



RF – TEST REPORT

- FCC Part 15.519, RSS-220 -

Type / Model Name : BMW FBD5S

Product Description : UWB LIN gateway for comfort access function in vehicles

Applicant : Aumovio Germany GmbH

Address : Siemensstraße 12
93055 REGENBURG, GERMANY

Manufacturer : Aumovio Germany GmbH

Address : Siemensstraße 12
93055 REGENBURG, GERMANY

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

POSITIVE

Test Report No. : 80286795-01 Rev_1

24. June 2026
Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00



Deutsche
Akkreditierungsstelle
D-PL-12030-01-00

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

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ATTACHMENT A as separate supplements

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

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (February 2026)

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 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements

FCC Rules and Regulations Part 15, Subpart F – Ultra Wideband Operation (February 2026)

Part 15, Subpart F, Section 15.519	Technical requirements for hand held UWB systems
Part 15, Subpart F, Section 15.521	Technical requirements applicable to all UWB devices

Industry Canada – Radio equipment standards

RSS-Gen, Issue 5 + A1 + A2, March 2019	General Requirements for Compliance of Radio Apparatus
RSS-220, Issue 1 + A1, July 2018	Devices Using Ultra-Wideband (UWB) Technology
ANSI C63.10-2020 + Cor. 1-2023 + C63.10a-2024 + Errata to C63.10a-2024	Testing Unlicensed Wireless Devices
KDB 393764 D01 v02r01 (April 25, 2022)	Ultra-Wideband (UWB) Devices – Frequently Asked Questions

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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 samples. Sample configuration, start-up and operation is carried out by the customer or according to his/her instructions.

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

2.4 Equipment type

handheld UWB Device

2.5 Short description of the equipment under test (EUT)

The FBD5s is a wireless UWB transceiver with LIN gateway for comfort access function in vehicles. 4 FBD5s anchors are mounted at the outer body of a vehicle. 2 further anchors (FBD5) are mounted inside the vehicle and provide BLE functionality for data transfer and security purposes between smartphone or ID tag. The anchors are connected to a central control unit and paired with a smartphone or wearable ID tag. The FBD5s can also communicate among each other for an initialization procedure. After initialization and training procedure the distance between FBD5s and smartphone or ID tag is measured and the position in relation to the vehicle is determined. The vehicle is unlocked, locked or started in case the smartphone or ID tag is in a permitted area around or inside the vehicle.

Number of tested samples:	1
Serial number:	Part-1
Firmware version:	A3C04888905
UWB driver version:	50D2C100_ATIC234

2.6 Variants of the EUT

There are no variants.

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2.7 Operation frequency and channel plan

The operating frequency band is 3100 MHz to 10600 MHz for FCC.

Channel plan FCC:

Channel number	f_c (MHz)
Channel 5	6489.6
Channel 6	6988.8
Channel 8	7488.0
Channel 9	7987.2

Channel plan ISCED

Channel number	f_c (MHz)
Channel 5	6489.6
Channel 6	6988.8
Channel 8	7488.0
Channel 9	7987.2

2.8 Transmit operating modes

Modulation: variable pulse position modulation (PPM) in combination with binary phase shift keying (BPSK).
Data rate: 6.8 Mbit/s

2.9 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	f-range (GHz)	Gain (dBi)	Average Gain (dBi)
1	Omni	PCB antenna	none	3.1 – 10.6	5.9	1
2	Omni	PCB antenna	none	3.1 – 10.6	5.4	2

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 12 V DC

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2.11 Peripheral devices and interface cables

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

- USB to CAN/LIN Interface Model : PCAN USB Pro FD, SN 37425
- DC power supply Model : HAMEG HM8143

2.12 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes with horizontal and vertical antenna positions to determine the worst case condition. For the further measurement the EUT is set in X position.

2.12.1 Test jig

No test jig is used.

2.12.2 Test software

Special test software is used for continuous transmission.

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

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3 TEST RESULT SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a) 15.521(j)	RSS-Gen, 8.8	AC power line conducted emissions	passed
15.519(b) 15.521(e)	RSS-220, 2, 5.1(a)	UWB Bandwidth	passed
---	RSS-Gen, 6.6	99 % Bandwidth	passed
15.209(a) 15.519(c) 15.521(c)(d)(h)	RSS-Gen, 8.9 RSS-220, 3.4, 5.3.1(c), 5.3.1(d)	Radiated Emissions 9 kHz to 40 GHz	passed
15.519(d)	RSS-220, 5.3.1(e)	Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz	passed
15.519(e) 15.521(g)	RSS-220, 5.3.1(g)	Peak Power radiated	passed
15.519(a)	RSS-220, 5.3.1(b)	Signal deactivation	passed
15.203 15.521(b)	---	Antenna requirement	passed *1
15.204 15.521(b)	---	External radio frequency power amplifiers and antenna modifications	passed *1
15.521(a)(f)(i)	---	Technical requirements applicable to all UWB devices	passed *2

- *1 According to the applicant, the EUT has an internal PCB antenna. No other antennas can be connected to the EUT. Therefore, the requirements are regarded as fulfilled.
- *2 According to the applicant, the EUT will be used in vehicular environment only.
The EUT is no imaging system.

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80286795-01	0	08 May 2026	Initial test report
80286795-01	1	24 June 2026	Section 3: clarification of notes to test result summary; Section 6: addition of detailed measurement periods; Overall: correction of FCC and IC ID

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

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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 : 12 August 2025

Testing concluded on : 30 April 2026

Checked by:

Tested by:



Klaus Gegenfurtner
2026.06.24
10:49:02 +02'00'

Klaus Gegenfurtner
Teamleader Radio



Sabine Kugler
p.p.
2026.06.24 10:18:08
+02'00'

Franz-Xaver Schrettenbrunner
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Straubinger Straße 100
94447 PLATTILING
GERMANY**

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15 - 35 °C

Humidity: 30 - 60 %

Atmospheric pressure: 86 - 106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2: 2011 + A1: 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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.

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4.5 Measurement protocol for FCC and ISED

4.5.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

**FCC: DE 0011
ISED: DE0009**

4.5.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

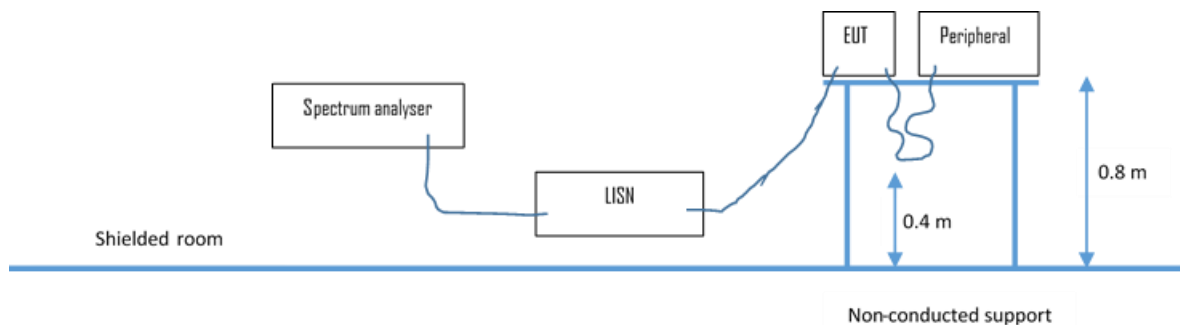
4.5.2.1 Justification

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

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



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

To convert between dB μ V and μ V, the following conversions apply:

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

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

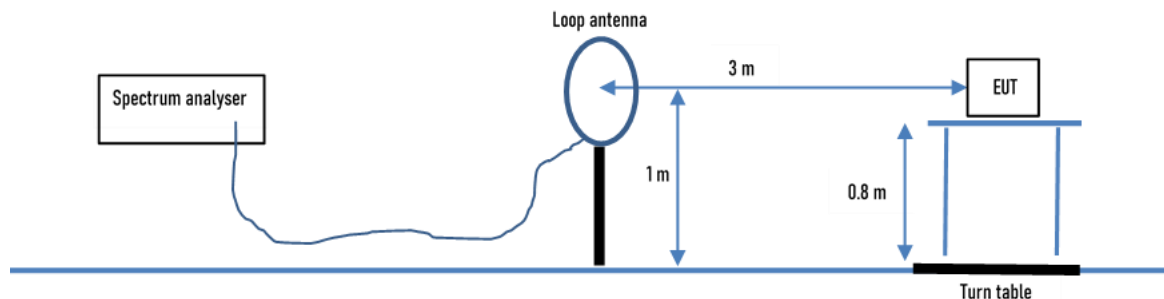
Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ 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.

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4.5.3.2 Radiated emission

4.5.3.2.1 Anechoic chamber test site (9 kHz - 30 MHz):

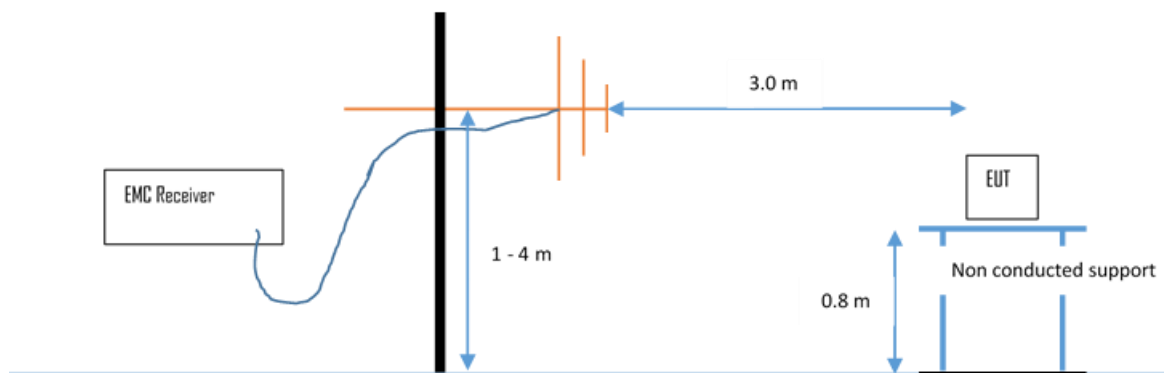
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 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 loop antenna is positioned 3, 10 or 30 metres from the EUT, aligning the measurement antenna along the site axis, orthogonal to the axis, and then with the measurement antenna horizontal. To locate maximum emissions from the test sample, for each measurement antenna alignment, the EUT is rotated through 0° to 360° on a turntable.

4.5.3.2.2 Anechoic chamber (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. Tabletop equipment is placed on a 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 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:

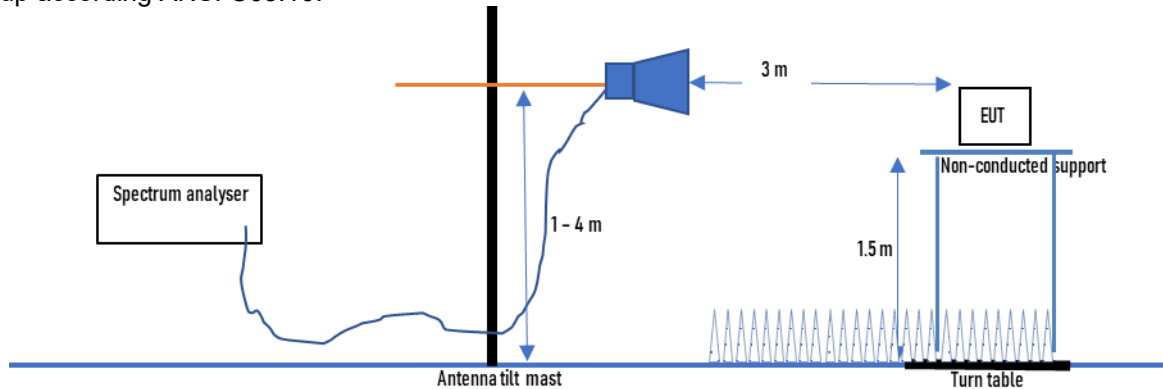
30 MHz – 1000 MHz: RBW: 120 kHz

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 (1000 MHz – 18000 MHz)

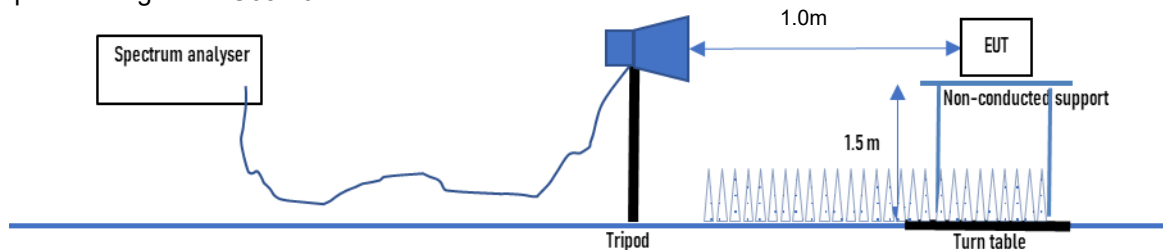
Test setup according ANSI C63.10.



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

4.5.3.2.4 Anechoic chamber (18 GHz – 40 GHz)

Test setup according ANSI C63.10



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. Tabletop equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit are adopted.

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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 SR2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

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

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

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5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin -19.0 dB at 15.876 MHz

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

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

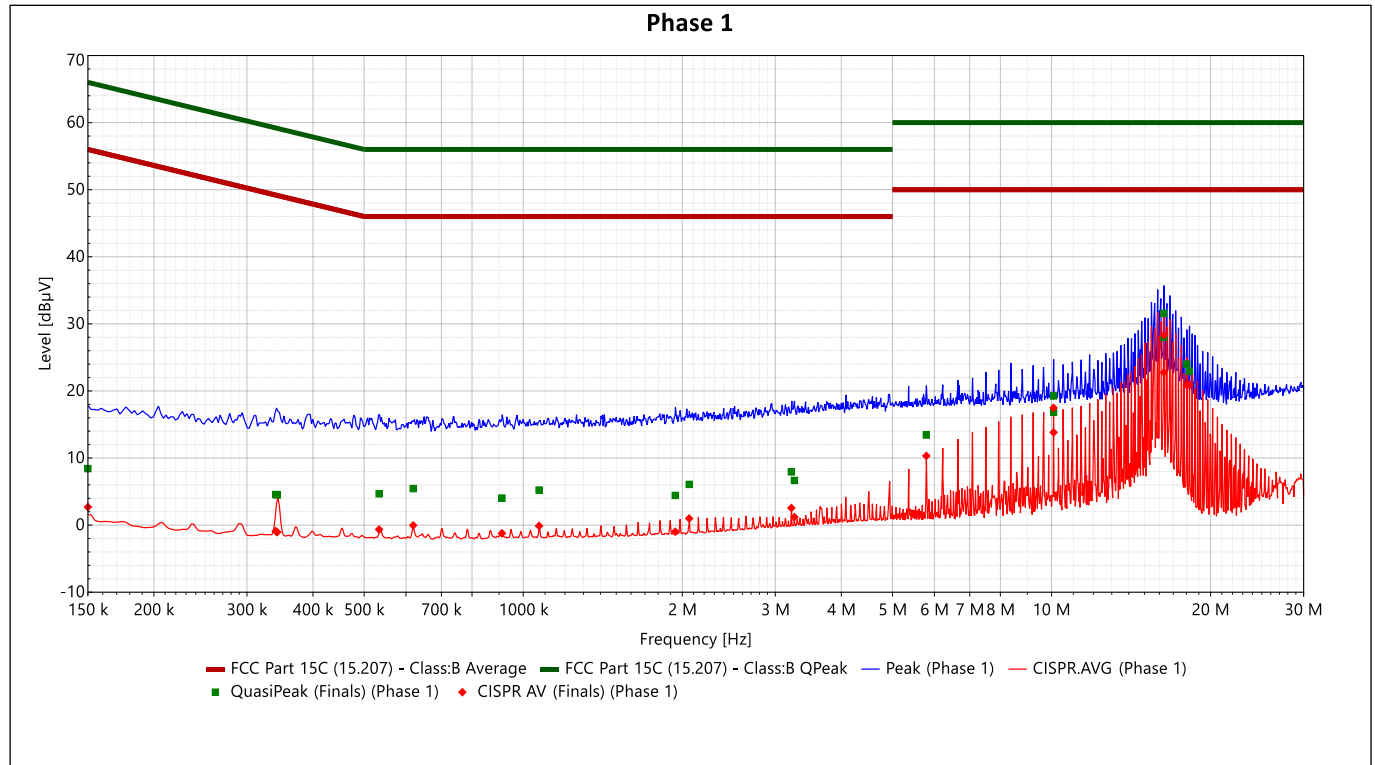
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

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

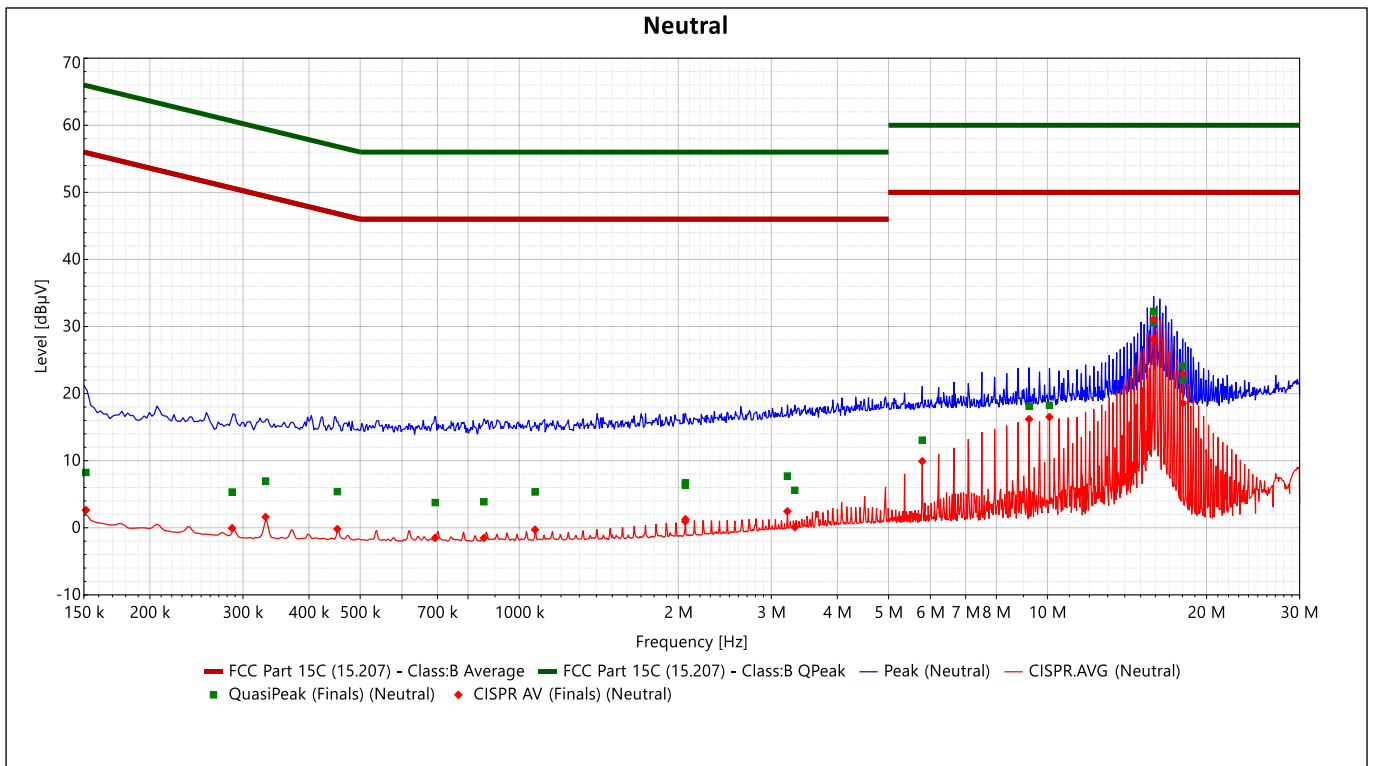
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
5.1.6 Test protocol

Frequency (Hz)	QuasiPeak (dBμV)	QP Margin	QP Limit (dBμV)	CISPR AV (dBμV)	CISPR AV Margin	AV Limit (dBμV)	RBW (Hz)	Correction (dB)
150.004 k	8.43	-57.57	66	2.7	-53.3	56	9000	10.37
340.107 k	4.57	-54.63	59.2	-0.89	-50.09	49.2	9000	10.37
342.357 k	4.5	-54.64	59.15	-1.05	-50.2	49.15	9000	10.37
533.607 k	4.67	-51.33	56	-0.65	-46.65	46	9000	10.4
619.107 k	5.44	-50.56	56	-0.03	-46.03	46	9000	10.42
911.607 k	4.03	-51.97	56	-1.22	-47.22	46	9000	10.45
1.071 M	5.23	-50.77	56	-0.12	-46.12	46	9000	10.48
1.94 M	4.43	-51.57	56	-0.98	-46.98	46	9000	10.59
2.061 M	6.07	-49.93	56	0.99	-45.01	46	9000	10.6
3.218 M	7.94	-48.06	56	2.56	-43.44	46	9000	10.65
3.261 M	6.66	-49.34	56	1.21	-44.79	46	9000	10.65
5.794 M	13.44	-46.56	60	10.32	-39.68	50	9000	10.56
10.087 M	19.26	-40.74	60	17.49	-32.51	50	9000	10.6
10.089 M	16.84	-43.16	60	13.82	-36.18	50	9000	10.6
16.313 M	31.56	-28.44	60	28.32	-21.68	50	9000	10.89
16.315 M	28	-32	60	22.75	-27.25	50	9000	10.89
18.03 M	24	-36	60	20.88	-29.12	50	9000	11
18.241 M	22.93	-37.07	60	20.95	-29.05	50	9000	11.02



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Frequency (Hz)	QuasiPeak (dBμV)	QP Margin	QP Limit (dBμV)	CISPR AV (dBμV)	CISPR AV Margin	AV Limit (dBμV)	RBW (Hz)	Correction (dB)
151.357 k	8.24	-57.68	65.93	2.64	-53.29	55.93	9000	10.37
286.107 k	5.33	-55.31	60.64	-0.05	-50.69	50.64	9000	10.37
331.107 k	6.97	-52.46	59.42	1.61	-47.81	49.42	9000	10.36
452.607 k	5.39	-51.44	56.83	-0.18	-47.01	46.83	9000	10.39
693.357 k	3.76	-52.24	56	-1.49	-47.49	46	9000	10.44
857.607 k	3.88	-52.12	56	-1.51	-47.51	46	9000	10.46
1.071 M	5.34	-50.66	56	-0.28	-46.28	46	9000	10.48
2.061 M	6.35	-49.65	56	0.96	-45.04	46	9000	10.61
2.064 M	6.71	-49.29	56	1.27	-44.73	46	9000	10.61
3.218 M	7.72	-48.28	56	2.46	-43.54	46	9000	10.67
3.324 M	5.59	-50.41	56	0.08	-45.92	46	9000	10.67
5.792 M	13.06	-46.94	60	9.91	-40.09	50	9000	10.6
9.225 M	18.15	-41.85	60	16.19	-33.81	50	9000	10.67
10.083 M	18.26	-41.74	60	16.51	-33.49	50	9000	10.71
15.876 M	32.26	-27.74	60	31.07	-18.93	50	9000	11.09
15.879 M	30.62	-29.38	60	28.06	-21.94	50	9000	11.09
18.021 M	24.11	-35.89	60	22.93	-27.07	50	9000	11.24
18.023 M	22.01	-37.99	60	18.56	-31.44	50	9000	11.24



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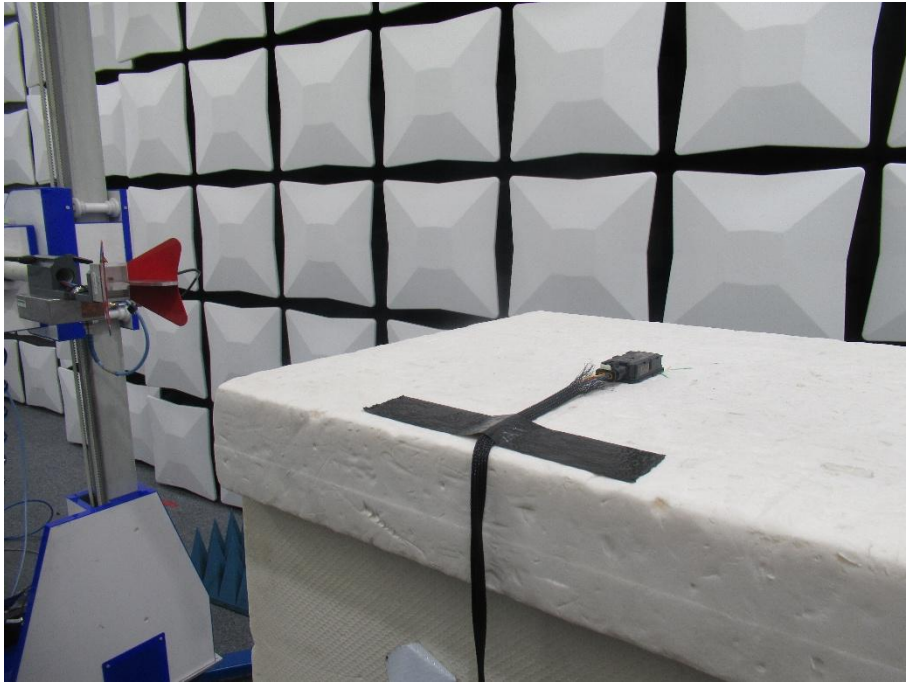
5.2 UWB Bandwidth

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

5.2.1 Description of the test location

Test location: Fully Anechoic Room FAR1

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15, Section 15.519(b):

The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

According to FCC Part 15, Section 15.503(d):

Ultra-wideband (UWB) transmitter. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

5.2.4 Description of Measurement

The bandwidth is measured following the procedure set out in ANSI C63-10, Item 10.1. The measurement was performed radiated at a distance of 3 m. The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -10 dB. The EUT is set in TX continuous mode while measuring.

Spectrum analyser settings:

RBW: 1 MHz, VBW: 3 MHz, Detector: Peak

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5.2.5 Test result

10 dBc

channel	antenna	lowest frequency f_L (MHz)	highest frequency f_H (MHz)	UWB bandwidth (MHz)	required UWB bandwidth (MHz)	result
5	1	6224.2	6770.1	545.9	> 500	passed
5	2	6224.2	6770.6	546.4	> 500	passed
6	1	6691.7	7269.9	578.2	> 500	passed
6	2	6691.7	7285.7	594.0	> 500	passed
8	1	7190.7	7784.8	594.1	> 500	passed
8	2	7190.7	7769.3	578.6	> 500	passed
9	1	7689.7	8268.4	578.7	> 500	passed
9	2	7689.7	8283.4	593.8	> 500	passed

99% OBW

channel	antenna	lowest frequency f_L (MHz)	highest frequency f_H (MHz)	UWB bandwidth (MHz)	required 99% OBW (MHz)
5	1	6203.3	6792.1	588.8	---
5	2	6204.5	6786.6	582.1	---
6	1	6689.2	7286.3	597.0	---
6	2	6688.0	7288.2	600.2	---
8	1	7191.2	7789.6	598.4	---
8	2	7191.2	7780.9	589.6	---
9	1	7685.4	8285.1	599.7	---
9	2	7684.5	8290.1	605.6	---

The requirements are **FULFILLED**.

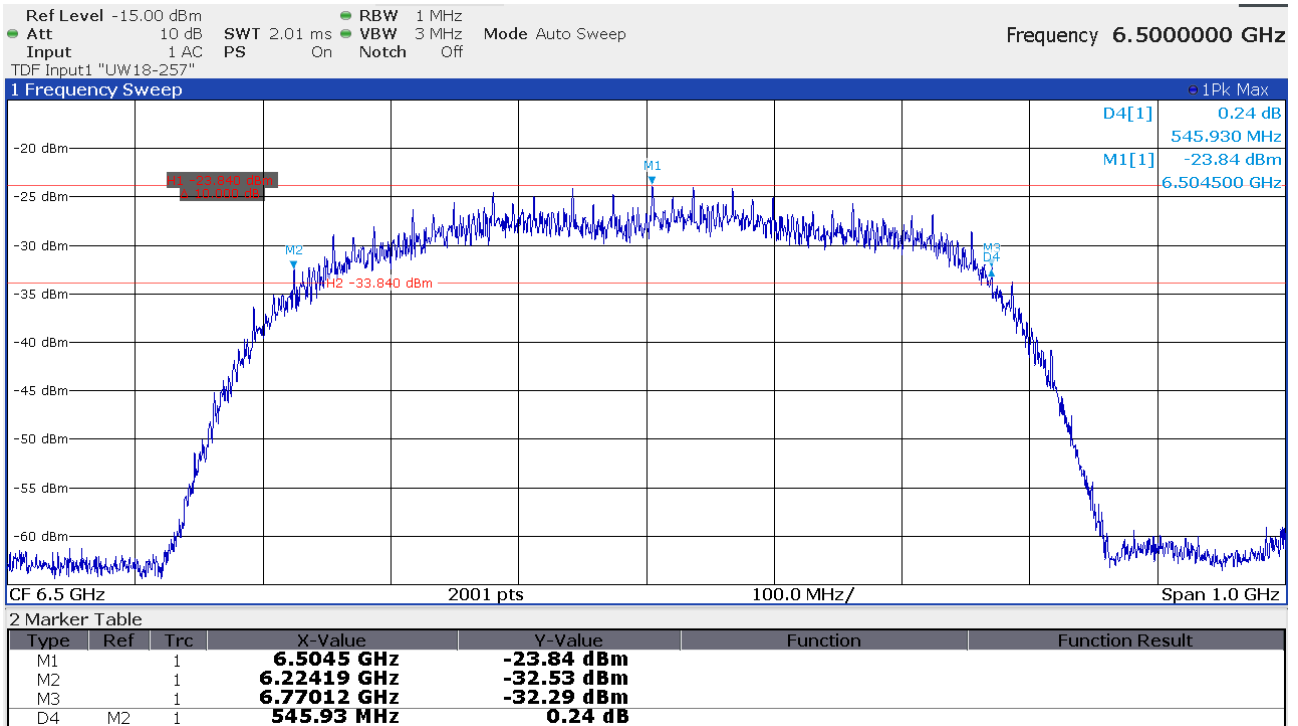
Remarks: For detailed test results please refer to following test protocols.

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

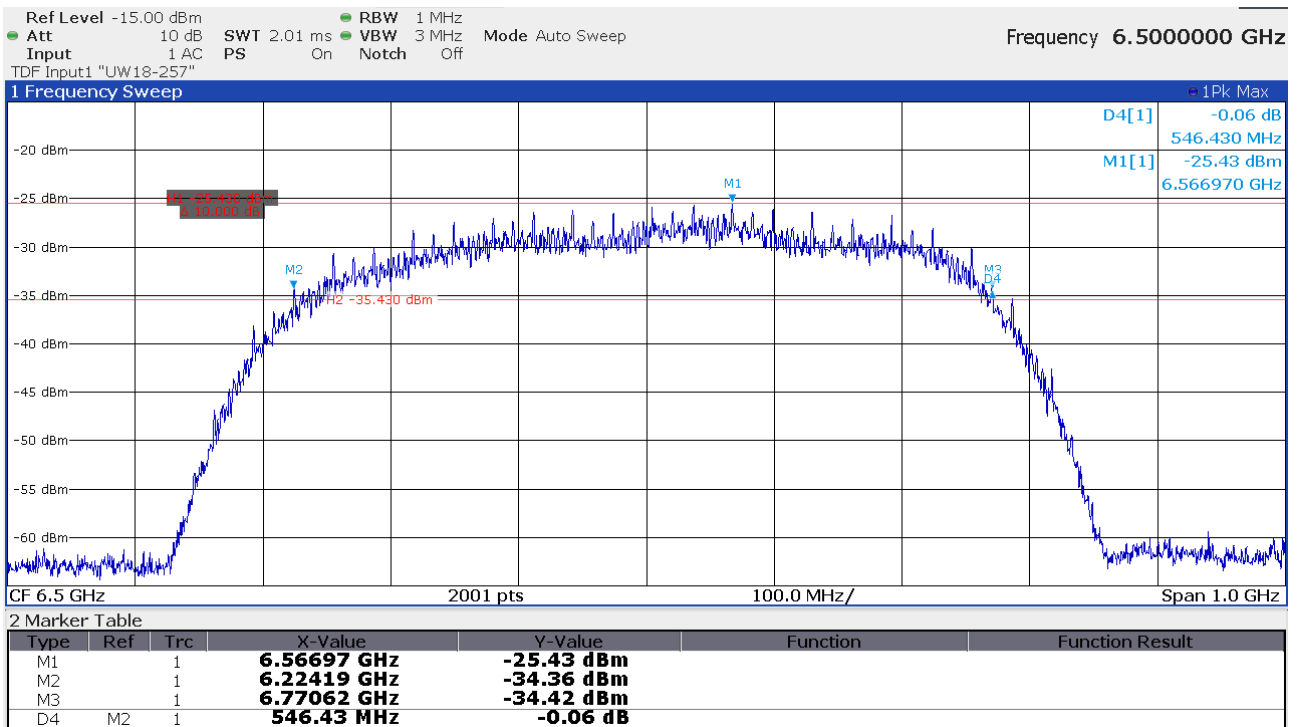
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

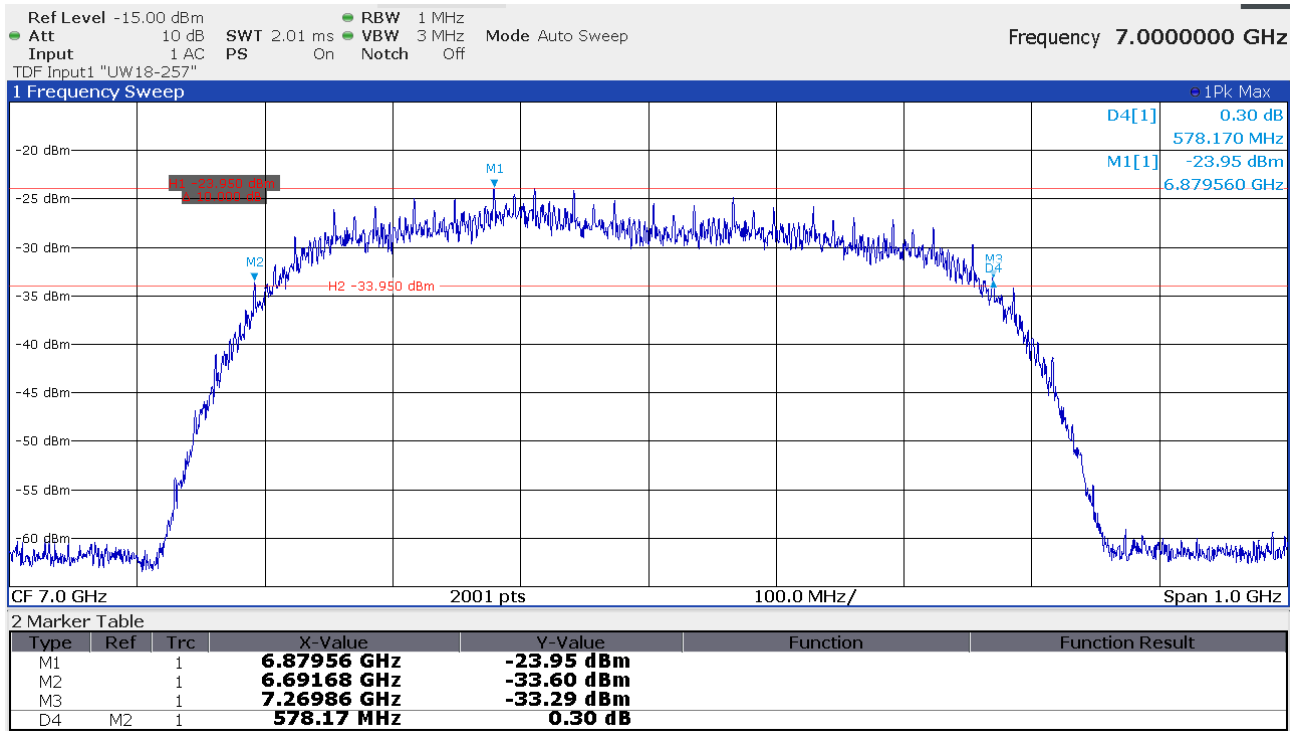
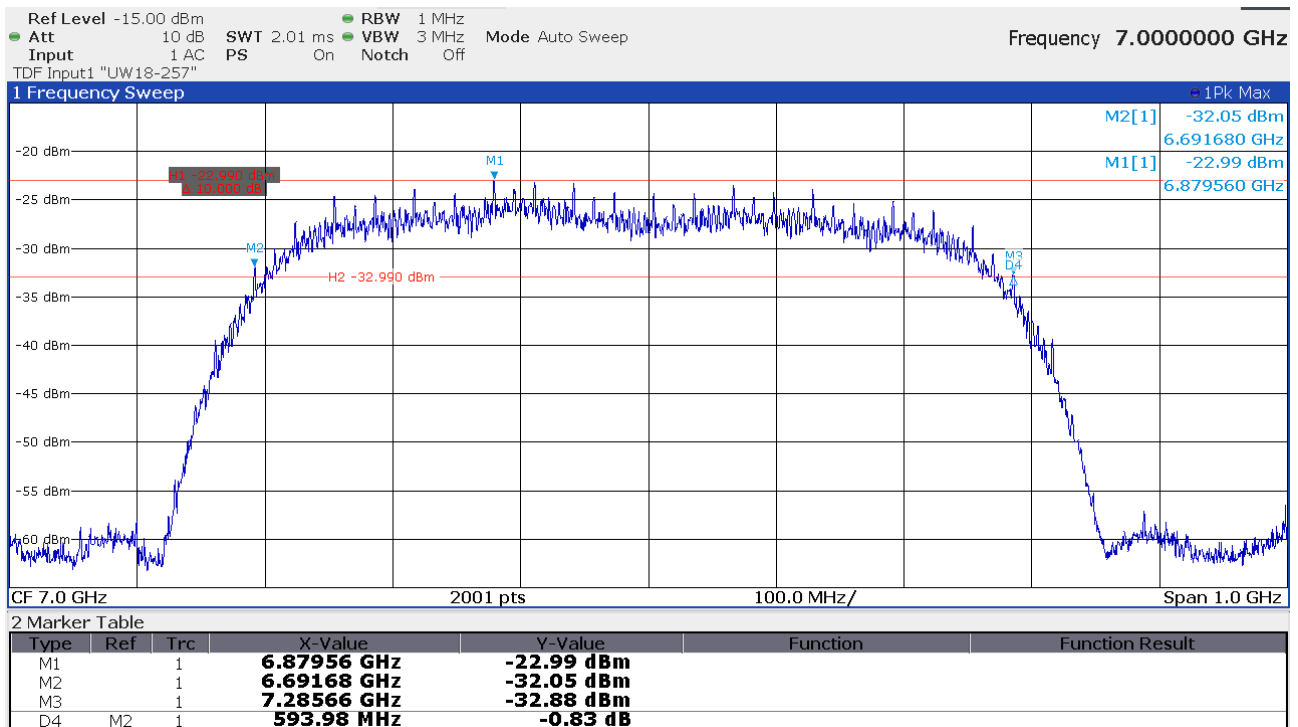
5.2.6 Test protocols EBW

