

EMI – TEST REPORT

- FCC Part 15.517, RSS-220 -

Type / Model Name	: KINEXON Mesh Tag / T07001
Product Description	: Tracking-Tag for an UWB localization system
Applicant	: Kinexon Inc.
Address	: 200 S Wacker Drive, Suite 3100
	CHICAGO, IL 60606, 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. :	80183169-06 Rev2	26. April 2024	
	00103109-0011642	Date of issue	



CSA Group Bayern GmbH Ohmstrasse 1-4 · 94342 STRASSKIRCHEN · GERMANY Tel.: +49(0)9424-94810 · Fax: +49(0)9424-9481440 File No. 80183169-06 Rev2, page 1 of 33



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ATTACHMENT A as separate supplements



1 TEST STANDARDS

The tests were performed according to following standards:

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 15.207	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 15.517	Technical requirements for indoor 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: 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 v02r01 (April 25, 2022)	Ultra-Wideband (UWB) Devices – Frequently Asked Questions



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

UWB Device for Indoor Use

2.5 Short description of the equipment under test (EUT)

The KINEXON Mesh system is a sophisticated real-time location system (RTLS) designed to provide precise tracking and asset management solutions. Tags are small devices equipped with UWB, BLE, and accelerometer functionalities. Devices affixed to assets that emit UWB beacons.

Number of tested samples:	1
Serial number:	pre-production sample #1 (cont. Tx on ch3)
	pre-production sample #10 (cont. Tx on ch5)
Firmware version:	V0.1.0

2.6 Variants of the EUT

According to the manufacturer, two different accelerometers as 1:1 replacement can be used in the EUT. For details, please refer to the user manual.

KNX-no.	Description	Comment
KNX-T7.1-1.1-1	Mesh Tag with accelerometer WSEN-ITDS	1:1 replacement for LIS2DE12, other supplier
KNX-T7.1-2.1-1	Mesh Tag with accelerometer LIS2DE12	1:1 replacement for WSEN-ITDS, other supplier



2.7 Operation frequency and channel plan

The operating frequency band is 3100 MHz to 10600 MHz.

Channel plan FCC:

Channel number	f _c (MHz)
Channel 3	4492.8
Channel 5	6489.6

Channel plan 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)	Gain (dBi)
1	Omni	PCB antenna WB001	None	3.5 – 7.0	4.0 at 4.0 GHz 3.7 at 6.5 GHz

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 3.0 V DC

2.11 Peripheral devices and interface cables

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

Model : _---



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.



2.12.1 Test jig

No test jig is used.

2.12.2 Test software

The test modes of the EUTs are provided by the manufacturer.



FCC ID: 2ALC5-KNX-TM1

IC: 25557-KNXTM1

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
15.517(b) 15.521(e)	RSS-220, 2, 5.1(a)	UWB Bandwidth	passed
	RSS-Gen, 6.6	99 % Bandwidth	passed
15.209(a) 15.517(c) 15.521(c)(d)(h)	RSS-Gen, 8.9 RSS-220, 3.4, 5.2.1(c), 5.2.1(d)	Radiated Emissions 9 kHz to 40 GHz	passed
15.517(d)	RSS-220, 5.2.1(e)	Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz	passed
15.517(e) 15.521(g)	RSS-220, 5.2.1(g)	Peak Power radiated	passed
15.203 15.521(b)		Antenna requirement	not applicable
15.204 15.521(b)		External radio frequency power amplifiers and antenna modifications	not applicable
15.521(a)(f)(i)		Technical requirements applicable to all UWB devices	not applicable

*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. The EUT uses a unique coupling for its external antenna (reverse polarity xyz connector) and no standard

The EUT uses a unique coupling for its external antenna (reverse polarity xyz connector) and no standard aerial socket. Therefor, the requirements are regarded as fulfilled.

*3 According to the applicant, the EUT will be used indoor only. The EUT is no imaging system. For details refer to the user manual.

3.1 Revision history of test report

Test report No	Rev.	Issue Date	Changes
80183169-06	0	15 December 2023	Initial test report
80183169-06	1	18 March 2024	Clause 2.6: Clarification of variants. Clause 4.5.2.2.4: height of EUT corrected to 1.5 m.
80183169-06	2	26 April 2024	Clause 5: OBW99% measurements data updated

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.

1

:

Date of receipt of test sample

acc. to storage records

Testing commenced on

19 September 2023

: 29 November 2023

Testing concluded on

Checked by:

Tested by:

Klaus Gegenfurtner Teamleader Radio Franz-Xaver Schrettenbrunner Radio Team



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TEST ENVIRONMENT 4

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 guality 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%	± 2.5 x 10 ⁻⁷
99% Occupied Bandwidth	Center frequency of EUT	95%	± 2.5 x 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

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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".

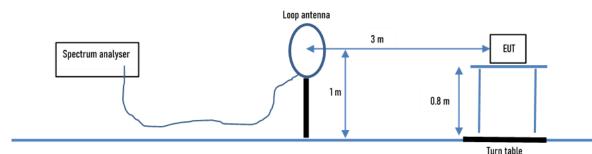
4.5.2.1 Justification

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

4.5.2.2 Radiated emission

4.5.2.2.1 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.



