RF – TEST REPORT

- FCC Part 15.247, RSS-247, partly -

Type / Model Name	:	PR 400-22 (01)
Product Description	:	Rotating laser
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. :	**80183252-04 Rev_2**	16. January 2025 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 (September 2021)

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

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September 2021)

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.
Performed tests:

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

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 rotating laser tool has a visible red rotating laser beam and a reference beam set at 90° to the main beam. The rotating laser can be used vertically, horizontally and for slopes. The tool is designed to be used to determine, transfer and check levels, verticals, slopes and right angles. The tool can be used remotely controlled by a laser receiver.

Number of tested samples:	1
Serial number:	000346
Firmware version:	3.1.2-1267 (main board) 0.1.1-135 (BLE board)

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

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} : 21.6 V DC

2.12 Peripheral devices and interface cables

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

- USB cable Model : Commercially available
- Notebook Model : HP EliteBook 840

2.13 Determination of worst-case conditions for final measurement

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

Modulation type	Available channel	Tested channels	Power setting	Modulation	Data rate
GFSK	0 to 39	37, 39	---	DSSS	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, 8.10	Emissions in restricted bands	Passed
15.247(e)	RSS-247, 5.2(b)	PSD	Not tested
15.35(c)	RSS-Gen, 8.2	Pulsed operation	Not tested
15.203	RSS-Gen, 6.8	Antenna requirement	Passed
-	RSS-Gen, 6.11	Transmitter frequency stability	Not tested
-	RSS-Gen, 6.7	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
80183252-04	0	16 May 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
	2	16 January 2025	clause 3: correction of references in summary table

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	:	03 May 2024
Testing concluded on	:	07 May 2024

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document
2025.01.16 12:03:12 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

I am the author of this document
2025.01.16 11:09:59 +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".

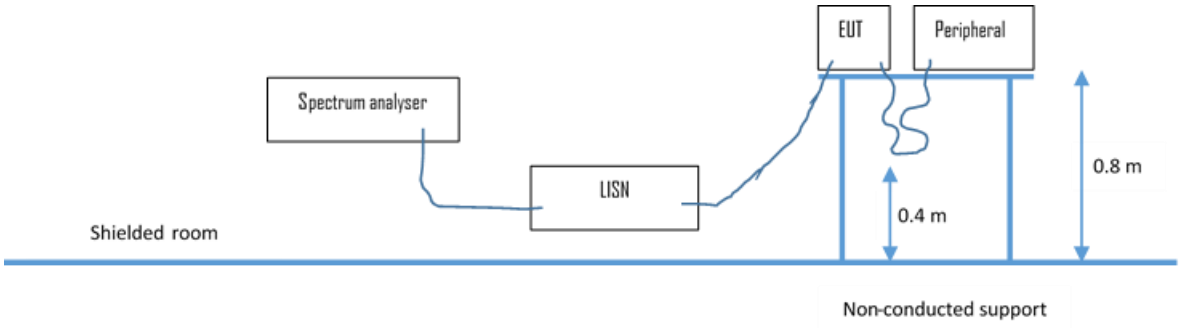
4.5.2.1 Justification

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.

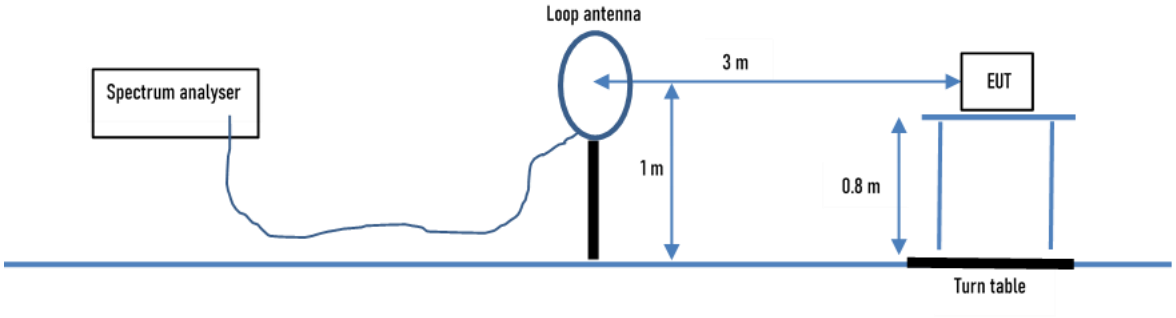
To convert between dBµV and µV, the following conversions apply:
dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

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):

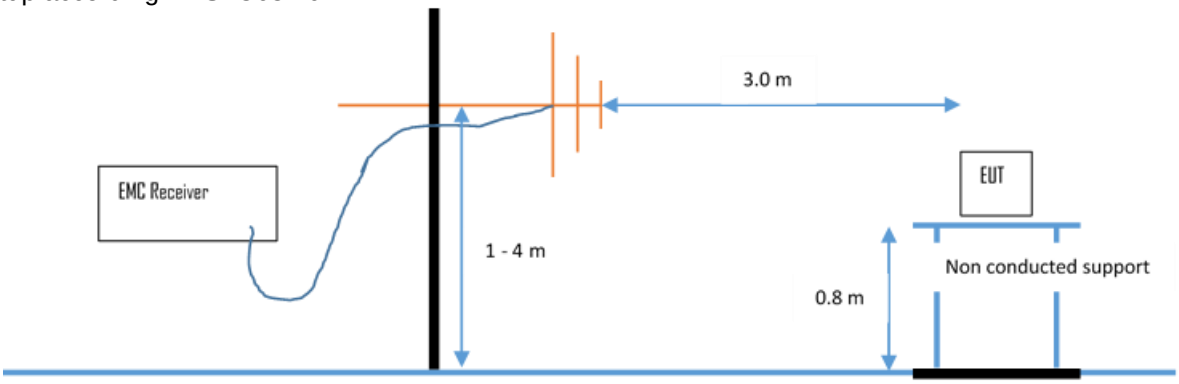
Test setup according ANSI C63.10



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.

