RF – TEST REPORT

- FCC Part 15.247, RSS-247, partly -

Type / Model Name	:	PRA 91 (02)
Product Description	:	Automatic Tripod
Applicant	:	Hilti Corporation
Address	:	Feldkircherstrasse 100
		9494 SCHAAN, LIECHTENSTEIN
Manufacturer	:	Hilti Corporation
Address	:	Feldkircherstrasse 100
		9494 SCHAAN, LIECHTENSTEIN

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

Test Report No. :	**80183250-04 Rev_1**	03. December 2024 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (May 2024)

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 (May 2024)

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

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03,	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2
KDB 558074 D01 v05r02	Guidance for compliance measurements on DTS; FHSS and hybrid system devices operating under Section 15.247 of the FCC rules, April 2, 2019.

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:

This report covers the emissions of the Hilti BLE Module "2392755" in combination with the host device PRA 91 (02).

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

2.5 Equipment type

BLE device

2.6 Short description of the equipment under test (EUT)

The PRA 91 is an automatic tripod onto which a rotating laser can be fitted. The tripod can be moved upwards and downwards using a remote control unit. Using the tripod and the rotating laser fitted to it, a horizontal laser plane can be established which is directed onto a particular target height. Examples of applications using the rotating laser are the transfer of meter marks, horizontal alignment at a target height or the examination of horizontal heights. The combination of the automatic tripod, the rotating laser and the laser receiver enables a laser plane to be automatically aligned onto a precise point. In this operation, only the target height has to be indicated using the laser receiver and the automatic tripod moves the laser plane of the rotating laser exactly to the required height.

Number of tested samples:	1
Serial number:	Sample for testing
Firmware version:	1.1.0-264

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:

Channel No.	Frequency (MHZ)	Channel No.	Frequency (MHZ)
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

Note: the marked frequencies are determined for final testing.

2.9 Transmit operating modes

The EUT uses GFSK modulation and may provide following data rates:

- 125 kbps (kbps = *kilobits per second)*

2.10 Antenna

The following antenna shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)
1	Omni	PCB inverted F antenna	PCB	2.4 – 2.5	1.1

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 7.2 V DC

2.12 Peripheral devices and interface cables

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

- Battery adapter incl. USB and DC cables Model : Made by applicant
- Notebook Model : HP EliteBook 840

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.

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:

Wireless system	Available channel	Tested channels	Modulation	Modulation type	Data rate
802.15.1	0 - 39	37, 39	DSSS	GFSK	125 kbps

2.13.1 Test jig

No test jig is used.

2.13.2 Test software

The applicant provides a special software that allows enabling a continuous transmission modulated and receiving mode for the test samples.

3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	Not applicable
15.247(a)(2)	RSS-247, 5.2.(a)	-6 dB EBW	Not tested
15.247(b)(3)	RSS-247, 5.2(d)	Maximum peak conducted output power	Passed
15.247(b)(4)	-	Defacto limit	Not tested
15.247(d)	RSS-247, 5.5	Out-of-band emission, radiated	Passed
15.247(d)	RSS-Gen, 8.9	Emissions in restricted bands	Passed
15.247(e)	RSS-247, 5.2(b)	PSD	Not tested
15.35(c)	RSS-Gen, 6.10	Pulsed operation	Not tested
15.203	RSS-Gen, 6.6	Antenna requirement	Passed
-	RSS-Gen, 6.11	Transmitter frequency stability	Not tested
-	RSS-Gen, 6.6	99 % Bandwidth	Not tested

The mentioned new RSS Rule Parts in the above table are related to:
RSS-Gen, Issue 5 + Amendment 1 + Amendment 2, March 2019
RSS-247, Issue 3, August 2023

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80183250-04	0	24 June 2024	Initial test report
	1	03 December 2024	clause 3: correction of references in summary table clause 4.5.3.2.4: correction of table height clause 5: removing test setup photos, see attachment B clause 5.3: clarification of measurement procedure

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

3.2 Final assessment

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

Date of receipt of test sample	:	acc. to storage records
Testing commenced on	:	27 May 2024
Testing concluded on	:	12 June 2024

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document
2024.12.03 10:23:13 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

I am the author of this document
2024.12.03 09:22:51 +01'00'

Franz-Xaver Schrettenbrunner
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%	± 2.5 x 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 30000 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".

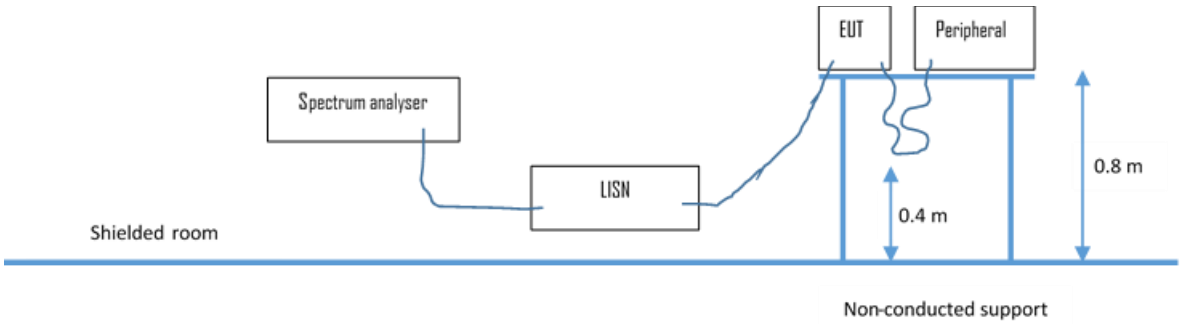
4.5.2.1 Justification

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 dBµV, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

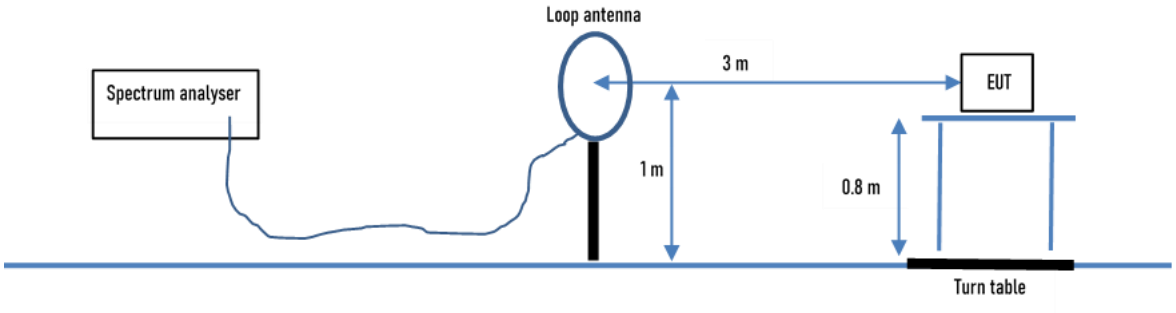
To convert between dBµV and µV, the following conversions apply:
dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

