EMC – TEST REPORT

- FCC Part 15B -

Type / Model Name	:	KNX-A1.8
Product Description	:	UWB Anchor
Applicant	:	Kinexon Sports & Media Inc.
Address	:	22 west 38th
		New York, NY 10018
Manufacturer	:	Kinexon GmbH
Address	:	Schellingstraße 35
		80799 München

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

Test Report No. :	**T44481-00-07KS**	27. November 2018 Date of issue

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

Bundesnetzagentur
BNetzA-CAB-13/21-07

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.

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October, 2018)

Part 15, Subpart B, Section 15.107	AC Line conducted emission ☐ Class A device ☒ Class B device
Part 15, Subpart B, Section 15.109	Radiated emission, general requirements ☐ Class A device ☒ Class B device
ANSI C63.4: 2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-4-2: 2011 + A1: 2014 EN 55016-4-2: 2011	Uncertainty in EMC measurement

2 SUMMARY

2.1 Summary for all EMC tests

Type of test	Test result
Emission:	
A4 Conducted emission (AC mains power / DC power)	passed
A5 Radiated emission (< 1 GHz)	passed
SER 3 Radiated emission (> 1 GHz)	passed

2.2 Final assessment

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

Date of receipt of test sample : acc. to storage records

Testing commenced on : 24. August 2018

Testing concluded on : 08. October 2018

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document.
2018.11.27 16:21:41 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Kathrin Schiebl
I am the author of this document
2018.11.27 16:16:19 +01'00'

Kathrin Schiebl
Radio Team

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT B

3.2 Power supply system utilised

Power supply voltage : 12 V DC

Note: The EUT has a DC socket which can be powered with 12 V to 24 V DC. The measurements were performed with a power adapter from the shelf (ETSA120330UD). The EUT can be powered over Ethernet, too. A PoE switch from Cisco was used. Additionally, the conducted emissions measurement was performed with a PoE switch from Cisco.

3.3 Highest internal frequency

Highest internal frequency : 5825 MHz

3.4 Short description of the Equipment under Test (EUT)

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: 3 samples
Serial number: pre-production samples
Firmware version: 4.15.0

3.5 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- Operation mode 1: UWB, BLE, WLAN 2.4 GHz & WLAN 5 GHz active

- Operation mode 2: UWB off

3.6 EUT configuration

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

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

- Laptop Model : Fujitsu E780
- Computer Model : Intel NUC Kit NUC6i5SYH
- PoE switch Model : Cisco SF302-08PP

Port	Cable	Screening	Transmission	Status	Length
1	AC power adaptor	unshielded	analogue	active	ca. 2.80 m
2	LAN	shielded	digital	active	ca. 5 m

Modifications during the EMC test: **None**

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Accreditation and Recognition of the test laboratory

Within the framework of the Mutual Recognition Agreement (MRA) between the European Community and the USA the EMC test laboratory listed above has been approved as a Conformity Assessment Body (CAB) designated by the EU member states through the conclusion of the MRA on the basis of Article 133 of the treaty

The site is accredited/registered by

- the German accreditation body DAkkS-Registration No.: D-PL-12030-01-01
- the Federal Communications Commission (FCC) Registration Number: 0013864798
- the German Federal Network Agency as Conformity assessment body (CAB) Registration No: BnetzA-CAB-13/21-07

4.3 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.4 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

4.5 Statement of the measurement uncertainty

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

4.6 Measurement protocol for FCC

4.6.1 General information

4.6.1.1 Test methodology

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4 procedures.

4.6.1.2 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.

4.6.2 Details of test procedures

4.6.2.1 General standard information

The test methods used comply with ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

4.6.3 Conducted emission

4.6.3.1 Description of measurement

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit.

To convert between dBµV and µV, the following conversions apply:

dBµV = 20(log µV)

µV = Inverse log(dBµV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 µH (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.6.4 Radiated emission (electrical field 30 MHz - 1 GHz)

4.6.4.1 Description of measurement

Spurious emission from the EUT is measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized 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 metre 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 C63.4. 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. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with both horizontal and vertical antenna polarization planes and the EUT is rotated 360 degrees.

The final level, expressed in dBµV/m, is arrived at by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver where the correction factors are stored. The FCC or CISPR limit is subtracted from this result in order to provide the limit margins listed in the measurement protocols.

The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Reading level (dBµV)	+	Correction Factor* (dB/m)	=	Level (dBµV/m)	-	CISPR Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

*Correction Factor = Antenna Factor + Cable Attenuation = 30 dB/m + 2.6 dB = 32.6 dB/m

4.6.4.2 Measurement Procedure

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.

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

4.6.5.1 Description of measurement

Radiated emission from the EUT are measured in the frequency range of 1 GHz to the maximum frequency as specified in 47 CFR Part 15 Subpart A section 15.33, using a tuned receiver (Spectrum Analyser) and appropriate linearly polarized antennas. Table top equipment is placed on a 0.65 X 1.5 metre non-conducting table 80 centimetres above the ground plane. The turntable must be fully covered with the appropriate absorber (Type VHP-12).
Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4.
The interface cables that are closer than 40 centimetres to the ground plane are bundled in the centre 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 centre of the table and to a screened room located outside the test area. The antenna is positioned 3 metres horizontally from the EUT.
Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to a peak detector function and a resolution and video bandwidth of 1 MHz. All tests are performed at a test distance of 3 metres. Hand-held or body-worn devices are rotated around three orthogonal axes in order to determine the position, angle and configuration having the maximum emission. The cables and equipment are placed and moved within the range of their likely positioning to find the maximum emission. These conditions will then be used for the final measurements. The antenna height is then adjusted from 1 m to 4 m maximizing the measured value. The antenna is mounted to a boresight axis so the antenna centre always points to the EUT.
Other devices are placed according to their general purpose. The turntable is rotated 360° until the spectrum analyser 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.
When the EUT is larger than the beamwidth 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 demonstrate that emissions are under the limits at the specified test distance.

5 TEST CONDITIONS AND RESULTS

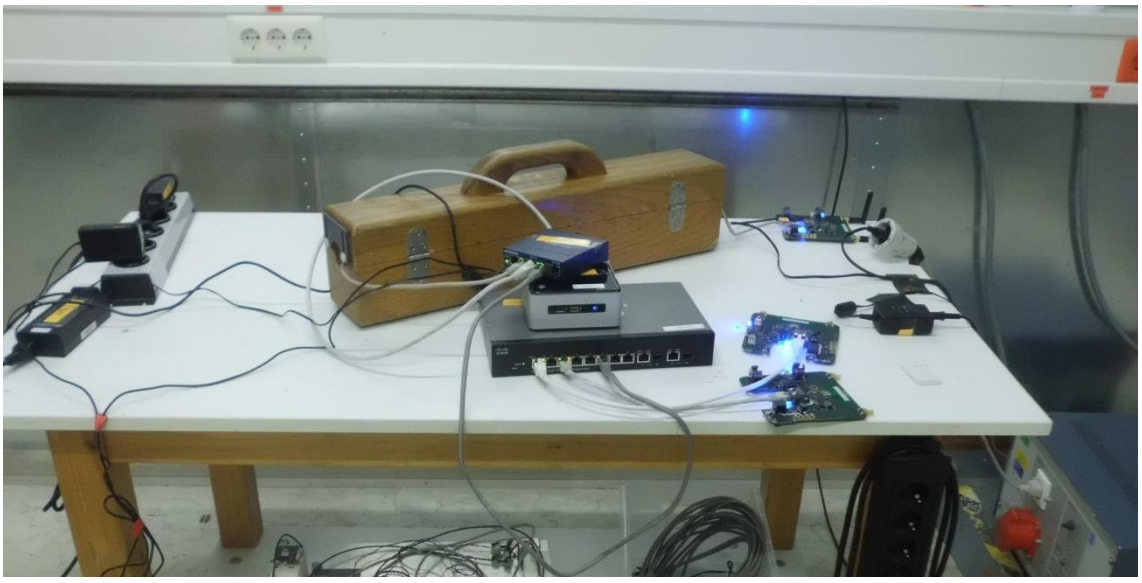
5.1 Conducted emission

For test instruments and accessories used see section 6 Part **A 4**.
Legend for tables:
QP-L … QuasiPeak reading including correction factor
AV-L … Average reading including correction factor
D-Limit… Measured value to limit delta (margin)

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test setup



5.1.3 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 4.84 dB at 0.15 MHz

The requirements are **FULFILLED.**

Remarks: For detailed results, please see the following page(s).

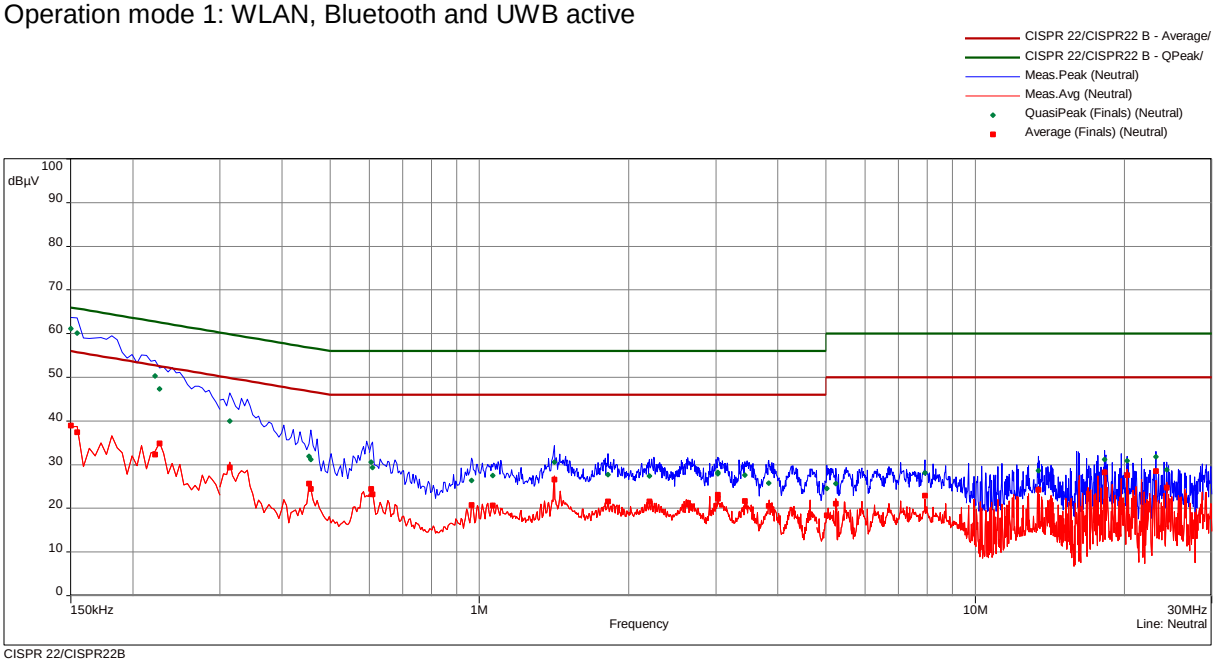
For description of the measurement see 4.6.3.