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 4.5.2.2 OATS1 test site (30 MHz - 1 GHz):
 Test setup according ANSI C63.10.

 Image: mail of the test state of test setup according test

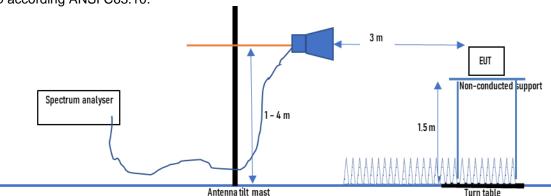
Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed 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 dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) 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

4.5.2.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz) Test setup according ANSI C63.10.

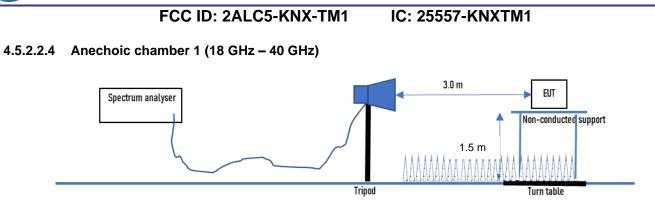


Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. 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.

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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

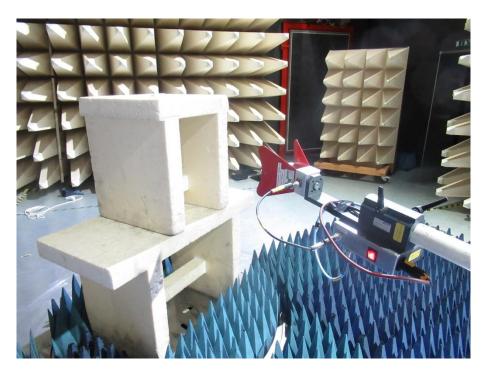
5.1 UWB Bandwidth

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 15.517(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 analysei	r settings:	
EBW:	RBW: 1 MHz,	VBW: 3 MHz,
OBW:	RBW: 10 MHz,	VBW: 28 MHz,

Detector: Peak Detector: Peak

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5.1.5 Test result

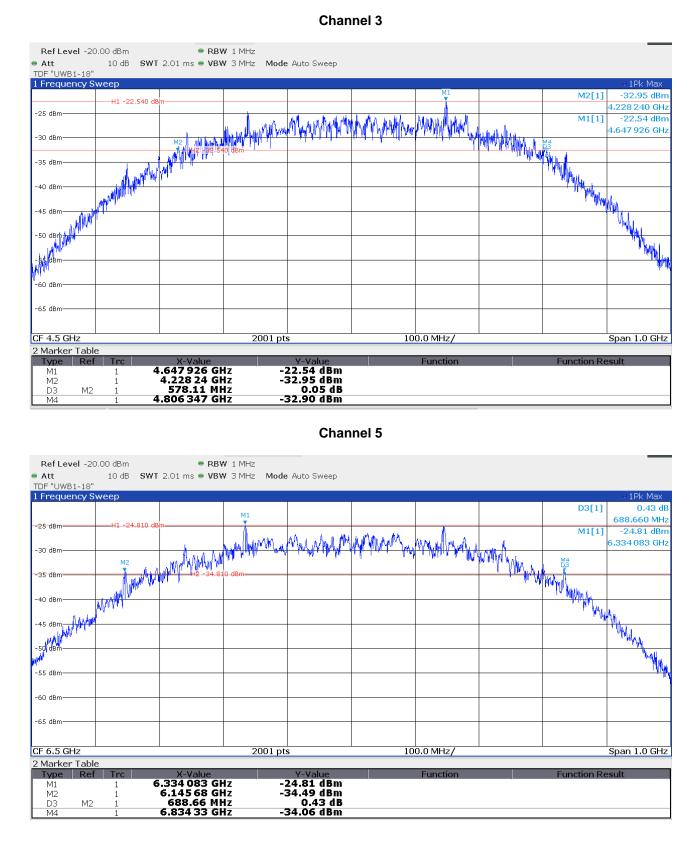
channel	lowest	highest	permitted	UWB	required	OBW 99%	result
	frequency	frequency	frequency	bandwidth	UWB		
	fL	f _н	range	(MHz)	bandwidth		
	(MHz)	(MHz)	(GHz)		(MHz)		
3	4228.24	4806.35	3.1 - 10.6	578.11	> 500	679.74	passed
5	6145.38	6834.33	3.1 – 10.6	688.66	> 500	818.78	passed

