# EMI – TEST REPORT

**- FCC Part 15.519 -**

| | | |
|---|---|---|
| **Type / Model Name** | : | KNX-A1.8 |
| **Product Description** | : | UWB Anchor |
| **Applicant** | : | Kinexon Sports & Media Inc |
| Address | : | 22 west 38th |
| | | NEW YORK, NY 10018, USA |
| **Manufacturer** | : | Kinexon GmbH |
| Address | : | Schellingstraße 35 |
| | | 80799 MÜNCHEN, GERMANY |

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

| | |
|---|---|
| **Test Report No. : T44481-01-00FX** | 06. May 2020<br>Date of issue |

Deutsche Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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: 2ALC5-KNX-HREC2**

# Contents



ATTACHMENT A1, A2 and B as separate supplements

**FCC ID: 2ALC5-KNX-HREC2**

# 1 TEST STANDARDS

The tests were performed according to following standards:

**FCC Rules and Regulations Part 15, Subpart A - General (September 2019)**

| | |
|---|---|
| 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 2019)**

| | |
|---|---|
| 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 2019)**

| | |
|---|---|
| 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 |

**FCC ID: 2ALC5-KNX-HREC2**

# 2 EQUIPMENT UNDER TEST

## 2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A1 and A2

## 2.2 Equipment type

Portable UWB Device

## 2.3 Short description of the equipment under test (EUT)

The EUT is a fully certified hand-held UWB device under **FCC ID: 2ALC5-KNX-HREC2**. The manufacturer changes the antenna of the device. The test report shows the further compliance of the EUT in the framework of a **Class 2 Permissive Change (C2PC)**.

The technology is used in sports as well as industrial environments. Kinexon Anchors communicate with each other and nearby Tags to obtain information on the Tag positions.

Additionally, the EUT has an integrated WLAN and Bluetooth low energy module with integrated antennas.

Number of tested samples: 2
Serial number: 40084, 40063
Firmware version: 4.27.0

**EUT configuration:**
(The CDF filled by the applicant can be viewed at the test laboratory.)

## 2.4 Variants of the EUT

There are no variants.

## 2.5 Operation frequency and channel plan

The operating frequency band is 3100 MHz to 10600 MHz.

Channel plan USA:

| Channel number | $f_c$ (MHz) |
|---|---|
| Channel 3 | 4492.8 |

## 2.6 Transmit operating modes

Modulation: variable pulse position modulation (PPM) in combination with binary phase shift keying (BPSK).

Data rate: 6.8 Mbit/s

## 2.7 Antenna

The following antennas shall be used with the EUT:

| Number | Characteristic | Model number | Plug | f-range (GHz) | Gain (dBi) | Average Gain (dBi) |
|---|---|---|---|---|---|---|
| 1 | directional | ES-0042 | RSMA | 3.1 – 10.3 | 9.0 | 9.0 |

## 2.8 Power supply system utilised

Power supply voltage, $V_{nom}$ : 48 V DC (PoE)

## 2.9 Peripheral devices and interface cables

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

- Laptop Model : Fujitsu notebook
- PoE switch Model : Cisco PoE
- Mini PC Model : Intel NUC6i5SYH

## 2.10 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.

### 2.10.1 Test jig

No test jig is used.

### 2.10.2 Test software

Special test software is used for continuous transmission and free power setting.

# 3 TEST RESULT SUMMARY

UWB device using digital modulation:

Operating in the 3100 MHz – 10600 MHz:

| FCC Rule Part | Description | Result |
|---|---|---|
| 15.207(a) | AC power line conducted emissions | not applicable |
| 15.519(b) | UWB Bandwidth | not applicable |
| 15.209(a)<br>15.519(c) | Radiated Emissions 9 kHz to 40 GHz | Not passed |
| 15.519(d) | Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz | Not passed |
| 15.519(e) | Peak Power radiated | passed |
| 15.519(a) | Signal deactivation | not applicable |

15.207(a) Not applicable, C2PC with different antenna
15.519(b) Not applicable, C2PC with different antenna
15.519(a) Not applicable, C2PC with different antenna

## 3.1 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 : 26 November 2019

Testing concluded on : 08 April 2020

Checked by:

K. Gegenfurtner

Klaus Gegenfurtner
I confirm the correctness and integrity of this document
2020.05.06 14:47:17 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

I am the author of this document
2020.05.06 14:06:58 +02'00'

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 acc. to CISPR 16-4-2 / 11.2003 „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.

| Measurement Type | Range | Confidence Level | Calculated Uncertainty |
|---|---|---|---|
| AC power line conducted emissions | 0.15 MHz to 30 MHz | 95% | ± 3.29 dB |
| EBW and OBW | 2400 MHz to 3000 MHz | 95% | ± 2.5 x $10^{-7}$ |
| Maximum peak conducted output power | 2400 MHz to 3000 MHz | 95% | ± 0.62 dB |
| Power spectral density | 2400 MHz to 3000 MHz | 95% | ± 0.62 dB |
| Conducted Spurious Emissions | 9 kHz to 10000 MHz | 95% | ± 2.15 dB |
| Conducted Spurious Emissions | 10000 MHz to 40000 MHz | 95% | ± 3.47 dB |
| Radiated Spurious Emissions | 9 kHz to 30 MHz | 95% | ± 3.53 dB |
| Radiated Spurious Emissions | 30 MHz to 1000 MHz | 95% | ± 3.71 dB |
| Radiated Spurious Emissions | 1000 MHz to 10000 MHz | 95% | ± 2.34 dB |
| Field strength of the fundamental | 100 kHz to 100 MHz | 95% | ± 3.53 dB |

## 4.4 Measurement protocol for FCC and ISED

### 4.4.1 General information

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

**FCC: DE 0011**
**ISED: DE0009**

### 4.4.2 General Standard information

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

#### 4.4.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

#### 4.4.2.2 Radiated emission (electrical field 30 MHz - 1 GHz)

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. The setup of the equipment under test is established in accordance with ANSI C63.10.The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from 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 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 | Level | + | Factor | = | Level | - | Limit | = | Delta |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBµV) | | (dB) | | (dBµV/m) | | (dBµV/m) | | (dB) |
| 719.0 | 75.0 | + | 32.6 | = | 107.6 | - | 110.0 | = | -2.4 |

4.4.2.3 Radiated emission (electrical field 1 GHz - 40 GHz)

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. The setup of the equipment under test is established in accordance with ANSI C63.10.The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the centre of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied 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.

