EMI – TEST REPORT

- FCC Part 15.519, RSS-220 -

Type / Model Name	:	Al Rihla Pro / HM8393
Product Description	:	Soccer ball with integrated UWB transmitter
Applicant	:	Adidas AG
Address	:	Adi-Dassler-Strasse 1
		91074 HERZOGENAURACH, GERMANY
Manufacturer	:	Adidas AG
Address	:	Adi-Dassler-Strasse 1
		91074 HERZOGENAURACH, GERMANY

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

Test Report No. : 80122260-03 Rev2	06. December 2022 Date of issue

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

CSA Group Bayern GmbH
Ohmstrasse 1-4 · 94342 STRASSKIRCHEN · GERMANY
Tel.: +49(0)9424-94810 · Fax: +49(0)9424-9481440

FCC ID: ZLG-ALRIHLAPRO IC: 9722B-ALRIHLAPRO

Contents

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

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	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements

FCC Rules and Regulations Part 15, Subpart F – Ultra Wideband Operation (October 2021)

Part 15, Subpart F, Section 15.503	Definitions
Part 15, Subpart F, Section 15.505	Cross reference
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

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 393764 D01 v02 (January 29, 2018)	Ultra-Wideband (UWB) Devices – Frequently Asked Questions
KDB 178919 D01 v06 (October 16, 2015)	Permissive Change Policy

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 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.4 Equipment type

Portable UWB Device

2.5 Short description of the equipment under test (EUT)

The EUT is a soccer ball with an integrated UWB transmitter.

Number of tested samples:	3
Serial number:	60782 (continuous transmission on channel 3) 161465 (continuous transmission on channel 5) 161470 (stand-by mode, used for testing §15.519(a))
Firmware version:	5.5.4

2.6 Variants of the EUT

There are no variants.

2.7 Operation frequency and channel plan

The operating frequency band is 3100 MHz to 10600 MHz.

Channel plan UWB (FCC):

Channel number	f_c (MHz)
Channel 3	4492.8
Channel 5	6489.6

Channel plan UWB (IC):

Channel number	f_c (MHz)
Channel 5	6489.6

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)	Peak Gain (dBi)
1	monopole antenna	TSA5NA6L5G55NS003T	None, PCB	3.1 – 8.0	2.6 (@ channel 3) 1.5 (@ channel 5)

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 3.8 V DC
Power supply voltage (alternative) : 3.6 V DC – 4.2 V DC

2.11 Peripheral devices and interface cables

No peripheral devices and interface cables are connected during the measurements. For the measurement of §15.519(a), a radio companion device was used consisting of:

- UWB transceiver — Model : Kinexon Anchor
- PoE Switch — Model : Netgear GS108LP
- Mini-PC — Model : Intel NUC
- LAN cables — Commercially available

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

No special test software is used.

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	not applicable *1
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 *2
15.204 15.521(b)	---	External radio frequency power amplifiers and antenna modifications	passed *2
15.521(a)(f)(i)	---	Technical requirements applicable to all UWB devices	passed *3

*1 Not applicable, the EUT can not be connected to the public utility (AC) power line.

*2 According to the applicant, the EUT has an internal PCB antenna. No other antennas can be connected to the EUT. Therefor, the requirements are regarded as fulfilled.

*3 According to the applicant, the EUT will not be be used in toys, aircrafts, or satellites. The EUT is no imaging system. For details refer to the user manual.

The mentioned RSS Rule Parts in the above table are related to:
RSS-Gen, Issue 5 + Amendment 1 + Amendment 2, March 2019
RSS-220, Issue 1 + Amendment 1, July 2018

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80122260-03	0	12 August 2022	Initial test report
80122260-03	1	25 November 2022	2.9 Antenna gain corrected; 6 Note added
80122260-03	2	06 December 2022	2.9 Antenna gain corrected

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

3.2 Final assessment

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

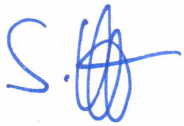
Date of receipt of test sample	:	acc. to storage records
Testing commenced on	:	11 April 2022
Testing concluded on	:	11 May 2022

Checked by:

Klaus Gegenfurtner
2022.12.06 14:24:37
+01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:



Sabine Kugler
i.A.
2022.12.06 13:59:23
+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 Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EUT	95%	$\pm 2.5 \times 10^{-7}$
99% Occupied Bandwidth	Center frequency of EUT	95%	$\pm 2.5 \times 10^{-7}$
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

4.4 Conformity Decision Rule

The applied conformity decision rule is based on ILAC G8:09/2019 clause 4.2.1 Binary Statement for Simple Acceptance Rule (w = 0).
Details can be found in the procedure CSA_B_V50_29.

4.5 Measurement protocol for FCC and ISED

4.5.1 General information

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

FCC: DE 0011
ISED: DE0009

4.5.2 General Standard information

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

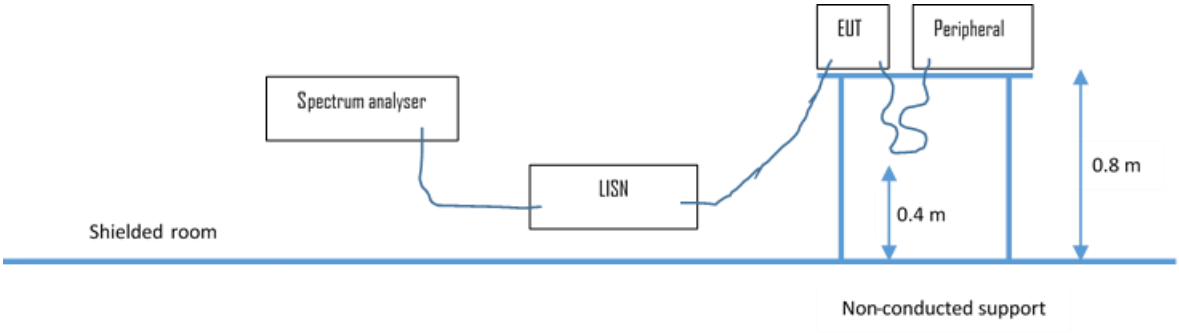
4.5.2.1 Justification

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

4.5.3 Details of test procedures

4.5.3.1 Conducted emission

Test setup according ANSI C63.10



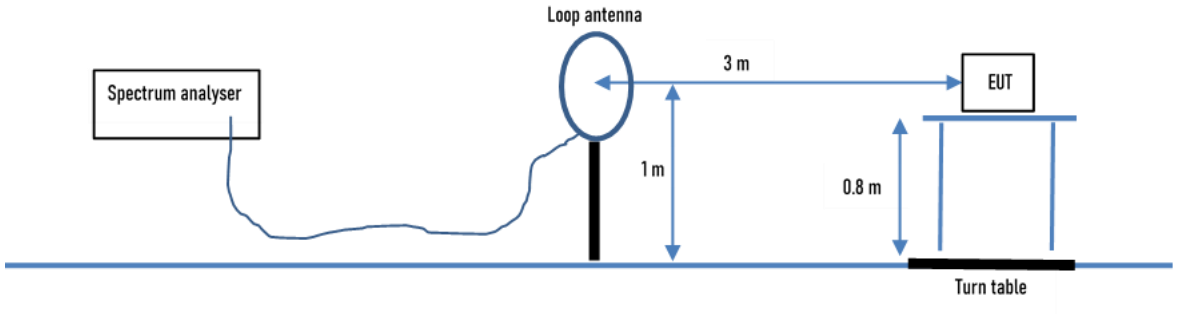
The final level, expressed in dBµV, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

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.

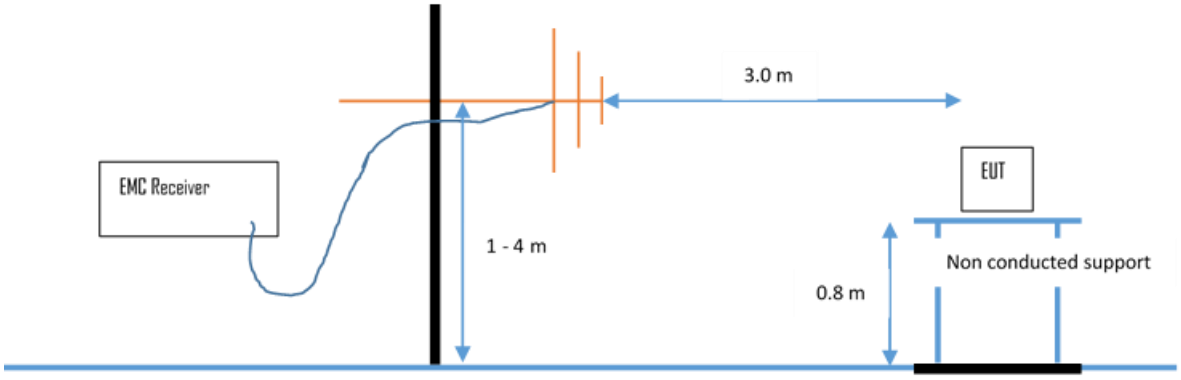
4.5.3.2 Radiated emission

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.

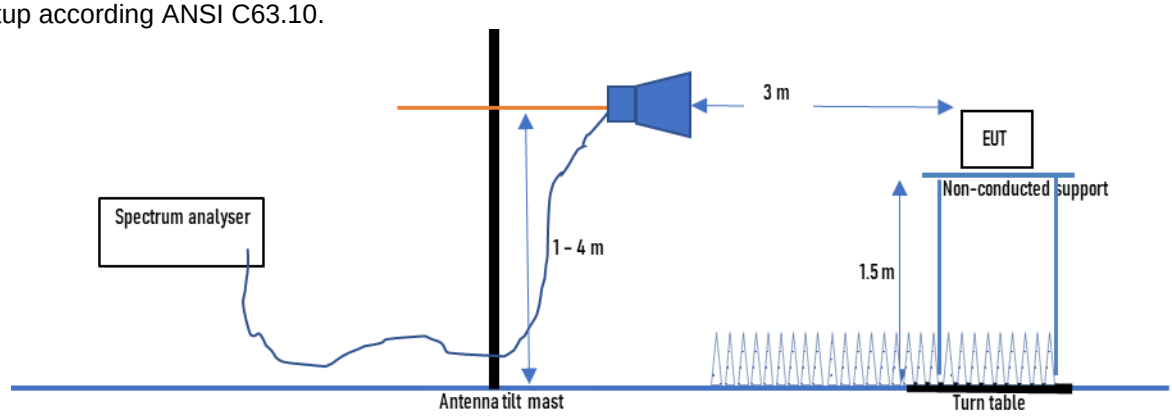
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

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

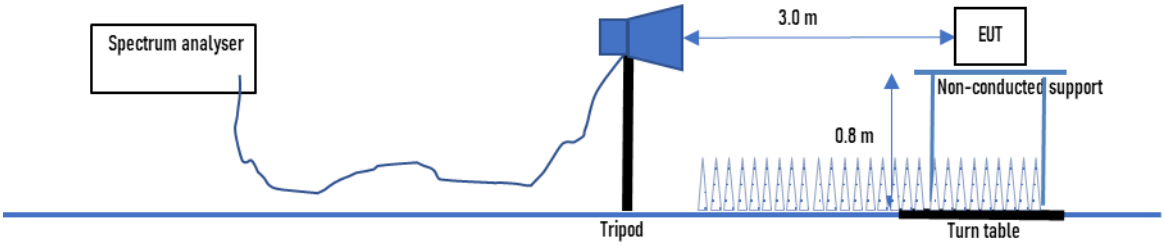
4.5.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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 center, 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, 0.8 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 in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit are adopted.