The requirements are **FULFILLED.**

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



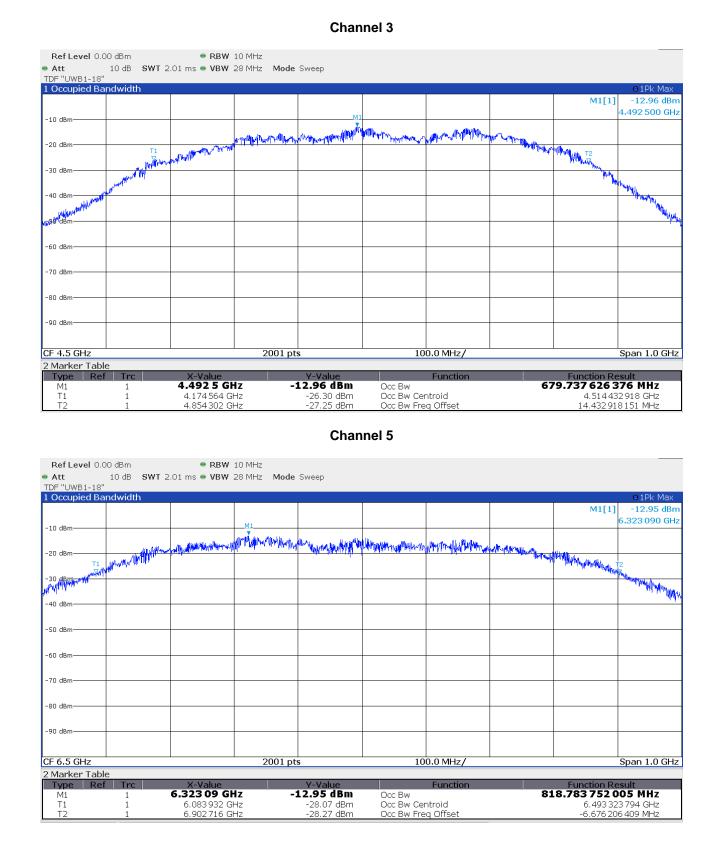
5.1.6 Test protocols EBW



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5.1.7 Test protocols EBW





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

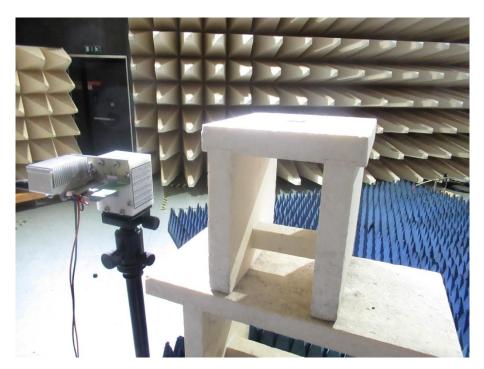
Test location:OATS 1Test location:Anechoic chamber 1

5.2.2 Photo documentation of the test set-up



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5.2.3 Applicable standard

According to FCC Part 15, Section 15.517(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.

5.2.4 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 150 kHz - 30 MHz 30 MHz – 960 MHz 960 MHz – 40 GHz	RBW: 200 Hz RBW: 9 kHz RBW: 120 kHz RBW: 1 MHz	Detector: QP 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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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. Emissions in this frequency range can be excluded because of the physical dimension of the EUT.

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)
150.00	3.5	3.9	19.5	18.9	23.0	22.8	43.5	-20.5
300.00	-3.5	1.2	20.2	20.8	16.7	22.0	46.0	-24.0
450.00	-8.3	-5.5	24.6	24.9	16.3	19.4	46.0	-26.6
600.00	-8.1	-4.4	28.3	28.6	20.2	24.2	46.0	-21.8
750.00	-8.0	-4.3	30.7	31.1	22.7	26.8	46.0	-19.2
900.00	-9.5	-9.3	32.9	33.4	23.4	24.1	46.0	-21.9

Note: Pre-scans show that no significant emissions occur in the frequency range from 30 MHz to 1000 MHz, independent on the operation mode of the EUT or channel. All recorded values represent the noise level of the test site.



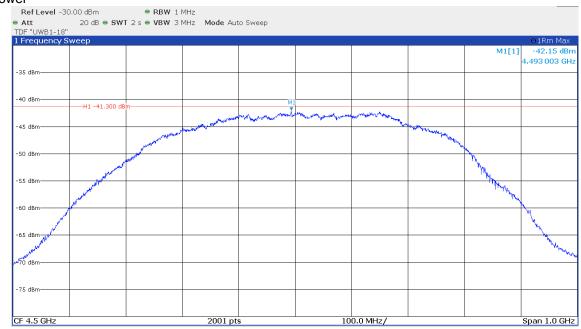
5.2.5.3 Measurement 960 MHz to 40 GHz

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 dB μ V/m at 3 meter distance, which corresponds to an EIRP of -41.3 dBm according to ANSI C63.10 2013 clause 10.3.9.

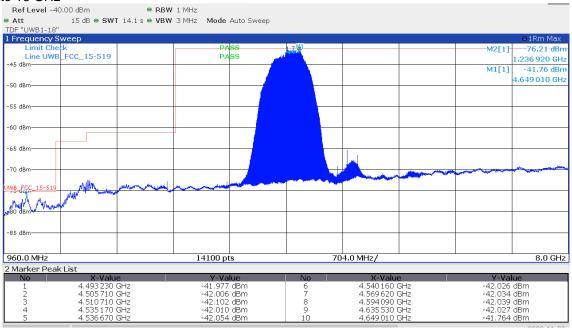
As proven in the following measurements, no emissions outside the UWB transmission can be detected in the frequency range 960 MHz and 40 GHz and the highest emissions occurs by the UWB emission itself, which lies under the UWB limit of -41.3 dBm. Therefore, the requirements according to § 15.209 can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