# 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 – see ATTACHMENT B

### 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 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.

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 | 4299.03 | 4801.91 | 3.1 – 10.6 | 502.88 | > 500 | passed |

The requirements are **FULFILLED.**

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

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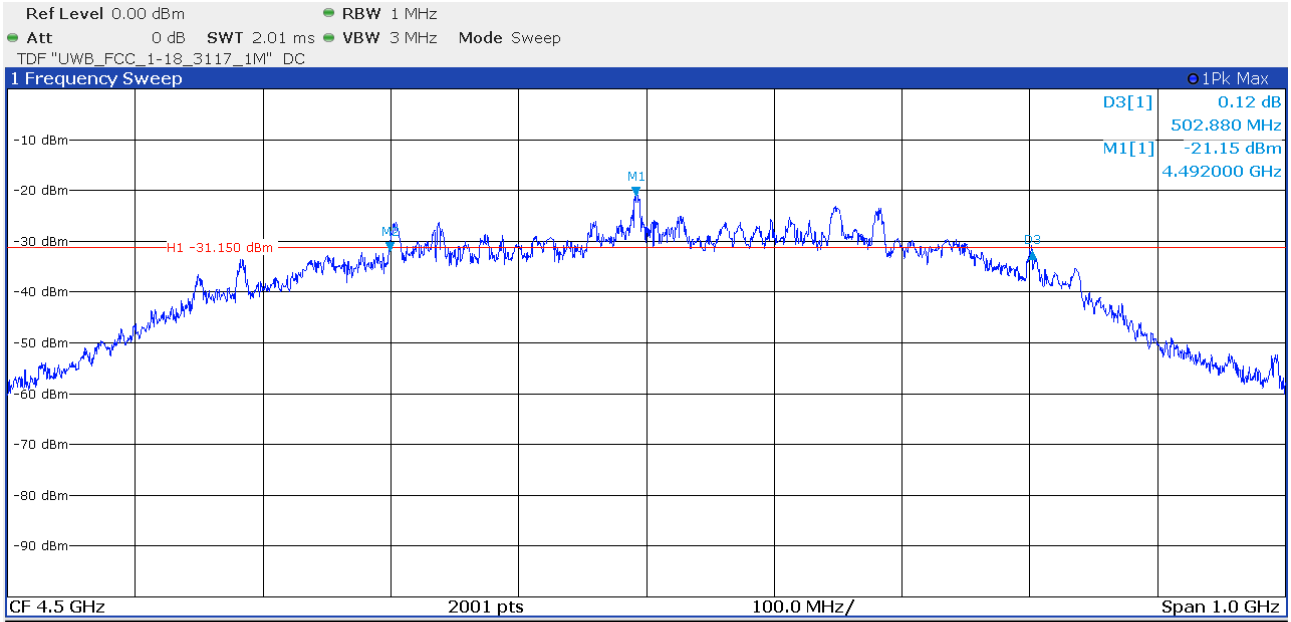
## 5.1.6 Test protocols EBW

### Channel 3




3 Marker Table

| Type | Ref | Trc | X-Value | Y-Value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | **4.492 GHz** | **-21.15 dBm** | | |
| M2 | | 1 | **4.29903 GHz** | **-32.03 dBm** | | |
| D3 | M2 | 1 | **502.88 MHz** | **0.12 dB** | | |

## 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 – see ATTACHMENT B

### 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 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

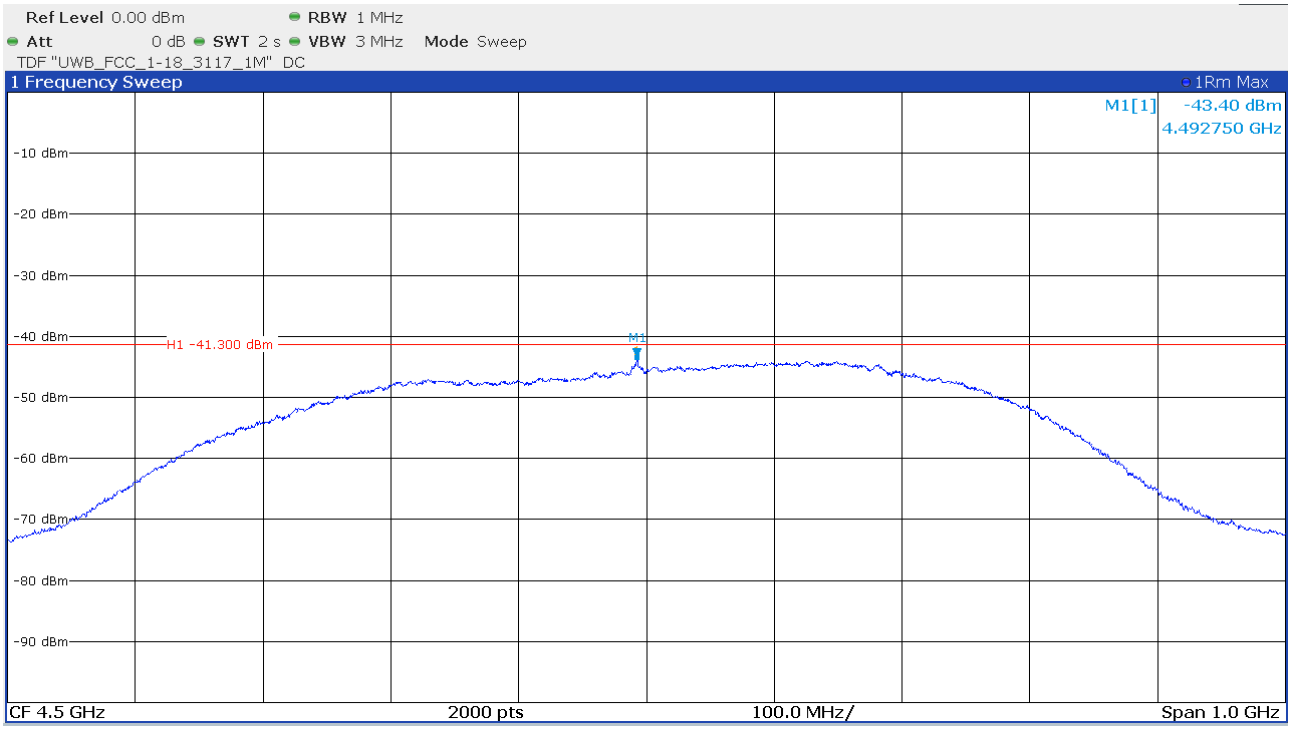
| Frequency (MHz) | Reading Vert. (dBµV) | Reading Hor. (dBµV) | Correct. Vert. (dB) | Correct. Hor. (dB) | Level Vert. (dBµV/m) | Level Hor. (dBµV/m) | Limit (dBµV/m) | Dlimit (dB) |
|---|---|---|---|---|---|---|---|---|
| 38.40 | 19.9 | 2.4 | 14.4 | 13.2 | 34.3 | 15.6 | 40.0 | -5.7 |
| 81.50 | 22.1 | 21.2 | 10.7 | 10.6 | 32.8 | 31.8 | 40.0 | -7.2 |
| 111.60 | 6.4 | 8.7 | 10.9 | 11.7 | 17.3 | 20.4 | 43.5 | -23.1 |
| 125.00 | 11.2 | 12.6 | 12.7 | 13.2 | 23.9 | 25.8 | 43.5 | -17.7 |
| 250.00 | 14.3 | 19.1 | 13.8 | 14.0 | 28.1 | 33.1 | 46.0 | -12.9 |
| 345.60 | 11.8 | 13.1 | 18.2 | 17.9 | 30.0 | 31.0 | 46.0 | -15.0 |
| 384.00 | 13.8 | 7.0 | 19.4 | 19.1 | 33.2 | 26.1 | 46.0 | -12.8 |
| 614.40 | 0.8 | 6.0 | 25.7 | 25.5 | 26.5 | 31.5 | 46.0 | -14.5 |
| 882.40 | -1.3 | -0.3 | 30.8 | 30.4 | 29.5 | 30.1 | 46.0 | -15.9 |

