



EMI - TEST REPORT

- FCC Part 15.250, RSS-210 -

Type / Model Name : KINEXON SafeTag KNX-T1.8-5

Product Description : Tracking System

Applicant : KINEXON Inc.

Address : 25 Broadway Floor 9

NEW YORK, NY 10004, 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. : T46535-00-01SK

11. August 2020

Date of issue



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

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ATTACHMENT A as separate supplement

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
Part 15, Subpart C, Section 15.250	Operation of wideband systems within the band 5925-7250 MHz

ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
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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
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KDB 393764 D01 v02 (January 29, 2018)	Ultra-Wideband (UWB) Devices – Frequently Asked Questions
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2 EQUIPMENT UNDER TEST

2.1 General remarks

This test report replaces the test report T46535-00-00SK.

2.2 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.

2.3 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.

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

2.5 Equipment type

Portable UWB Device

2.6 Short description of the equipment under test (EUT)

The product emits UWB signals which can be used to measure the time-of-flight to determine the distance between two or more tags and alert the user in case the distance falls below a configurable level. Also, this tag can be used as part of a real-time location system (RTLS) to determine its absolute position.

Number of tested samples: 1
Serial number: 67319
Firmware version: 4.29.0

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

2.7 Variants of the EUT

There are no variants. The EUT does contain a USB interface which is contacted by two of the pins at the bottom of the housing and connected to the charging station.

2.8 Operation frequency and channel plan

The operating frequency band is 5925 MHz to 7250 MHz.

Channel plan:

Channel number	f _c (MHz)
Channel 5	6489.6

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

2.9 Transmit operating modes

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

Data rate: 6.8 Mbit/s

2.10 Antenna

The EUT has only an integrated PCB antenna, no temporary connector and no external antenna to be connected.

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 3.7 V/DC

2.12 Peripheral devices and interface cables

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

- | | | | |
|---|-------------|---------|----------|
| - | <u>None</u> | Model : | <u>-</u> |
| - | <u></u> | Model : | <u></u> |

2.13 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.

2.13.1 Test jig

No test jig is used.

2.13.2 Test software

No test software was used. The EUT is in a continuous transmission mode.

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

3 TEST RESULT SUMMARY

UWB device using digital modulation:

Operating in the 5925 MHz - 7250 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	not applicable
15.250(b)	RSS-210, Annex K, K2	UWB Bandwidth	passed
15.209(a) 15.250(c)	RSS-Gen, 8.9 RSS-210, Annex K, K3(a)	Radiated Emissions 9 kHz to 40 GHz	passed
15.250(d)	RSS-210, Annex K, K3(b)	Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz	passed
15.250(d)	RSS-210, Annex K, K3(c)	Peak Power radiated	passed
15.203	RSS-Gen, 6.6	Antenna requirement	passed

Note: AC power line conducted emissions not applicable because EUT has no AC mains connection.

The mentioned RSS Rule Parts in the above table are related to:
RSS-Gen, Issue 5, March 2019
RSS-210, Issue 10, December 2019

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 : 18 June 2020

Testing concluded on : 03 August 2020

Checked by:

Tested by:

Klaus Gegenfurtner
Teamleader Radio

Sabine Kugler
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 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	$\pm 3.29 \text{ dB}$
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%	$\pm 3.53 \text{ dB}$
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	$\pm 3.71 \text{ dB}$
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	$\pm 2.34 \text{ dB}$
Peak conducted output power	902 MHz to 928 MHz	95%	$\pm 0.35 \text{ dB}$
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	$\pm 2.15 \text{ dB}$

4.4 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

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 (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 or CISPR 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	-	CISPR Limit	=
Delta								
(MHz)	(dBµV)		(dB)		(dBµV/m)		(dBµV/m)	(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	= -2.4

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

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency 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 1.0 X 1.5 metre non-conducting table, 1.5 metre above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in 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 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. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyzer set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

The peak EIRP limit on the peak level of the emission according to FCC Part 15 Subpart C §15.250:
For RBW = 50 MHz: $20 * \log_{10}(\text{RBW}/50) \text{ dBm} = \mathbf{0 \text{ dBm}}$

The test setup is prepared with the EUT at the desired EUT-antenna separation.
The turntable is rotated 360° until the test receiver displays the maximum level at the observed frequency.
The antenna height is then adjusted from 1 m to 4 m maximizing the measured value.
The turntable is re-adjusted to re-affirm the maximum emission value which is then recorded.
This procedure is repeated for all frequencies of interest.

5 TEST CONDITIONS AND RESULTS

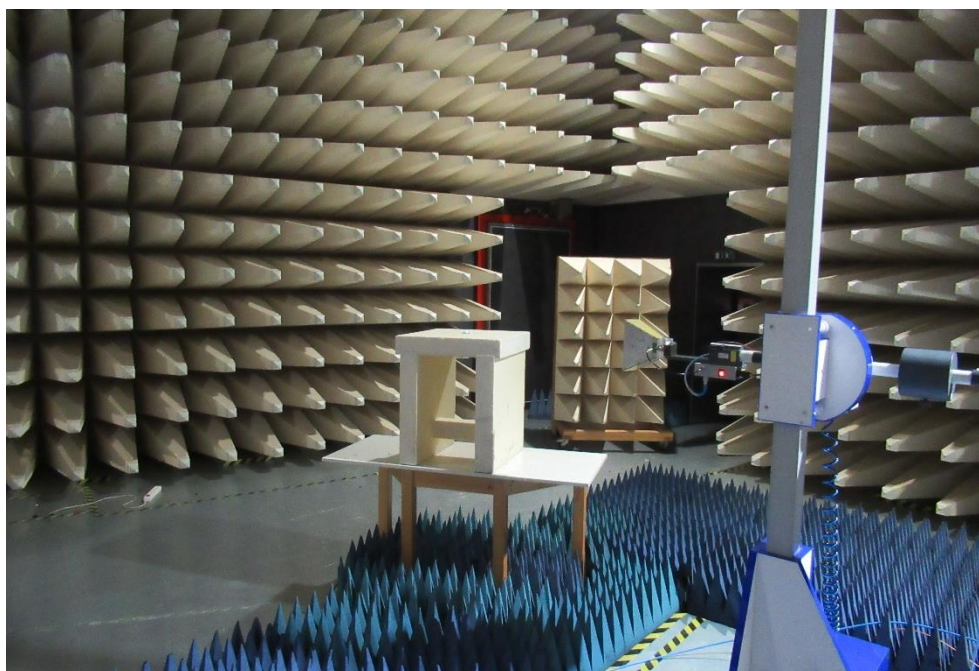
5.1 UWB Bandwidth

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



FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

5.1.3 Applicable standard

According to FCC Part 15, Section 15.250(a):

The -10 dB bandwidth of a device operating under the provisions of this section must be contained within the 5925-7250 MHz band under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

According to FCC Part 15, Section 15.250(b):

The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the -10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of §15.31(m)

5.1.4 Description of Measurement

The measurement was performed radiated at a distance of 1 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

lowest frequency f_L (MHz)	highest frequency f_H (MHz)	permitted frequency range (GHz)	UWB bandwidth (MHz)	required UWB bandwidth (MHz)	result
6239.4	6738.25	5.925 – 7.250	498.85	> 50	passed
				< 500	passed

Limit according to FCC Part 15, Section 15.250(b):

The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz.

