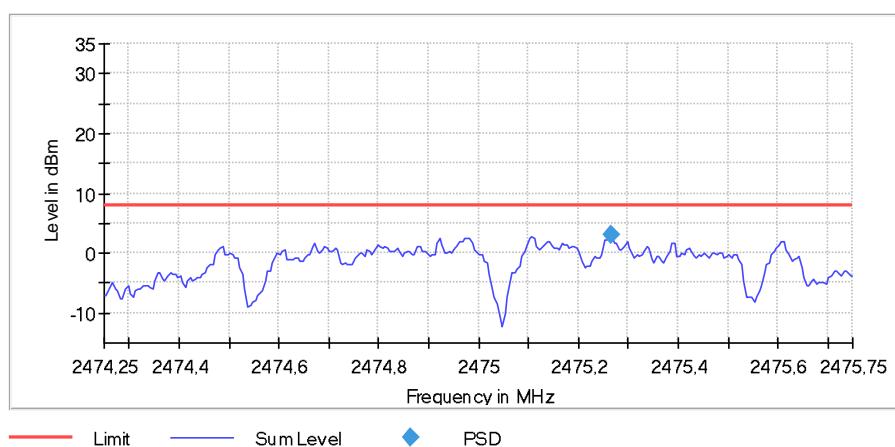
Channel 18 (2440 MHz)

Peak Power Spectral Density



Channel 25 (2475 MHz)

Peak Power Spectral Density



5.5 Spurious emissions radiated

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

5.5.1 Description of the test location

Test location: SAC 2 (9 kHz - 1 GHz)
Test location: FAR (1 GHz - 25 GHz)

Test distance: 3 m (9 kHz - 18 GHz)
Test distance: 1 m (18 GHz - 25 GHz)

5.5.2 Photo documentation of the test set-up

See Attachment B for detailed photo documentation of the test set-up.

5.5.3 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.

5.5.4 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 SER1, SER2:

9kHz-150kHz	RBW: 200 Hz	Detector: Quasi peak*	Meas. Time: 1 s,
150kHz-30MHz	RBW: 9 kHz	Detector: Quasi peak*	Meas. Time: 1 s,
30MHz-1GHz	RBW: 120 kHz	Detector: Quasi peak	Meas. Time: 1 s,

*AV Detector in the ranges 9-90kHz and 110-490kHz

Spectrum analyser settings for SER3:

1GHz-25GHz	RBW: 1 MHz	Detector: Max. peak	Trace: Max. hold	Sweep: Auto
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- 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
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5.5.5 Test result

f < 30 MHz

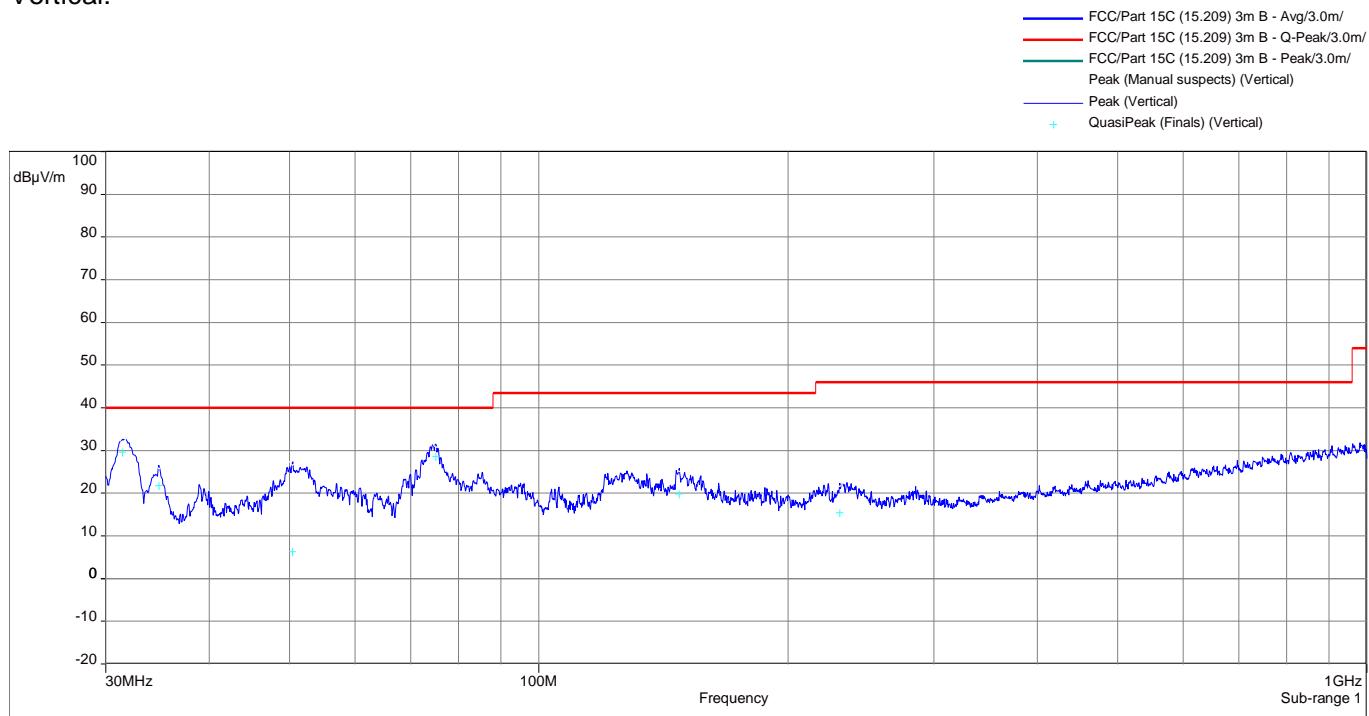
According to FCC 15.209					
Frequency (MHz)	Reading (dB μ V)	Correction (dB)*	Field strength (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
0.009	68.9	-58.8	10.1	48.5	-38.4
0.048	38.3	19.0	-22.7	34.0	-56.7
0.120	29.9	18.1	-32.0	26.0	-58.0
0.560	32.0	17.7	9.7	32.6	-22.9
2.100	33.7	18.3	12.0	30.0	-18.0
24.000	23.8	18.0	1.8	30.0	-28.2

According to RSS-Gen 8.9				
Frequency (kHz)	Field strength (dB μ V/m)	QP calc. (dB μ A/m)	Limit (dB μ A/m)	Dlimit (dB)
9	10.1	-41.4	17.0	-58.4
48	-22.7	-74.2	2.5	-76.7
120	-32.0	-83.5	-5.5	-78.0
560	9.7	-41.8	-18.9	-22.9
2100	12.0	-39.5	-21.9	-17.6
24000	1.8	-49.7	-21.9	-27.8

Note: No emissions detected in the frequency range 9 kHz to 30 MHz. The recorded values are noise values.

30 MHz < f < 1000 MHz:

Vertical:

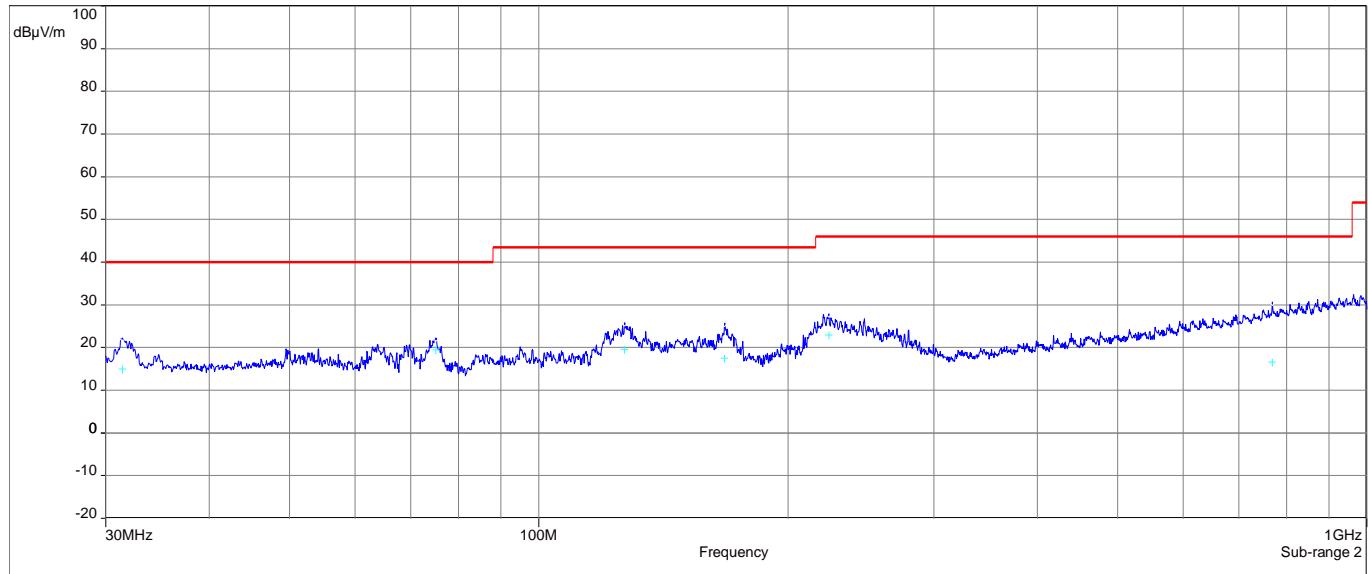


Finals

Frequency (Hz)	QuasiPeak (dB μ V/m)	QP Limit (dB μ V/m)	angle	height	polarization	RBW (Hz)	Meas. Time (s)	Correction (dB)
31.461936 M	29.667	40.0	252	1.07	Vertical	120000	0.01	-12.906
34.7754965 M	21.804	40.0	306	1.02	Vertical	120000	0.01	-12.914
50.3840852 M	6.343	40.0	357	3.35	Vertical	120000	0.01	-10.87
75.0396475 M	28.641	40.0	256	1.12	Vertical	120000	0.01	-14.019
147.6971223 M	19.761	43.5	86	1.02	Vertical	120000	0.01	-9.025
230.9857123 M	15.487	46.0	96	1.86	Vertical	120000	0.01	-11.84

Horizontal:

— FCC/Part 15C (15.209) 3m B - Avg/3.0m/
— FCC/Part 15C (15.209) 3m B - Q-Peak/3.0m/
— FCC/Part 15C (15.209) 3m B - Peak/3.0m/
— Peak (Horizontal)
+ quasipeak (finals) (vertical) (Horizontal)