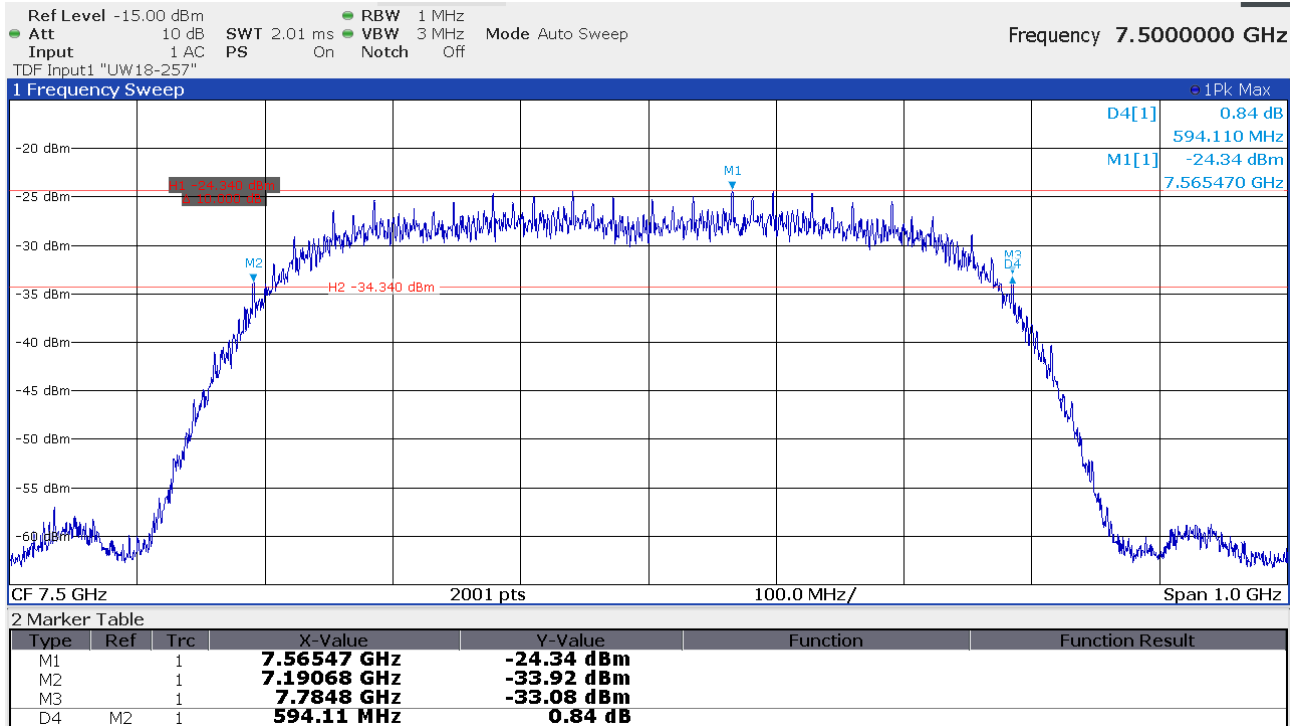
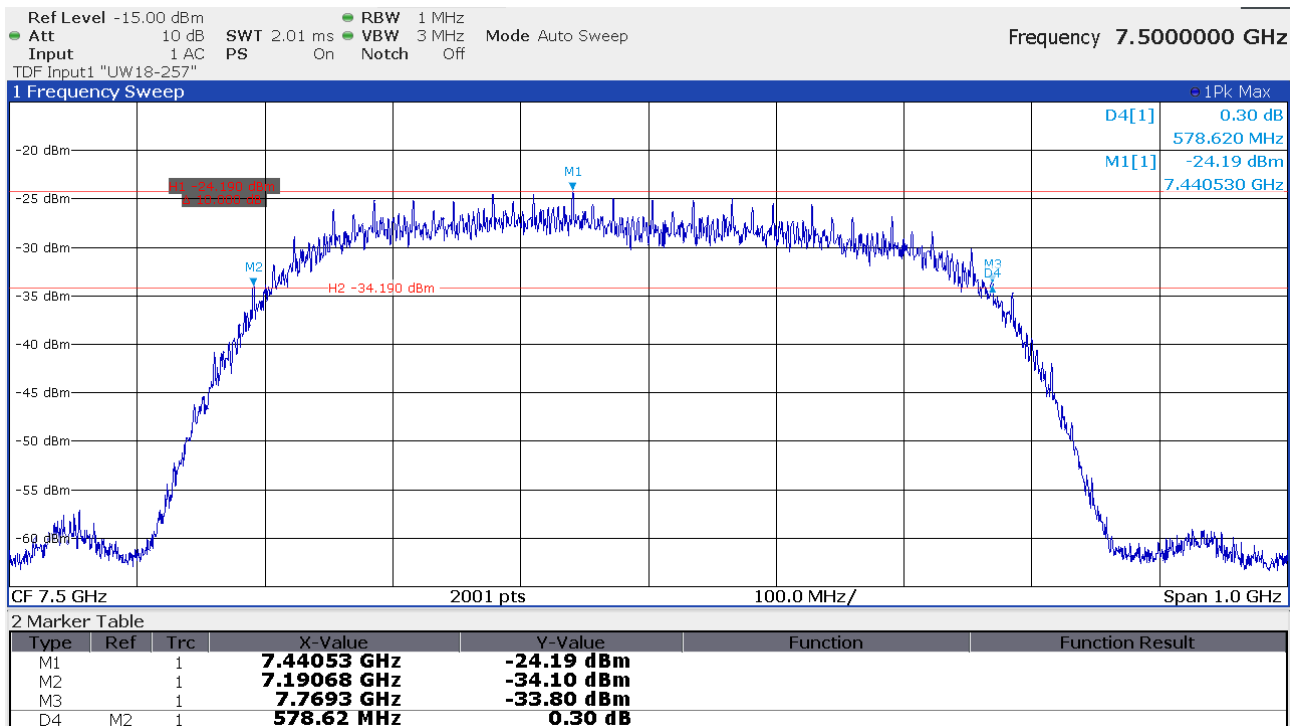
Channel 5 antenna 1

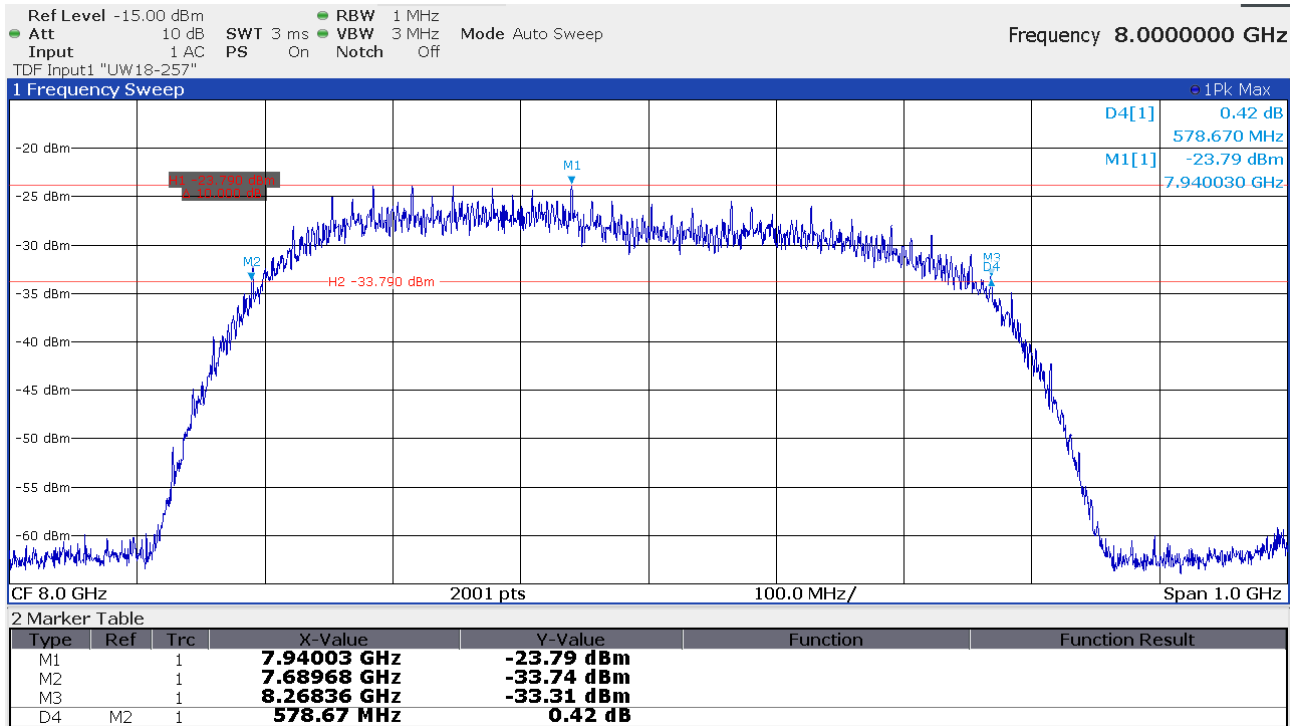
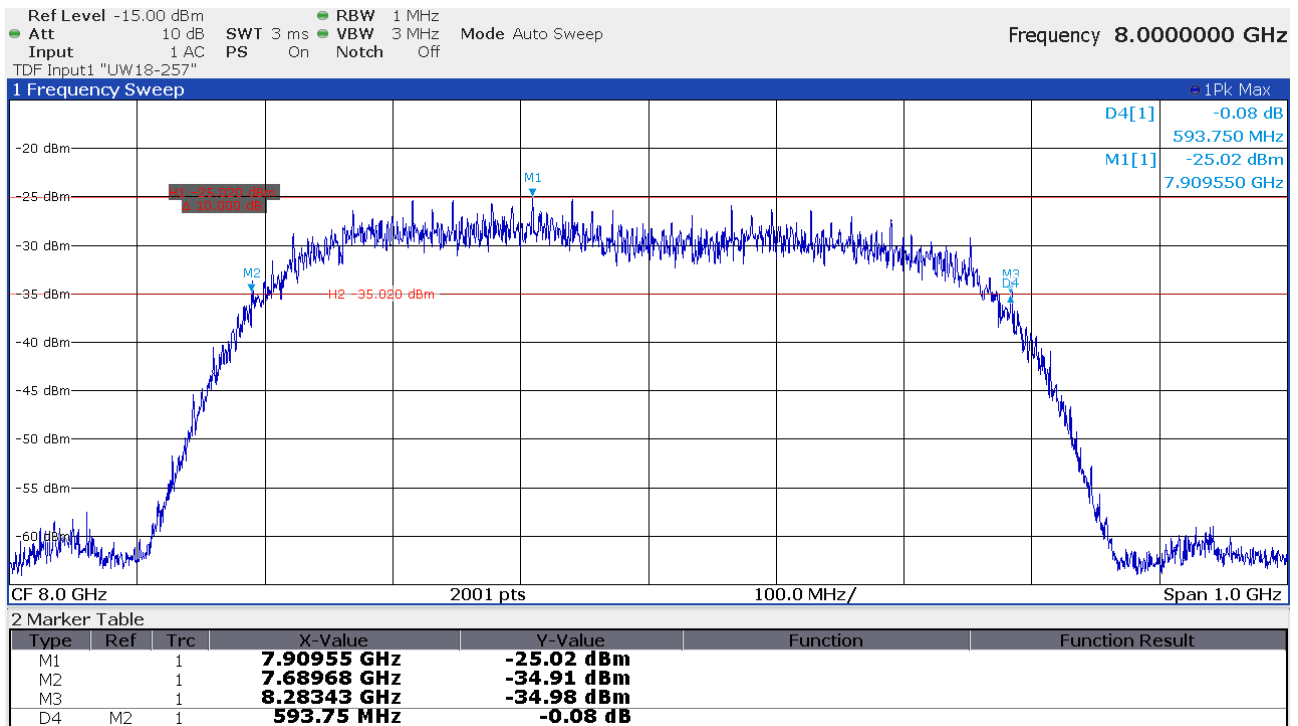


Channel 5 antenna 2



FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 1

Channel 6 antenna 2


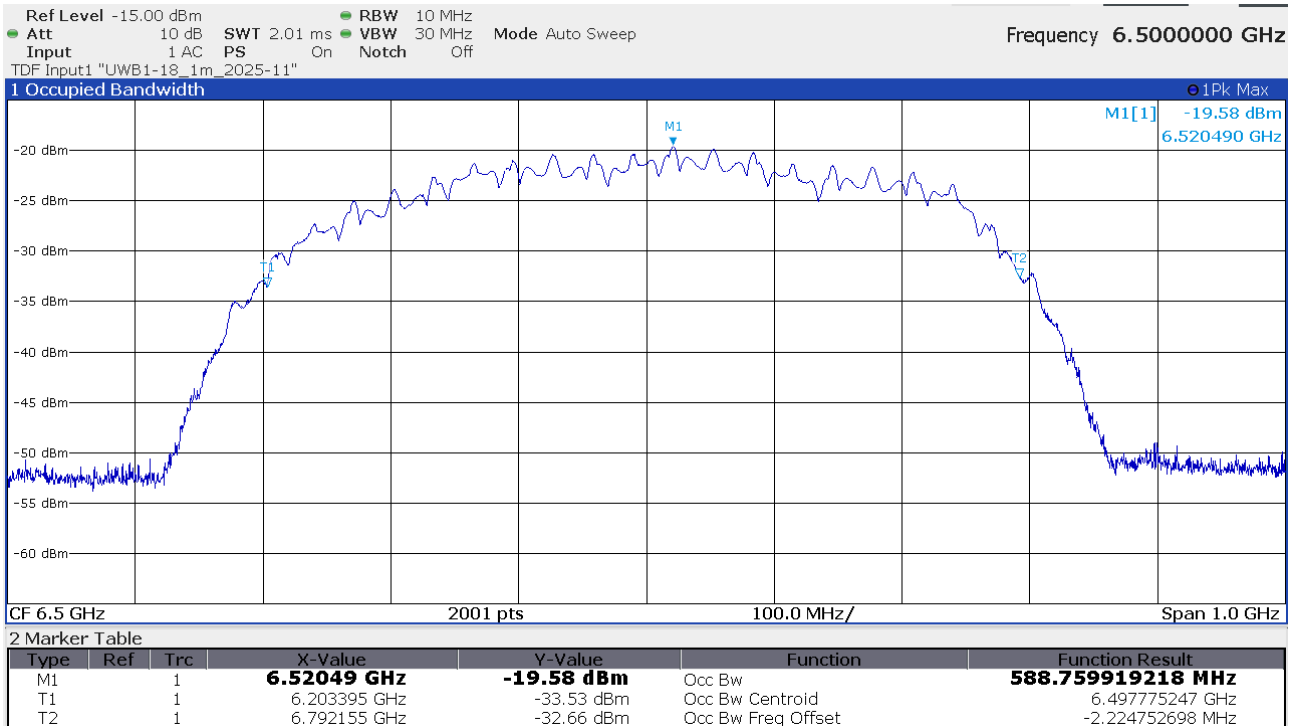
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 1

Channel 8 antenna 2


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 1

Channel 9 antenna 2


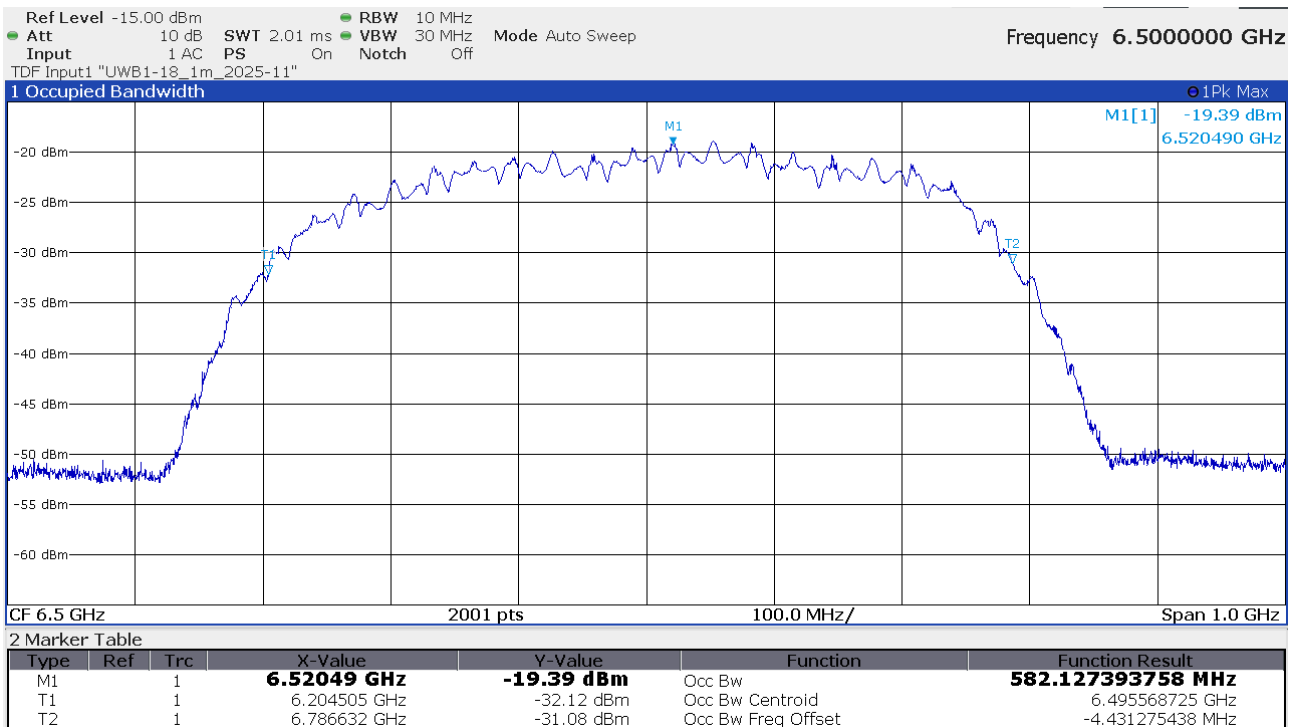
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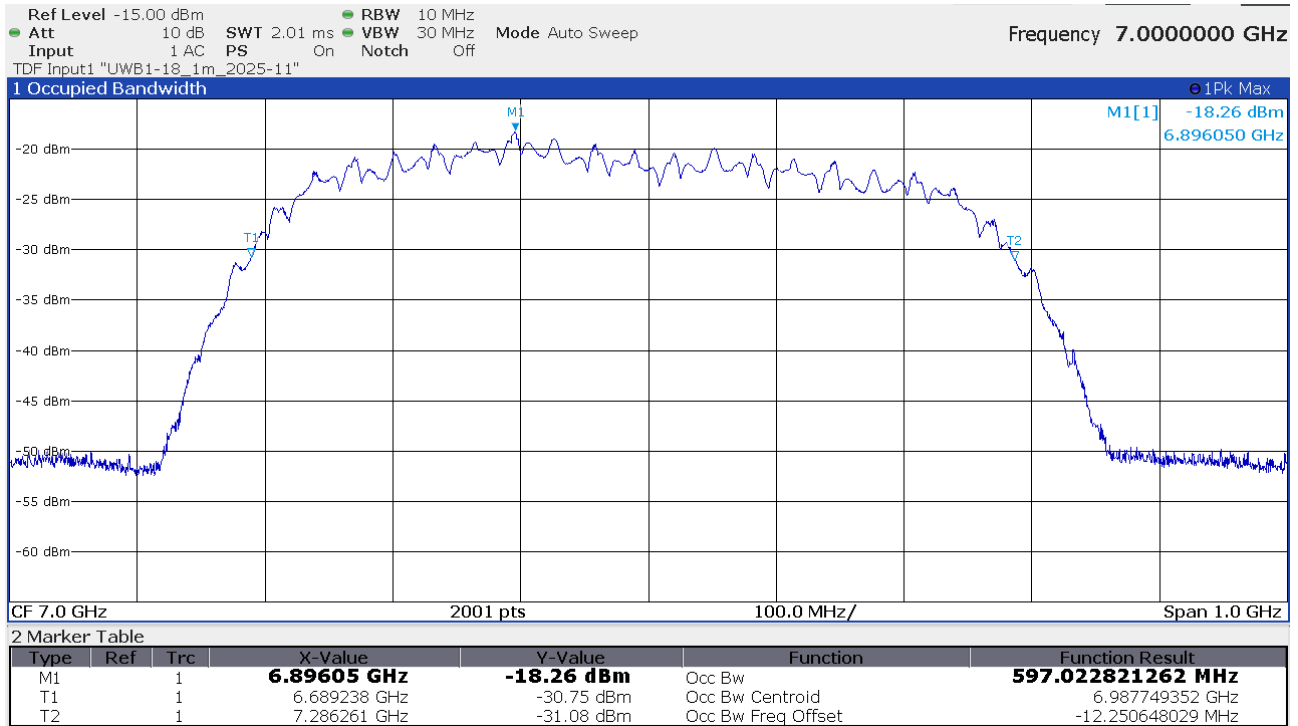
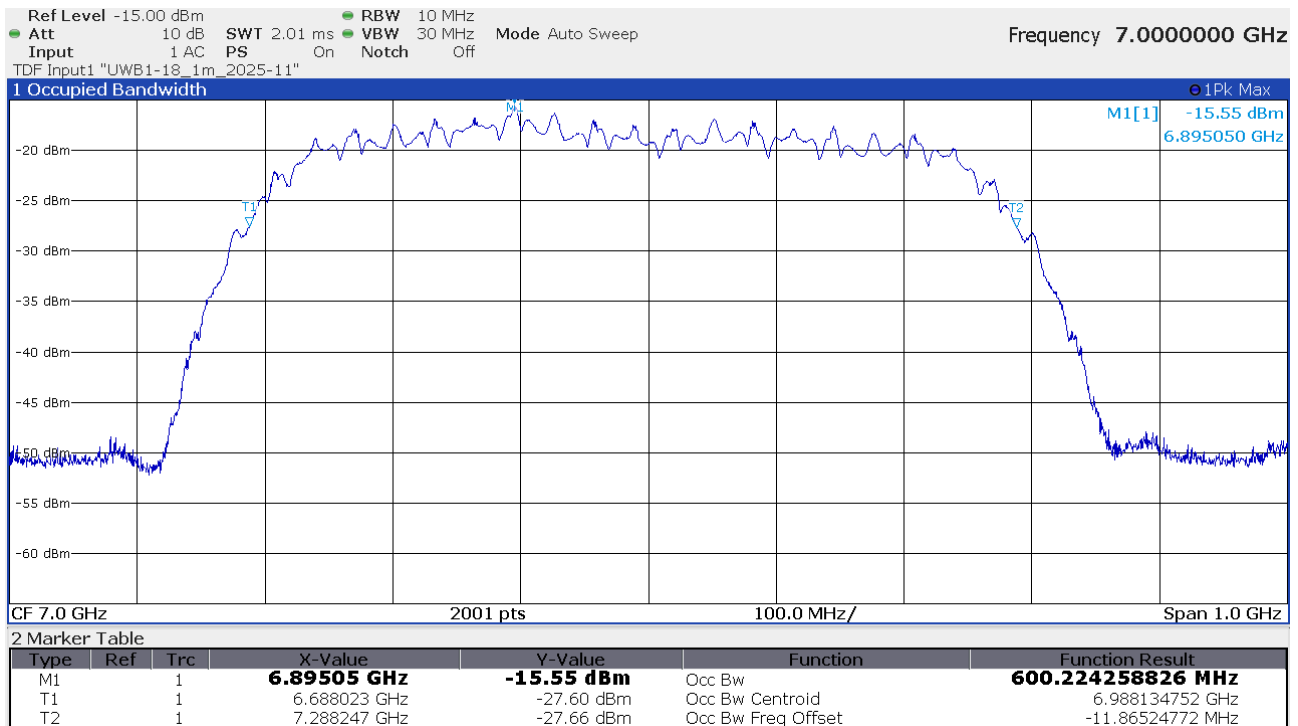
5.2.7 Test protocols OBW

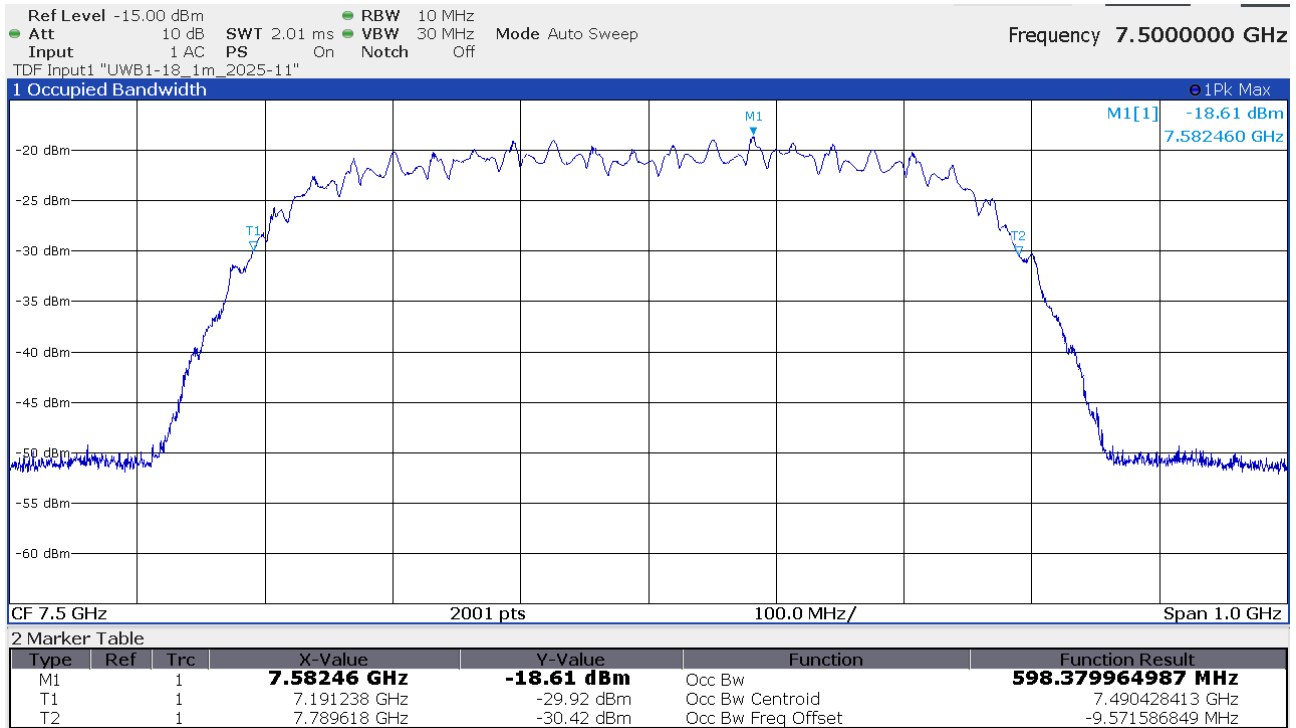
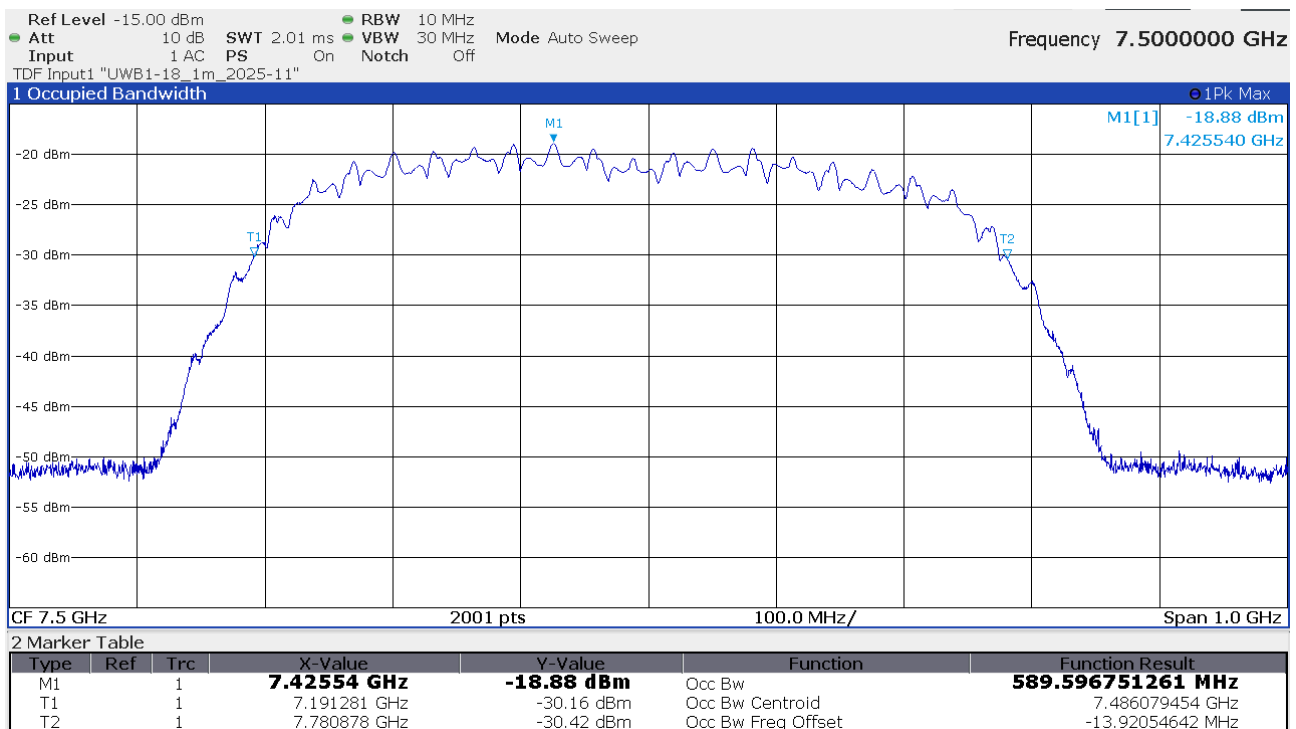
Channel 5 antenna 1

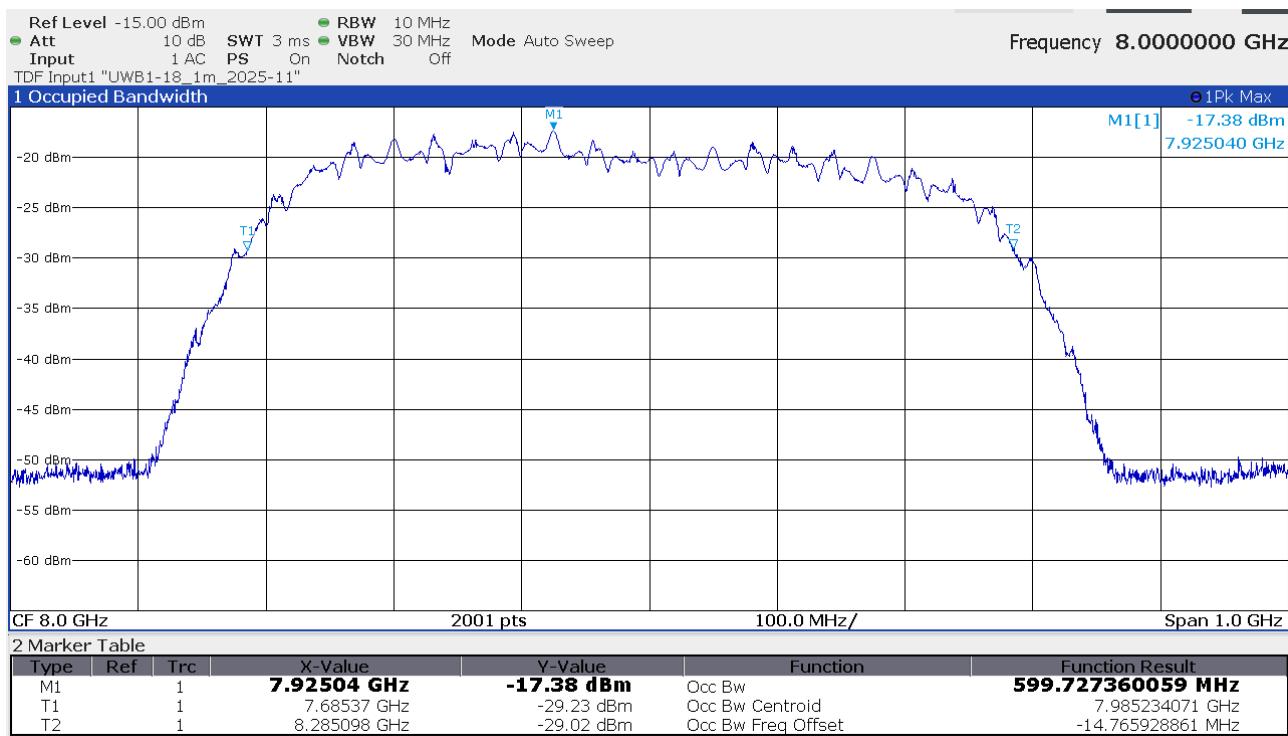
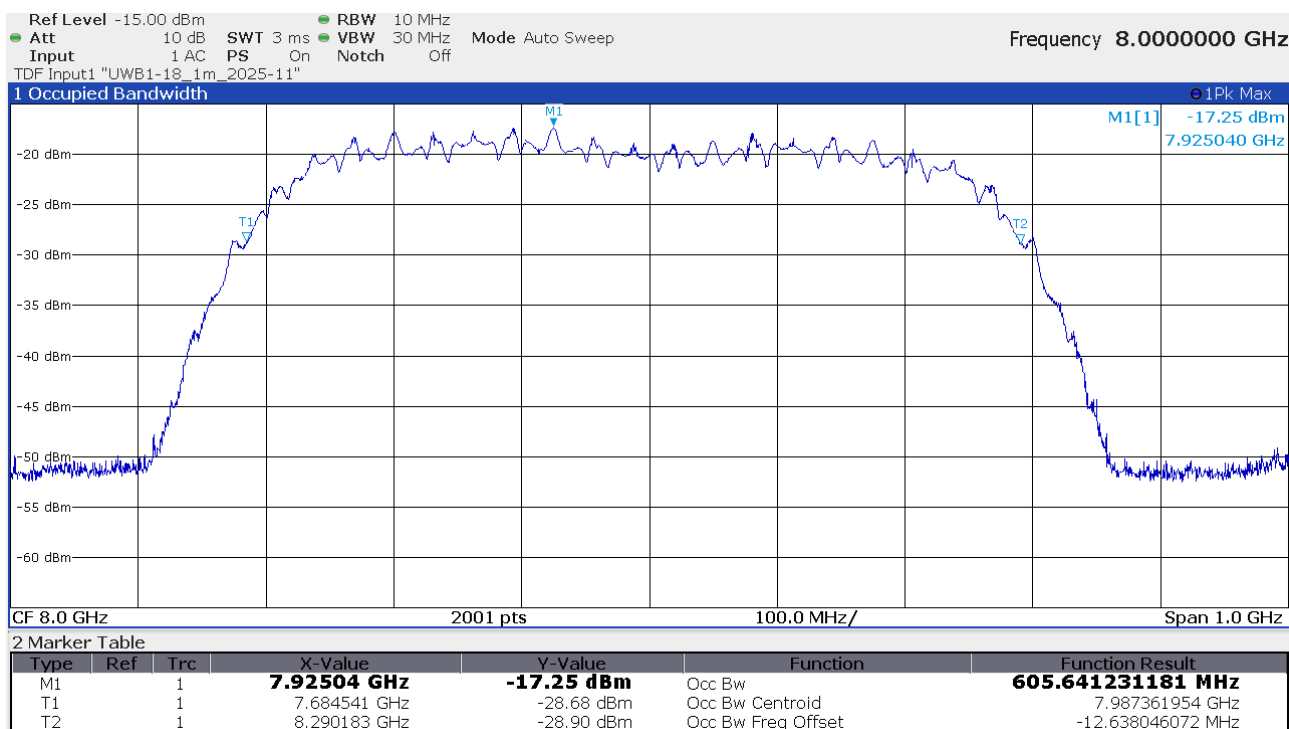


Channel 5 antenna 2



FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 1

Channel 6 antenna 2


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 1

Channel 8 antenna 2


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 1

Channel 9 antenna 2


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

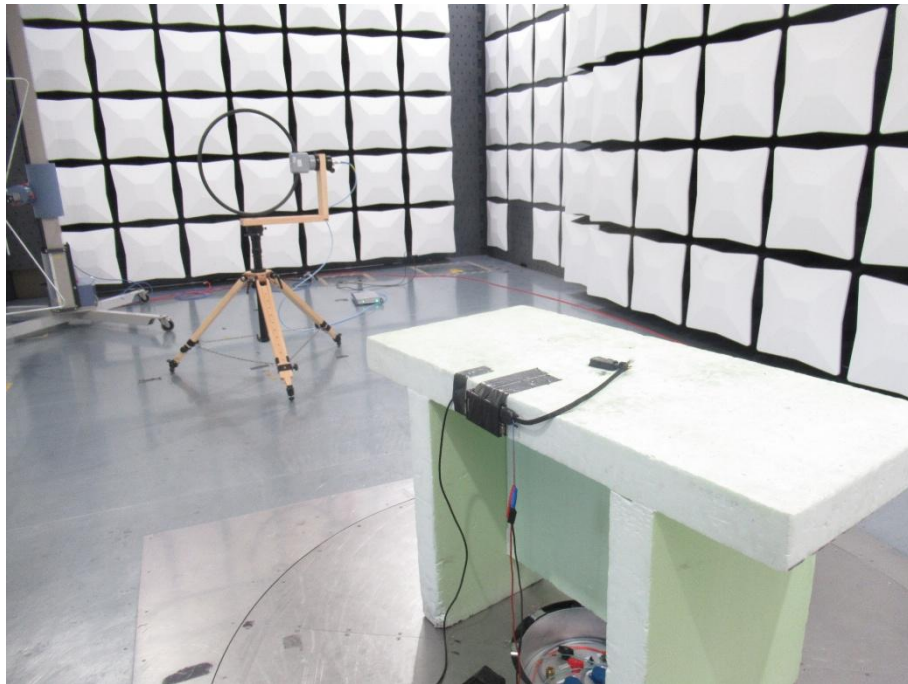
5.3 Radiated Emissions 9 kHz to 40 GHz

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

5.3.1 Description of the test location

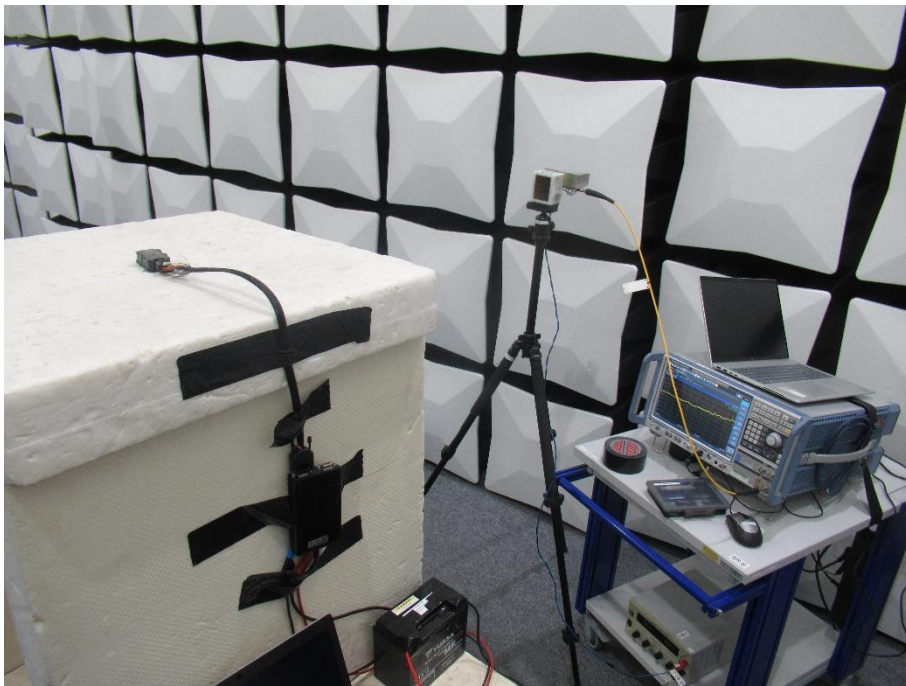
Test location: Semi-anechoic Chamber SAC2
Test location: Fully Anechoic Room FAR1

5.3.2 Photo documentation of the test set-up



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

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23



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

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
5.3.3 Applicable standard

According to FCC Part 15, Section 15.519(c):

The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.