Limit according to RSS-210 Annex K, K.2(b):

The 10 dB bandwidth of the device shall be at least 50 MHz and less than 500 MHz.

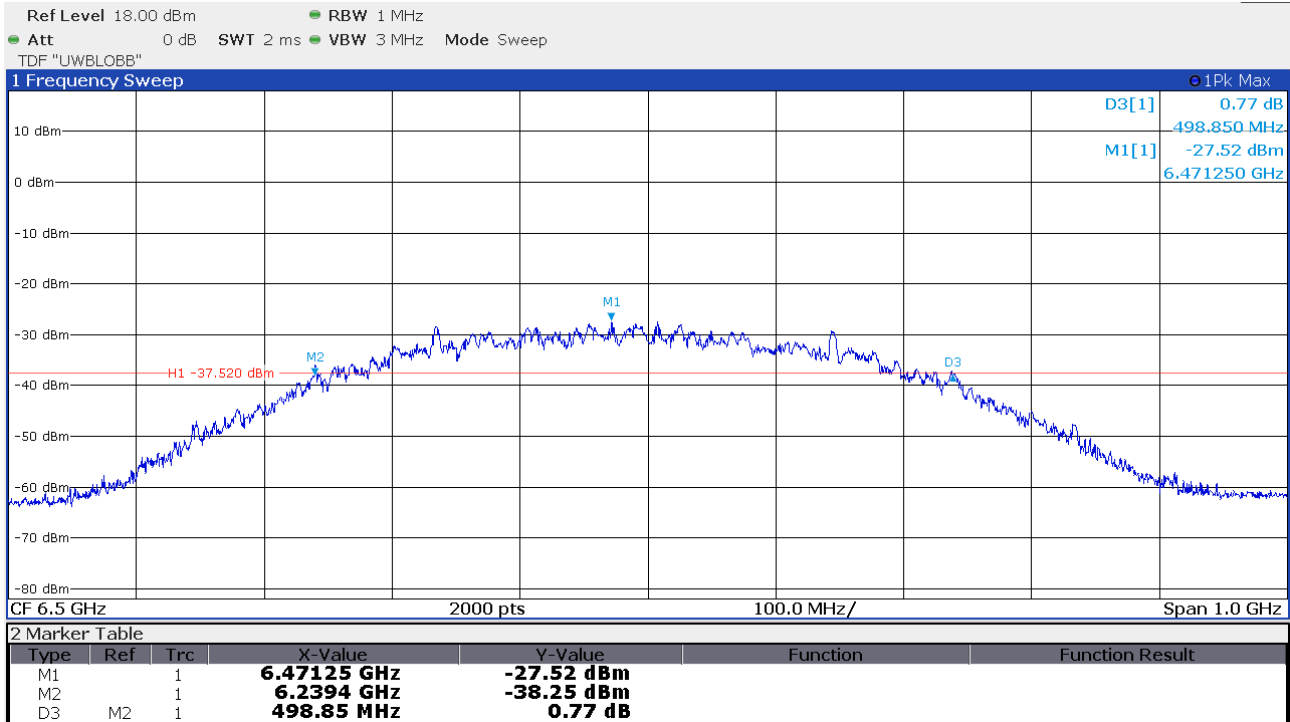
The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to the following test protocol.

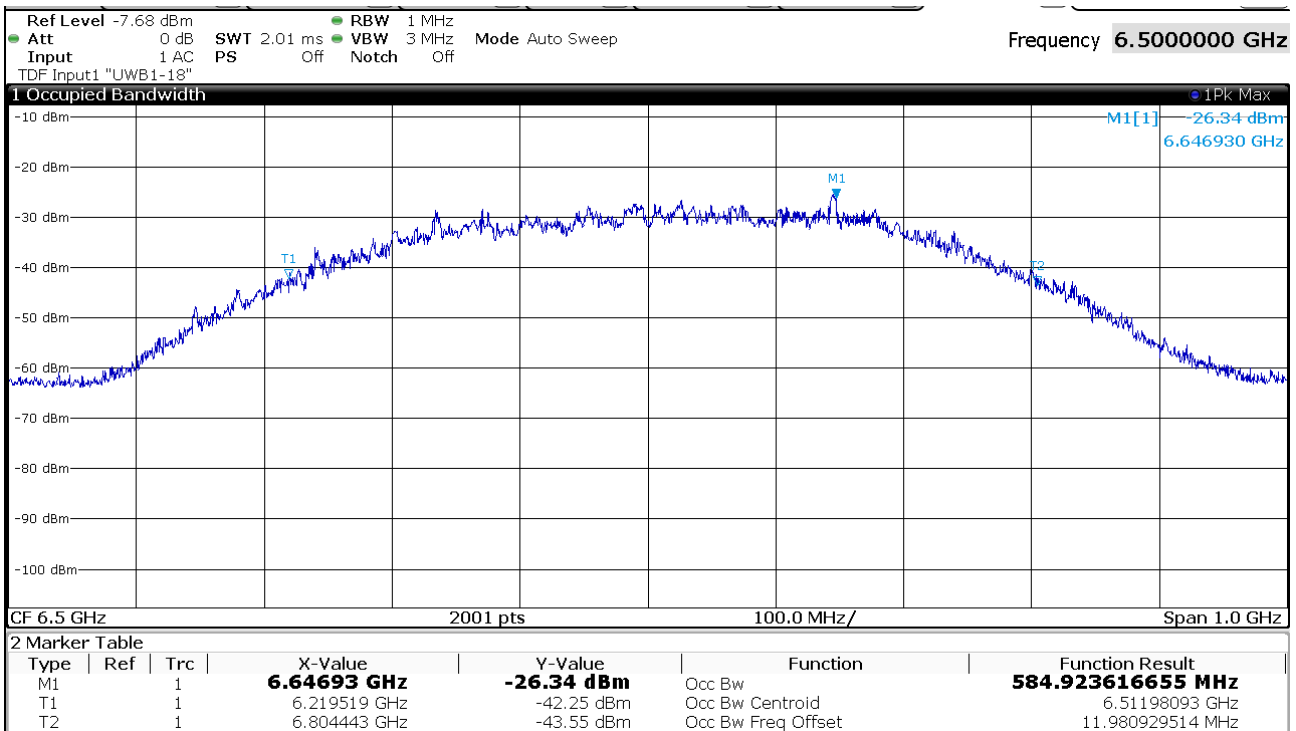
FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