5 TEST CONDITIONS AND RESULTS

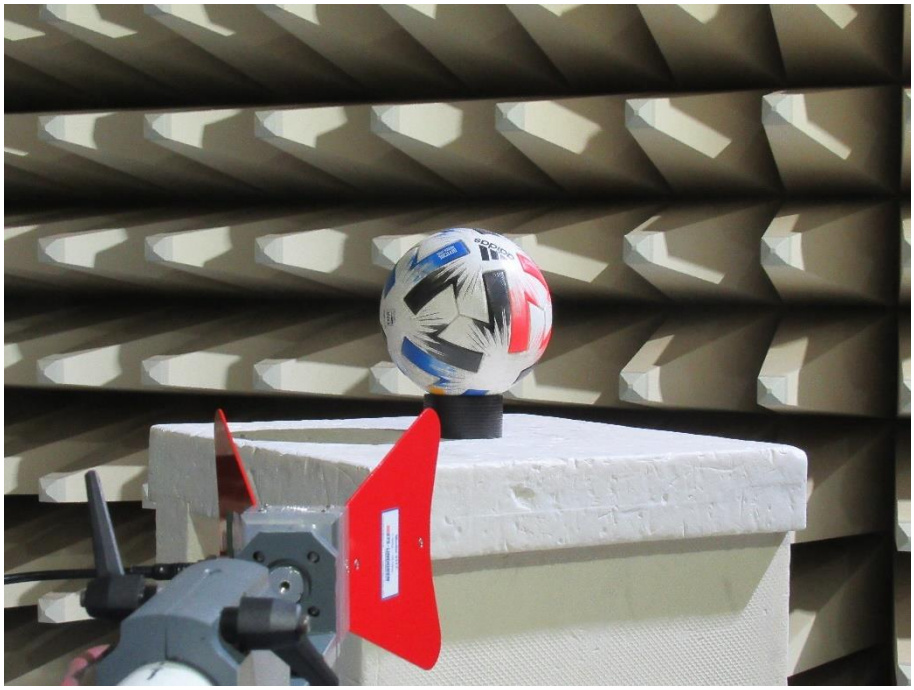
5.1 UWB Bandwidth

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



5.1.3 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.

5.1.4 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

5.1.5 Test result

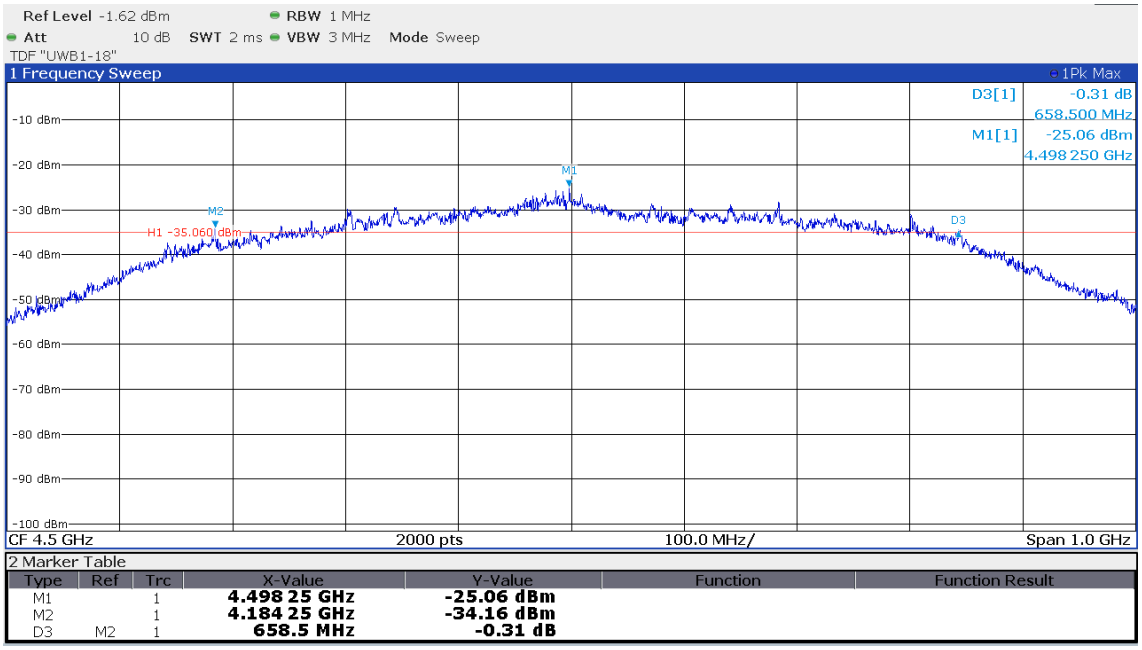
channel	lowest frequency f_L (MHz)	highest frequency f_H (MHz)	permitted frequency range (GHz)	UWB bandwidth (MHz)	required UWB bandwidth (MHz)	result
3	4184.3	4842.8	3.1 – 10.6	658.5	> 500	passed
5	6247.2	6798.0	3.1 – 10.6	550.8	> 500	passed

The requirements are **FULFILLED.**

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

5.1.6 Test protocols EBW

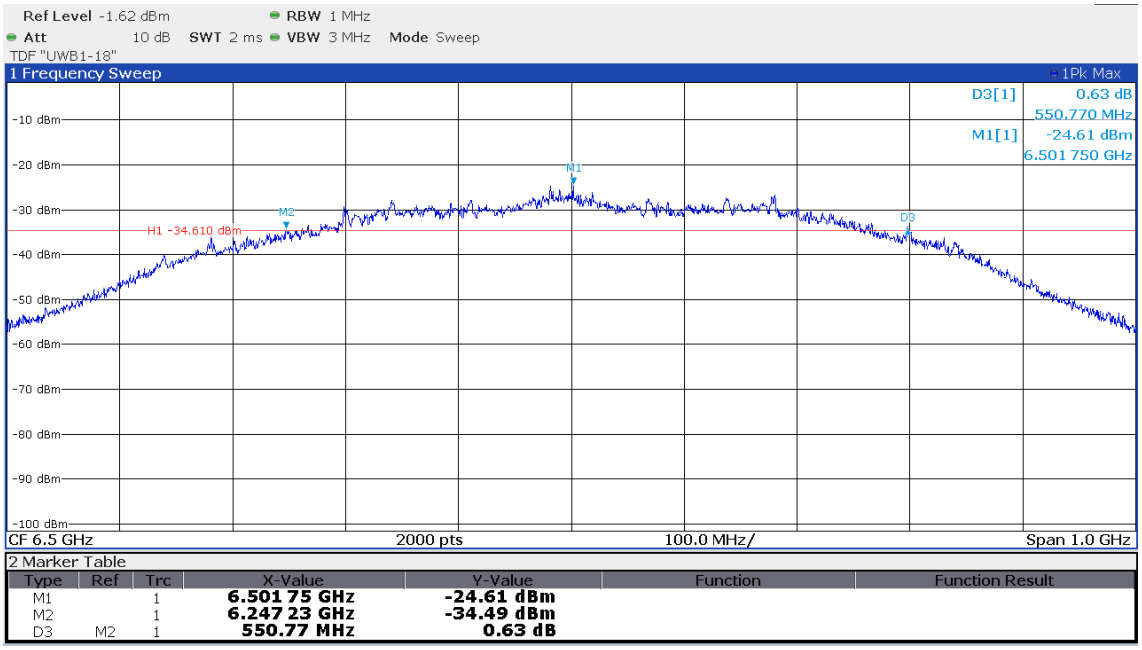
Channel 3



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	4.498 25 GHz	-25.06 dBm		
M2		1	4.184 25 GHz	-34.16 dBm		
D3	M2	1	658.5 MHz	-0.31 dB		

Channel 5

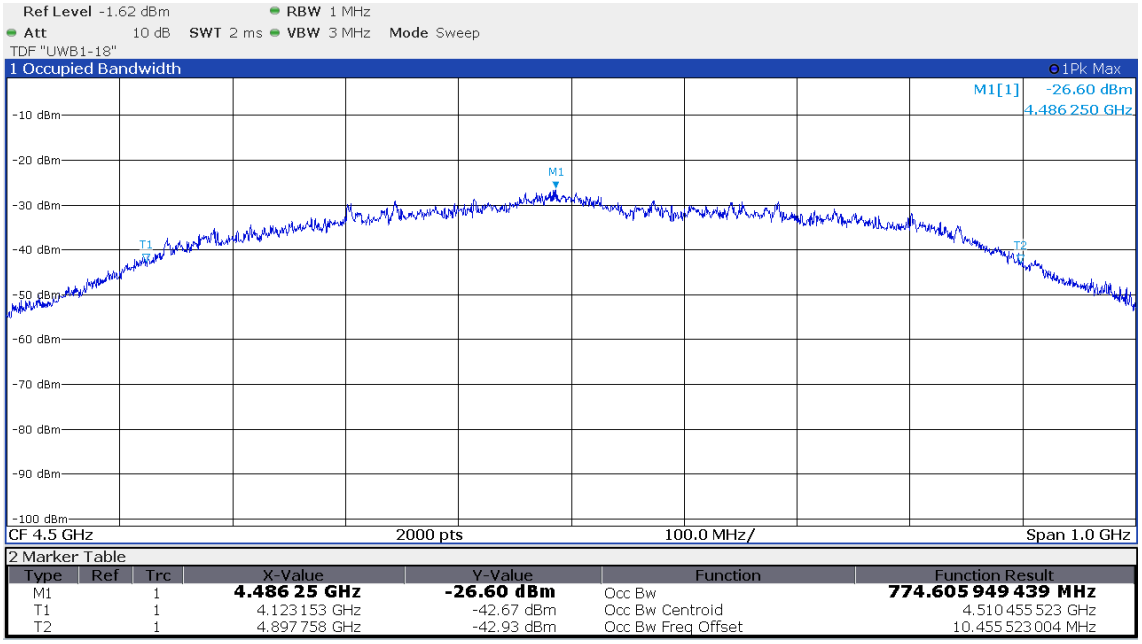


2 Marker Table

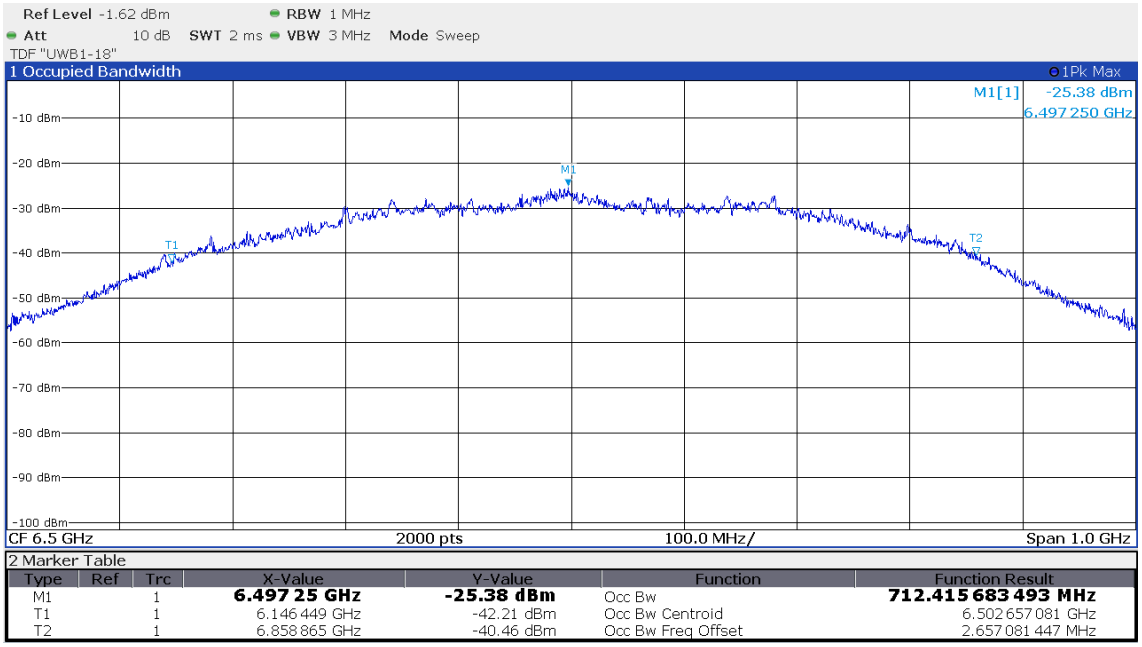
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	6.501 75 GHz	-24.61 dBm		
M2		1	6.247 23 GHz	-34.49 dBm		
D3	M2	1	550.77 MHz	0.63 dB		