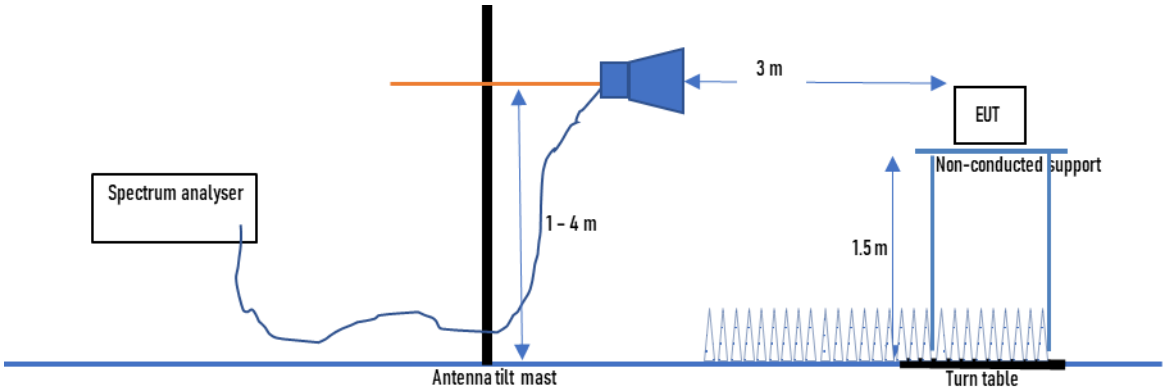
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

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

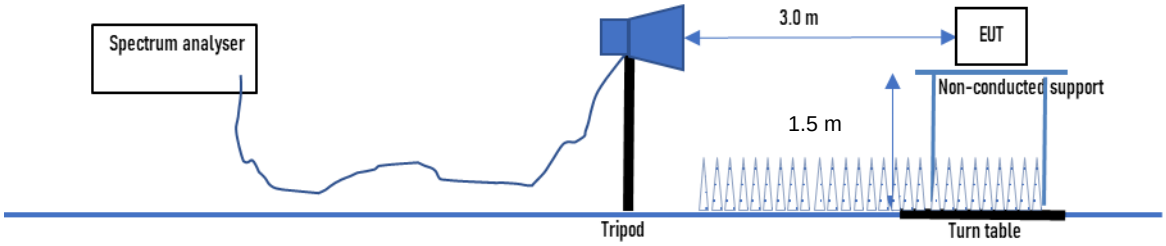
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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}	107.7	12.5	36.0	-23.5
Highest frequency: CH39					
T_{nom}	V_{nom}	106.9	11.7	36.0	-24.3

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

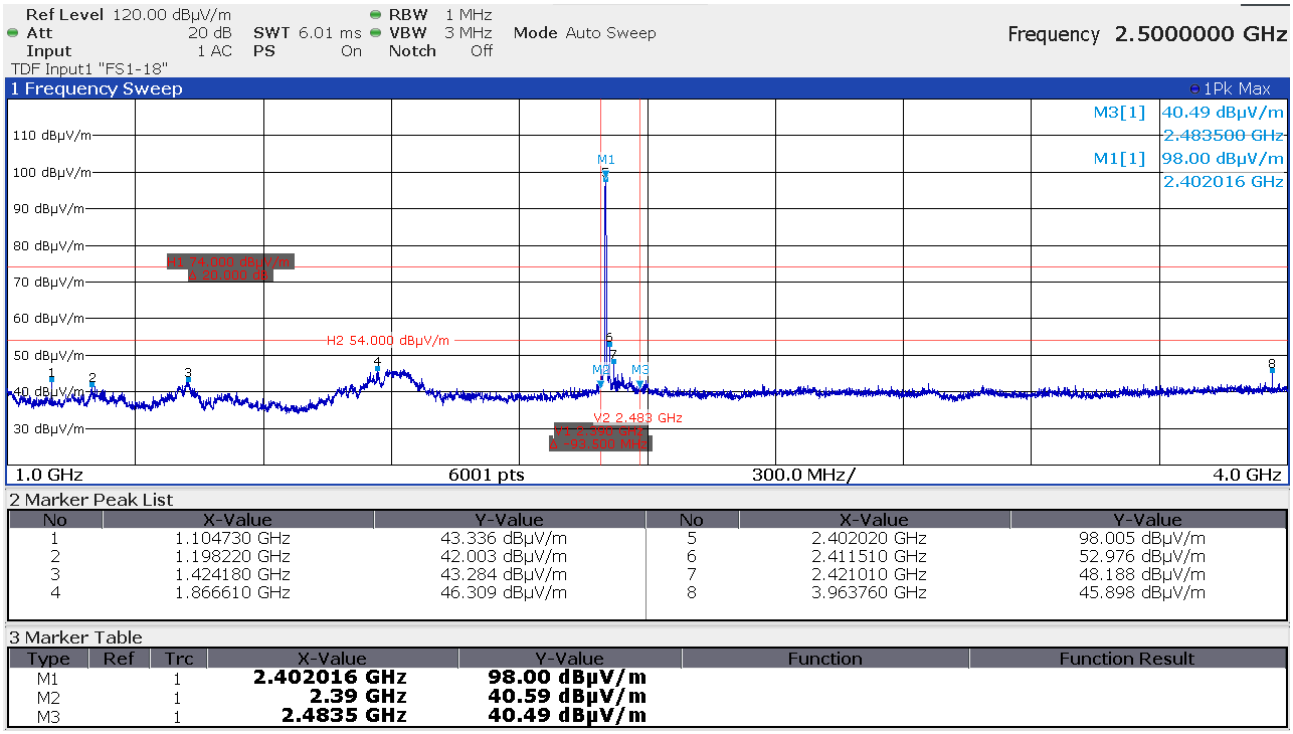
5.2.5 Test result

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)
80.00	11.7	1.7	14.2	14.5	25.9	16.2	40.0	-14.1
134.23	5.3	5.4	18.7	17.9	24.0	23.3	43.5	-19.5
167.98	4.6	-0.2	19.2	18.7	23.8	18.5	43.5	-19.7
405.28	-6.6	-7.6	23.4	23.7	16.8	16.1	46.0	-29.2
415.00	-0.1	-4.6	23.7	24.0	23.6	19.4	46.0	-22.4
424.94	-6.0	-1.1	23.9	24.2	17.9	23.1	46.0	-22.9
572.40	-7.1	-9.3	27.6	27.9	20.5	18.6	46.0	-25.5