This test was performed with the sample 36123 and the samples 36101 & 36099 as companion device.

5.1.4 Test protocol

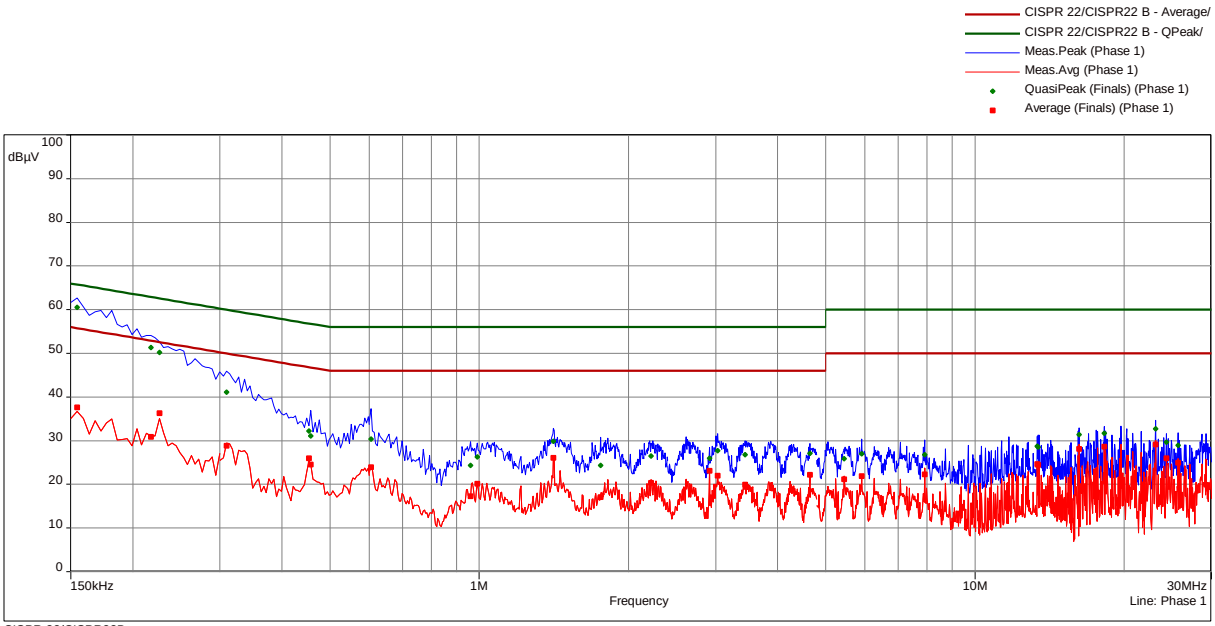
Powered with power adapter ETSA 120330UD

Operation mode 1: WLAN, Bluetooth and UWB active



CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.15	61.16	4.84	66.00	38.93	17.07	56.00	Neutral	10.07
0.1545	60.11	5.64	65.75	37.38	18.37	55.75	Neutral	10.08
0.222	50.31	12.43	62.74	32.29	20.46	52.74	Neutral	10.11
0.2265	47.37	15.20	62.58	34.90	17.67	52.58	Neutral	10.11
0.3135	39.99	19.89	59.88	29.36	20.52	49.88	Neutral	10.12
0.453	31.91	24.91	56.82	25.63	21.19	46.82	Neutral	10.14
0.4575	31.16	25.57	56.74	24.40	22.33	46.74	Neutral	10.14
0.6045	30.61	25.39	56.00	24.47	21.53	46.00	Neutral	10.16
0.609	29.34	26.66	56.00	23.26	22.74	46.00	Neutral	10.16
0.9645	26.41	29.59	56.00	20.77	25.23	46.00	Neutral	10.18
1.0635	27.51	28.49	56.00	20.68	25.32	46.00	Neutral	10.20
1.416	30.61	25.39	56.00	26.63	19.37	46.00	Neutral	10.25
1.8165	27.69	28.31	56.00	21.63	24.37	46.00	Neutral	10.26
2.2035	27.39	28.61	56.00	21.59	24.41	46.00	Neutral	10.28
3.0255	27.88	28.12	56.00	22.22	23.78	46.00	Neutral	10.34
3.03	28.25	27.75	56.00	23.08	22.92	46.00	Neutral	10.34
3.435	27.64	28.36	56.00	21.66	24.34	46.00	Neutral	10.35
3.8355	25.79	30.21	56.00	20.52	25.48	46.00	Neutral	10.38
5.025	24.58	35.42	60.00	18.37	31.63	50.00	Neutral	10.45
5.2365	25.69	34.31	60.00	21.02	28.98	50.00	Neutral	10.46
7.923	28.08	31.92	60.00	22.95	27.05	50.00	Neutral	10.61
13.4205	28.62	31.38	60.00	24.27	25.73	50.00	Neutral	10.90
18.2445	31.24	28.76	60.00	28.24	21.76	50.00	Neutral	11.17
20.2575	30.86	29.14	60.00	27.61	22.39	50.00	Neutral	11.25
23.1285	31.86	28.14	60.00	28.49	21.51	50.00	Neutral	11.27
24.348	28.86	31.14	60.00	24.80	25.20	50.00	Neutral	11.27

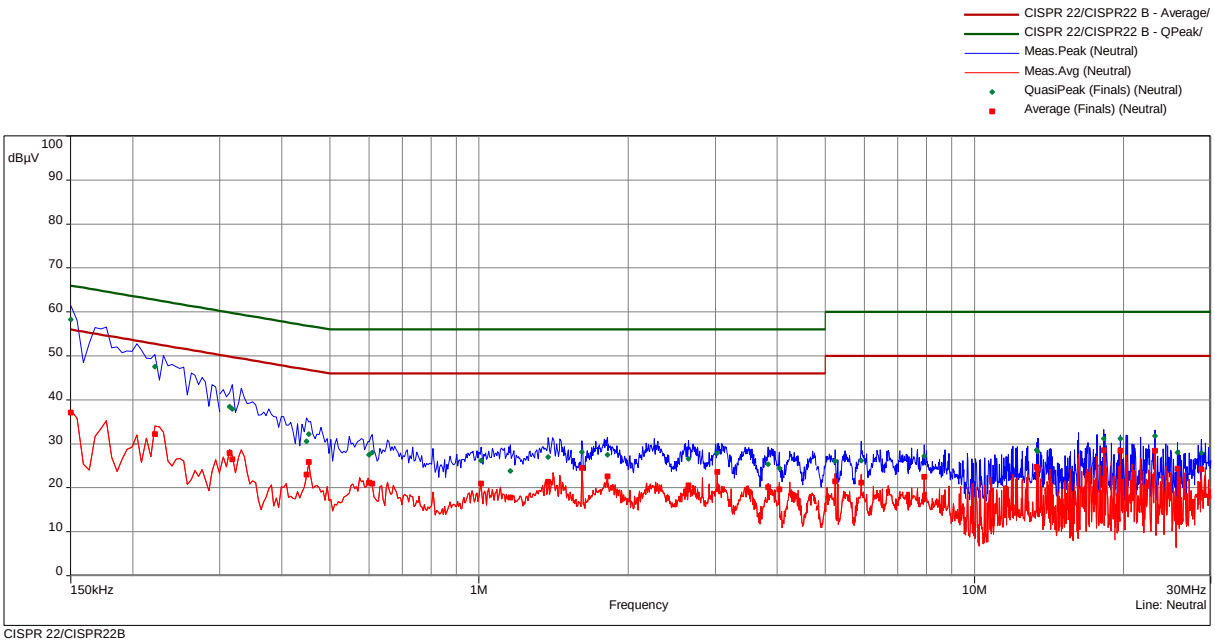


CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.1545	60.57	5.19	65.75	37.65	18.10	55.75	Phase 1	10.08
0.2175	51.30	11.61	62.91	30.89	22.02	52.91	Phase 1	10.09
0.2265	50.25	12.33	62.58	36.30	16.28	52.58	Phase 1	10.10
0.309	41.11	18.89	60.00	28.87	21.13	50.00	Phase 1	10.12
0.453	32.18	24.64	56.82	26.01	20.81	46.82	Phase 1	10.14
0.4575	31.12	25.62	56.74	24.52	22.22	46.74	Phase 1	10.14
0.6045	30.36	25.64	56.00	23.95	22.05	46.00	Phase 1	10.16
0.96	24.35	31.65	56.00	17.26	28.74	46.00	Phase 1	10.18
0.9915	26.33	29.67	56.00	20.18	25.82	46.00	Phase 1	10.19
1.4115	29.90	26.10	56.00	26.08	19.92	46.00	Phase 1	10.25
1.758	24.30	31.70	56.00	17.05	28.95	46.00	Phase 1	10.27
2.2215	26.46	29.54	56.00	20.39	25.61	46.00	Phase 1	10.29
2.913	26.00	30.00	56.00	23.13	22.87	46.00	Phase 1	10.34
3.0255	27.75	28.25	56.00	21.94	24.06	46.00	Phase 1	10.35
3.4395	26.81	29.19	56.00	19.95	26.05	46.00	Phase 1	10.35
4.6455	27.07	28.93	56.00	22.17	23.83	46.00	Phase 1	10.44
5.4525	25.93	34.07	60.00	21.19	28.81	50.00	Phase 1	10.49
5.907	27.03	32.97	60.00	21.91	28.09	50.00	Phase 1	10.52
7.923	26.75	33.25	60.00	22.25	27.75	50.00	Phase 1	10.65
13.3575	28.70	31.30	60.00	24.66	25.34	50.00	Phase 1	11.04
13.4205	28.51	31.49	60.00	24.44	25.56	50.00	Phase 1	11.05
16.2285	31.42	28.58	60.00	28.12	21.88	50.00	Phase 1	11.25
18.2445	31.70	28.30	60.00	28.65	21.35	50.00	Phase 1	11.37
23.1285	32.70	27.30	60.00	29.12	20.88	50.00	Phase 1	11.61
24.348	29.64	30.36	60.00	25.96	24.04	50.00	Phase 1	11.66
25.6935	28.99	31.01	60.00	24.97	25.03	50.00	Phase 1	11.69