5.1.7 Test protocols OBW

Channel 3



Channel 5



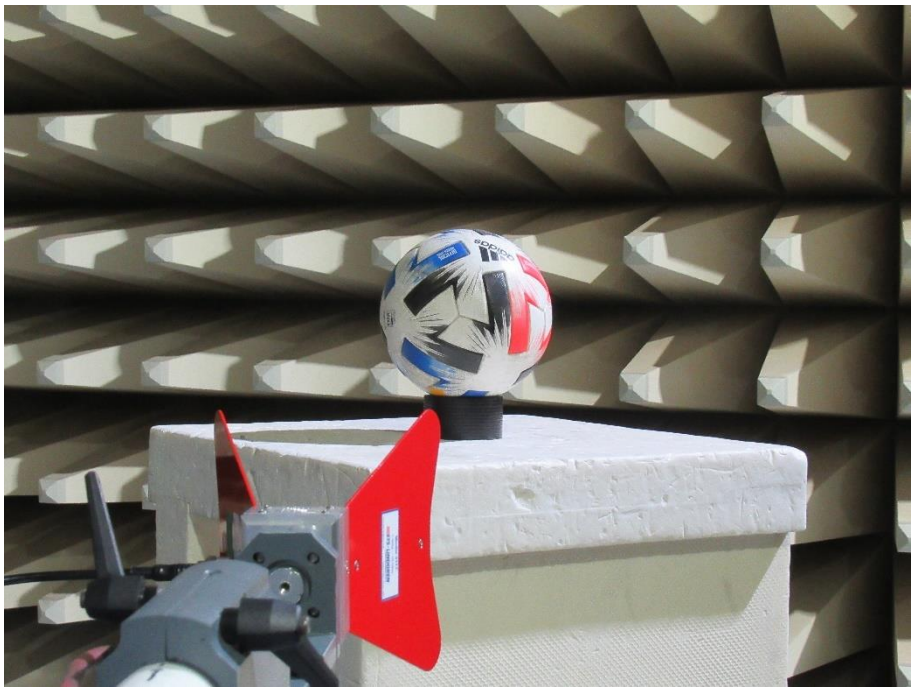
5.2 Radiated Emissions 9 kHz to 40 GHz

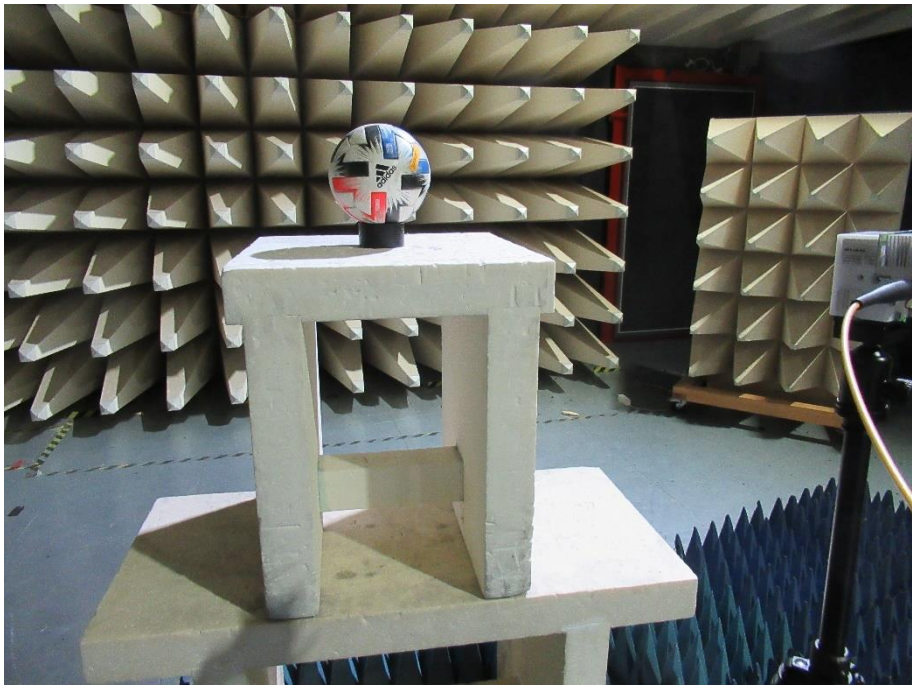
For test instruments and accessories used see section 6 Part **SER 2** and **SER 3**.

5.2.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1

5.2.2 Photo documentation of the test set-up





5.2.3 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.

5.2.4 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

5.2.5 Test result

5.2.5.1 Measurement 9 kHz to 30 MHz

Note: Pre-measurements have shown, there are no detectable emissions in this frequency range.

5.2.5.2 Measurement 30 MHz to 960 MHz

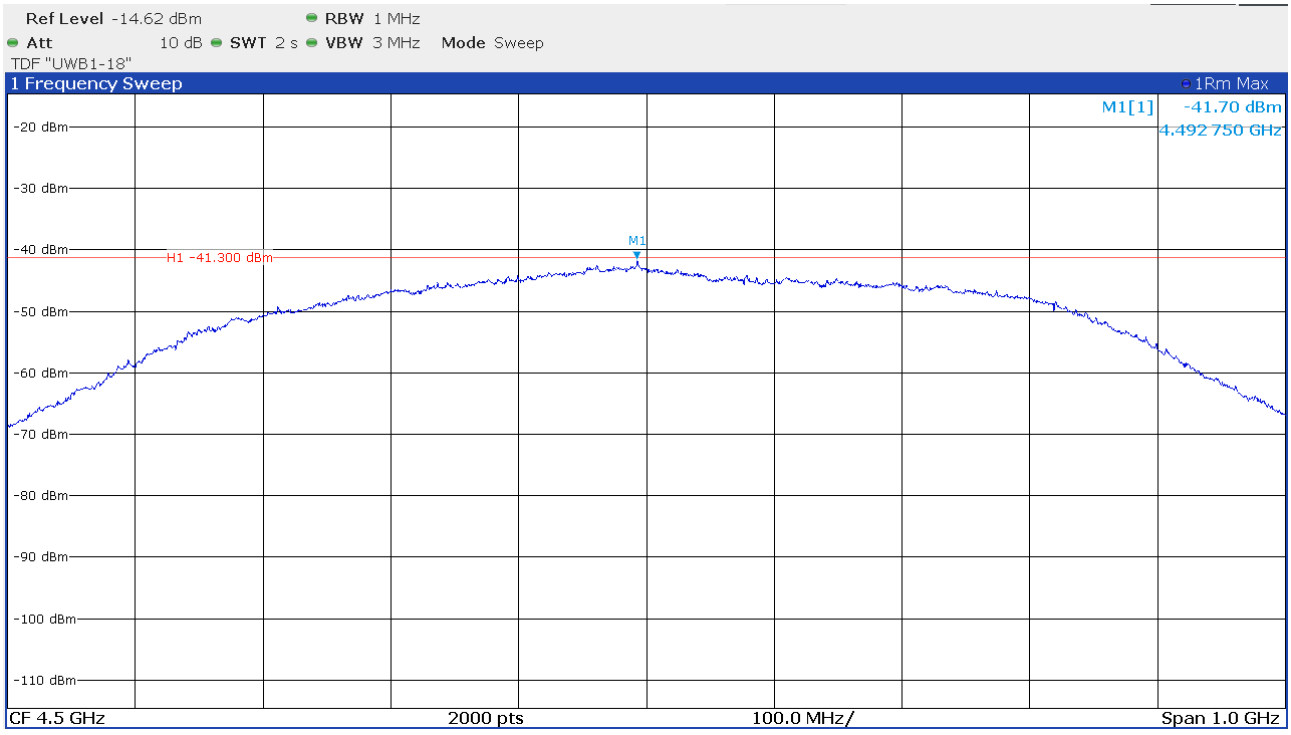
Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
40.00	2.4	-2.1	14.7	13.4	17.1	11.3	40.0	-22.9
156.00	1.8	1.3	14.3	15.1	16.1	16.4	43.5	-27.1
345.00	-1.7	-2.9	18.2	17.9	16.5	15.0	46.0	-29.5
501.00	-3.3	-3.1	22.5	22.3	19.2	19.2	46.0	-26.8
700.00	-3.9	-3.9	27.0	26.5	23.1	22.6	46.0	-22.9
905.00	-2.1	-2.1	31.2	30.8	29.1	28.7	46.0	-16.9

5.2.5.3 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. Therefor, the requirements according to § 15.209 can be regarded as fulfilled.