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 Ω / 50 µH (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):

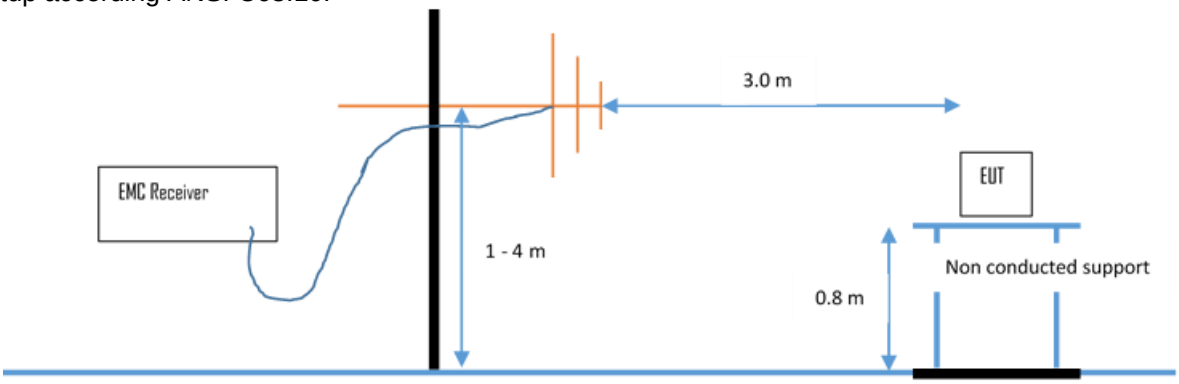
Test setup according ANSI C63.10



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.

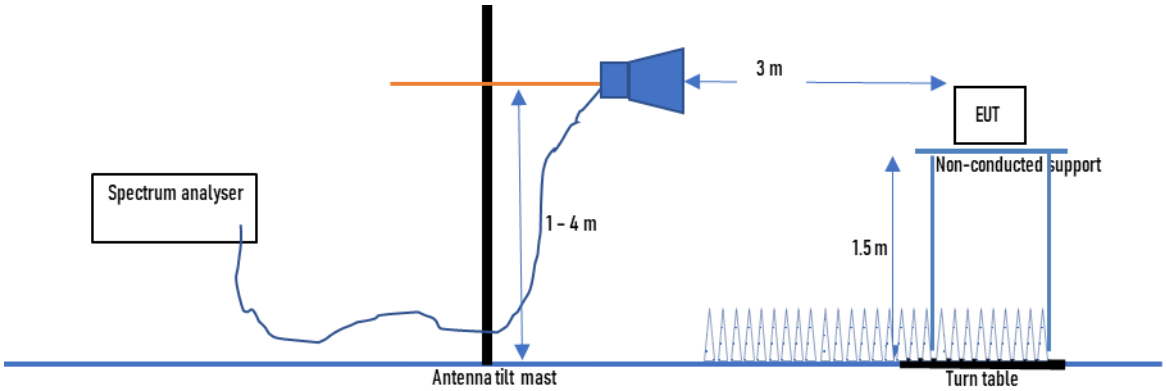
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

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

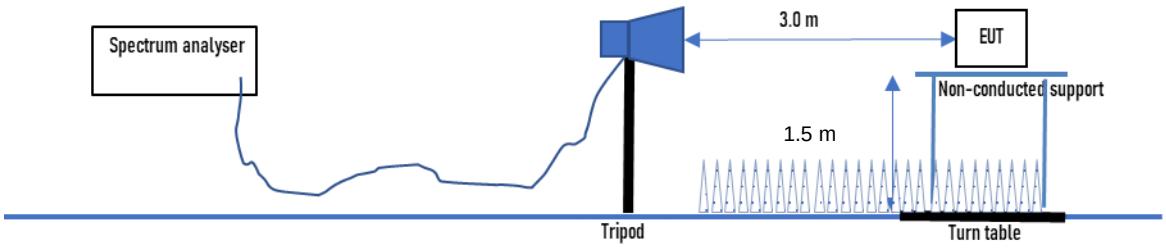
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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 centre, forming a bundle 30 cm to 40 cm long. Measurements are made in 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 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 Maximum peak radiated output power

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

5.1.1 Description of the test location

Test location: Anechoic chamber 1

5.1.2 Photo documentation of the test set-up – Detailed photos see attachment B

5.1.3 Applicable standard

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

5.1.4 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 11.9.2.2. The EUT is set in TX continuous mode while measuring. The radiated measurement was performed in terms of fieldstrength. Therefore, the formula set out in ANSI C63.10, item 9.5 (Equation 22) is changed into the following term:

$$E = EIRP - (20*\log_{10}(3)) + 104.7$$

5.1.5 Test result

802.15.1, 125 kbps, TX		Test results radiated			
		Fieldstrength E (dBµV/m)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Lowest frequency: CH37					
T_{nom}	V_{nom}	106.3	11.1	36.0	-24.9
Highest frequency: CH39					
T_{nom}	V_{nom}	105.6	10.4	36.0	-24.6

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

Frequency (MHz)	Peak Power Limit	
	(dBm)	(W)
902-928	36	4.0
2400-2483.5	**36**	**4.0**
5725-5850	36	4.0

The requirements are **FULFILLED.**

Remarks: None.

5.2 Radiated emissions in restricted bands

For test instruments and accessories used see section 6 Part **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 – Detailed photos see attachment B

5.2.3 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).

5.2.4 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.

Test receiver settings for SER2:
RBW: 120 MHz, Detector: Quasi peak, Mes. Time: 1 s,

Spectrum analyser settings for SER3:
RBW: 1 MHz, VBW: 3 MHz, Detector: Max. peak, Trace: Max. hold, Sweep: Auto