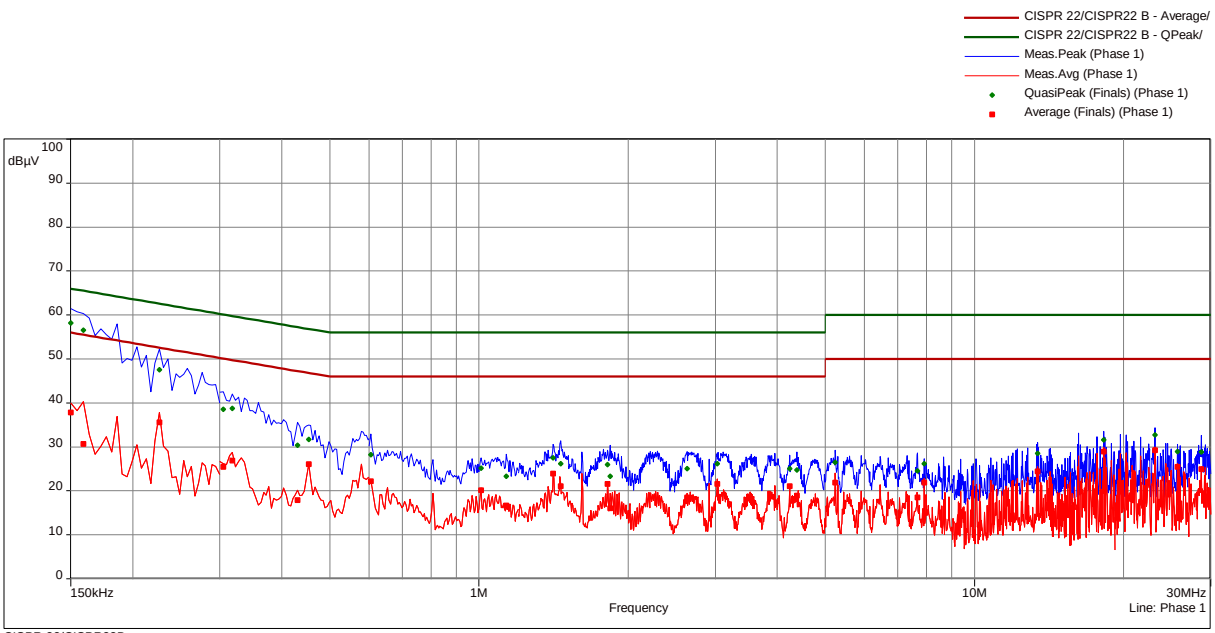
Powered with power adapter ETSA 120330UD

Operation mode 2: Standby, WLAN, Bluetooth and UWB off



CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.15	58.33	7.67	66.00	37.15	18.85	56.00	Neutral	10.07
0.222	47.50	15.24	62.74	32.19	20.56	52.74	Neutral	10.11
0.3135	38.42	21.45	59.88	27.94	21.94	49.88	Neutral	10.12
0.318	37.98	21.77	59.76	26.54	23.22	49.76	Neutral	10.13
0.4485	30.61	26.30	56.90	22.97	23.93	46.90	Neutral	10.14
0.453	32.23	24.59	56.82	25.88	20.94	46.82	Neutral	10.14
0.6	27.51	28.49	56.00	21.20	24.80	46.00	Neutral	10.15
0.609	27.98	28.02	56.00	21.00	25.00	46.00	Neutral	10.16
1.0095	26.19	29.81	56.00	20.92	25.08	46.00	Neutral	10.19
1.158	23.88	32.12	56.00	17.80	28.20	46.00	Neutral	10.21
1.38	26.98	29.02	56.00	21.42	24.58	46.00	Neutral	10.24
1.614	28.15	27.85	56.00	24.52	21.48	46.00	Neutral	10.26
1.8165	27.51	28.49	56.00	22.59	23.41	46.00	Neutral	10.26
2.6475	26.58	29.42	56.00	20.54	25.46	46.00	Neutral	10.32
3.0255	27.95	28.05	56.00	23.63	22.37	46.00	Neutral	10.34
3.831	25.34	30.66	56.00	20.13	25.87	46.00	Neutral	10.38
4.038	24.41	31.59	56.00	19.69	26.31	46.00	Neutral	10.39
5.2365	26.13	33.87	60.00	21.45	28.55	50.00	Neutral	10.46
5.907	26.17	33.83	60.00	21.15	28.85	50.00	Neutral	10.50
7.923	27.20	32.80	60.00	22.48	27.52	50.00	Neutral	10.61
13.3575	28.63	31.37	60.00	24.78	25.22	50.00	Neutral	10.90
13.4205	28.20	31.80	60.00	24.34	25.66	50.00	Neutral	10.90
18.2445	31.16	28.84	60.00	28.49	21.51	50.00	Neutral	11.17
19.7085	31.18	28.82	60.00	28.43	21.57	50.00	Neutral	11.23
23.1285	31.83	28.17	60.00	28.44	21.56	50.00	Neutral	11.27
25.6935	28.03	31.97	60.00	24.39	25.61	50.00	Neutral	11.24
28.686	27.95	32.05	60.00	24.29	25.71	50.00	Neutral	11.14

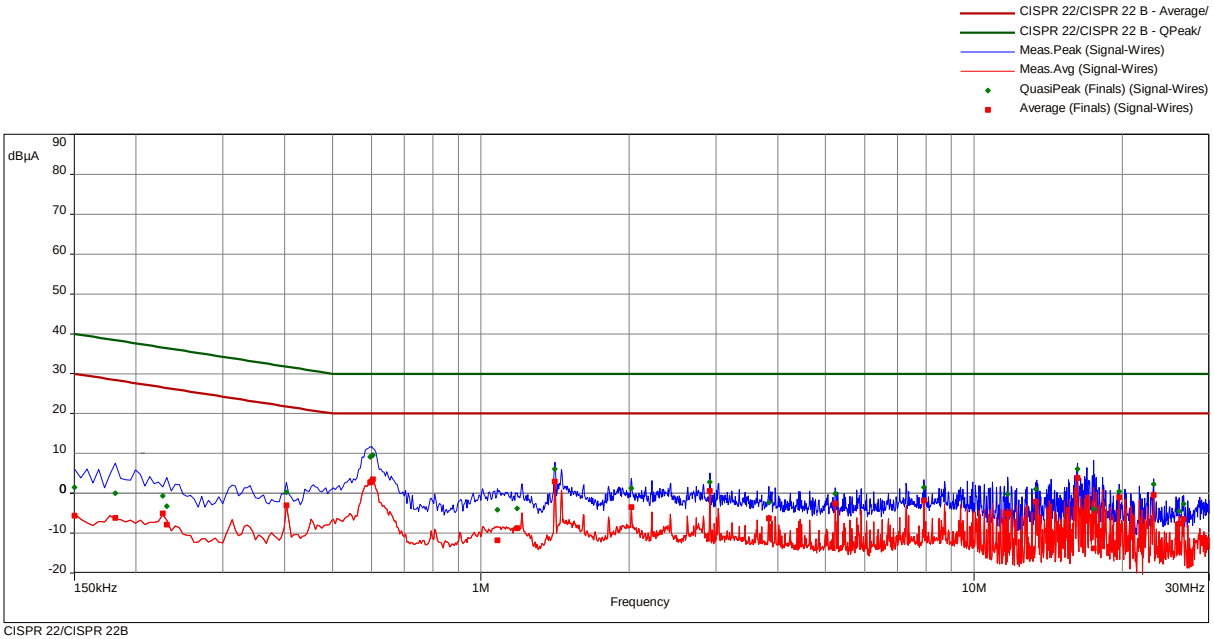


CISPR 22/CISPR22B

freq	QP	margin	limit	AV	margin	limit	line	corr
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB		dB
0.15	58.16	7.84	66.00	37.83	18.17	56.00	Phase 1	10.07
0.159	56.51	9.01	65.52	30.66	24.86	55.52	Phase 1	10.08
0.2265	47.54	15.04	62.58	35.63	16.94	52.58	Phase 1	10.10
0.3045	38.55	21.56	60.12	25.48	24.64	50.12	Phase 1	10.12
0.318	38.80	20.96	59.76	26.93	22.83	49.76	Phase 1	10.13
0.4305	30.39	26.85	57.24	17.94	29.30	47.24	Phase 1	10.14
0.453	31.68	25.14	56.82	26.05	20.77	46.82	Phase 1	10.14
0.6045	28.24	27.76	56.00	22.16	23.84	46.00	Phase 1	10.16
1.0095	25.13	30.87	56.00	20.15	25.85	46.00	Phase 1	10.19
1.1355	23.32	32.68	56.00	16.70	29.30	46.00	Phase 1	10.21
1.4115	27.54	28.46	56.00	23.94	22.06	46.00	Phase 1	10.25
1.461	26.20	29.80	56.00	21.09	24.91	46.00	Phase 1	10.25
1.8165	25.94	30.06	56.00	21.57	24.43	46.00	Phase 1	10.26
1.839	23.36	32.64	56.00	16.02	29.98	46.00	Phase 1	10.26
2.634	25.10	30.90	56.00	18.47	27.53	46.00	Phase 1	10.33
3.0255	26.22	29.78	56.00	21.57	24.43	46.00	Phase 1	10.35
4.236	25.02	30.98	56.00	21.11	24.89	46.00	Phase 1	10.42
4.3845	24.80	31.20	56.00	18.96	27.04	46.00	Phase 1	10.43
5.2365	26.53	33.47	60.00	21.91	28.09	50.00	Phase 1	10.47
7.671	24.52	35.48	60.00	18.47	31.53	50.00	Phase 1	10.64
7.923	26.15	33.85	60.00	21.86	28.14	50.00	Phase 1	10.65
13.4205	28.50	31.50	60.00	24.46	25.54	50.00	Phase 1	11.05
18.2445	31.57	28.43	60.00	28.93	21.07	50.00	Phase 1	11.37
23.1285	32.68	27.32	60.00	29.26	20.74	50.00	Phase 1	11.61
25.6935	28.93	31.07	60.00	25.42	24.58	50.00	Phase 1	11.69
28.686	28.82	31.18	60.00	24.95	25.05	50.00	Phase 1	11.71