f > 1000 MHz

CH37 horizontal

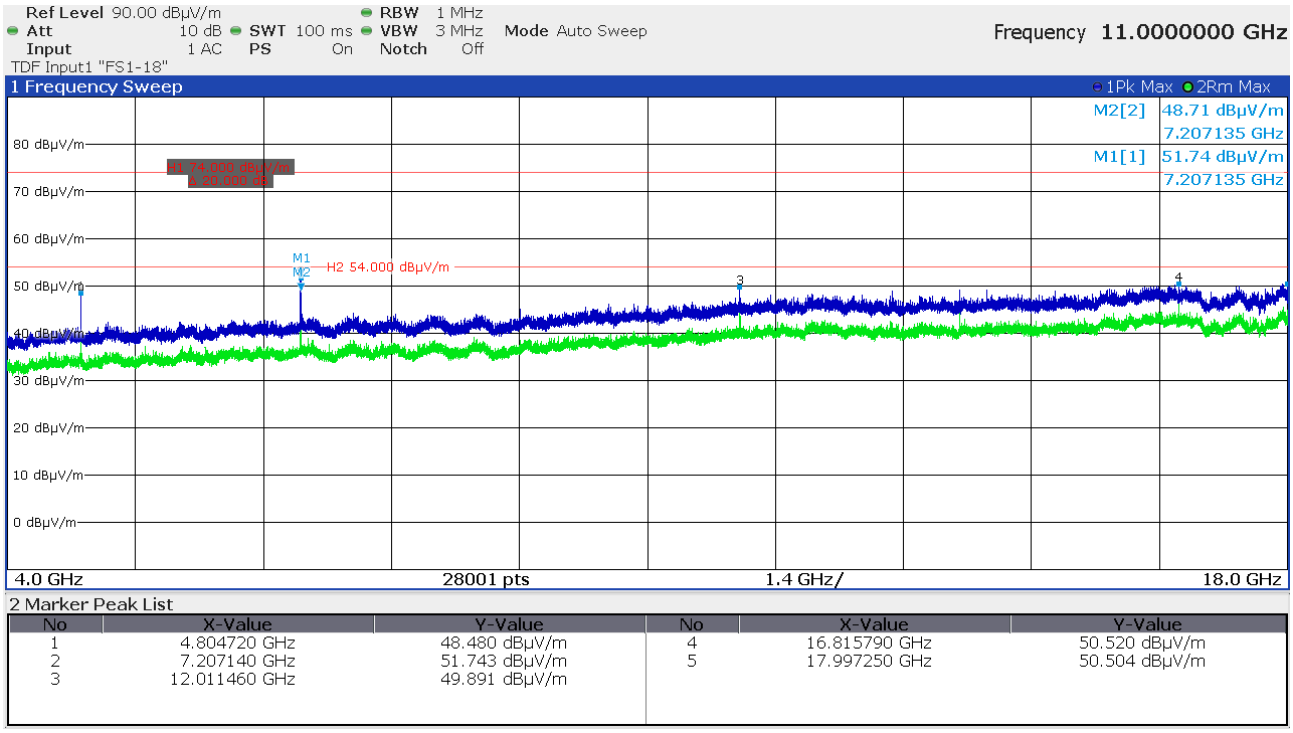


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.104730 GHz	43.336 dBµV/m	5	2.402020 GHz	98.005 dBµV/m
2	1.198220 GHz	42.003 dBµV/m	6	2.411510 GHz	52.976 dBµV/m
3	1.424180 GHz	43.284 dBµV/m	7	2.421010 GHz	48.188 dBµV/m
4	1.866610 GHz	46.309 dBµV/m	8	3.963760 GHz	45.898 dBµV/m

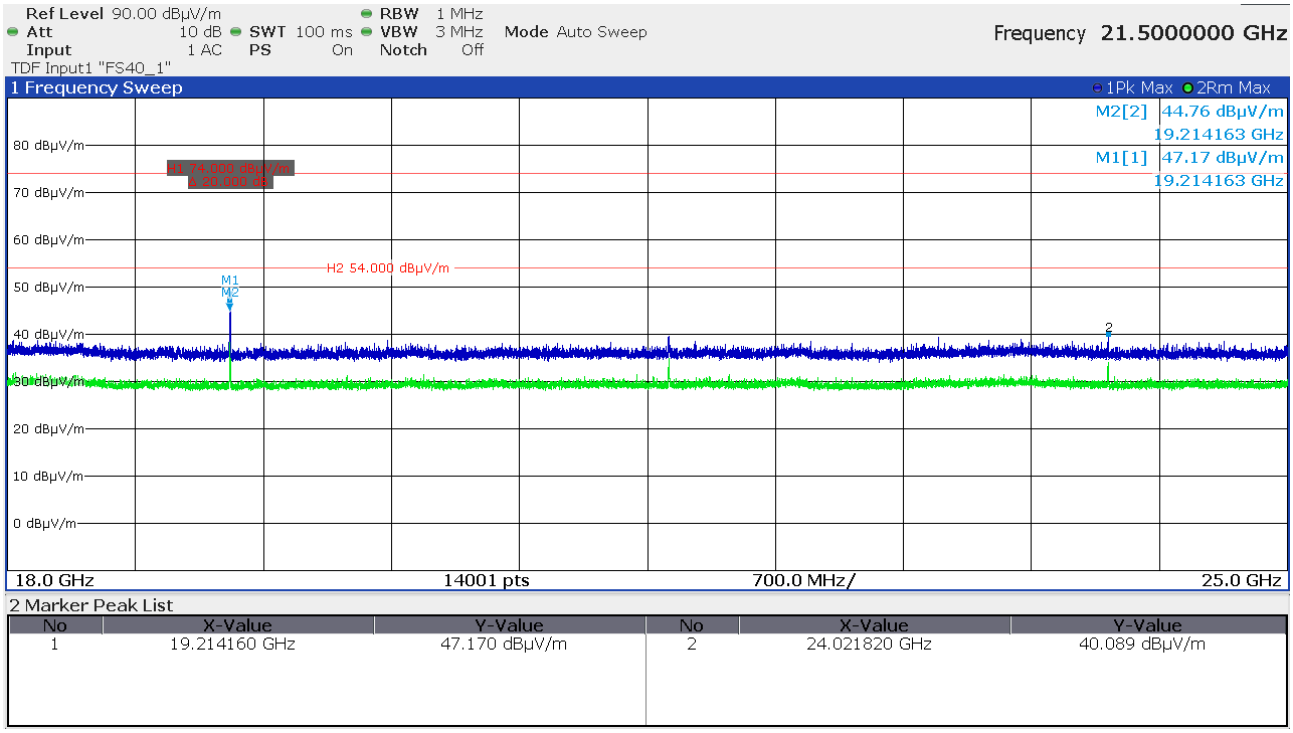
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.402016 GHz**	**98.00 dBµV/m**		
M2		1	**2.39 GHz**	**40.59 dBµV/m**		
M3		1	**2.4835 GHz**	**40.49 dBµV/m**		