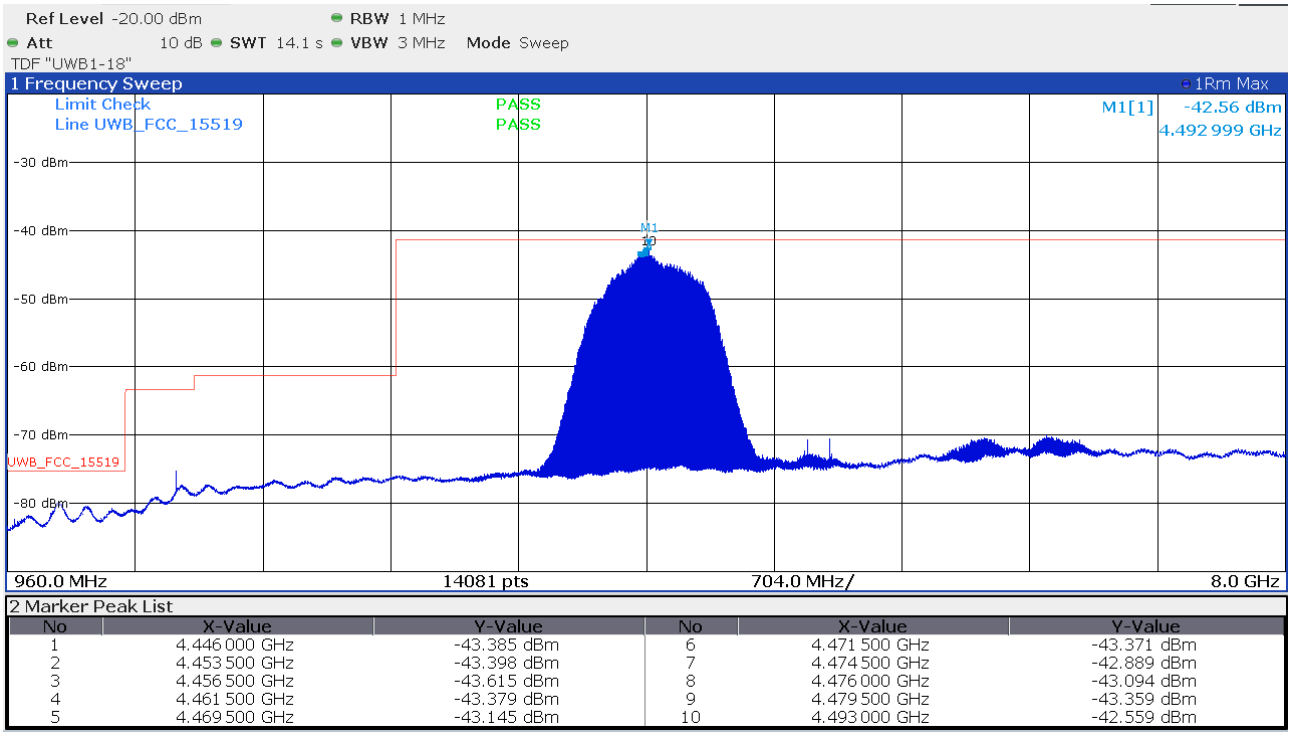
Channel 3

Mean Power



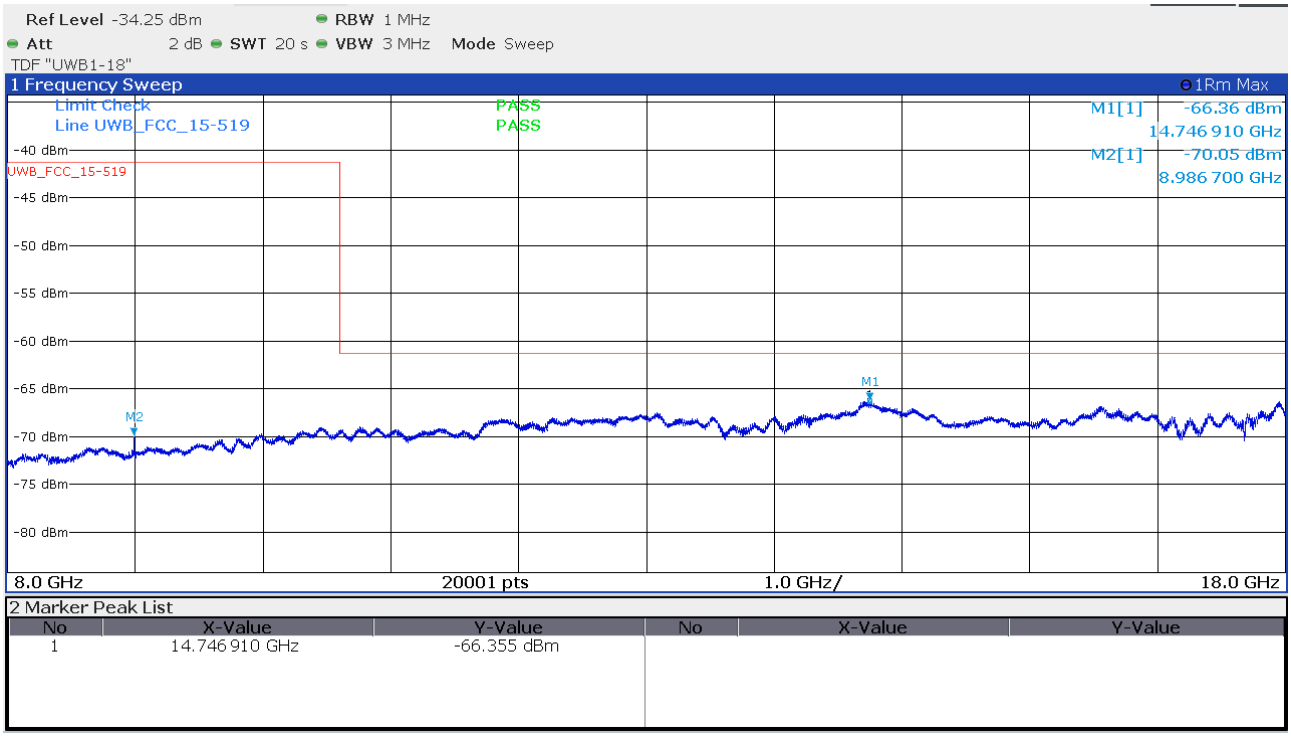
FCC ID: ZLG-ALRIHLAPRO IC: 9722B-ALRIHLAPRO

960 MHz to 18 GHz



2 Marker Peak List

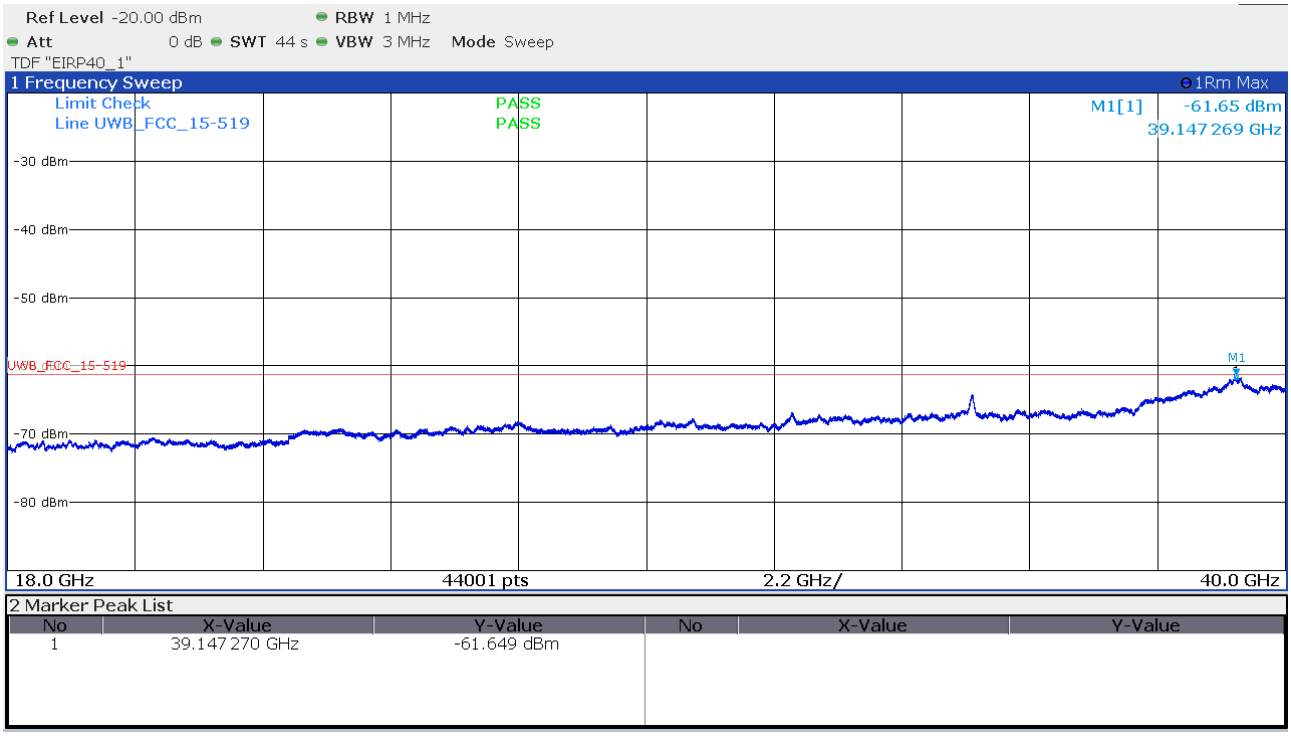
No	X-Value	Y-Value	No	X-Value	Y-Value
1	4.446 000 GHz	-43.385 dBm	6	4.471 500 GHz	-43.371 dBm
2	4.453 500 GHz	-43.398 dBm	7	4.474 500 GHz	-42.889 dBm
3	4.456 500 GHz	-43.615 dBm	8	4.476 000 GHz	-43.094 dBm
4	4.461 500 GHz	-43.379 dBm	9	4.479 500 GHz	-43.359 dBm
5	4.469 500 GHz	-43.145 dBm	10	4.493 000 GHz	-42.559 dBm



2 Marker Peak List

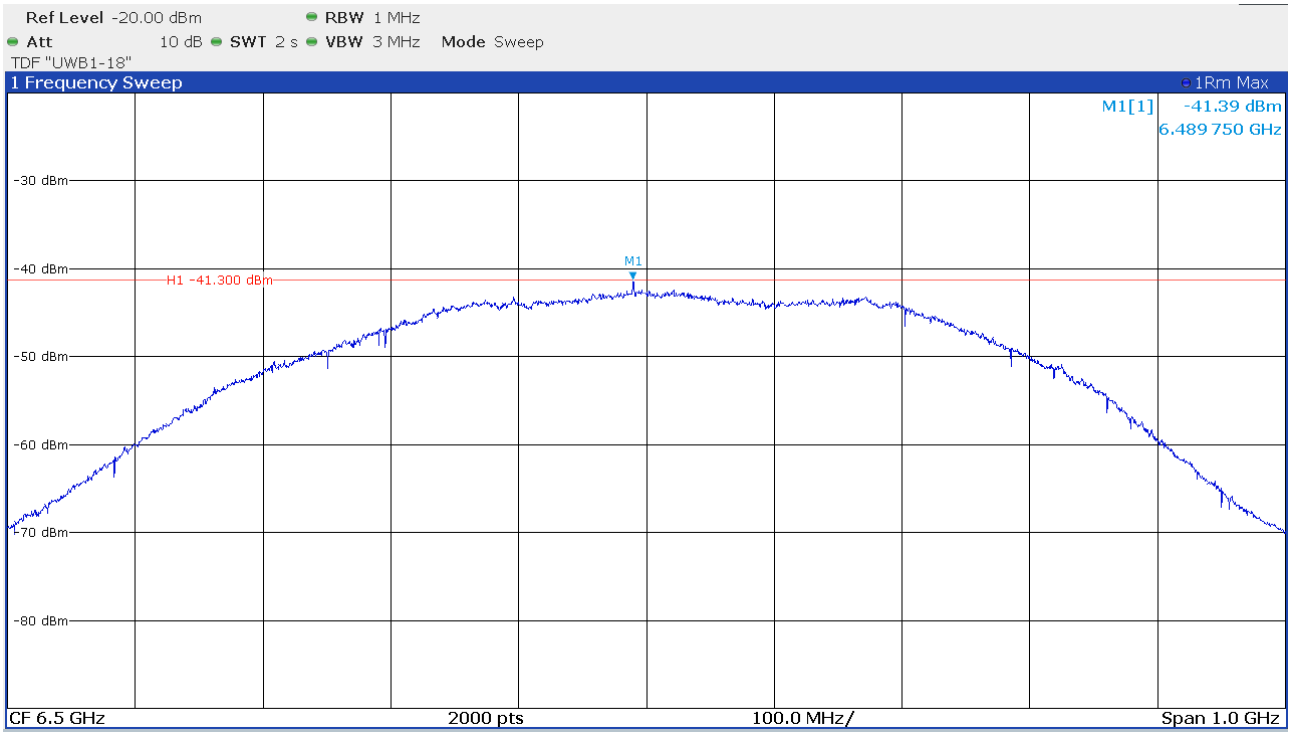
No	X-Value	Y-Value	No	X-Value	Y-Value
1	14.746 910 GHz	-66.355 dBm			