Channel 3

Mean Power



960 MHz to 18 GHz



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		FC	C ID: 2	ALC5-K	NX-TM	1 IC	C: 25557	-KNXTN	//1	
Ref L	evel -40	.00 dBm	RBW	1 MHz						
🛛 Att		6 dB 🖷 SW1	1 20 s 👄 VBW	3 MHz Mode Au	uto Sweep					
	VB1-18"									
	uency S									●1Rm Max
UWB_FCC	mit Che 15-519	k _FCC_15-519	<u> </u>	PA					M1[1]	-62.96 dBm
-45 dBm		_FCC_15-519		PA	ss				1	6.602 320 GHz
-43 ubm										
-50 dBm										
-55 dBm				-						
-60 dBm									M1	
	1								8	
-65 dBm									<u> </u>	
00 00.00					han	h m	~~~~	\sim	/ V V · · · · · ·	1 Maria
-70 dBm			$-\infty$					¥		11
-70 übm	mar l									
.										
-75 dBm										
-80 dBm										
-85 dBm										
00 00.0										
8.0 GH	lz			20001 pt	s	1	.0 GHz/			18.0 GHz
2 Mark	er Peak	List								
No		X-Valu		Y-Va		No	X-Value		Y-Va	
1		8.985700	GHz	-62.985	dBm	2	16.602320	GHz	-62.961	dBm

18 GHz to 40 GHz

40 0112								
Ref Level -4	0.00 dBm	RBW 1 MHz						
Att	0 dB 👄 SWT 44	s 🖷 VBW 3 MHz 🛛 Mo	de Sweep					
TDF "EIRP40_H								
1 Frequency S	Sweep							●1Rm Max
							M1[1]	-61.91 dBr
-50 dBm							3	9.719756 GH
-50 uBm								
co. Jp.,								M
-60 dBm	H2 -61.300 dBm							
					mon	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~
-70 dBm			- Andrew					
r -								
-80 dBm								
-90 dBm								
-100 dBm								
-110 dBm								
120 dBm								
-130 dBm								
18.0 GHz		4400	01 pts		2.2 GHz/			40.0 GH
2 Marker Peal	k List	110	vi pto		212 0112/			1010 011
No	X-Value		/-Value	No	X-Value	2	Y-Va	lue
1	39.719760 GHz		.909 dBm					

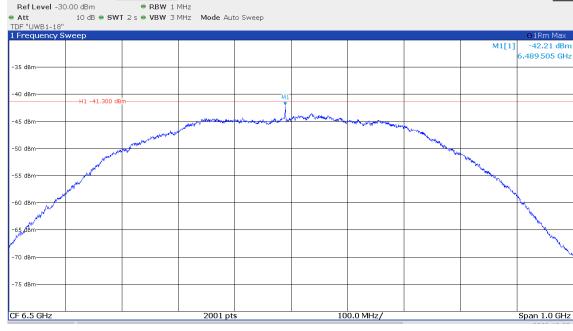


FCC ID: 2ALC5-KNX-TM1

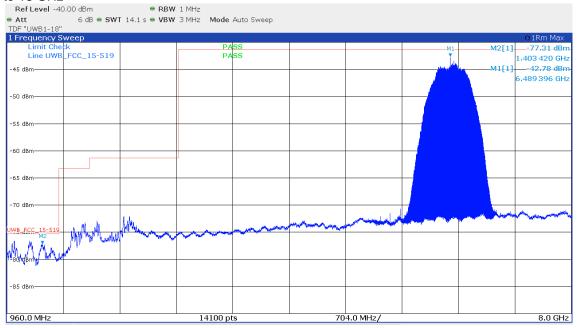
IC: 25557-KNXTM1

Channel 5

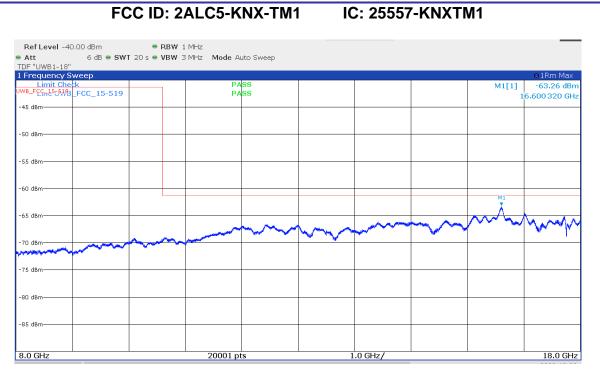
Mean Power



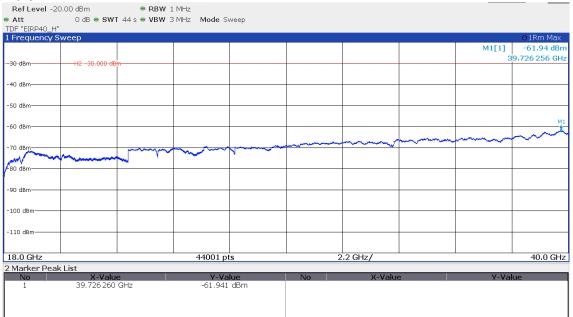
960 MHz to 18 GHz







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 §15.517(c) in the frequency range 960 MHz to 40 GHz:

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-53.3
1990-3100	-51.3
3100-10600	-41.3
Above 10600	-51.3

Limit according RSS-220 5.2.1 (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	-51.3

The requirements are FULFILLED.