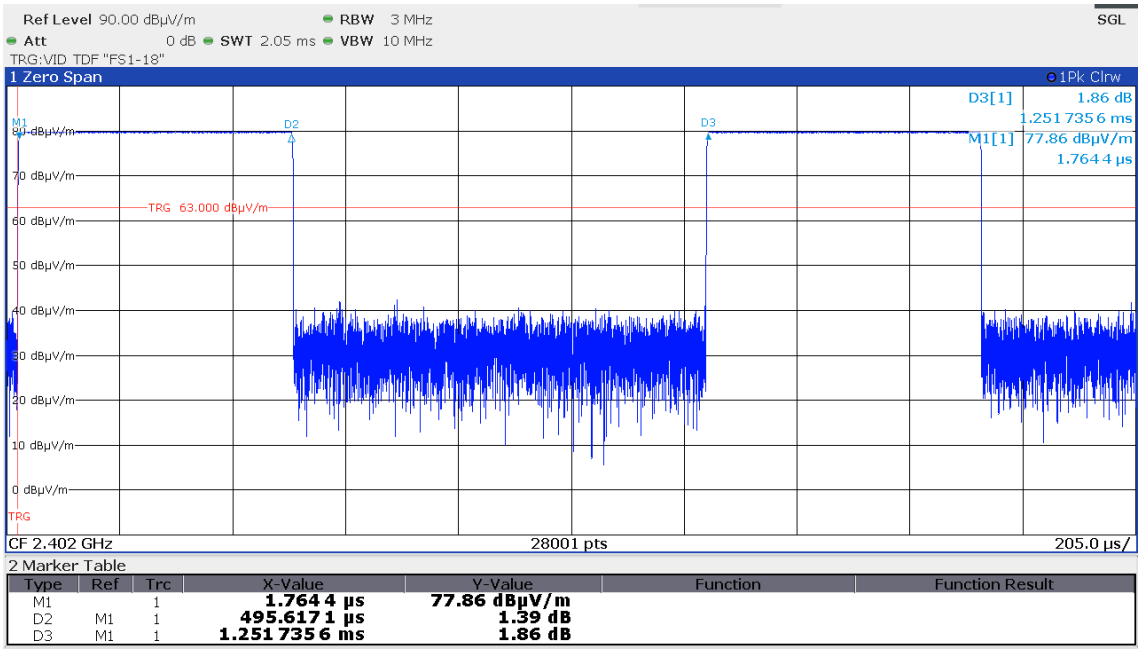
5.2.5 Test result

f < 1000 MHz

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
84.00	16.2	3.9	13.8	13.7	30.0	17.6	40.0	-10.0
119.89	1.1	2.2	17.3	16.8	18.4	19.0	43.5	-24.5
190.49	4.8	4.6	17.7	17.1	22.5	21.7	43.5	-21.0
368.20	-4.1	-2.5	22.3	22.7	18.2	20.2	46.0	-25.8
424.19	-0.6	-9.0	23.9	24.2	23.3	15.2	46.0	-22.7
710.00	-9.2	-9.1	30.0	30.5	20.8	21.4	46.0	-24.6

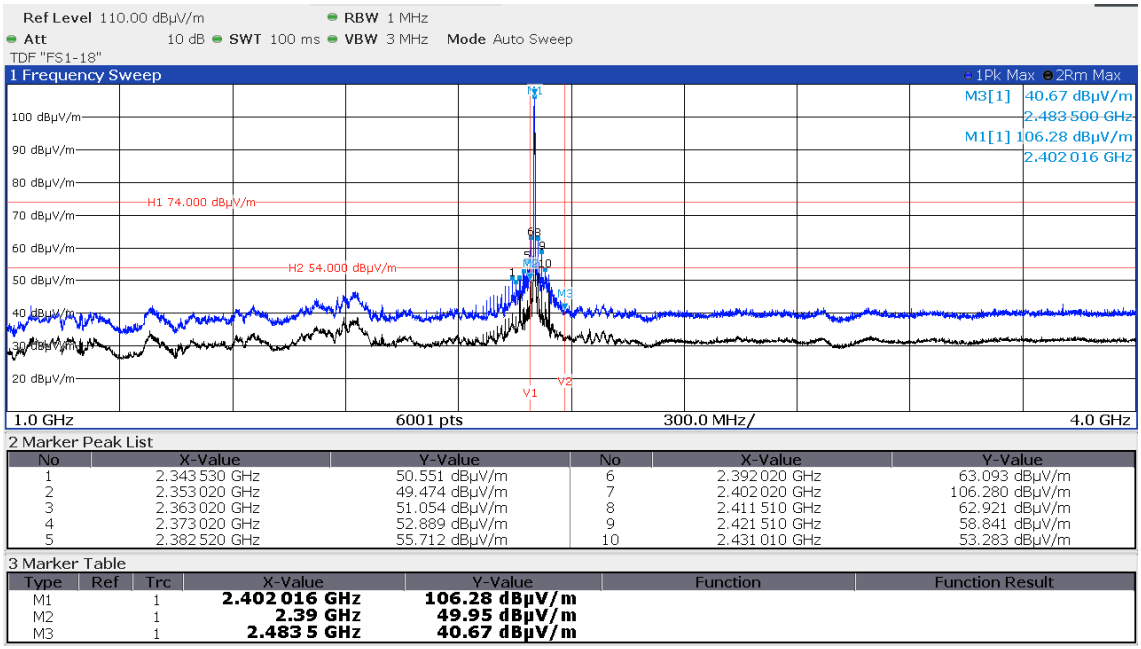
f > 1000 MHz

Duty Cycle of the EUT



According to procedures for duty cycle correction, the factor can be calculated as δ(dB) = 20log(Δ). The duty cycle is equal for all used frequencies with T_{ON} = 495.6µs and T_{OFF} = 756.1 µs, therefore all peak values can be corrected with a factor **δ(dB) = -8.0 dB.**