2 Marker Peak List

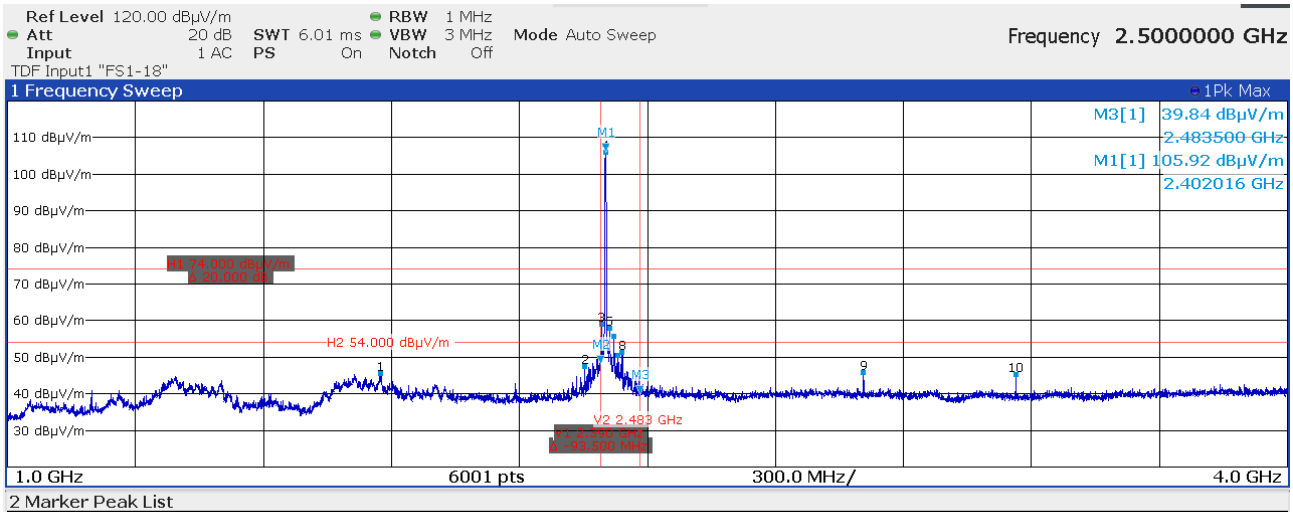
No	X-Value	Y-Value	No	X-Value	Y-Value
1	4.804720 GHz	48.480 dBµV/m	4	16.815790 GHz	50.520 dBµV/m
2	7.207140 GHz	51.743 dBµV/m	5	17.997250 GHz	50.504 dBµV/m
3	12.011460 GHz	49.891 dBµV/m			



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	19.214160 GHz	47.170 dBµV/m	2	24.021820 GHz	40.089 dBµV/m

CH37 vertical

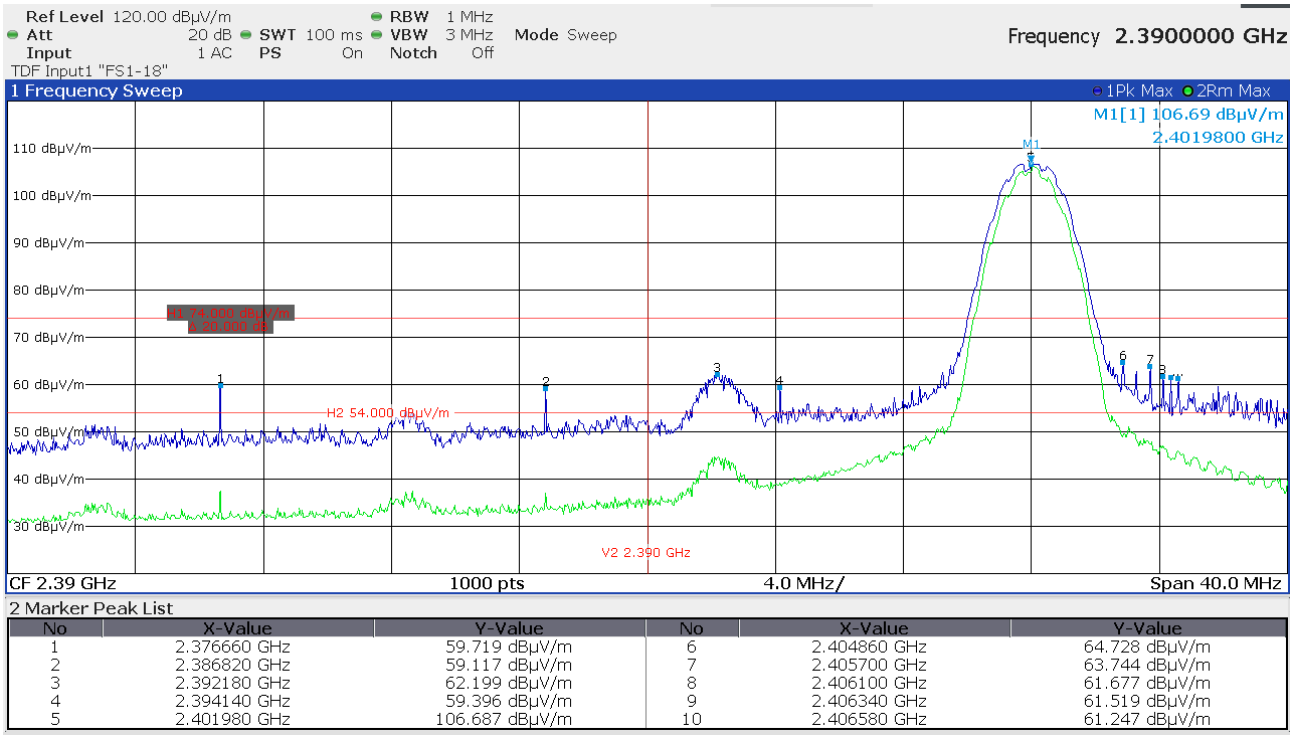


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.873600 GHz	45.550 dBµV/m	6	2.421510 GHz	55.840 dBµV/m
2	2.353020 GHz	47.545 dBµV/m	7	2.431010 GHz	50.624 dBµV/m
3	2.392020 GHz	59.076 dBµV/m	8	2.441010 GHz	51.218 dBµV/m
4	2.402020 GHz	105.921 dBµV/m	9	3.006420 GHz	45.908 dBµV/m
5	2.411510 GHz	58.018 dBµV/m	10	3.362860 GHz	45.408 dBµV/m

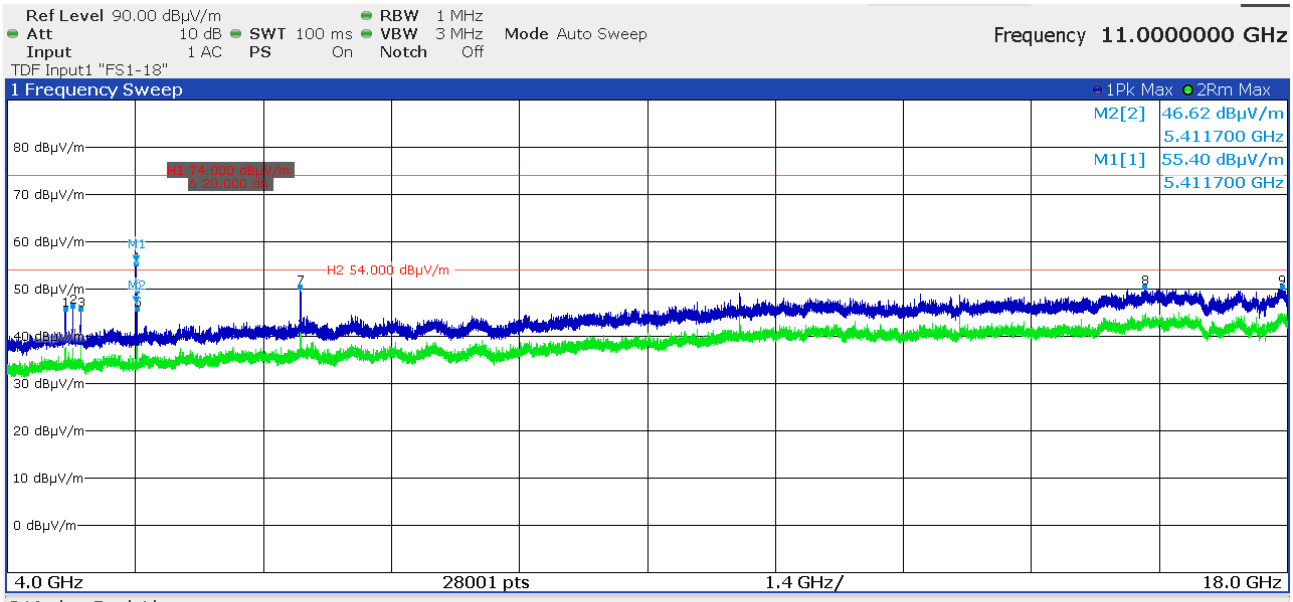
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.402016 GHz**	**105.92 dBµV/m**		
M2		1	**2.39 GHz**	**47.98 dBµV/m**		
M3		1	**2.4835 GHz**	**39.84 dBµV/m**		