18 GHz to 40 GHz



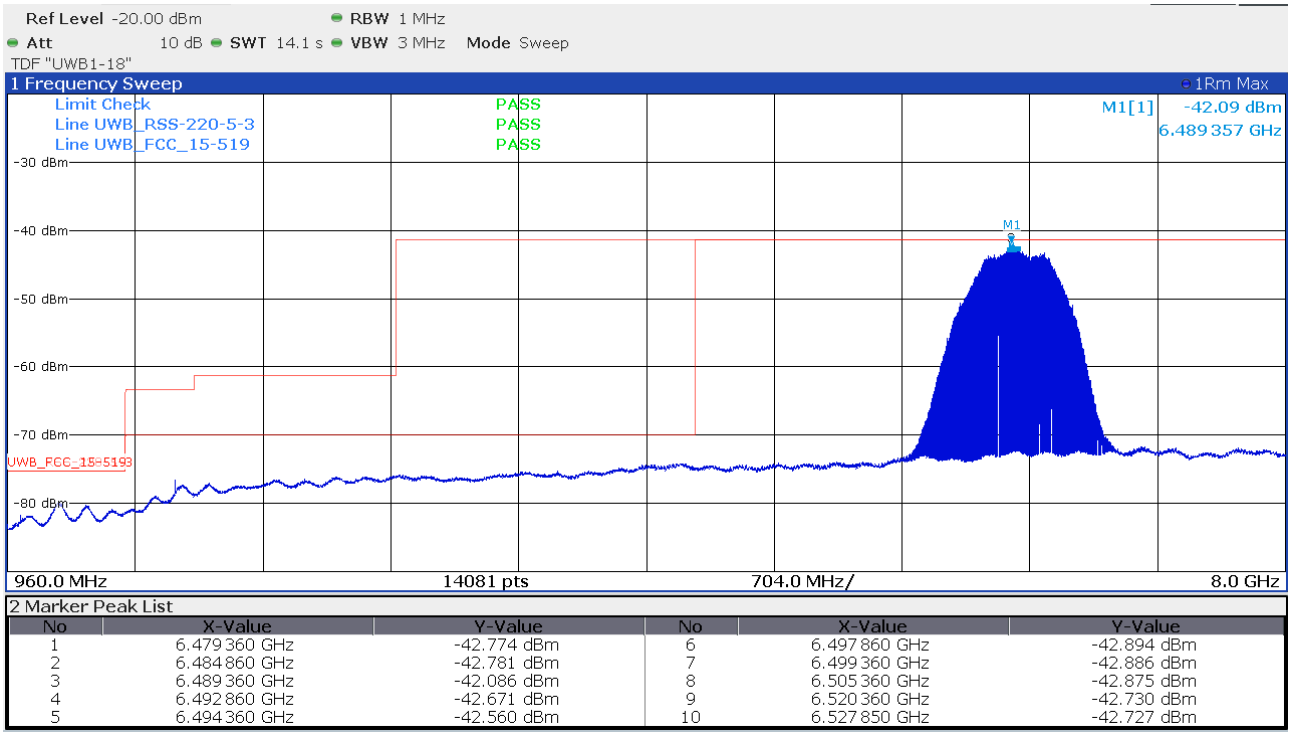
Channel 5

Mean Power



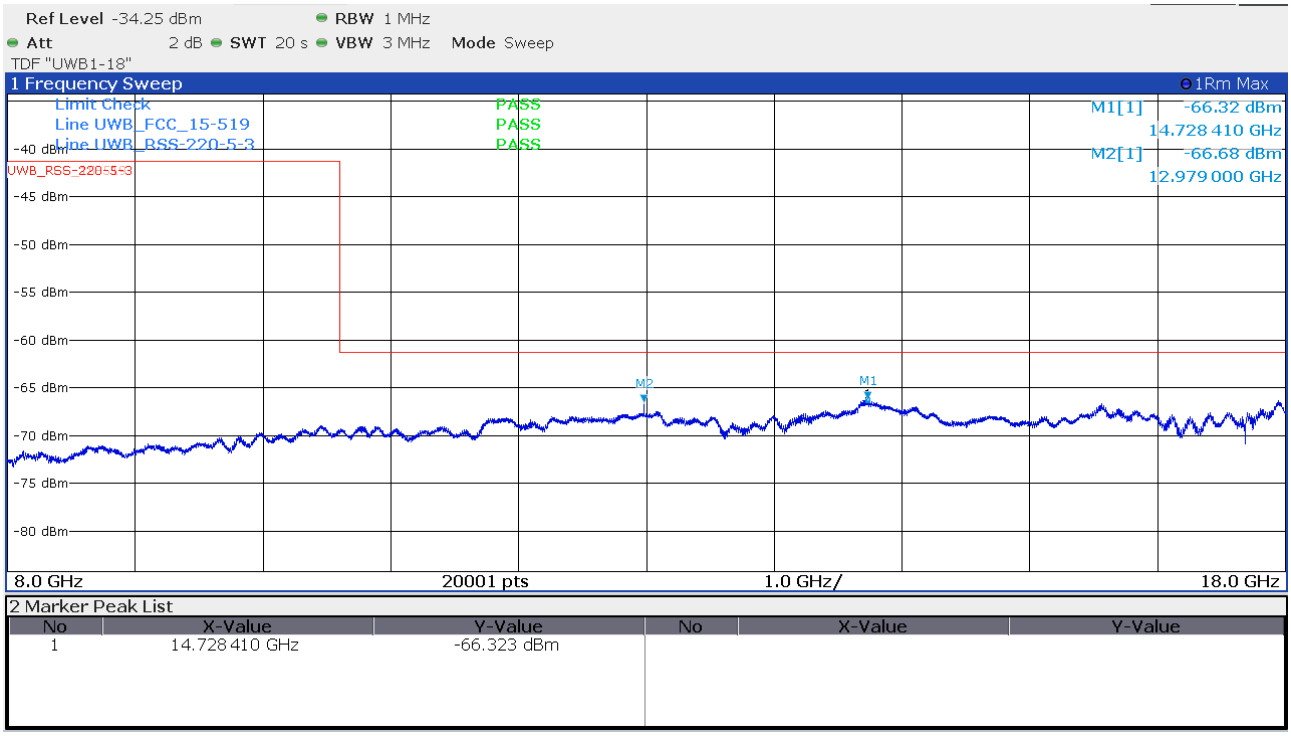
FCC ID: ZLG-ALRIHLAPRO IC: 9722B-ALRIHLAPRO

960 MHz to 18 GHz



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	6.479 360 GHz	-42.774 dBm	6	6.497 860 GHz	-42.894 dBm
2	6.484 860 GHz	-42.781 dBm	7	6.499 360 GHz	-42.886 dBm
3	6.489 360 GHz	-42.086 dBm	8	6.505 360 GHz	-42.875 dBm
4	6.492 860 GHz	-42.671 dBm	9	6.520 360 GHz	-42.730 dBm
5	6.494 360 GHz	-42.560 dBm	10	6.527 850 GHz	-42.727 dBm

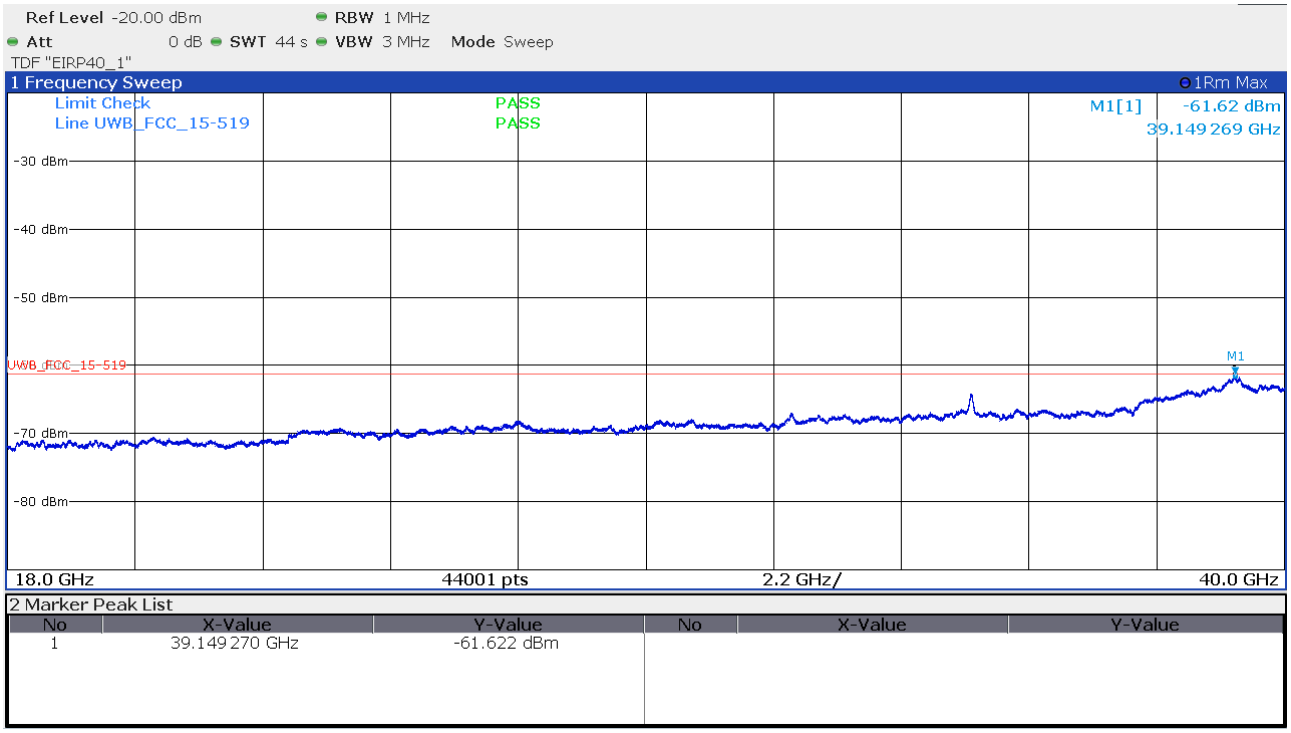


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	14.728 410 GHz	-66.323 dBm			

FCC ID: ZLG-ALRIHLAPRO **IC: 9722B-ALRIHLAPRO**

18 GHz to 40 GHz



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.

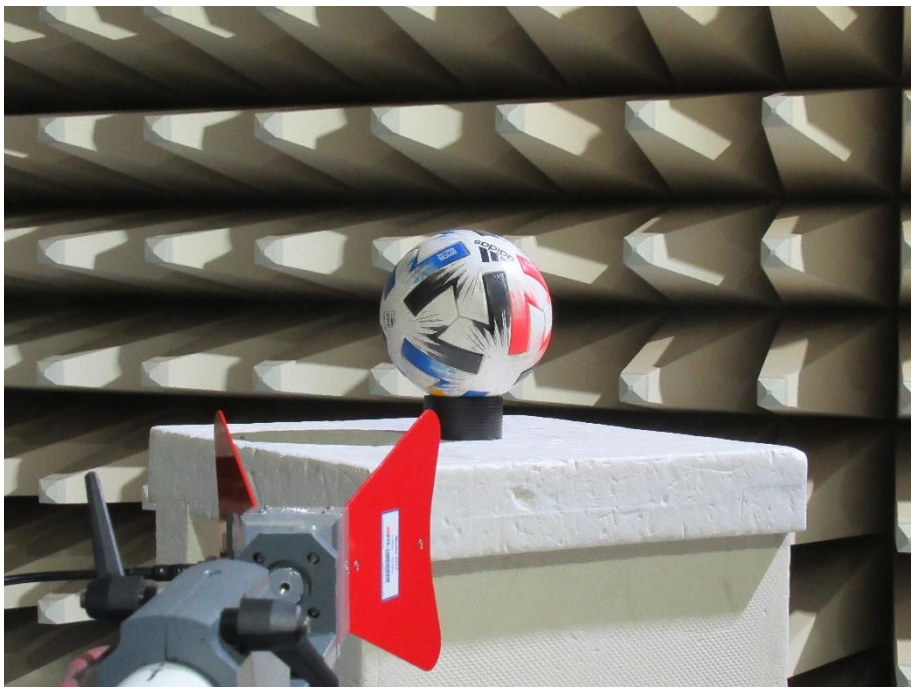
5.3 Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz

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

5.3.1 Description of the test location

Test location: Anechoic chamber 1

5.3.2 Photo documentation of the test set-up



5.3.3 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.

5.3.4 Description of Measurement

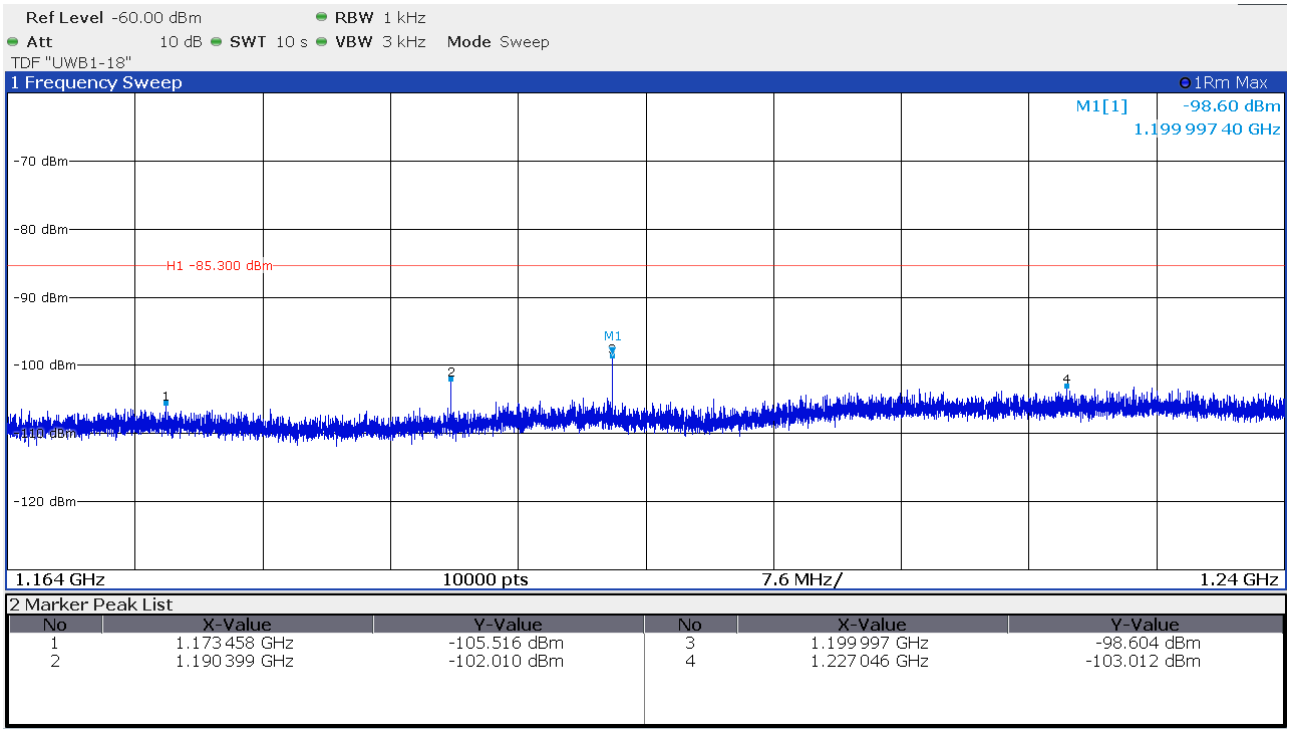
The spectral line is measured following the procedure set out in ANSI C63-10, item 10.3.10. The EUT is set in TX continuous mode while measuring.