5.1.6 Test protocol EBW

-10dB bandwidth



99% bandwidth



FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

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

30 MHz – 960 MHz:

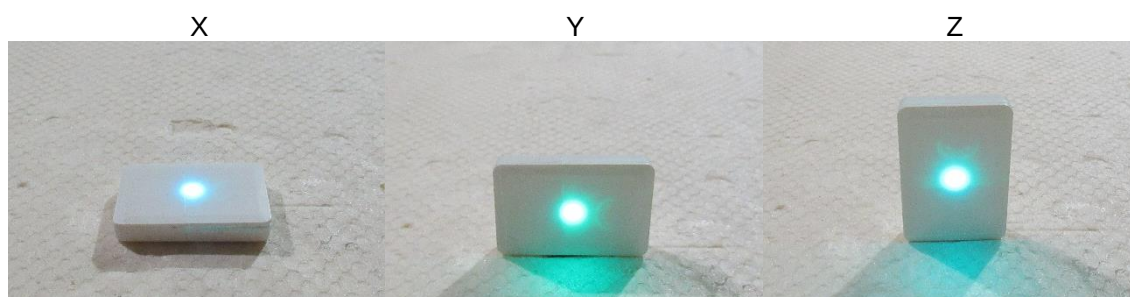
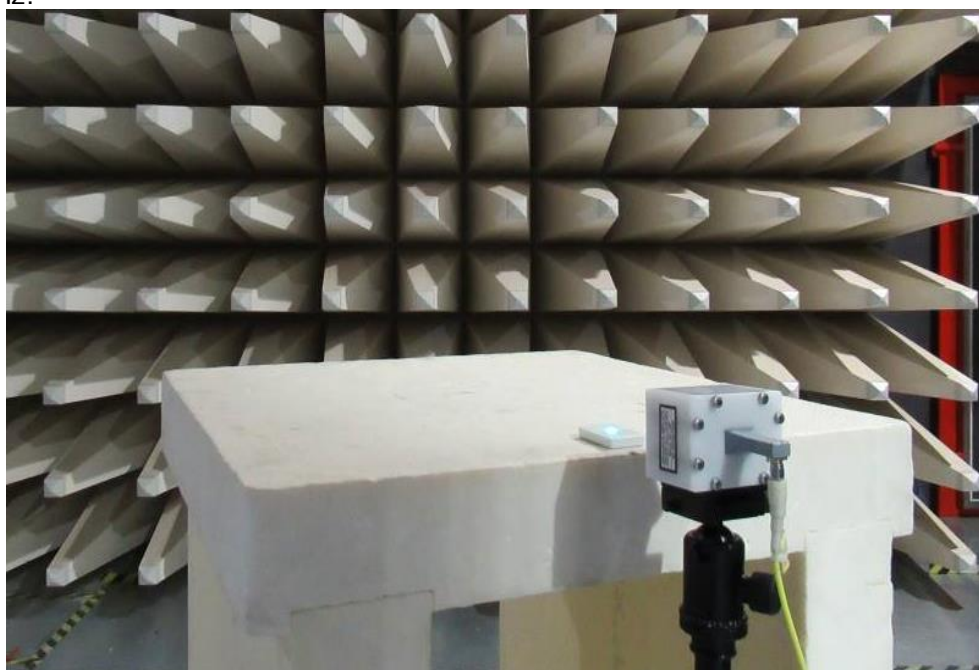


960 MHz – 18 GHz:



FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

18 GHz – 40 GHz:



5.2.3 Applicable standard

According to FCC Part 15, Section 15.250(d):

Radiated emissions at or below 960 MHz 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 RMS average limits based on measurements using a 1 MHz resolution bandwidth.

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	Sweptime: 1ms per MHz

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

5.2.5 Test result

5.2.5.1 Measurement 9 kHz to 30 MHz

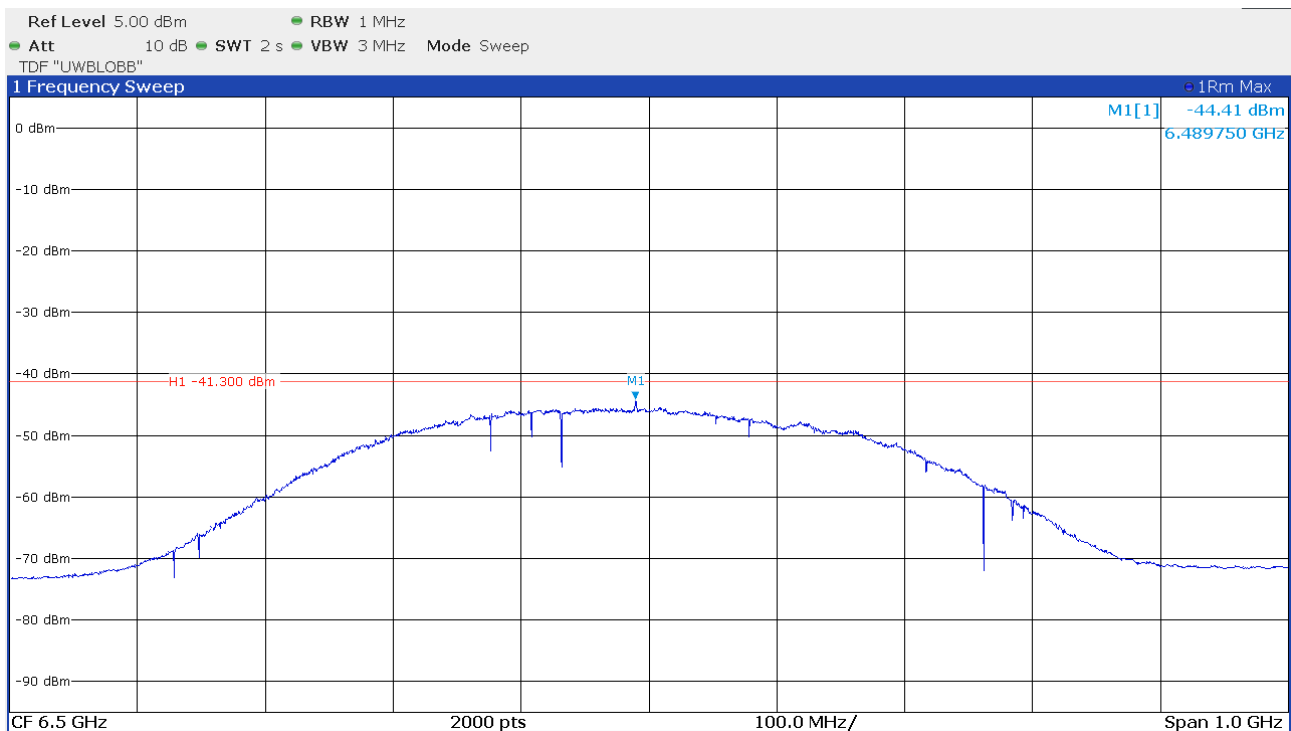
Note: Pre-measurements have shown, there are no detectable emissions in this frequency range.