Power over Ethernet switch

Operation mode 1: WLAN, Bluetooth and UWB active

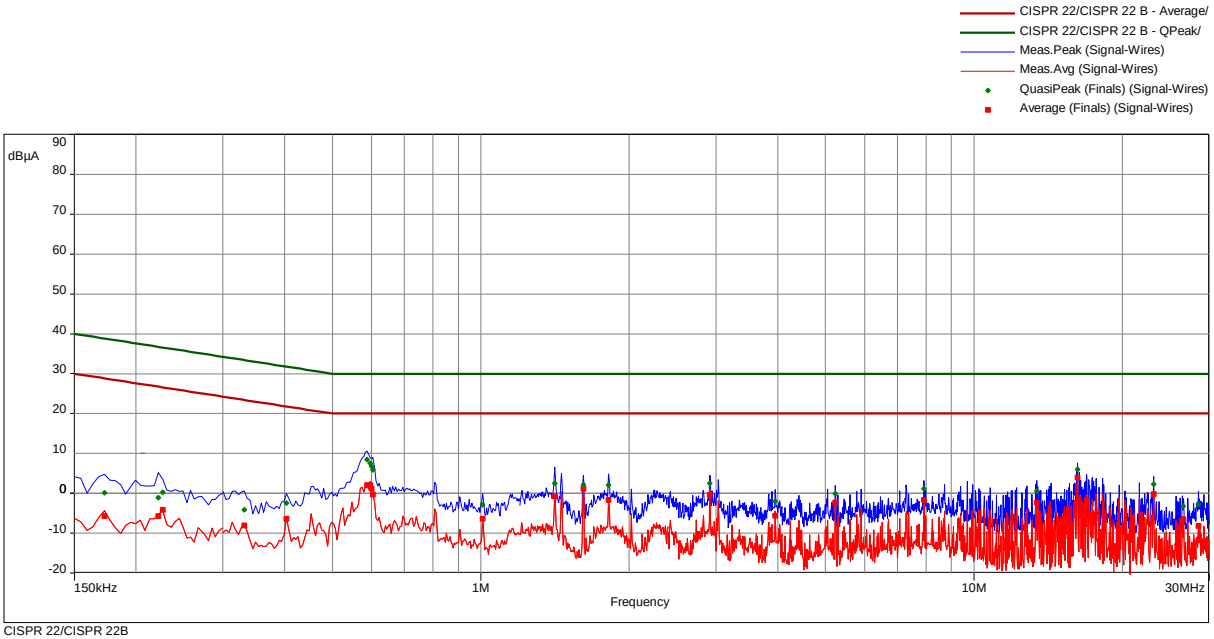


CISPR 22/CISPR 22B

freq	QP	margin	limit	AV	margin	limit	corr
MHz	dB(µA)	dB	dB	dB(µA)	dB	dB	dB
0.15	1.51	38.49	40.00	-5.54	35.54	30.00	2.88
0.1815	0.07	38.35	38.42	-6.17	34.58	28.42	1.33
0.2265	-0.66	37.24	36.58	-4.98	31.56	26.58	-0.24
0.231	-3.28	39.70	36.41	-7.86	34.28	26.41	-0.36
0.4035	0.22	31.56	31.78	-3.06	24.84	21.78	-4.15
0.597	9.18	20.82	30.00	2.77	17.23	20.00	-6.32
0.6	9.35	20.65	30.00	2.99	17.01	20.00	-6.34
0.6045	9.57	20.43	30.00	3.53	16.47	20.00	-6.36
1.0815	-4.14	34.14	30.00	-11.76	31.76	20.00	-8.48
1.185	-3.74	33.74	30.00	-8.72	28.72	20.00	-8.58
1.4115	6.05	23.95	30.00	2.92	17.08	20.00	-8.79
2.019	1.21	28.79	30.00	-3.46	23.46	20.00	-9.37
2.913	2.86	27.14	30.00	0.55	19.45	20.00	-9.38
3.8355	-2.30	32.30	30.00	-6.28	26.28	20.00	-9.44
5.2365	-0.14	30.14	30.00	-2.52	22.52	20.00	-9.48
7.923	1.47	28.53	30.00	-1.73	21.73	20.00	-9.40
11.7105	-0.14	30.14	30.00	-5.12	25.12	20.00	-9.35
13.3575	1.09	28.91	30.00	-2.06	22.06	20.00	-9.33
16.2285	6.12	23.88	30.00	3.82	16.18	20.00	-9.32
17.4975	-3.91	33.91	30.00	-13.82	33.82	20.00	-9.32
19.7085	0.51	29.49	30.00	-0.95	20.95	20.00	-9.34
23.1285	2.30	27.70	30.00	-0.38	20.38	20.00	-9.24
26.076	-4.46	34.46	30.00	-7.67	27.67	20.00	-9.17
26.607	-2.66	32.66	30.00	-6.49	26.49	20.00	-9.16

Power over Ethernet switch

Operation mode 2: Standby, WLAN, Bluetooth and UWB off



CISPR 22/CISPR 22B

freq	QP	margin	limit	AV	margin	limit	corr
MHz	dB(µA)	dB	dB	dB(µA)	dB	dB	dB
0.1725	0.10	38.74	38.84	-5.68	34.51	28.84	1.75
0.222	-1.09	37.83	36.74	-5.67	32.41	26.74	-0.11
0.2265	0.29	36.29	36.58	-4.14	30.71	26.58	-0.24
0.3315	-4.11	37.52	33.41	-8.12	31.53	23.41	-2.76
0.4035	-2.50	34.28	31.78	-6.39	28.17	21.78	-4.15
0.588	8.46	21.54	30.00	2.02	17.98	20.00	-6.27
0.597	7.54	22.46	30.00	2.09	17.91	20.00	-6.32
0.6	6.73	23.27	30.00	1.10	18.90	20.00	-6.34
0.6045	5.90	24.10	30.00	-0.31	20.31	20.00	-6.36
1.0095	-2.95	32.95	30.00	-6.39	26.39	20.00	-8.42
1.4115	2.46	27.54	30.00	-0.70	20.70	20.00	-8.79
1.614	2.19	27.81	30.00	1.17	18.83	20.00	-8.99
1.8165	2.04	27.96	30.00	-1.64	21.64	20.00	-9.19
2.913	2.53	27.47	30.00	-0.41	20.41	20.00	-9.38
3.9525	-2.00	32.00	30.00	-5.62	25.62	20.00	-9.44
5.2365	-0.06	30.06	30.00	-2.33	22.33	20.00	-9.48
7.923	1.16	28.84	30.00	-1.66	21.66	20.00	-9.40
13.4205	0.55	29.45	30.00	-2.32	22.32	20.00	-9.33
16.2285	5.99	24.01	30.00	4.01	15.99	20.00	-9.32
23.1285	2.33	27.67	30.00	-0.25	20.25	20.00	-9.24
26.5485	-3.27	33.27	30.00	-6.50	26.50	20.00	-9.16
28.5645	-2.80	32.80	30.00	-8.23	28.23	20.00	-9.13

5.2 Radiated emission < 1 GHz (electric field)

For test instruments and accessories used see section 6 Part **A 5**.
Legend for tables:
Level vert. QuasiPeak reading including correction factor for vertically polarised antenna
Level hor. QuasiPeak reading including correction factor for horizontally polarised antenna
Limit Limit referred to the appropriate standard
DLimit… Delta between limit and result (margin)
Noise Characteristic of disturbance (narrowband or broadband)

5.2.1 Description of the test location

Test location: OATS 1

Test distance: 3 metres

5.2.2 Photo documentation of the test setup

5.2.3 Test result

Frequency range: 30 MHz - 1000 MHz

Min. limit margin 0.8 dB at 31.40 MHz

The requirements are **FULFILLED.**

Remarks: For detailed results, please see the following page(s).

For description of the measurement see 4.6.4.

This test was performed with the sample 36151.