# FCC ID: 2ALC5-KNX-HREC2

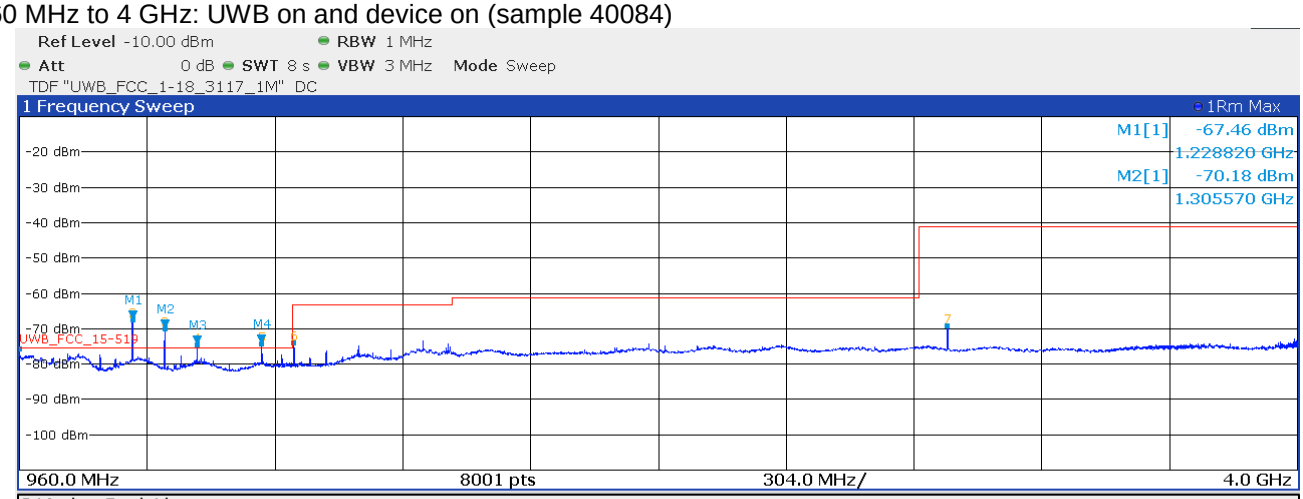
## 5.2.5.3 Measurement 960 MHz to 40 GHz

**Channel 3**

Mean Power




960 MHz to 4 GHz: UWB on and device on (sample 40084)




2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 960.190000 MHz | -75.816 dBm | 5 | 1.535820 GHz | -74.254 dBm |
| 2 | 1.228820 GHz | -67.461 dBm | 6 | 1.612950 GHz | -74.135 dBm |
| 3 | 1.305570 GHz | -70.185 dBm | 7 | 3.167710 GHz | -69.213 dBm |
| 4 | 1.382320 GHz | -74.467 dBm | | | |

3 Marker Table

| Type | Ref | Trc | X-Value | Y-Value | Function | Function Result |
|---|---|---|---|---|---|---|
| M1 | | 1 | **1.22882 GHz** | **-67.46 dBm** | | |
| M2 | | 1 | **1.30557 GHz** | **-70.18 dBm** | | |
| M3 | | 1 | **1.38232 GHz** | **-74.47 dBm** | | |
| M4 | | 1 | **1.53582 GHz** | **-74.25 dBm** | | |