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

5.3.5 Test result

Channel 3:

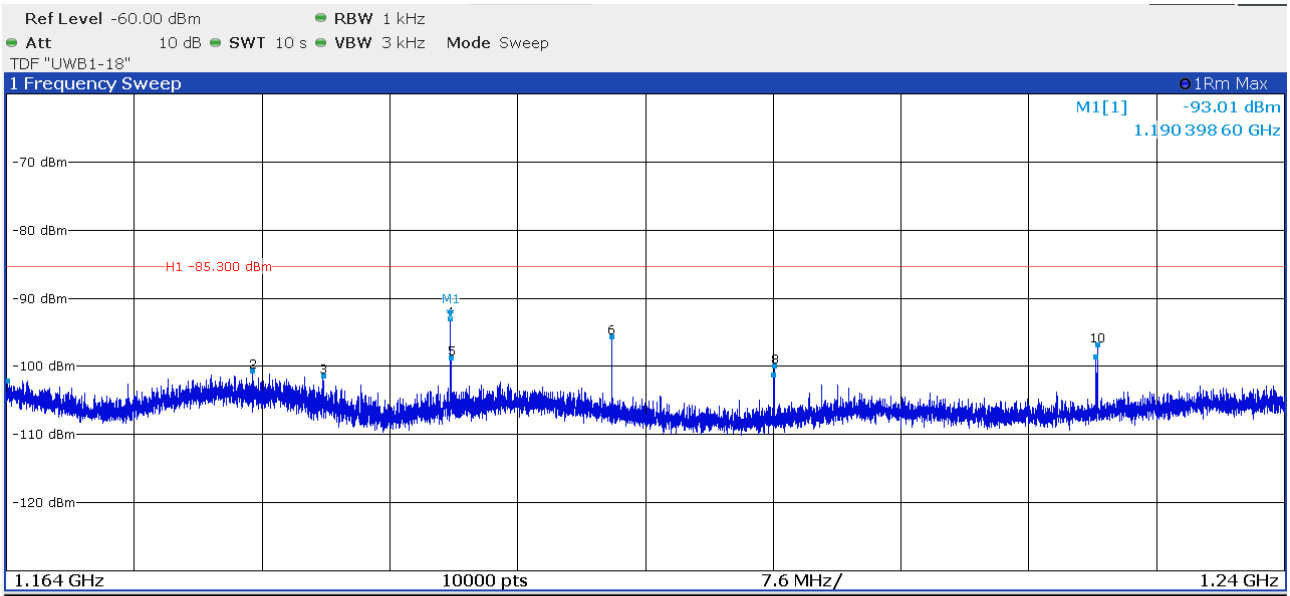
1164 MHz to 1240 MHz horizontal



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.173 458 GHz	-105.516 dBm	3	1.199 997 GHz	-98.604 dBm
2	1.190 399 GHz	-102.010 dBm	4	1.227 046 GHz	-103.012 dBm

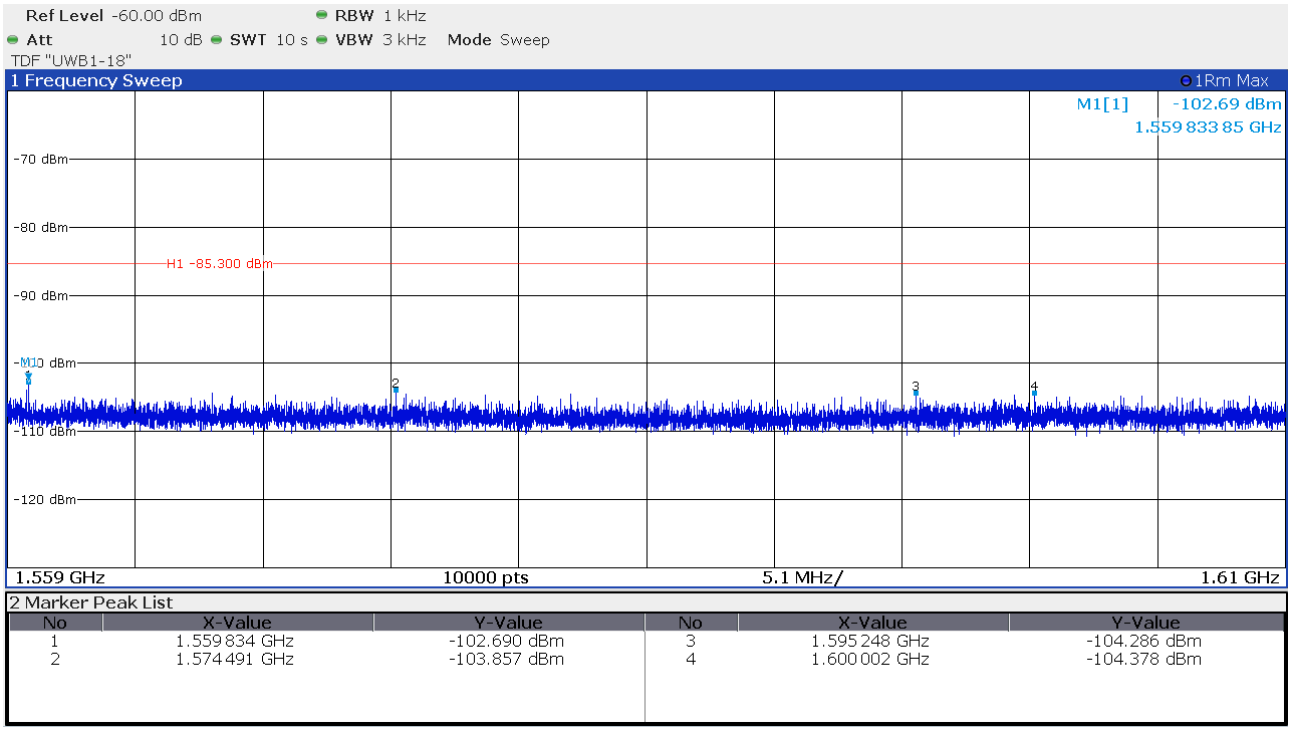
1164 MHz to 1240 MHz vertical



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.164 042 GHz	-102.166 dBm	6	1.199 997 GHz	-95.601 dBm
2	1.178 657 GHz	-100.679 dBm	7	1.209 604 GHz	-101.254 dBm
3	1.182 837 GHz	-101.410 dBm	8	1.209 672 GHz	-99.930 dBm
4	1.190 399 GHz	-93.015 dBm	9	1.228 801 GHz	-98.607 dBm
5	1.190 467 GHz	-98.705 dBm	10	1.228 870 GHz	-96.775 dBm

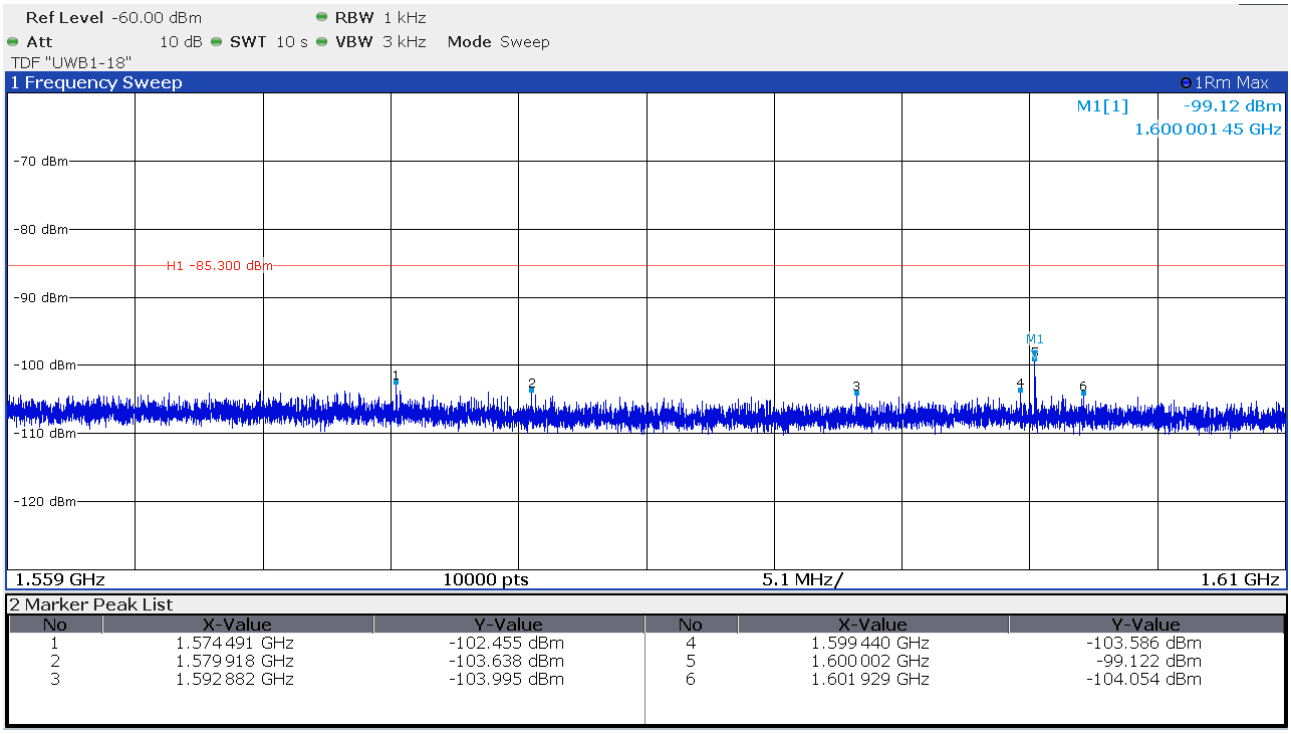
1559 MHz to 1610 MHz horizontal



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.559 834 GHz	-102.690 dBm	3	1.595 248 GHz	-104.286 dBm
2	1.574 491 GHz	-103.857 dBm	4	1.600 002 GHz	-104.378 dBm