CH37 horizontal

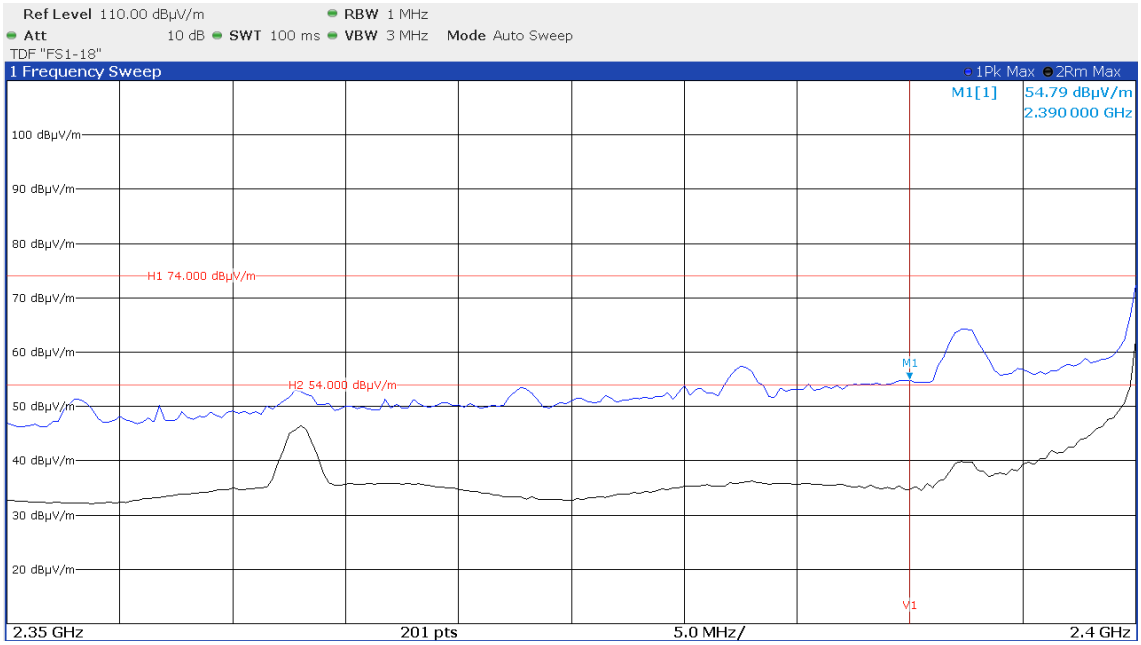


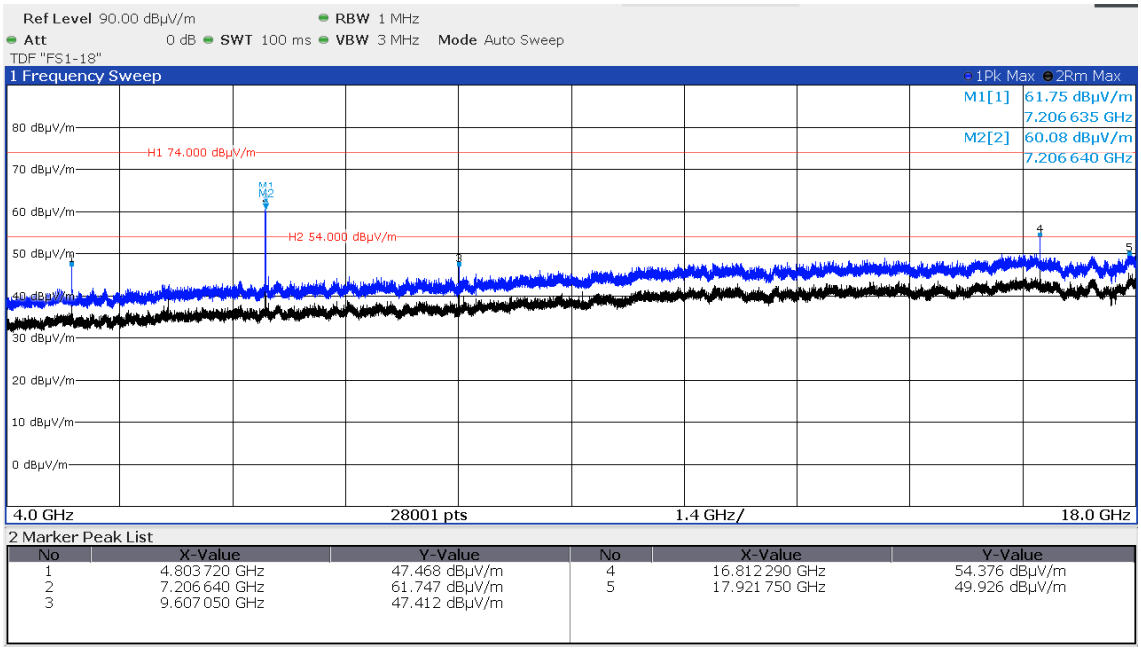
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	2.343 530 GHz	50.551 dBµV/m	6	2.392 020 GHz	63.093 dBµV/m
2	2.353 020 GHz	49.474 dBµV/m	7	2.402 020 GHz	106.280 dBµV/m
3	2.363 020 GHz	51.054 dBµV/m	8	2.411 510 GHz	62.921 dBµV/m
4	2.373 020 GHz	52.889 dBµV/m	9	2.421 510 GHz	58.841 dBµV/m
5	2.382 520 GHz	55.712 dBµV/m	10	2.431 010 GHz	53.283 dBµV/m

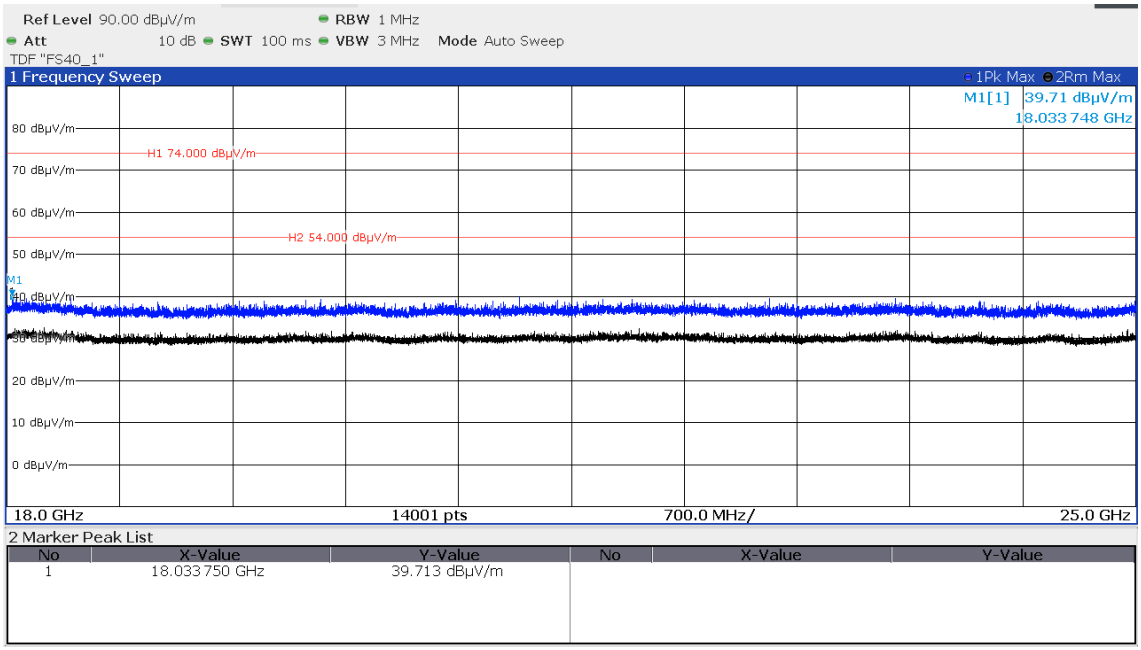
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.402 016 GHz**	**106.28 dBµV/m**		
M2		1	**2.39 GHz**	**49.95 dBµV/m**		
M3		1	**2.483 5 GHz**	**40.67 dBµV/m**		