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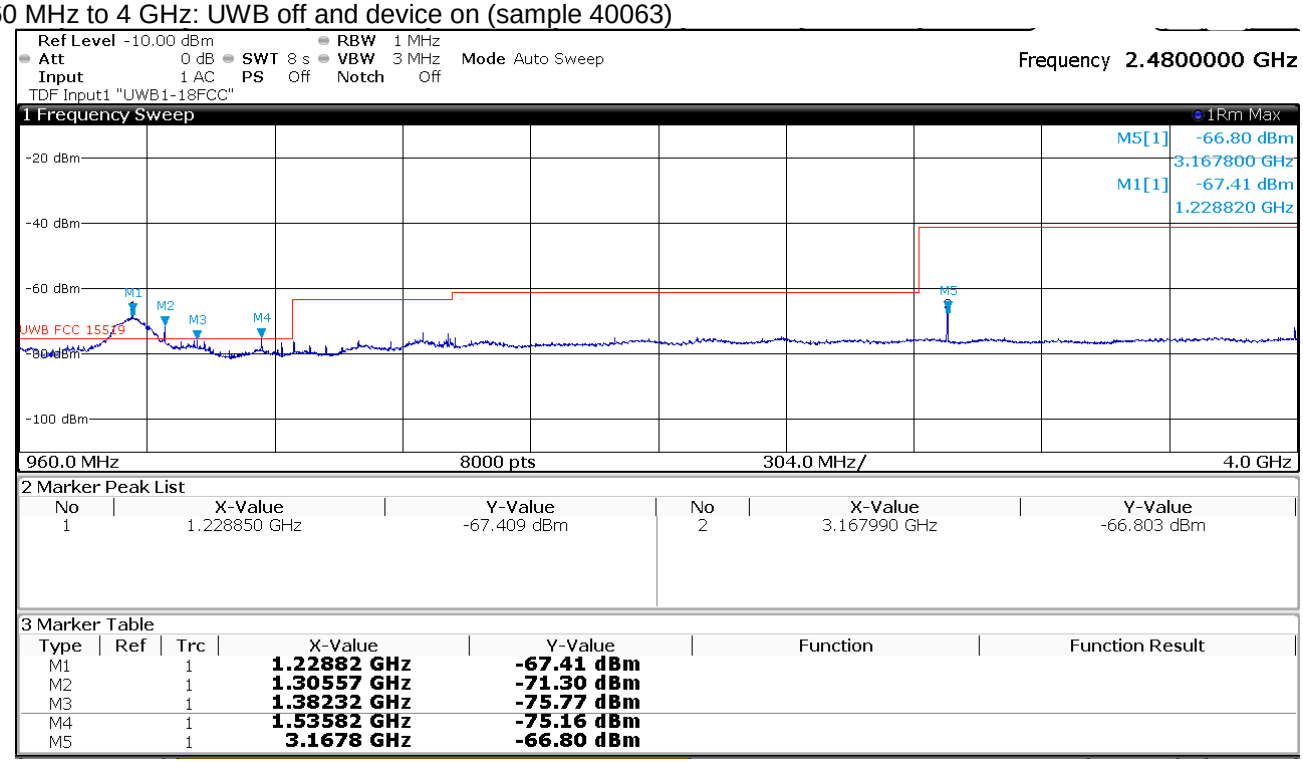
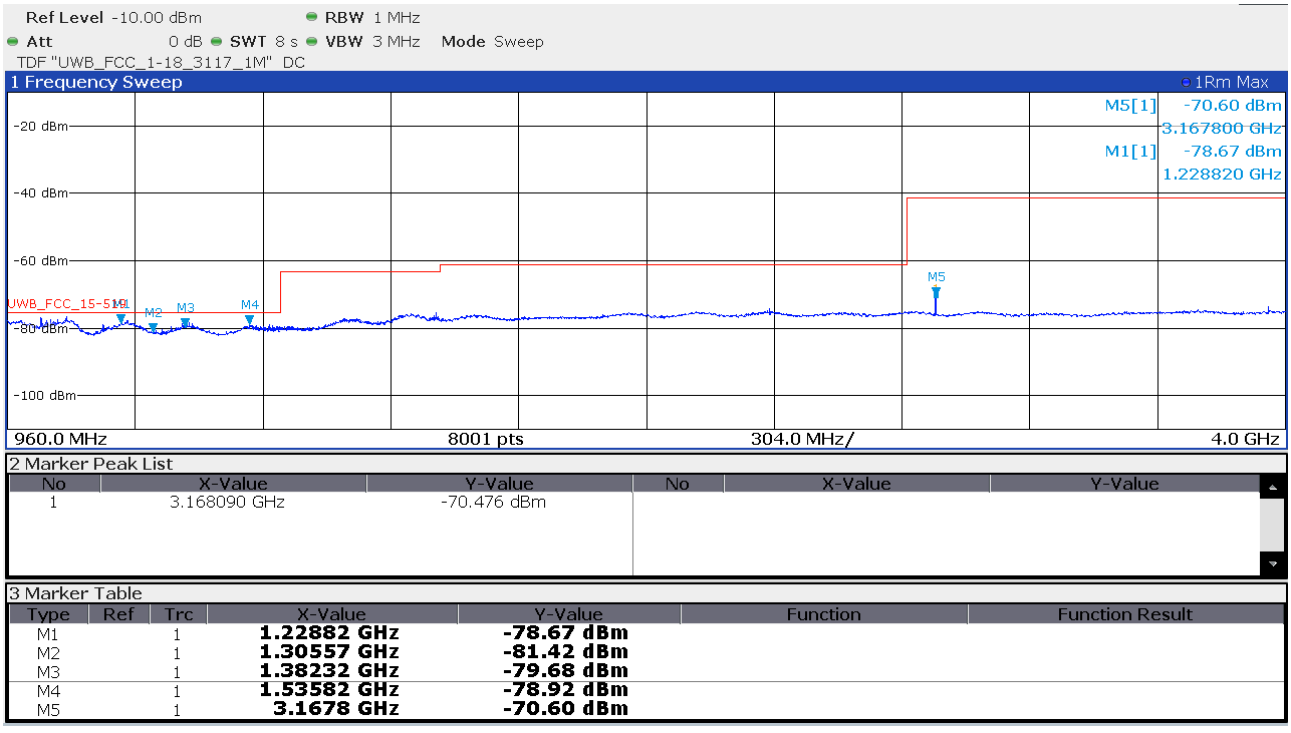
960 MHz to 4 GHz: UWB off and device on (sample 40063)




960 MHz to 4 GHz: UWB off and device off




Note: The emission points M1 – M5 are not a result of UWB transmission but of the device itself. They comply with the general limit of §15.209.