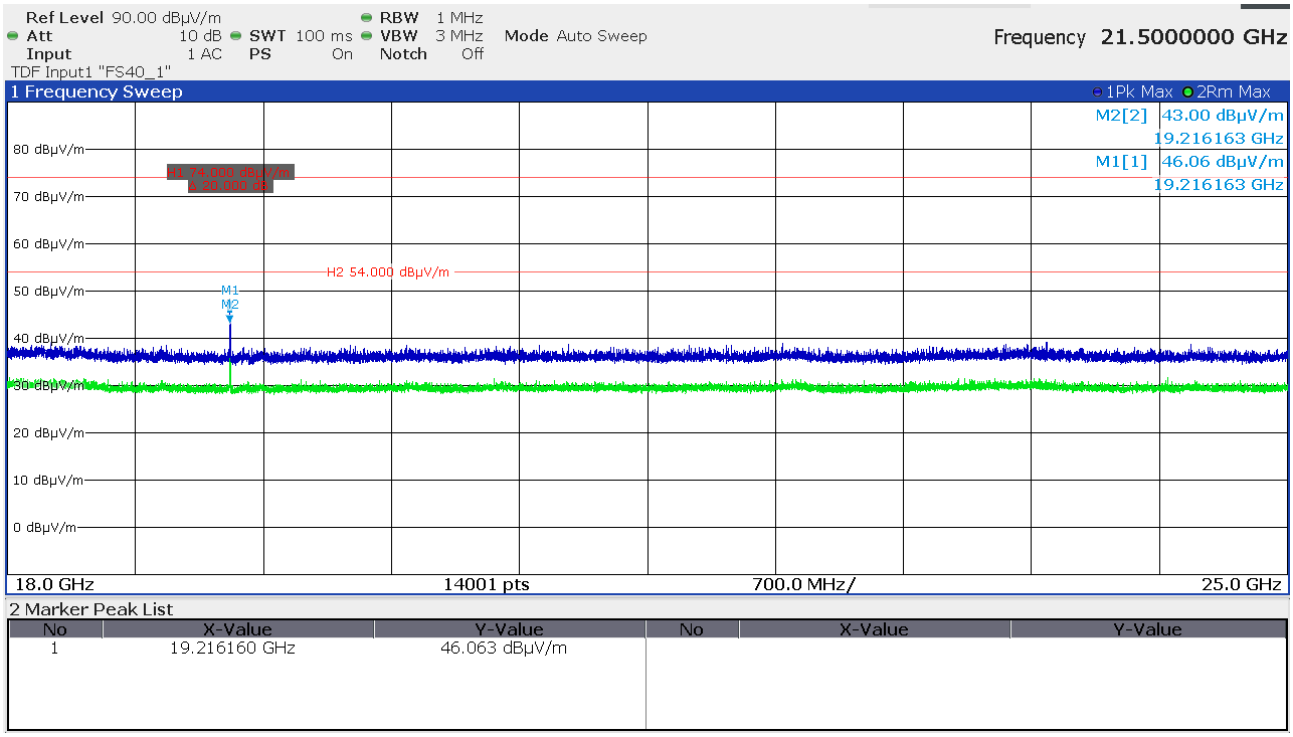
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	2.376660 GHz	59.719 dBµV/m	6	2.404860 GHz	64.728 dBµV/m
2	2.386820 GHz	59.117 dBµV/m	7	2.405700 GHz	63.744 dBµV/m
3	2.392180 GHz	62.199 dBµV/m	8	2.406100 GHz	61.677 dBµV/m
4	2.394140 GHz	59.396 dBµV/m	9	2.406340 GHz	61.519 dBµV/m
5	2.401980 GHz	106.687 dBµV/m	10	2.406580 GHz	61.247 dBµV/m