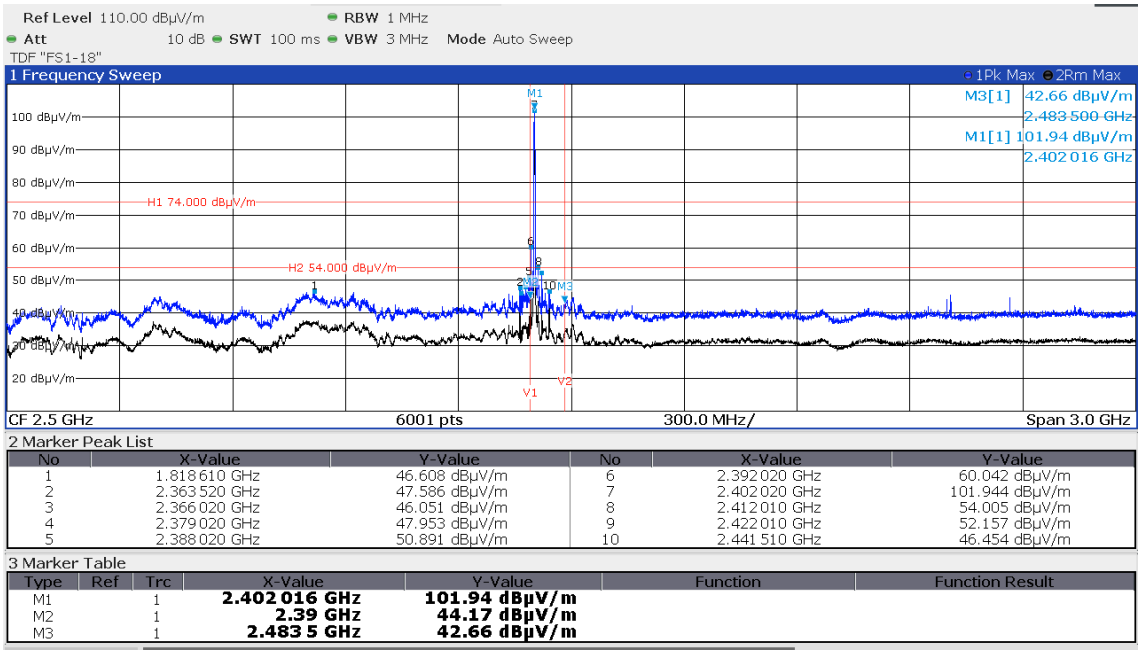


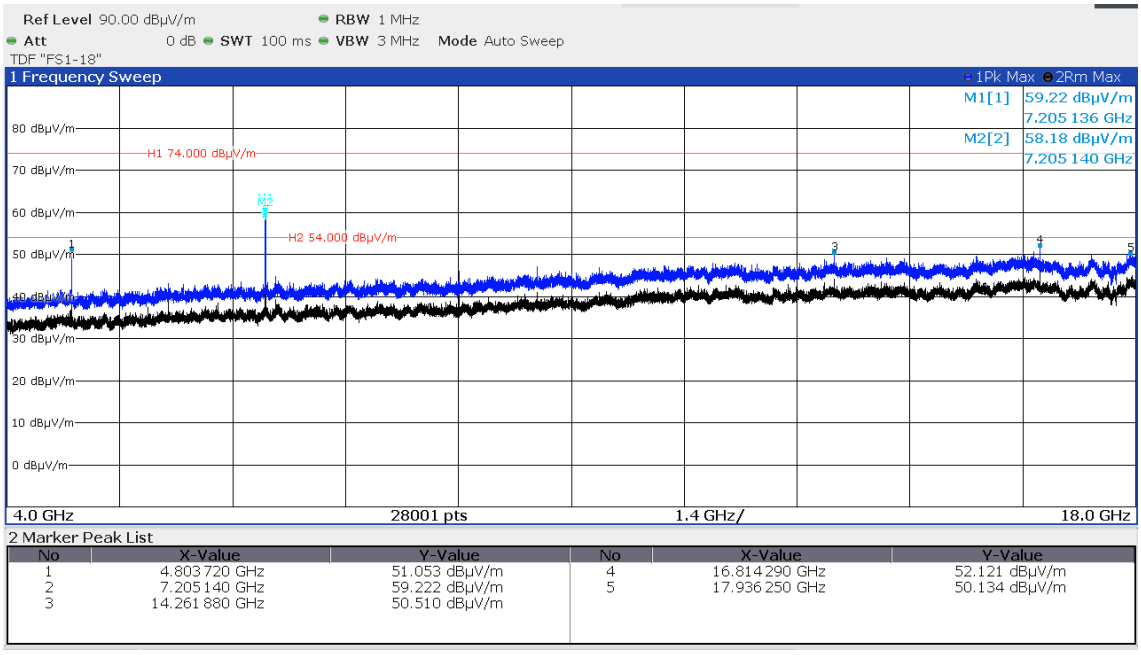


MP (#)	f (GHz)	Peak (dBµV/m)	DC corr. (dB)	AV (dBµV/m)	AV Limit (dBµV/m)	Margin (dB)
2	7.20664	61.7	-8.0	53.7	54.0	-0.3
4	16.81229	54.4	-8.0	46.4	54.0	-7.6