5.2.4 Test protocol

Operation mode: Operation mode 1: UWB, BLE, WLAN 2.4 GHz & WLAN 5 GHz active Result: positive

Remarks: Powered with power adapter ETSA 120330UD

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)
41.62	17.1		13.8		30.9		40.0	-9.1
45.05	17.4		14.2		31.6		40.0	-8.4
48.47	21.2	7.8	14.2	13.1	35.4	20.9	40.0	-4.6
66.03	17.6		13.4		31.0		40.0	-9.0
70.37	18.0		13.1		31.1		40.0	-8.9
74.77	18.9		11.8		30.7		40.0	-9.3

Operation mode: Operation mode 1: UWB, BLE, WLAN 2.4 GHz & WLAN 5 GHz active Result: positive

Remarks: Powered over ethernet

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)
30.64	26.1		12.9		39.0		40.0	-1.0
31.40	26.3		12.9		39.2		40.0	-0.8
32.04	24.8		12.9		37.7		40.0	-2.3
32.59	25.8		13.0		38.8		40.0	-1.2
33.44	22.0		13.0		35.0		40.0	-5.0
35.34	17.8		13.0		30.8		40.0	-9.2
43.83	13.2		14.0		27.2		40.0	-12.8
47.80	14.0		14.2		28.2		40.0	-11.8
51.80	11.1		14.1		25.2		40.0	-14.8
53.95	15.6		14.1		29.7		40.0	-10.3
56.79	20.9		14.0		34.9		40.0	-5.1
59.25	23.9		13.9		37.8		40.0	-2.2
60.86	24.0		13.8		37.8		40.0	-2.2
61.68	23.1		13.7		36.8		40.0	-3.2
64.70	15.4		13.5		28.9		40.0	-11.1
66.21	14.8		13.4		28.2		40.0	-11.8
69.11	15.4		13.2		28.6		40.0	-11.4
73.20	17.7		12.3		30.0		40.0	-10.0
74.57	20.4		11.9		32.3		40.0	-7.7
76.53	18.7		11.4		30.1		40.0	-9.9
77.20	21.6		11.2		32.8		40.0	-7.2
79.43	17.8		10.5		28.3		40.0	-11.7
81.23	24.0		10.1		34.1		40.0	-5.9
82.03	22.6		9.9		32.5		40.0	-7.5
85.32	21.5		9.2		30.7		40.0	-9.3
111.64	21.8		10.2		32.0		43.5	-11.5
116.28	15.2		11.1		26.3		43.5	-17.2

Result: positive

Operation mode: Operation mode 2: UWB off
Remarks: Powered with power adapter ETSA 120330UD

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)
30.58	13.1		12.9		26.0		40.0	-14.0
36.14	14.8		13.1		27.9		40.0	-12.1
39.55	14.4		13.6		28.0		40.0	-12.0
43.76	20.4		14.0		34.4		40.0	-5.6
56.81	16.3		14.0		30.3		40.0	-9.7
69.78	18.6		13.2		31.8		40.0	-8.2
74.57	23.3		11.9		35.2		40.0	-4.8
81.23	21.6		10.1		31.7		40.0	-8.3
110.79	18.8		10.1		28.9		43.5	-14.6
139.21	17.1		12.6		29.7		43.5	-13.8
141.22	14.6		12.7		27.3		43.5	-16.2

Operation mode: Operation mode 2: UWB off Result: positive
Remarks: Powered over ethernet

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)
30.64	20.5		12.9		33.4		40.0	-6.6
31.37	19.9		12.9		32.8		40.0	-7.2
33.44	25.2		13.0		38.2		40.0	-1.8
35.34	22.5		13.0		35.5		40.0	-4.5
37.36	18.2		13.3		31.5		40.0	-8.5
39.68	13.2		13.6		26.8		40.0	-13.2
43.77	14.6		14.0		28.6		40.0	-11.4
45.78	16.1		14.2		30.3		40.0	-9.7
47.03	14.1		14.2		28.3		40.0	-11.7
51.12	14.1		14.2		28.3		40.0	-11.7
56.82	19.9		14.0		33.9		40.0	-6.1
58.23	18.8		13.9		32.7		40.0	-7.3
60.29	19.6		13.8		33.4		40.0	-6.6
62.94	19.1		13.6		32.7		40.0	-7.3
69.11	17.9		13.2		31.1		40.0	-8.9
70.84	20.2		12.9		33.1		40.0	-6.9
74.57	27.4		11.9		39.3		40.0	-0.7
76.53	22.0		11.4		33.4		40.0	-6.6
79.43	18.6		10.5		29.1		40.0	-10.9
81.23	22.7		10.1		32.8		40.0	-7.2
85.32	21.2		9.2		30.4		40.0	-9.6
108.77	22.5		9.7		32.2		43.5	-11.3
111.64	23.3		10.2		33.5		43.5	-10.0
116.28	18.1		11.1		29.2		43.5	-14.3
139.16	22.4		12.6		35.0		43.5	-8.5
141.23	23.9		12.7		36.6		43.5	-6.9
143.24	23.5		12.8		36.3		43.5	-7.2
148.13	20.0		13.1		33.1		43.5	-10.4
445.71	20.0		20.0		40.0		46.0	-6.0

5.3 Radiated emission > 1 GHz (electric field)

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
Test distance: 3 metres

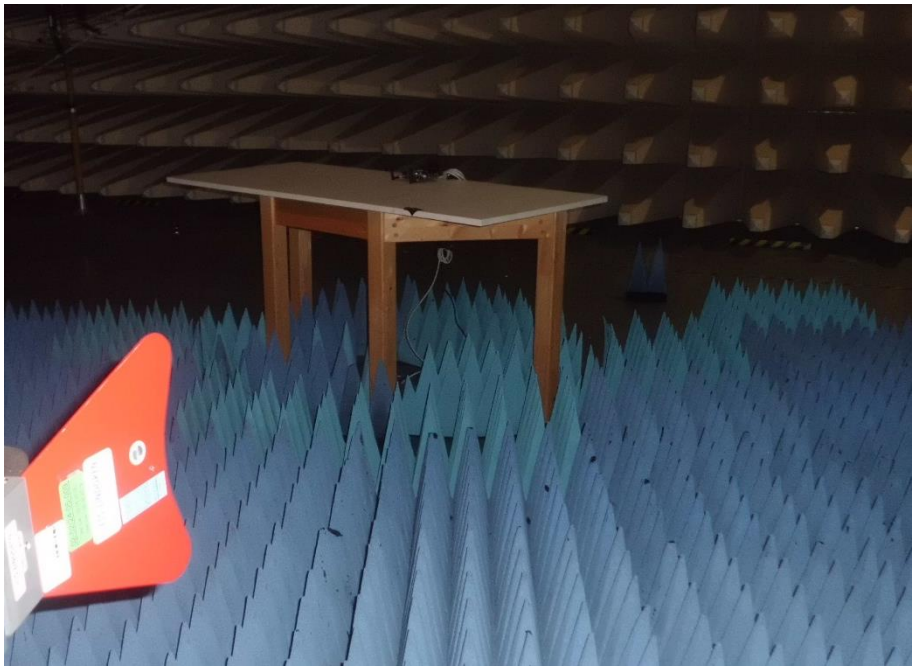
ETS Lindgren 3117:
Dimension of the line tangent to the EUT according to CISPR 16-2-3:2010

Note: The Θ 3dB min values were given by the antenna manufacturer

Frequenz GHz	Θ 3dB min	Measurement distance	***w*** min
1	88	3 m	5.79 m
2	67	3 m	3.97 m
4	69	3 m	4.12 m
6	53	3 m	2.99 m
10	40	3 m	2.18 m
18	36	3 m	1.95 m

Frequenz GHz	Θ 3dB min	Measurement distance	***w*** min
18	18.0	1 m	0.32 m
20	17.0	1 m	0.30 m
25	14.5	1 m	0.25 m
30	13.0	1 m	0.23 m
35	13.0	1 m	0.23 m
40	17.0	1 m	0.30 m

5.3.2 Photo documentation of the test setup



5.3.3 Test result

Frequency range: 1 GHz to 40 GHz

Min. limit margin 7.40 dB at 16613.5 MHz

The requirements are **FULFILLED**

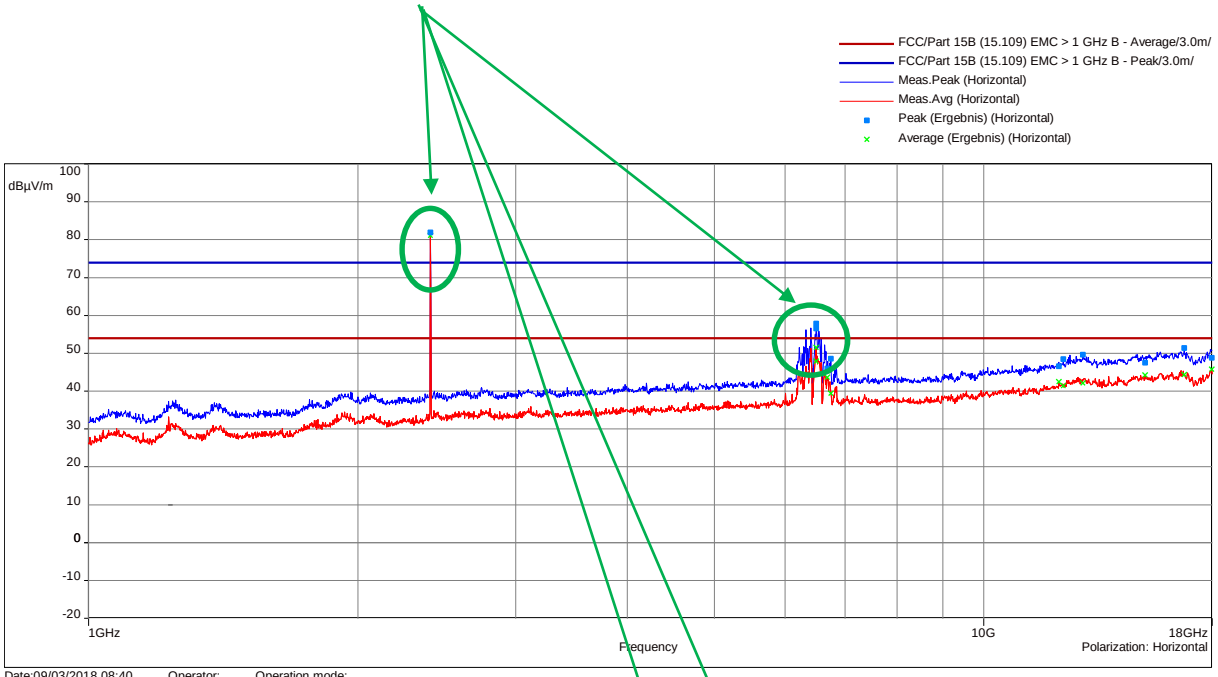
Remarks: For detailed results, please see the following page(s).