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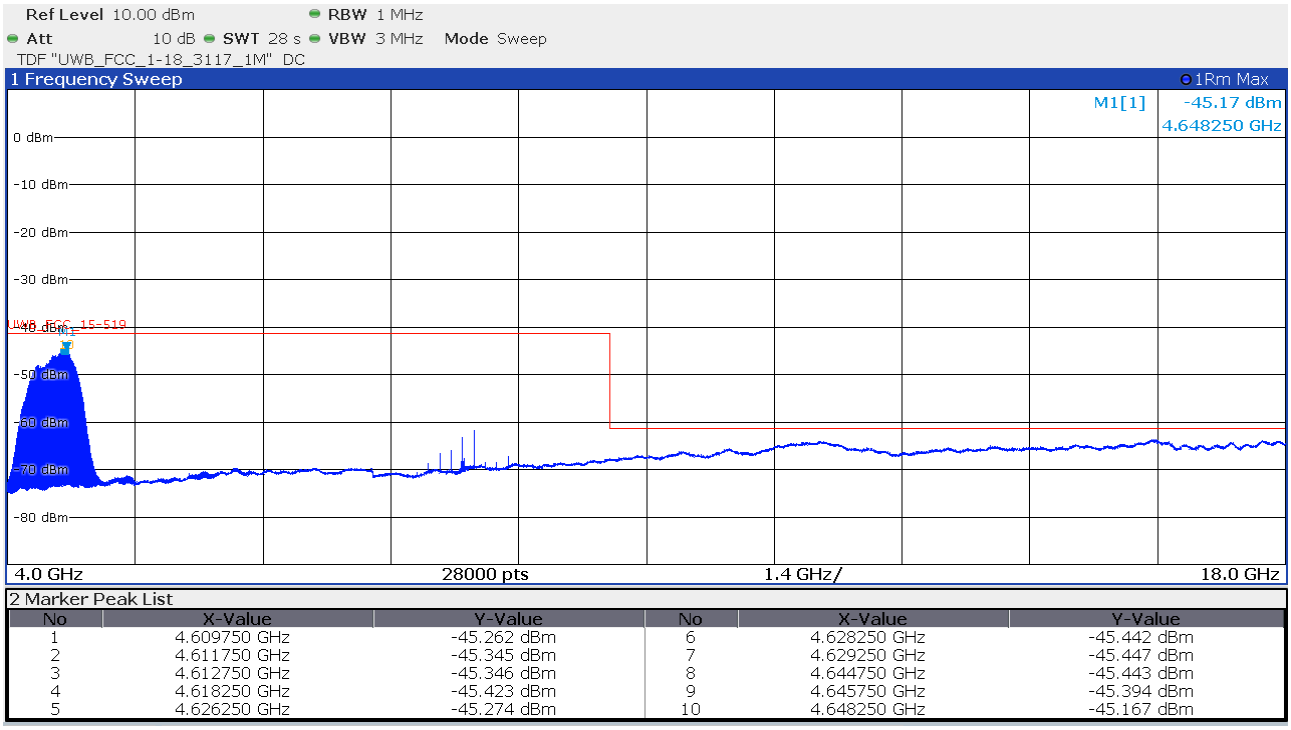
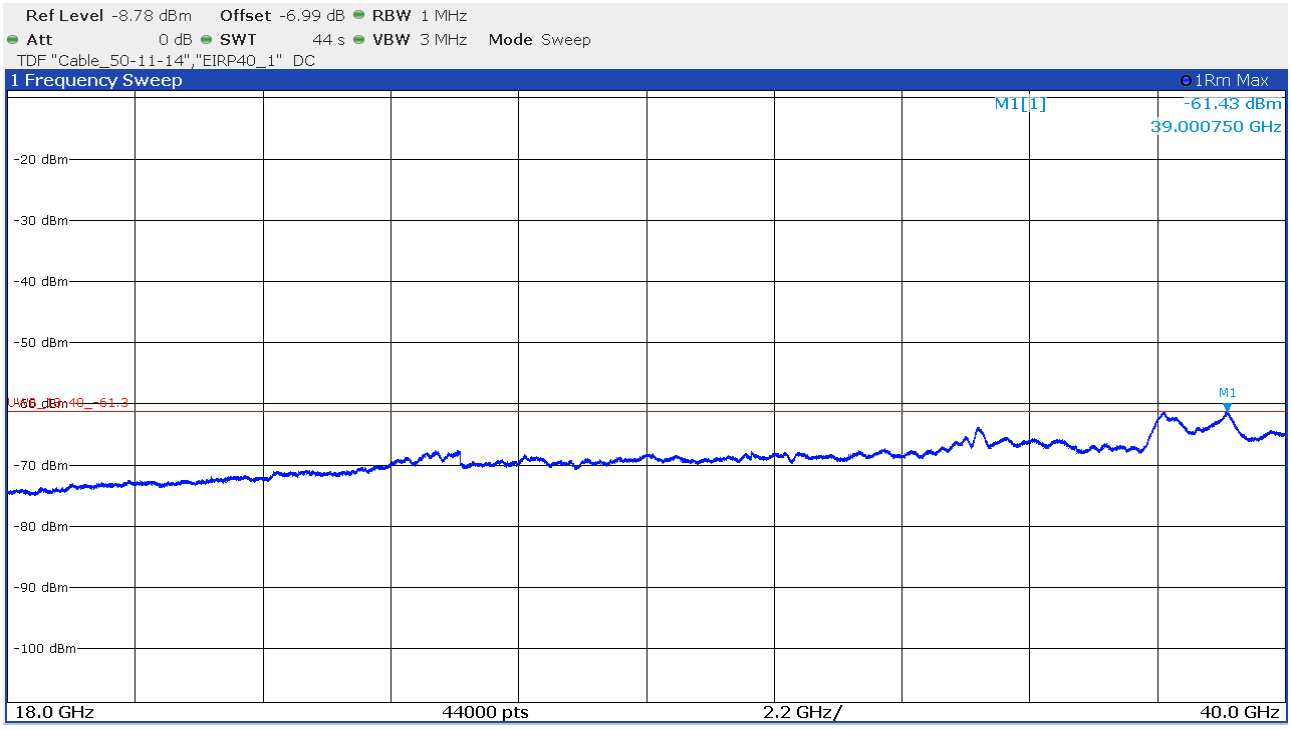
## 4 GHz to 18 Ghz




2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 4.609750 GHz | -45.262 dBm | 6 | 4.628250 GHz | -45.442 dBm |
| 2 | 4.611750 GHz | -45.345 dBm | 7 | 4.629250 GHz | -45.447 dBm |
| 3 | 4.612750 GHz | -45.346 dBm | 8 | 4.644750 GHz | -45.443 dBm |
| 4 | 4.618250 GHz | -45.423 dBm | 9 | 4.645750 GHz | -45.394 dBm |
| 5 | 4.626250 GHz | -45.274 dBm | 10 | 4.648250 GHz | -45.167 dBm |