1559 MHz to 1610 MHz vertical

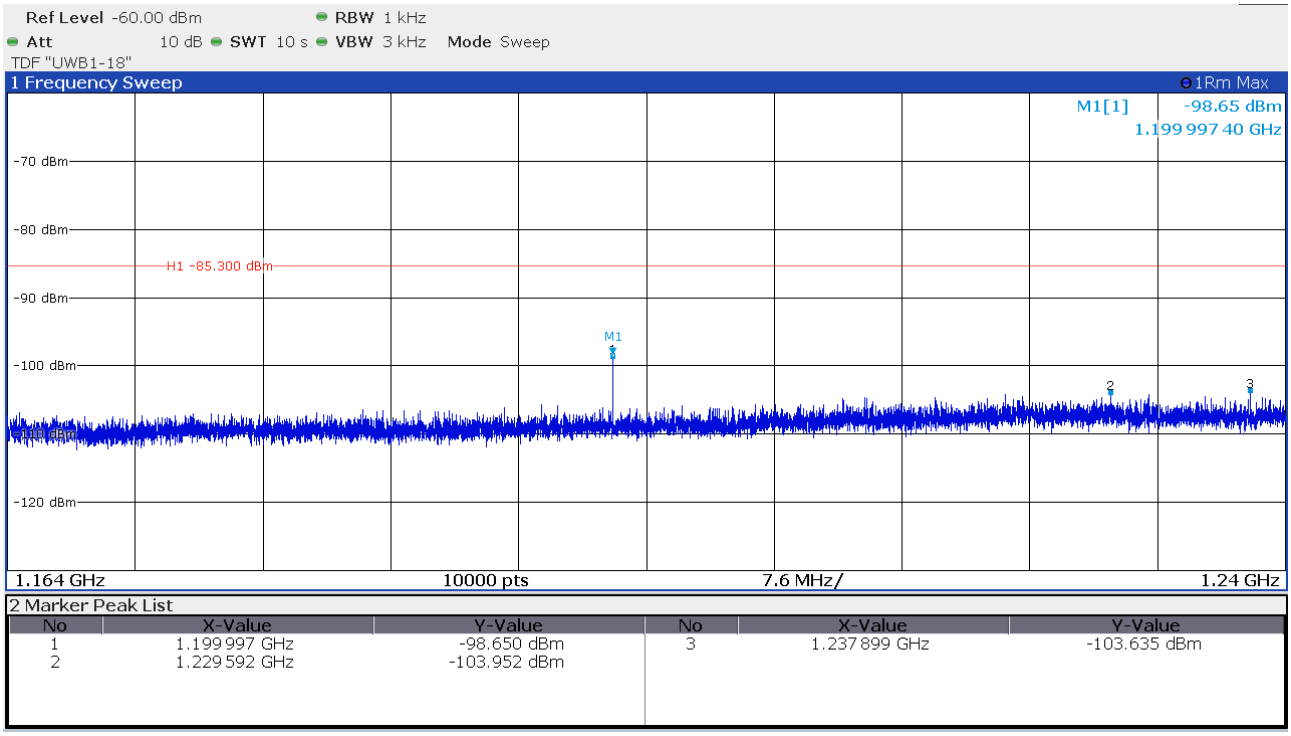


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.574 491 GHz	-102.455 dBm	4	1.599 440 GHz	-103.586 dBm
2	1.579 918 GHz	-103.638 dBm	5	1.600 002 GHz	-99.122 dBm
3	1.592 882 GHz	-103.995 dBm	6	1.601 929 GHz	-104.054 dBm

Channel 5:

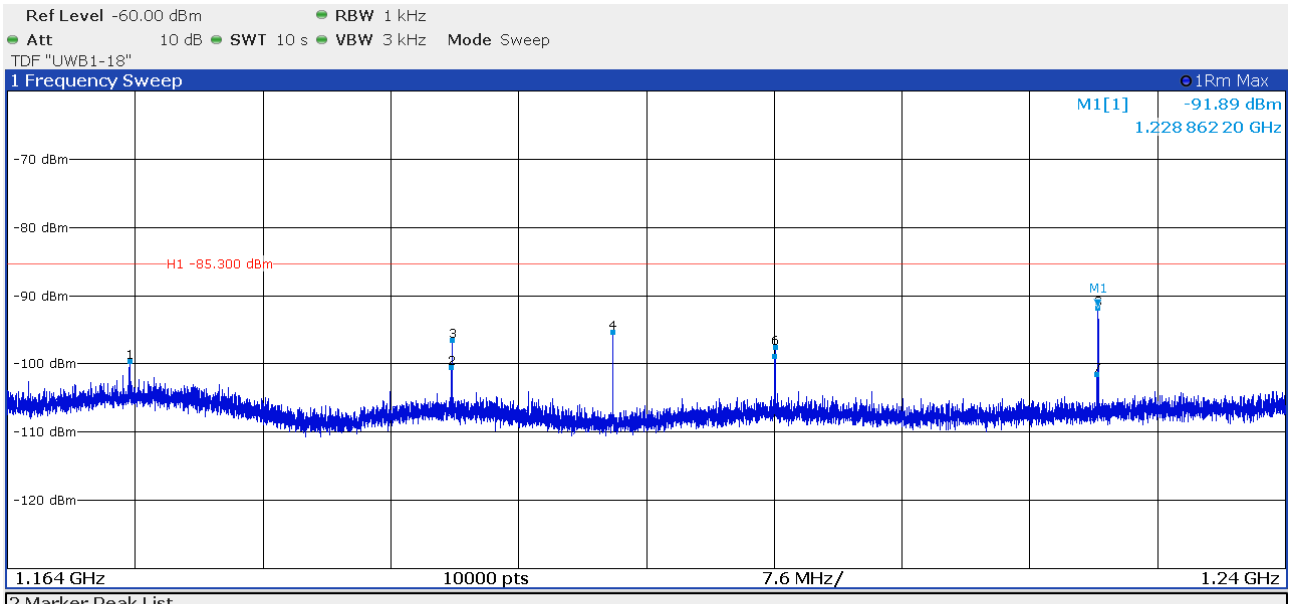
1164 MHz to 1240 MHz horizontal



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.199 997 GHz	-98.650 dBm	3	1.237 899 GHz	-103.635 dBm
2	1.229 592 GHz	-103.952 dBm			

1164 MHz to 1240 MHz vertical

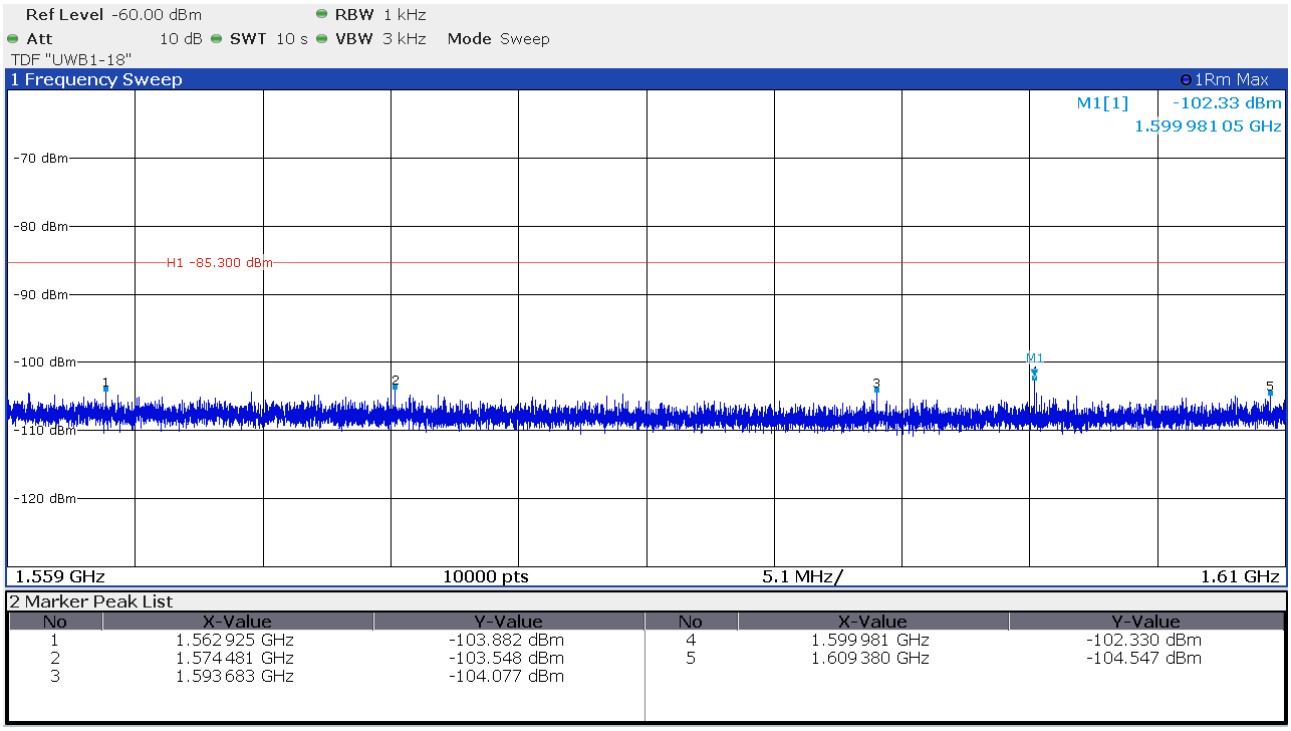


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.171 262 GHz	-99.680 dBm	5	1.209 604 GHz	-98.851 dBm
2	1.190 399 GHz	-100.542 dBm	6	1.209 665 GHz	-97.639 dBm
3	1.190 459 GHz	-96.550 dBm	7	1.228 801 GHz	-101.493 dBm
4	1.199 997 GHz	-95.420 dBm	8	1.228 862 GHz	-91.885 dBm

FCC ID: ZLG-ALRIHLAPRO IC: 9722B-ALRIHLAPRO

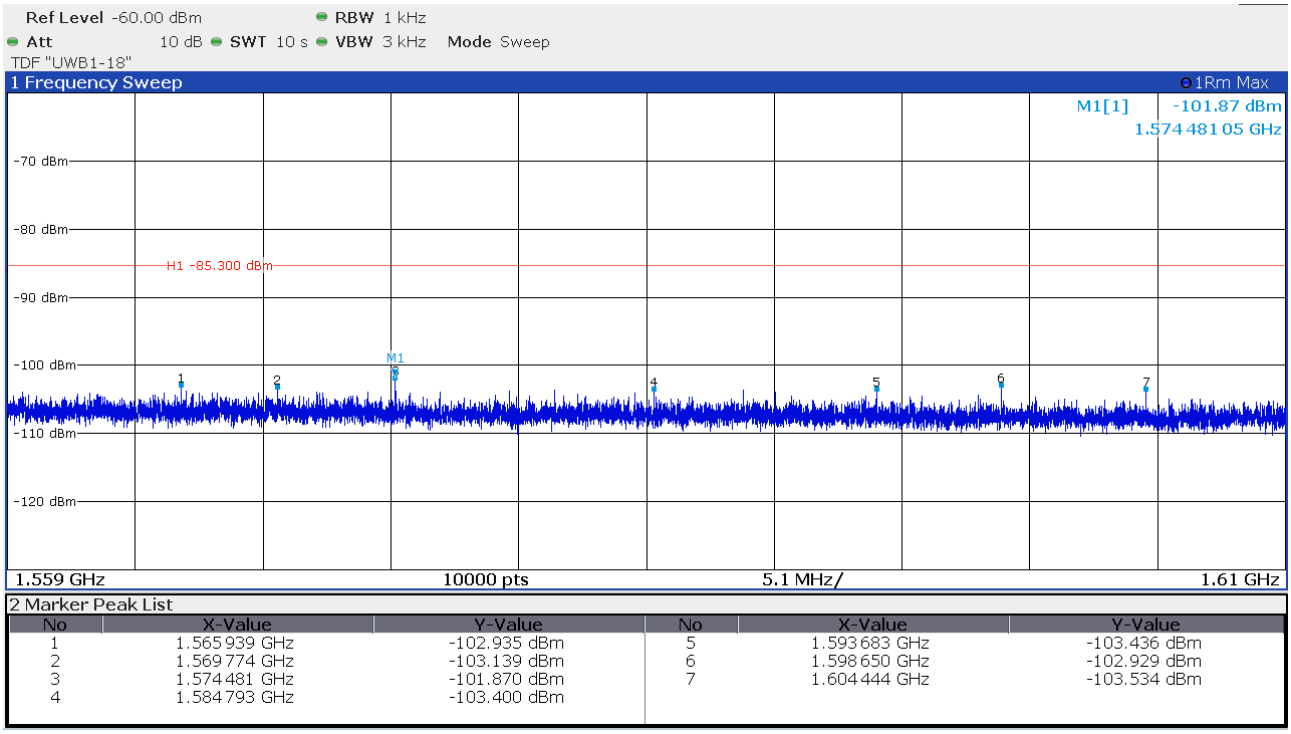
1559 MHz to 1610 MHz horizontal



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.562 925 GHz	-103.882 dBm	4	1.599 981 GHz	-102.330 dBm
2	1.574 481 GHz	-103.548 dBm	5	1.609 380 GHz	-104.547 dBm
3	1.593 683 GHz	-104.077 dBm			

1559 MHz to 1610 MHz vertical



2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	1.565 939 GHz	-102.935 dBm	5	1.593 683 GHz	-103.436 dBm
2	1.569 774 GHz	-103.139 dBm	6	1.598 650 GHz	-102.929 dBm
3	1.574 481 GHz	-101.870 dBm	7	1.604 444 GHz	-103.534 dBm
4	1.584 793 GHz	-103.400 dBm			

FCC ID: ZLG-ALRIHLAPRO IC: 9722B-ALRIHLAPRO

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.