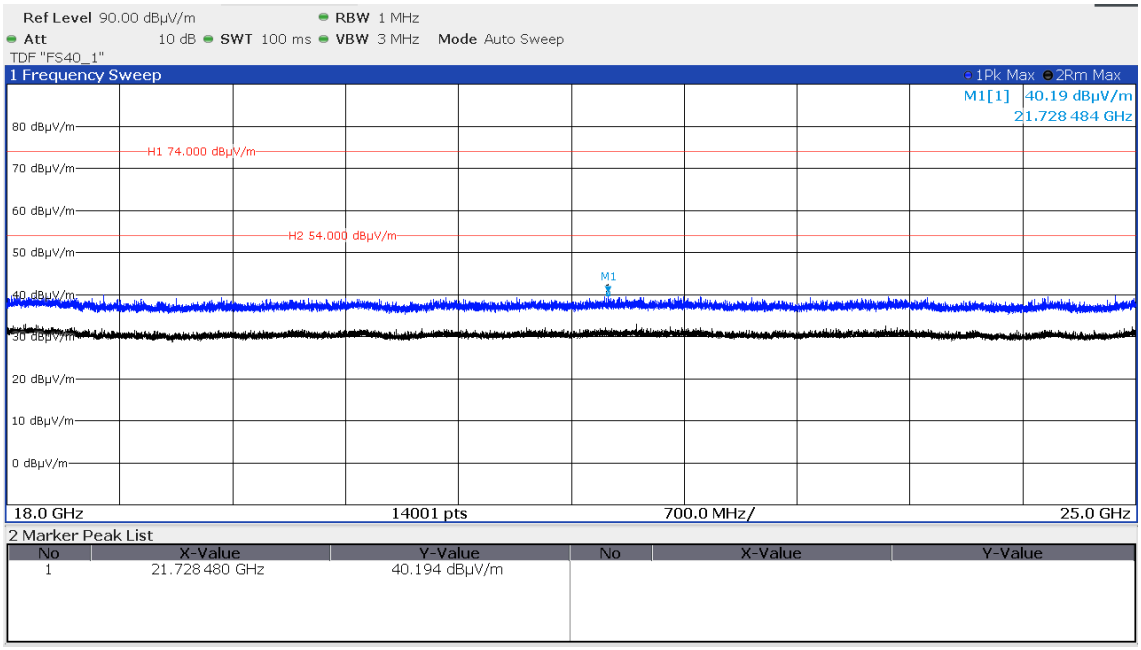


CH37 vertical





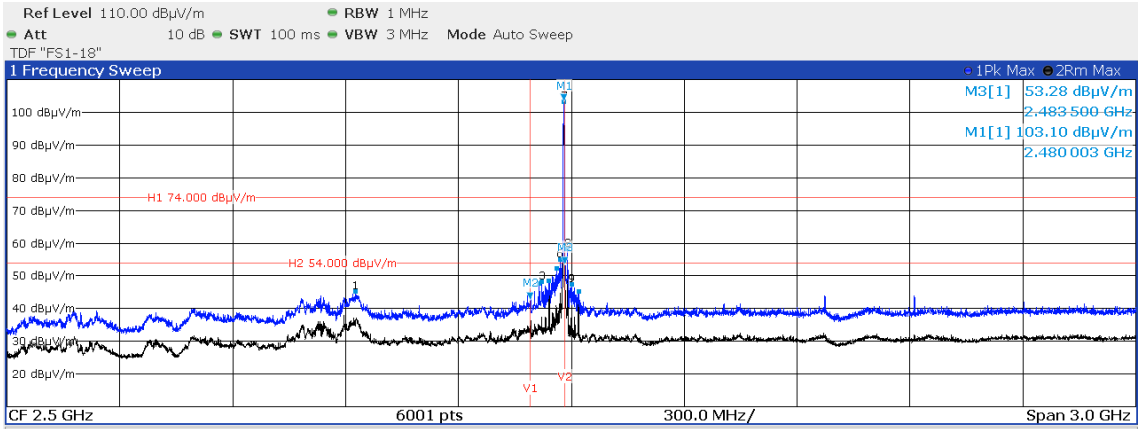
MP (#)	f (GHz)	Peak (dBµV/m)	DC corr. (dB)	AV (dBµV/m)	AV Limit (dBµV/m)	Margin (dB)
2	7.20514	59.2	-8.0	51.2	54.0	-2.8



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	21.728 480 GHz	40.194 dBµV/m			

CH39 horizontal

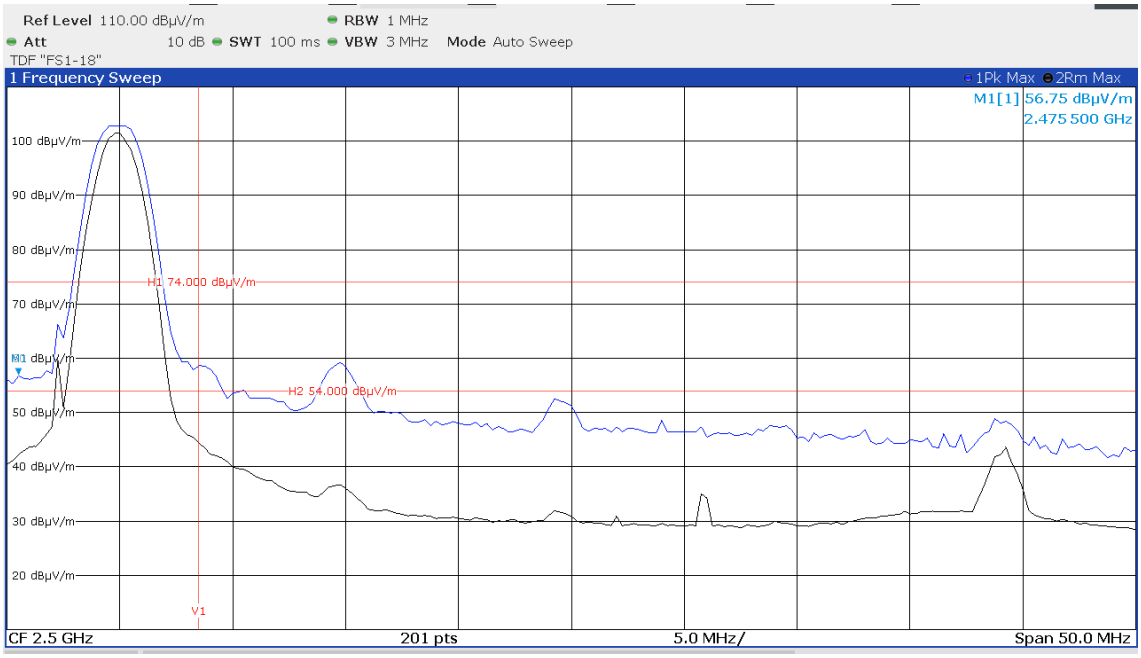


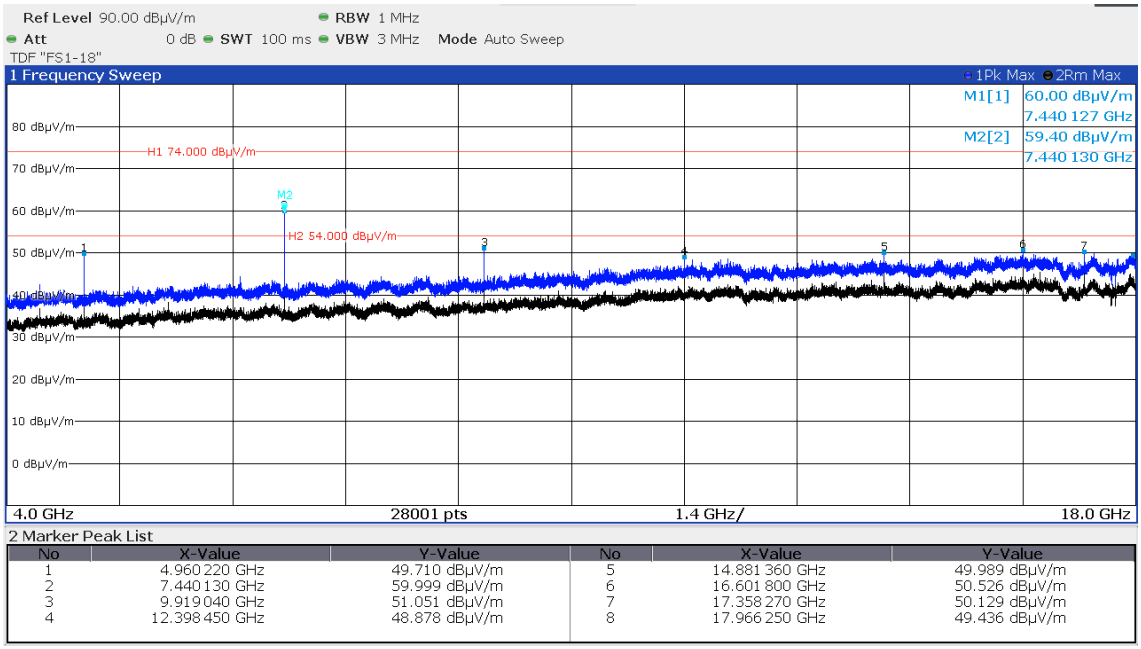
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.926 600 GHz	45.344 dBµV/m	6	2.470 000 GHz	54.885 dBµV/m
2	2.415 010 GHz	47.627 dBµV/m	7	2.480 000 GHz	103.099 dBµV/m
3	2.421 510 GHz	48.086 dBµV/m	8	2.489 500 GHz	58.141 dBµV/m
4	2.440 510 GHz	48.479 dBµV/m	9	2.500 500 GHz	47.374 dBµV/m
5	2.460 510 GHz	52.254 dBµV/m	10	2.519 500 GHz	45.306 dBµV/m