Remarks: The tighter limit of -61.3 dBm of hand-held devices is shown in the plots.

All emissions for ch5 between 1610 MHz and 4750 MHz are under RSS-220 limit of -70.0 MHz.



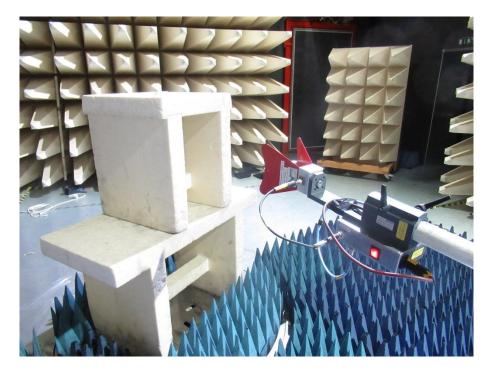
5.3 Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz

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 15.517(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

		ontai							
Ref Level -70).00 dBm	RBW	1 kHz						
Att	5 dB 🖷 SW1	f 10 s 👄 VBW	3 kHz Mode Au	uto Sweep					
TDF "UWB1-18"									
1 Frequency S	weep								o1Rm Max
								M1[1]	-98.49 dBm
								1.1	99 997 40 GHz
-75 dBm									
-80 dBm									
85-dBm	H1 -85.300 dB	m							
-90 dBm									
-95 dBm									
				M1					
-100 dBm				· ·					8
	1 2 3		de at mate da u	5				dia ma	
-105 dBm			ah waxaya a amila a bi ba	aller te mil here	delle le la contrada	بمراجعه ويراطل م	المراجع والمغادير والمراجع	ANAL AND A DESCRIPTION	AN ALL ALL ALL ALL ALL ALL ALL ALL ALL A
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-110 dBm	all the later to a state of the later of the	and a contraction of the second se		a and a first and a first of the first of th	And the second	and the state of the second second second	diation of the state of the state		
110 0.000									
-115 dBm									
1.164 GHz			10000 pt	ts	7	.6 MHz/			1.24 GHz
2 Marker Peak	List								
No	X-Valu	e	Y-Va	lue	No	X-Value		Y-Val	ue
1	1.173147	GHz	-103.624		5	1.198736 (-102.884	
2 3 4	1.174537		-102.288		6	1.199.997 (-98.486	
3	1.178 611 1.190 771		-101.869 -101.64		7	1.226803 (1.239350 (-101.598 -99.401	
1 7	1.190771	0112	-101.04.	/ ubm	0	1.2393300	21 12	-99.401	ubm

1164 MHz to 1240 MHz vertical

Ref Level -7	0.00 dBm	RBW 1	l kHz						
 Att 		F 10 s 🗢 VBW 3	3 kHz Mode Au	ito Sweep					
TDF "UWB1-18"									
1 Frequency S	Sweep								o1Rm Max
								M1[1]	-96.71 dBm
-75 dBm								1.1	79 766 20 GHz
i o doni									
-80 dBm									
-so ubili									
	H1 -85.300 dB	m							
-90 dBm									
-95 dBm		M1							
	3	ľ							
-100 dBm -2	4	<u>, 6. 7</u>						8	10
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-110 dBm			and a start doubt of the start	to a second second	an di sur danta i	and a local manufacture of the	Mail and Manager and Address of the	1	
110 0.011									
-115 dBm									
-115 UBM									
1.164 GHz	1		10000 pt	ts	7	.6 MHz/		1	1.24 GHz
2 Marker Pea	k List								
No	X-Valu		Y-Va		No	X-Value		Y-Va	
1	1.167675		-100.872		6	1.183186 (-100.538	
2	1.169552 1.176331		-100.772 -98.489		7	1.186272 (1.226932 (-100.802 -100.357	
3	1.170331		-100.824		o g	1.233194 (-100.357	
1 2	1 170 766		-06.707		10	1.2001940		-100.703	

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1559 MHz to 1610 MHz horizontal

Ref Level -70).00 dBm	RBW 1	. kHz						
Att	5 dB 🖷 SW1	10 s 🗢 VBW 3	8 kHz Mode Au	to Sweep					
TDF "UWB1-18"									
1 Frequency S	weep		1						O1Rm Max
								M1[1]	-97.72 dBm
-75 dBm								1.5	92 025 05 GHz
-75 ubm									
-80 dBm									
85-dBm	H1 -85.300 dB	m							
-90 dBm									
-95 dBm						M1			
						7			
-100 dBm									
1	2	3 4				8		9	10
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110 000									
-115 dBm									
1.559 GHz			10000 pt	s	5	.1 MHz/			1.61 GHz
2 Marker Peal	List								
No	X-Valu	e	Y-Va	lue	No	X-Value	2	Y-Va	ue
1	1.561 981 (-103.078		6	1.589541 (-103.191	dBm
2	1.564 541		-102.590		7	1.592.025 (-97.724	
3	1.570875 1.573849		-102.594 -103.210		8	1.594320 (1.600083 (-103.279 -103.254	
5	1.574027		-103.250		10	1.608 427 (-103.014	
2	1.5740271	эНZ	-103.230) abm	10	1.608427 (эНZ	-103.014	aBm