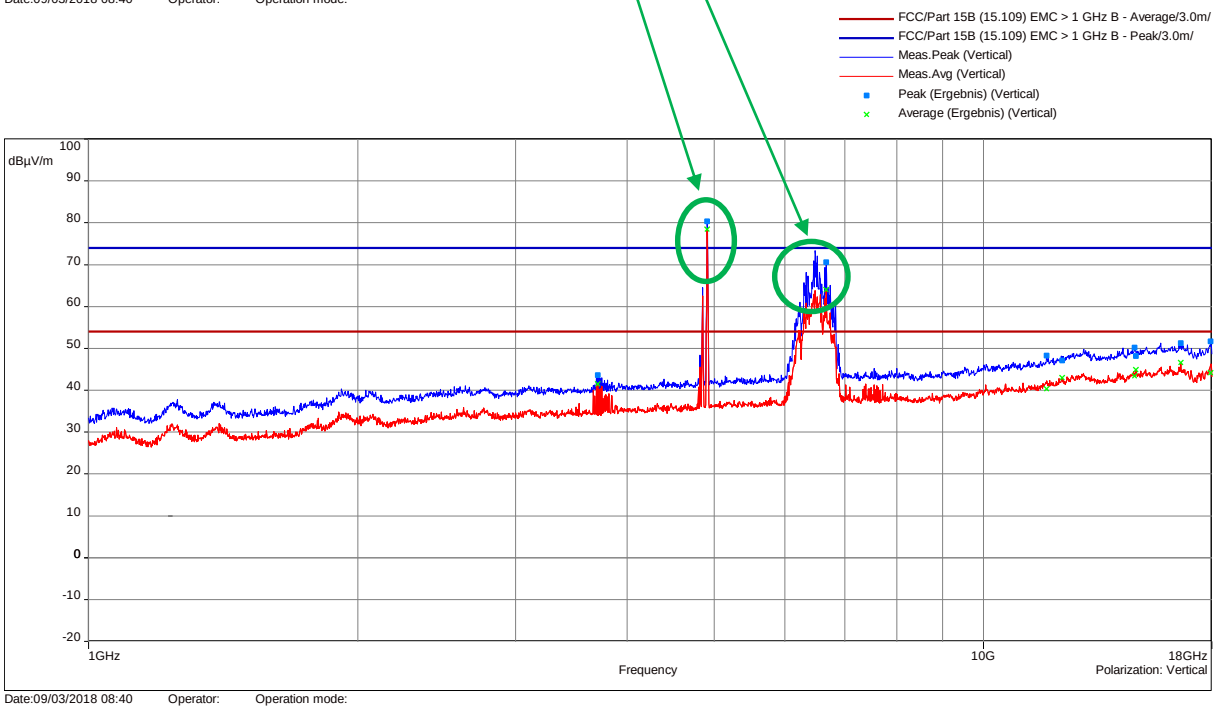
For description of the measurement see 4.6.5.

This test was performed with the sample 36099.

5.3.4 Test protocol

Operation mode:	Operation mode 1: UWB, BLE, WLAN 2.4 GHz & WLAN 5 GHz active	Result: positive
Remarks:	Powered with power adapter ETSA 120330UD. Emissions of the radio modules are not considered (see marked frequencies)	



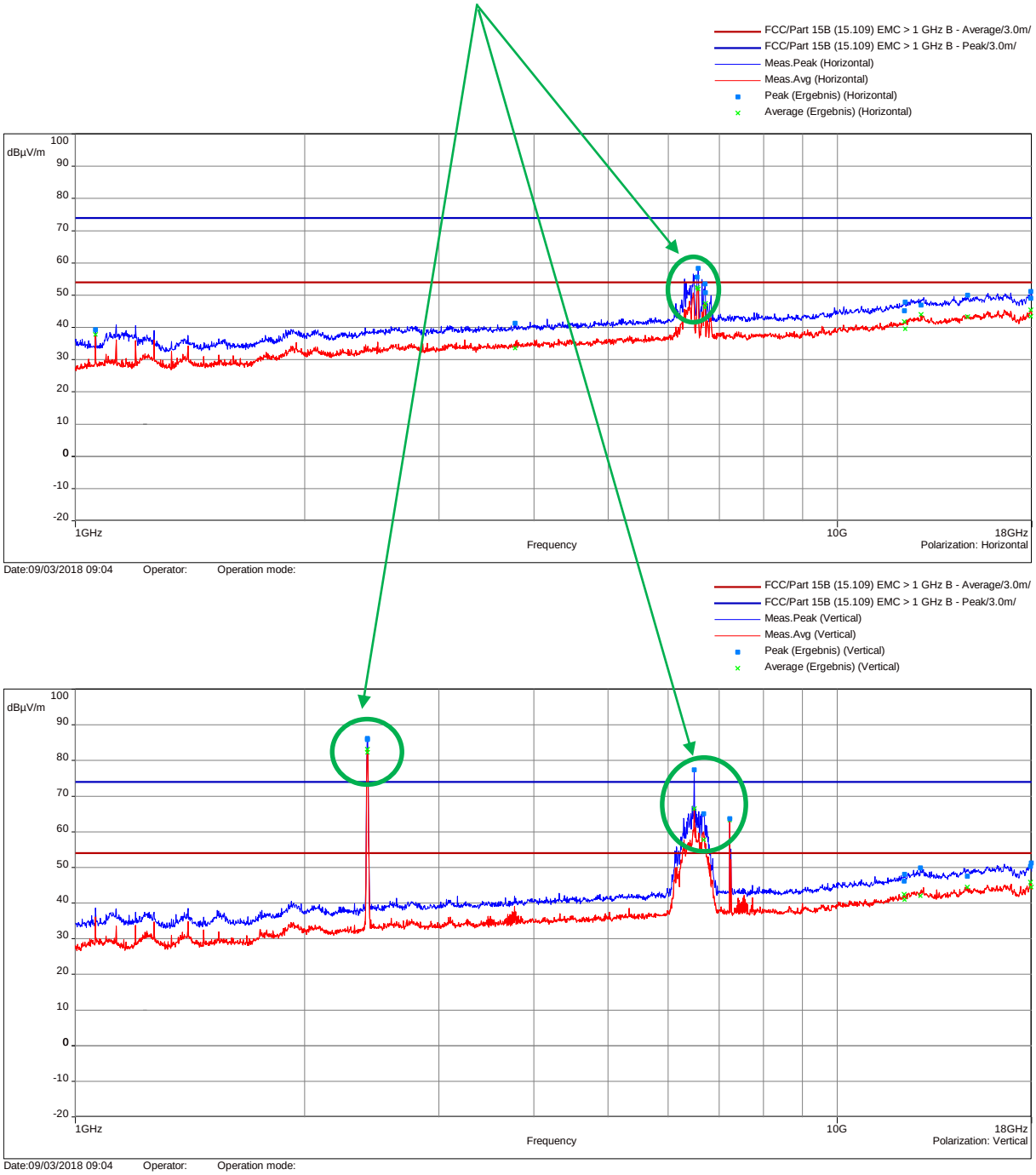


frequency	Peak	limit Peak	margin	Peak angle	Average	limit AV	margin	AV angle	polarisation	correction
MHz	dBµV/m	dBµV/m	dB	°	dBµV/m	dBµV/m	dB	°		dB
3706.5	43.63	74.00	30.37	315.20	41.45	54.00	12.55	306.20	Vertical	-6.34
4914	80.38	74.00	-6.38	7.00	78.48	54.00	-24.48	7.00	Vertical	-4.10
6676	70.58	74.00	3.42	351.40	64.05	54.00	-10.05	351.40	Vertical	-1.99
11762	48.32	74.00	25.68	220.90	40.29	54.00	13.71	177.50	Vertical	3.30
12241.5	47.14	74.00	26.86	312.90	43.01	54.00	10.99	41.40	Vertical	4.20
14761	50.18	74.00	23.82	266.10	43.39	54.00	10.61	266.10	Vertical	5.19
14801.5	48.22	74.00	25.78	347.40	44.90	54.00	9.10	58.60	Vertical	5.35
16613.5	51.22	74.00	22.78	139.00	46.60	54.00	7.40	147.90	Vertical	6.33
17941.5	51.70	74.00	22.30	7.00	44.15	54.00	9.85	67.60	Vertical	6.38
2409.5	81.97	74.00	-7.97	206.30	81.10	54.00	-27.10	206.30	Horizontal	-6.78
6498.5	57.80	74.00	16.20	309.50	47.86	54.00	6.14	314.00	Horizontal	-1.86
6501.5	56.61	74.00	17.39	309.50	51.55	54.00	2.45	317.00	Horizontal	-1.85
6684	45.95	74.00	28.05	155.50	43.67	54.00	10.33	155.50	Horizontal	-1.99
6746.5	48.52	74.00	25.48	110.50	39.41	54.00	14.59	110.50	Horizontal	-2.14
12137.5	46.59	74.00	27.41	170.30	42.53	54.00	11.47	79.20	Horizontal	4.21
12268	48.49	74.00	25.51	263.10	41.37	54.00	12.63	254.10	Horizontal	4.14
12899.5	49.66	74.00	24.34	231.70	42.09	54.00	11.91	272.10	Horizontal	5.49
15153.5	47.49	74.00	26.51	348.40	44.19	54.00	9.81	224.30	Horizontal	4.95
16745	51.40	74.00	22.60	246.60	44.32	54.00	9.68	67.10	Horizontal	5.83
17980.5	48.87	74.00	25.13	309.50	45.77	54.00	8.23	228.70	Horizontal	6.26