3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.480 003 GHz**	**103.10 dBµV/m**		
M2		1	**2.39 GHz**	**42.45 dBµV/m**		
M3		1	**2.483 5 GHz**	**53.28 dBµV/m**		

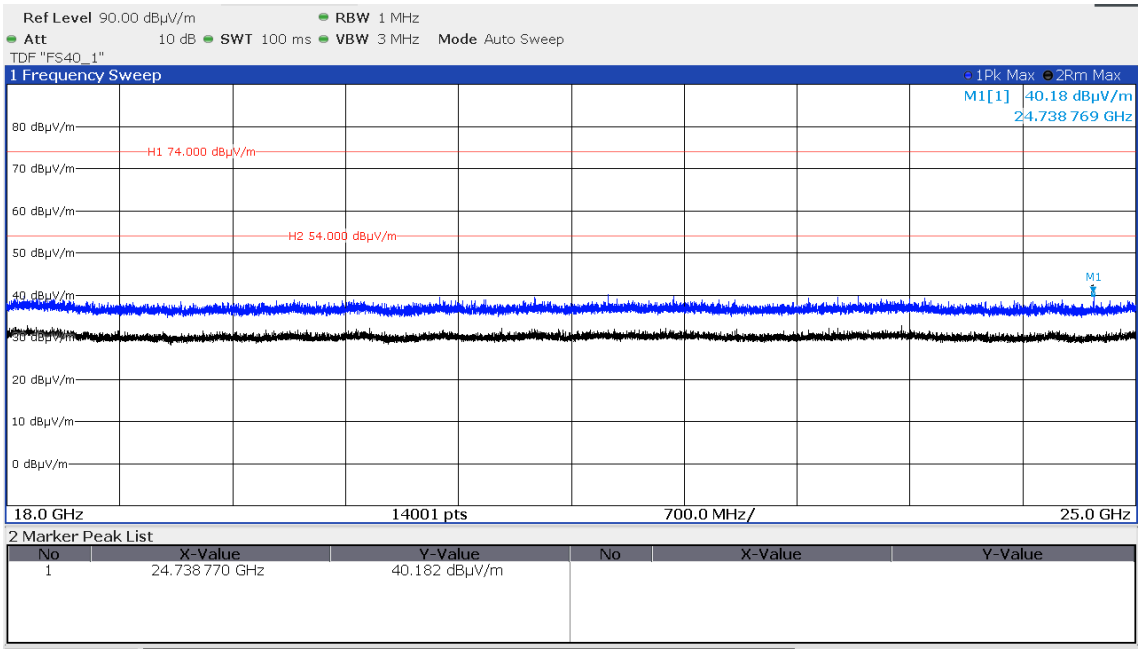




2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	4.960 220 GHz	49.710 dBµV/m	5	14.881 360 GHz	49.989 dBµV/m
2	7.440 130 GHz	59.999 dBµV/m	6	16.601 800 GHz	50.526 dBµV/m
3	9.919 040 GHz	51.051 dBµV/m	7	17.358 270 GHz	50.129 dBµV/m
4	12.398 450 GHz	48.878 dBµV/m	8	17.966 250 GHz	49.436 dBµV/m

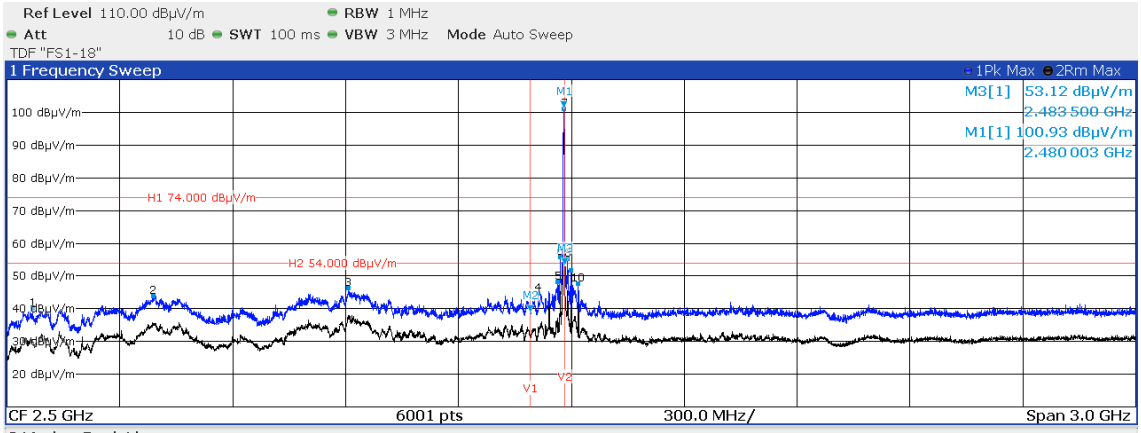
MP (#)	f (GHz)	Peak (dBµV/m)	DC corr. (dB)	AV (dBµV/m)	AV Limit (dBµV/m)	Margin (dB)
2	7.44013	60.0	-8.0	52.0	54.0	-2.0



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	24.738 770 GHz	40.182 dBµV/m			