According to FCC Part 15, Section 15.521(c):

Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in § 15.209, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in § 15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of this part.

5.3.4 Description of Measurement

The maximum emission is measured following the procedure set out in ANSI C63-10, item 10.2. The EUT is set in TX continuous mode while measuring.

Analyser settings:

9 kHz – 150 kHz	RBW: 200 Hz			
150 kHz - 30 MHz	RBW: 9 kHz			
30 MHz – 960 MHz	RBW: 120 kHz	Detector: QP		
960 MHz – 40 GHz	RBW: 1 MHz	VBW: 3 MHz	Detector: RMS	Sweeptime: 1ms per MHz

for § 15.521(c) additionally:

960 MHz – 40 GHz	RBW: 1 MHz	VBW3: MHz	Detector: Peak/Av	Sweeptime: 100 ms
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
5.3.5 Test result
5.3.5.1 Measurement 9 kHz to 30 MHz

Note: Pre-measurements have shown, there are no detectable emissions in this frequency range. All values represent the noise floor of the test chamber.

f (MHz)	Level @3m (dBμV)	Ant. factor (dB/m)	Field strength @3m dB(μV/m)	Distance corr. 3m to 30m (dB)	Corrected level @30m dB(μV/m)	Limit @30m dB(μV/m)	Delta (dB)
1.0	3.6	20.0	23.6	-40.0	-16.4	27.6	-44.0
5.0	1.8	20.0	21.8	-40.0	-18.2	29.5	-47.7
10.0	1.6	20.0	21.6	-40.0	-18.4	29.5	-47.9
15.0	1.7	20.0	21.7	-40.0	-18.3	29.5	-47.8
20.0	1.3	20.0	21.3	-40.0	-18.7	29.5	-48.2
25.0	1.7	20.0	21.7	-40.0	-18.3	29.5	-47.8

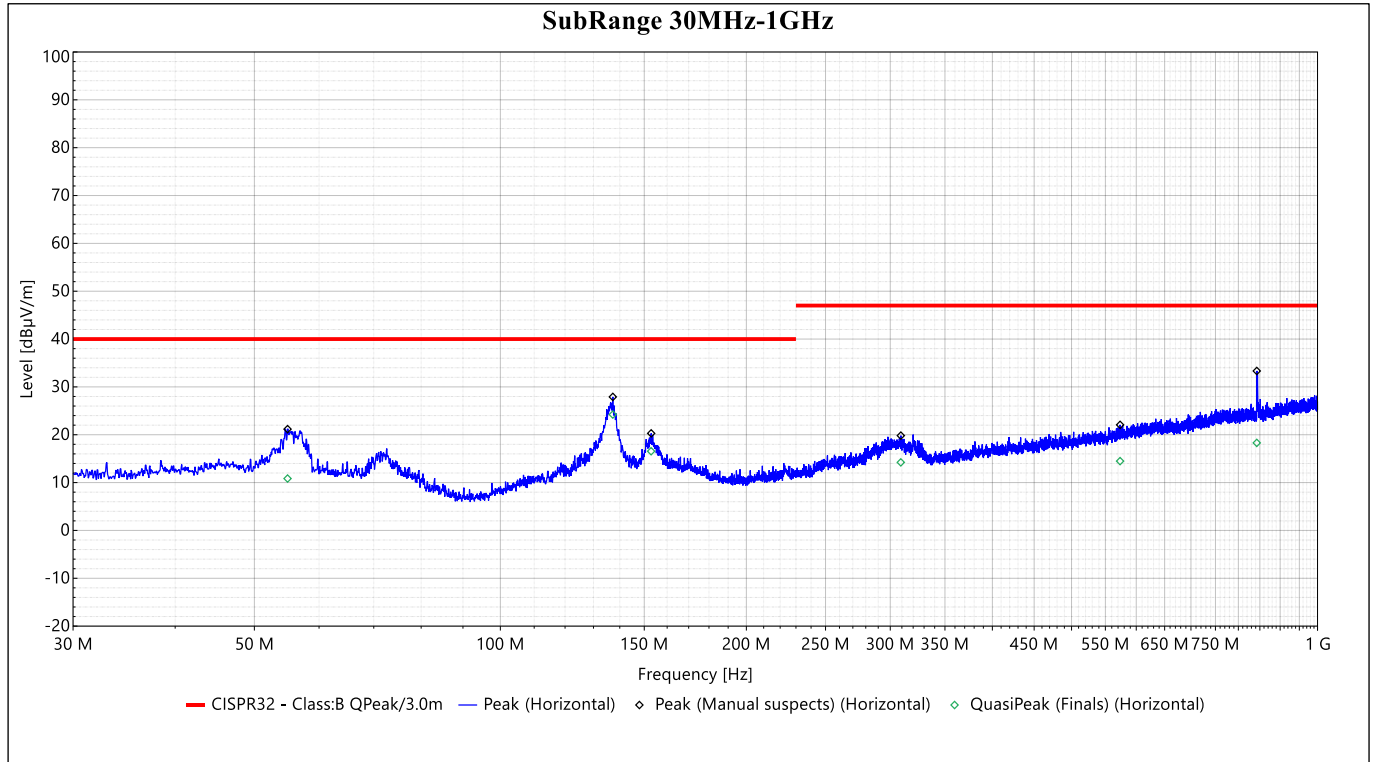
f (MHz)	Level AV@3m (dBμV)	Ant. factor (dB/m)	Field strength AV@3m dB(μA/m)	Distance corr. 3m to 30m (dB)	Corrected level AV@30m dB(μA/m)	Limit AV@30m dB(μA/m)	Delta (dB)
1.0	3.6	20.0	-27.9	-40.0	-67.9	-23.9	-44.0
5.0	1.8	20.0	-29.7	-40.0	-69.7	-21.9	-47.8
10.0	1.6	20.0	-29.9	-40.0	-69.9	-21.9	-48.0
15.0	1.7	20.0	-29.8	-40.0	-69.8	-21.9	-47.9
20.0	1.3	20.0	-30.2	-40.0	-70.2	-21.9	-48.3
25.0	1.7	20.0	-29.8	-40.0	-69.8	-21.9	-47.9

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

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

5.3.5.2 Measurement 30 MHz to 960 MHz

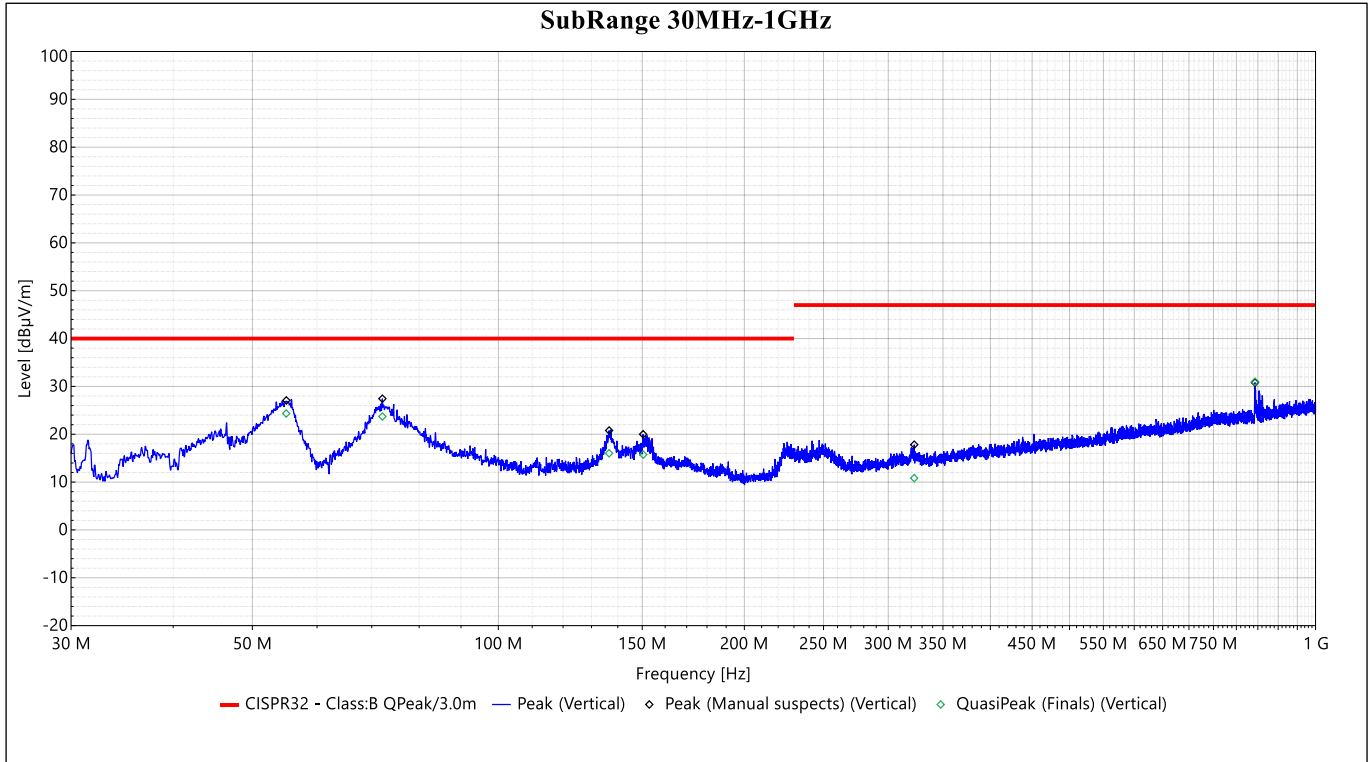
Frequency (Hz)	QuasiPeak (dBµV/m)	QP Margin	QP Limit (dBµV/m)	angle	height	polarization	RBW (Hz)	Meas.Time (s)	Correction (dB)
54.9036913 M	10.844	-29.156	40	0	1	Horizontal	120000	0.01	-9.95
137.2782507 M	24.221	-19.279	43.5	277	2.2	Horizontal	120000	0.01	-10.22
152.9276815 M	16.553	-26.947	43.5	225	1.84	Horizontal	120000	0.01	-9.369
309.0637715 M	14.227	-31.773	46	156	1.18	Horizontal	120000	0.01	-8.185
573.2710115 M	14.486	-31.514	46	233	1	Horizontal	120000	0.01	-1.639
842.6046901 M	18.299	-27.701	46	66	2.19	Horizontal	120000	0.01	2.931



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

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

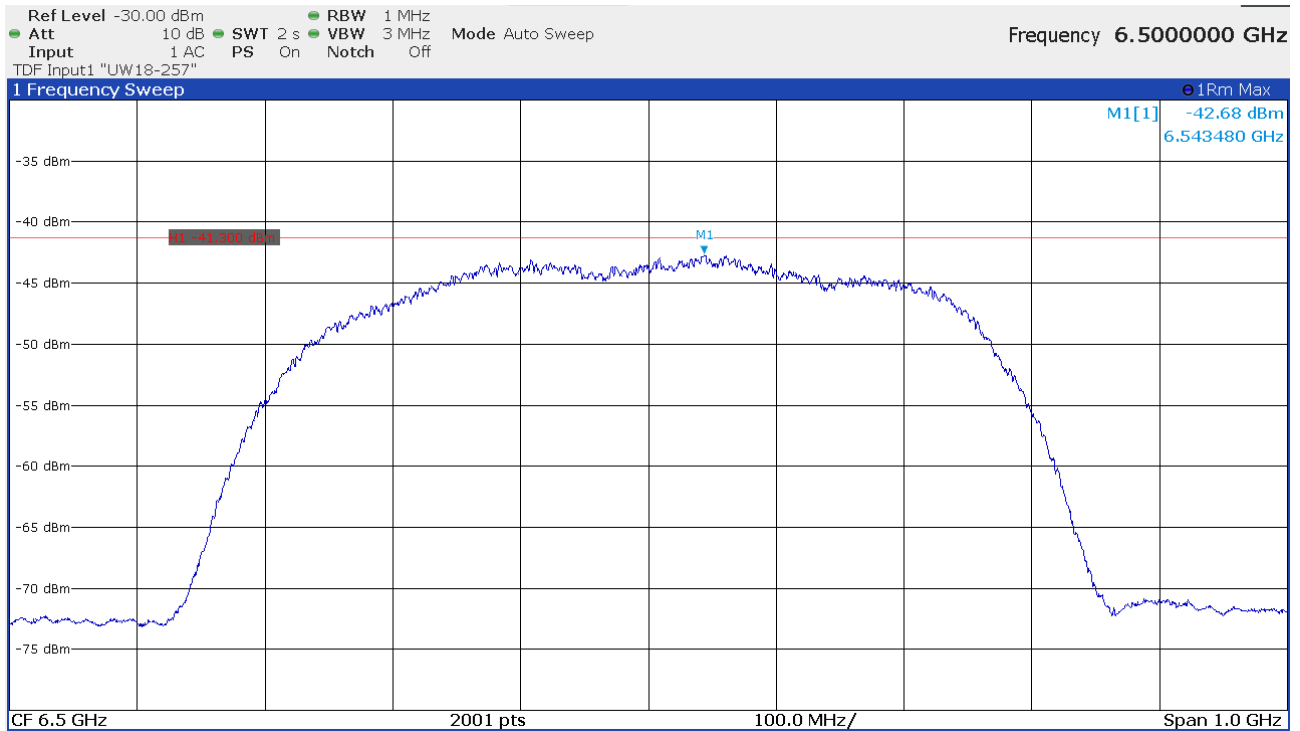
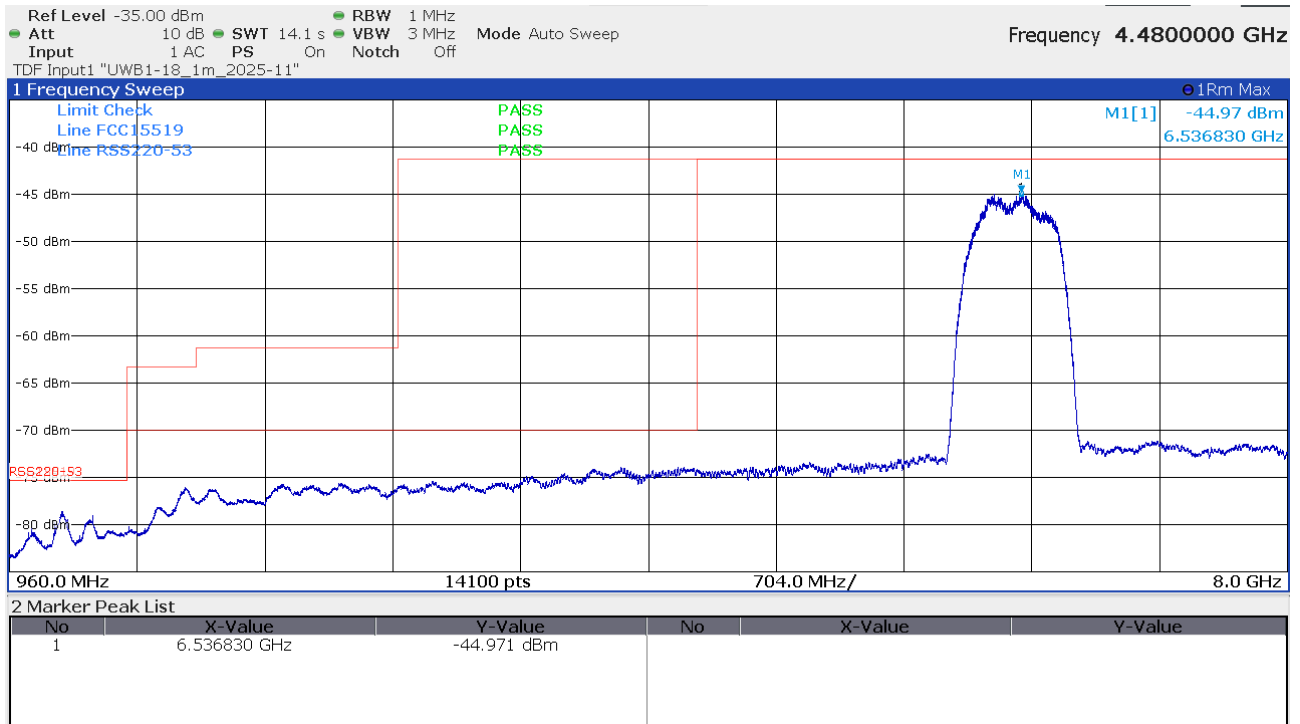
Frequency (Hz)	QuasiPeak (dBμV/m)	QP Margin	QP Limit (dBμV/m)	angle	height	polarization	RBW (Hz)	Meas.Time (s)	Correction (dB)
54.9975815 M	24.326	-15.674	40	0	1	Vertical	120000	0.01	-10.982
72.1265467 M	23.708	-16.292	40	233	1	Vertical	120000	0.01	-13.271
136.6059915 M	16.021	-27.479	43.5	337	1	Vertical	120000	0.01	-9.504
150.3842388 M	15.748	-27.752	43.5	185	1	Vertical	120000	0.01	-8.557
322.7737044 M	10.834	-35.166	46	320	1.59	Vertical	120000	0.01	-8.052
843.1308537 M	30.983	-15.017	46	0	3	Vertical	120000	0.01	2.372

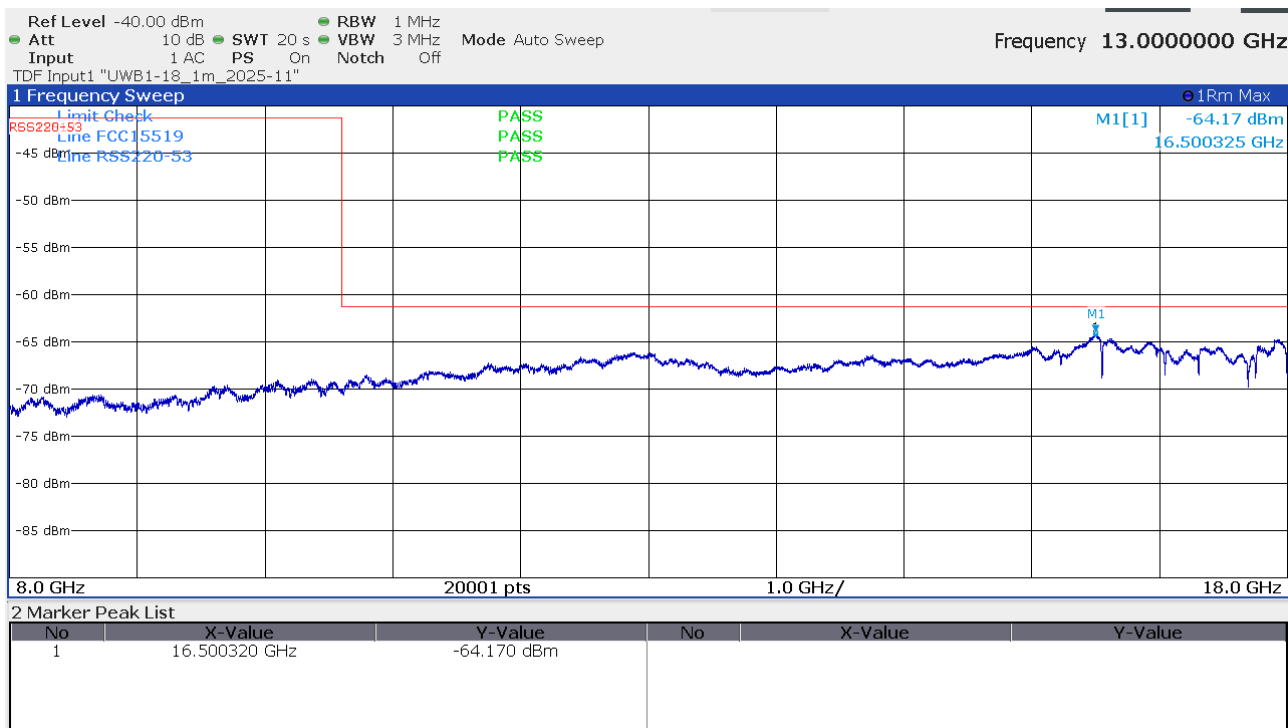
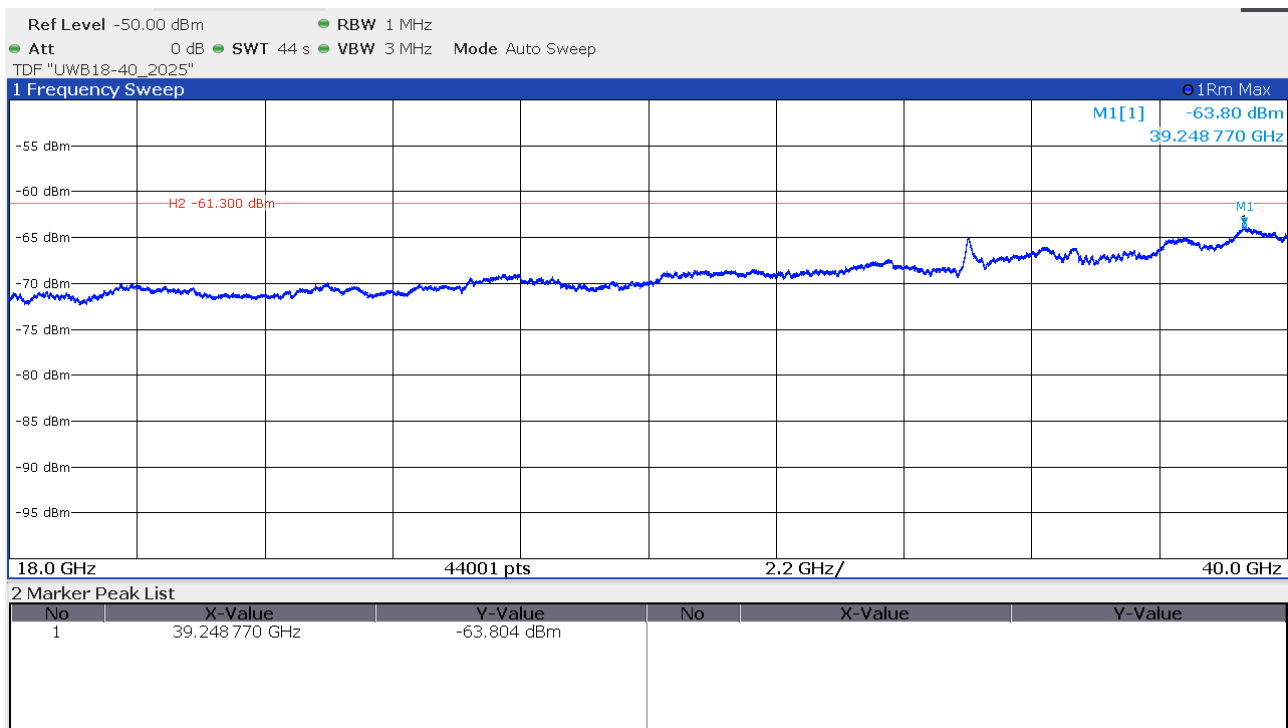


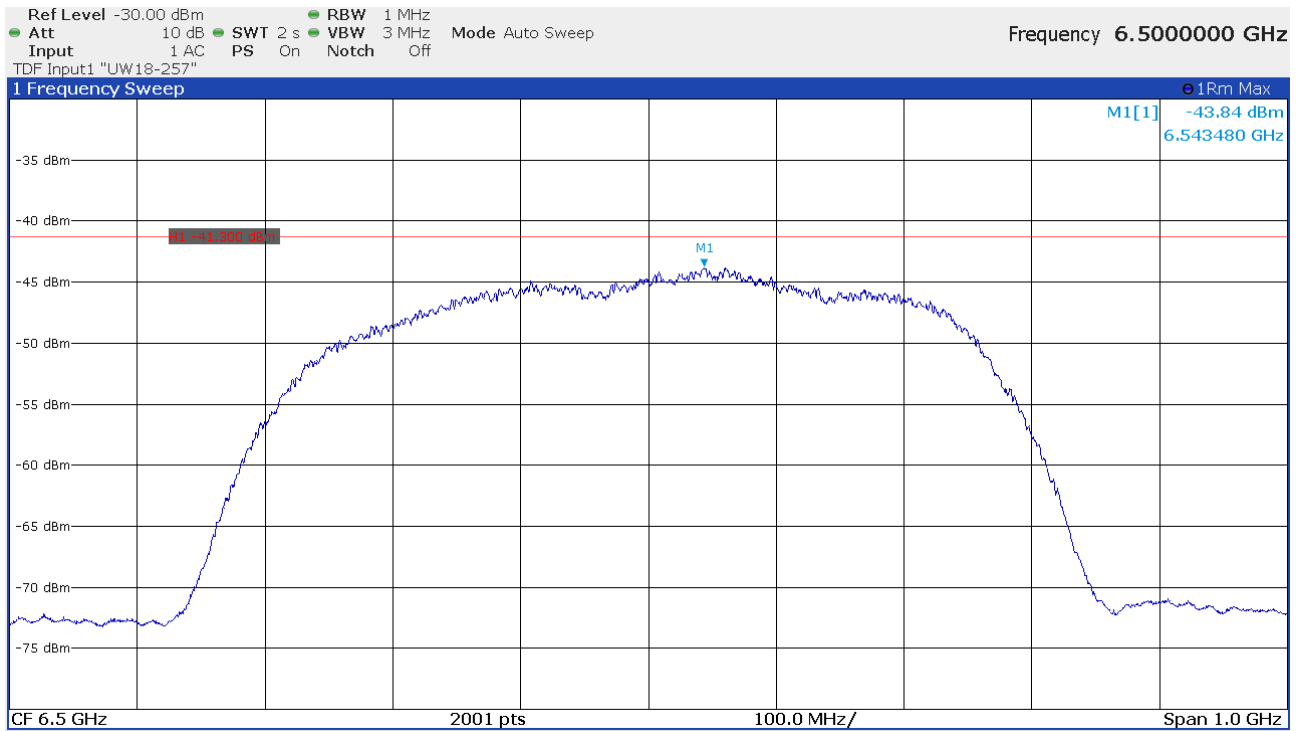
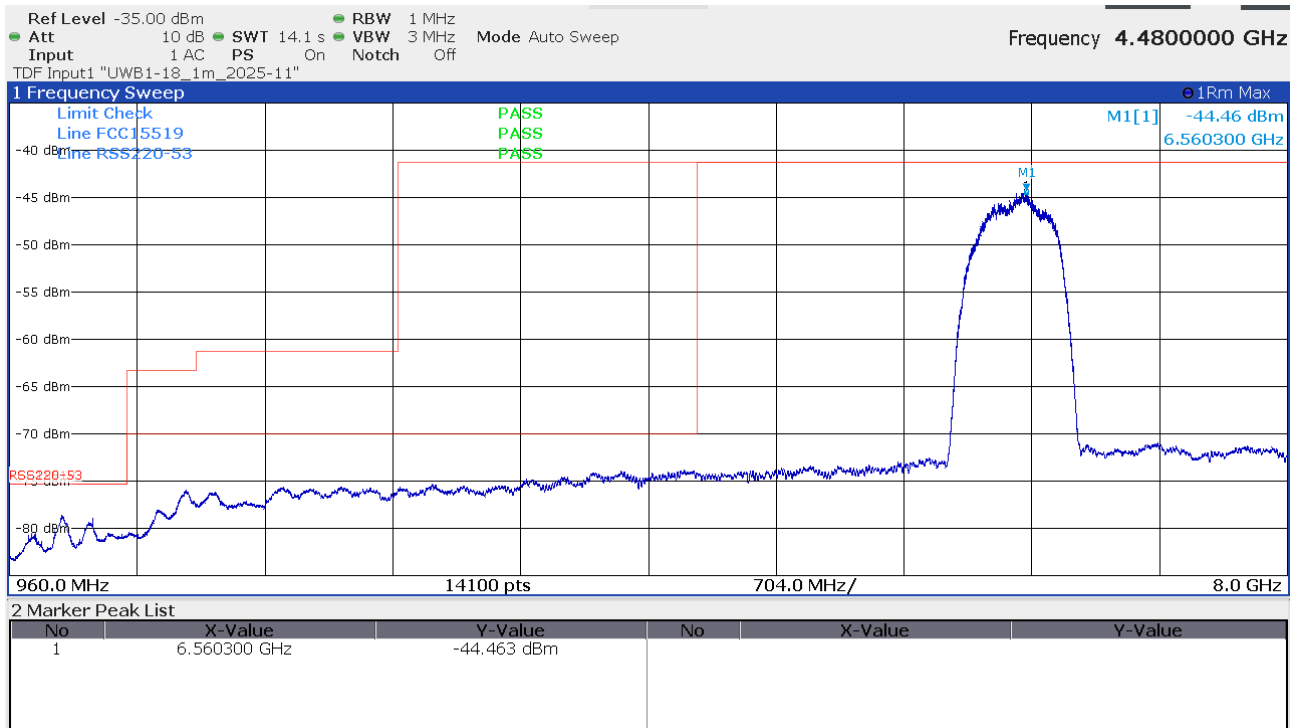
5.3.5.3 Measurement 960 MHz to 40 GHz

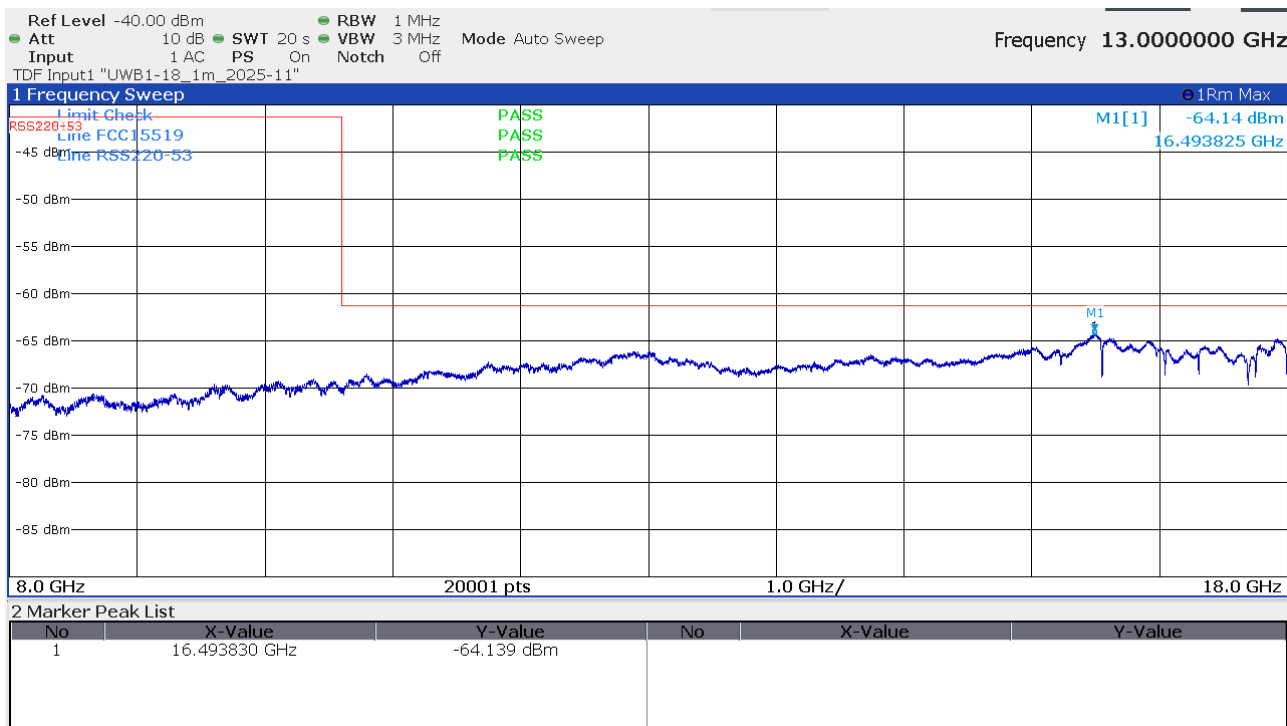
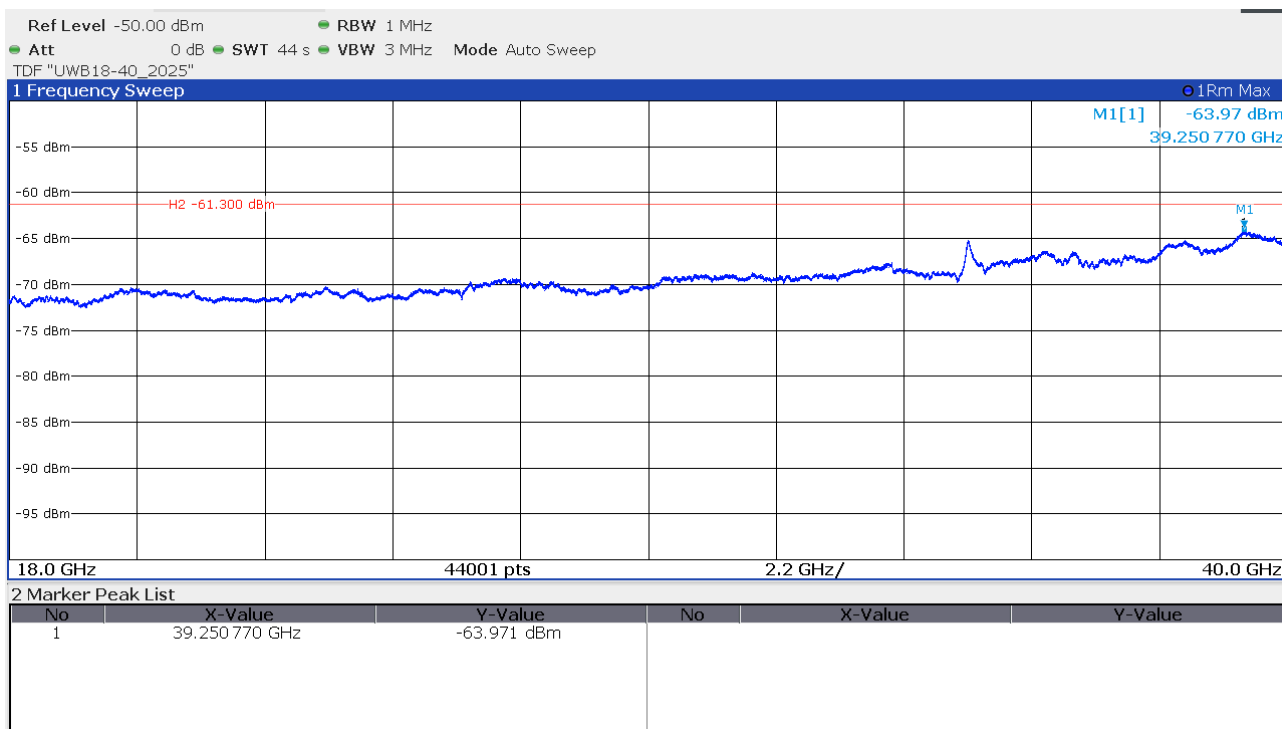
According to § 15.521(c), missions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in § 15.209. The average limit is given by 54 dBμV/m at 3 meter distance, which corresponds to an EIRP of -41.3 dBm according to ANSI C63.10 2013 clause 10.3.9.

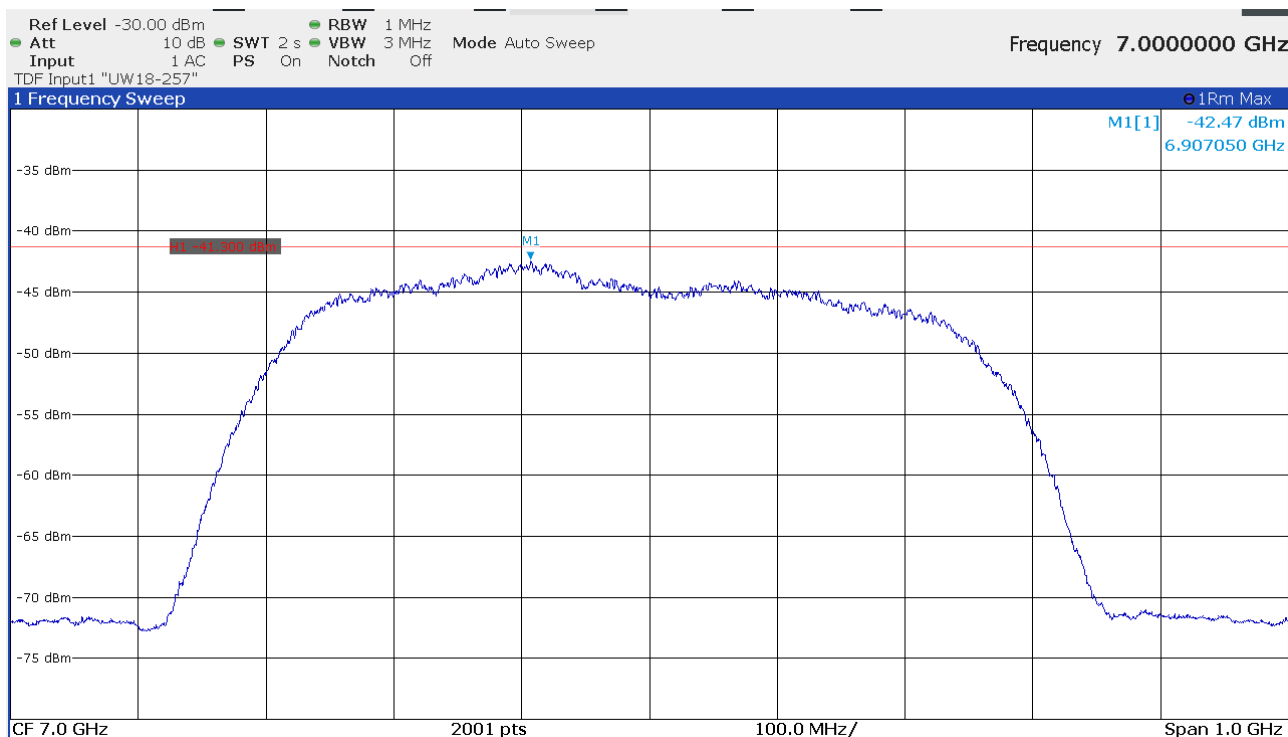
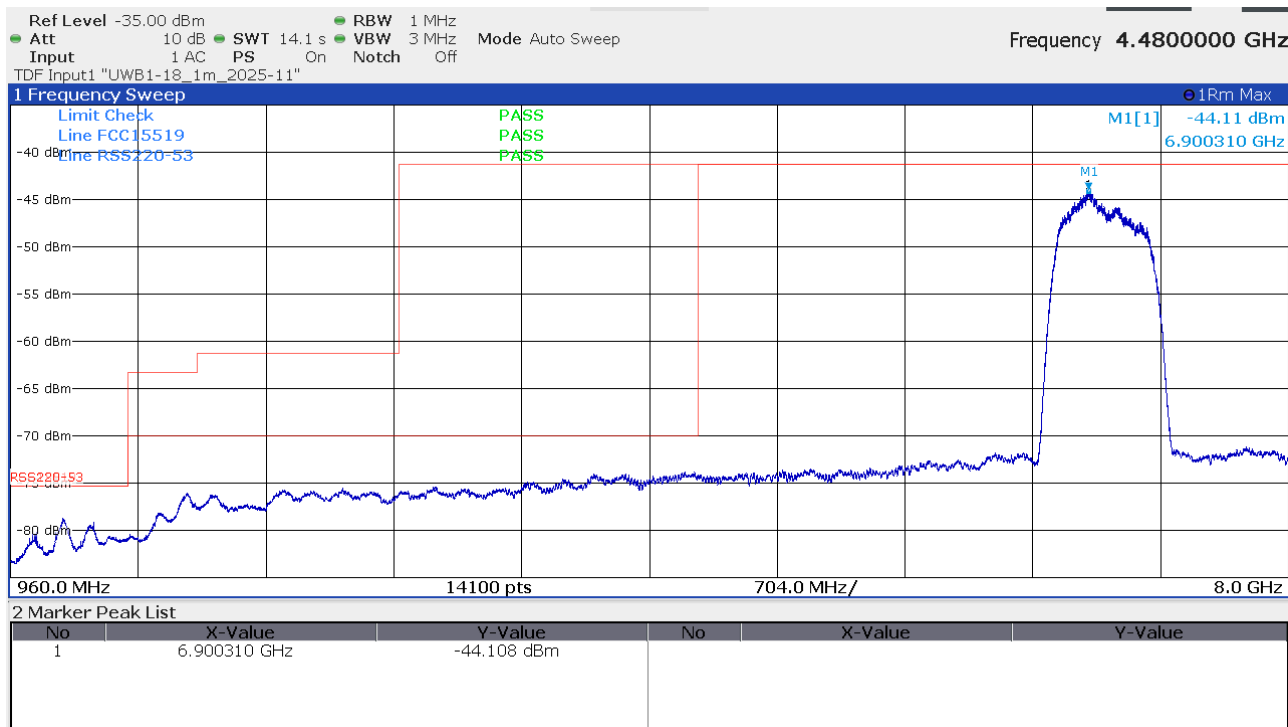
As proven in the following measurements, no emissions outside the UWB transmission can be detected in the frequency range 960 MHz and 40 GHz and the highest emissions occurs by the UWB emission itself, which lies under the UWB limit of -41.3 dBm. Therefore, the requirements according to § 15.209 can be regarded as fulfilled.