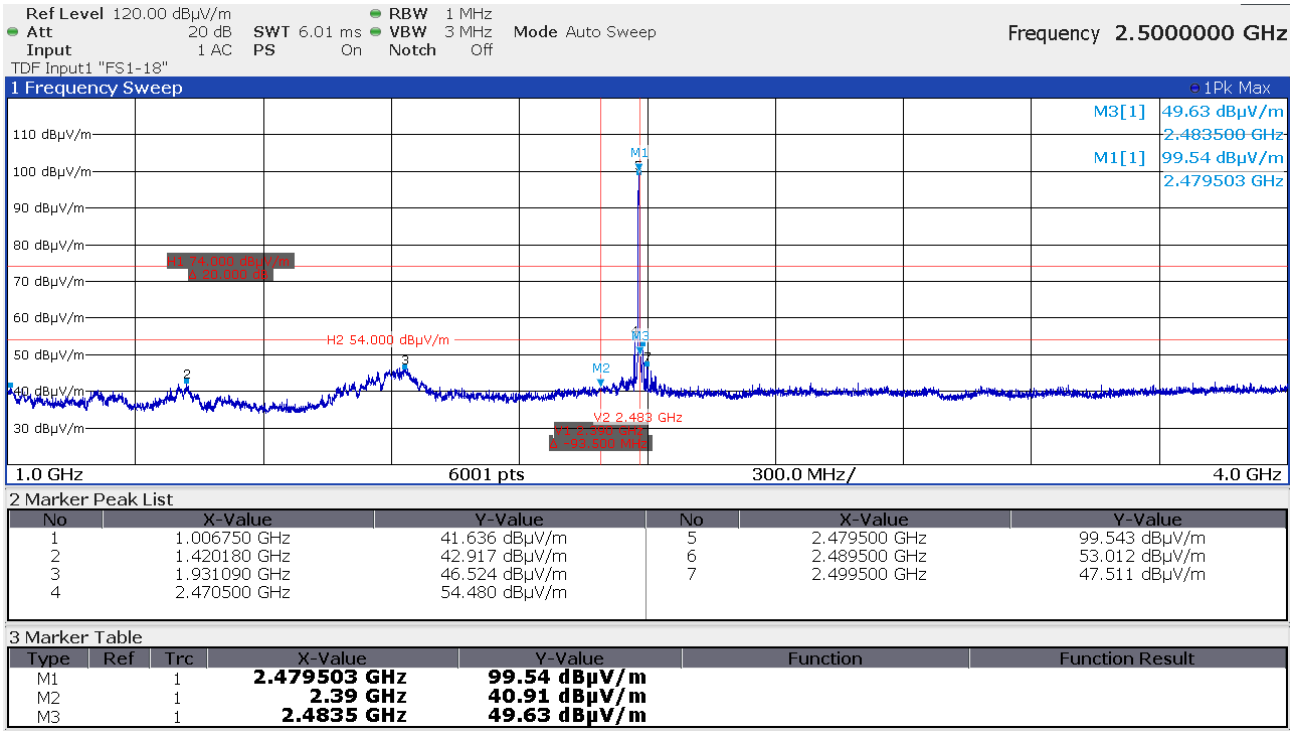


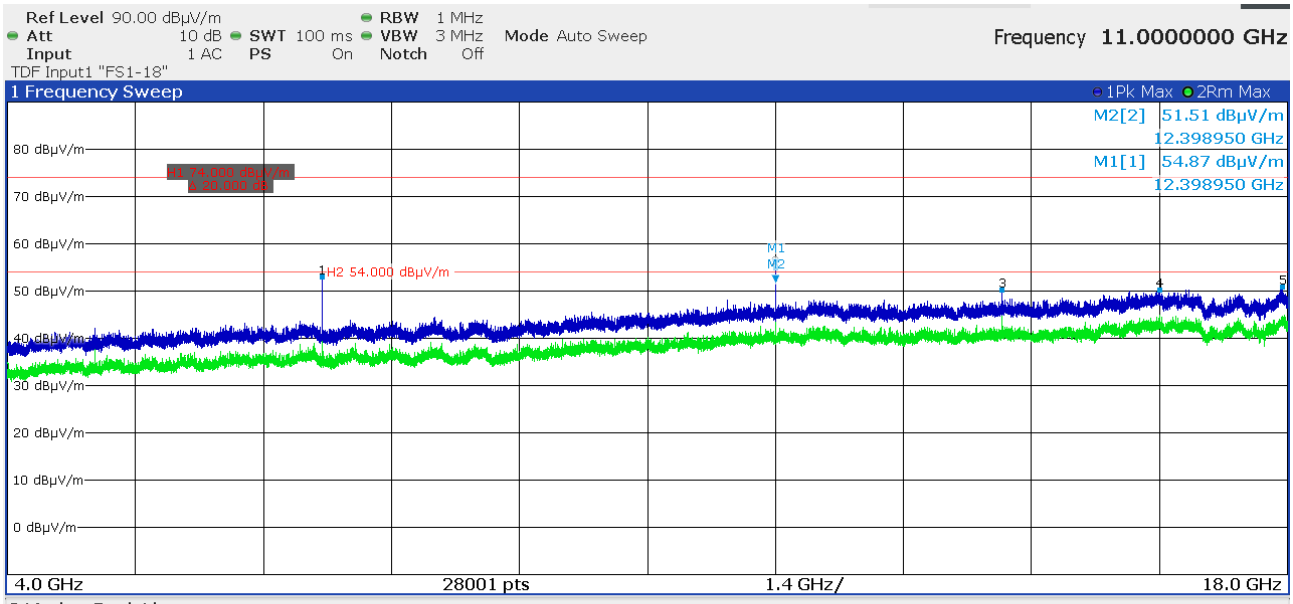
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	4.632730 GHz	45.691 dBµV/m	6	5.421700 GHz	49.586 dBµV/m
2	4.715720 GHz	46.429 dBµV/m	7	7.205140 GHz	50.474 dBµV/m
3	4.804720 GHz	45.645 dBµV/m	8	16.441810 GHz	50.332 dBµV/m
4	5.411700 GHz	55.399 dBµV/m	9	17.943250 GHz	50.374 dBµV/m
5	5.418700 GHz	45.662 dBµV/m			