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)
36.30	5.0	-3.1	12.6	13.7	17.6	10.6	40.0	-22.4
109.90	0.4	-3.1	12.5	11.6	12.9	8.5	43.5	-30.6
197.90	3.1	1.0	13.3	12.7	16.4	13.7	43.5	-27.1
304.80	-3.0	-1.4	16.5	16.9	13.5	15.5	46.0	-30.5
442.50	-3.5	-3.5	20.5	20.7	17.0	17.2	46.0	-28.8
604.70	-3.5	-3.4	24.2	24.6	20.7	21.2	46.0	-24.8
730.10	-3.0	-3.2	26.0	26.5	23.0	23.3	46.0	-22.7
841.00	-2.5	-2.6	27.7	28.3	25.2	25.7	46.0	-20.3

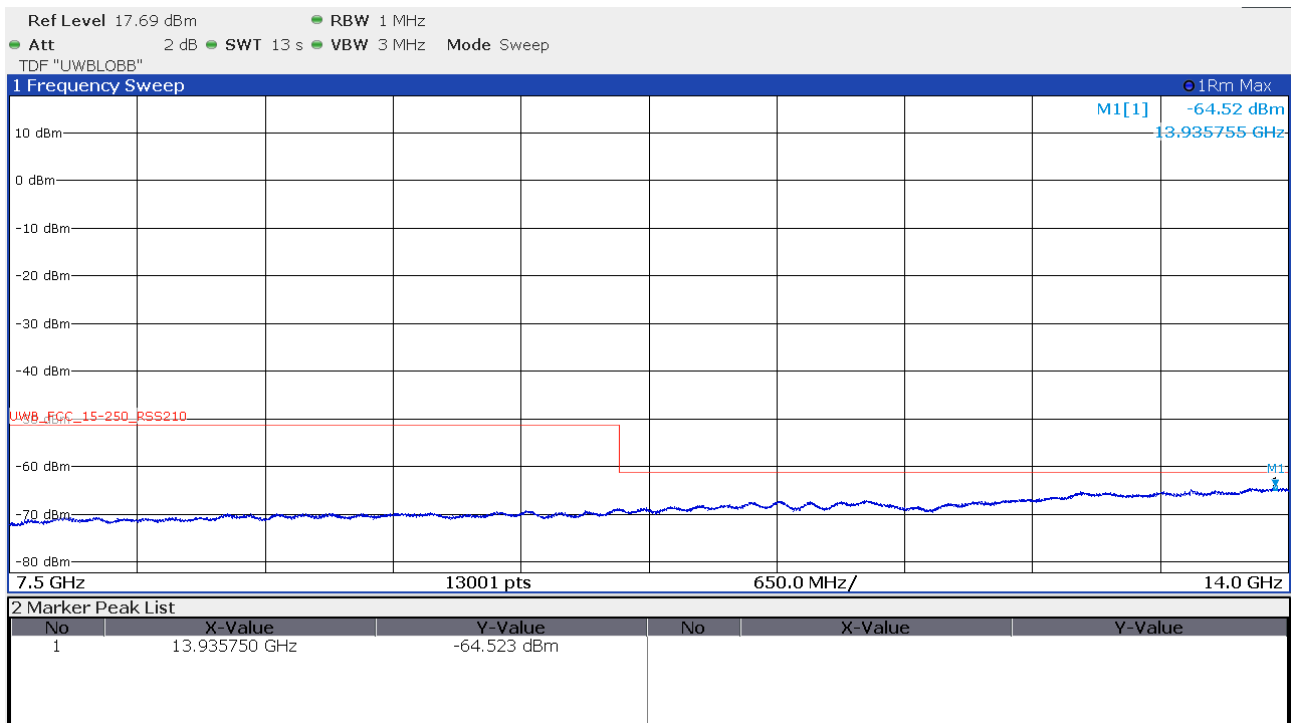
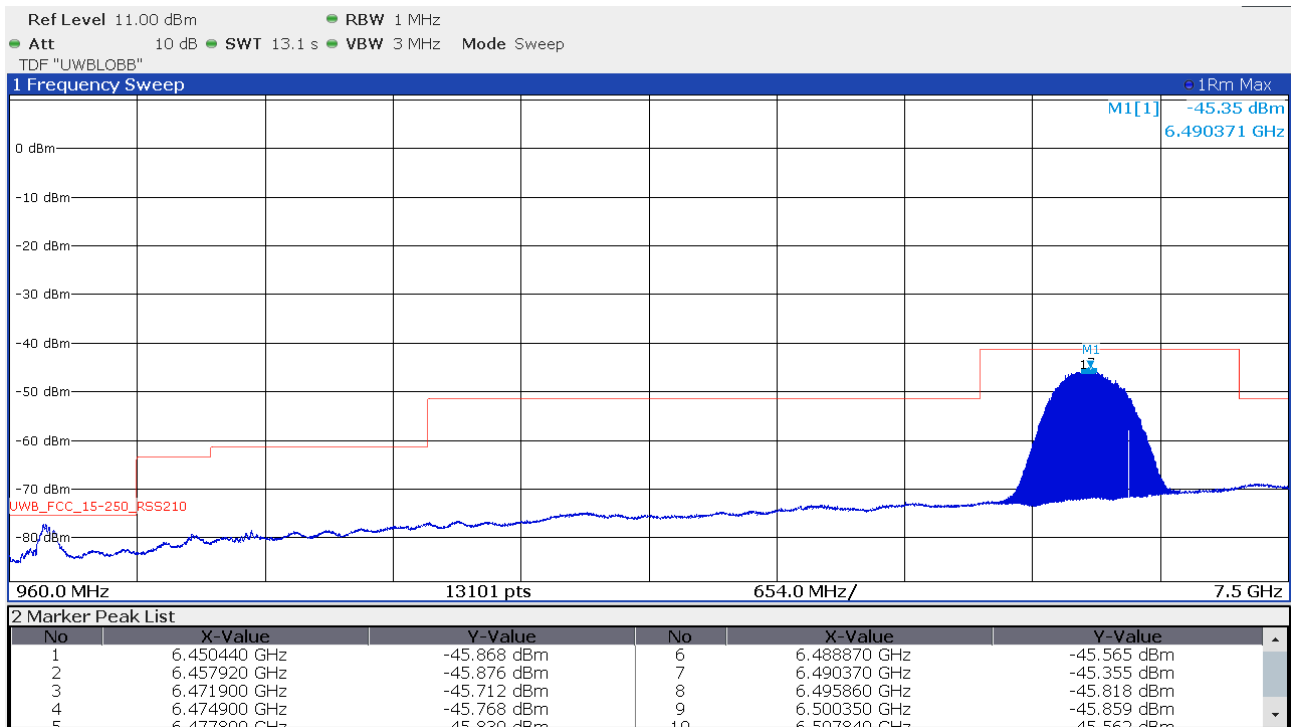
5.2.5.3 Measurement 960 MHz to 40 GHz