## 18 GHz to 40 GHz at 20 cm distance



## FCC ID: 2ALC5-KNX-HREC2

**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 |

The requirements are **FULFILLED.**

**Remarks:** None.

# FCC ID: 2ALC5-KNX-HREC2

## 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 – see ATTACHMENT B

### 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.

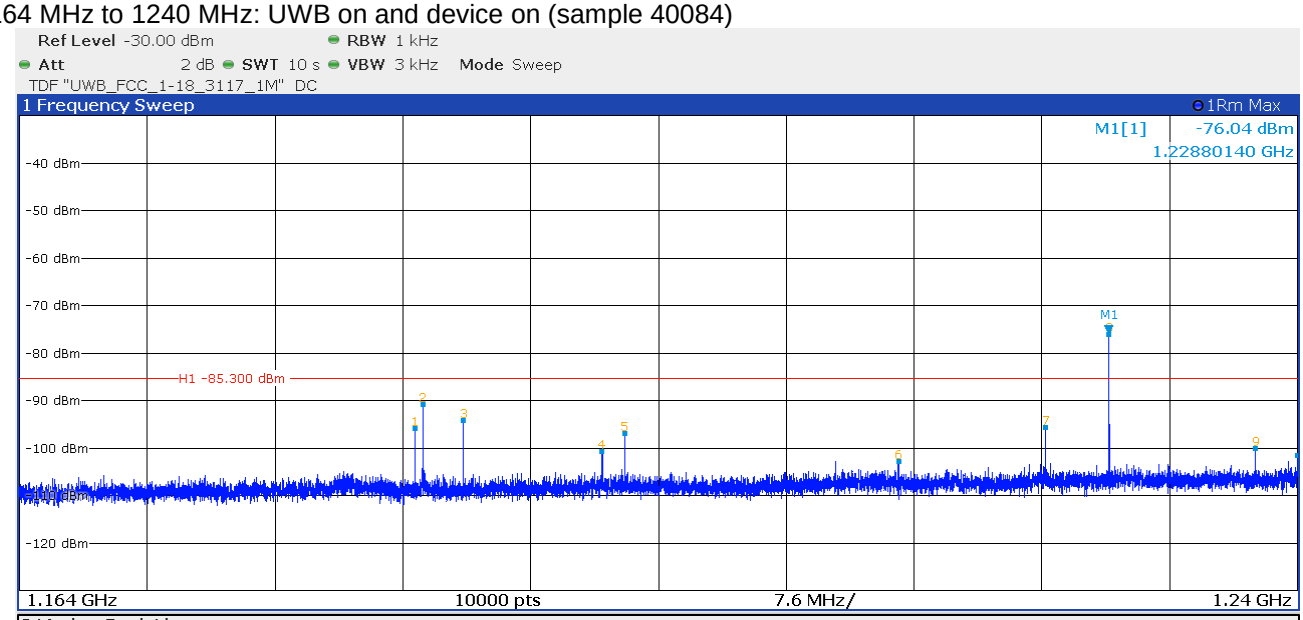
### 5.3.4 Analyser settings

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: UWB on and device on (sample 40084)

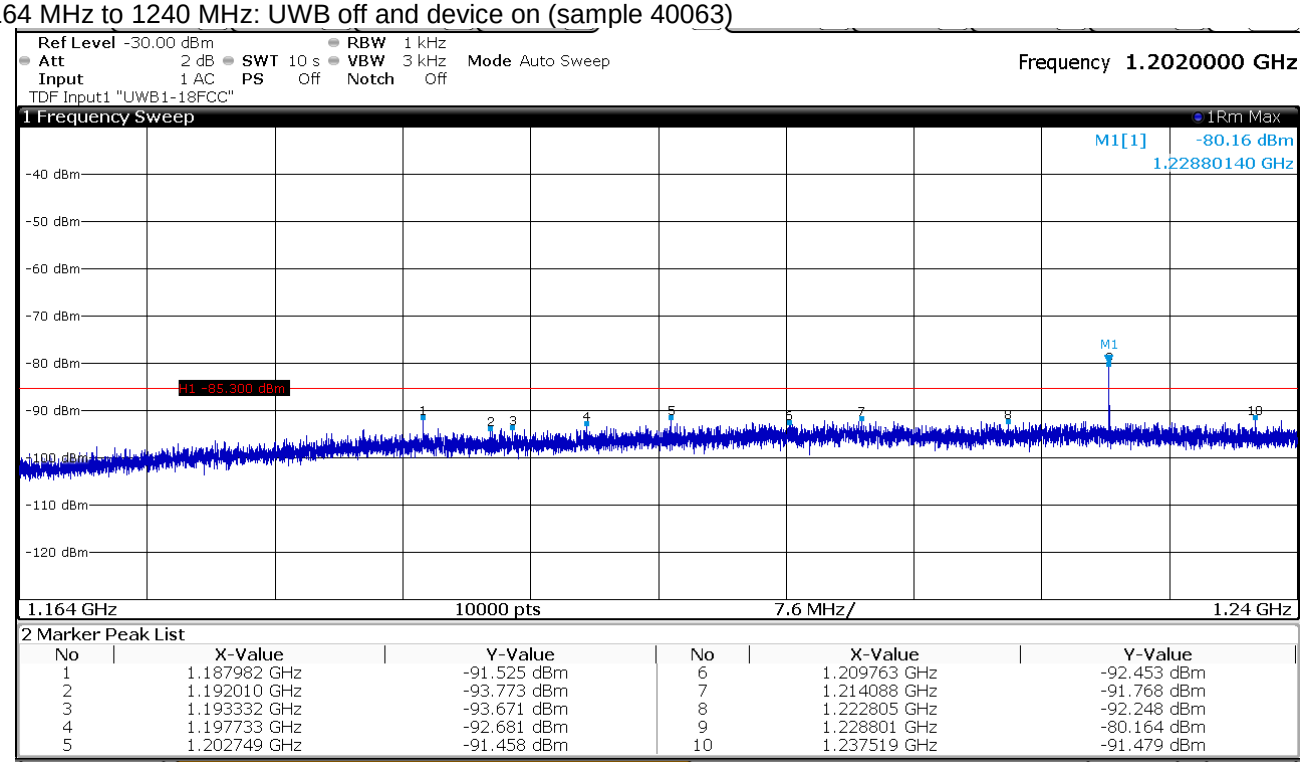



2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 1.187518 GHz | -95.901 dBm | 6 | 1.216269 GHz | -102.793 dBm |
| 2 | 1.187982 GHz | -90.872 dBm | 7 | 1.225017 GHz | -95.671 dBm |
| 3 | 1.190399 GHz | -94.201 dBm | 8 | 1.228801 GHz | -76.041 dBm |
| 4 | 1.198652 GHz | -100.816 dBm | 9 | 1.237519 GHz | -100.050 dBm |
| 5 | 1.199997 GHz | -96.876 dBm | 10 | 1.239996 GHz | -101.603 dBm |