CH39 vertical

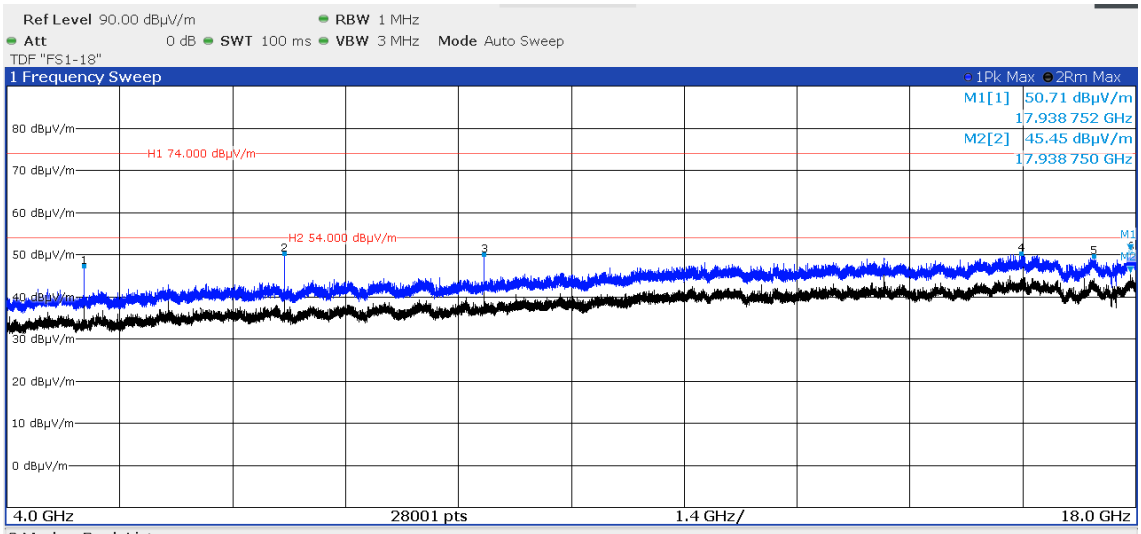


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.067 740 GHz	40.071 dBµV/m	6	2.470 500 GHz	55.767 dBµV/m
2	1.388 190 GHz	43.966 dBµV/m	7	2.480 000 GHz	100.930 dBµV/m
3	1.907 100 GHz	46.381 dBµV/m	8	2.490 000 GHz	55.238 dBµV/m
4	2.412 010 GHz	44.572 dBµV/m	9	2.499 500 GHz	51.643 dBµV/m
5	2.463 510 GHz	48.303 dBµV/m	10	2.518 500 GHz	47.799 dBµV/m

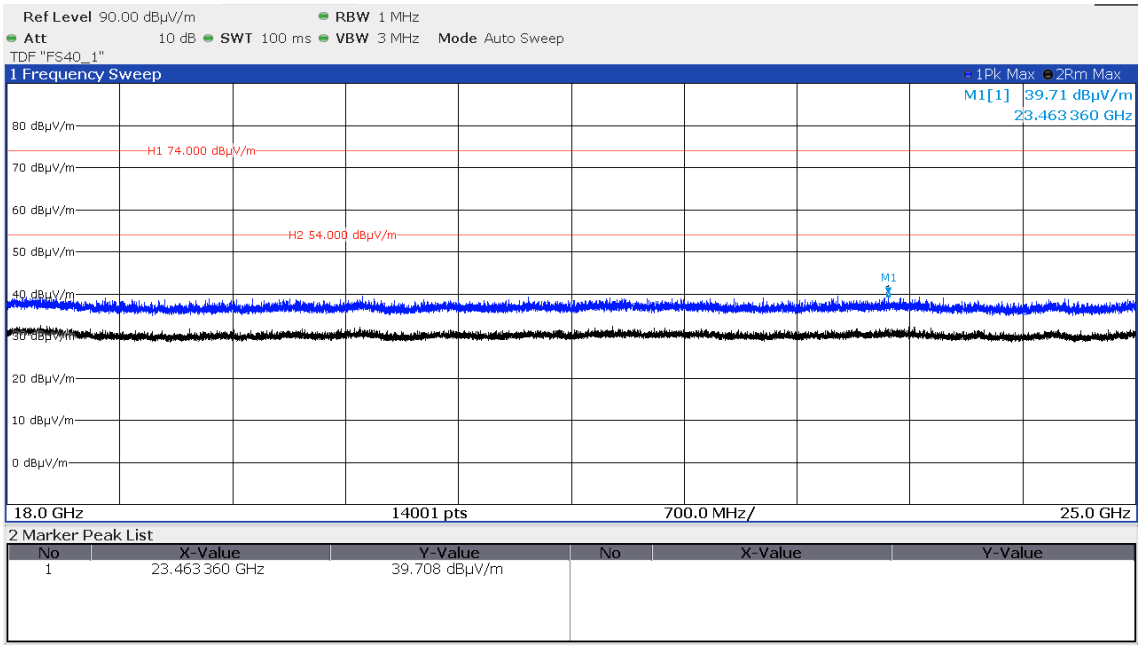
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.480 003 GHz**	**100.93 dBµV/m**		
M2		1	**2.39 GHz**	**38.75 dBµV/m**		
M3		1	**2.483 5 GHz**	**53.12 dBµV/m**		



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	4.959 720 GHz	47.197 dBµV/m	4	16.581 800 GHz	50.286 dBµV/m
2	7.439 130 GHz	50.263 dBµV/m	5	17.478 770 GHz	49.669 dBµV/m
3	9.921 040 GHz	49.961 dBµV/m	6	17.938 750 GHz	50.711 dBµV/m



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	23.463 360 GHz	39.708 dBµV/m			

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

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
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 10th harmonic. Only the worst-case plots are listed.

5.3 Spurious emissions radiated

5.3.1 Description of the test location

Test location: NONE

Test distance: -

5.3.2 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.

5.3.3 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.

5.3.4 Test result

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 MHz	Detector: Quasi peak	Meas. Time: 1 s,

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

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

Result: All emissions are below general limit, see clause 5.2.

The requirements are **FULFILLED.**

Remarks: None.

5.4 Antenna application

5.4.1 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 supplied antenna meets the requirements of part 15.203 and 15.204.

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.
CPR 3	FSW43	02-02/11-15-001	13/05/2025	13/05/2024		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	12/07/2024	12/07/2023		
	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				
	18N-20	02-02/50-21-009	17/10/2024	17/04/2024		
	BAT-EMC 2023.0.8.0	02-02/68-13-001				
SER 2	ESCI	02-02/03-05-004	05/10/2024	05/10/2023		
	ESCI	02-02/03-05-005	15/12/2024	15/12/2023		
	ESR 7	02-02/03-13-001	14/03/2025	14/03/2024		
	ESCI	02-02/03-15-001	03/07/2024	03/07/2023		
	UHALP 9108 A	02-02/24-05-022	23/05/2025	23/05/2024		
	BBA 9106 / VHA 9103	02-02/24-05-023	23/05/2025	23/05/2024		
	HCM	02-02/50-05-115				
	N-3000-N	02-02/50-05-191				
	ON100493	02-02/50-14-014				
	KK-SF406-2X11N-20.0M	02-02/50-16-021				
	KK-EF393	02-02/50-16-025				
SER 3	FSW43	02-02/11-15-001	13/05/2025	13/05/2024		
	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	22/01/2025	22/01/2024
	WHK 3.0/18G-10EF	02-02/50-05-180				
	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-KMS116-1.	02-02/50-20-026				
	BAT-EMC 2023.0.8.0	02-02/68-13-001				