1559 MHz to 1610 MHz vertical

Ref Level -70.00 dbm RBW 1 kHz Att or 5 db • SWT 10 s • VBW 3 kHz Mode Auto Sweep OF TWB1:18" TFrequency Sweep OF TRM Max Att or 5 db • SWT 10 s • VBW 3 kHz Mode Auto Sweep TFrequency Sweep OF TRM Max To for 0001 45 GHz -75 dbm MI1[1] -101.45 GHz -80 dbm -101 Auto Sweep -60 dbm -101 Auto Sweep -90 dbm -101 Auto Sweep -90 dbm -101 Auto Sweep -100 dbm -101 Auto Sweep -101 Auto Sweep -101 Auto Sweep -			ai							
O 1Rm Max 1 Frequency Sweep O 1Rm Max 11 Frequency Sweep O 1Rm Max -75 dbm M1[1] -101.45 dBm -75 dbm M1[1] -101.45 dBm -80 dBm -101 dBm -101 dBm -80 dBm -101 dBm -101 dBm -90 dBm -101 dBm -101 dBm -90 dBm -101 dBm -101 dBm -100 dBm -101 dBm -101 dBm -101 dBm -101 dBm -115 dBm -101 dBm	Ref Level -70).00 dBm	RBW 1	. kHz						
O 1Rm Max 1 Frequency Sweep O 1Rm Max 11 Frequency Sweep O 1Rm Max -75 dbm M1[1] -101.45 dBm -75 dbm M1[1] -101.45 dBm -80 dBm -101 dBm -101 dBm -80 dBm -101 dBm -101 dBm -90 dBm -101 dBm -101 dBm -90 dBm -101 dBm -101 dBm -100 dBm -101 dBm -101 dBm -101 dBm -101 dBm -115 dBm -101 dBm	Att	5 dB 🖷 SW1	E 10 s ∈ VBW 3	kHz Mode Au	ito Sween					
1 Frequency Sweep 0 1Rm Max -75 dbm M1[1] -101.45 dBm -75 dbm 1.600.001 45 GHz -80 dBm -100 dBm -100 dBm -90 dBm -100 dBm -100 dBm -100 dBm -115 dBm -100 dBm			1030 000		10 01/000					
And the second secon										1Rm Max
-75 dbm Image: dbm	111 equency o	reep							M1[1]	
-75 dBm -80 dBm -80 dBm -90 dBm -90 dBm -90 dBm -10 dBm -115 dBm -11										
85-d8m	-75 dBm								1.6	00 001 45 GHz
85-d8m										
85-d8m	00.40.0									
-90 dBm -95 dBm -95 dBm -100 dBm	-80 asm									
-90 dBm -95 dBm -95 dBm -100 dBm										
-95 dBm -00 dBm -100 dBm	85-dBm	H1 -85.300 dB	m							
-95 dBm -95 dBm -00 dBm -100 dBm										
-95 dBm -95 dBm -00 dBm -100 dBm	-90 dBm									
Image: second	So dom									
Image: second										
No X-Value Y-Value No X-Value Y-Value 1.559 GHz 1.61 GHz 1.61 GHz 1.61 GHz 1.61 GHz 2 1.559 GHz 1.61 GHz 1.61 GHz 1.61 GHz 1 1.559 GHz 1.61 GHz 1.61 GHz 1.61 GHz 2 1.569 565 GHz -103.496 dBm 7 1.600 940 GHz -102.882 dBm 3 1.580 037 GHz -102.828 dBm 8 1.607 193 GHz -103.398 dBm 3 1.589 056 GHz -103.396 dBm 7 1.600 940 GHz -103.398 dBm 3 1.589 056 GHz -102.828 dBm 8 1.607 193 GHz -103.398 dBm 4 1.590 056 GHz -103.371 dBm 9 1.609 054 GHz -103.398 dBm	-95 dBm									
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No X-Value Y-Value No X-Value Y-Value 1 1.559 GHz 10000 pts 5.1 MHz/ 1.61 GHz 2 1.559 5GHz -101.449 dBm 6 1.600 002 GHz -101.449 dBm 2 1.559 5G GHz -103.496 dBm 7 1.600 940 GHz -102.828 dBm 3 1.589 037 GHz -102.828 dBm 8 1.607 193 GHz -103.398 dBm 4 1.590 064 GHz -103.371 dBm 9 1.600 940 GHz -103.398 dBm <td></td> <td></td> <td>2</td> <td></td> <td></td> <td>3</td> <td>4</td> <td>5</td> <td>ĨZ</td> <td>8 910</td>			2			3	4	5	ĨZ	8 910
No X-Value Y-Value No X-Value Y-Value 1 1.559 GHz 10000 pts 5.1 MHz/ 1.61 GHz 2 1.559 5GHz -101.449 dBm 6 1.600 002 GHz -101.449 dBm 2 1.559 5G GHz -103.496 dBm 7 1.600 940 GHz -102.828 dBm 3 1.589 037 GHz -102.828 dBm 8 1.607 193 GHz -103.398 dBm 4 1.590 064 GHz -103.371 dBm 9 1.600 940 GHz -103.398 dBm <td>abd Broken do th</td> <td>catalogical de la l</td> <td>անակություն հայո</td> <td>that so a</td> <td>بياهي المان</td> <td>ور الآلي م</td> <td>fit and the second second</td> <td>la di anazar</td> <td>L . an anna</td> <td>มา ป้า ปไว้เ</td>	abd Broken do th	catalogical de la l	անակություն հայո	that so a	بياهي المان	ور الآلي م	fit and the second second	la di anazar	L . an anna	มา ป้า ปไว้เ
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No X-Value Y-Value No X-Value Y-Value 1 1.559064 GHz -102.735 dBm 6 1.600002 GHz -101.449 dBm 2 1.569565 GHz -103.496 dBm 7 1.600940 GHz -102.882 dBm 3 1.588037 GHz -102.828 dBm 8 1.607193 GHz -103.398 dBm 4 1.590082 GHz -103.371 dBm 9 1.609054 GHz -103.035 dBm										
No X-Value Y-Value No X-Value Y-Value 1 1.559064 GHz -102.735 dBm 6 1.600002 GHz -101.449 dBm 2 1.569565 GHz -103.496 dBm 7 1.600940 GHz -102.882 dBm 3 1.588037 GHz -102.828 dBm 8 1.607193 GHz -103.398 dBm 4 1.590082 GHz -103.371 dBm 9 1.609054 GHz -103.035 dBm										
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No X-Value V-Value No X-Value V-Value 1 1.559064 GHz -102.735 dBm 6 1.600002 GHz -101.449 dBm 2 1.569565 GHz -103.496 dBm 7 1.600940 GHz -102.882 dBm 3 1.589037 GHz -102.828 dBm 8 1.607193 GHz -103.398 dBm 4 1.590082 GHz -103.371 dBm 9 1.609054 GHz -103.393 dBm	2 Marker Peak	List								
1 1.559064 GHz -102.735 dBm 6 1.600002 GHz -101.449 dBm 2 1.569565 GHz -103.496 dBm 7 1.600940 GHz -102.882 dBm 3 1.588037 GHz -102.828 dBm 8 1.607193 GHz -103.398 dBm 4 1.590082 GHz -103.371 dBm 9 1.609054 GHz -103.035 dBm			e	Y-Va	lue	No	X-Value	-	Y-Va	ue
2 1.569555 GHz -103.496 dBm 7 1.600940 GHz -102.882 dBm 3 1.588037 GHz -102.882 dBm 8 1.607193 GHz -103.396 dBm 4 1.590082 GHz -103.371 dBm 9 1.609054 GHz -103.035 dBm										
3 1.588 037 GHz -102.828 dBm 8 1.607 193 GHz -103.398 dBm 4 1.590 082 GHz -103.371 dBm 9 1.609 054 GHz -103.035 dBm	2	1.569 565	GHz	-103.496	5 dBm		1.600 940 (GHz	-102.882	dBm
	3									
I 5 1 596 998 GHz -103 533 dBm I 10 1 609 635 GHz -103 367 dBm I										
	<u> </u>	1.596 998	GHz	-103.533	3 dBm	10	1.6096350	GHz	-103.367	'dBm