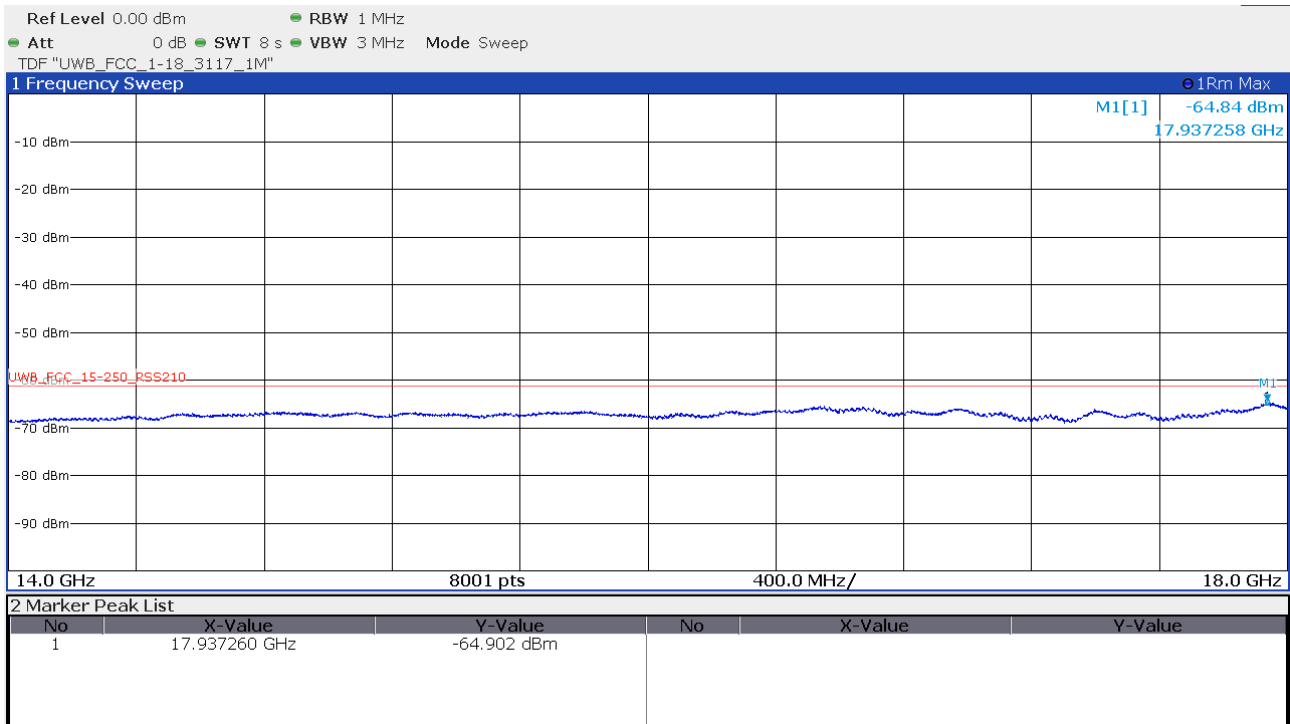
Mean Power



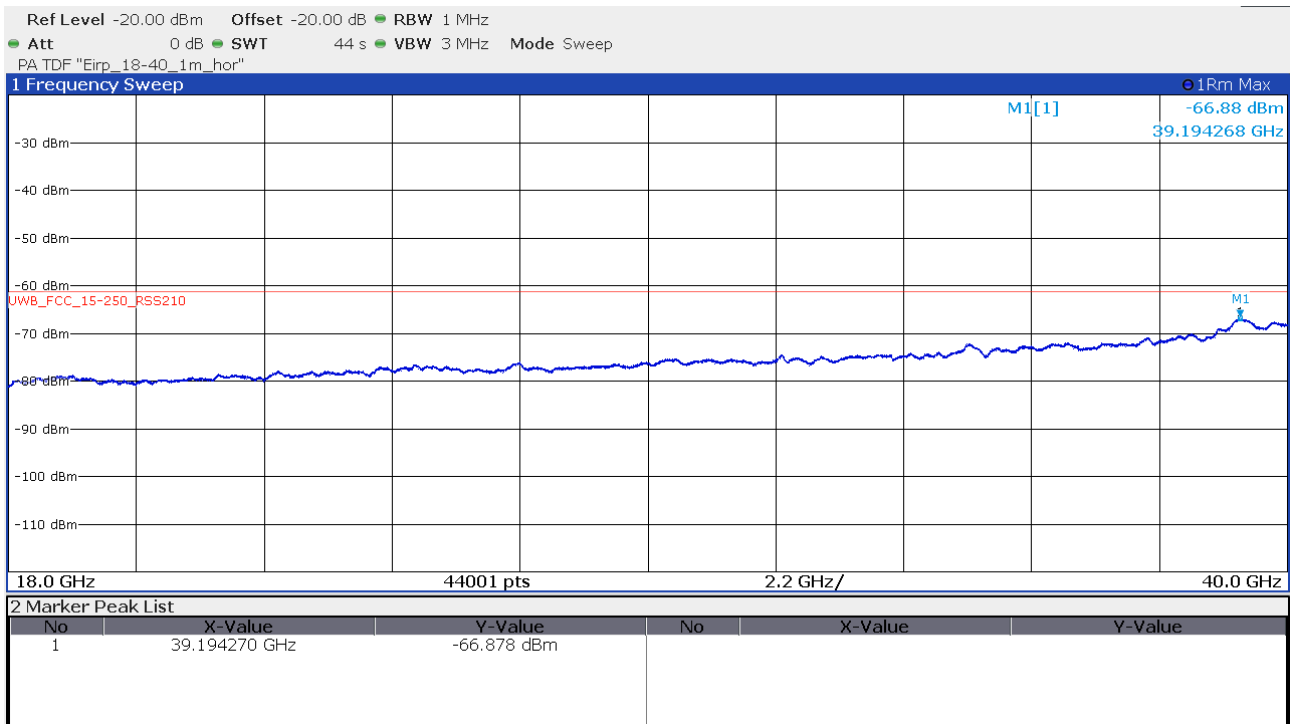
FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

960 MHz to 18 GHz:



FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1


18 GHz to 40 GHz at 10 cm distance:



Note: The measurement distance for the frequency range 18 GHz to 40 GHz was changed from 1 m to 10 cm. Therefore an offset of 20 dB/decade was added (according to §15.31(f)(1)).

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1
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 §15.250(d)(1) 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
3100-5925	-51.3
5925-7250	-41.3
7250-10600	-51.3
Above 10600	-61.3

Limit according RSS-210 K.3(a) 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
3100-5925	-51.3
5925-7250	-41.3
7250-10600	-51.3
Above 10600	-61.3

The requirements are **FULFILLED**.

Remarks: None.