Operation mode: Operation mode 1: UWB, BLE, WLAN 2.4 GHz & WLAN 5 GHz active

Result: positive

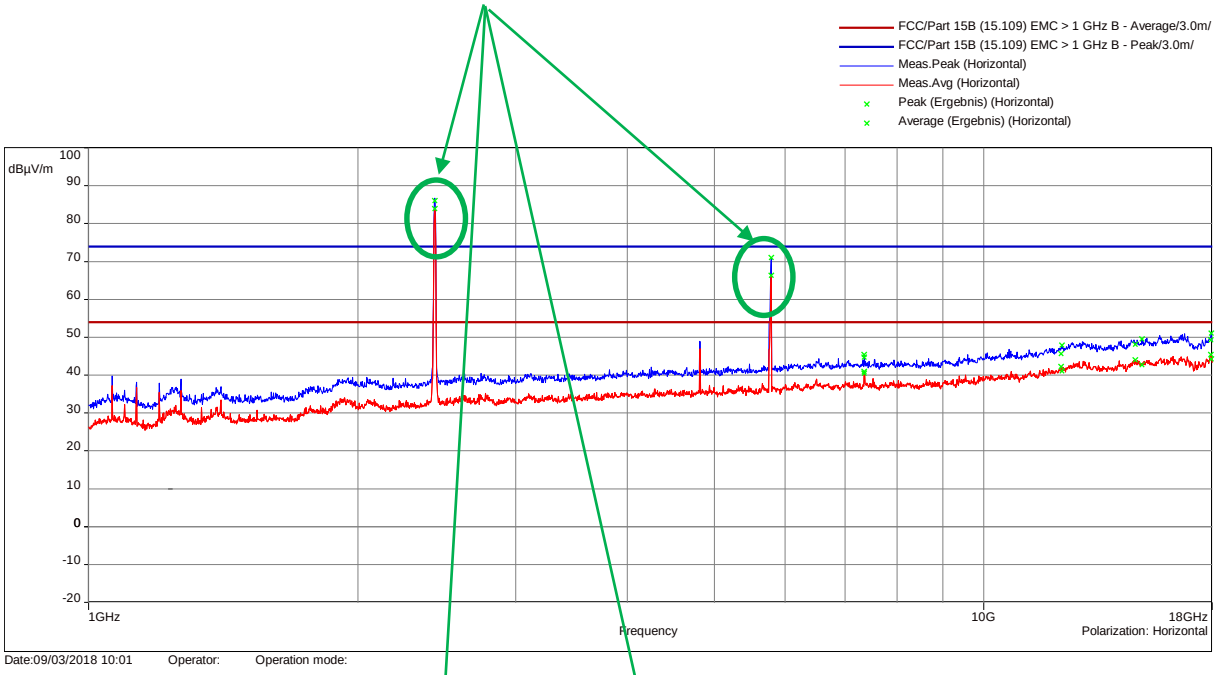
Remarks: Powered over ethernet. Emissions of the radio modules are not considered (see marked frequencies)

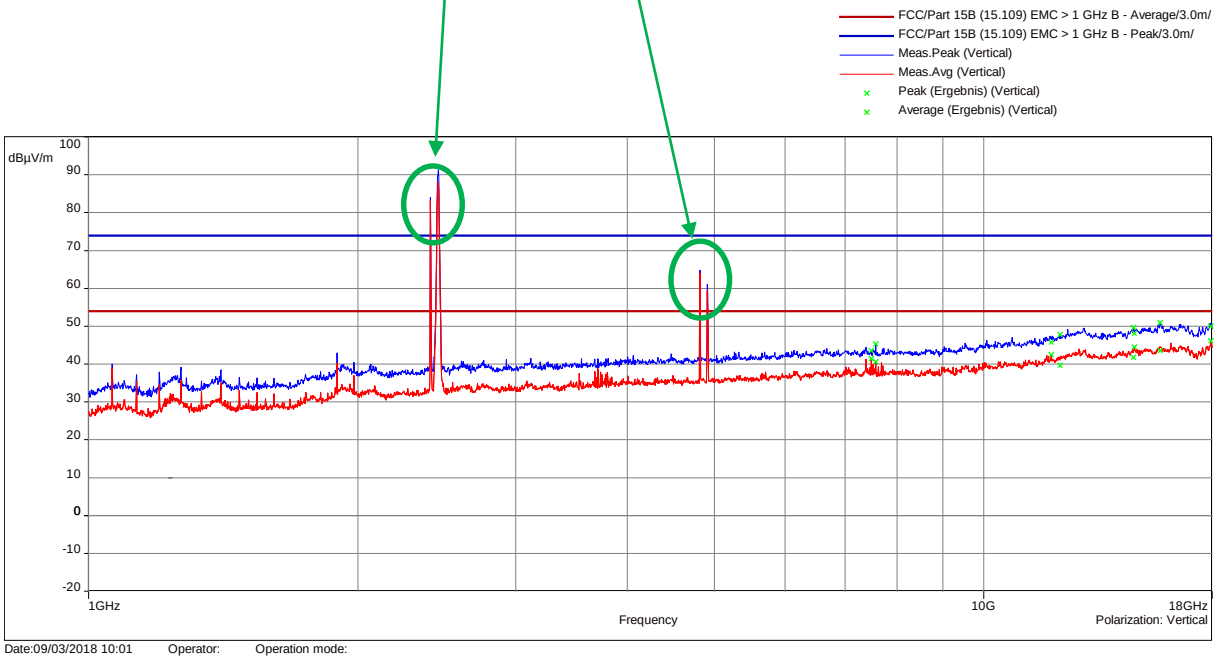


frequency	Peak	limit Peak	margin	Peak angle	Average	limit AV	margin	AV angle	polarisation	correction
MHz	dBµV/m	dBµV/m	dB	°	dBµV/m	dBµV/m	dB	°		dB
2417.5	85.93	74.00	-11.93	154.90	83.09	54.00	-29.09	154.90	Vertical	-6.82
2418	86.18	74.00	-12.18	154.90	82.27	54.00	-28.27	154.90	Vertical	-6.82
6489.5	77.42	74.00	-3.42	351.20	66.41	54.00	-12.41	351.20	Vertical	-1.91
6677.5	65.09	74.00	8.91	351.20	57.72	54.00	-3.72	119.60	Vertical	-1.99
7230	63.68	74.00	10.32	308.00	63.25	54.00	-9.25	308.00	Vertical	-1.96
12246	46.18	74.00	27.82	118.80	42.49	54.00	11.51	26.60	Vertical	4.19
12262.5	48.12	74.00	25.88	197.10	41.01	54.00	12.99	266.00	Vertical	4.15
12866	49.88	74.00	24.12	17.60	42.07	54.00	11.93	17.60	Vertical	5.36
14826	47.50	74.00	26.50	352.40	44.50	54.00	9.50	352.40	Vertical	5.36
17941.5	50.26	74.00	23.74	0.00	45.82	54.00	8.18	145.00	Vertical	6.38
17983.5	51.30	74.00	22.70	66.40	44.47	54.00	9.53	66.40	Vertical	6.25
1062.5	39.30	74.00	34.70	247.90	37.75	54.00	16.25	229.90	Horizontal	-12.33
3778	41.29	74.00	32.71	282.30	33.52	54.00	20.48	282.30	Horizontal	-5.92
6546.5	55.61	74.00	18.39	163.50	52.30	54.00	1.70	171.00	Horizontal	-1.69
6565	58.28	74.00	15.72	163.50	51.83	54.00	2.17	171.00	Horizontal	-1.71
6703	53.56	74.00	20.44	179.10	46.27	54.00	7.73	170.10	Horizontal	-1.99
6710	50.82	74.00	23.18	179.10	47.35	54.00	6.65	170.10	Horizontal	-2.02
12248.5	45.14	74.00	28.86	232.30	41.79	54.00	12.21	352.00	Horizontal	4.19
12271	47.92	74.00	26.08	352.00	39.53	54.00	14.47	326.50	Horizontal	4.13
12873	46.97	74.00	27.03	257.70	43.95	54.00	10.05	257.70	Horizontal	5.38
14821.5	50.02	74.00	23.98	239.80	43.30	54.00	10.70	239.80	Horizontal	5.36
17940	49.10	74.00	24.90	75.90	45.40	54.00	8.60	232.30	Horizontal	6.38
17944.5	51.21	74.00	22.79	138.00	43.46	54.00	10.54	352.00	Horizontal	6.38

Operation mode: UWB off Result: positive

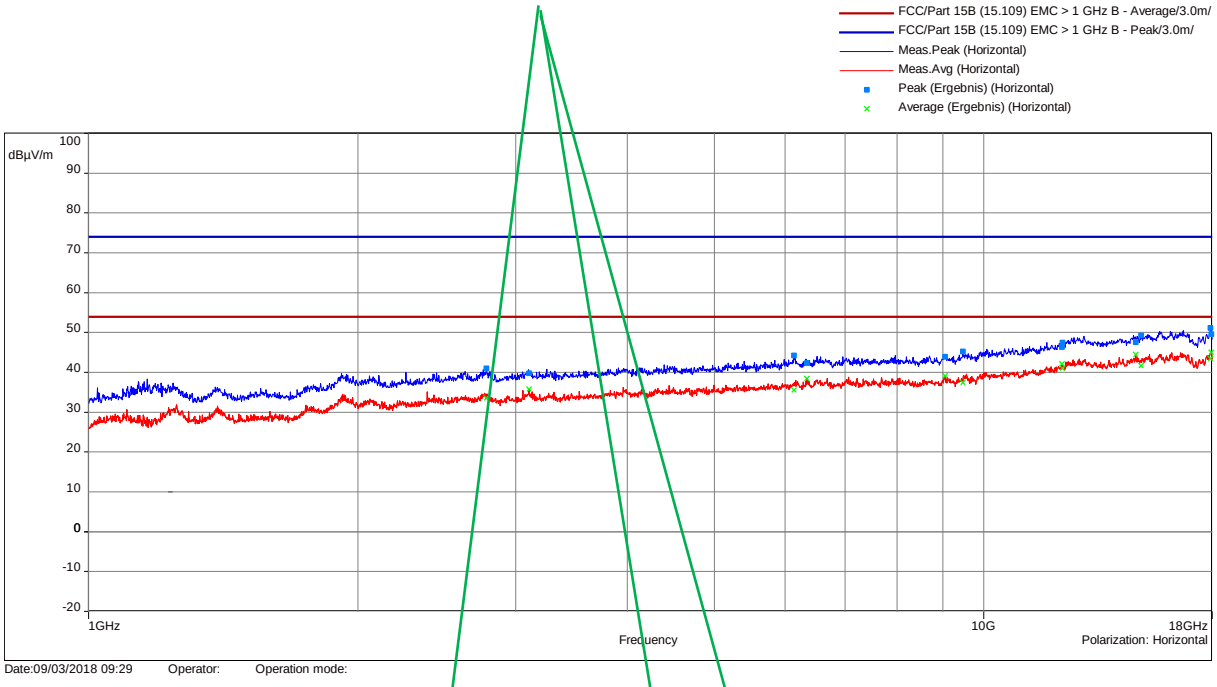
Remarks: Powered with power adapter ETSA 120330UD.
Emissions of the BLE & WLAN module are not considered (see marked frequencies).