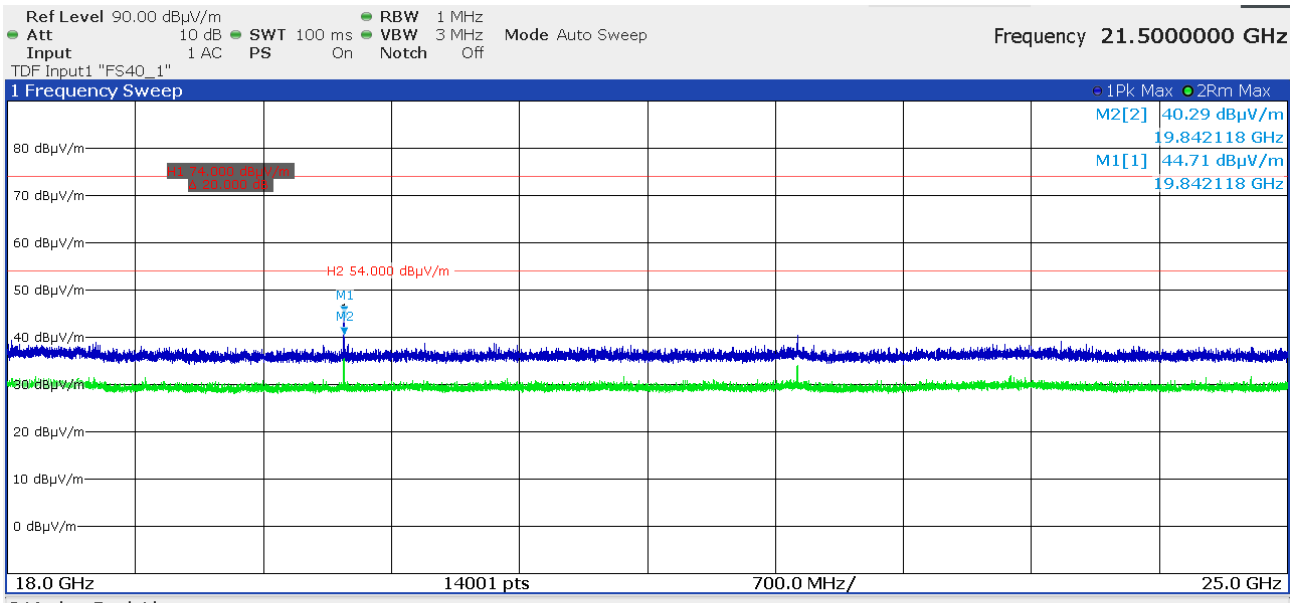
CH39 horizontal





2 Marker Peak List

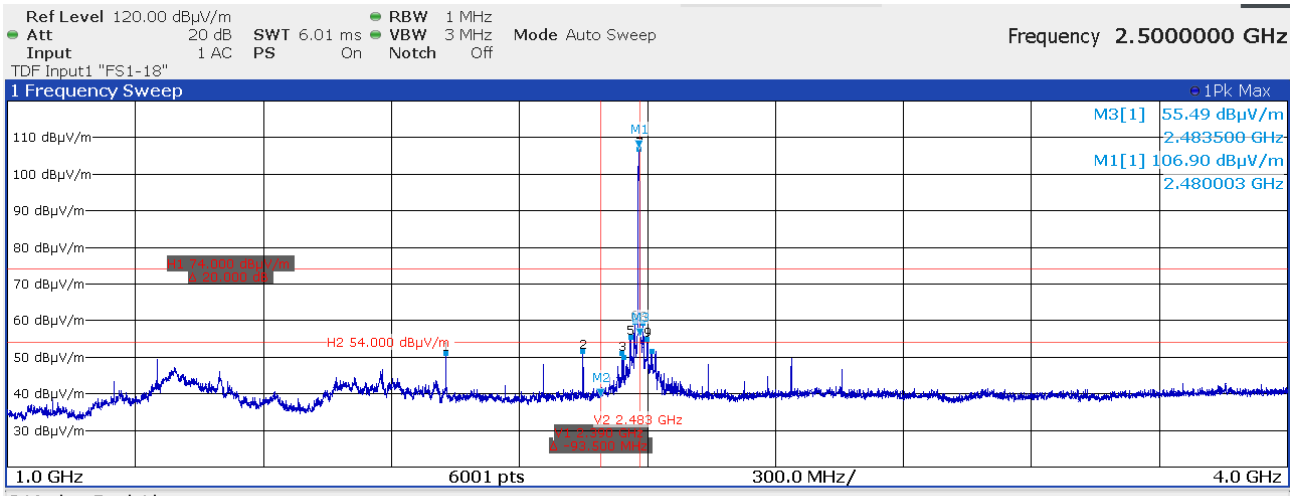
No	X-Value	Y-Value	No	X-Value	Y-Value
1	7.440630 GHz	53.060 dBµV/m	4	16.600800 GHz	50.264 dBµV/m
2	12.398950 GHz	54.873 dBµV/m	5	17.946750 GHz	50.947 dBµV/m
3	14.881360 GHz	50.288 dBµV/m			



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	19.842120 GHz	44.710 dBµV/m			

CH39 vertical

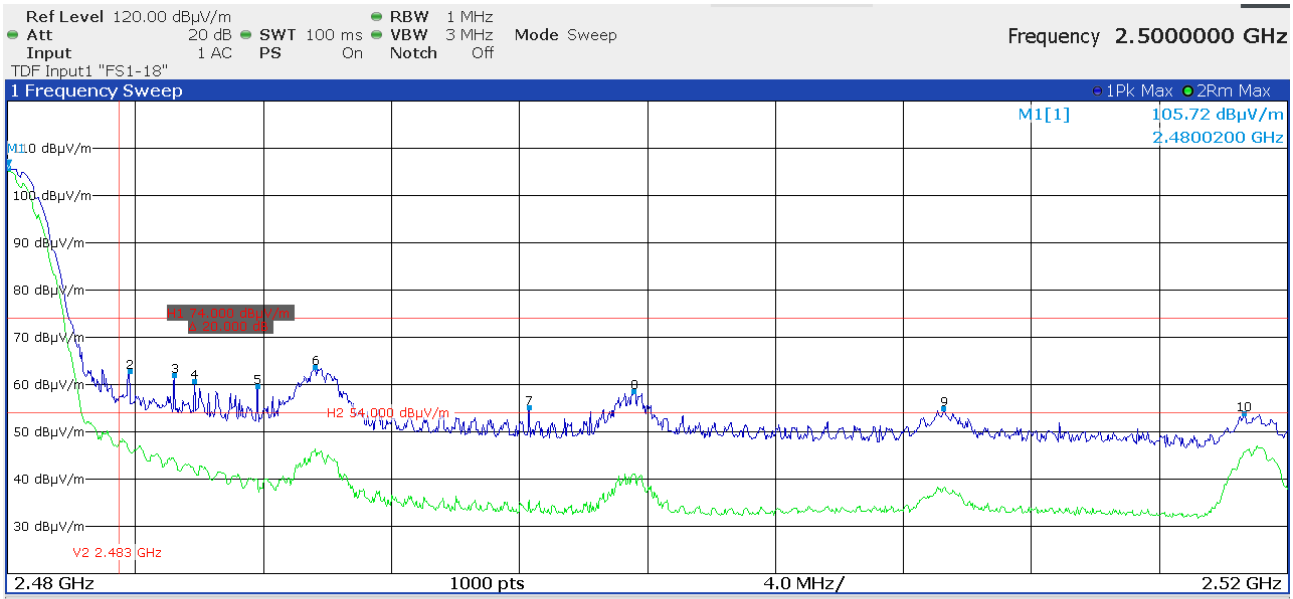


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	2.027080 GHz	51.006 dBµV/m	6	2.470000 GHz	59.678 dBµV/m
2	2.349030 GHz	51.649 dBµV/m	7	2.480000 GHz	106.902 dBµV/m
3	2.440010 GHz	50.940 dBµV/m	8	2.490000 GHz	59.224 dBµV/m
4	2.444010 GHz	49.881 dBµV/m	9	2.499500 GHz	54.967 dBµV/m
5	2.460010 GHz	55.350 dBµV/m	10	2.509500 GHz	51.599 dBµV/m