# FCC ID: 2ALC5-KNX-HREC2

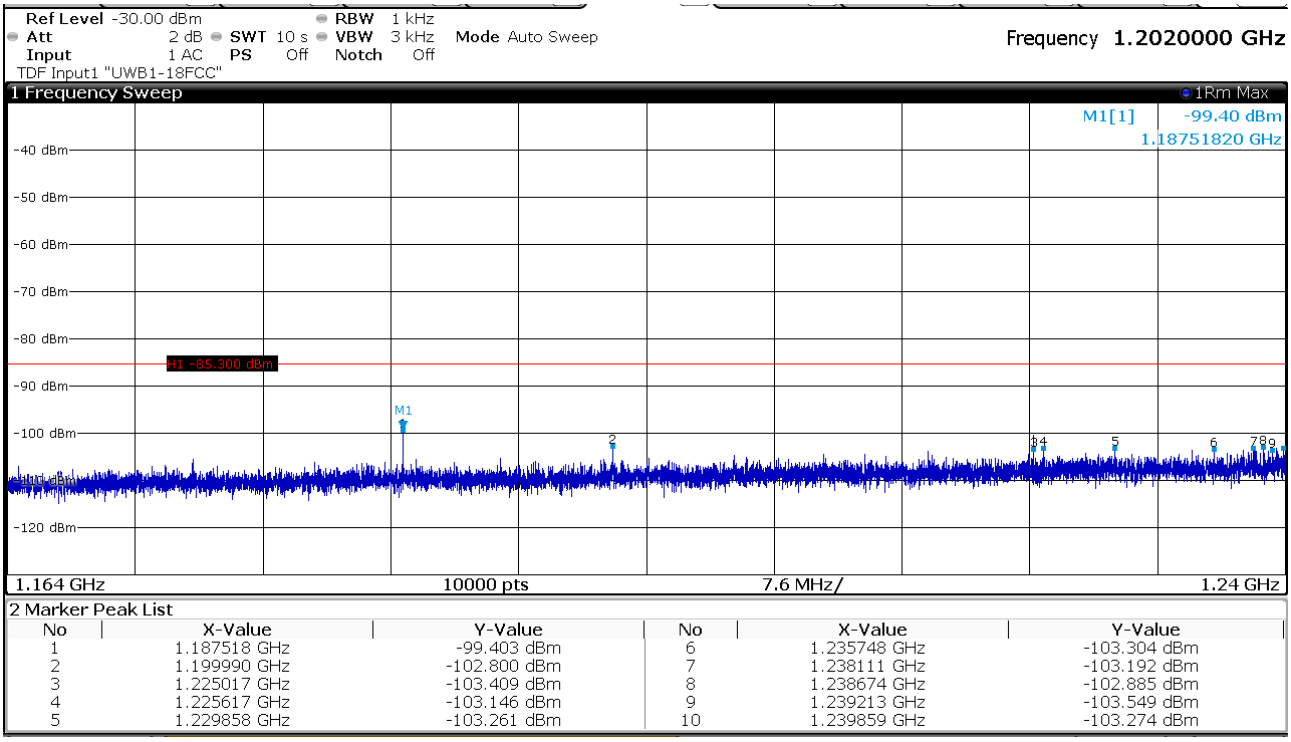
1164 MHz to 1240 MHz: UWB off and device on (sample 40063)




2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 1.187982 GHz | -91.525 dBm | 6 | 1.209763 GHz | -92.453 dBm |
| 2 | 1.192010 GHz | -93.773 dBm | 7 | 1.214088 GHz | -91.768 dBm |
| 3 | 1.193332 GHz | -93.671 dBm | 8 | 1.222805 GHz | -92.248 dBm |
| 4 | 1.197733 GHz | -92.681 dBm | 9 | 1.228801 GHz | -80.164 dBm |
| 5 | 1.202749 GHz | -91.458 dBm | 10 | 1.237519 GHz | -91.479 dBm |

1164 MHz to 1240 MHz: UWB off and device off



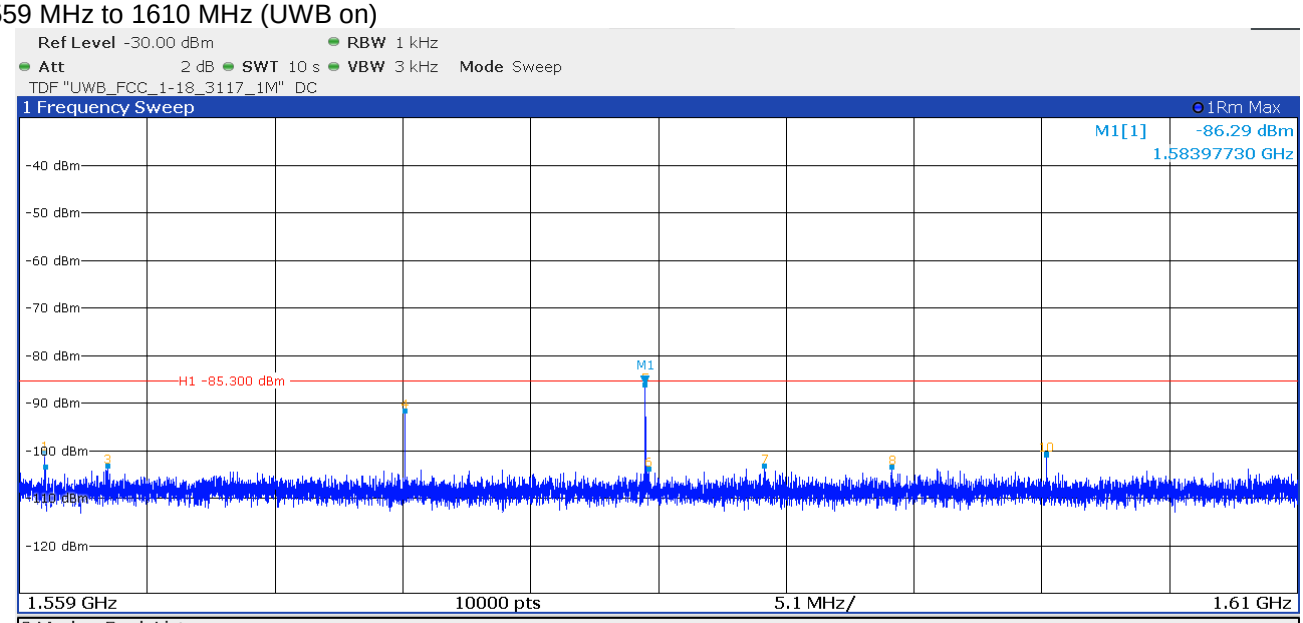

2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 1.187518 GHz | -99.403 dBm | 6 | 1.235748 GHz | -103.304 dBm |
| 2 | 1.199990 GHz | -102.800 dBm | 7 | 1.238111 GHz | -103.192 dBm |
| 3 | 1.225017 GHz | -103.409 dBm | 8 | 1.238674 GHz | -102.885 dBm |
| 4 | 1.225617 GHz | -103.146 dBm | 9 | 1.239213 GHz | -103.549 dBm |
| 5 | 1.229858 GHz | -103.261 dBm | 10 | 1.239859 GHz | -103.274 dBm |

Note: The emission point M1 is not a result of UWB transmission but of the device itself. It complies with the general limit of §15.209.