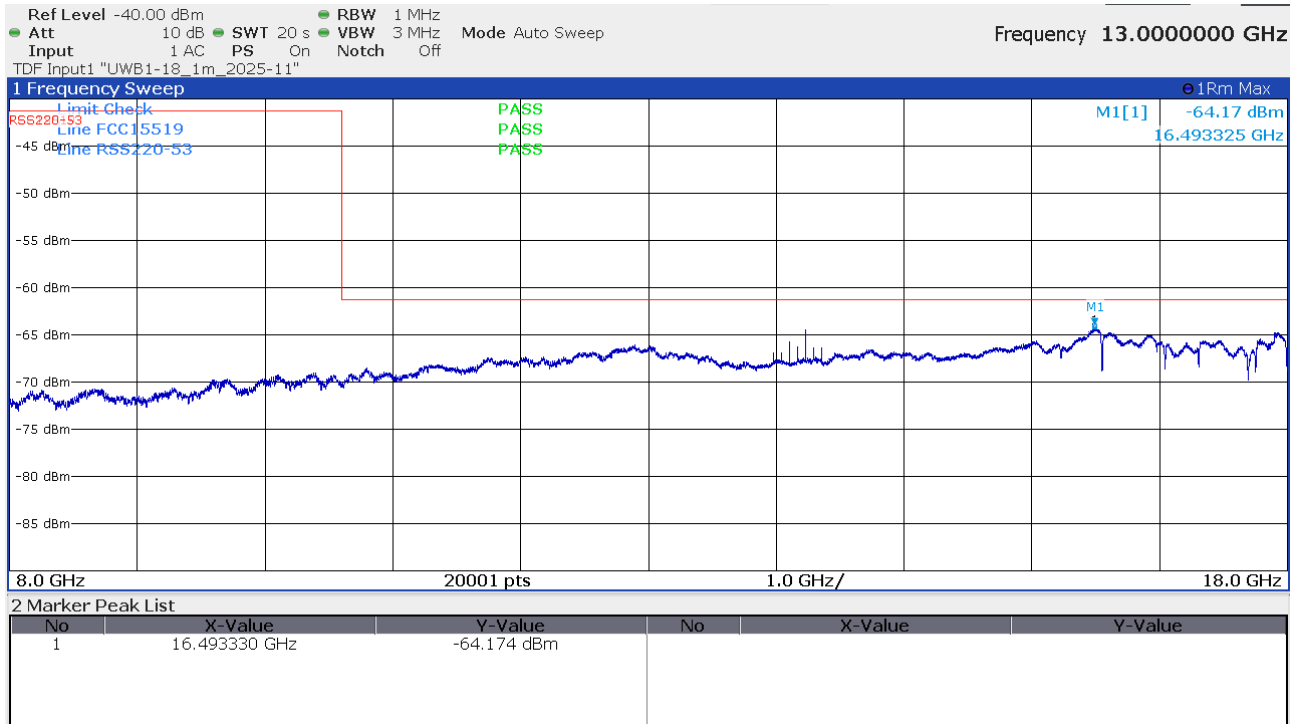
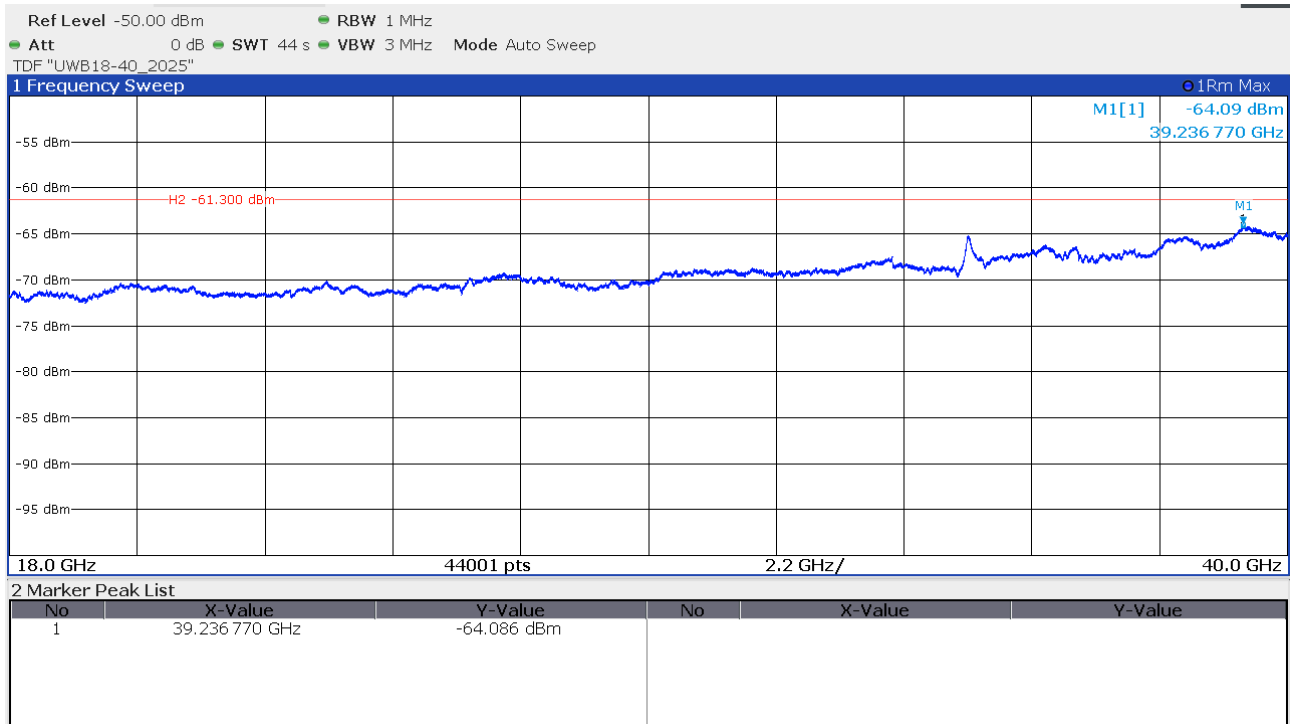
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 5 antenna 1
Mean Power

960 MHz to 18 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


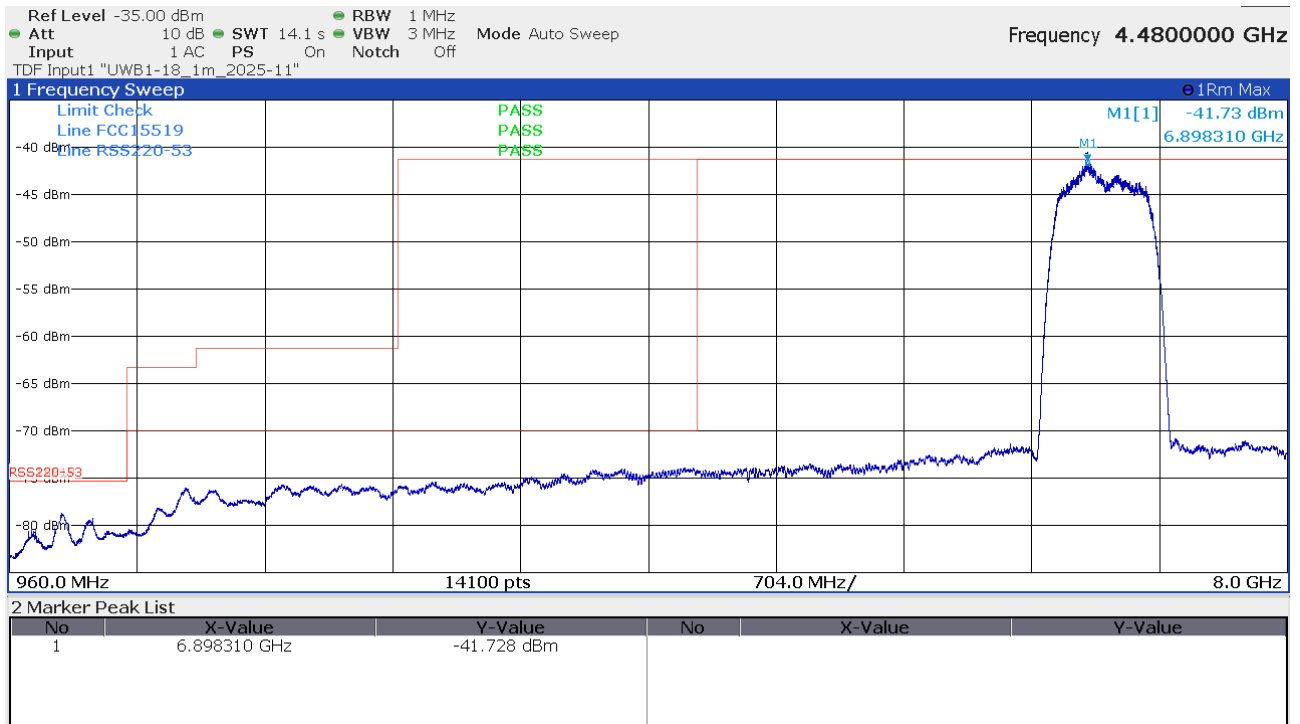
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 5 antenna 2
Mean Power

960 MHz to 18 GHz


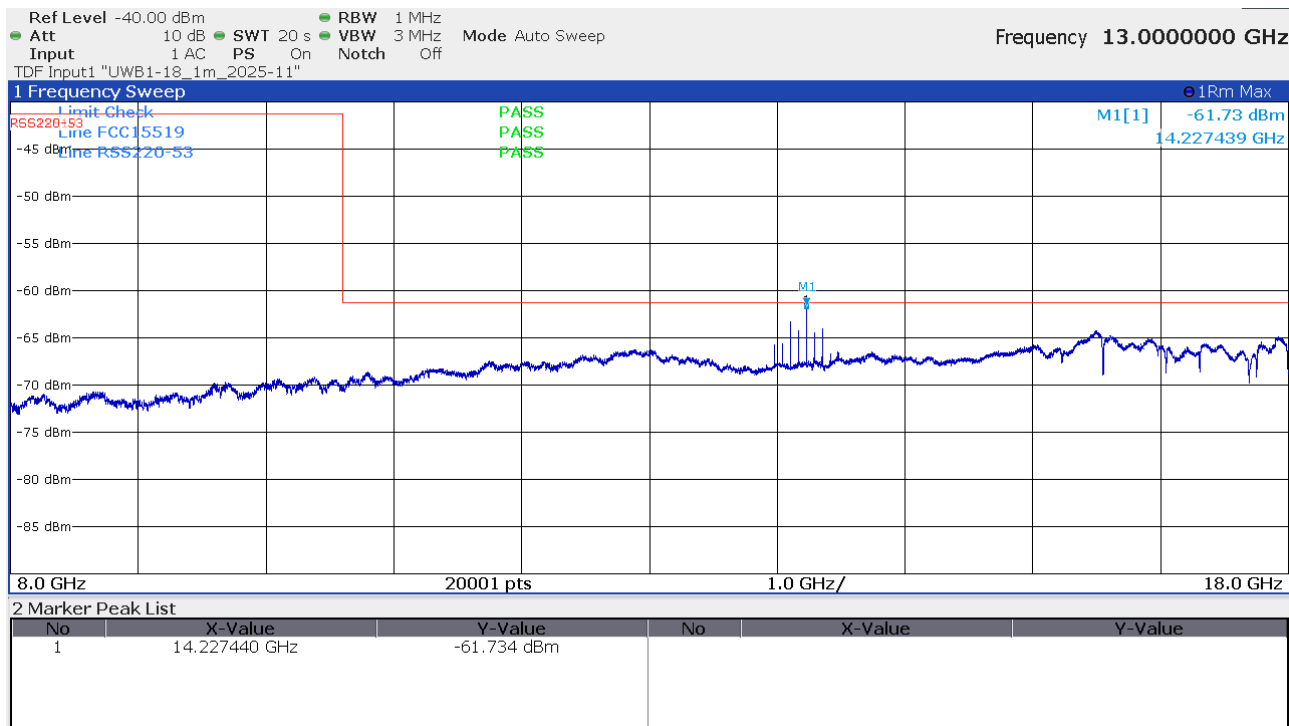
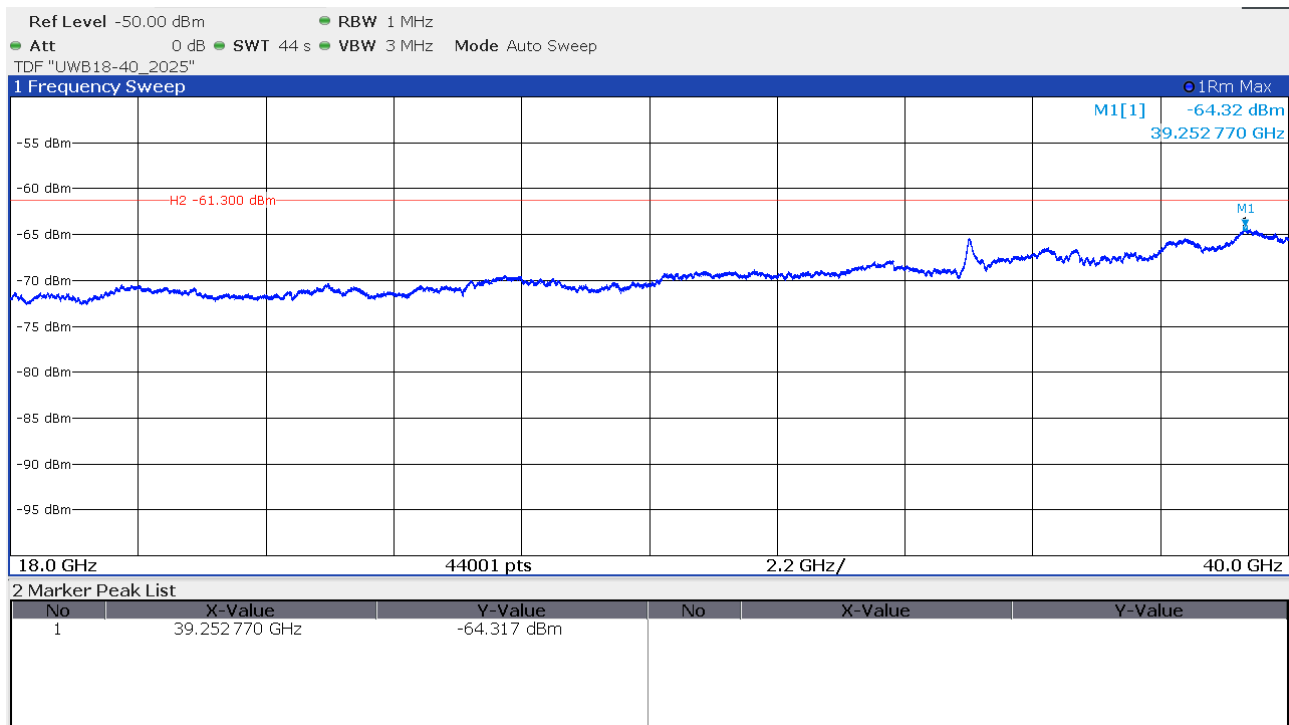
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


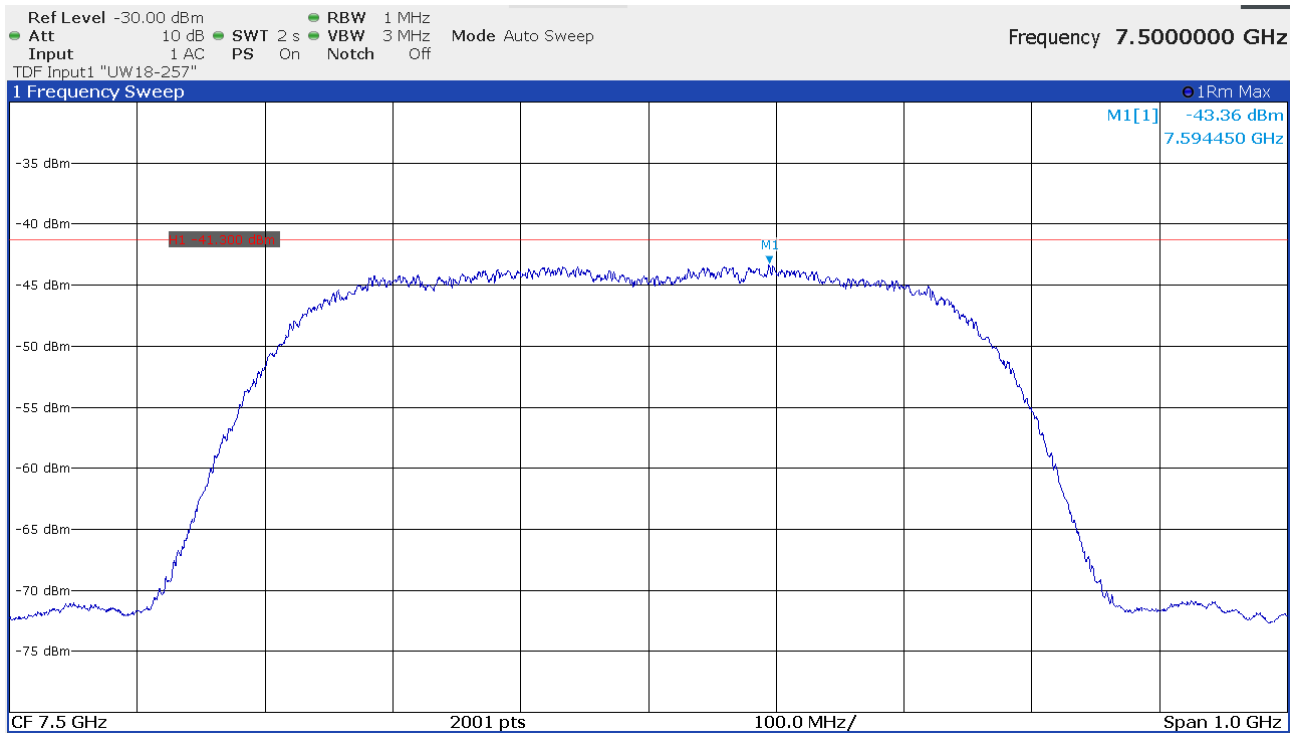
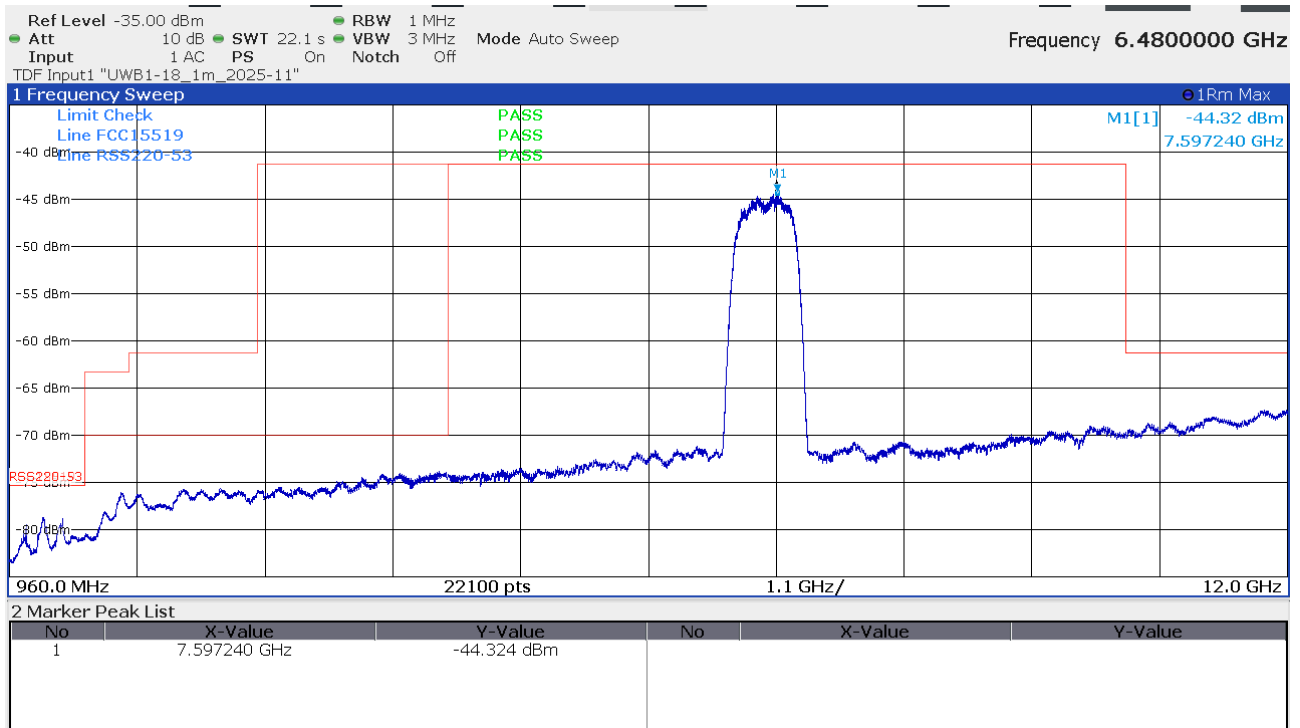
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 1
Mean Power

960 MHz to 18 GHz


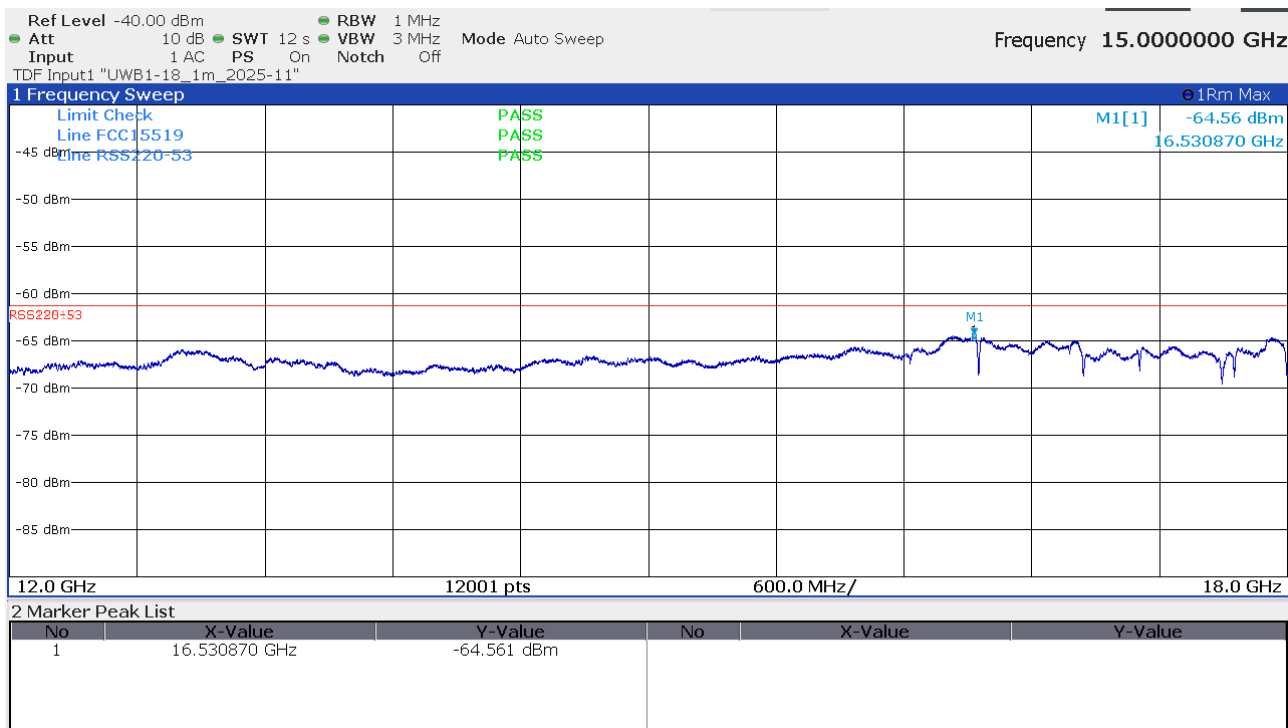
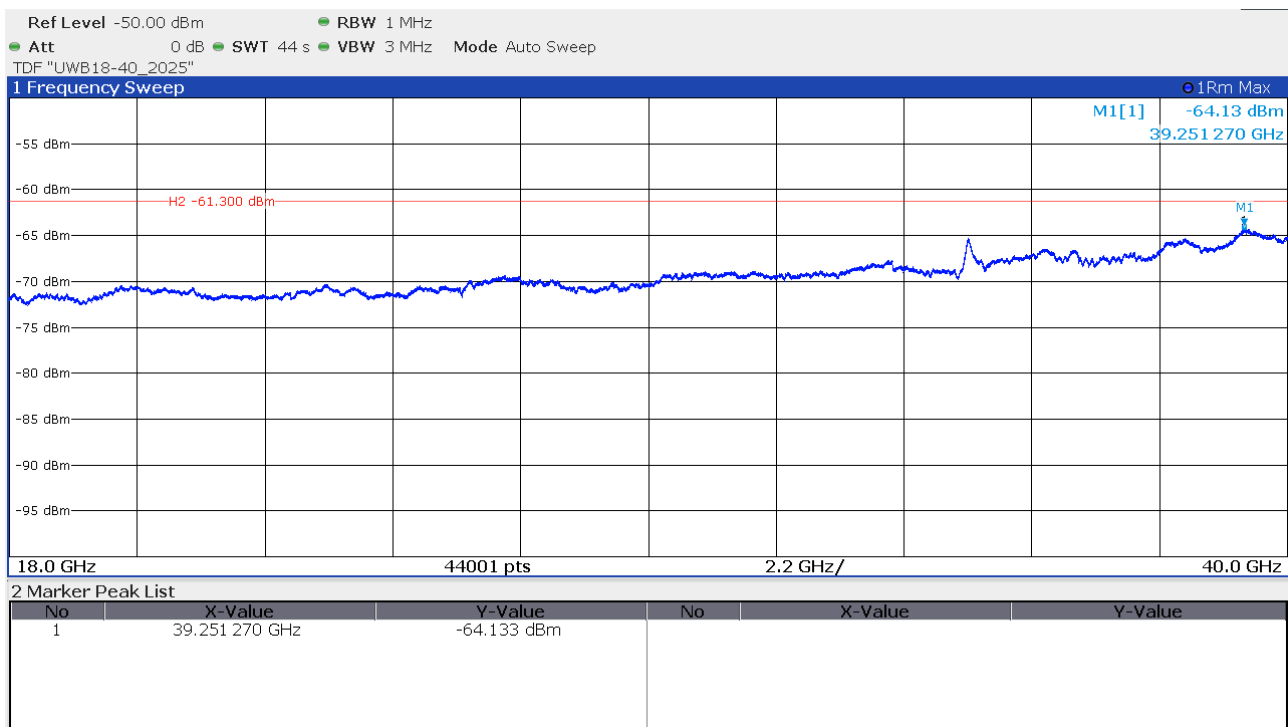
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


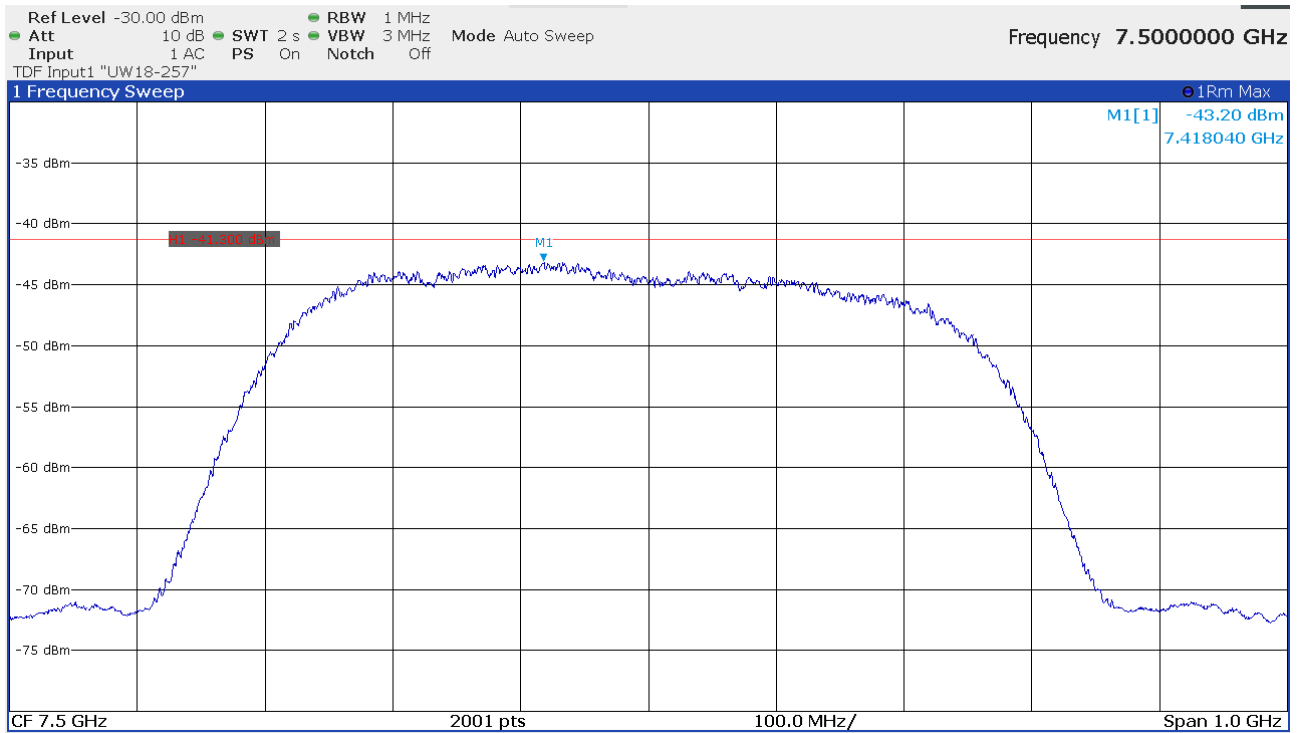
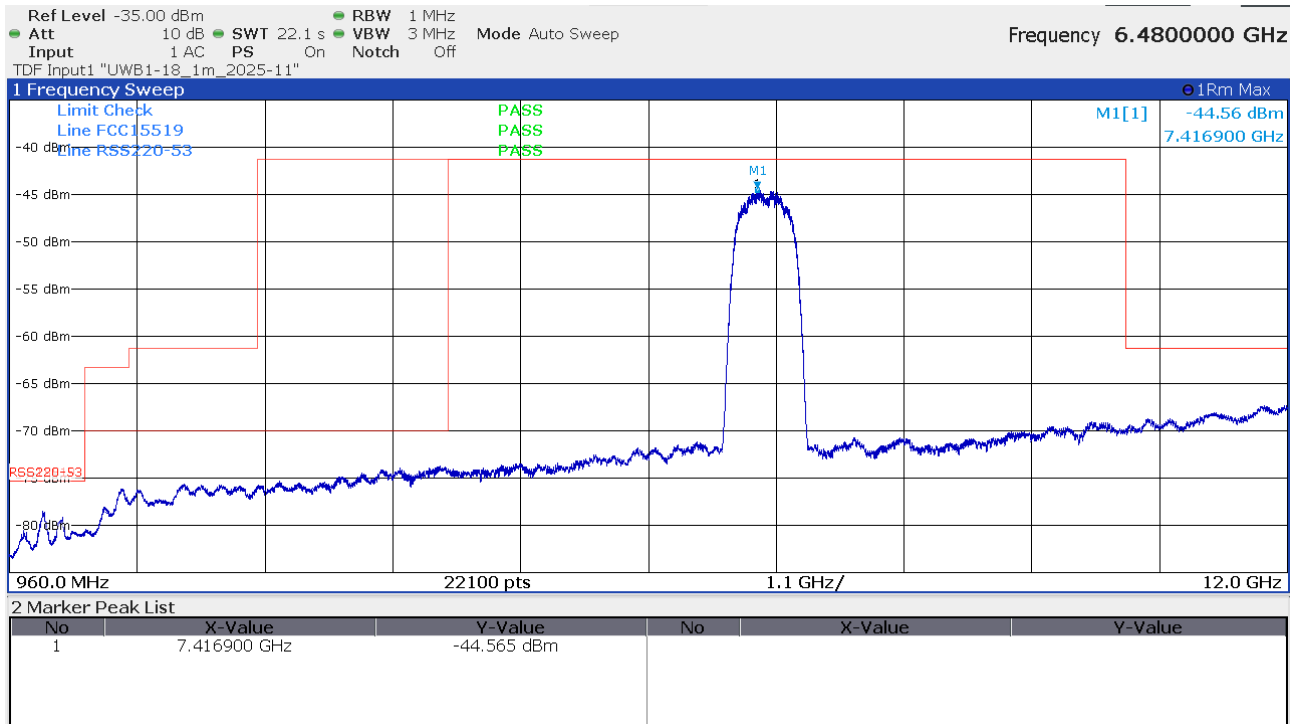
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 2
Mean Power

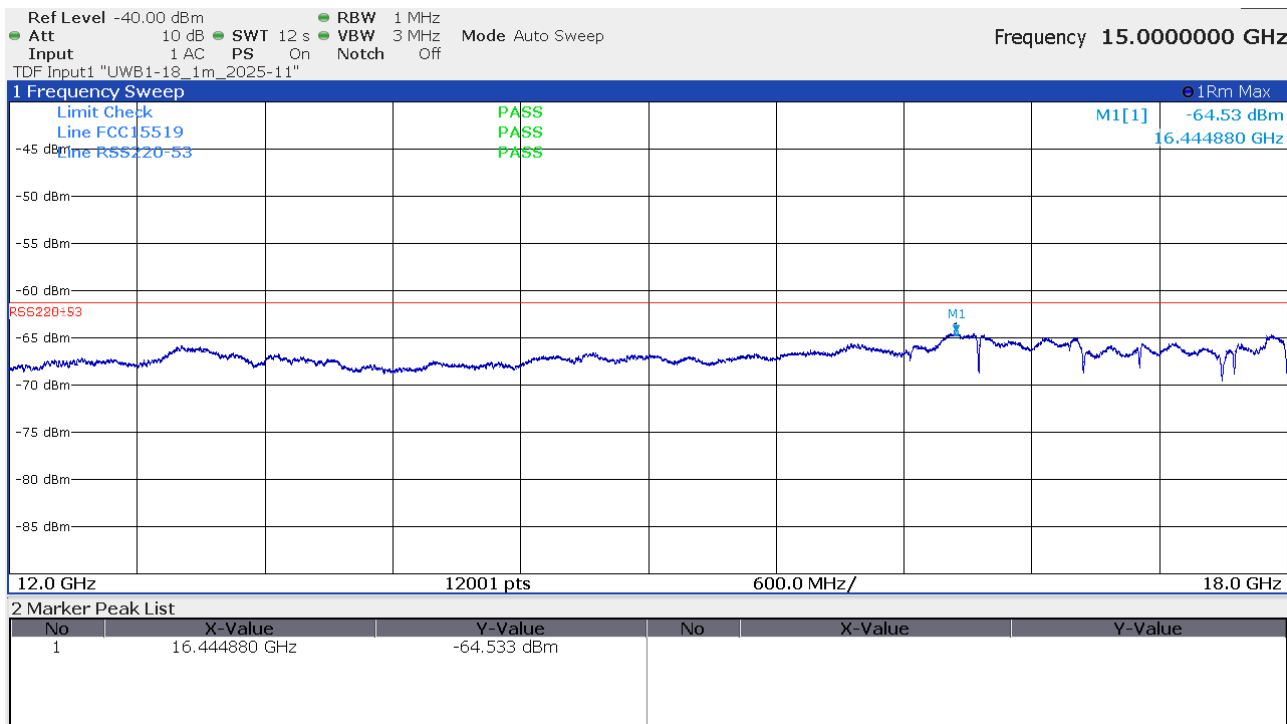
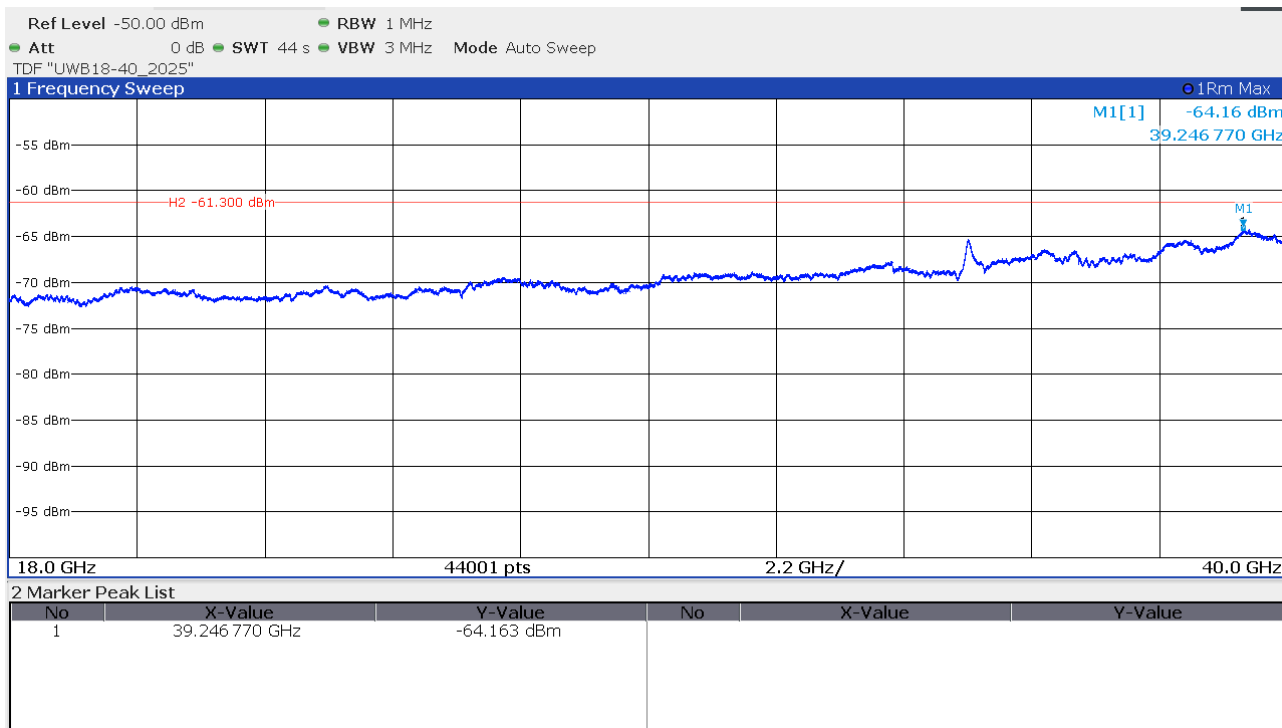
960 MHz to 18 GHz