Finals

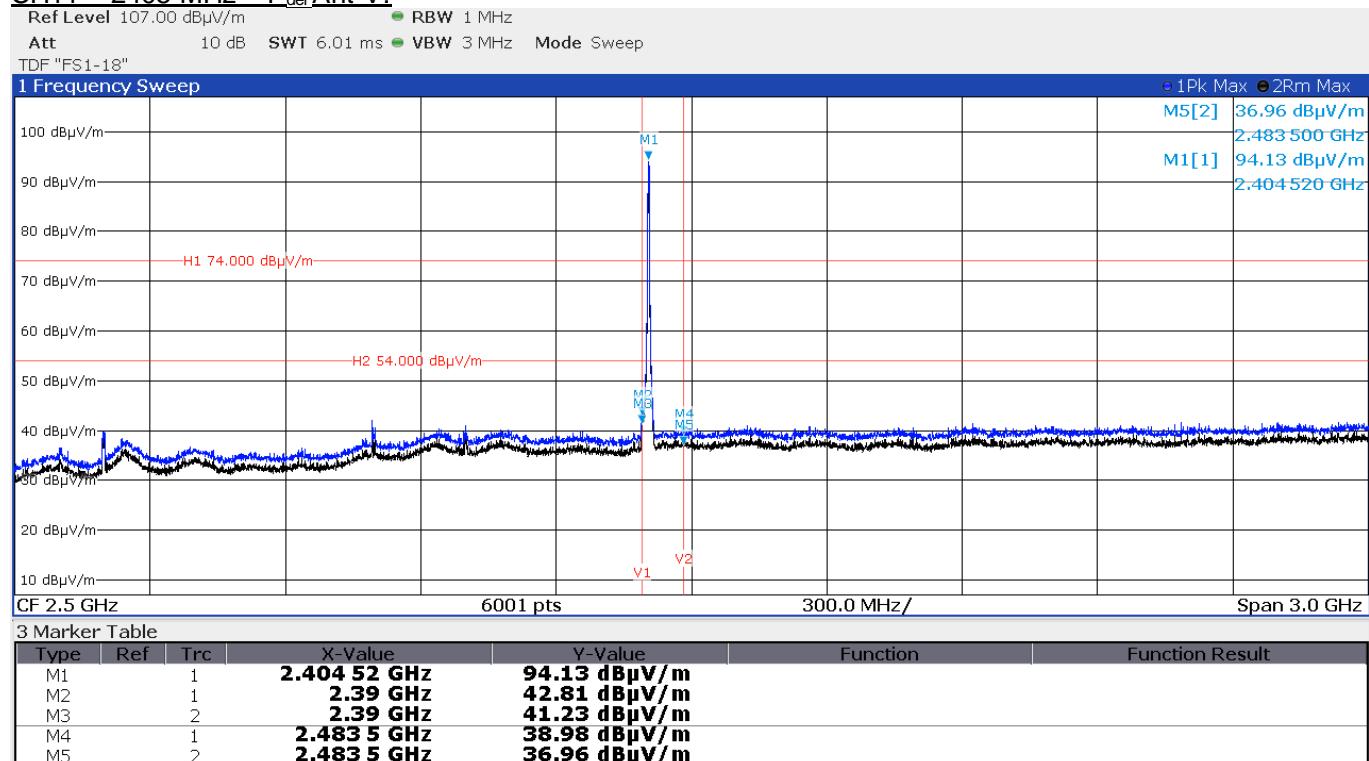
Frequency (Hz)	QuasiPeak (dBµV/m)	QP Limit (dBµV/m)	angle	height	polarization	RBW (Hz)	Meas.Time (s)	Correction (dB)
31.4651403 M	14.994	40.0	115	1.95	Horizontal	120000	0.01	-10.964
75.0996535 M	19.421	40.0	201	2.66	Horizontal	120000	0.01	-14.053
126.9949923 M	19.614	43.5	194	3.27	Horizontal	120000	0.01	-11.563
167.7391923 M	17.515	43.5	306	1.22	Horizontal	120000	0.01	-9.896
224.0350115 M	22.899	46.0	140	1.07	Horizontal	120000	0.01	-12.228
768.5210975 M	16.631	46.0	132	2.2	Horizontal	120000	0.01	1.101

Note: No emissions detected in the frequency range 30 MHz to 1 GHz. The recorded values are noise values.