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

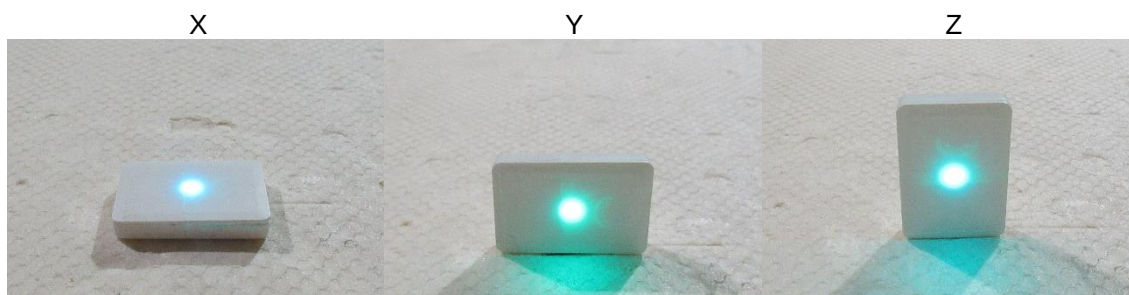
5.3 Radiated Emissions at 1164-1240 MHz and 1559-1610 MHz

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 15.250(d):

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

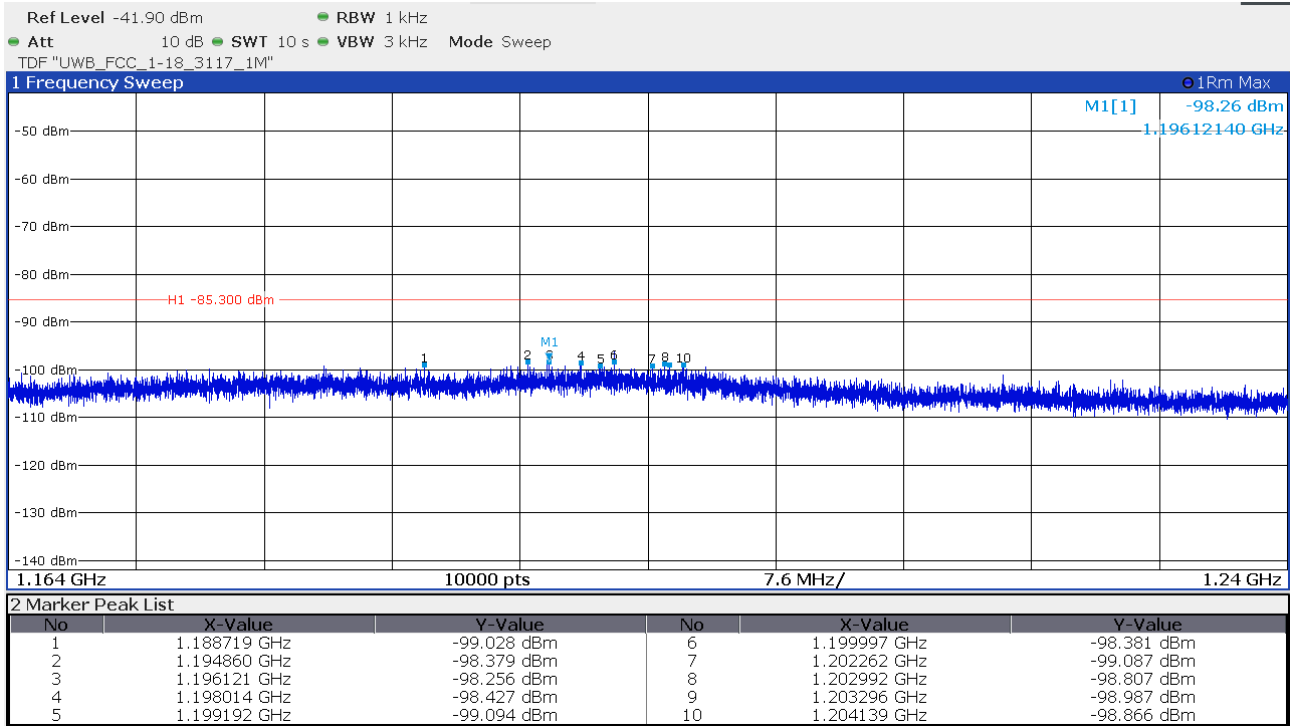
5.3.4 Analyser settings

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

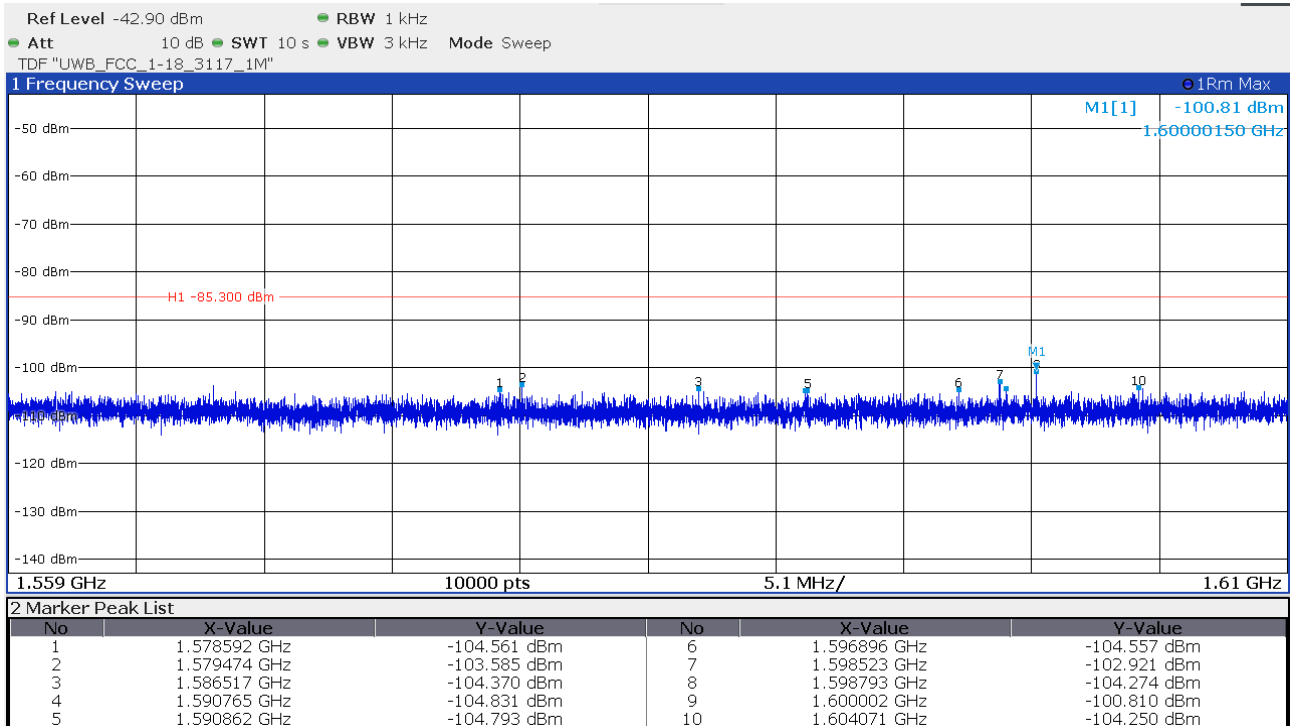
FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

5.3.5 Test result

1164 MHz to 1240 MHz



1559 MHz to 1610 MHz



FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

Limit according §15.250(d)(2):

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

The requirements are **FULFILLED**.**Remarks:** None.