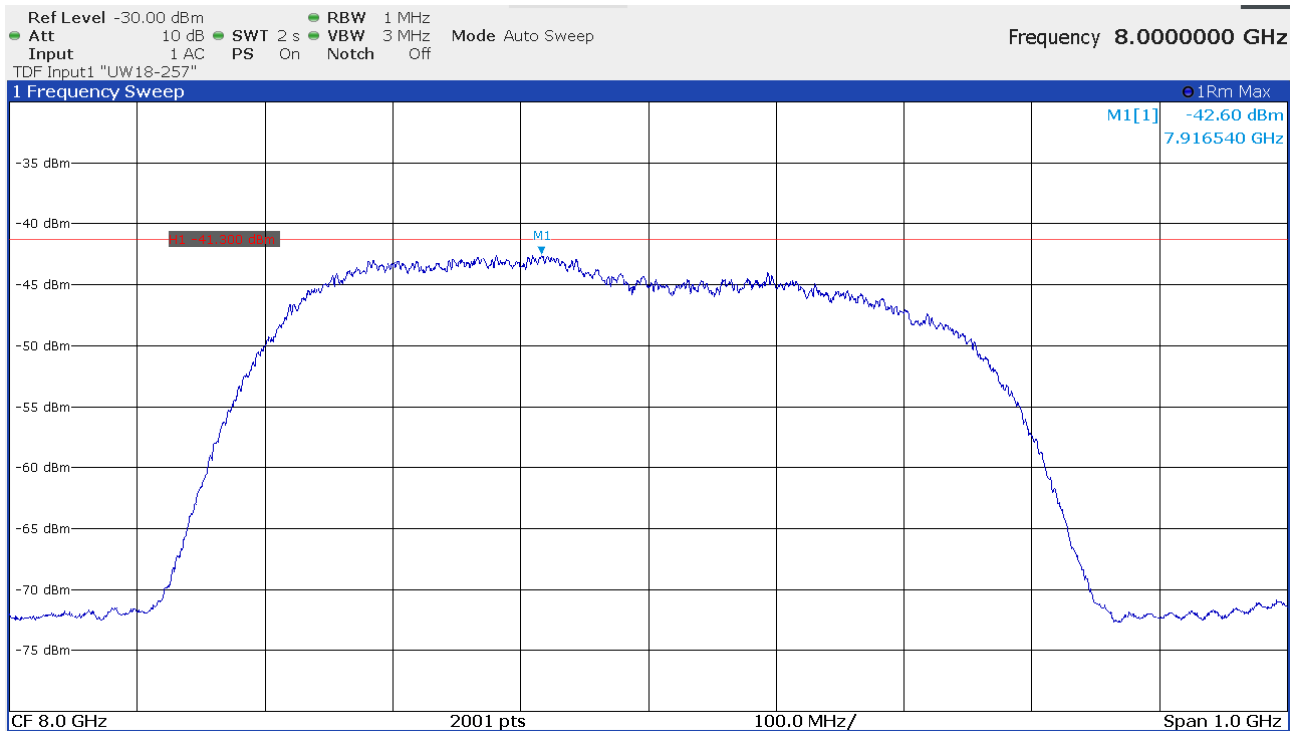
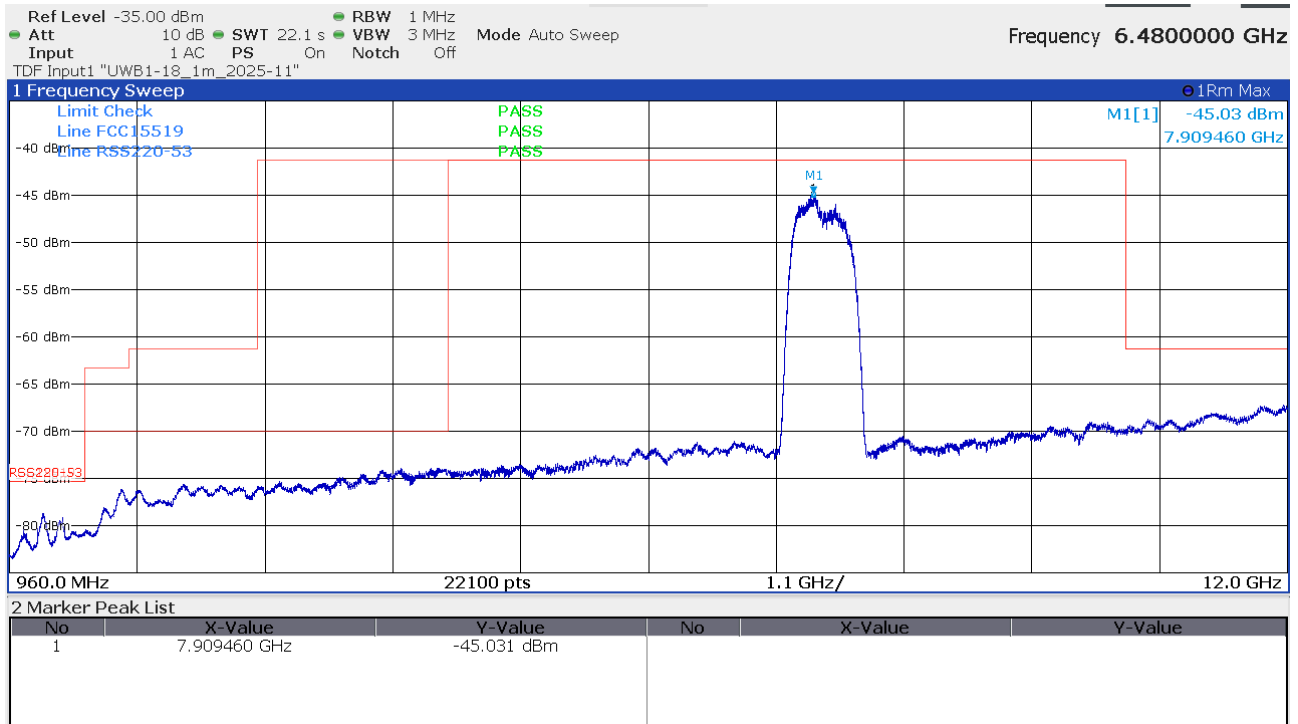
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


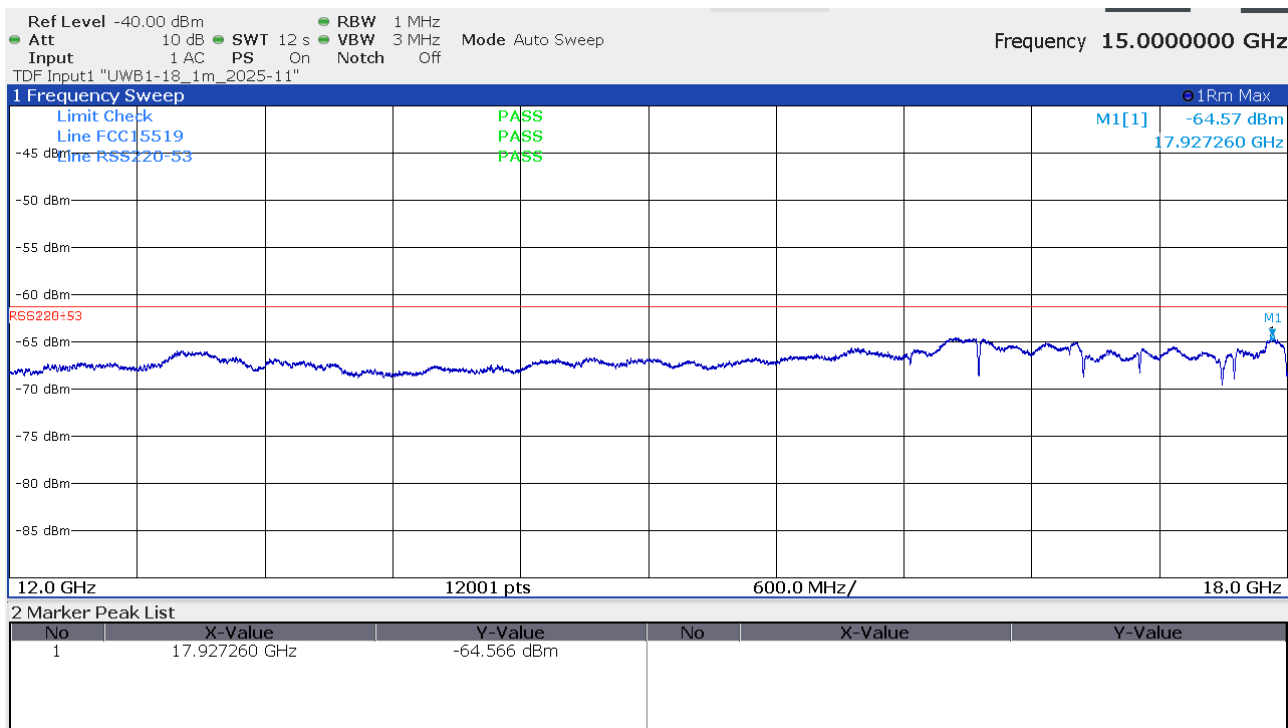
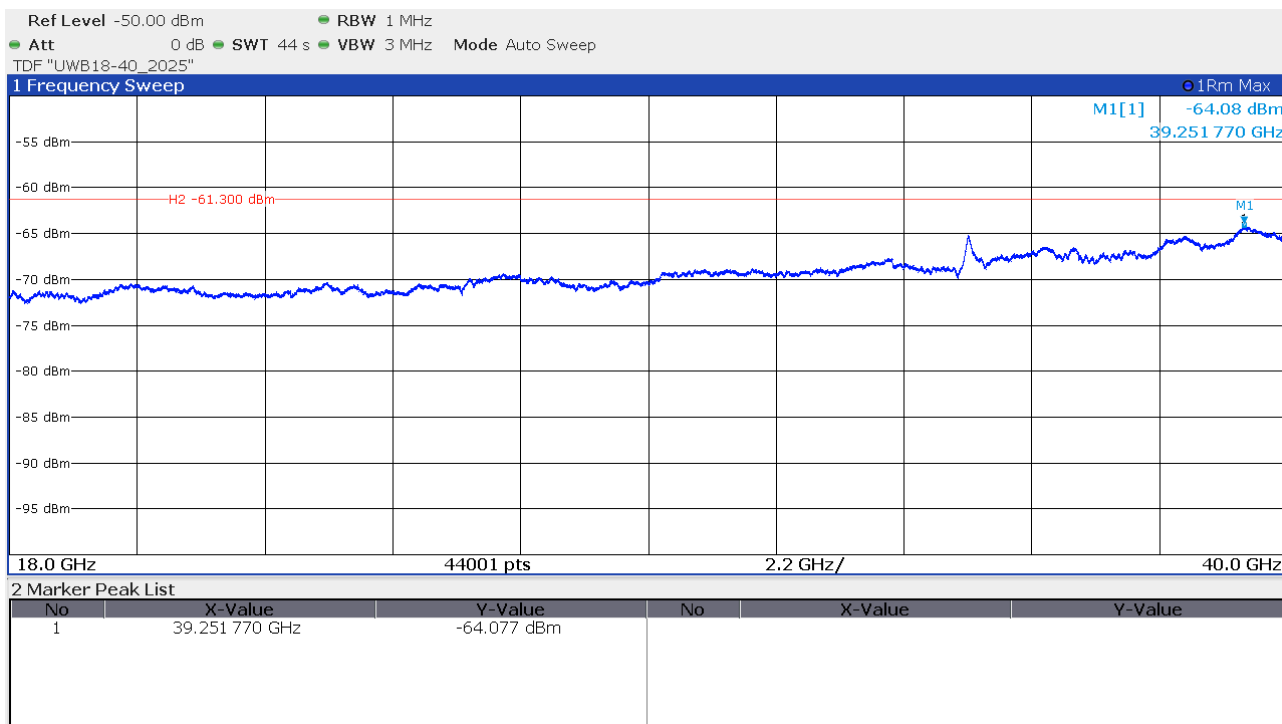
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 1
Mean Power

960 MHz to 18 GHz


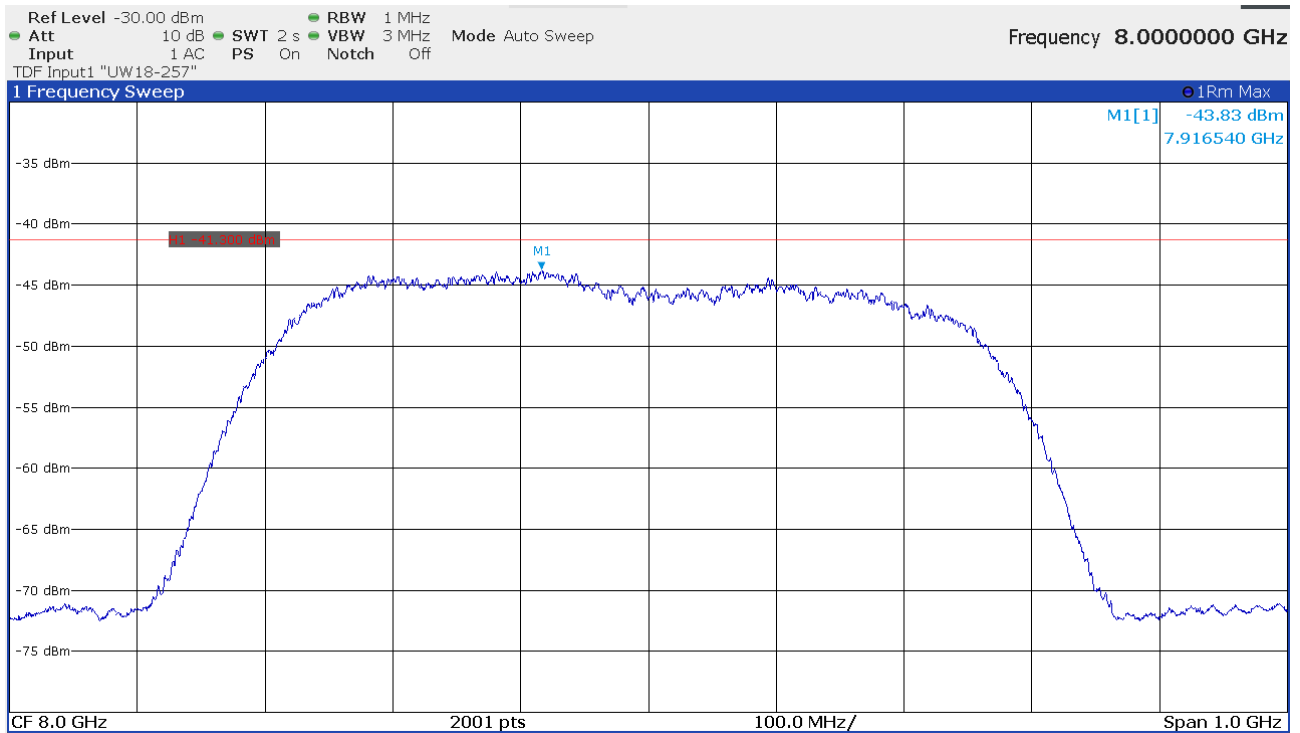
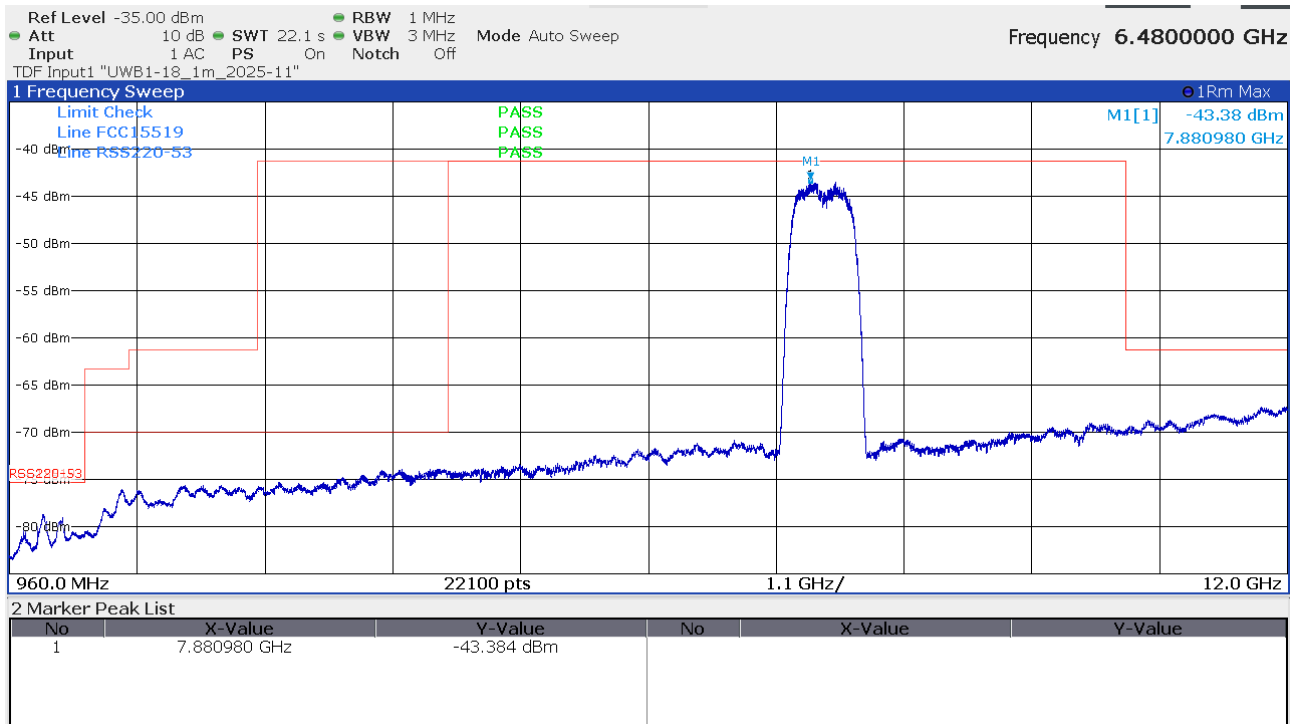
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18 GHz to 40 GHz


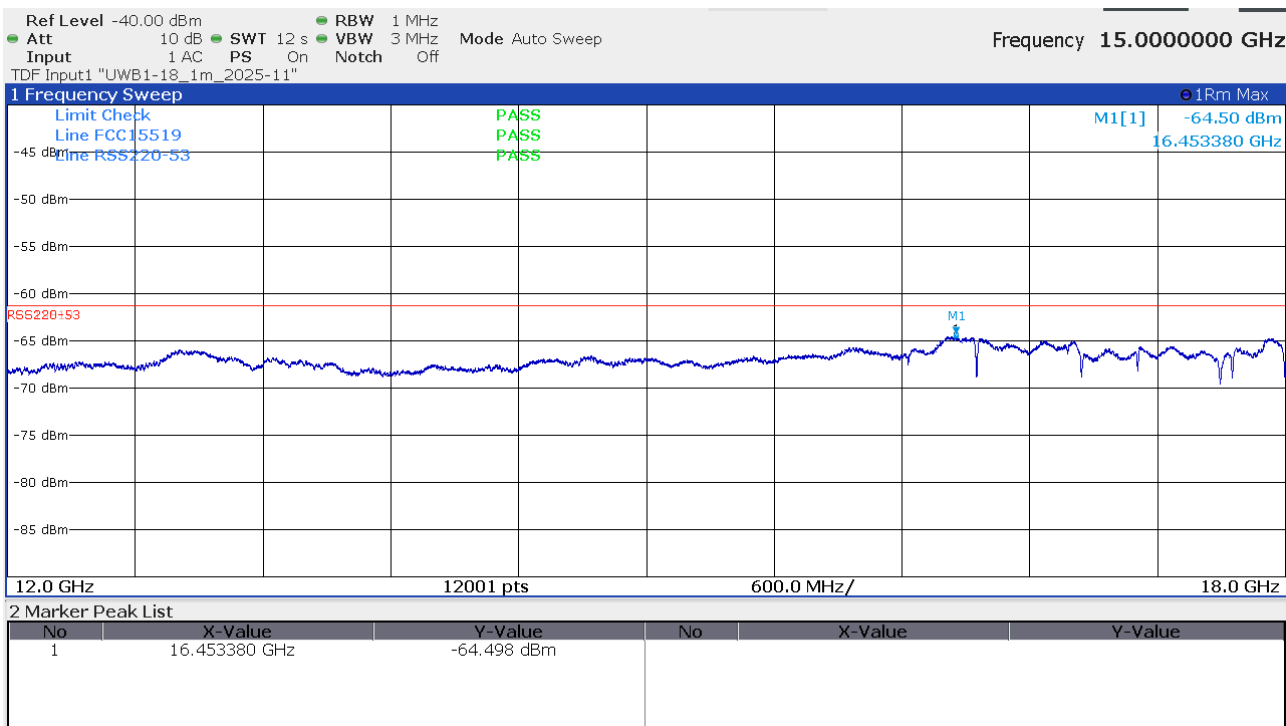
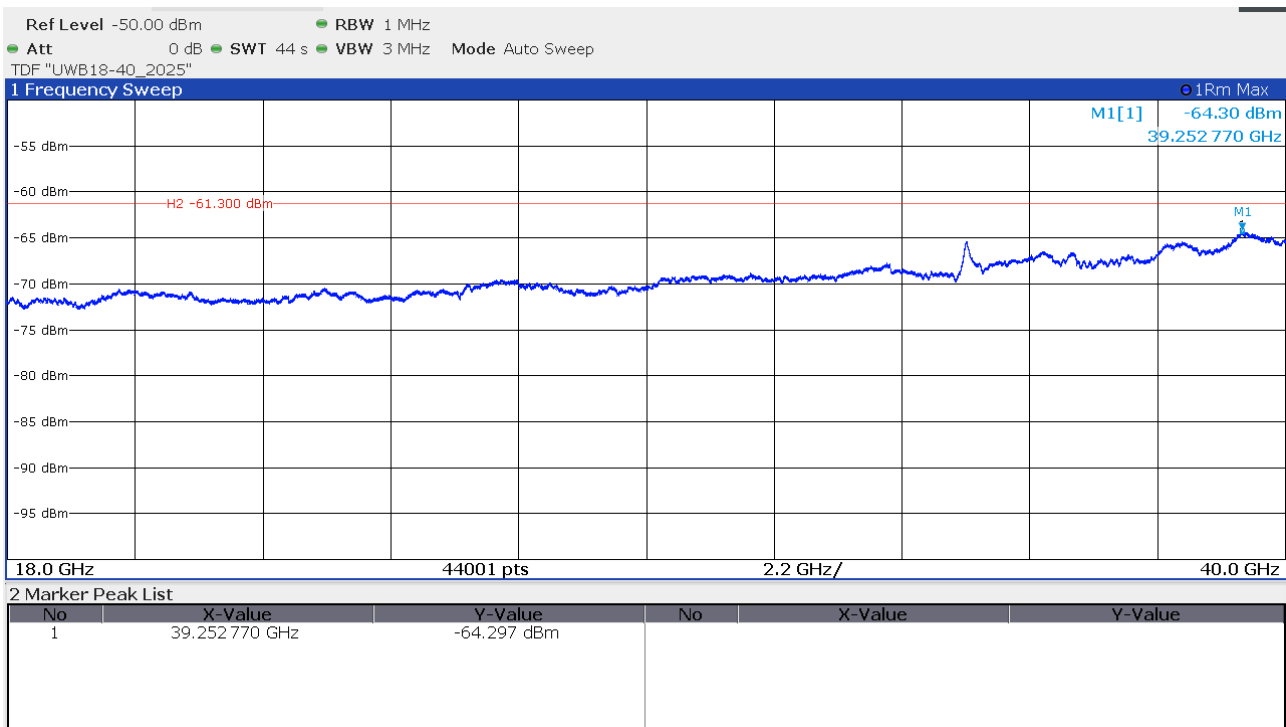
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 2
Mean Power

960 MHz to 18 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 1
Mean Power

960 MHz to 18 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 2
Mean Power

960 MHz to 18 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

18 GHz to 40 GHz


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Limits:

Limit according §15.209(a) in the frequency range 9 kHz 960 MHz:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	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

Limit according §15.519(c) in the frequency range 960 MHz to 40 GHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

Limit according RSS-220 5.3.1 (d) in the frequency range 960 MHz to 40 GHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-4750	-70.0
4750-10600	-41.3
Above 10600	-61.3

The requirements are **FULFILLED**.

Remarks: None.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

5.4 Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz

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

5.4.1 Description of the test location

Test location: Fully Anechoic Room FAR1

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.519(d):

In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz.

5.4.4 Description of Measurement

The spectral line is measured following the procedure set out in ANSI C63-10, item 10.3.10. The EUT is set in TX continuous mode while measuring.

Analyser settings:

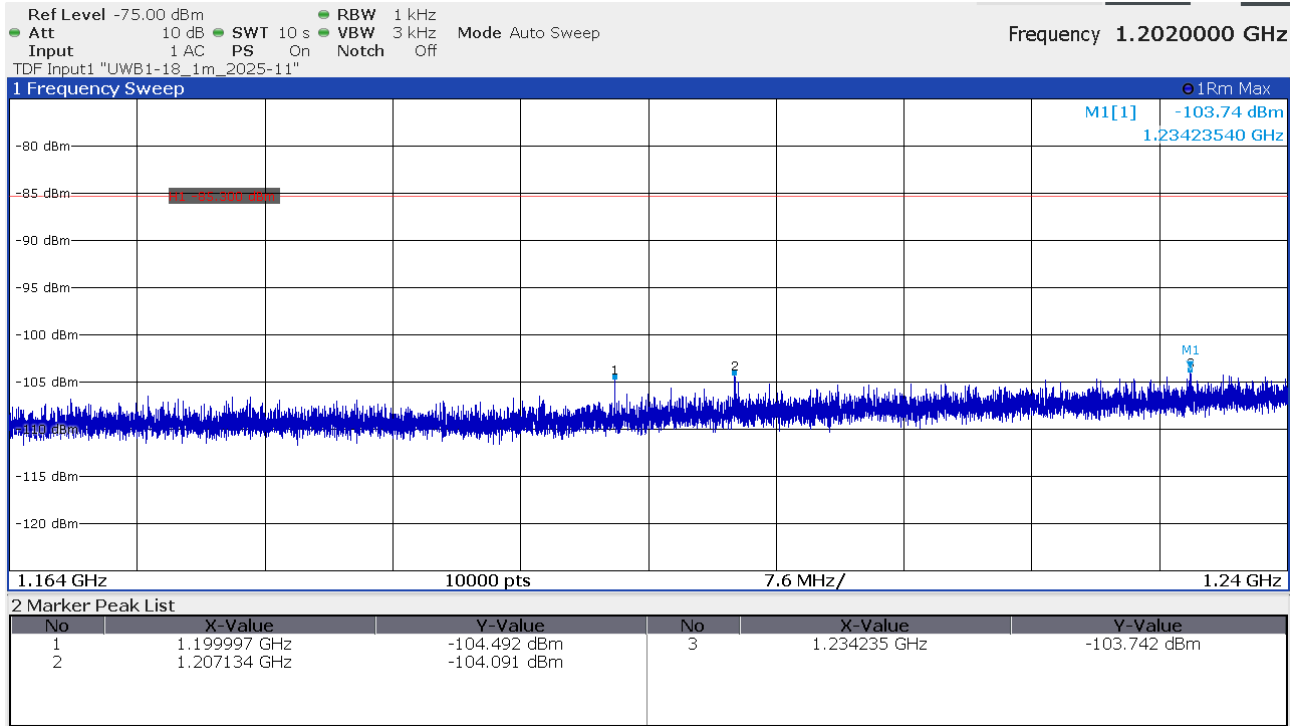
RBW: 1 kHz, VBW: 3 kHz, Detector: RMS, Sweep time: 1 ms/1kHz,

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

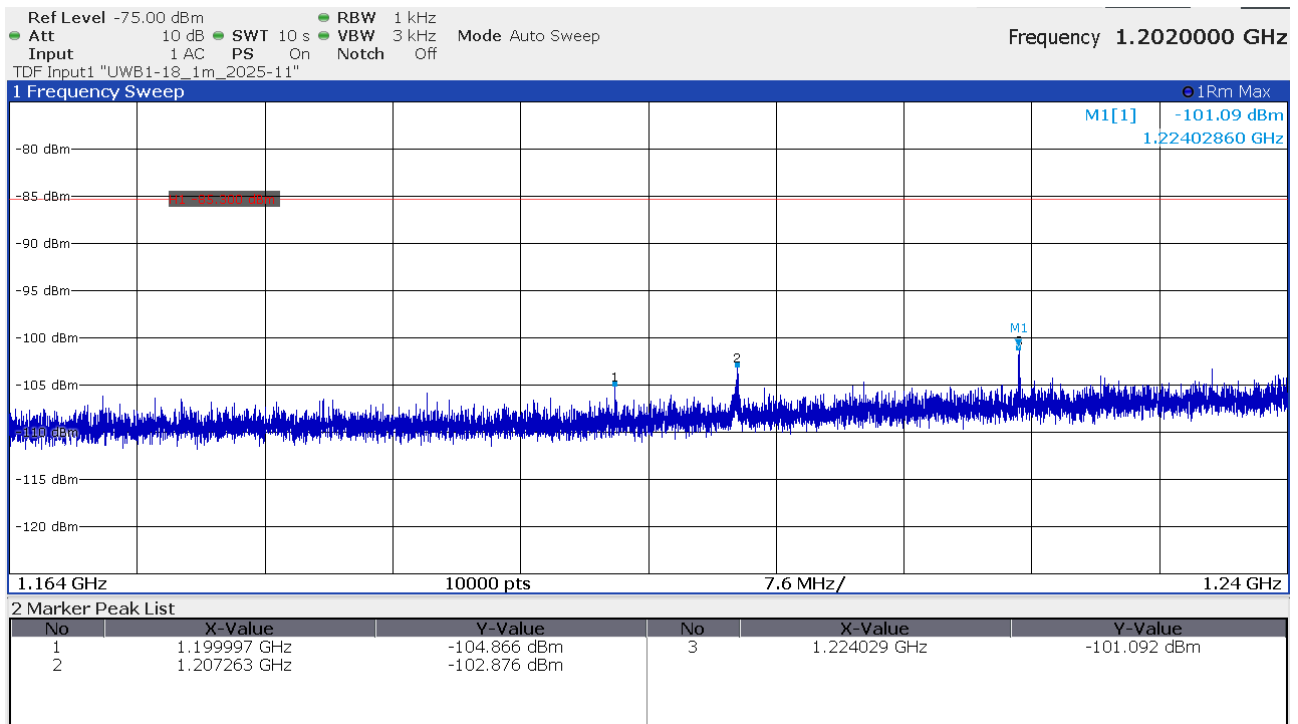
5.4.5 Test result

Channel 5 antenna 1

1164 MHz to 1240 MHz horizontal

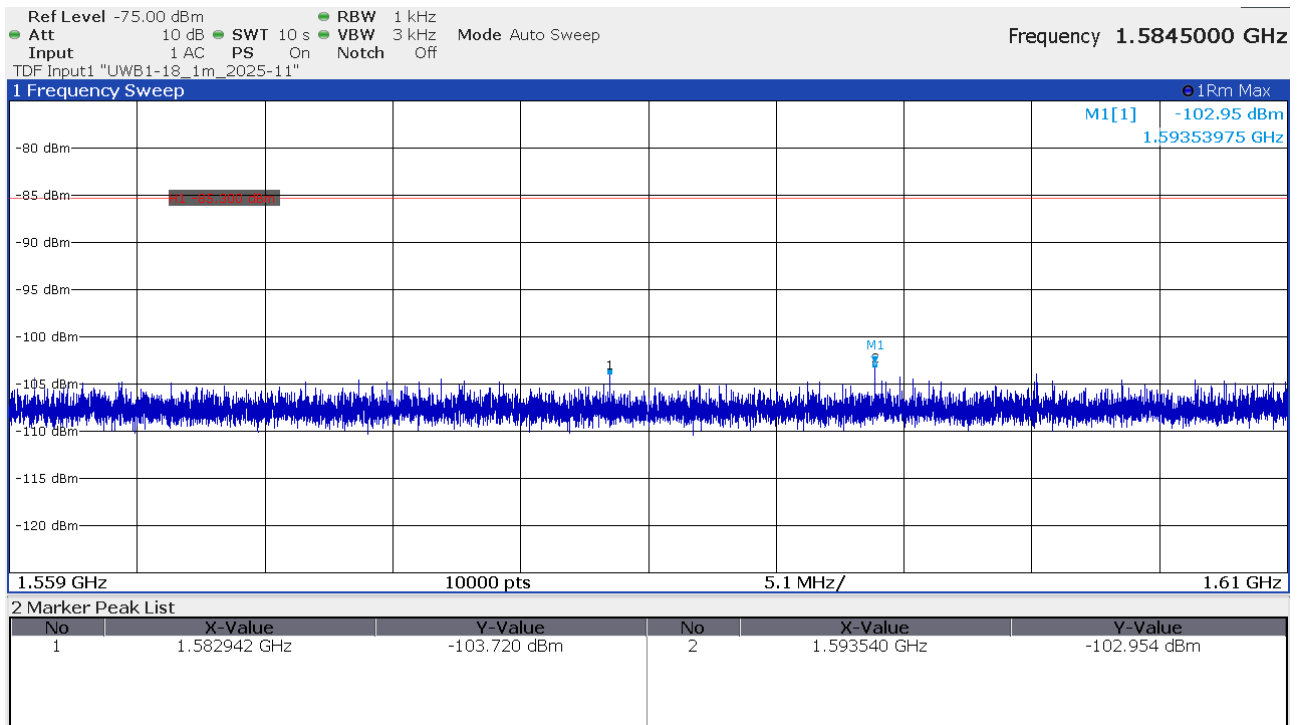


1164 MHz to 1240 MHz vertical

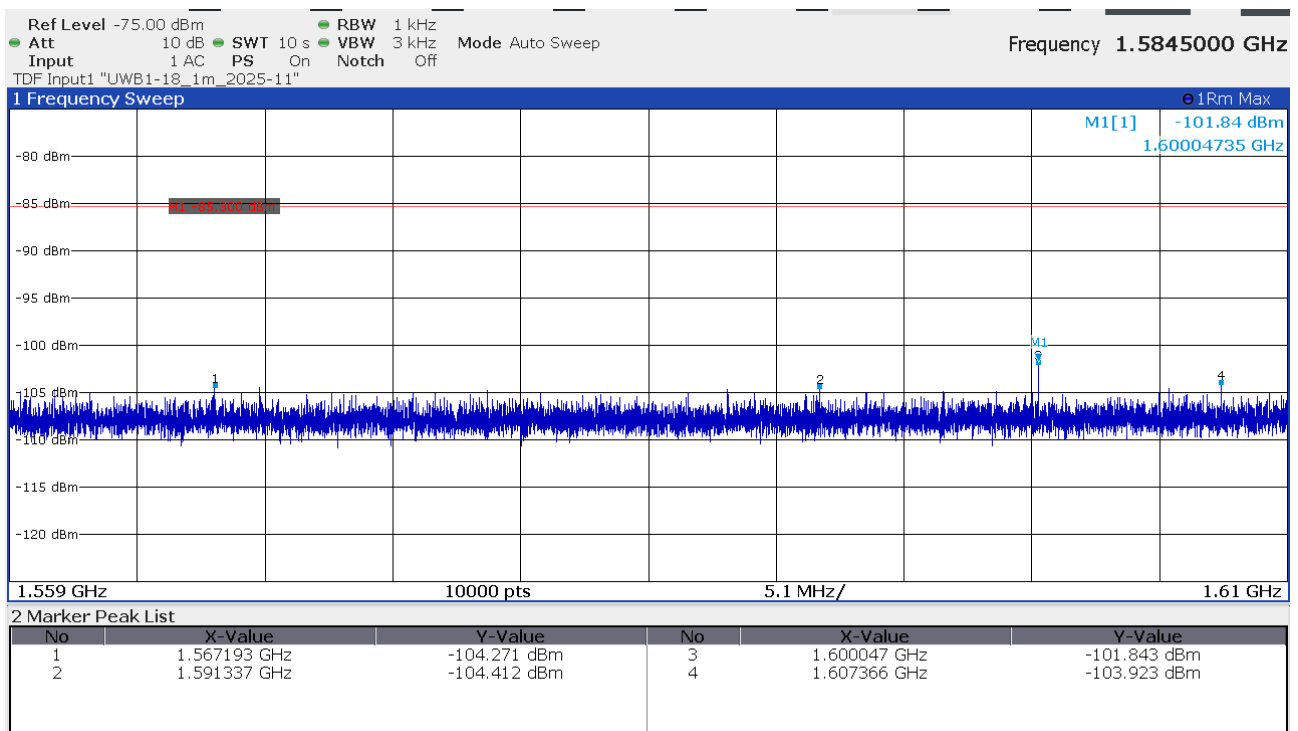


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal



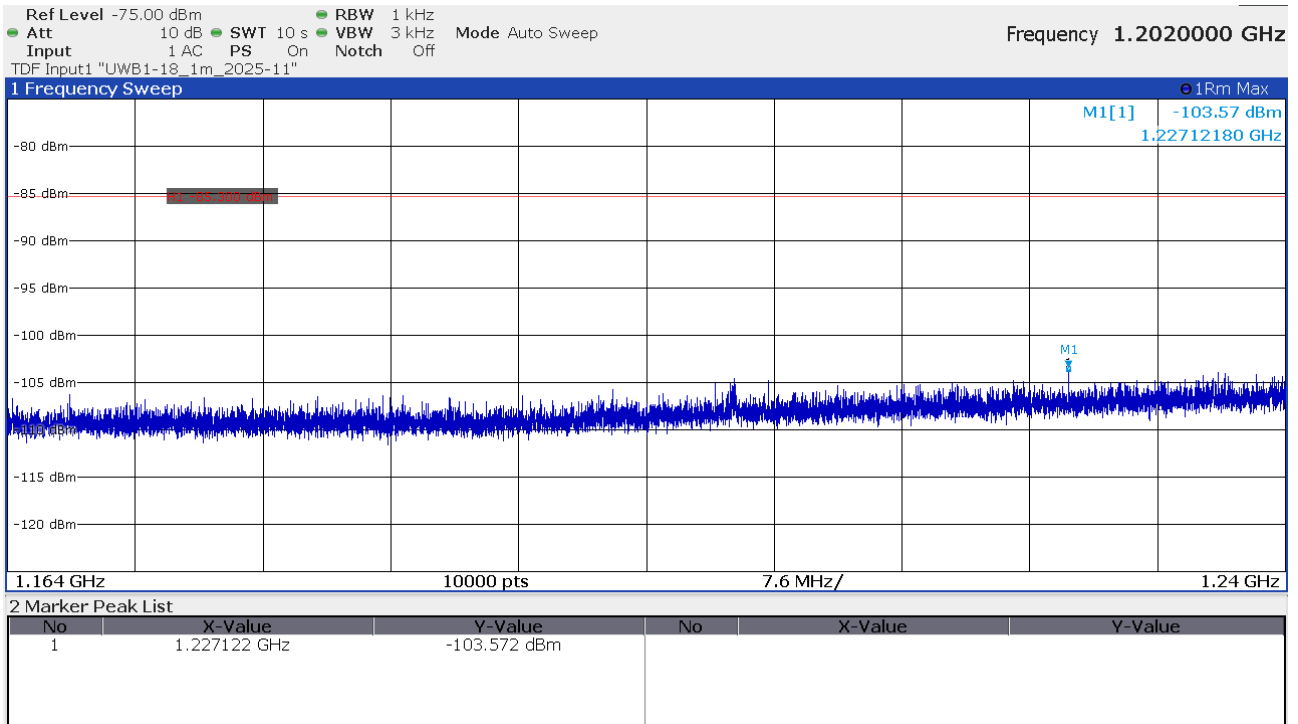
1559 MHz to 1610 MHz vertical



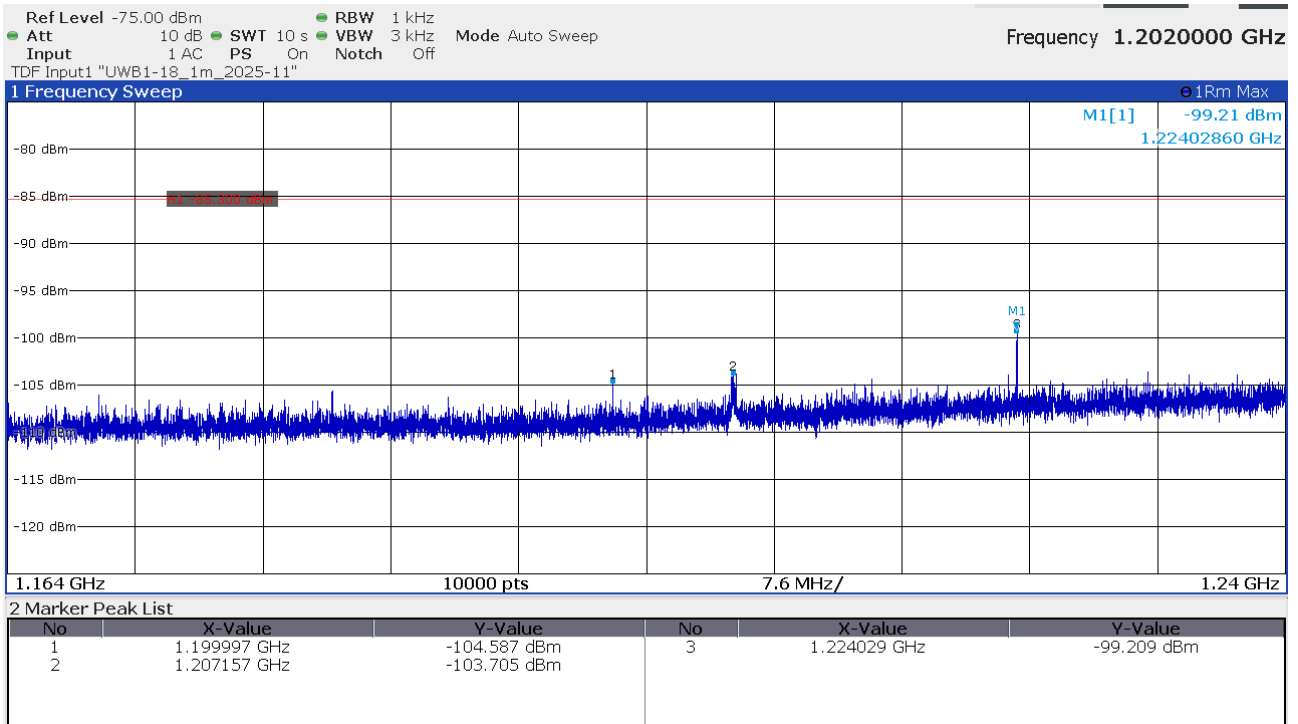
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 5 antenna 2