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Channel 5:

1164 MHz to 1240 MHz horizontal

RefLevel -70	0.00 dBm	 RBW 1 	. kHz						
Att		「10 s ● VBW 3	8 kHz Mode AL	uto Sweep					
TDF "UWB1-18" 1 Frequency S									• 1Rm Max
								M1[1]	-101.55 dBm
								1.2	23 352 20 GHz
-75 dBm									
-80 dBm									
-85_dBm	H1 -85.300 dB								
	HI -85.300 UB								
-90 dBm									
-95 dBm									
-100 dBm							M1-		
							المألب المست	տեստեւ է են	
-105 dBm		un de las stilles	Hat he is in			وساعته اعتراب العالي المرابع		nana na akasimik 104	
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-110 dBm	had been glog pool to prove by	International and the second sec	needed Algebraic Properties	had hay personal and the second s	Perfording a double to a	the first states of the states			
-110 dBm-									
-115 dBm									
1.164 GHz	1	1	10000 pt	lts	7	.6 MHz/	1		1.24 GHz
			2000 p						

1164 MHz to 1240 MHz vertical

Ref Level -70	0.00 dBm	 RBW 1 	kHz						
 Att TDF "UWB1-18" 	5 dB 😑 SW1	10 s 👄 VBW 3	kHz Mode Au	ito Sweep					
1 Frequency Sv	weep								o1Rm Max
								M1[1] 1.2	-98.07 dBm 34 775 00 GHz
-75 dBm									
-80 dBm									
85dBm	H1 -85.300 dB	m							
-90 dBm									
-95 dBm									
-100 dBm								La. Intel	M1
		es, ally here the large ball.			in the state of th	hipping pandalayand		¹⁴ 49-14 Constraints (1997) V Chille and Constraints (1997)	allan (japon) (an an a
105 dBm 1444	adhilan pilanadaquili	and the provident	and a fail of the state of the			and a starked	i ^M ill <mark>er (18. 01. 11. 11. 11. 11. 11. 11. 11. 11. 11</mark>		
-110 dBm									
-115 dBm									
1.164 GHz			10000 pt	S	7	.6 MHz/			1.24 GHz