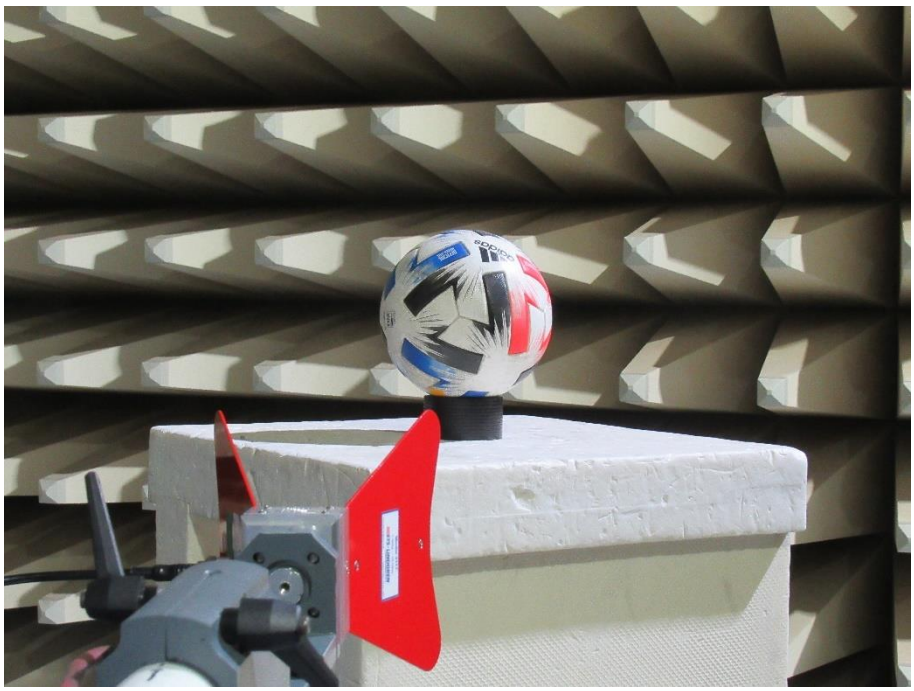
5.4 Peak Power radiated

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

5.4.1 Description of the test location

Test location: Anechoic chamber 1

5.4.2 Photo documentation of the test set-up



5.4.3 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.

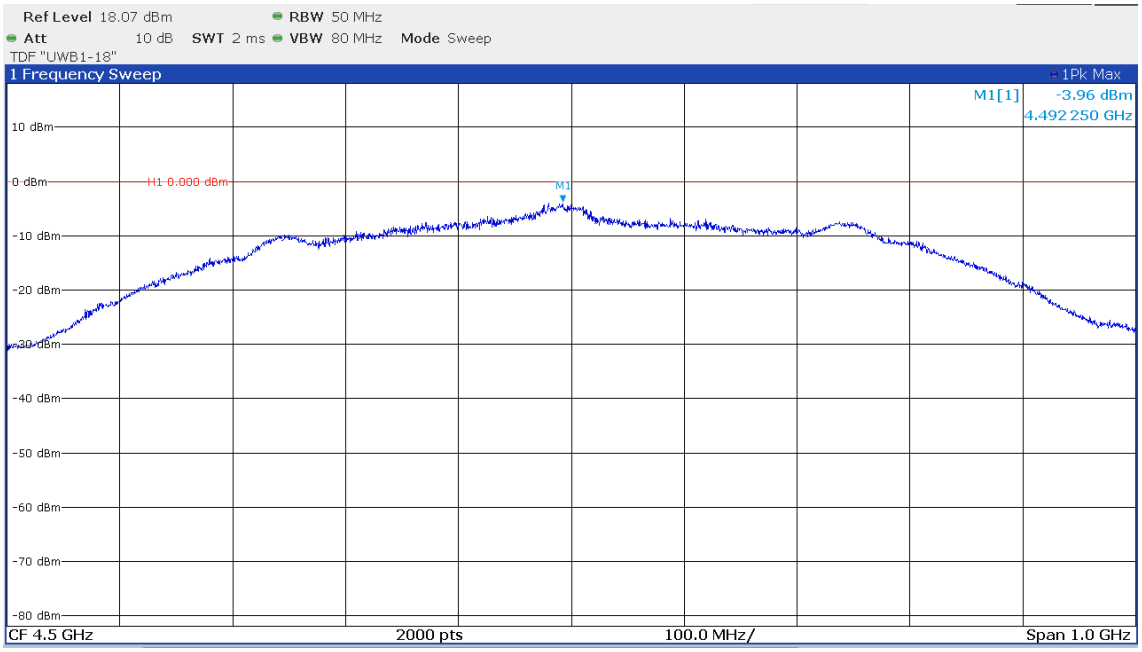
5.4.4 Description of Measurement

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.

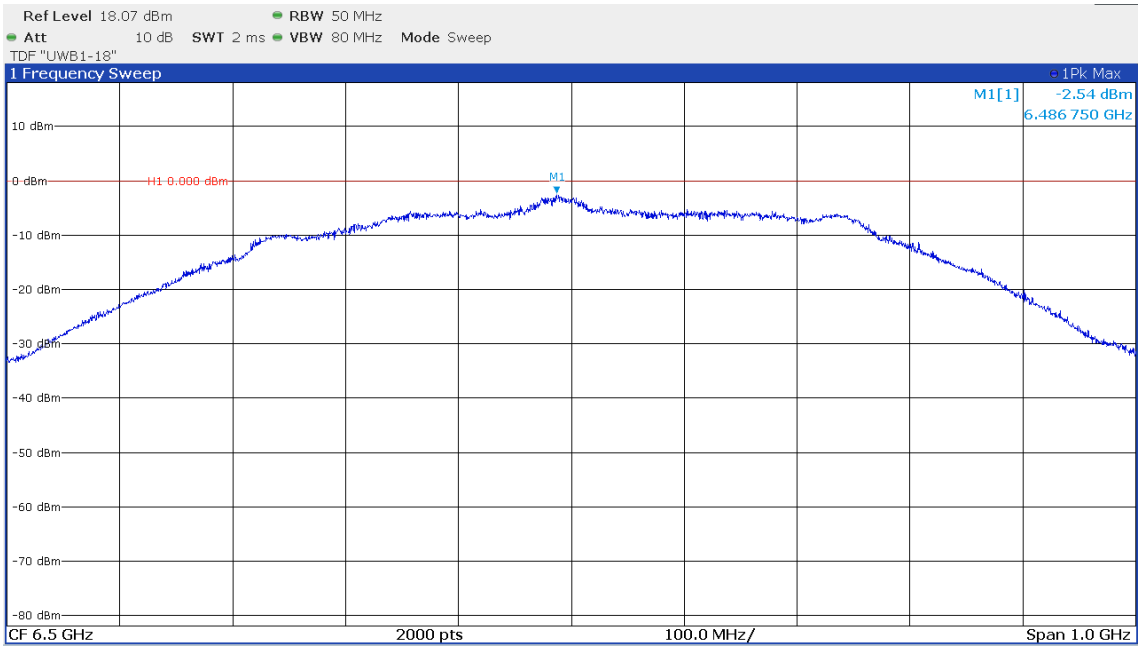
Analyser settings:
RBW: 50 MHz, VBW: 80 MHz, Detector: Peak, Trace Mode: Max hold

5.4.5 Test result

Channel 3



Channel 5



Min. limit margin: -2.54 dB at 6485.75 MHz

The requirements are **FULFILLED.**

Remarks: None.

5.5 Signal deactivation

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

5.5.1 Description of the test location

Test location: Shielded room S3

5.5.2 Photo documentation of the test set-up

5.5.3 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.

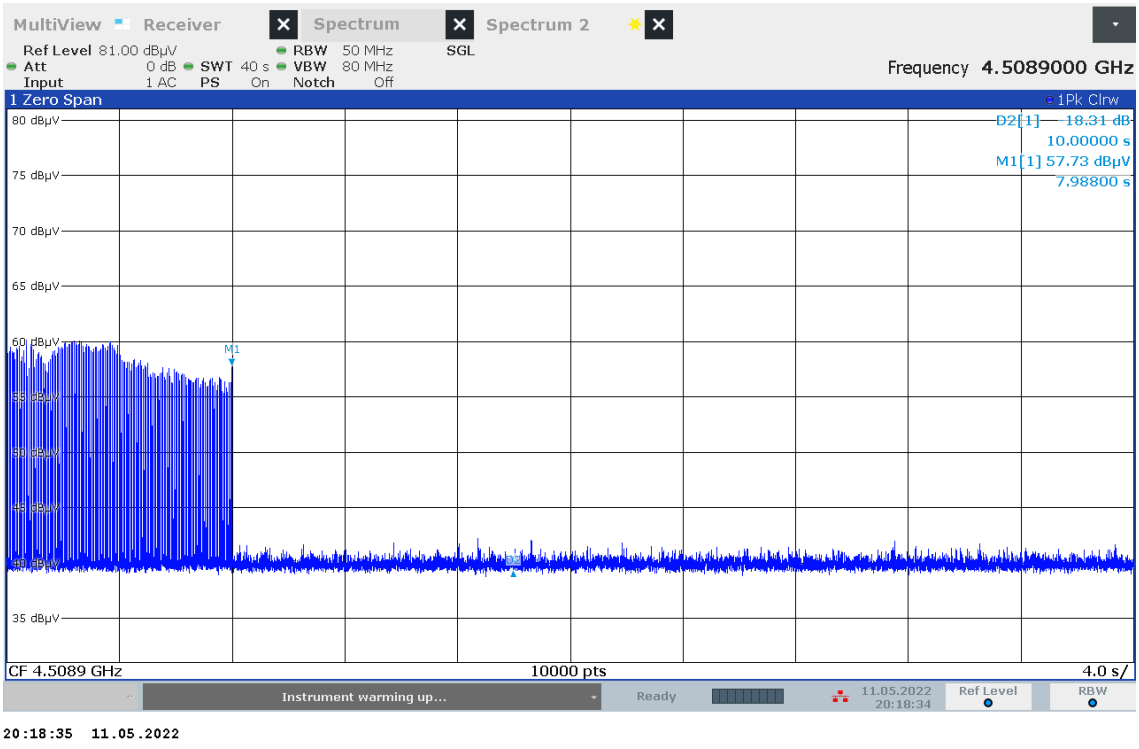
According to KDB 393764 D01 UWB FAQ v02 section 4:
An acknowledgement of reception must continue to be received by the UWB device at least once every 10 seconds, or else the device shall cease transmission of any information other than periodic signals for use in the establishment or re-establishment of a communications link with an associated receiver.

5.5.4 Description of Measurement

The measurement was performed radiated.

Spectrum analyser settings:
RBW: 80 MHz, VBW: 80 MHz, Detector: peak, zero span

5.5.5 Test result



Explanation:

The tests were performed with an EUT, which supports a total of two channels. The signal deactivation is independent of the chosen channel and shown here for a signal with channel 3.

A companion device described in section 2.11 was used to establish a communication link. At the time M1 = 8s the companion device was powered off. The EUT immediately stopped transmissions.

This behaviour is in accordance with the applicable standards.

The requirements are **FULFILLED.**

Remarks: None.

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	28/06/2022	28/06/2021		
	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				
	BAT-EMC 3.21.0.24	02-02/68-13-001				
MB	BBHA 9120	02-02/24-05-031				
SER 2	ESVS 30	02-02/03-05-006	09/07/2022	09/07/2021		
	VULB 9168	02-02/24-05-005	20/12/2022	20/12/2021	07/07/2022	07/07/2021
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
	50F-003 N 3 dB	02-02/50-21-010				
SER 3	FSW43	02-02/11-21-001	08/05/2022	08/04/2021		
	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	28/06/2022	28/06/2021		
	BBHA 9170	02-02/24-05-013	19/05/2023	19/05/2020	10/03/2023	10/03/2022
	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 3.21.0.24	02-02/68-13-001				

Note: FSW43 used for measurements in the time period 11/04/2022 and 12/04/2022.