1164 MHz to 1240 MHz horizontal

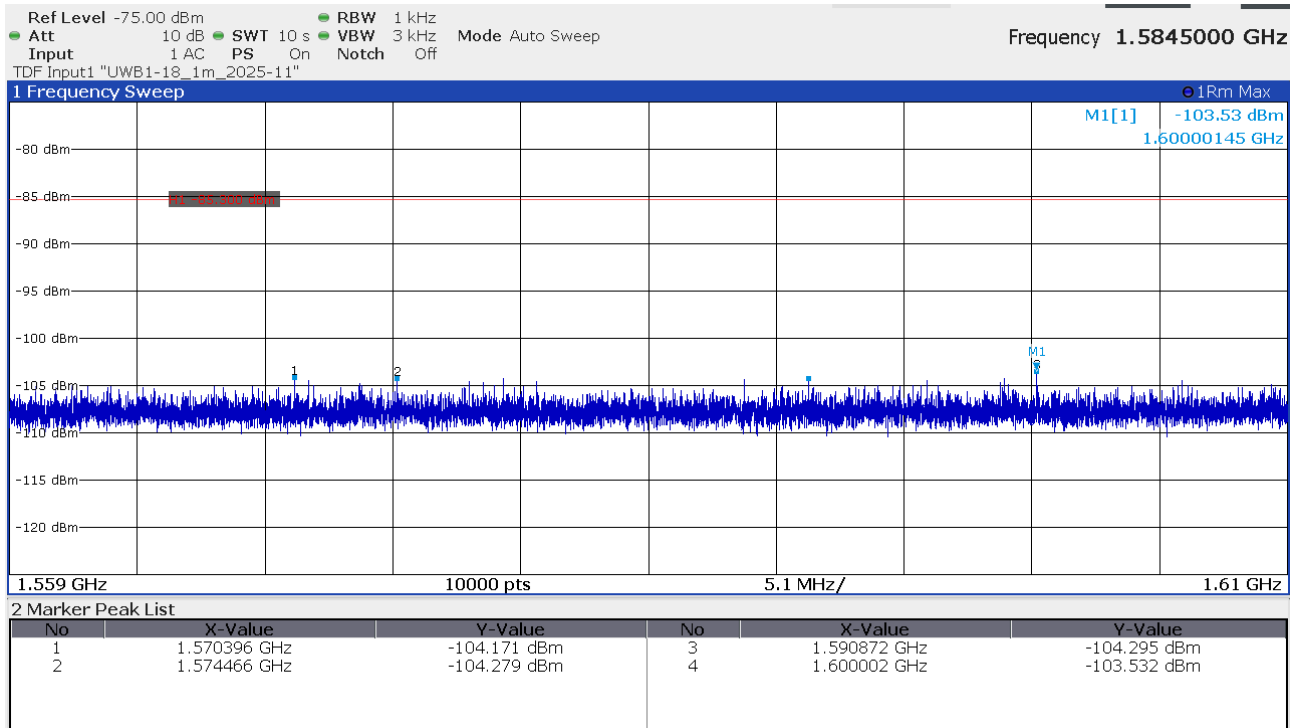


1164 MHz to 1240 MHz vertical

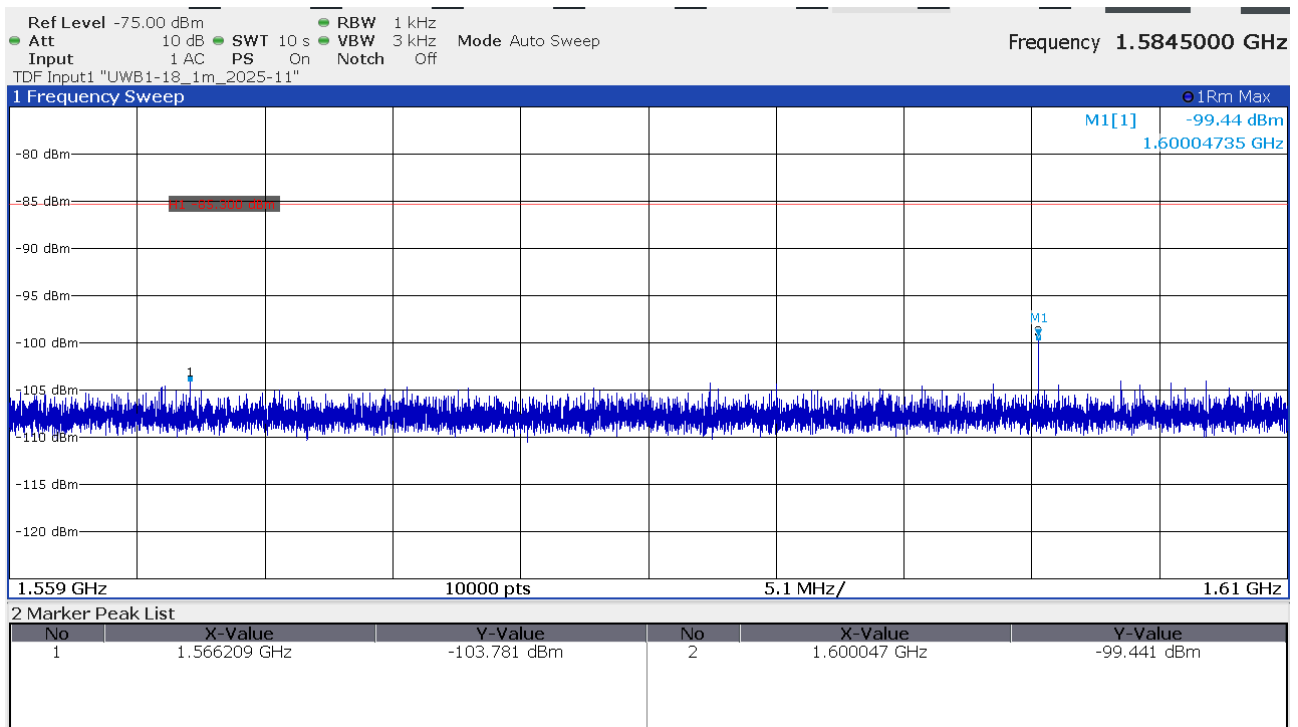


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal

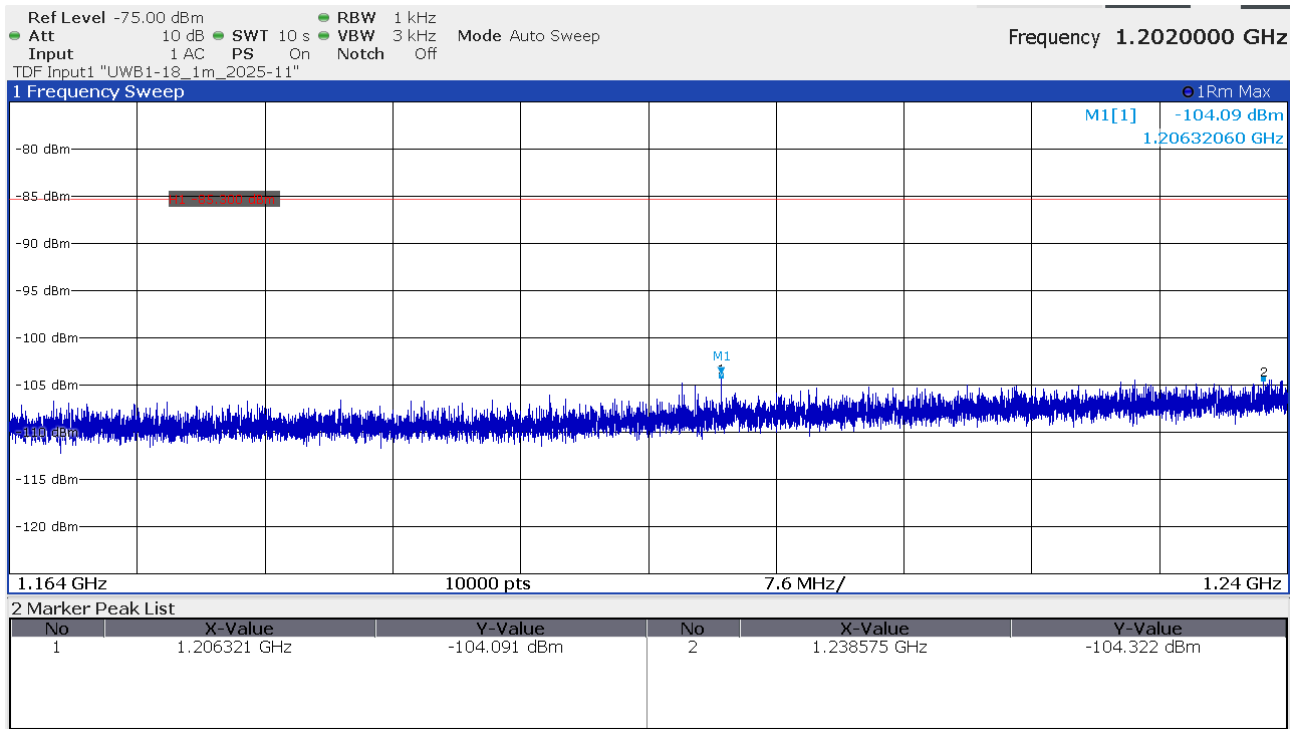


1559 MHz to 1610 MHz vertical

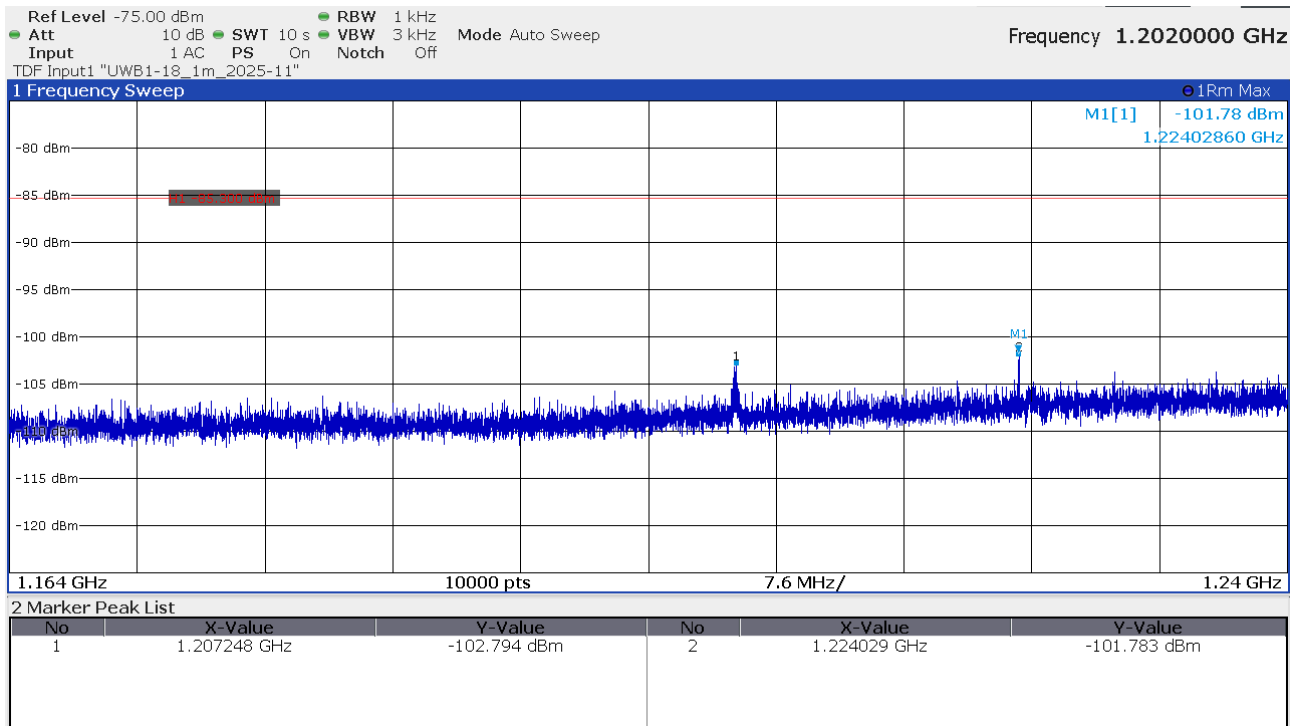


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 1

1164 MHz to 1240 MHz horizontal

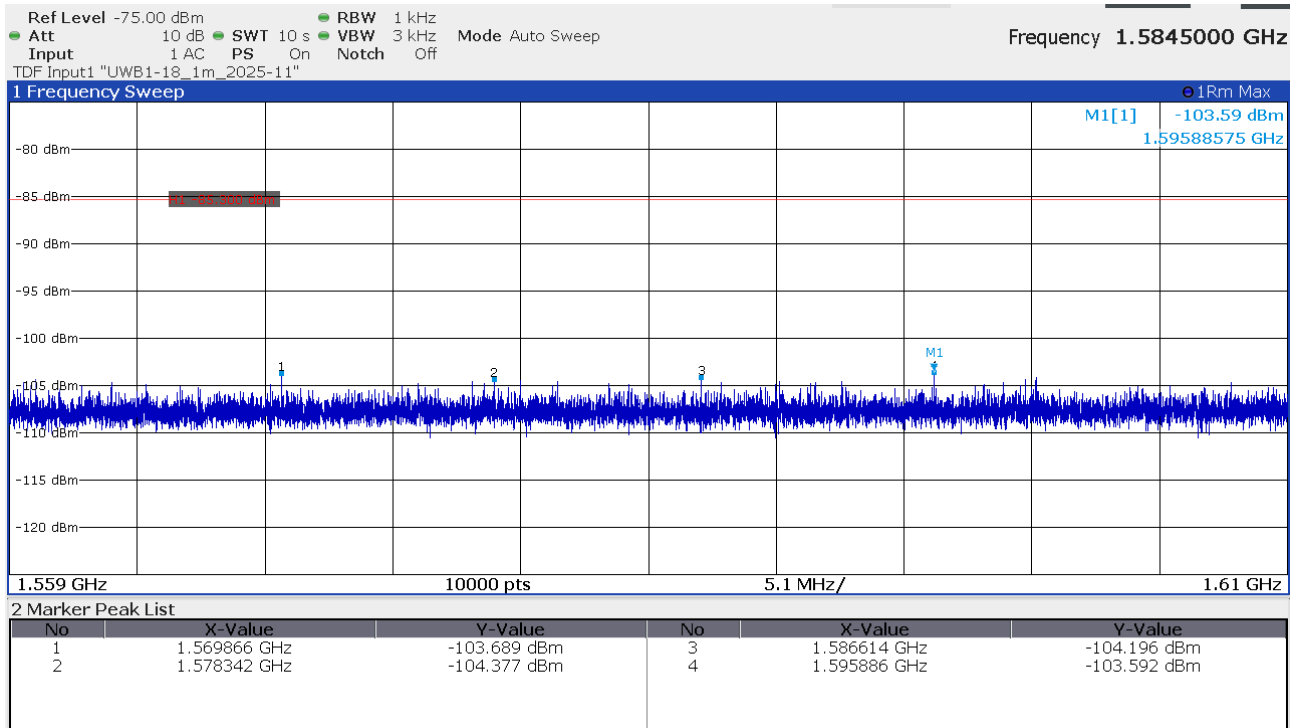


1164 MHz to 1240 MHz vertical

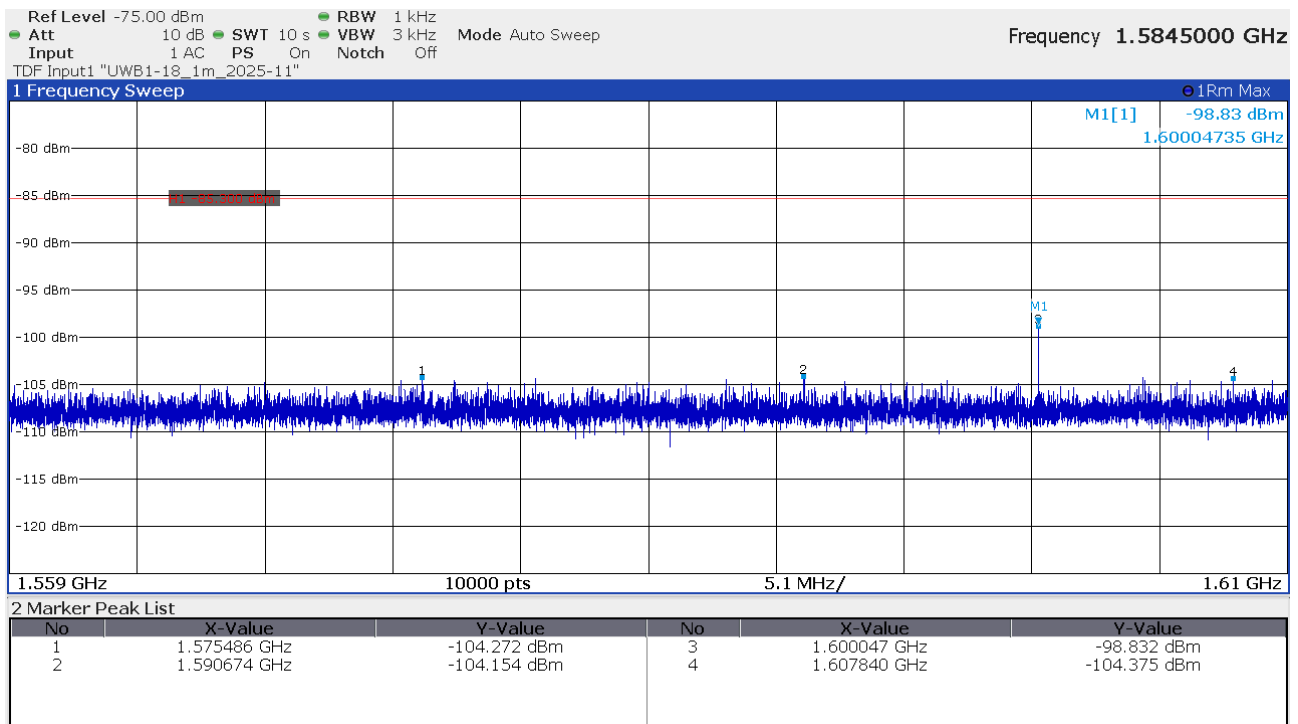


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal



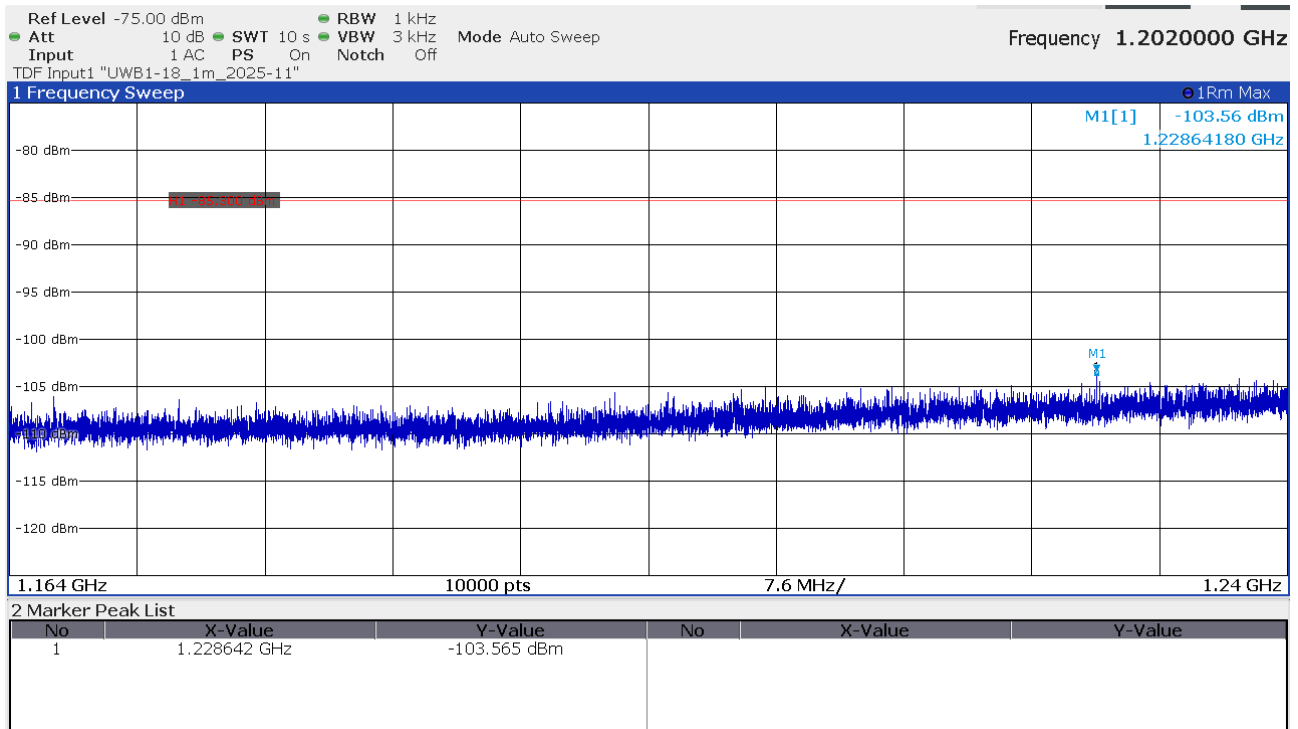
1559 MHz to 1610 MHz vertical



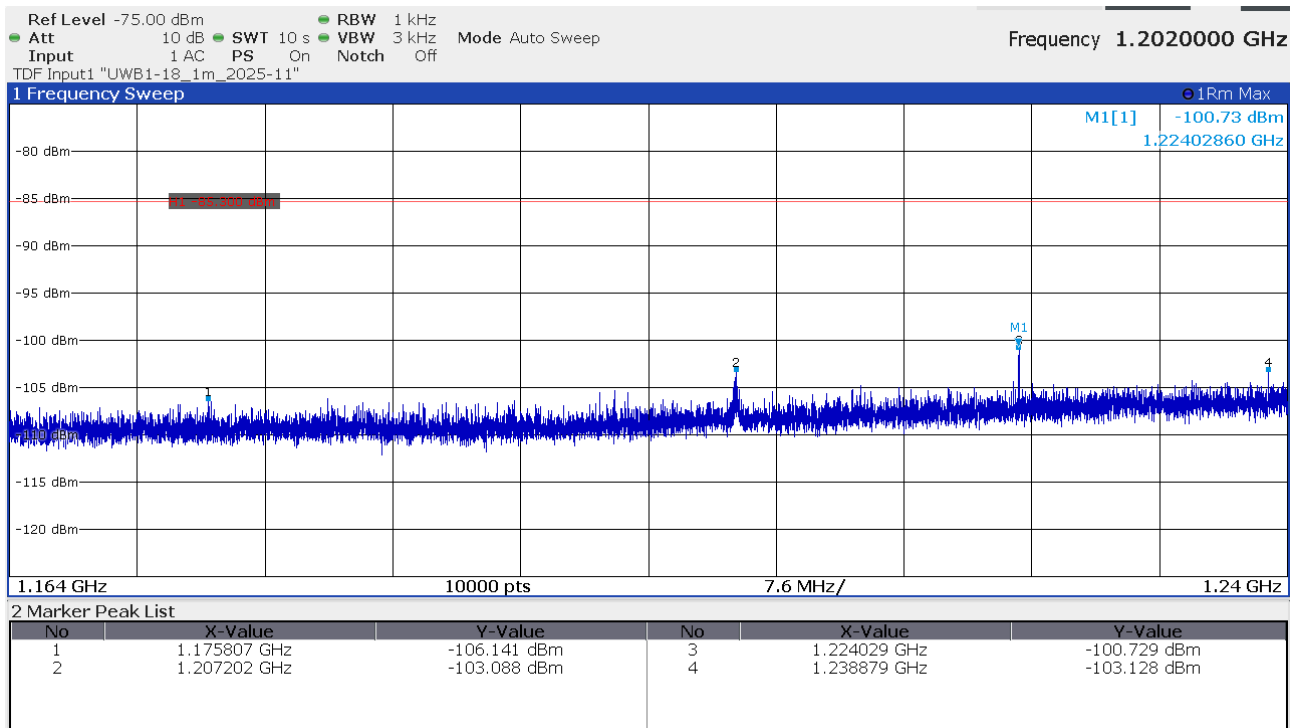
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 2