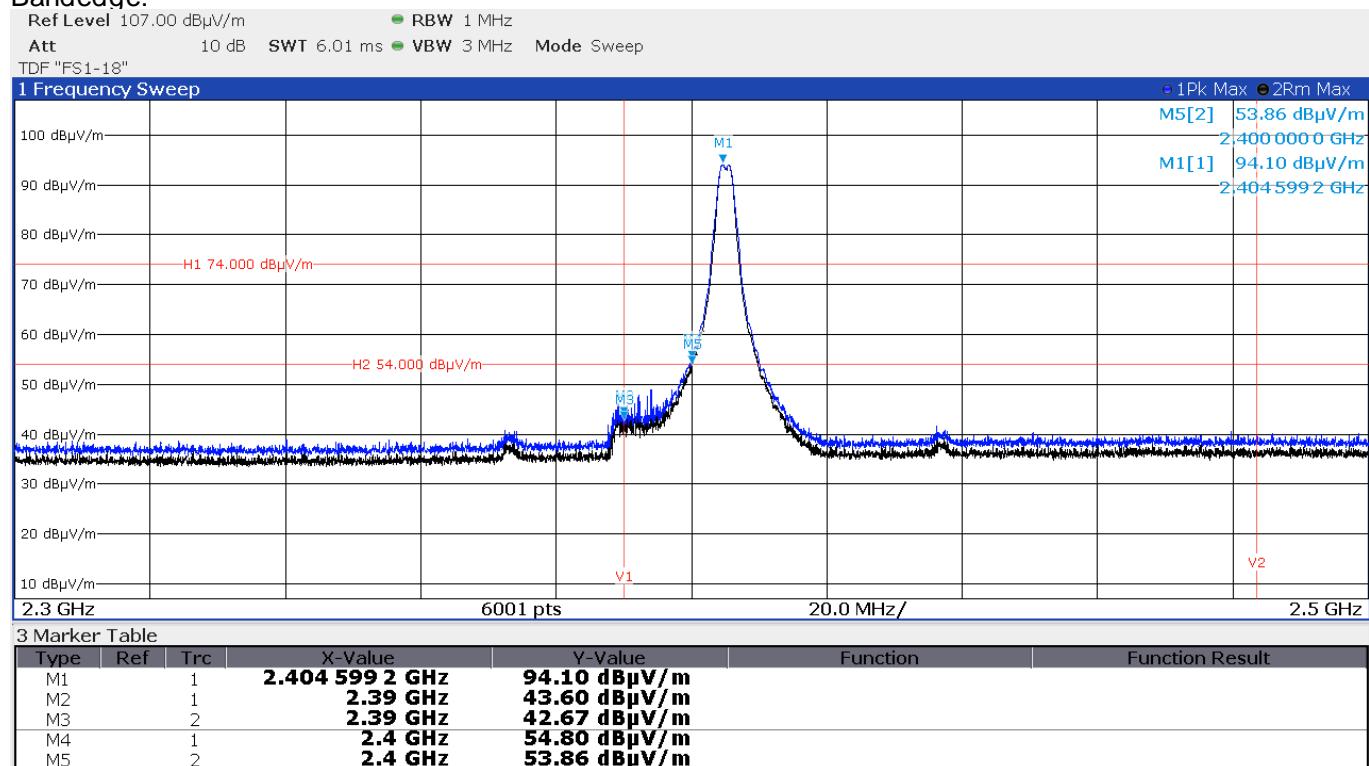
$f > 1000$ MHz

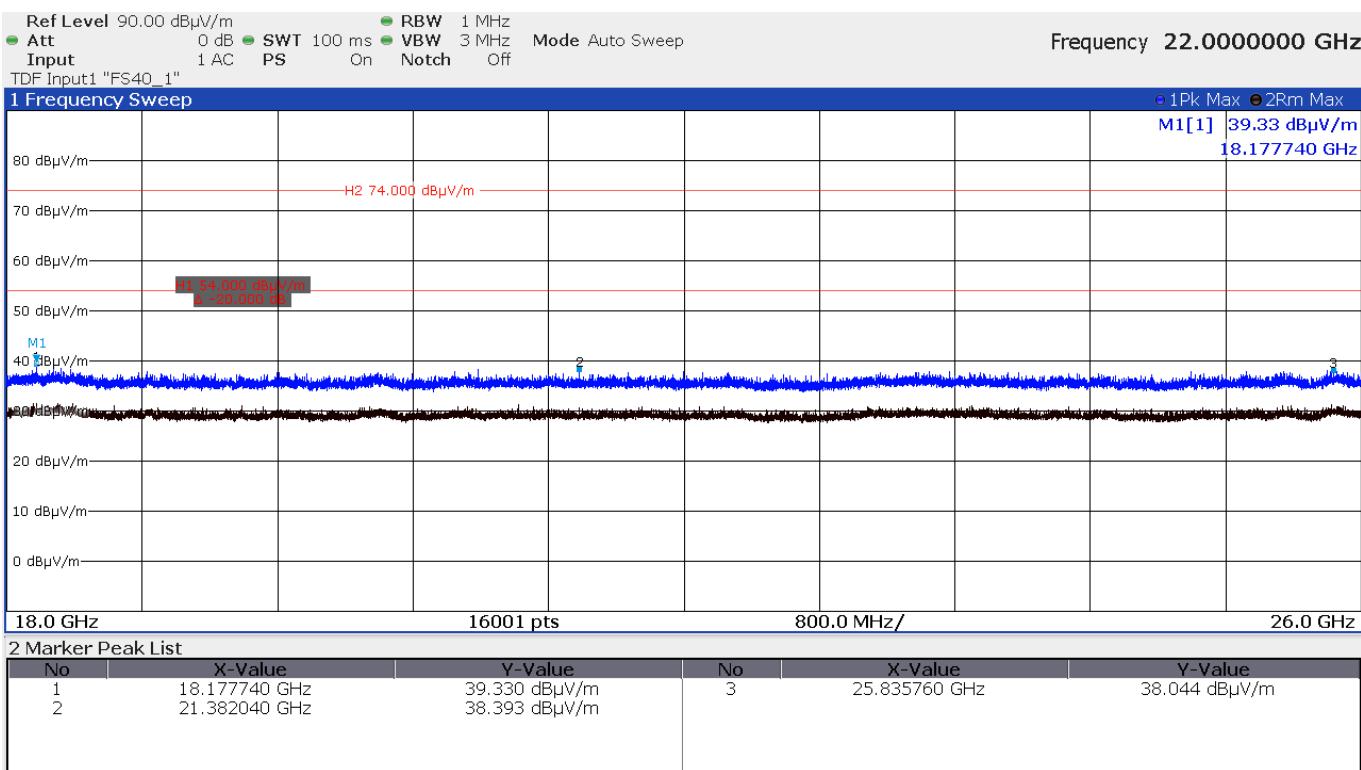
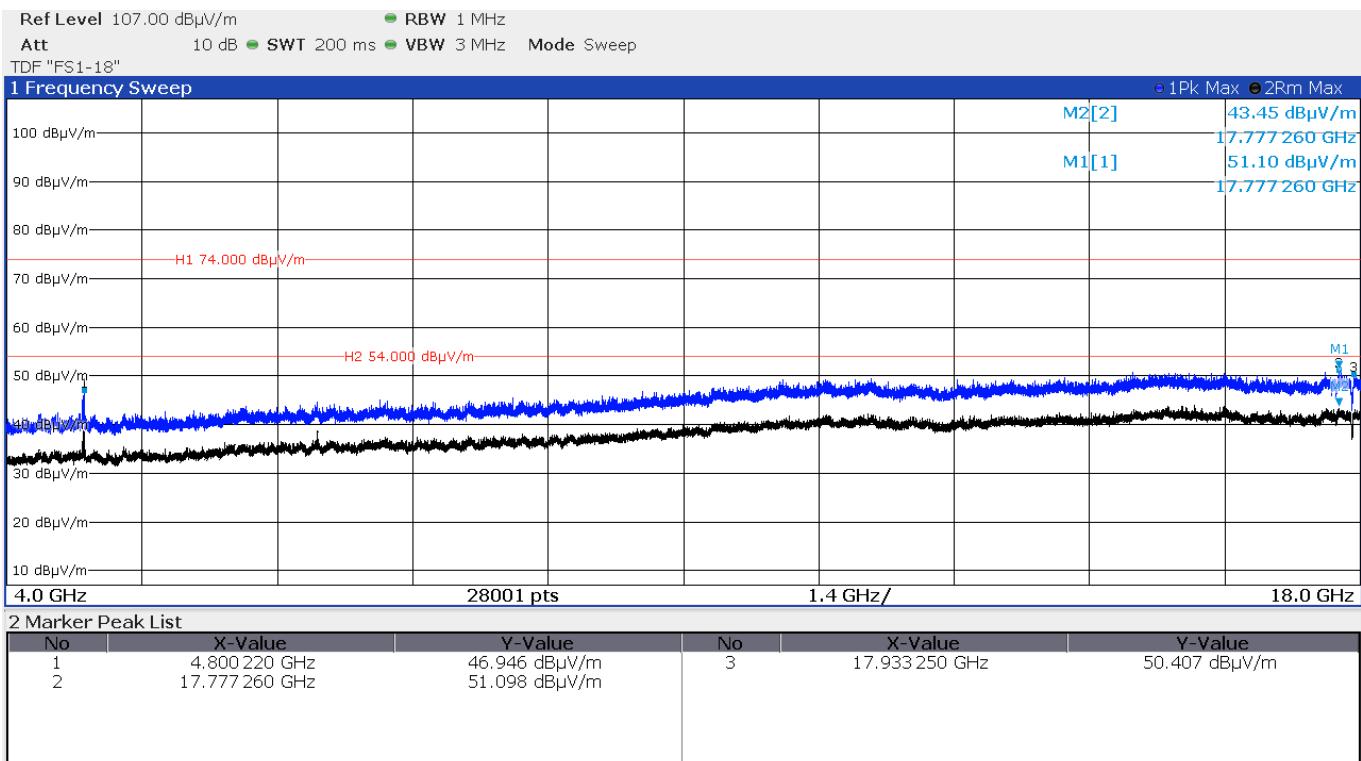
Measurement of emissions according to General Limit specified in section 15.209(a) / RSS-Gen 8.9:

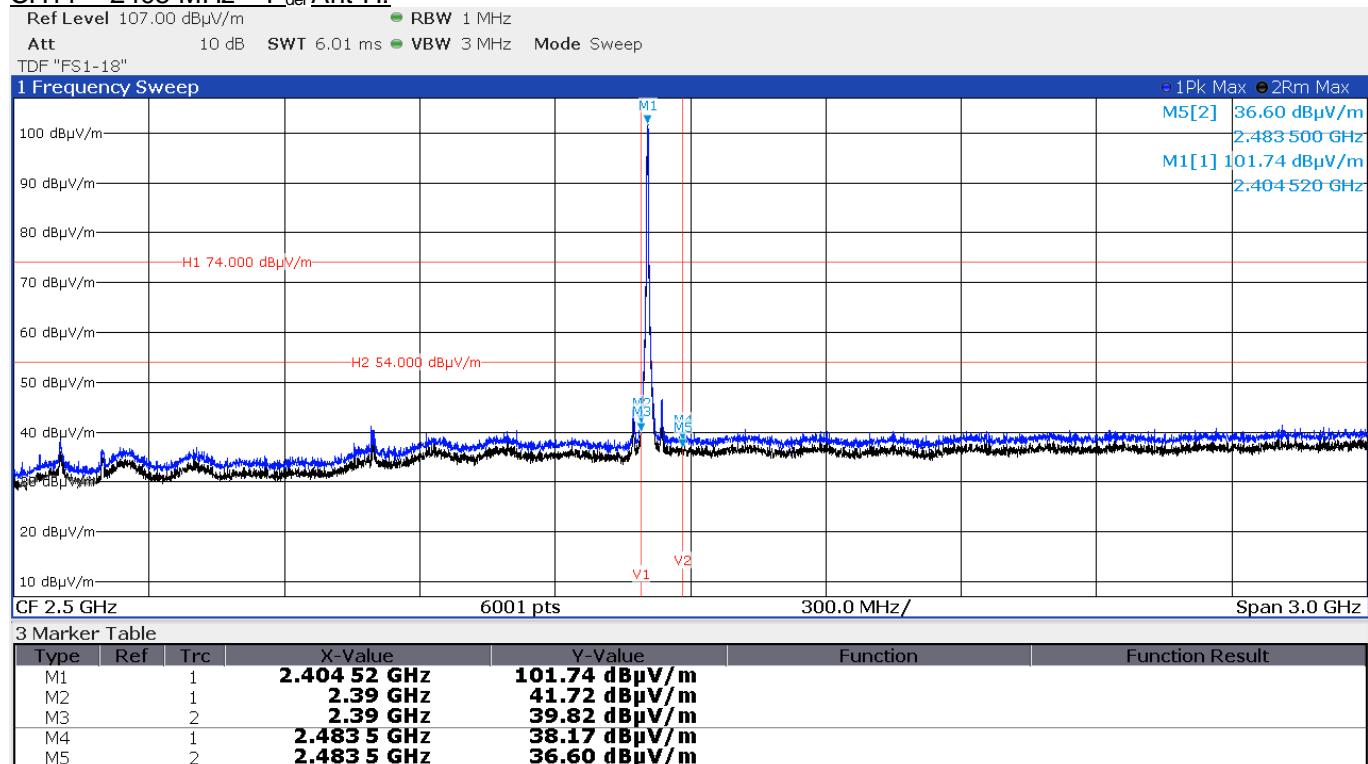
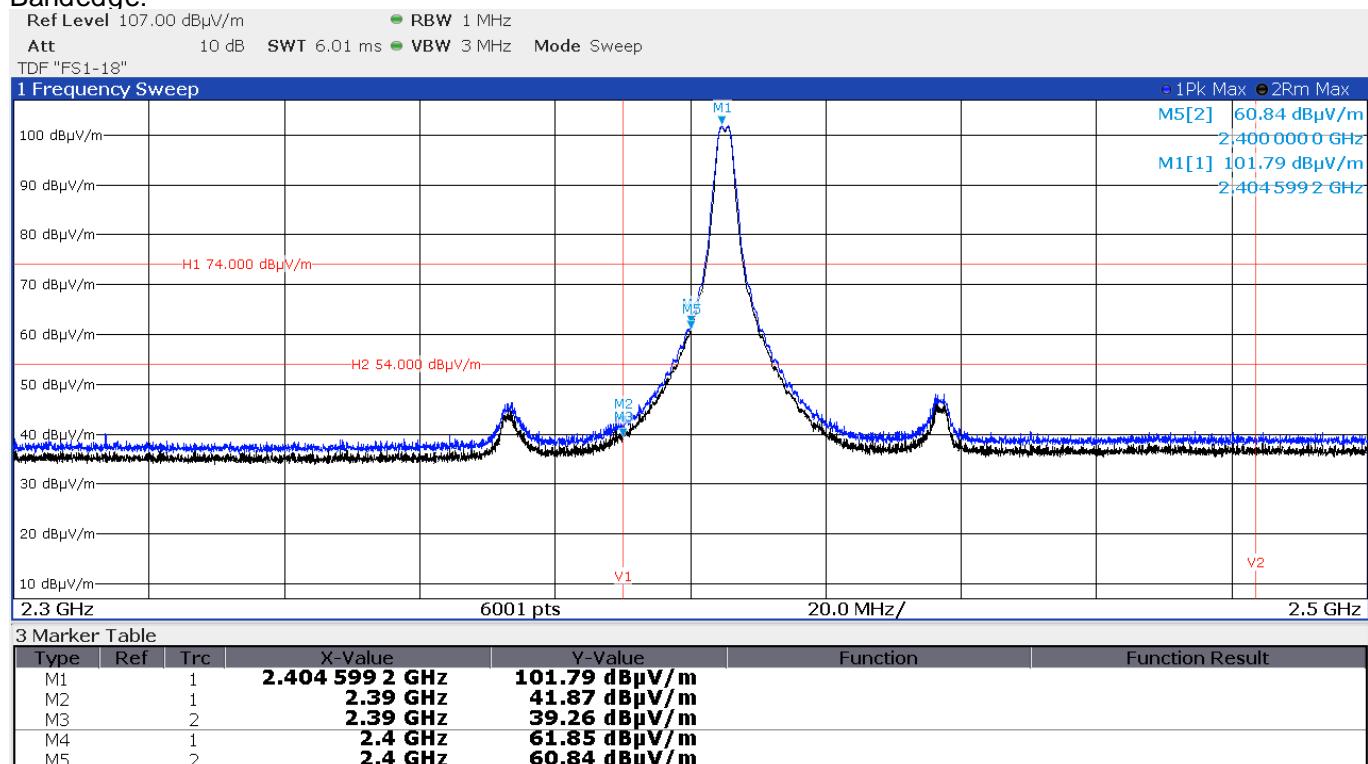
CH11 – 2405 MHz – P_{def} Ant-V:

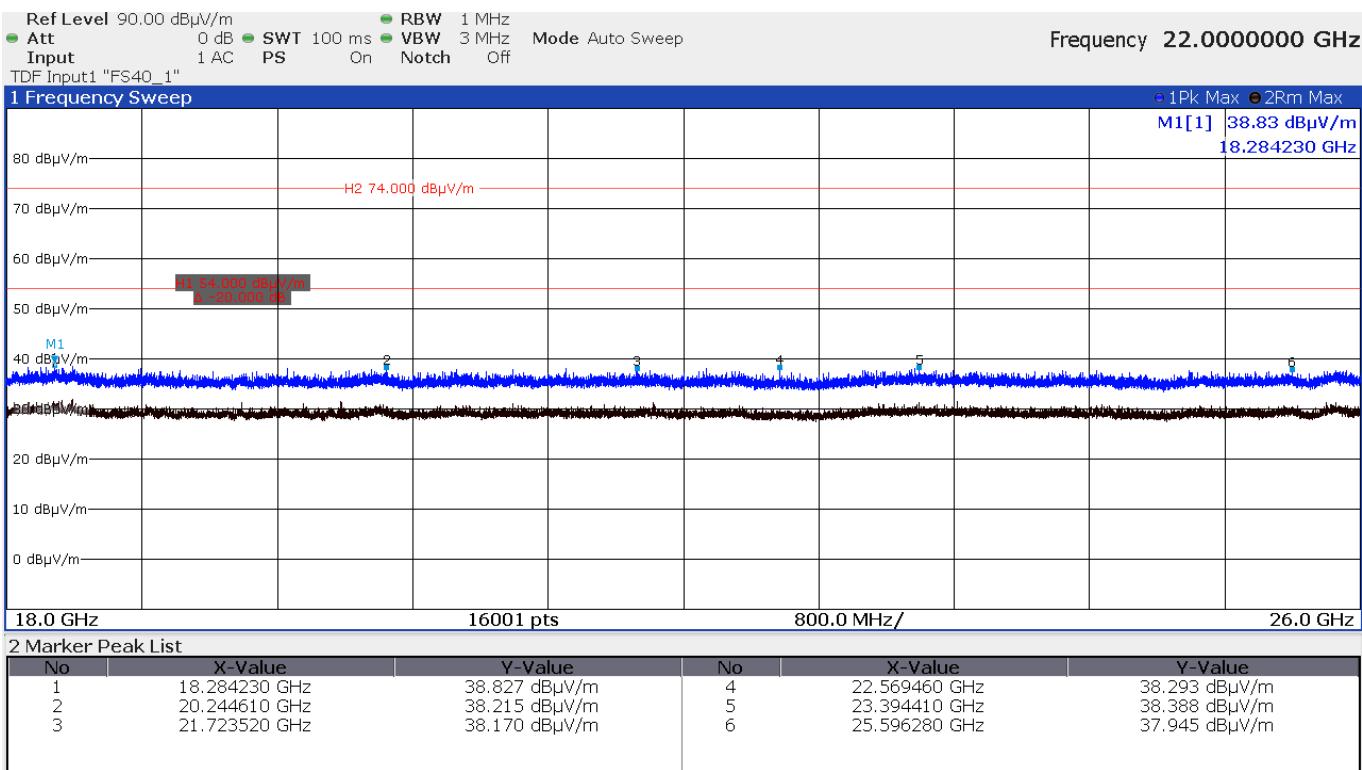
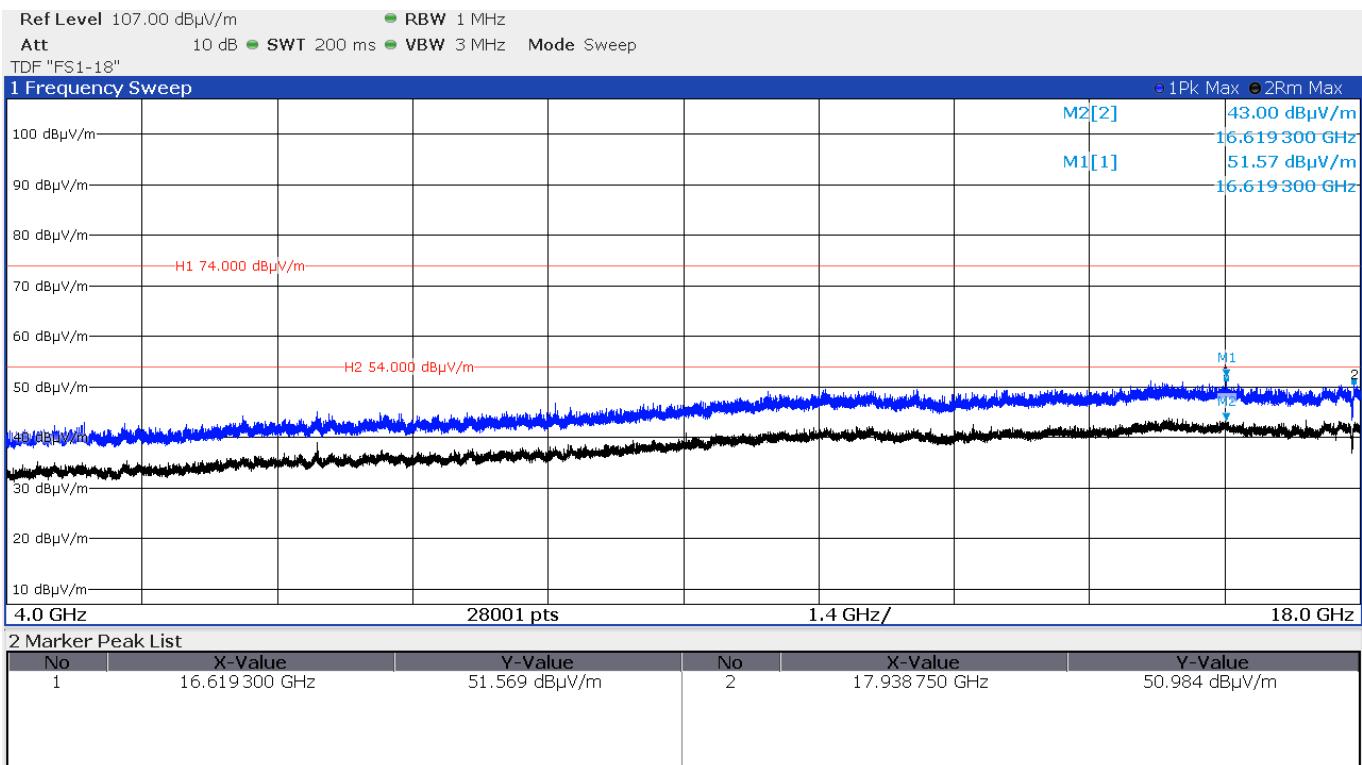


Bandedge:

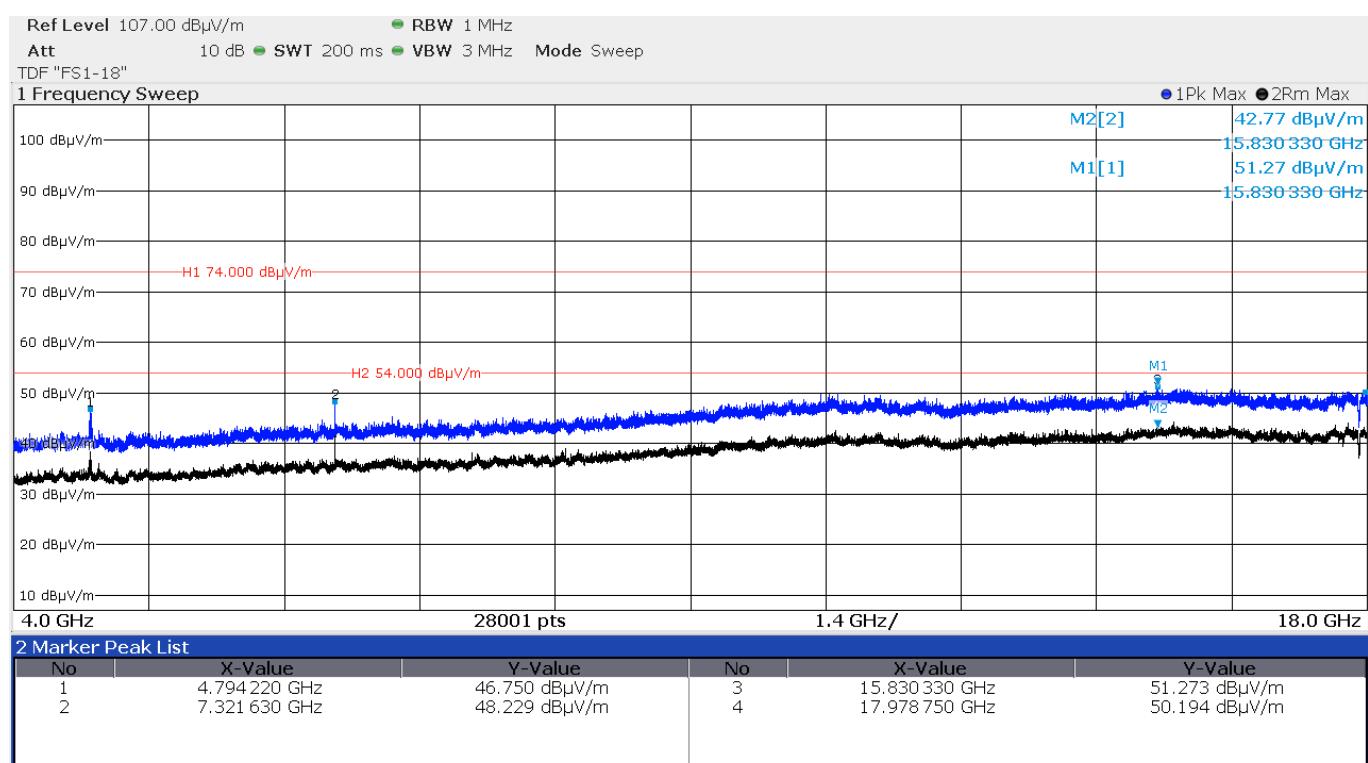
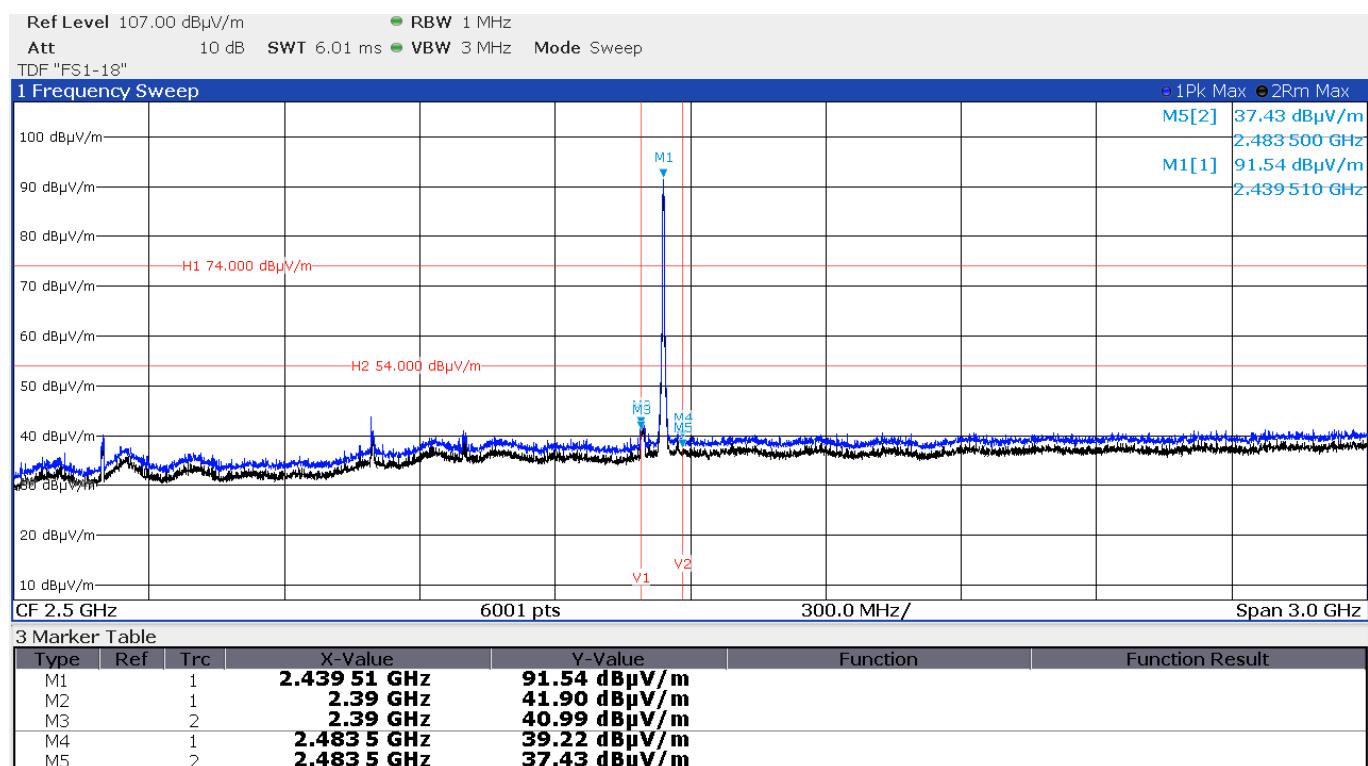


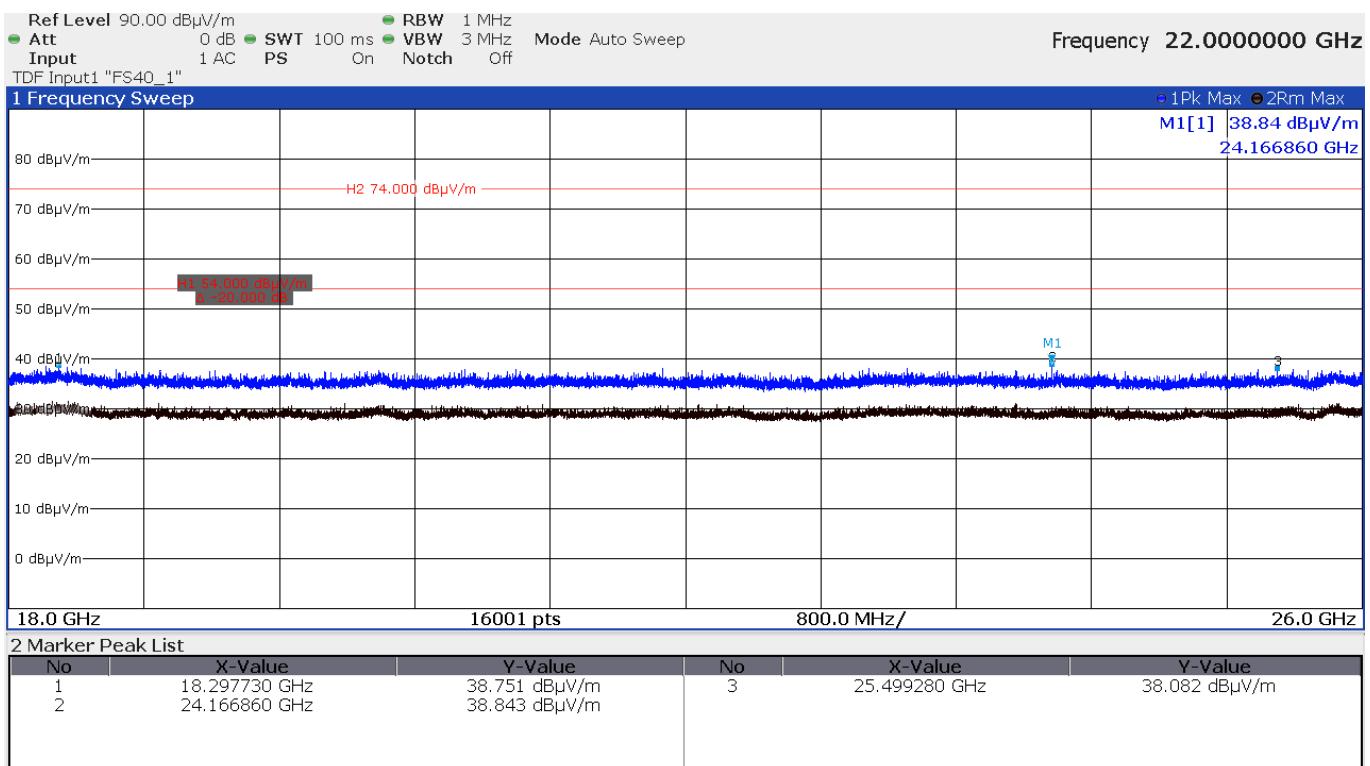


CH11 – 2405 MHz – P_{def} Ant-H:

Bandedge:


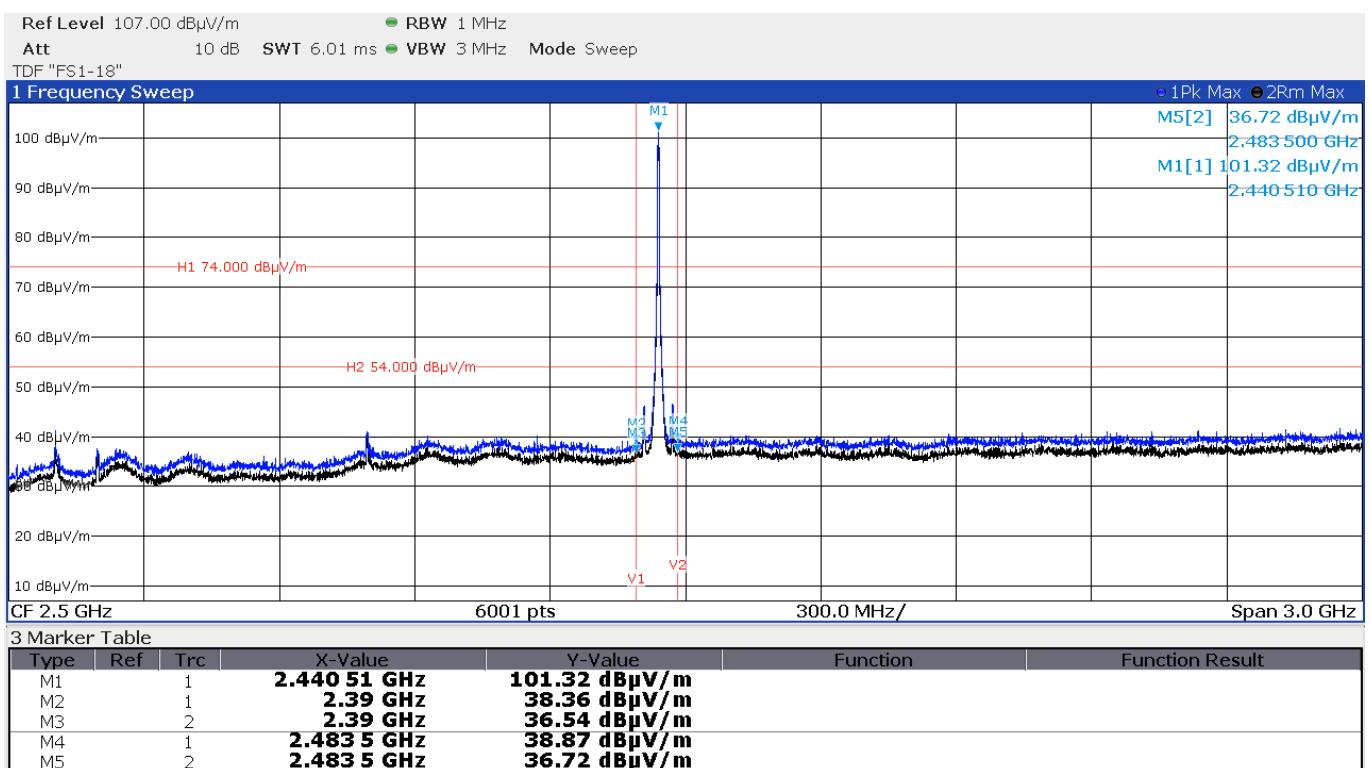


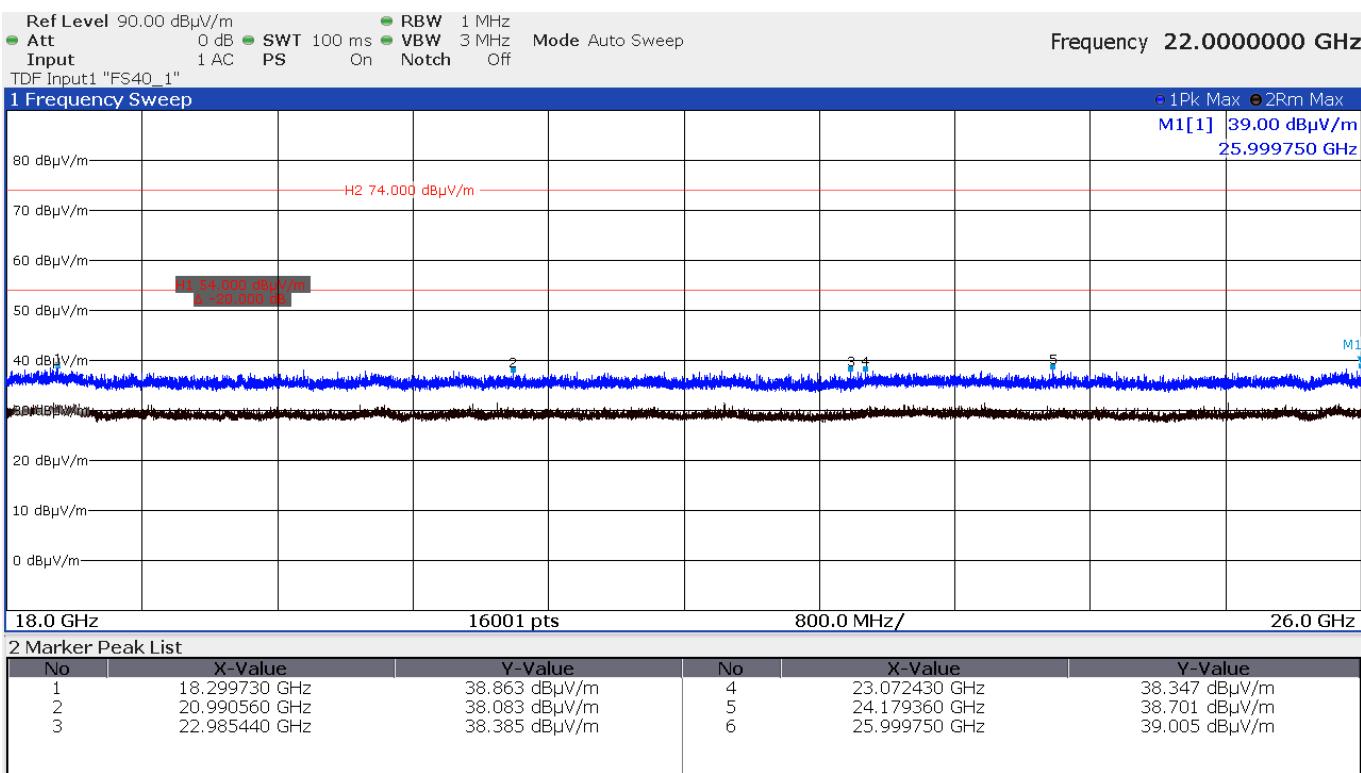
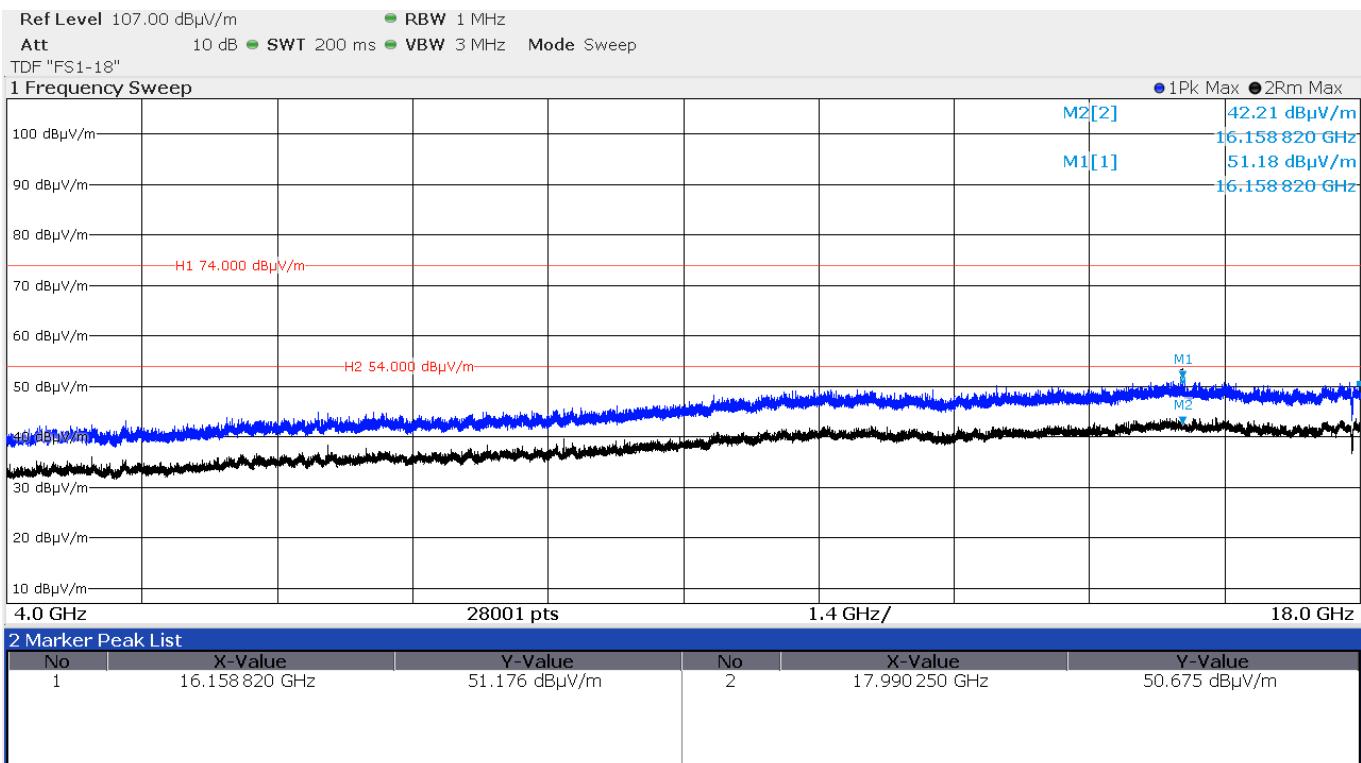
CH18 – 2440 MHz – P_{def} Ant-V:



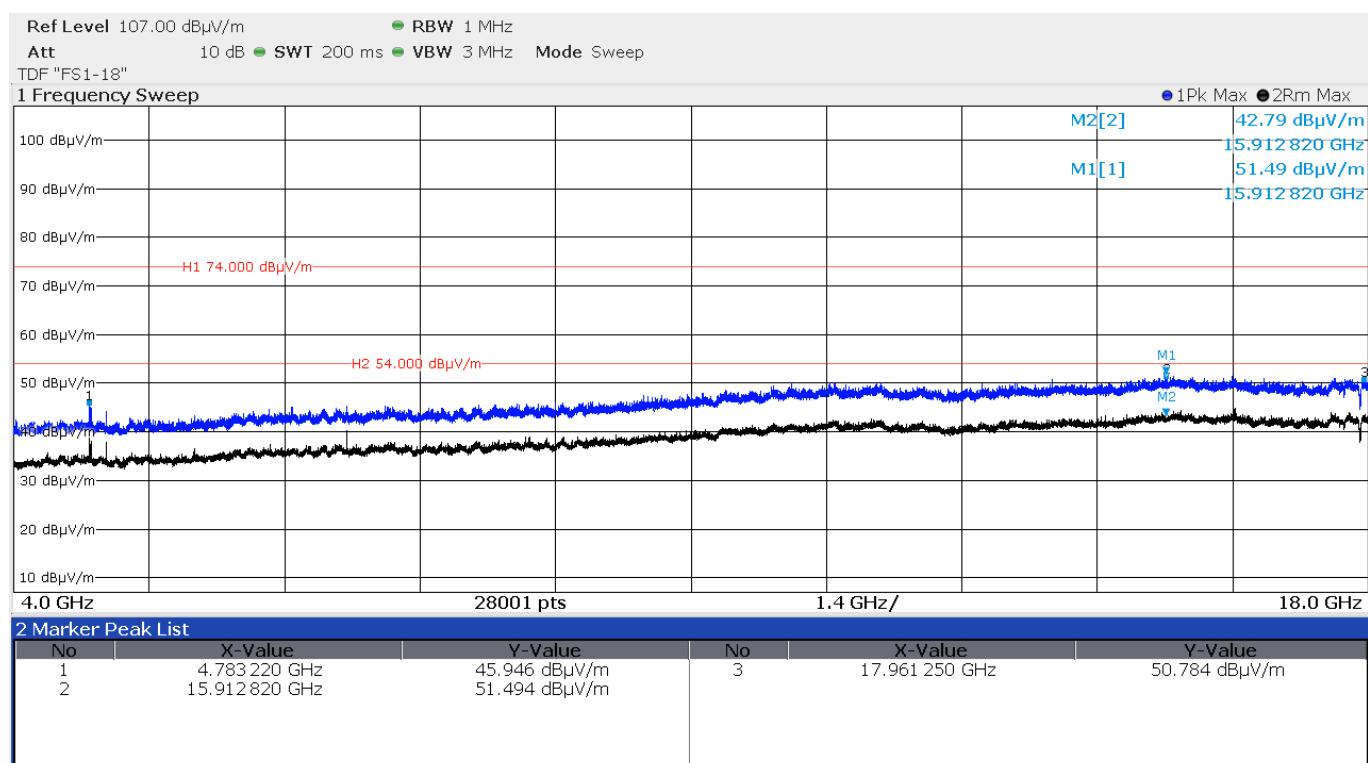
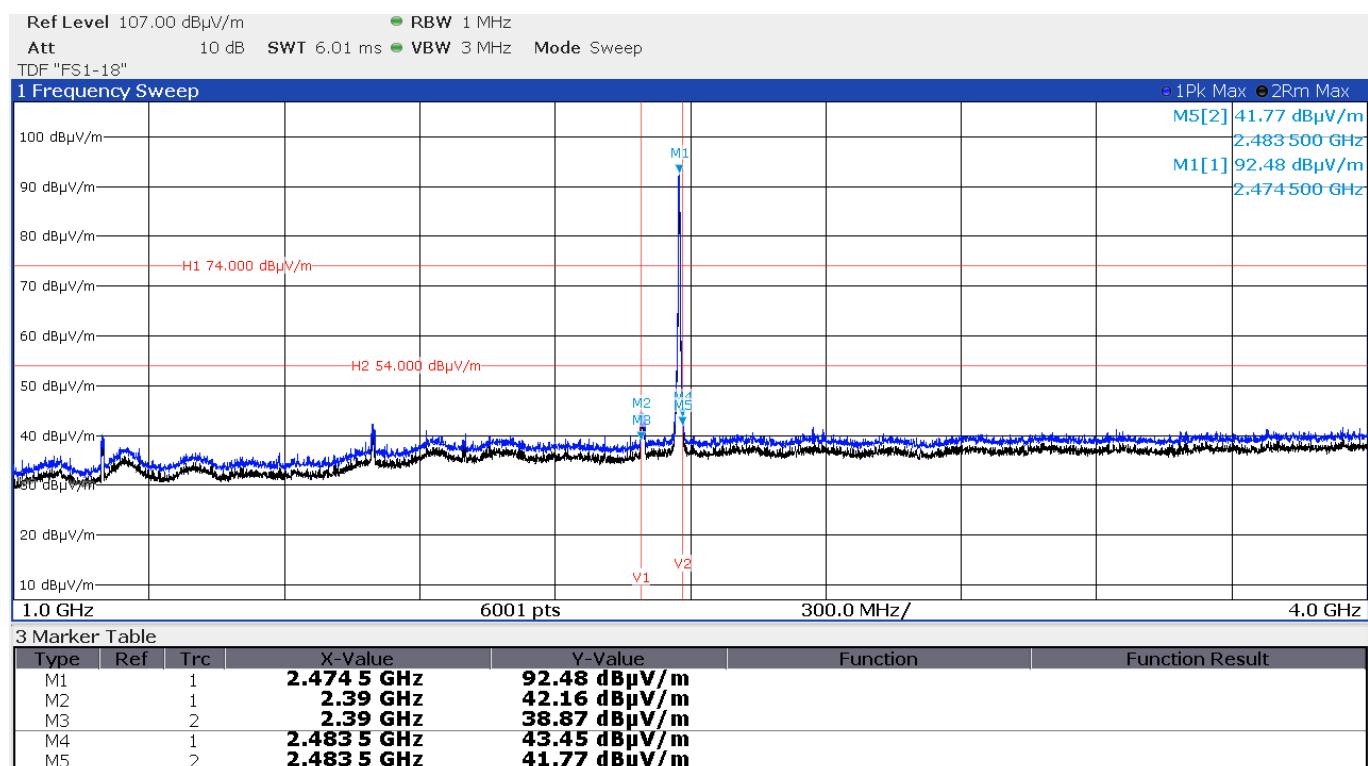


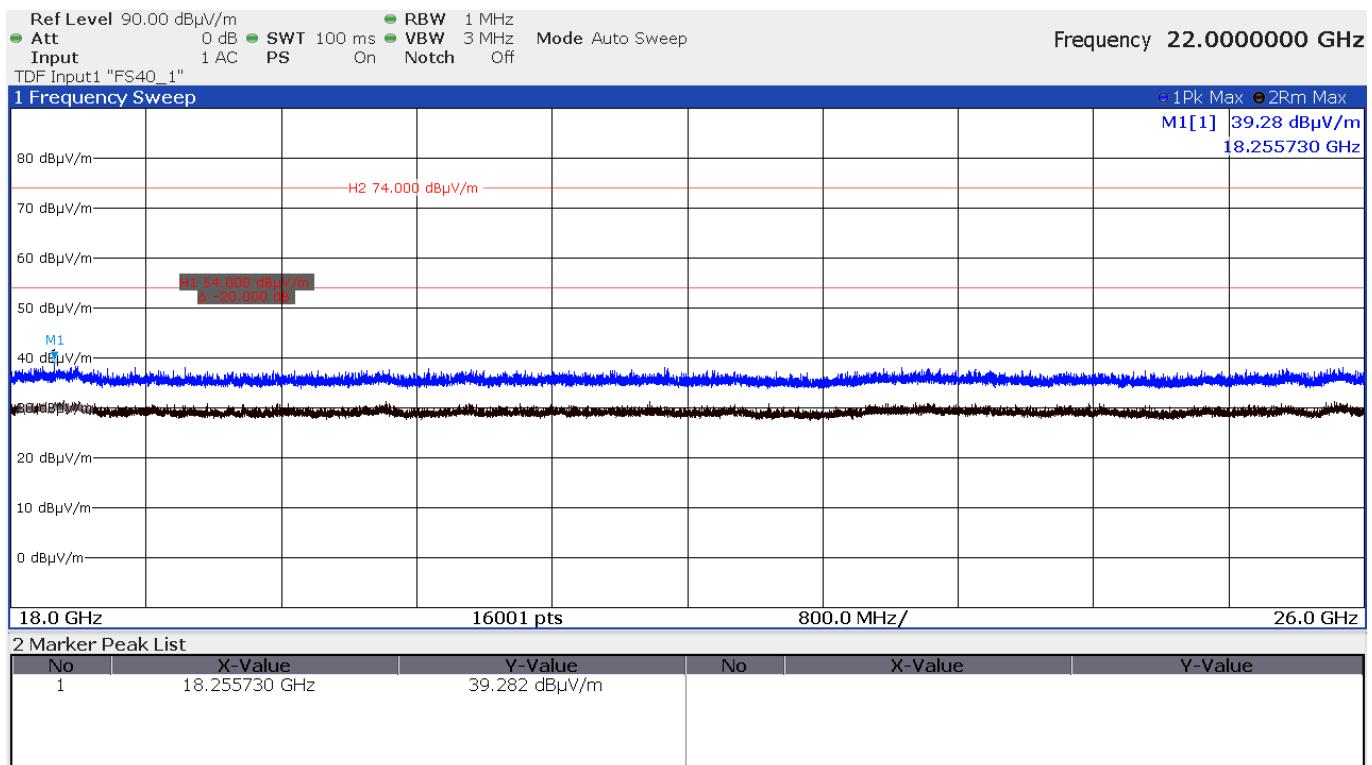
CH18 – 2440 MHz – P_{def} Ant-H:



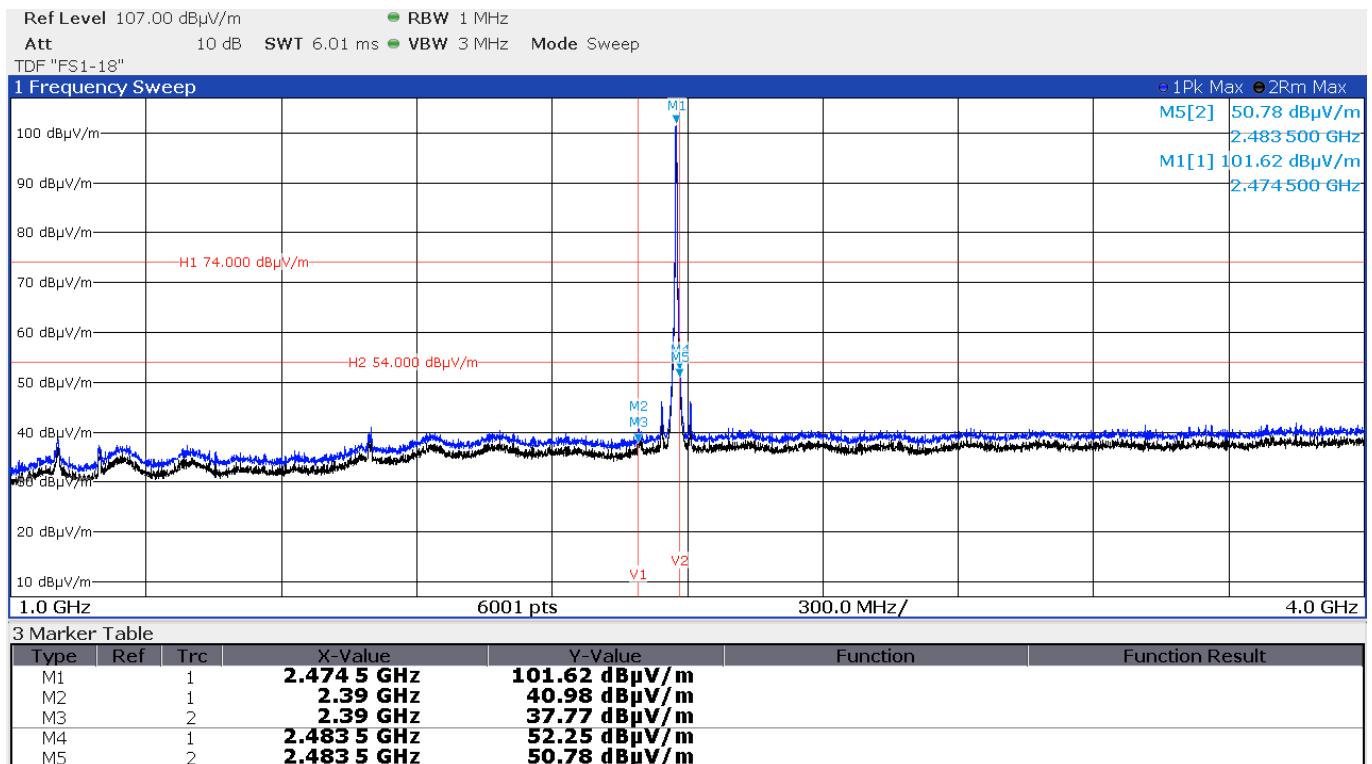


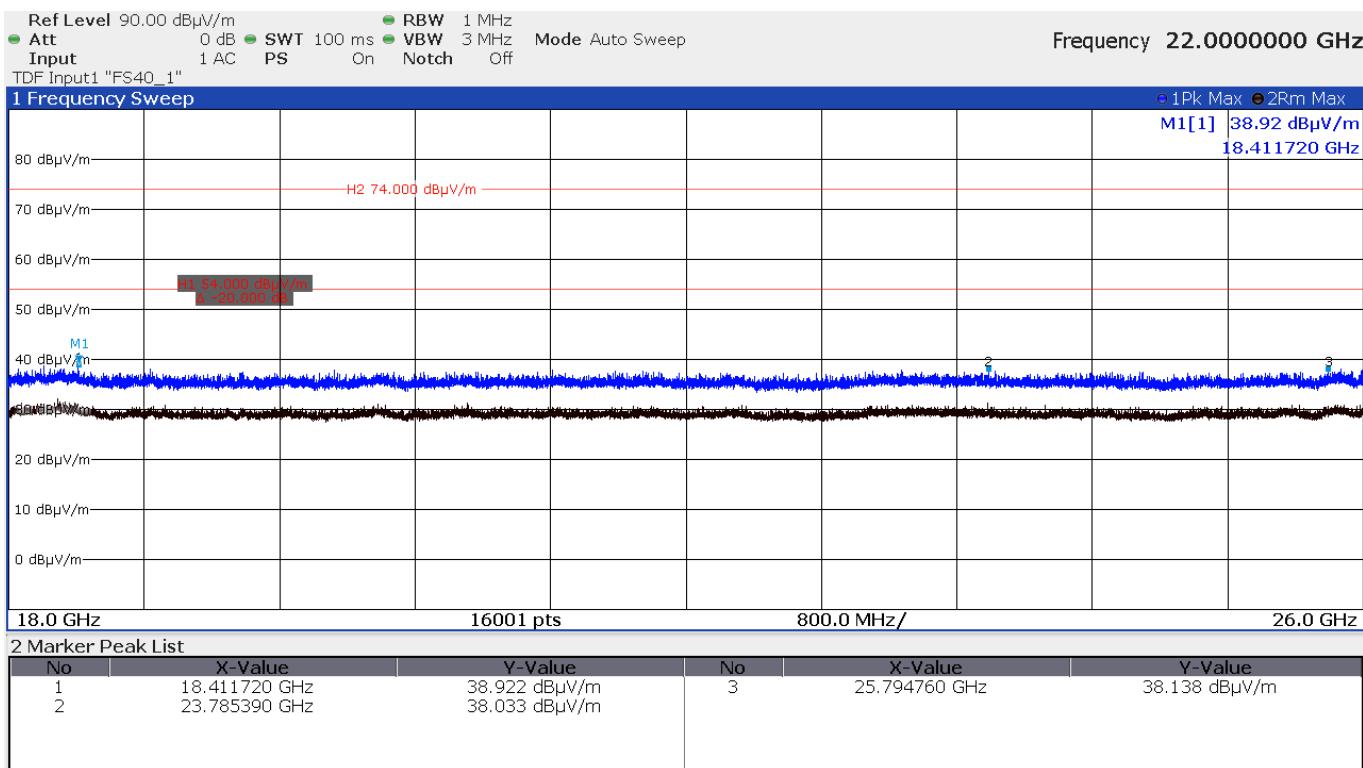
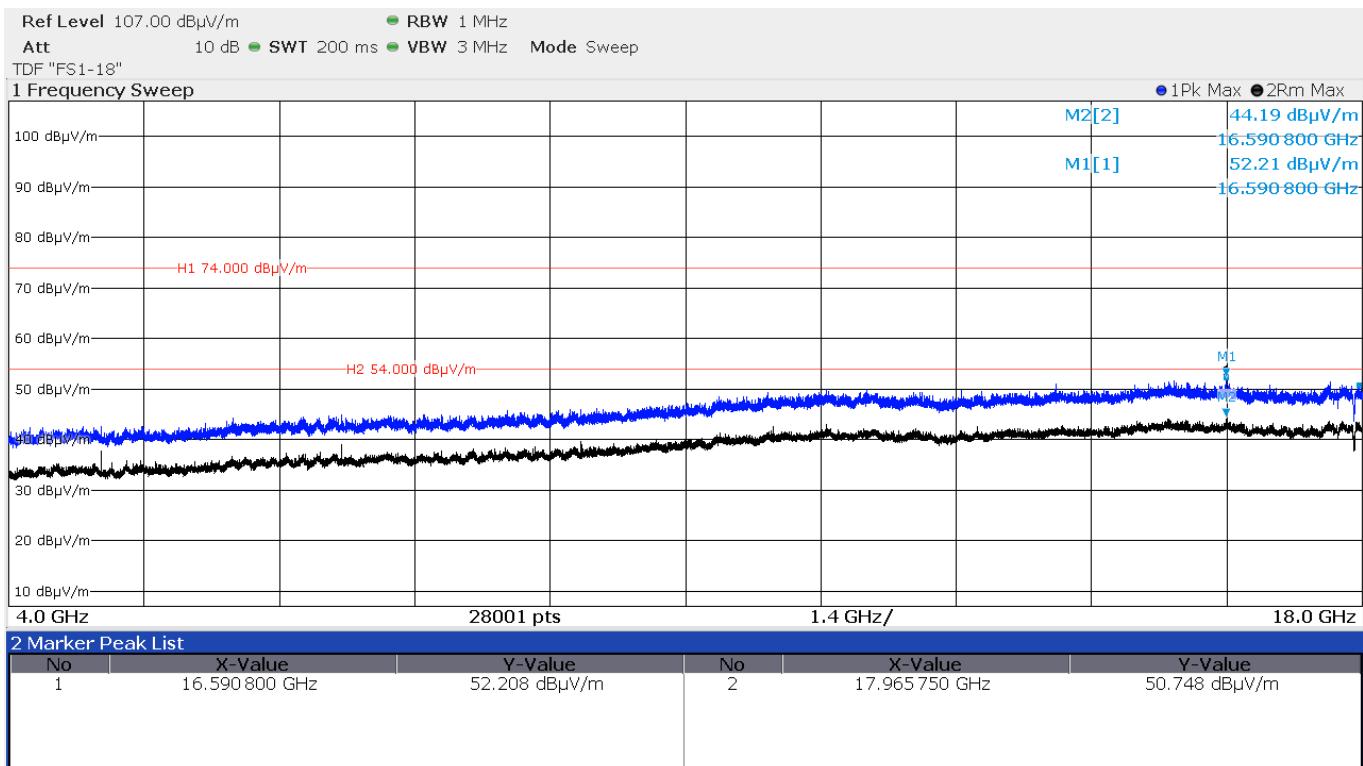
CH25 – 2475 MHz – P_{def} Ant-V:





CH25 – 2475 MHz – P_{def} Ant-H:





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

Frequency (MHz)	15.209 Limits (μ V/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 (μ A/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 (μ V/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.
- Measurement of emissions according to spurious emissions limit specified in section 15.247(d) /
- RSS-247 5.5 not necessary as PK values are below general limit.
- Frequency range 18 - 26 GHz: Test distance reduced from 3 to 1 m, transducer factor adjusted accordingly for evaluation of 3 m limit.
- Measurements performed on the 29.11.2024, 07.01.2025 and 04.02.2025.

5.6 Antenna application

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 an integrated antenna. No other antenna can be used with the device.

The supplied antenna meets the requirements of part 15.203.

The requirements are **FULFILLED**.

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.
CPR 3	ESW26 AMF-6D-01002000-22-10P 3117 BAM 4.5-P KK-SF106-2X11N-6,5M 0_5 Meter DC-18GHz	02-02/03-17-002 02-02/17-15-004 02-02/24-20-007 02-02/50-17-024 02-02/50-18-016 09-16/50-23-003	16/04/2025	16/04/2024		
SER 1	ESR 7 HFH2-Z2E IN600 KK-7.8F-2XNM_4.0M KK-7.8F-2XNM_4.5M KK-7.8F-2XNM_9.5M 50F-003 N 3dB CDB-10K-18-50V-NMF-I KK-SF526S-2X11N-10.0M BAT-EMC 2023.0.8.0	02-02/03-17-001 09-02/24-21-001 09-02/50-21-015 09-02/50-21-018 09-02/50-21-023 09-02/50-21-025 09-02/50-22-002 09-02/50-22-031 09-02/50-25-002 09-02/68-21-002	22/10/2025	22/10/2024		
SER 2	ESR 7 VULB 9168 NW-2000-NB KK-EF393/U-16N-21N20 m KK-SD_7/8-2X21N-33,0M 50F-003 N 3 dB	02-02/03-17-001 02-02/24-05-005 02-02/50-05-113 02-02/50-12-018 02-02/50-15-028 02-02/50-21-010	22/10/2025 15/05/2025	22/10/2024 15/05/2024		15/05/2025 15/05/2024
SER 3	ESW26 AMF-6D-01002000-22-10P 3117 BAM 4.5-P KK-SF106-2X11N-6,5M 0_5 Meter DC-18GHz	02-02/03-17-002 02-02/17-15-004 02-02/24-20-007 02-02/50-17-024 02-02/50-18-016 09-16/50-23-003	16/04/2025	16/04/2024		
CPC	ESW26 OSP-B157W8 with OSP120 OSP-B157WX with OSP120 Sucoflex N-1000-SMA KMS116-GL140SE-KMS116- 2.4/5.2/5.8GHz Antenna + S Semflex K-400-K SMB-K27 PULSETRAIN	02-02/03-17-002 02-02/30-13-002 02-02/30-18-007 02-02/50-05-072 02-02/50-16-010 02-02/50-17-027 02-02/50-19-013 02-02/68-19-001	16/04/2025 05/07/2025 08/07/2025	16/04/2024 05/07/2024 08/07/2024		

- End of test report -