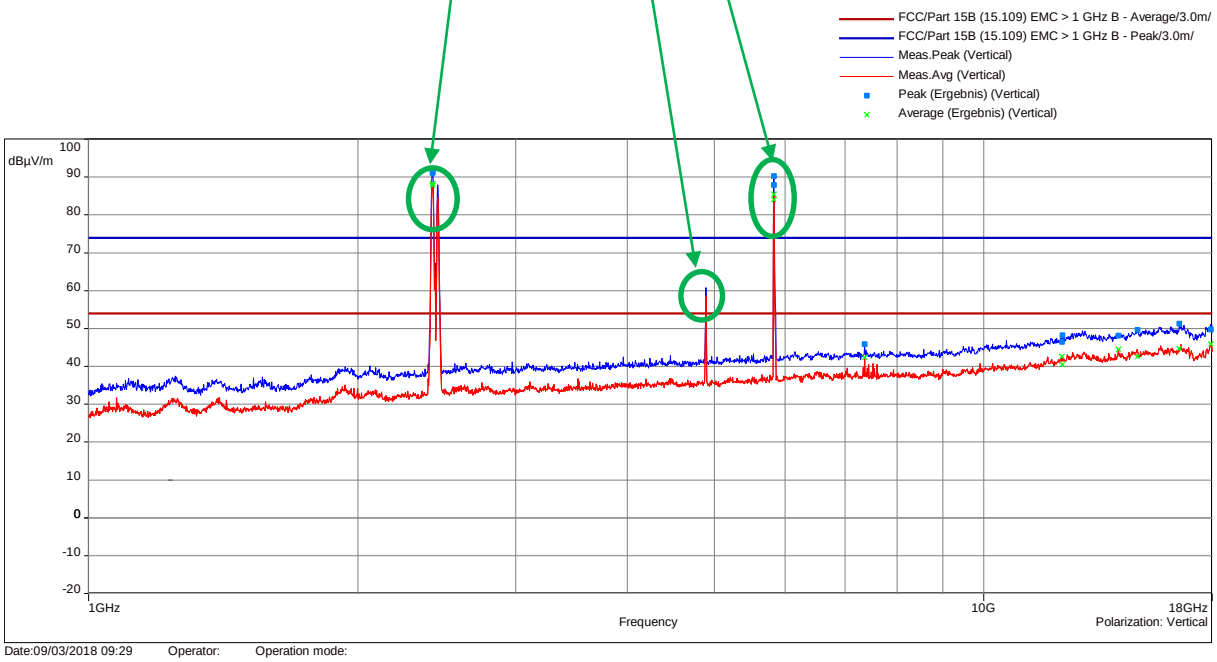




frequency	Peak	limit Peak	margin	Peak angle	Average	limit AV	margin	AV angle	polarisation	correction
MHz	dBµV/m	dBµV/m	dB	°	dBµV/m	dBµV/m	dB	°		dB
7493	43.57	74.00	30.43	283.50	41.44	54.00	12.56	283.50	Vertical	-1.40
7573	45.26	74.00	28.74	283.50	40.54	54.00	13.46	351.70	Vertical	-1.66
11902.5	45.73	74.00	28.27	25.50	42.45	54.00	11.55	351.70	Vertical	3.61
12181.5	47.75	74.00	26.25	153.40	39.62	54.00	14.38	7.40	Vertical	4.25
14710.5	49.65	74.00	24.35	351.70	41.76	54.00	12.24	351.70	Vertical	5.15
14734.5	48.06	74.00	25.94	308.30	44.46	54.00	9.54	162.40	Vertical	5.14
15746.5	50.88	74.00	23.12	24.70	43.48	54.00	10.52	352.30	Vertical	5.90
17942.5	49.97	74.00	24.03	136.00	46.11	54.00	7.89	50.70	Vertical	6.38
2436	86.07	74.00	-12.07	112.60	83.98	54.00	-29.98	112.60	Horizontal	-6.96
5791	70.99	74.00	3.01	94.70	66.29	54.00	-12.29	94.70	Horizontal	-2.91
7356.5	44.68	74.00	29.32	352.00	40.93	54.00	13.07	352.00	Horizontal	-1.51
7357	45.44	74.00	28.56	352.00	40.53	54.00	13.47	352.00	Horizontal	-1.51
12208.5	45.65	74.00	28.35	358.00	42.22	54.00	11.78	221.10	Horizontal	4.25
12234.5	47.89	74.00	26.11	275.70	41.12	54.00	12.88	283.20	Horizontal	4.21
14770	48.09	74.00	25.91	147.10	44.05	54.00	9.95	25.10	Horizontal	5.22
15020	49.52	74.00	24.48	352.00	42.70	54.00	11.30	352.00	Horizontal	5.12
17932.5	49.26	74.00	24.74	93.90	45.46	54.00	8.54	7.20	Horizontal	6.38
17950.5	51.02	74.00	22.98	317.60	44.21	54.00	9.79	69.30	Horizontal	6.38

Operation mode: Operation mode 2: UWB off Result: positive
Remarks: Powered over ethernet. Emissions of the radio modules are not considered (see marked frequencies).





frequency	Peak	limit Peak	margin	Peak angle	Average	limit AV	margin	AV angle	polarisation	correction
MHz	dBµV/m	dBµV/m	dB	°	dBµV/m	dBµV/m	dB	°		dB
2422.5	91.05	74.00	-17.05	95.10	88.31	54.00	-34.31	95.10	Vertical	-6.85
2423	91.30	74.00	-17.30	95.10	87.77	54.00	-33.77	359.00	Vertical	-6.86
5830.5	90.30	74.00	-16.30	129.00	84.06	54.00	-30.06	138.00	Vertical	-2.98
5831.5	87.86	74.00	-13.86	129.00	85.47	54.00	-31.47	138.00	Vertical	-2.98
7360	45.86	74.00	28.14	138.00	42.40	54.00	11.60	146.90	Vertical	-1.49
12233	46.46	74.00	27.54	352.40	42.58	54.00	11.42	7.80	Vertical	4.21
12250	48.19	74.00	25.81	120.50	40.47	54.00	13.53	351.90	Vertical	4.18
14148.5	48.07	74.00	25.93	154.40	44.45	54.00	9.55	163.40	Vertical	4.93
14857	49.60	74.00	24.40	69.10	42.62	54.00	11.38	351.90	Vertical	5.35
16545	51.33	74.00	22.67	0.00	44.73	54.00	9.27	0.00	Vertical	6.47
17935.5	49.79	74.00	24.21	300.00	45.92	54.00	8.08	92.40	Vertical	6.38
2781	40.99	74.00	33.01	145.50	33.50	54.00	20.50	222.50	Horizontal	-6.21
3104.5	39.79	74.00	34.21	351.20	35.72	54.00	18.28	351.20	Horizontal	-5.86
6138.5	44.19	74.00	29.81	274.10	35.53	54.00	18.47	25.00	Horizontal	-2.43
6347.5	42.40	74.00	31.60	206.10	38.45	54.00	15.55	249.40	Horizontal	-2.46
9051.5	43.92	74.00	30.08	94.60	39.14	54.00	14.86	94.60	Horizontal	0.06
9482	45.30	74.00	28.70	351.20	37.46	54.00	16.54	351.20	Horizontal	0.41
12228	46.38	74.00	27.62	188.80	42.13	54.00	11.87	24.30	Horizontal	4.22
12249.5	47.51	74.00	26.49	351.20	41.04	54.00	12.96	351.20	Horizontal	4.18
14796	47.56	74.00	26.44	146.20	44.42	54.00	9.58	351.20	Horizontal	5.34
15000	49.24	74.00	24.76	351.20	41.69	54.00	12.31	145.50	Horizontal	5.11
17918	51.14	74.00	22.86	291.30	43.50	54.00	10.50	300.30	Horizontal	6.38
17958	49.58	74.00	24.42	256.90	45.08	54.00	8.92	309.30	Horizontal	6.35

Note: In the frequency range 18 GHz to 40 GHz no detectable values belonging to the EUT could be detected.

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.18.0.17	01-02/68-13-001				
	ESCI	02-02/03-15-001	11/06/2019	11/06/2018		
	ESH 2 - Z 5	02-02/20-05-004	25/10/2019	25/10/2017	30/10/2018	30/04/2018
	NNLK 8121	02-02/20-06-001			20/02/2019	20/08/2018
	EZ-17_20 Hz-100 MHz	02-02/22-08-005	26/06/2019	26/06/2018		
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	F-203I-DCN-32 mm	02-02/50-05-145				
	ESH 3 - Z 2	02-02/50-05-155	18/11/2019	18/11/2016	07/11/2018	07/05/2018
	6430	02-02/50-13-014				
	ISN	02-02/50-14-021			29/08/2019	29/08/2018
A 5	ESVS 30	02-02/03-05-006	06/06/2019	06/06/2018		
	VULB 9168	02-02/24-05-005	18/04/2019	18/04/2018		
	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	FSP 40	02-02/11-11-001	17/10/2019	17/10/2018		
	FSW43	02-02/11-15-001	19/03/2019	19/03/2018		
	JS4-18004000-30-5A	02-02/17-05-017				
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	08/05/2019	08/05/2018		
	BBHA 9170	02-02/24-05-014	12/06/2021	12/06/2018	12/06/2019	12/06/2018
	KMS102-1 m	02-02/50-11-014				
	KMS102-0.2 m	02-02/50-11-016				
	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				

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 with a disturbance limit shall be determined in the following manner:

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	+ 3.29 / - 3.29
Radiated disturbance (electric field) - 10 m test distance - 3 m test distance - Frequency range: 30 MHz – 300 MHz	 + 3.86 / - 3.91 + 4.14 / - 4.78
Radiated disturbance (electric field) - 10 m test distance - 3 m test distance - Frequency range: 300 MHz – 1000 MHz	 + 4.11 / - 4.11 + 4.13 / - 4.14
Radiated disturbance (electric field) - 3 m test distance - Frequency range: 1 GHz – 30 GHz	 + 2.89 / -2.89