1164 MHz to 1240 MHz horizontal

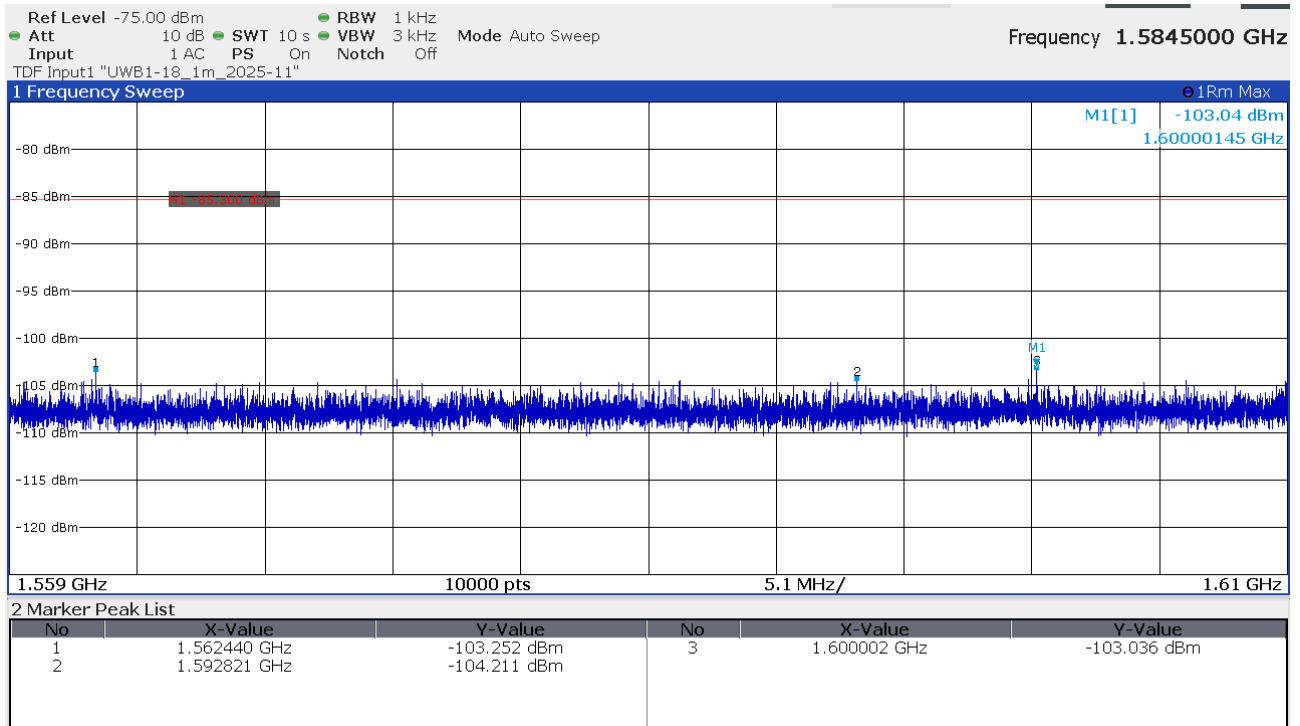


1164 MHz to 1240 MHz vertical

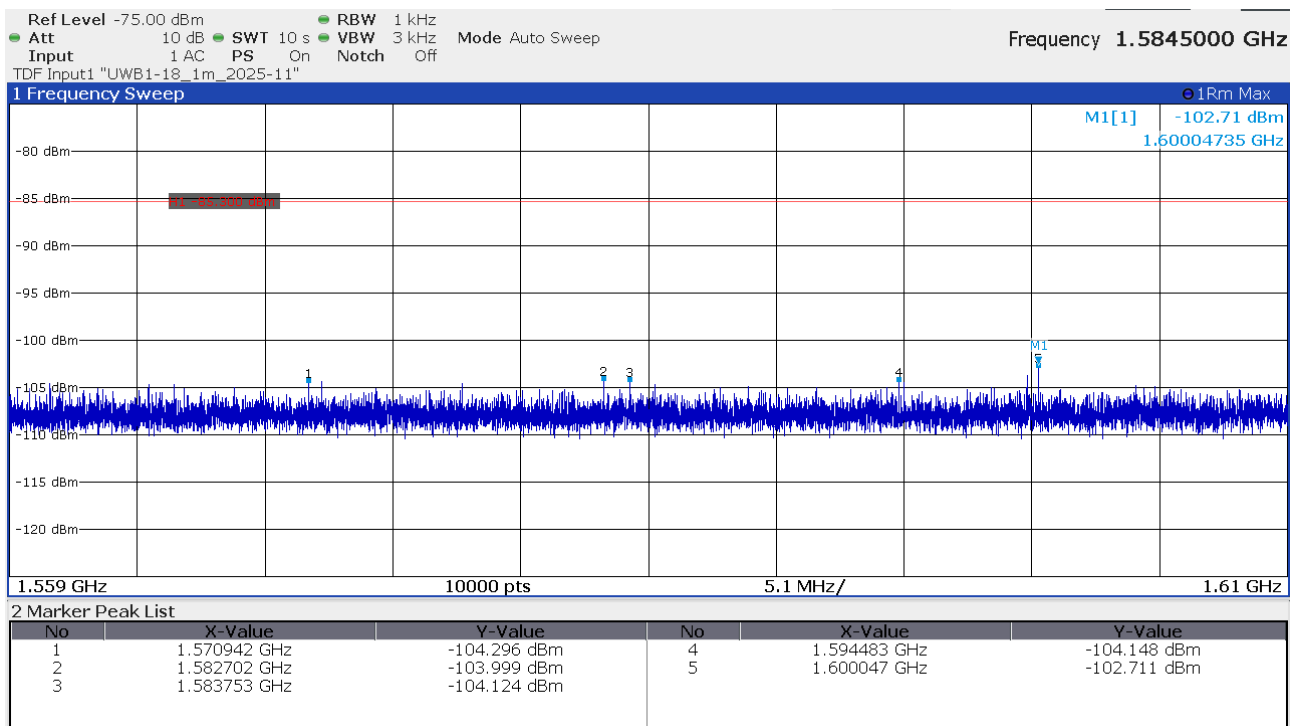


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal

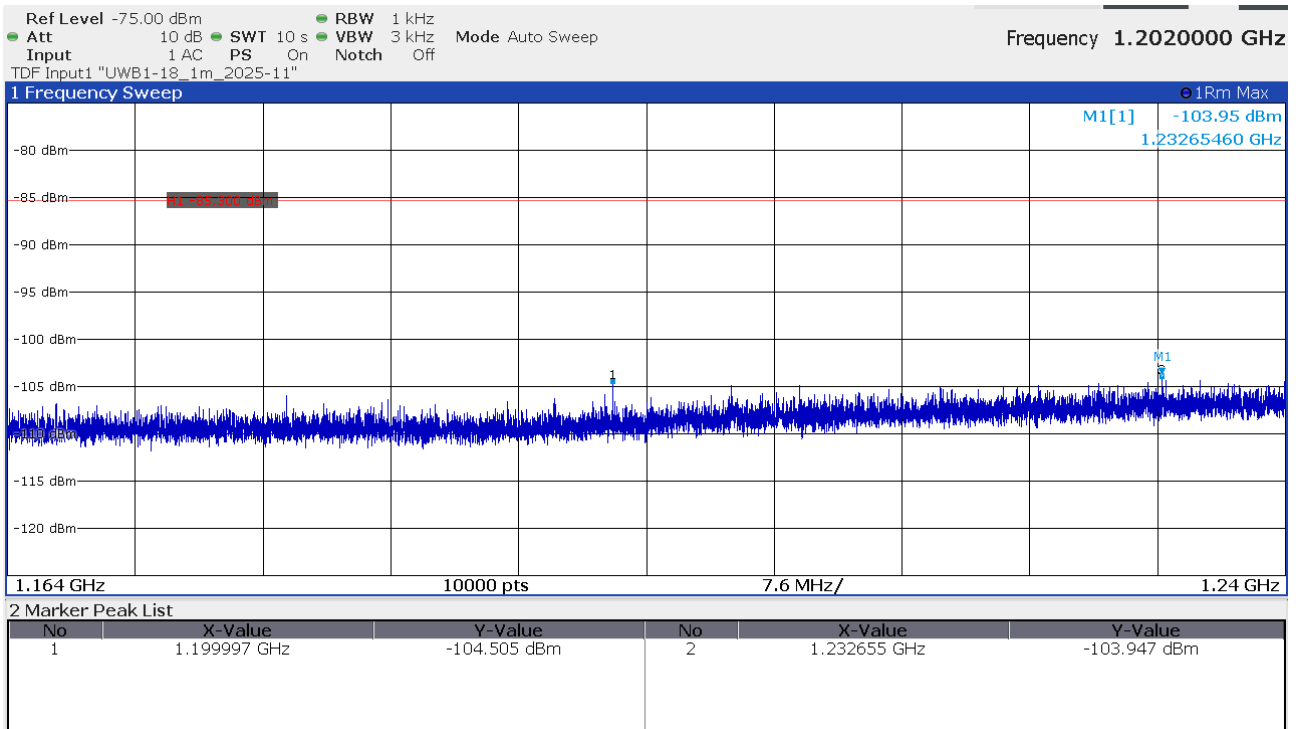


1559 MHz to 1610 MHz vertical

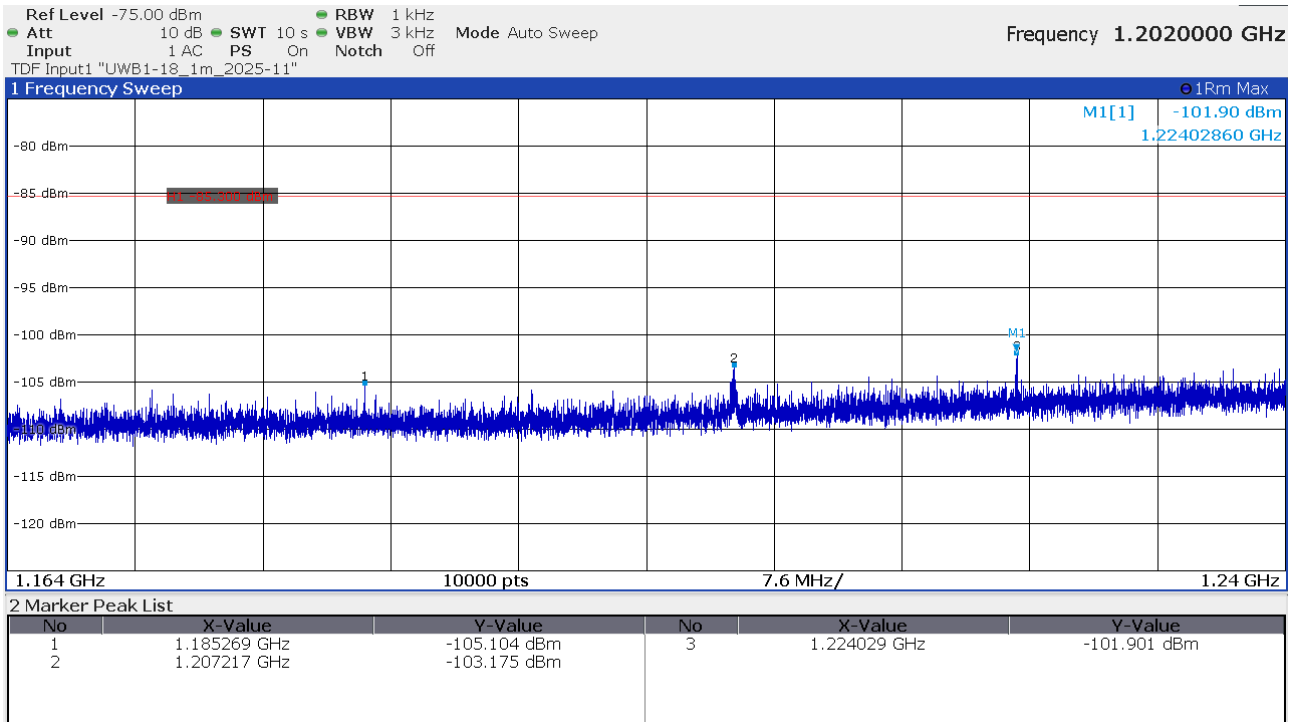


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 1

1164 MHz to 1240 MHz horizontal

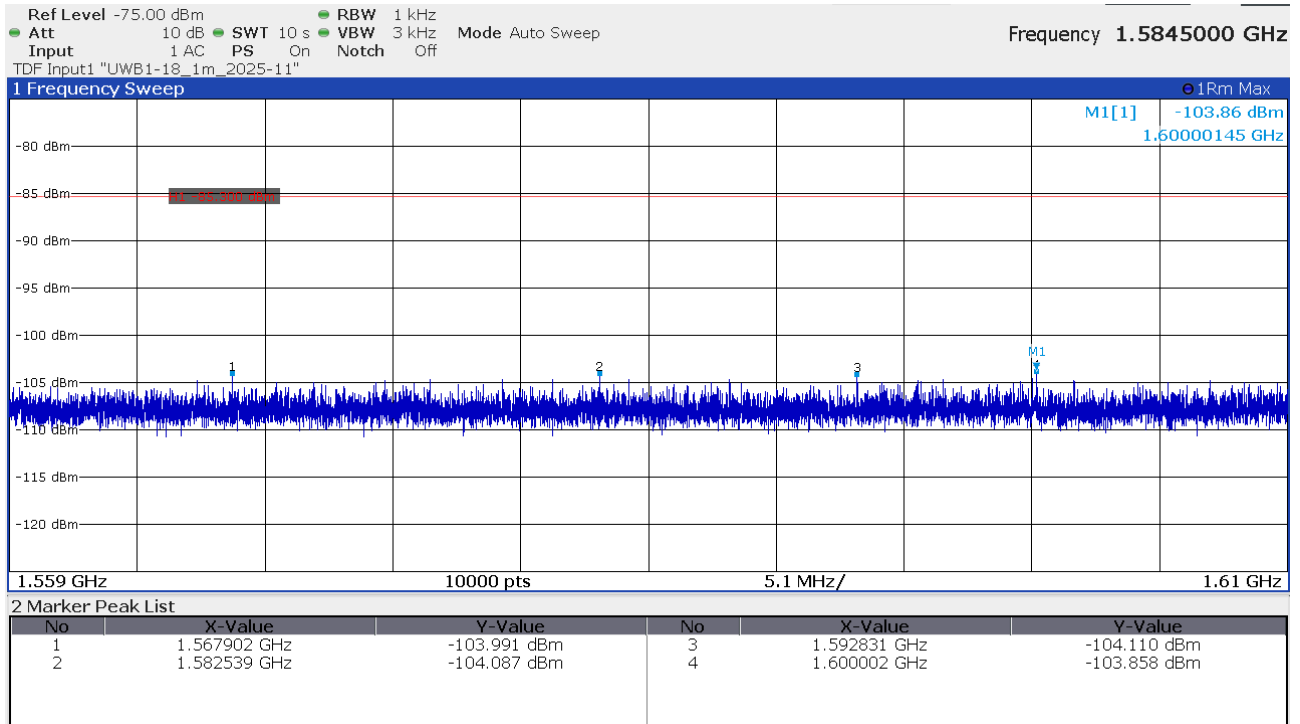


1164 MHz to 1240 MHz vertical

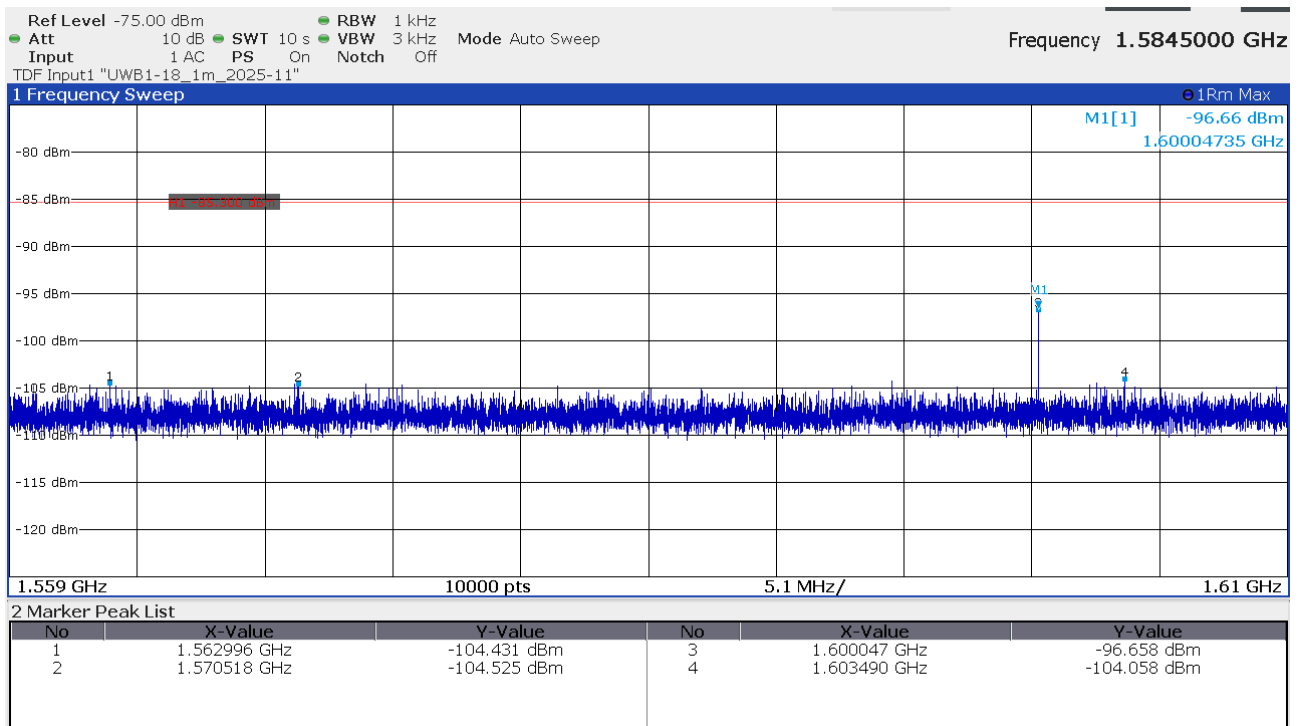


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal



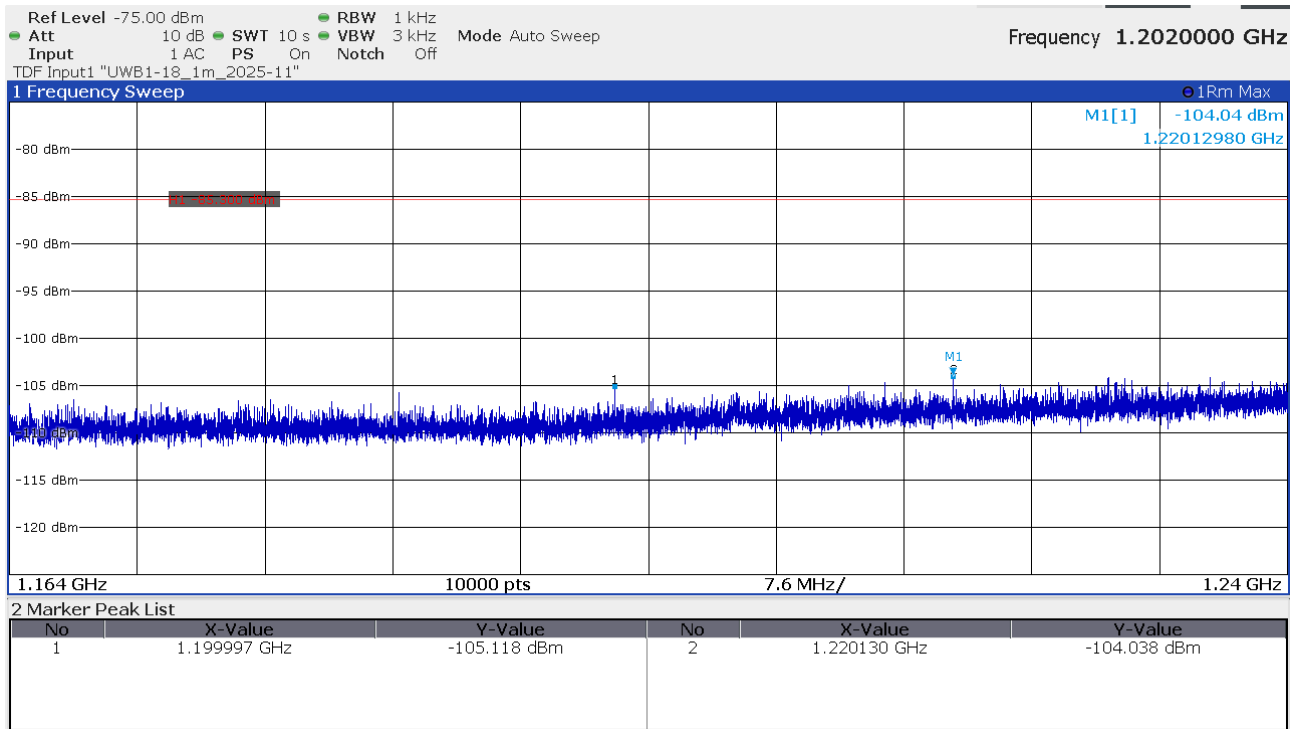
1559 MHz to 1610 MHz vertical



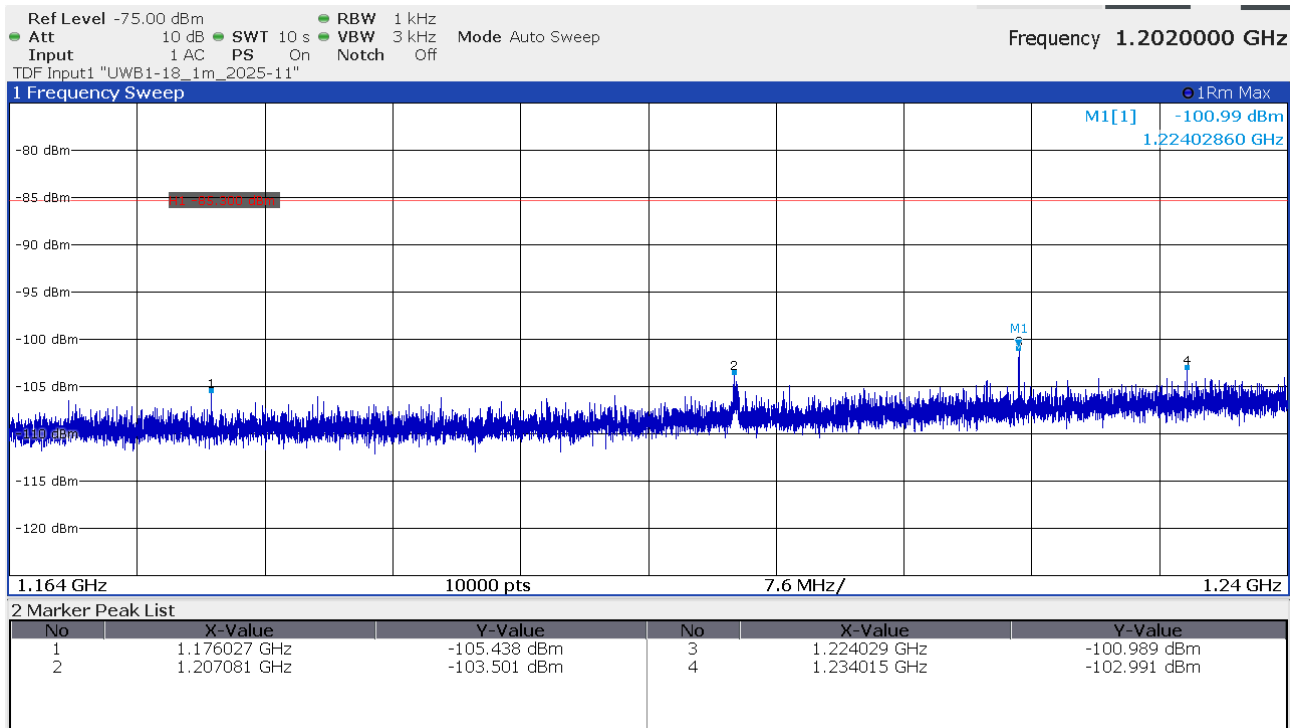
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 2

1164 MHz to 1240 MHz horizontal

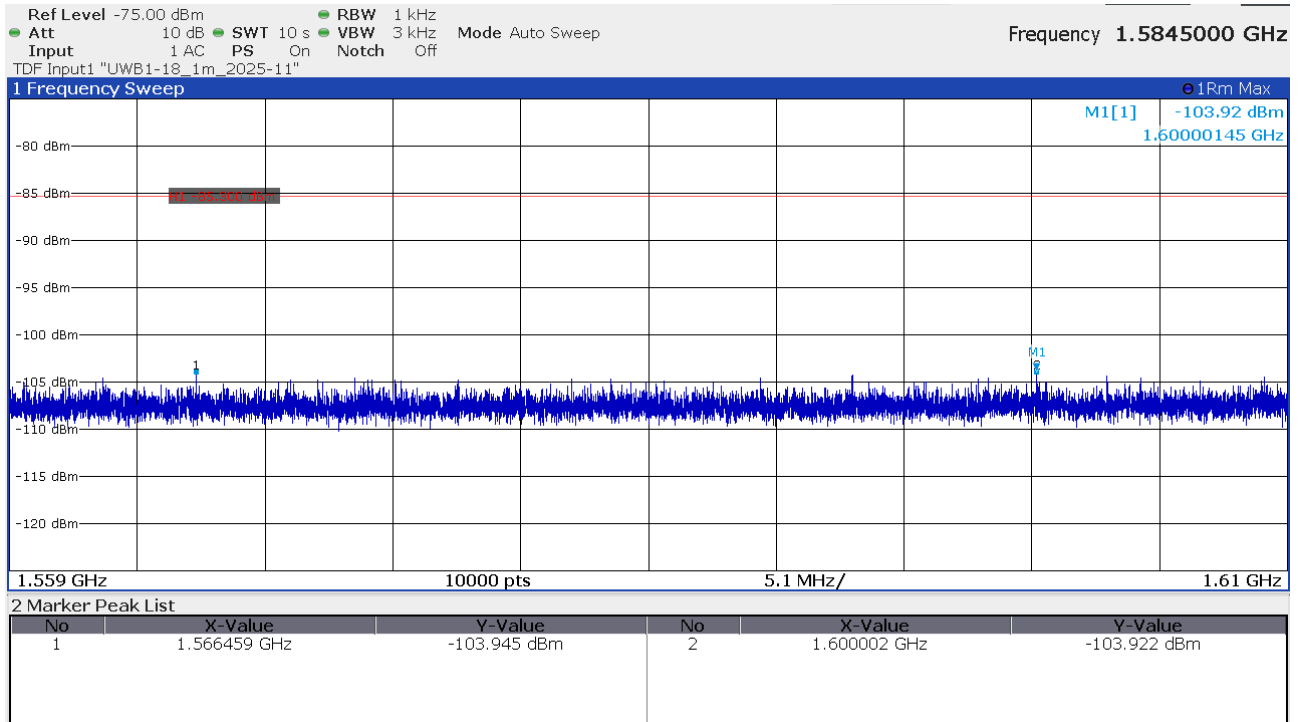


1164 MHz to 1240 MHz vertical

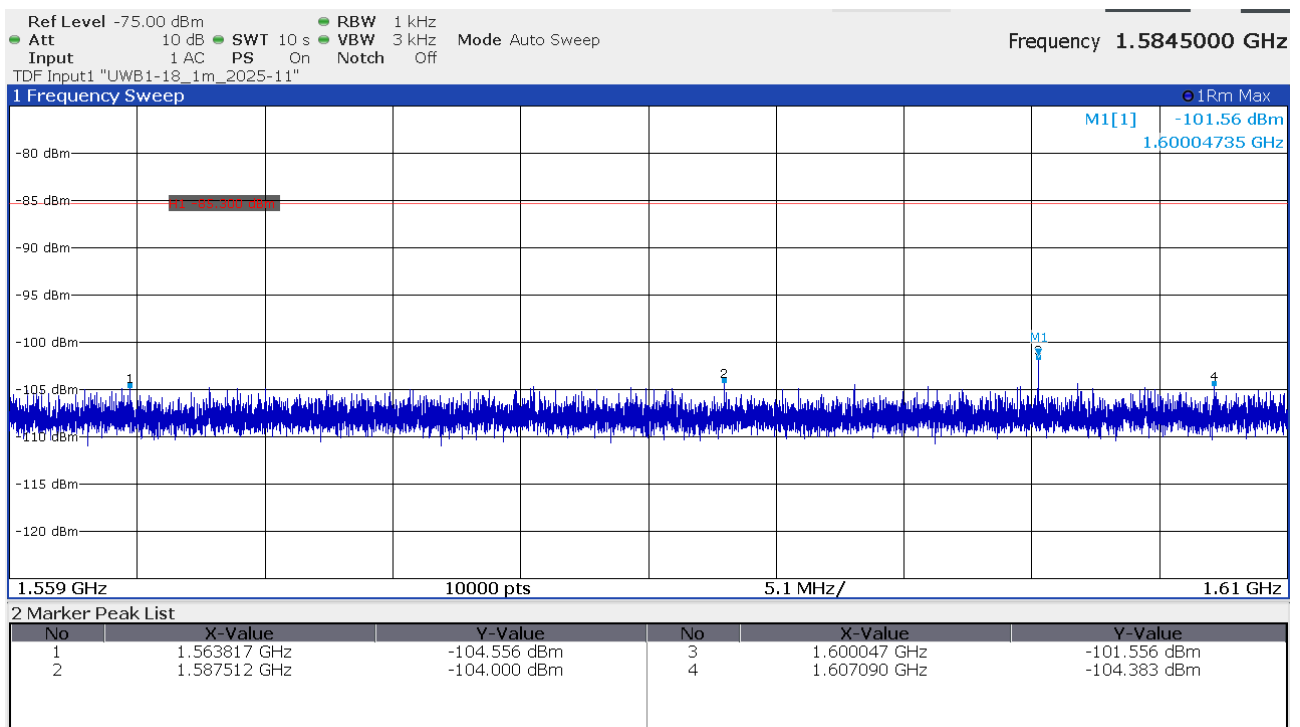


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal



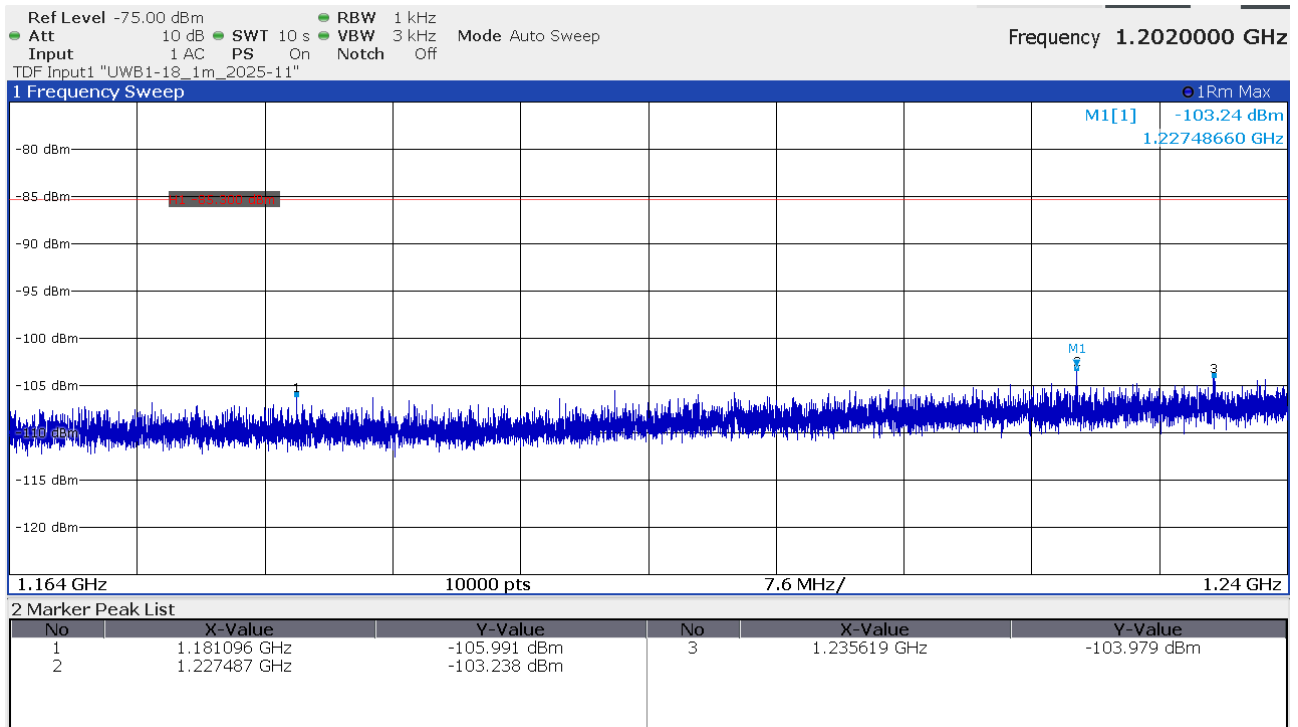
1559 MHz to 1610 MHz vertical



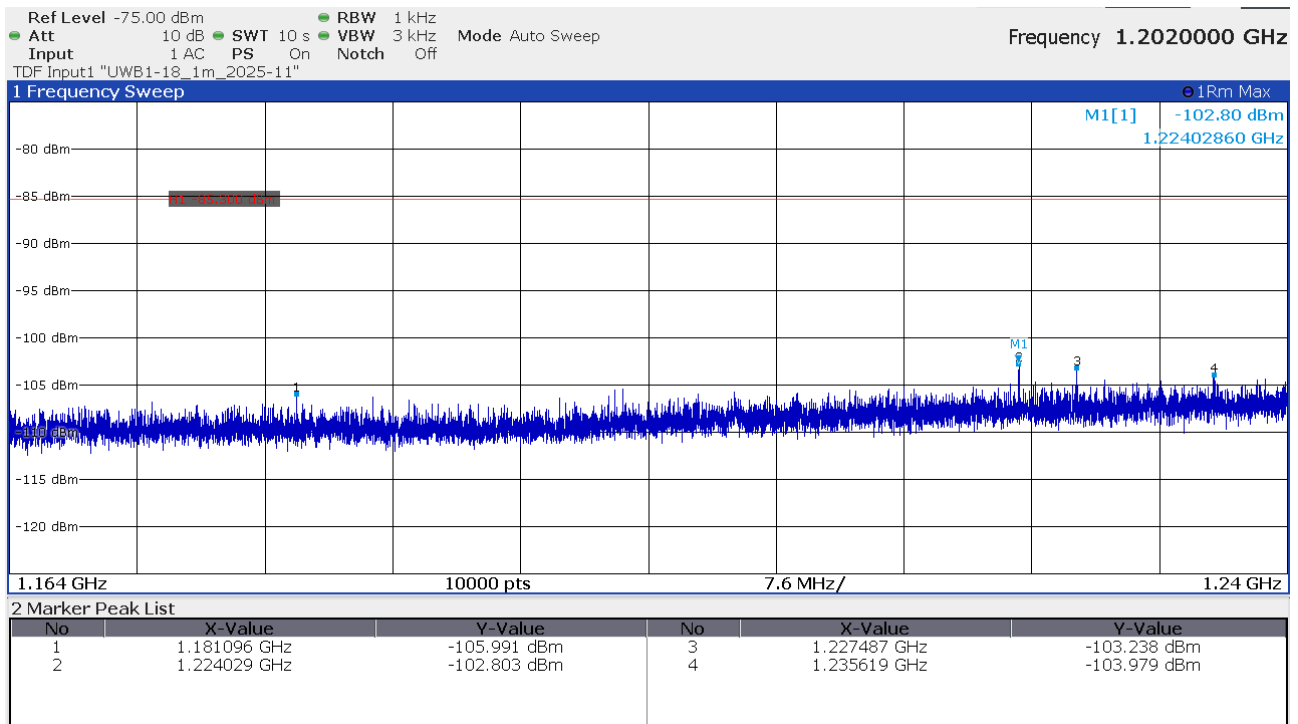
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 1

1164 MHz to 1240 MHz horizontal

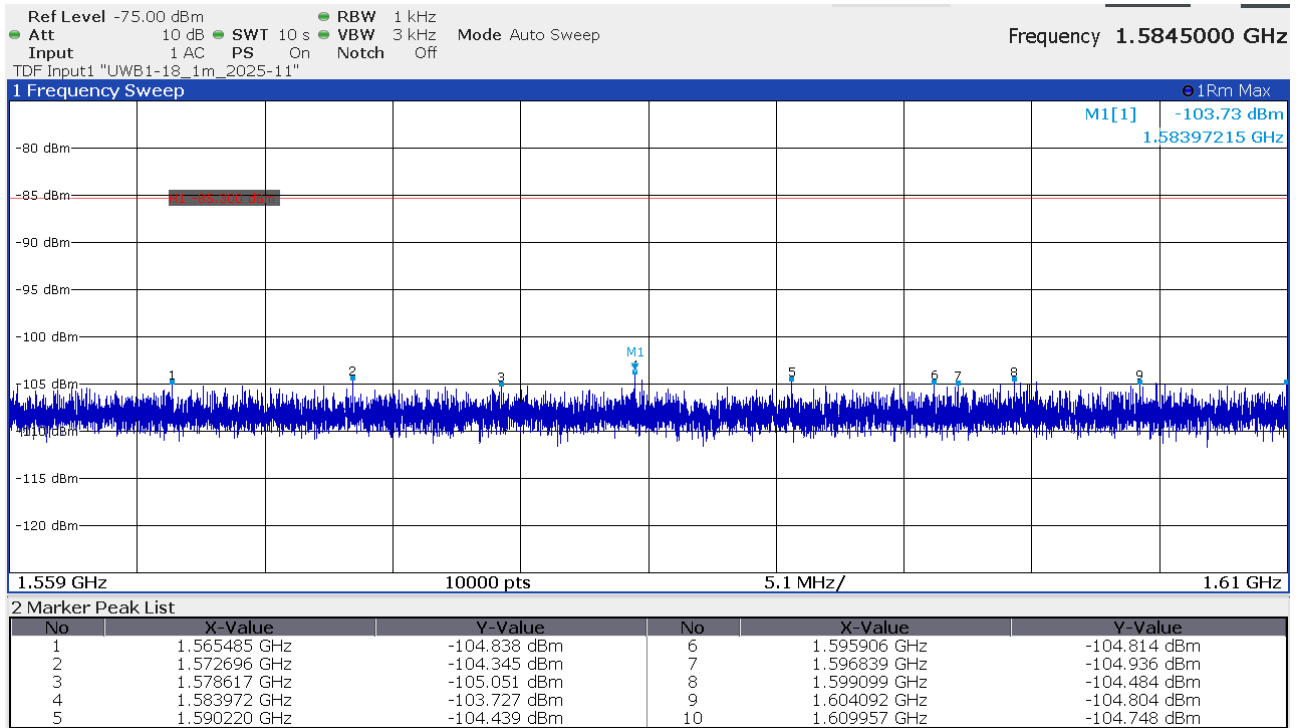


1164 MHz to 1240 MHz vertical

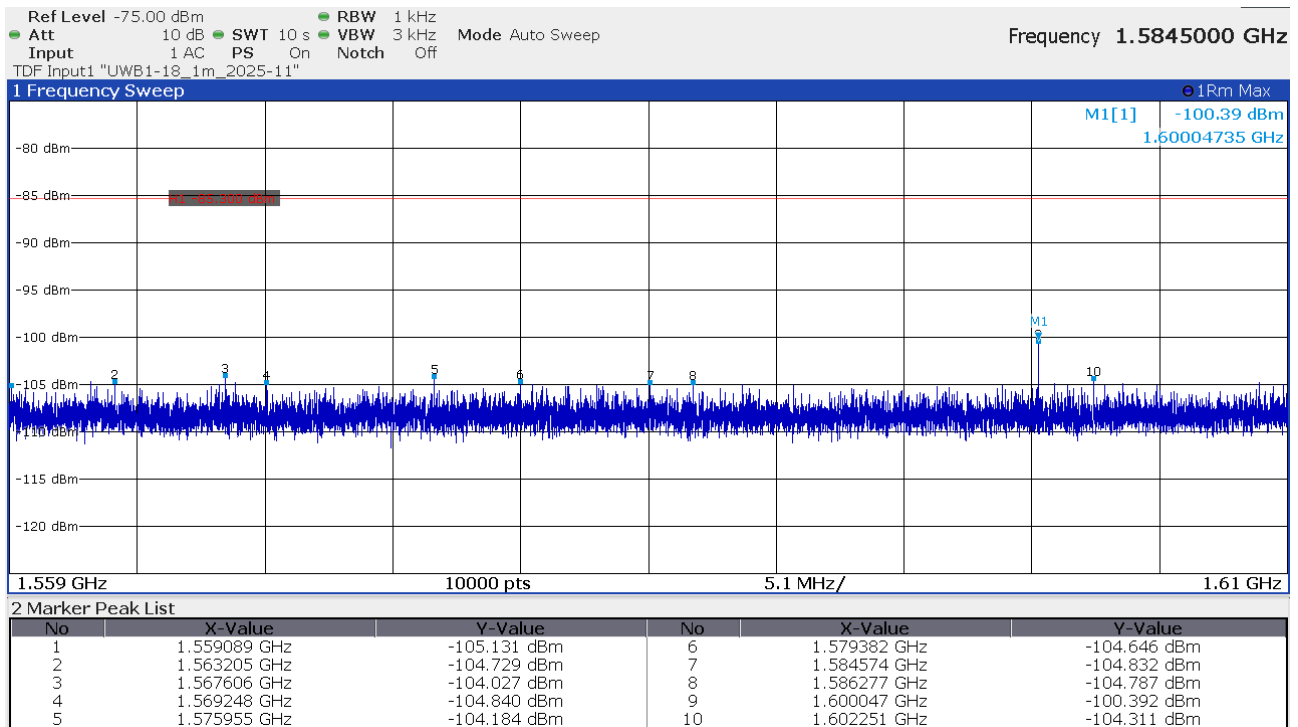


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal

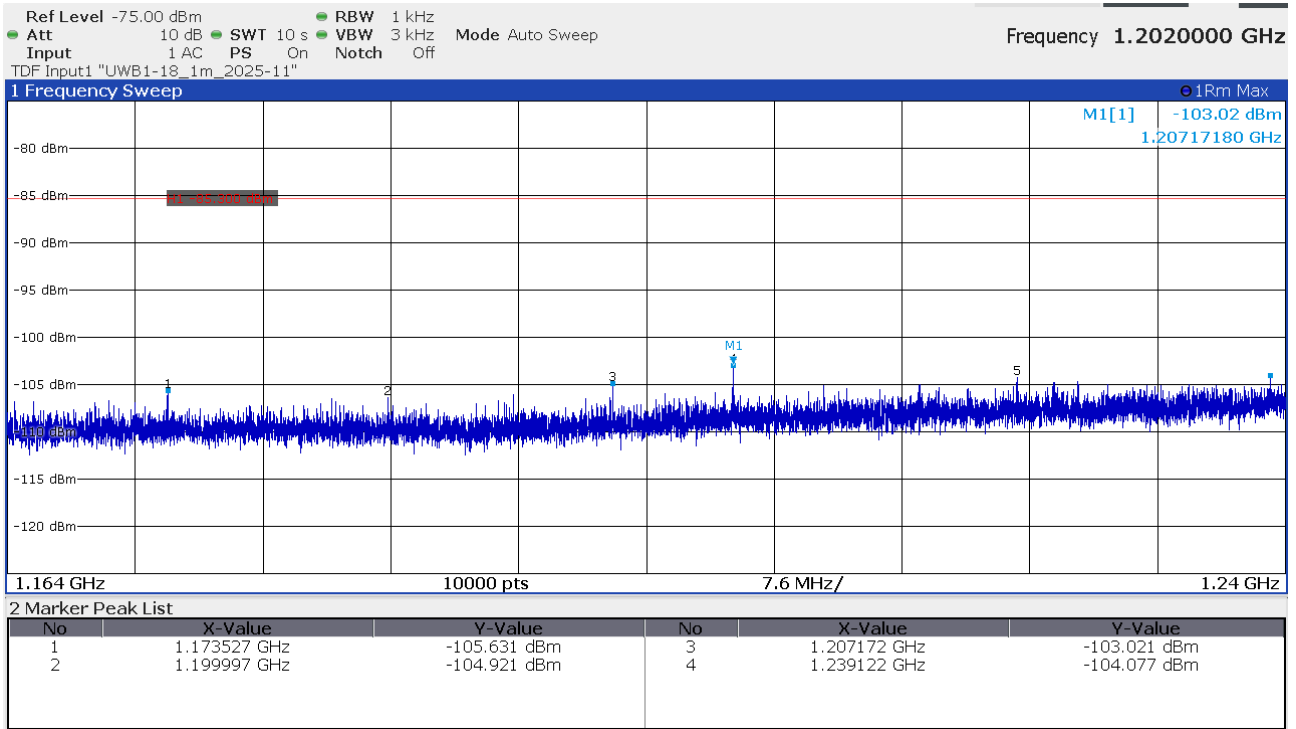


1559 MHz to 1610 MHz vertical

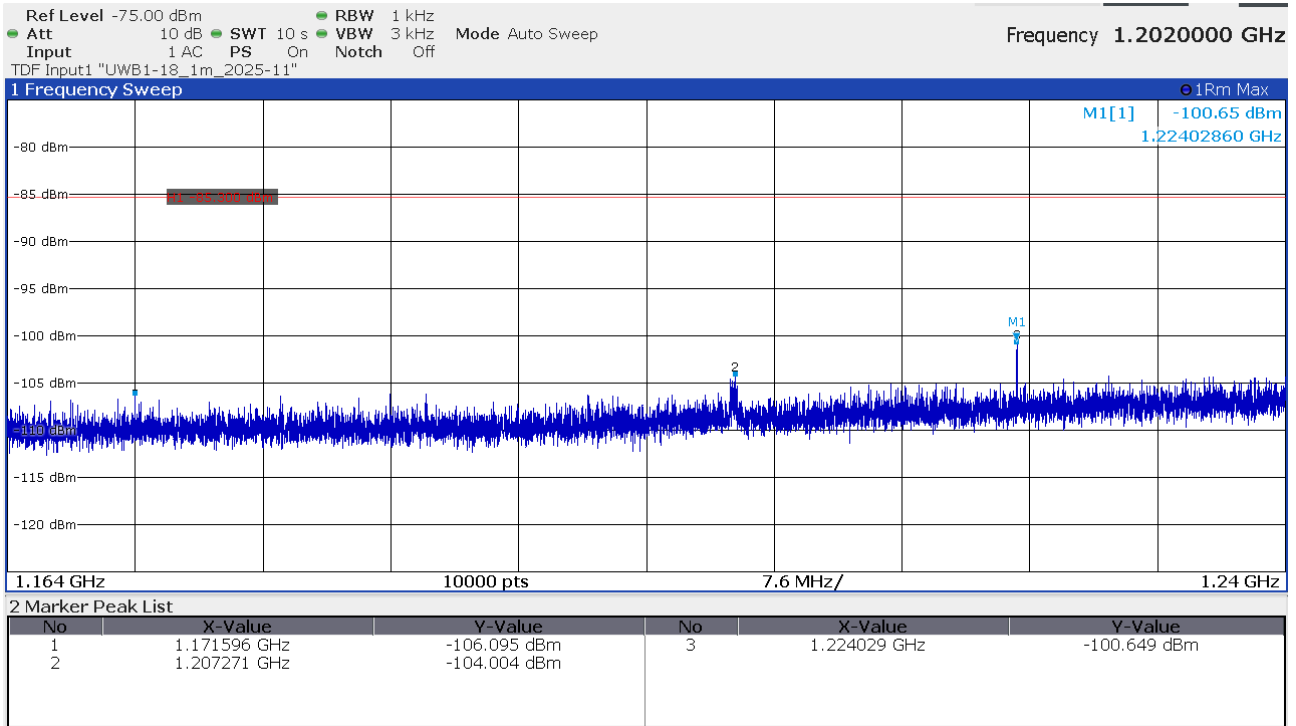


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 2

1164 MHz to 1240 MHz horizontal

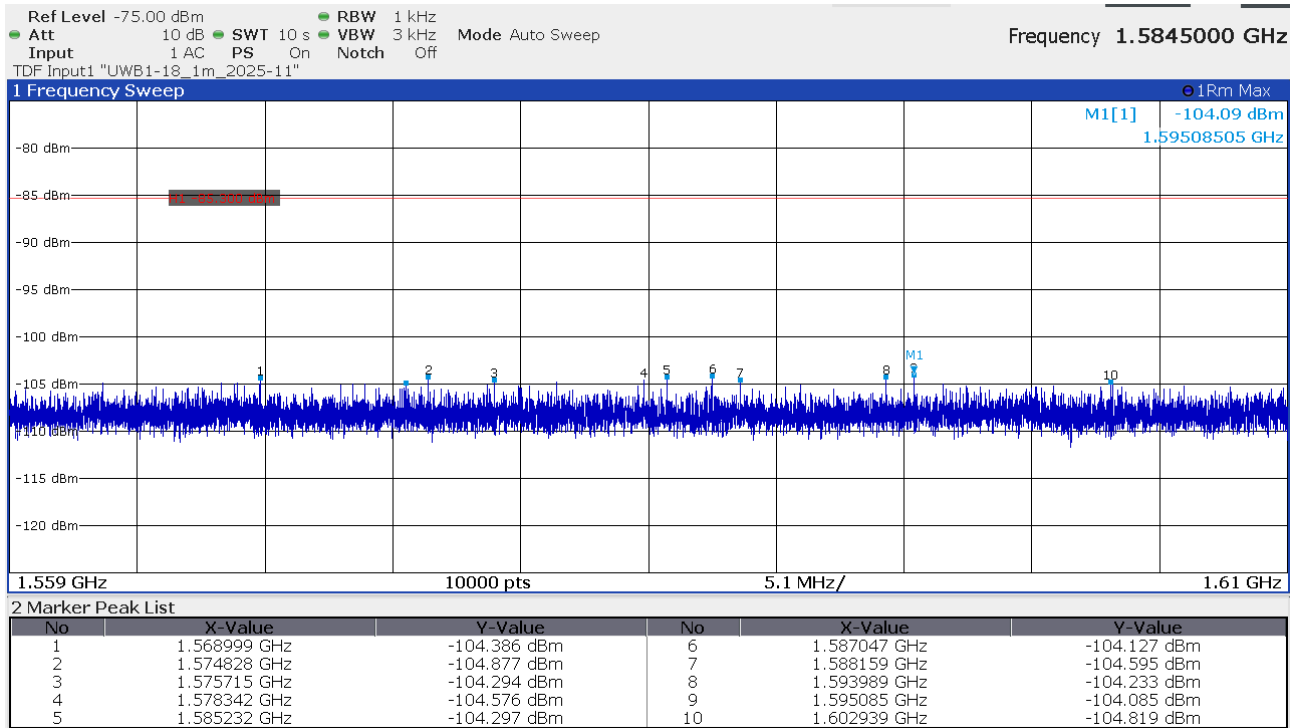


1164 MHz to 1240 MHz vertical

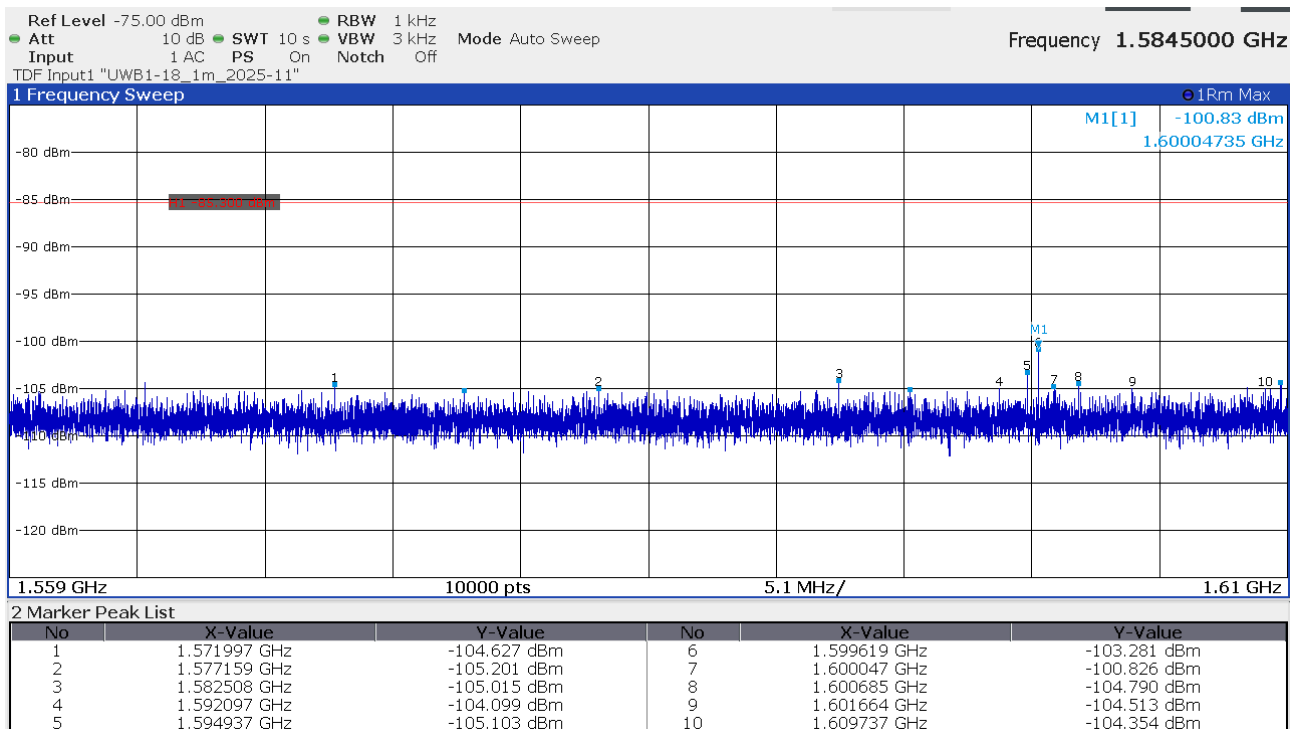


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

1559 MHz to 1610 MHz horizontal



1559 MHz to 1610 MHz vertical



FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

Limit according §15.519(c) in the frequency

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

The requirements are **FULFILLED**.