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1559 MHz to 1610 MHz horizontal

Ref Level -7	0.00 dBm	RBW 1	. kHz						
Att		F 10 s 🗢 VBW 3	8 kHz - Mode Au	ito Sweep					
TDF "UWB1-18"									
1 Frequency S	weep								●1Rm Max
								M1[1]	-97.78 dBm
								1.6	00 001 45 GHz
-75 dBm									
-80 dBm									
-oo ubiii									
-85_dBm	H1 -85.300 dB	m							
-90 dBm									
-95 dBm									
50 dbm								41	
								Ĭ	
-100 dBm									
to all the all distance	a solution of	بالمتحال المليا	الاساني واللاط	والقصافيا المتحاريان المقاسما		a sa ang ang ang ang ang ang ang ang ang an	alla, te uda alladia di Uda	المواليسانية ويقالك الألبار الأ	a billio tari ti babi da ku
nder halte de la de l			i ki si da kati kat i ku si si si si	We are shared from a low	est officilly is house of	dender nichte die Auflichen.	a heliata a	and the state of t	i frys i staat i s
-105 dBm	linght activities with total	La sub considerate de	hala and a child	Amerika ka k	A CONTRACTOR OF A CONTRACT	koniolihaan ka kaki	hi peri di tetti della	a hilara kirihi a na a a	an de la technicia de la
a collecte and all	and the first first states.	امتلاع لين بالشمانات هريباه	Read International Co	de la colte de la			the market of the		distribution of the
-110 dBm									
-115 dBm									
1.559 GHz			10000 pt	S	5	.1 MHz/			1.61 GHz

1559 MHz to 1610 MHz vertical

2 10 16 10 1			1.1.1						
RefLevel -70 Att		• RBW 1 10 s • VBW 3							
TDF "UWB1-18"		10 2 - ARM 2	KHZ Mode Au	to Sweep					
1 Frequency S									o1Rm Max
								M1[1]	-97.78 dBm
								1.6	00 001 45 GHz
-75 dBm									
-80 dBm									
-85_dBm	H1 -85,300 dB								
00-0011	HI -85.300 dB	m							
-90 dBm									
-95 dBm									
								41 Y	
-100 dBm									
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-110 dBm									
-115 dBm									
1.559 GHz			10000 pt	S	5	1 MHz/			1.61 GHz

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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.



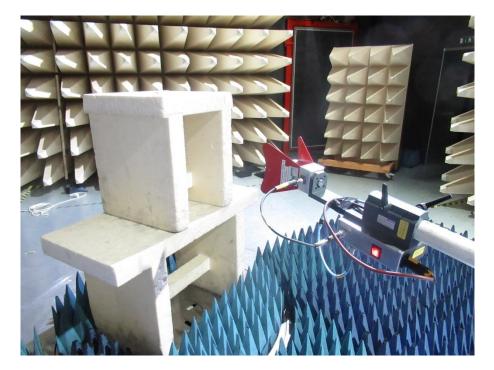
5.4 Peak Power radiated

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 15.517(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



FCC ID: 2ALC5-KNX-TM1

IC: 25557-KNXTM1

5.4.5 Test result





Channel 5



Min. limit margin:

-0.22 dB at 4495.0 MHz

The requirements are FULFILLED.

Remarks:

None.

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6 USED TEST EQUIPMENT AND ACCESSORIES

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

IC: 25557-KNXTM1

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	FSW43 AMF-6D-01002000-22-10P	02-02/11-21-001 02-02/17-15-004	22/05/2024	22/05/2023		
	AMF-6D-01002000-22-10P 3117 BAM 4.5-P NCD KK-SF106-2X11N-6,5M BAT-EMC 2022.0.23.0	02-02/17-15-004 02-02/24-05-009 02-02/50-17-024 02-02/50-17-025 02-02/50-18-016 02-02/68-13-001	12/07/2024	12/07/2023		
SER 2	ESVS 30 VULB 9168 NW-2000-NB KK-EF393/U-16N-21N20 m KK-SD_7/8-2X21N-33,0M 50F-003 N 3 dB	02-02/03-05-006 02-02/24-05-005 02-02/50-05-113 02-02/50-12-018 02-02/50-15-028 02-02/50-21-010	27/07/2024 20/04/2024	27/07/2023 20/04/2023	03/05/2024	03/05/2023
SER 3	FSW43 AMF-6D-01002000-22-10P LNA-40-18004000-33-5P	02-02/11-21-001 02-02/17-15-004 02-02/17-20-002	22/05/2024	22/05/2023		
	3117 BBHA 9170 BAM 4.5-P NCD KK-SF106-2X11N-6,5M KMS116-GL140SE-KMS116- BAT-EMC 2022.0.23.0	02-02/24-05-009 02-02/24-05-013 02-02/50-17-024 02-02/50-17-025 02-02/50-18-016	12/07/2024 21/03/2026	12/07/2023 21/03/2023	21/03/2024	21/03/2023