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

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



X

Y

Z



5.4.3 Applicable standard

According to FCC Part 15, Section 15.250(d)(3):

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.

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

5.4.4 Analyser settings

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

Since the RBW is set greater than 3 MHz the following information is required:

Detailed Description of the test procedure

The EUT was placed on a 1.50 m high pedestal. The measuring system containing of a horn antenna and a pre-amplifier was placed at a distance of 1 m from the EUT. All measurements were performed in a semi-anechoic chamber. In order to determine the worst case orientation, the EUT was set in all 3 orthogonal axes, where in each orientation the EUT was rotated 360° and high scans up to 4 m were performed.

Instrumentation employed in the testing

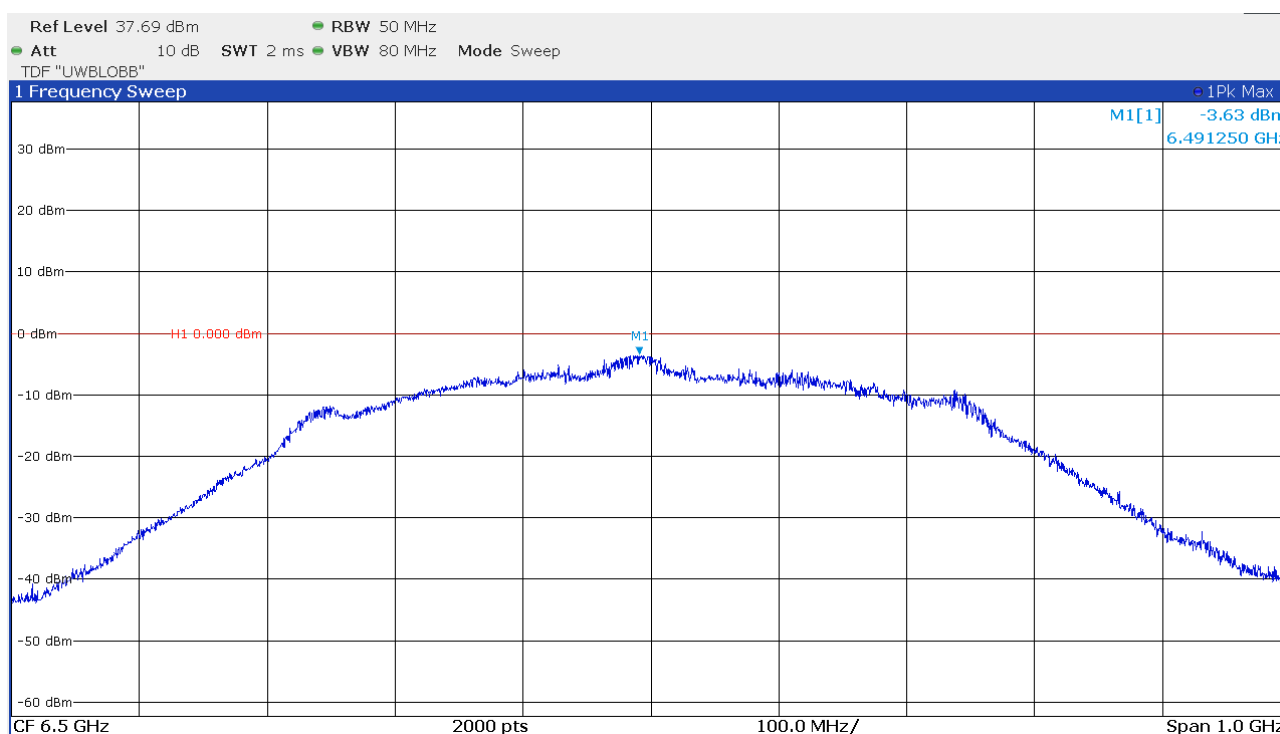
Please see section 6 part CPR 3 of this test report.

Calibration of the test setup

Please see the calibration certificates in section 8 of this test report.

For the determination of the measurement data please see ANSI C63.10-2013 chapter 10.3.8 and 10.3.9.

5.4.5 Test result



Min. limit margin: -3.63 dB at 6491.25 MHz

The requirements are **FULFILLED**.

Remarks: None.

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

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 an integrated antenna. No other antenna can be used with the device.

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

Remarks: None

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

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	Kind of Equipment	Manufacturer	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	ESW26	EMI Test Receiver	Rohde & Schwarz München	02-02/03-17-002	16/01/2021	16/01/2020		
	FSW43	Spectrum Analyser	Rohde & Schwarz München	02-02/11-15-001	02/04/2021	02/04/2020		
	AMF-6D-01002000-22-10P	RF Amplifier	MITEQ, Inc.	02-02/17-15-004				
	3117	Horn Antenna 1 - 18 GH	EMCO Elektronik GmbH	02-02/24-05-009	18/06/2021	18/06/2020		
	LOBB 18	Horn Antenna 1 - 18 GH	TÜV Slowakai	02-02/24-05-026	27/02/2021	27/02/2020		
	18N-20	Coax Attenuator 20dB	Tactron Elektronik	02-02/50-17-003				
	NMS111-GL200SC01-NMS	RF Cable	GigaLane Co., Ltd.	02-02/50-17-012				
	BAM 4.5-P	Antenna Mast	maturo GmbH	02-02/50-17-024				
	NCD	Controller for Antenna M	maturo GmbH	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	RF Cable	Huber + Suhner	02-02/50-18-016				
	BAT-EMC 3.19.1.24	Nexio Software	EMCO Elektronik GmbH	02-02/68-13-001				
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006	15/07/2021	15/07/2020		
	VULB 9168	Trilog Broadband Antenn	Schwarzbeck Mess-Elektron	02-02/24-05-005	19/09/2020	19/07/2019		
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	RF Cable 20m	Huber + Suhner	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	RF Cable 33 m	Huber + Suhner AG	02-02/50-15-028				
SER 3	FSW43	Spectrum Analyser	Rohde & Schwarz München	02-02/11-15-001	02/04/2021	02/04/2020		
	AMF-6D-01002000-22-10P	RF Amplifier	MITEQ, Inc.	02-02/17-15-004				
	3117	Horn Antenna 1 - 18 GH	EMCO Elektronik GmbH	02-02/24-05-009	18/06/2021	18/06/2020		
	BBHA 9170	SHF-EHF Horn Antenna	Schwarzbeck Mess-Elektron	02-02/24-05-014	12/06/2021	12/06/2018	14/01/2021	14/01/2020
	LOBB 18	Horn Antenna 1 - 18 GH	TÜV Slowakai	02-02/24-05-026	27/02/2021	27/02/2020		
	KMS102-1 m	RF Cable	Tactron Elektronik	02-02/50-11-014				
	18N-20	Coax Attenuator 20dB	Tactron Elektronik	02-02/50-17-003				
	NMS111-GL200SC01-NMS	RF Cable	GigaLane Co., Ltd.	02-02/50-17-012				
	BAM 4.5-P	Antenna Mast	maturo GmbH	02-02/50-17-024				
	NCD	Controller for Antenna M	maturo GmbH	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	RF Cable	Huber + Suhner	02-02/50-18-016				
	BAT-EMC 3.19.1.24	Nexio Software	EMCO Elektronik GmbH	02-02/68-13-001				

7 DETAILED MEASUREMENT UNCERTAINTY

7.1 Overview

Measurement instrumentation uncertainty shall be taken into account when determining compliance or non-compliance with a disturbance limit.