Remarks: None.

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

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

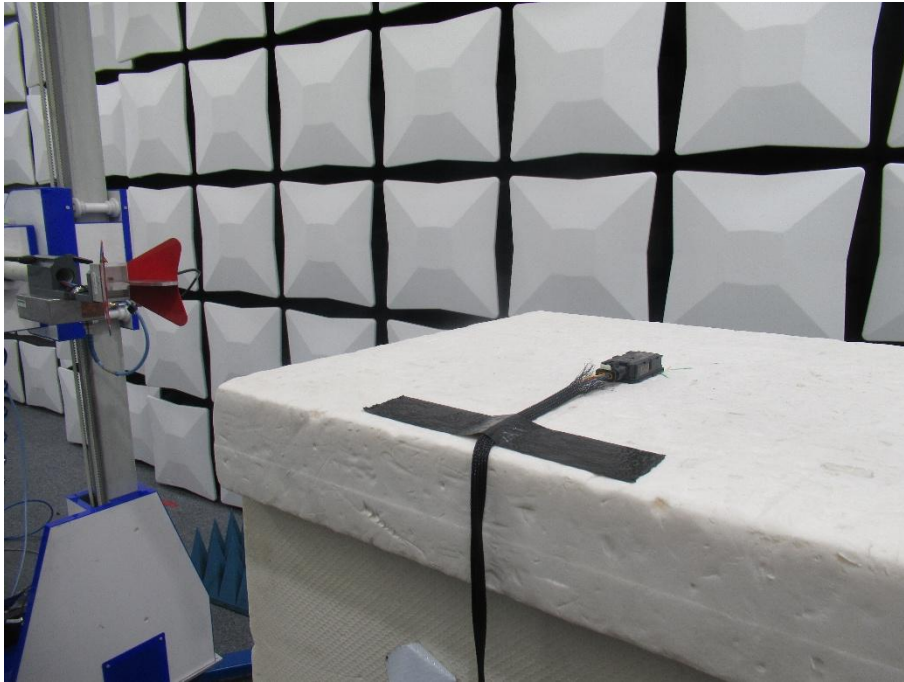
5.5 Peak Power radiated

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

5.5.1 Description of the test location

Test location: Fully Anechoic Room FAR1

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15, Section 15.519(e):

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_m . That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

5.5.4 Description of Measurement

The peak power is measured following the procedure set out in ANSI C63-10, item 10.3.5. The EUT is set in TX continuous mode while measuring.

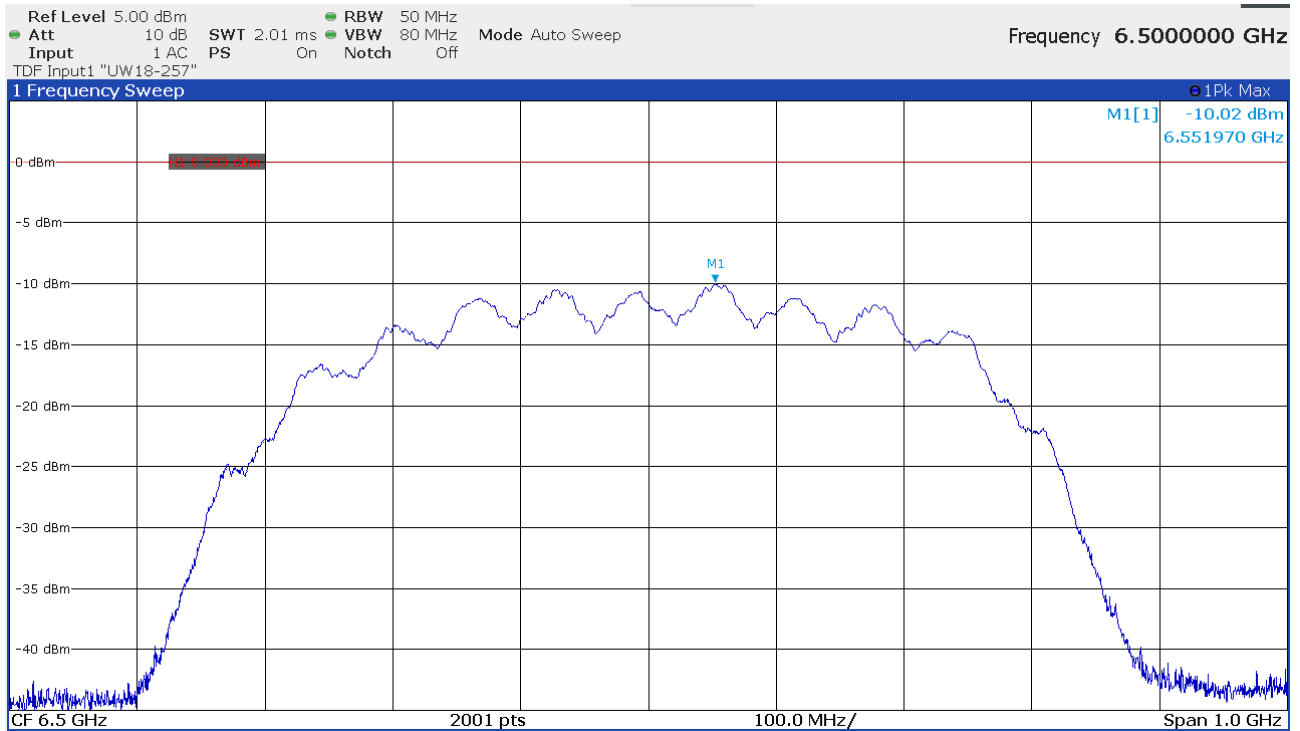
Analyser settings:

RBW: 50 MHz, VBW: 80 MHz, Detector: Peak, Trace Mode: Max hold

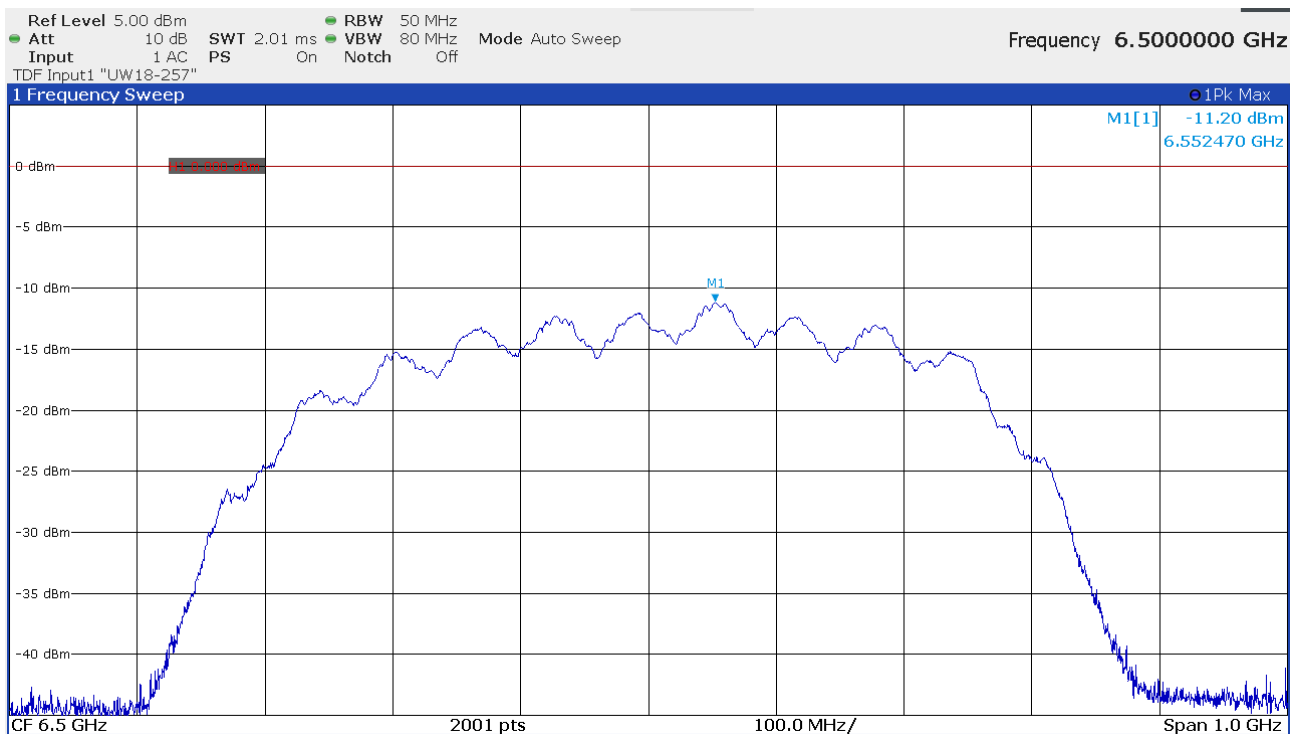
FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

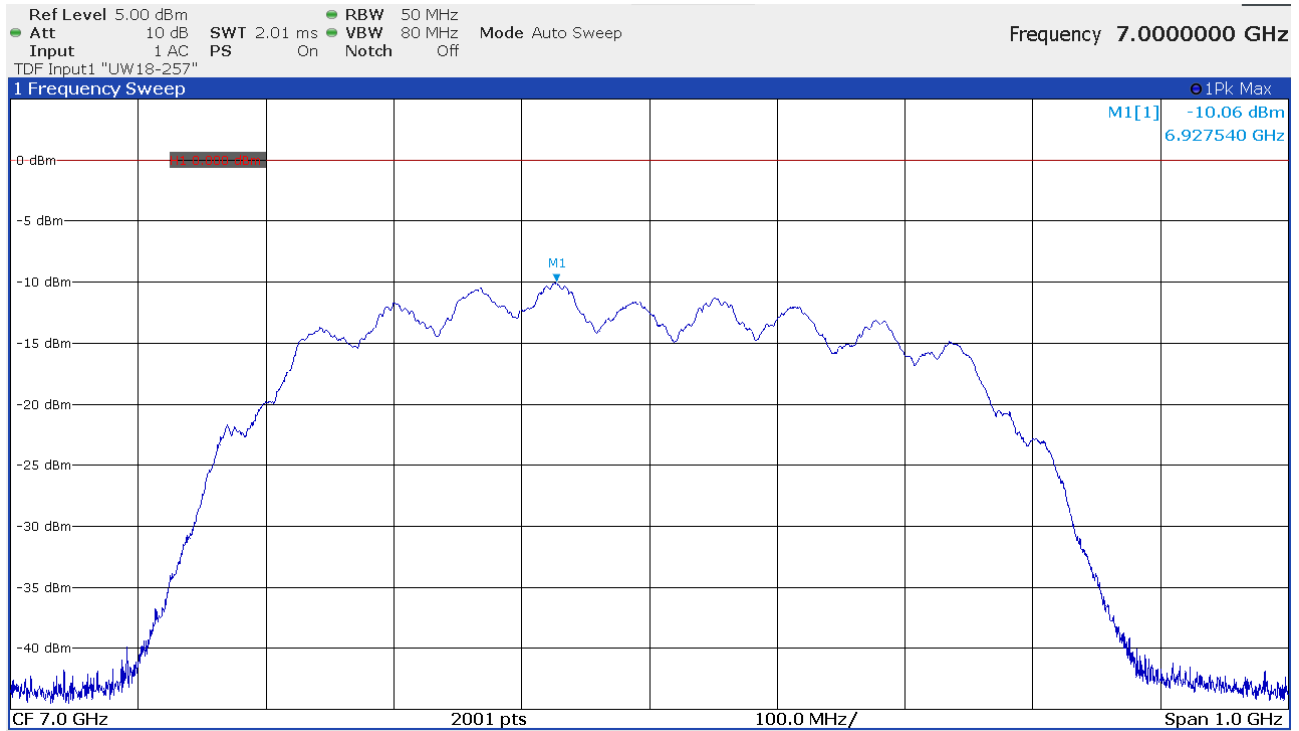
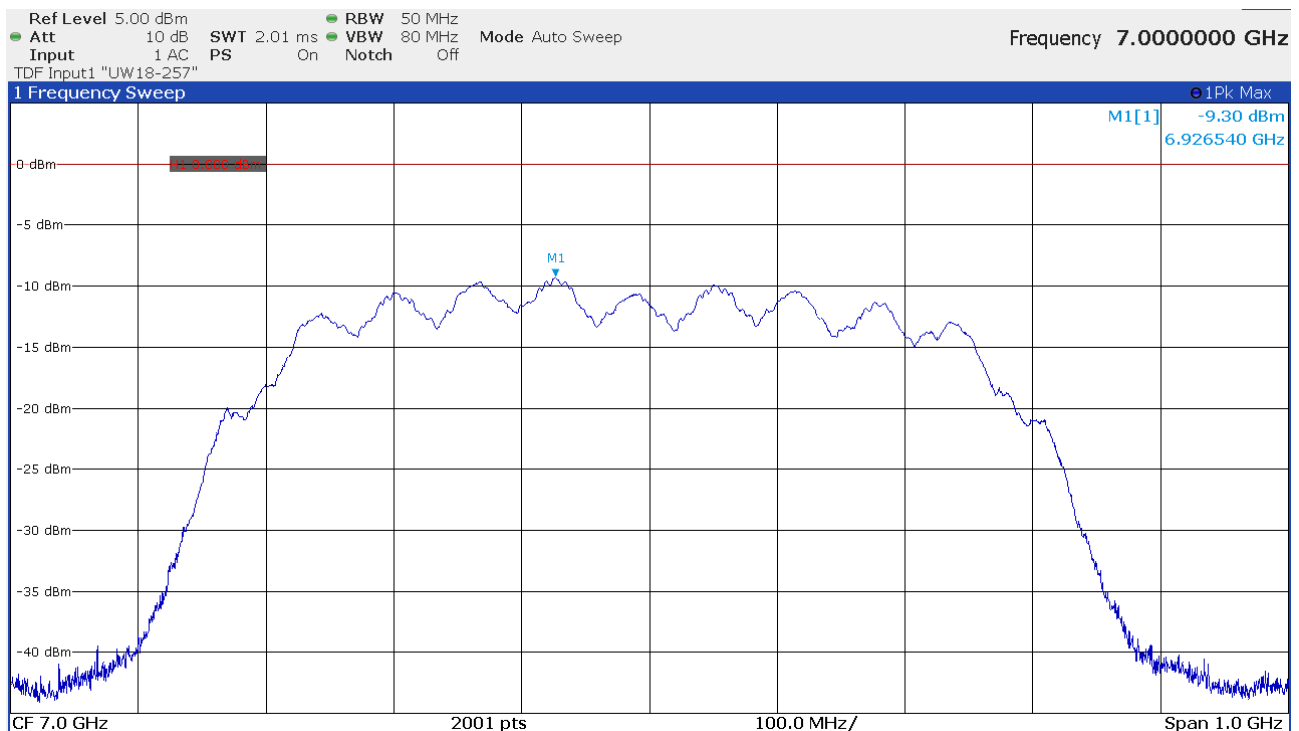
5.5.5 Test result

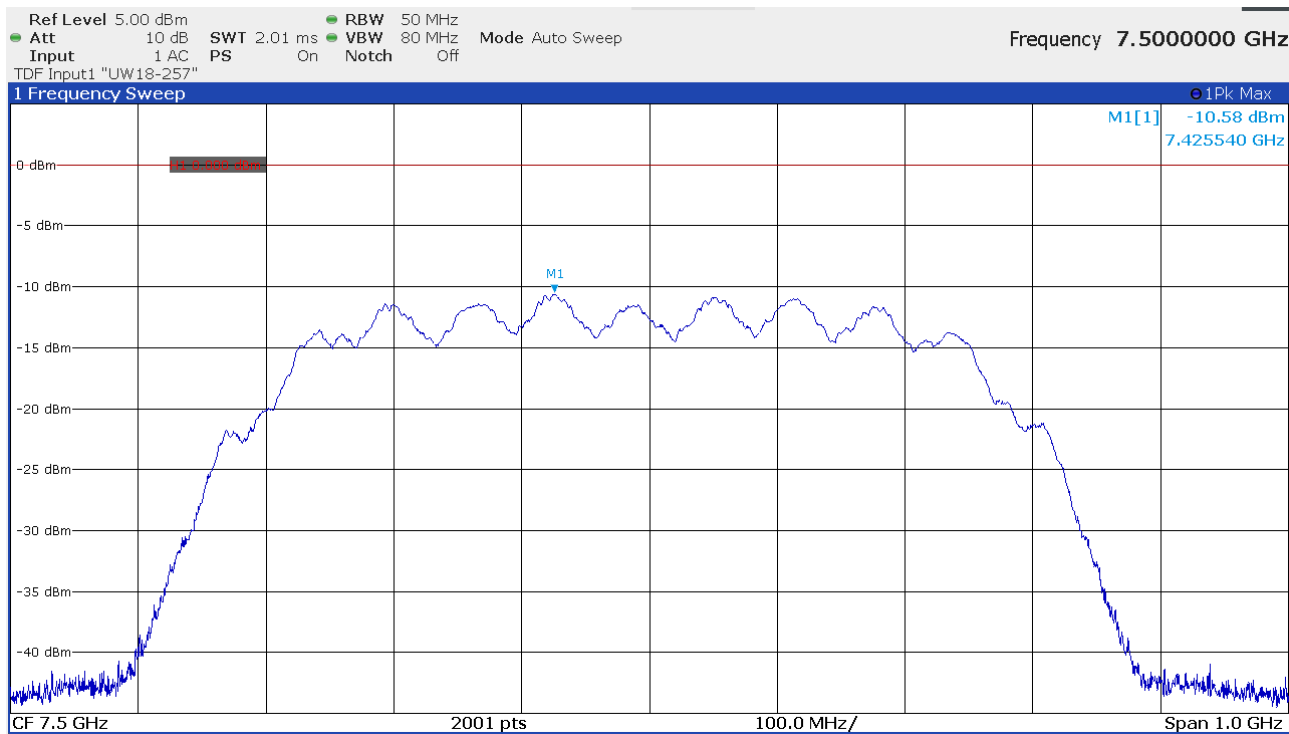
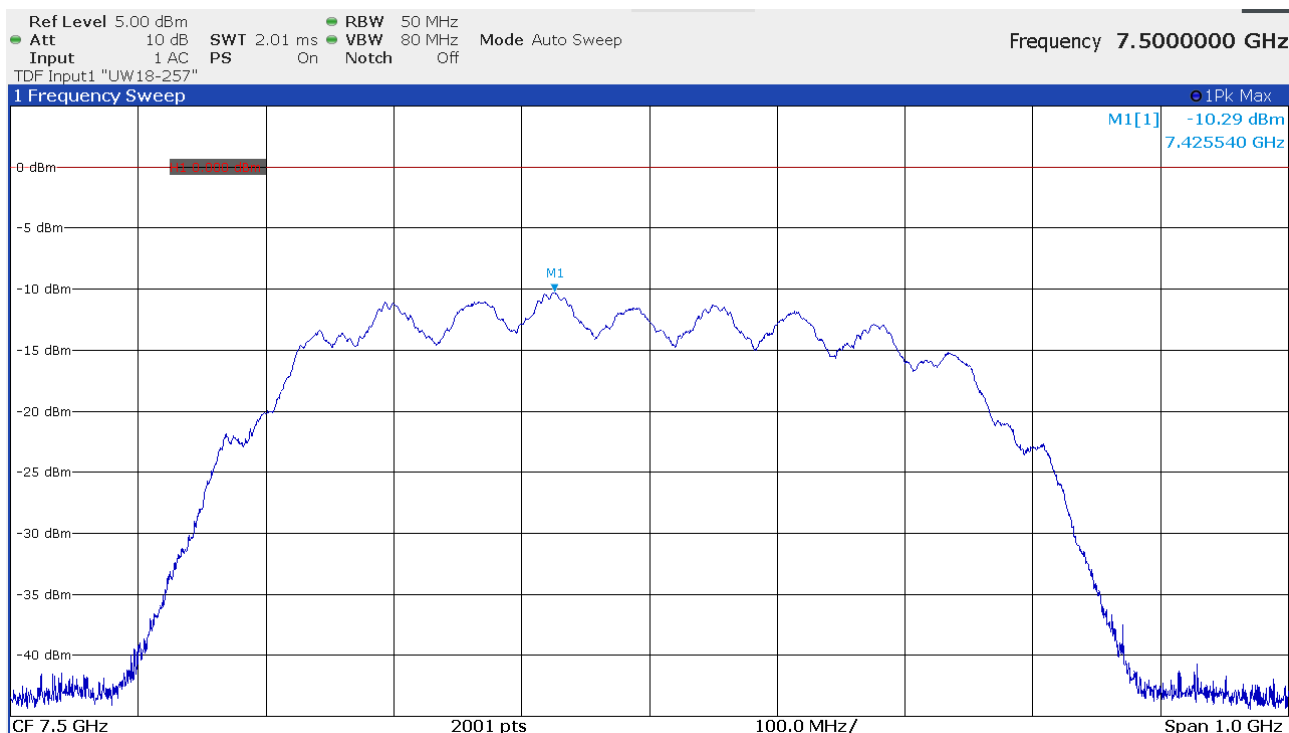
Channel 5 antenna 1

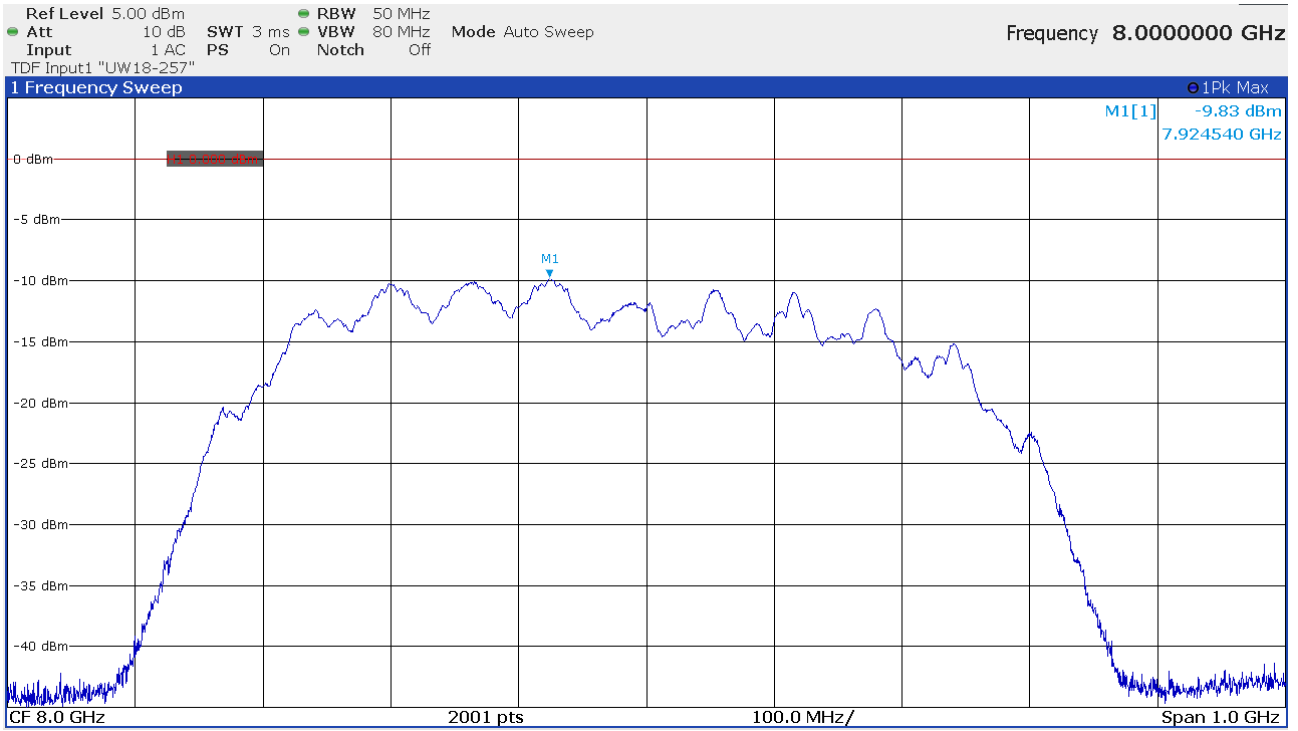
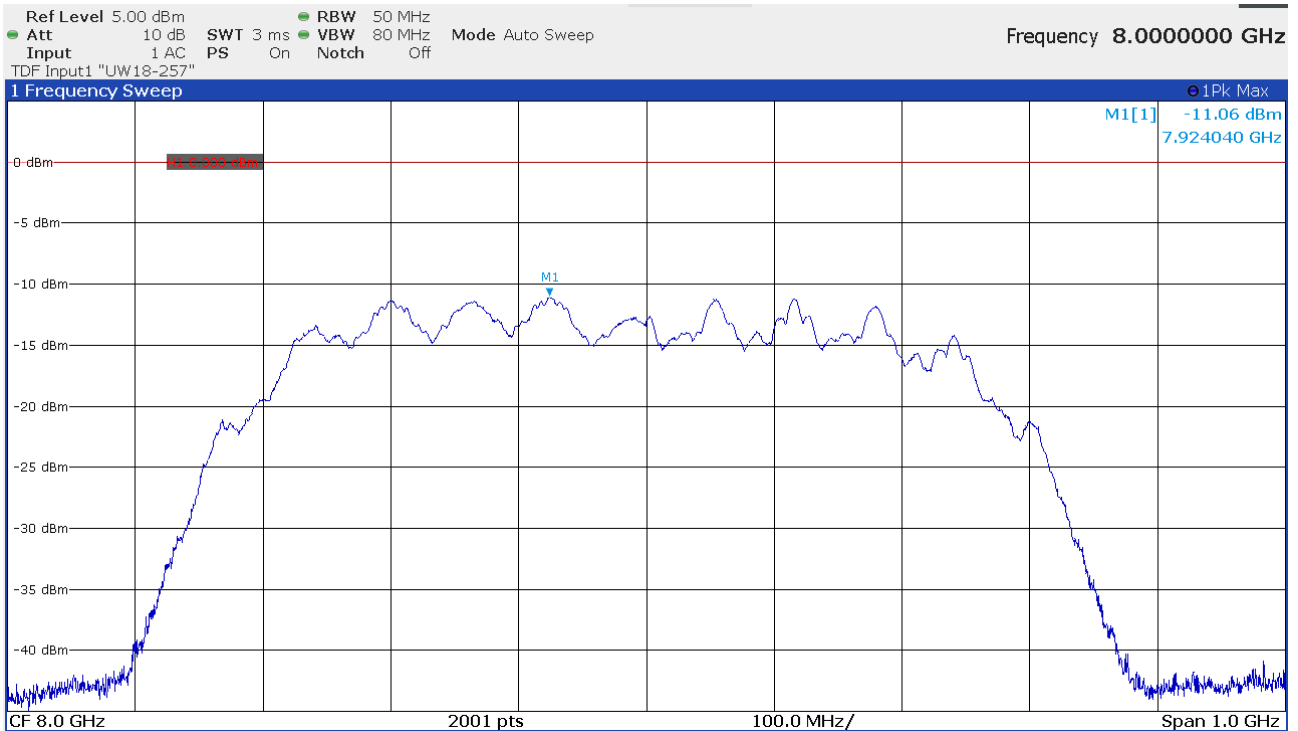


Channel 5 antenna 2



FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 6 antenna 1

Channel 6 antenna 2


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 8 antenna 1

Channel 8 antenna 2


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
Channel 9 antenna 1

Channel 9 antenna 2

The requirements are **FULFILLED**.

Remarks: None.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

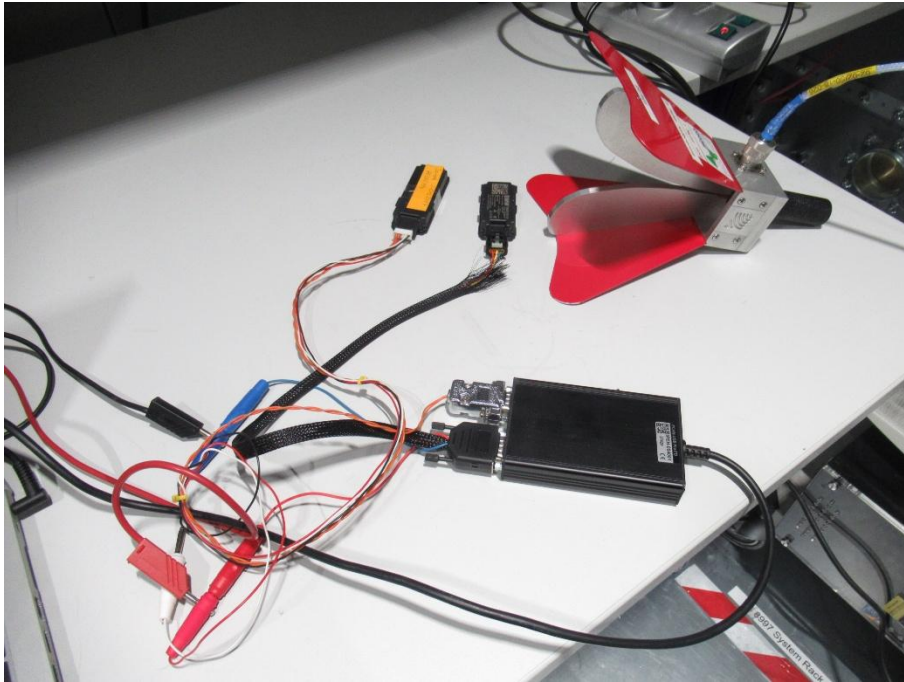
5.6 Signal deactivation

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

5.6.1 Description of the test location

Test location: Shielded room S6

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

According to FCC Part 15, Section 15.519(a)(1):

A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

According to KDB 393764 D01 UWB FAQ v02 section 4:

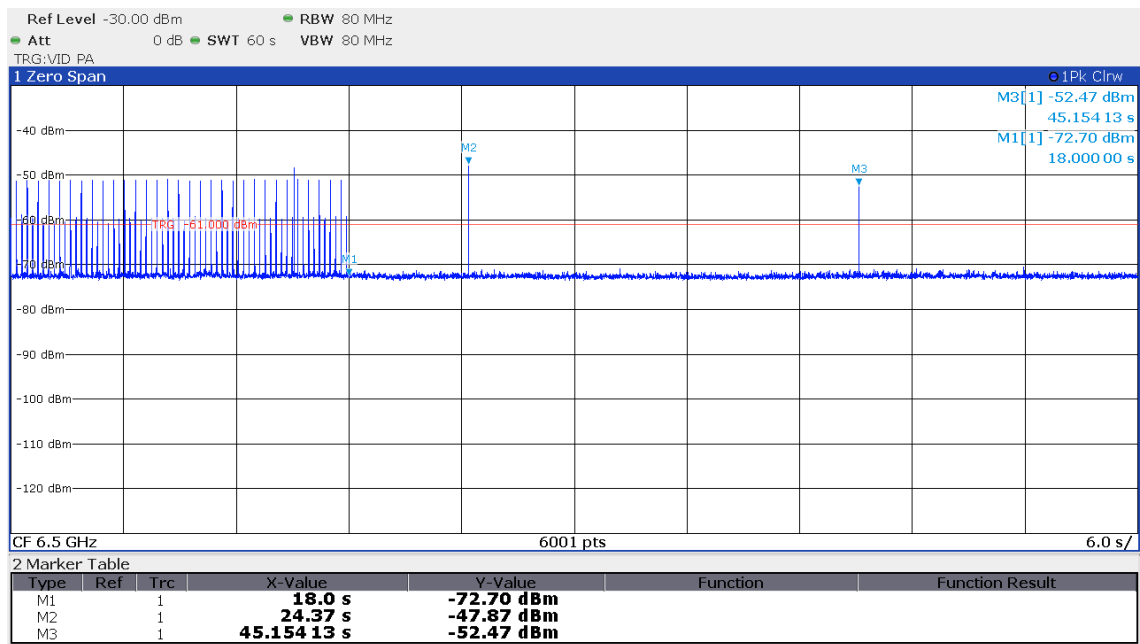
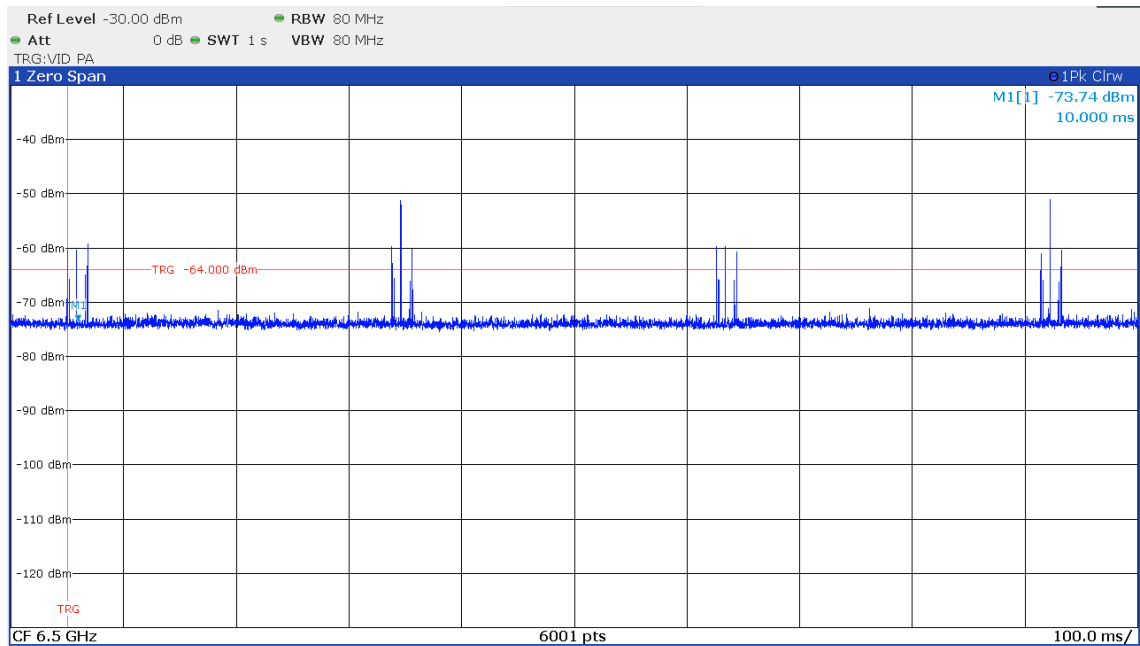
An acknowledgement of reception must continue to be received by the UWB device at least once every 10 seconds, or else the device shall cease transmission of any information other than periodic signals for use in the establishment or re-establishment of a communications link with an associated receiver.

5.6.4 Description of Measurement

The measurement was performed radiated.

Spectrum analyser settings:

RBW: 80 MHz, VBW: 80 MHz, Detector: peak, zero span

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23
5.6.5 Test result


FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23**Explanation:**

The tests are performed with an EUT, which supports a total of four channels. The signal deactivation is independent of the chosen channel and shown here for a signal with channel 5.

At the time M1 the companion device was powered off. The EUT stops transmissions immediately and after 6.4 s retries to get a connection to a companion device. The EUT makes two additional attempts to get a connection, then all transmissions stopped.

This behaviour is in accordance with the applicable standards.

The requirements are **FULFILLED**.

Remarks: None.

FCC ID: KR5FBD5SMY23 IC: 7812D-FBD5SMY23

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 2024.0.12.0	01-02/68-13-001				
	ESCI	02-02/03-15-001	07/07/2026	07/07/2025		
	ESH 2 - Z 5	02-02/20-05-004	01/10/2028	01/10/2025	01/10/2026	01/10/2025
	N-4000-BNC	02-02/50-05-138				
	ESH 3 - Z 2	02-02/50-05-155	28/10/2028	28/10/2025	28/04/2026	28/10/2025
	Note: Measurement was carried out on 09.03.2026					
CPR 3	ESW26	02-02/03-17-002	25/06/2026	25/04/2025		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-20-007	20/11/2025	20/11/2024		
	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				
	Note: Measurement was carried out on 12.08.2025					
MB	FSW43	02-02/11-21-001	09/09/2026	09/09/2025		
	3117	02-02/24-05-009	17/03/2027	17/03/2026		
	KK-SF126-11SMA-11N-1,5M	02-02/50-18-026				
	Note: Measurement was carried out on 30.04.2026					
SER 1	ESR 7	09-02/03-21-004	18/08/2026	18/08/2025		
	HFH2-Z2E	09-02/24-21-001	05/08/2026	05/08/2025		
	IN600	09-02/50-21-015				
	KK-7.8F-2XNM_4.0M	09-02/50-21-018				
	KK-7.8F-2XNM_4.5M	09-02/50-21-023				
	KK-7.8F-2XNM_9.5M	09-02/50-21-025				
	KK-SF118-2X11N-4.0M	09-02/50-23-034				
	Note: Measurement was carried out on 05.03.2026					
SER 2	ESR 7	09-02/03-21-004	18/08/2026	18/08/2025		
	BBV 9743 B	09-02/17-21-002			25/11/2026	25/11/2025
	VULB9168	09-02/24-22-003	05/08/2026	05/08/2025	21/08/2026	21/08/2025
	SAC2 - NSA 3m	09-02/30-23-003	16/09/2026	16/09/2025		
	KK-7.8F-2XNM_4.0M	09-02/50-21-018				
	KK-7.8F-2XNM_4.5M	09-02/50-21-023				
	KK-7.8F-2XNM_9.5M	09-02/50-21-025				
	50F-003 N 3dB	09-02/50-22-002				
	CDB-10K-18-50V-NMF-I	09-02/50-22-031	04/06/2026	04/06/2025		
	KK-SF526S-2X11N-10.0M	09-02/50-25-002				
	BAT-EMC 2026.0.4.1	09-02/68-21-002				
	Note: Measurement was carried out on 02.02.2026					
SER 3	ESW26	02-02/03-17-002	25/06/2026	25/04/2025		
	FSW43	02-02/11-15-001	19/05/2026	19/05/2025		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	LNA-40-18004000-33-5P	02-02/17-20-002				
	BBHA 9170	02-02/24-05-015	06/03/2028	06/03/2025		
	3117	02-02/24-20-007	31/08/2026	17/11/2025		
	BAM 4.5-P	02-02/50-17-024				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	KMS116-GL140SE-KMS116-	02-02/50-20-026				
	0_5 Meter DC-18GHz	09-16/50-23-003				
	Note: Measurements were carried out during the period from 25.02.2026 to 03.03.2026					