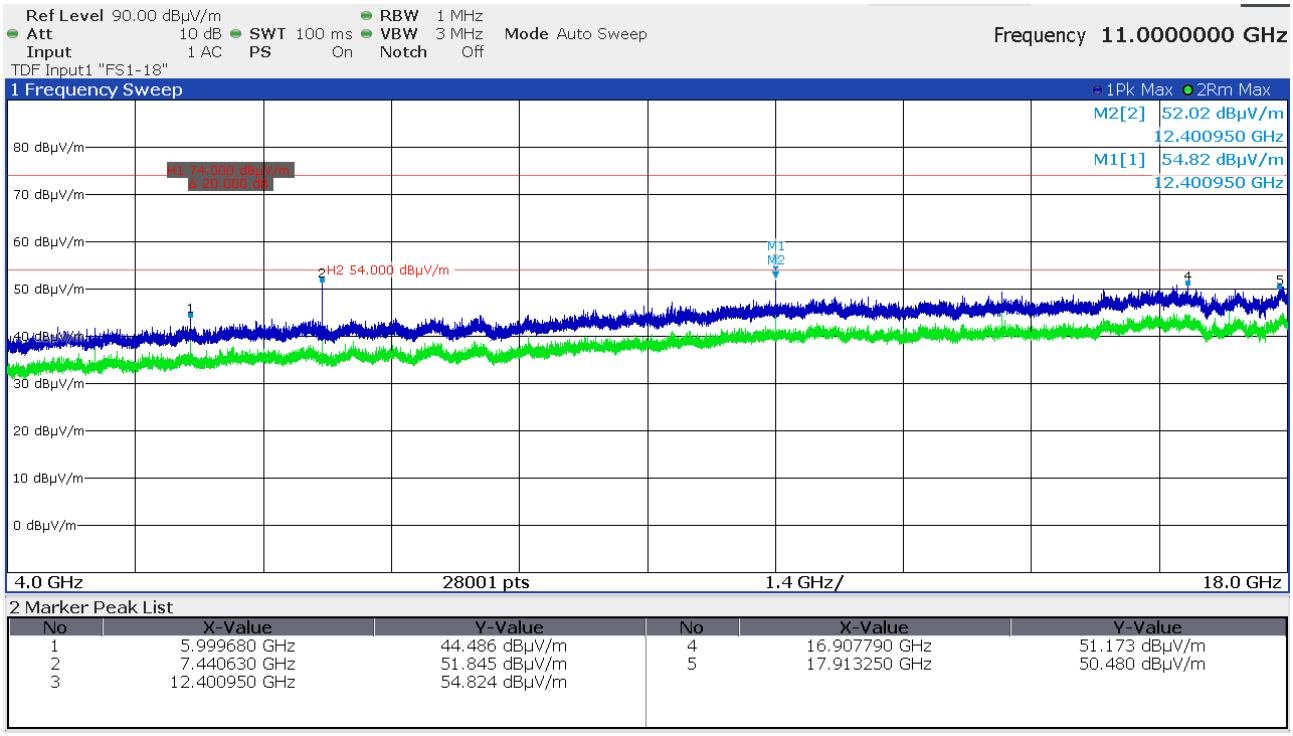
3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.480003 GHz**	**106.90 dBµV/m**		
M2		1	**2.39 GHz**	**39.09 dBµV/m**		
M3		1	**2.4835 GHz**	**55.49 dBµV/m**		



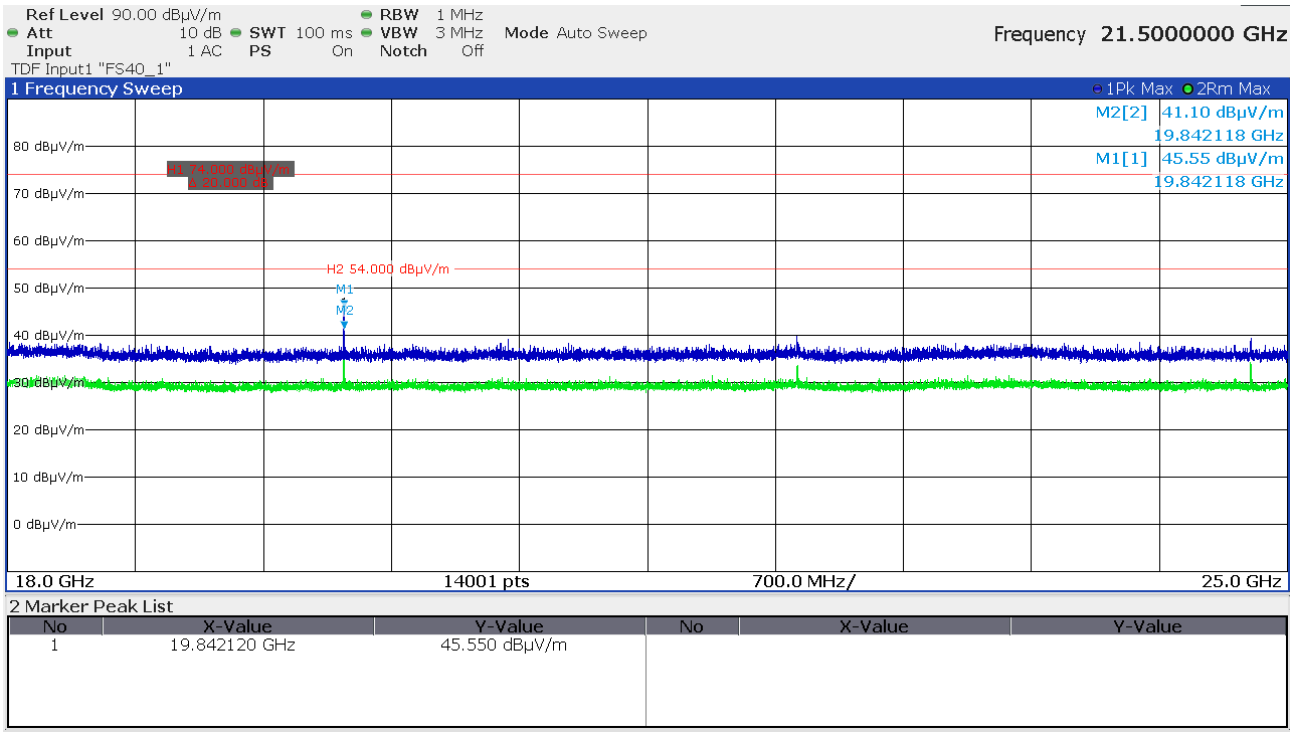
2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	2.480020 GHz	105.720 dBµV/m	6	2.489620 GHz	63.630 dBµV/m
2	2.483820 GHz	62.829 dBµV/m	7	2.496300 GHz	55.155 dBµV/m
3	2.485220 GHz	61.909 dBµV/m	8	2.499580 GHz	58.564 dBµV/m
4	2.485860 GHz	60.621 dBµV/m	9	2.509260 GHz	54.969 dBµV/m
5	2.487820 GHz	59.493 dBµV/m	10	2.518660 GHz	53.746 dBµV/m



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	5.999680 GHz	44.486 dBµV/m	4	16.907790 GHz	51.173 dBµV/m
2	7.440630 GHz	51.845 dBµV/m	5	17.913250 GHz	50.480 dBµV/m
3	12.400950 GHz	54.824 dBµV/m			



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	19.842120 GHz	45.550 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

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

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.
SER 2	ESR 7	02-02/03-13-001	14/03/2025	14/03/2024		
	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	ESW26	02-02/03-17-002	16/04/2025	16/04/2024		
	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-	02-02/50-20-026				
	BAT-EMC 2023.0.8.0	02-02/68-13-001				