The measurement instrumentation uncertainty for a test laboratory shall be evaluated. The standard uncertainty $u(x_i)$ in decibels and the sensitivity coefficient c_i shall be evaluated for the estimate x_i of each quantity. The combined standard uncertainty $u_c(y)$ of the estimate y of the measurand shall be calculated as

$$u_c(y) = \sqrt{\sum_i c_i^2 u^2(x_i)}$$

The expanded measurement instrumentation uncertainty U_{lab} for a test laboratory shall be calculated as $U_{lab} = 2 u_c(y)$

$$U_{lab} = 2 u_c(y)$$

Compliance or non-compliance
following manner:

with a disturbance limit shall be determined in the

If U_{lab} is less than or equal to U_{CISPR} in the table below, then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{CISPR} in the table below, then:

- compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{CISPR})$, exceeds the disturbance limit.
- non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{CISPR})$, exceeds the disturbance limit.

7.2 Definitions and symbols

X_i	Input quantity
x_i	estimate of X_i
$u(x_i)$	standard uncertainty of x_i
c_i	sensitivity coefficient
$u_c(y)$	(combined) standard uncertainty of y
Y	result of a measurement, (the estimate of the measured), corrected for all recognised significant systematic effects
U	expanded uncertainty of y

7.3 Measurement uncertainty

Measurement	U_{lab} [dB]
Conducted disturbance	+ 2.53 / - 2.77
Radiated disturbance (electric field)	
- 10 m test distance	+ 3.16 / - 3.22
- 3 m test distance	+ 3.16 / - 3.22
- Frequency range: 30 MHz – 200 MHz	
Radiated disturbance (electric field)	
- 10 m test distance	+ 4.51 / - 4.51
- 3 m test distance	+ 4.51 / - 4.51
- Frequency range: 200 MHz – 1000 MHz	
Radiated disturbance (electric field)	
- 3 m test distance	+ 5.07 / -3.70
- Frequency range: 1 GHz – 30 GHz	

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8 CALIBRATION DATA

Verification Data of Anechoic Chamber 1:



Form

Verification Protocol – SiteVSWR A1

Description:	Order Nr.:
SER3 – A1	☒ 02-02/30-11-001

Literature

CISPR 16-1-4, Edition 3.2, 2017: Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances.

Remarks:

This verification protocol describes the site validation as defined in CISPR 16-1-4.
Due to the fact that the QM system describes verification and calibration only,
it was not renamed in "Validation Protocol"

Tested by:	Approved by:
 Oliver Hauser 2020.01.14 21:17:54 +01'00'	 Seamus Murray 2020.01.15 09:50:28 +01'00'
Date: 14.01.2020	Date: 15.01.2020

CSA Group Bayern GmbH
Ohmstraße 1-4
D-94342 Strasskirchen
Telefon: +49 9424 9481-0

Erstellt von: Oliver Hauser

Seite 1 von 11

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

Calibration Certificate of FSW43 02-02/11-15-001



akkreditiert durch die / accredited by the

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / as calibration laboratory in the



Deutschen Kalibrierdienst



Kalibrierschein

Calibration certificate

Kalibrierzeichen

Calibration mark

547380
D-K- 15195-01-01
2020-04

Gegenstand
Object **FSW43 SPECTRUM ANALYZER 43GHZ**

Hersteller
Manufacturer **ROHDE & SCHWARZ**

Typ
Type **FSW43**

Fabrikat/Serien-Nr.
Serial number **103792**

Auftraggeber
Customer **CSA Group Bayern GmbH**

**Ohmstraße 1-4
94342 Straßkirchen
DE**

Auftragsnummer
Order No. **265/20, 02-02/11-15-001**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **3 Certificate
18 Outgoing Results
18 Incoming Results**

Datum der Kalibrierung
Date of calibration **2020-04-02**

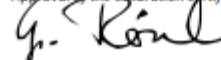
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Datum der Ausstellung
Date of issue

2020-04-03

Freigabe des Kalibrierscheins durch
Approval of the calibration certificate by



Dr. Gerhard Rösel
Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory



Daniel Gust
Bearbeiter
Person in charge

Rohde & Schwarz Messgerätebau GmbH • Rohde-und-Schwarz-Str. 1 • 87700 Memmingen • Telephone national: 08331/10-80 International: 0049 8331/10-80
Fax: 08331/10-811 24 • Managing Director: Jürgen Steigmüller • Chairman of the Supervisory Board: Dr. Marc Sesterhenn • Company's Place of Business: München
Commercial Register No.: HRB 1 059 • VAT Identification No.: DE 811 190 745

FCC ID: 2ALC5-KNX-STAG1 IC: 25557-KNXSTAG1

Calibration Certificate of Antenna LOBB 18 02-02/24-05-026:

CSA Internal

SEIBERSDORF
LABORATORIES

Kalibrierstelle für Antennen und Feldsonden
Calibration Body for Antennas and Field Probes

Akkreditiert durch / accredited by
AKKREDITIERUNG AUSTRIA



Kalibrierschein nach ISO/IEC 17025
Calibration Certificate according to ISO/IEC 17025

Kalibrierzeichen
Calibration mark

EH-A276/20
0612
26.02.2020

Gegenstand
Object
Horn Antenna

Hersteller & Typ
Manufacturer & Type
TÜV Slowakia LOBB 18

Herstellernummer
Serial number
AH0401001/10QN622008D

Auftraggeber
Customer
CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 Strasskirchen
Deutschland

Auftragsnummer
Order Nr.
LL7.00059.0.0-A-7574_1
Ext. Ord. No.: 05/20

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The user is obliged to have the object recalibrated at appropriate intervals.

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate
1 - 4

Datum der Kalibrierung
Date of calibration
26.02.2020

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Datum
Date
26.02.2020

Zeichnungsberechtigter
Authorized person


Patrick Preiner

Bearbeiter
Person responsible


Markus Václav

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Regional court Wiener Neustadt | Company no. 319187v | DVR no. 4000728 | VAT: ATU64767504 | Tax no. 15265/1 | Certified according to ISO 9001:2008
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