# FCC ID: 2ALC5-KNX-HREC2

1559 MHz to 1610 MHz (UWB on)




2 Marker Peak List

| No | X-Value | Y-Value | No | X-Value | Y-Value |
|---|---|---|---|---|---|
| 1 | 1.559997 GHz | -100.576 dBm | 6 | 1.584110 GHz | -103.924 dBm |
| 2 | 1.560043 GHz | -103.369 dBm | 7 | 1.588746 GHz | -103.304 dBm |
| 3 | 1.562522 GHz | -103.305 dBm | 8 | 1.593830 GHz | -103.535 dBm |
| 4 | 1.574399 GHz | -91.642 dBm | 9 | 1.599976 GHz | -100.949 dBm |
| 5 | 1.583977 GHz | -86.294 dBm | 10 | 1.599996 GHz | -100.677 dBm |

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 – see ATTACHMENT B

### 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 Analyser settings

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

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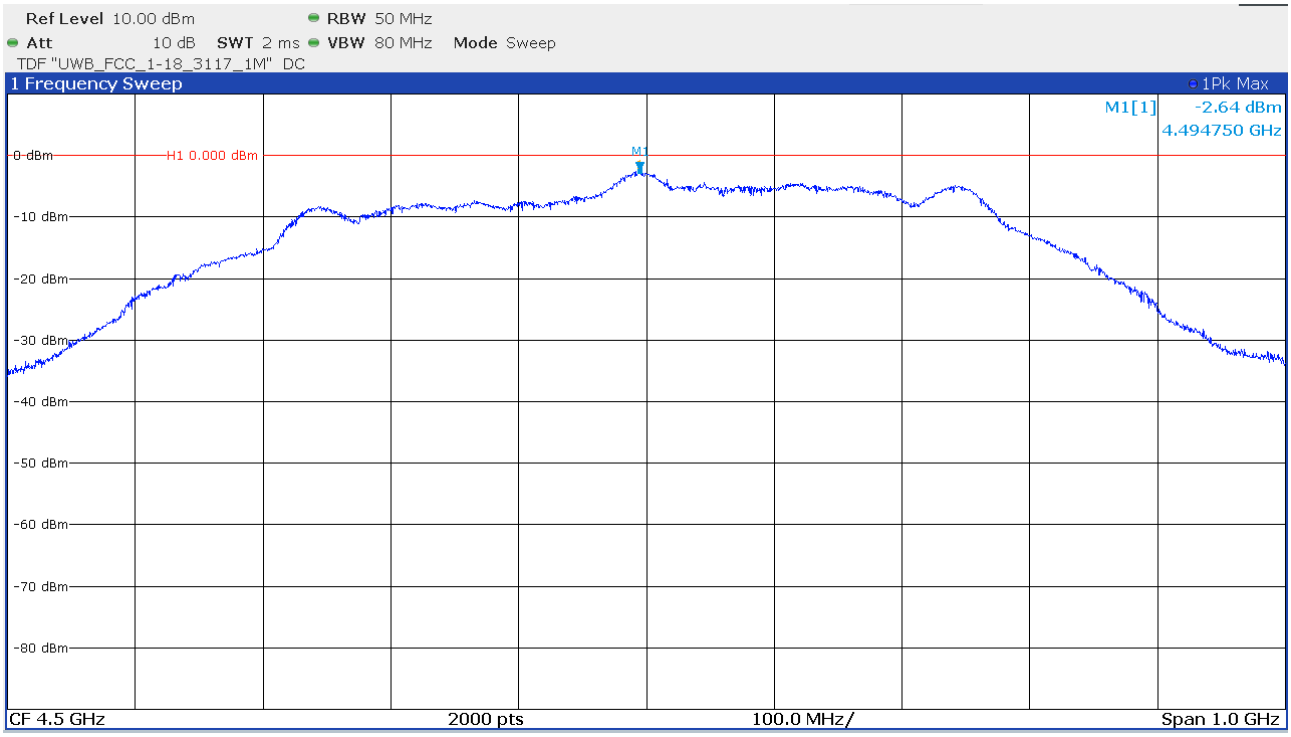
### 5.4.5 Test result

**Channel 3**




The requirements are **FULFILLED.**

**Remarks:** None.

## 5.5 Antenna application

### 5.5.1 Applicable standard

According to FCC Part 15C, Section 15.203:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has two mounted antennas, Reverse Polarity SMA connectors are used.

All supplied antennas meet the requirements of part 15.203 and 15.204.

**Remarks:** None.

**FCC ID: 2ALC5-KNX-HREC2**

# 6 USED TEST EQUIPMENT AND ACCESSORIES

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

| Test ID | Model Type | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---|---|---|---|---|---|---|
| CPR 3 | FSW43 | 02-02/11-15-001 | 08/04/2020 | 08/04/2019 | | |
| | AMF-6D-01002000-22-10P | 02-02/17-15-004 | | | | |
| | 311702-02/24-05-009 | 06/06/2020 | 06/06/2019 | | | |
| | 18N-20 | 02-02/50-17-003 | | | | |
| | NMS111-GL200SC01-NMS11 | 02-02/50-17-012 | | | | |
| | 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 | | | | |
| SER 2 | ESVS 30 | 02-02/03-05-006 | 19/08/2020 | 19/08/2019 | | |
| | VULB 9168 | 02-02/24-05-005 | 19/07/2020 | 19/07/2019 | | |
| | 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 | | | | |
| SER 3 | FSW43 | 02-02/11-15-001 | 08/04/2020 | 08/04/2019 | | |
| | JS4-18004000-30-5A | 02-02/17-05-017 | | | | |
| | AMF-6D-01002000-22-10P | 02-02/17-15-004 | | | | |
| | 311702-02/24-05-009 | 06/06/2020 | 06/06/2019 | | | |
| | BBHA 9170 | 02-02/24-05-014 | 12/06/2021 | 12/06/2018 | 14/01/2021 | 14/01/2020 |
| | KMS102-0.2 m | 02-02/50-11-020 | | | | |
| | 18N-20 | 02-02/50-17-003 | | | | |
| | NMS111-GL200SC01-NMS11 | 02-02/50-17-012 | | | | |
| | 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 | | | | |