

TEST REPORT

BNNetzA-CAB-02/21-102

Test report no.: 1-4085/22-01-02-A

Testing laboratory

CTC advanced GmbH

Untertuerkheimer Strasse 6 – 10

66117 Saarbruecken / Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

Internet: <https://www.ctcadvanced.com>

e-mail: mail@ctcadvanced.com

Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

Applicant

Ingenico Group

9 Avenue de la Gare Rovaltain

26958 Valence Cedex 9 / FRANCE

Phone: -/-

Contact: Nicolas Jacquemont

e-mail: nicolas.jacquemont@ingenico.com

Manufacturer

Ingenico Group

9 Avenue de la Gare Rovaltain

26958 Valence Cedex 9 / FRANCE

Test standard/s

FCC - Title 47 CFR Part 15 FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - 247 Issue 2 Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item: **Payment terminal**
Model name: **Move/5000 CL/4G/WI**
FCC ID: **XKB-M5000CL4GWI**
ISED certification number: **2586D-M5000CL4GWI**
Frequency: 2400 MHz to 2483.5 MHz
Technology tested: WLAN
Antenna: Integrated antenna
Power supply: 3.6 V DC by battery
Temperature range: 10°C to 50°C

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

cn=Michael Dorongovski, o=CTC advanced GmbH, ou=DOR-210422,
email=Michael.Dorongovski@ctcadvanced.com, c=DE
2022.12.12 12:03:32 +01'00'

Michael Dorongovski
Lab Manager
Radio Communications

Test performed:

cn=Andreas Kurzkurt, o=CTC advanced GmbH,
ou=KZK-200114,
email=Andreas.Kurzkurt@ctcadvanced.com, c=DE

Andreas Kurzkurt
Testing Manager
Radio Communications

1 Table of contents

1	Table of contents	2
2	General information	3
2.1	Notes and disclaimer	3
2.2	Application details	3
2.3	Test laboratories sub-contracted	3
3	Test standard/s, references and accreditations	4
4	Reporting statements of conformity – decision rule	5
5	Test environment	6
6	Test item	6
6.1	General description	6
6.2	Additional information	6
7	Description of the test setup.....	7
7.1	Shielded fully anechoic chamber	8
8	Sequence of testing	9
8.1	Sequence of testing radiated spurious 1 GHz to 18 GHz	9
9	Measurement uncertainty	10
10	Summary of measurement results	11
11	Additional information and comments	13
12	Additional EUT parameter.....	14
13	Measurement results	15
13.1	Band edge compliance radiated	15
13.2	Spurious emissions radiated above 1 GHz	19
14	Observations	27
15	Glossary	27
16	Document history.....	28
17	Accreditation Certificate – D-PL-12076-01-04	28
18	Accreditation Certificate – D-PL-12076-01-05	29

2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CTC advanced GmbH.

The testing service provided by CTC advanced GmbH has been rendered under the current "General Terms and Conditions for CTC advanced GmbH".

CTC advanced GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

Under no circumstances does the CTC advanced GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.

Under no circumstances does the CTC advanced GmbH test report include or imply any product or service warranties from CTC advanced GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CTC advanced GmbH.

All rights and remedies regarding vendor's products and services for which CTC advanced GmbH has prepared this test report shall be provided by the party offering such products or services and not by CTC advanced GmbH. In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

This test report replaces the test report with the number 1-4085/22-01-02 and dated 2022-07-08.

2.2 Application details

Date of receipt of order: 2022-03-30

Date of receipt of test item: 2022-05-18

Start of test:* 2022-06-17

End of test:* 2022-06-17

Person(s) present during the test: -/-

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

2.3 Test laboratories sub-contracted

None

3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 2	February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices
RSS - Gen Issue 5 incl. Amendment 1 & 2	February 2021	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
KDB 558074 D01	v05r02	GUIDANCE FOR COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEM, FREQUENCY HOPPING SPREAD SPECTRUM SYSTEM, AND HYBRID SYSTEM DEVICES OPERATING UNDER SECTION 15.247 OF THE FCC RULES
ANSI C63.10-2013	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf   DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-04
D-PL-12076-01-05	Telecommunication FCC requirements https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf   DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-05

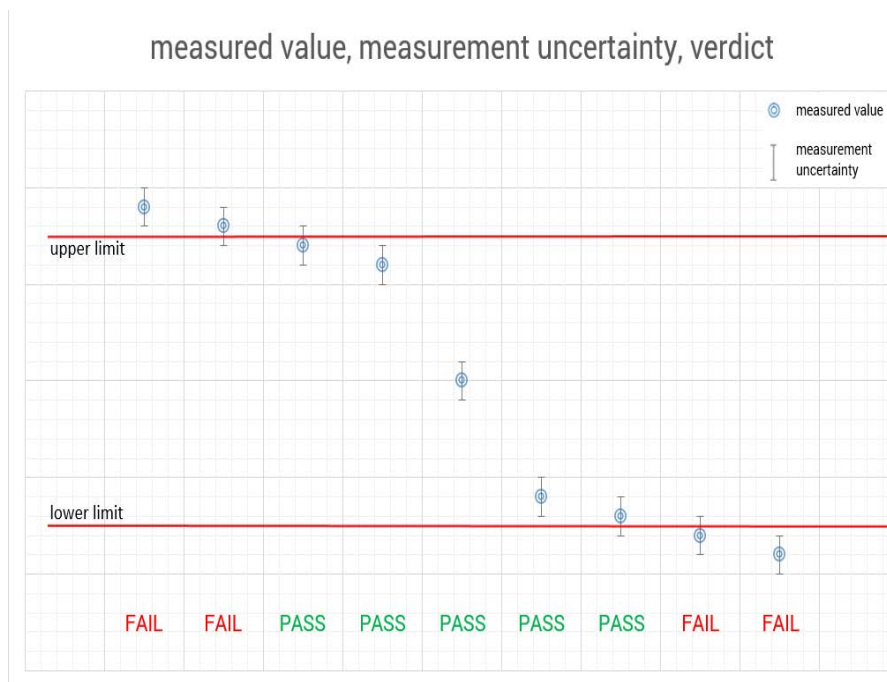
ISED Testing Laboratory Recognized Listing Number: DE0001

FCC designation number: DE0002

4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9 but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



5 Test environment

Temperature :	T_{nom} T_{max} T_{min}	22 °C during room temperature tests No testing under high temperature conditions required No testing under low temperature conditions required
Relative humidity content :		65 %
Barometric pressure :		Not relevant for this kind of testing
Power supply :	V_{nom} V_{max} V_{min}	3.6 V DC by battery No testing under high voltage conditions required No testing under low voltage conditions required

6 Test item

6.1 General description

Kind of test item :	Payment terminal
Model name :	Move/5000 CL/4G/WI
HMN :	-/-
PMN :	Move/5000 Move/3500
HVIN :	Move/5000 CL/4G/WiFi Move/3500 CL/4G/WiFi
FVIN :	-/-
S/N serial number :	182787303201096503249553
Hardware status :	01
Software status :	HTB009400
Firmware status :	ELS81-US
Frequency band :	2400 MHz to 2483.5 MHz
Type of radio transmission :	DSSS, OFDM
Use of frequency spectrum :	
Type of modulation :	CCK, (D)BPSK, (D)QPSK, 16 – QAM, 64 – QAM
Number of channels :	11 (20 MHz); 9 (40 MHz)
Antenna :	Integrated antenna
Power supply :	3.6 V DC by battery
Temperature range :	10°C to 50°C

6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-4085/22-01-01_AnnexA
 1-4085/22-01-01_AnnexD

7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

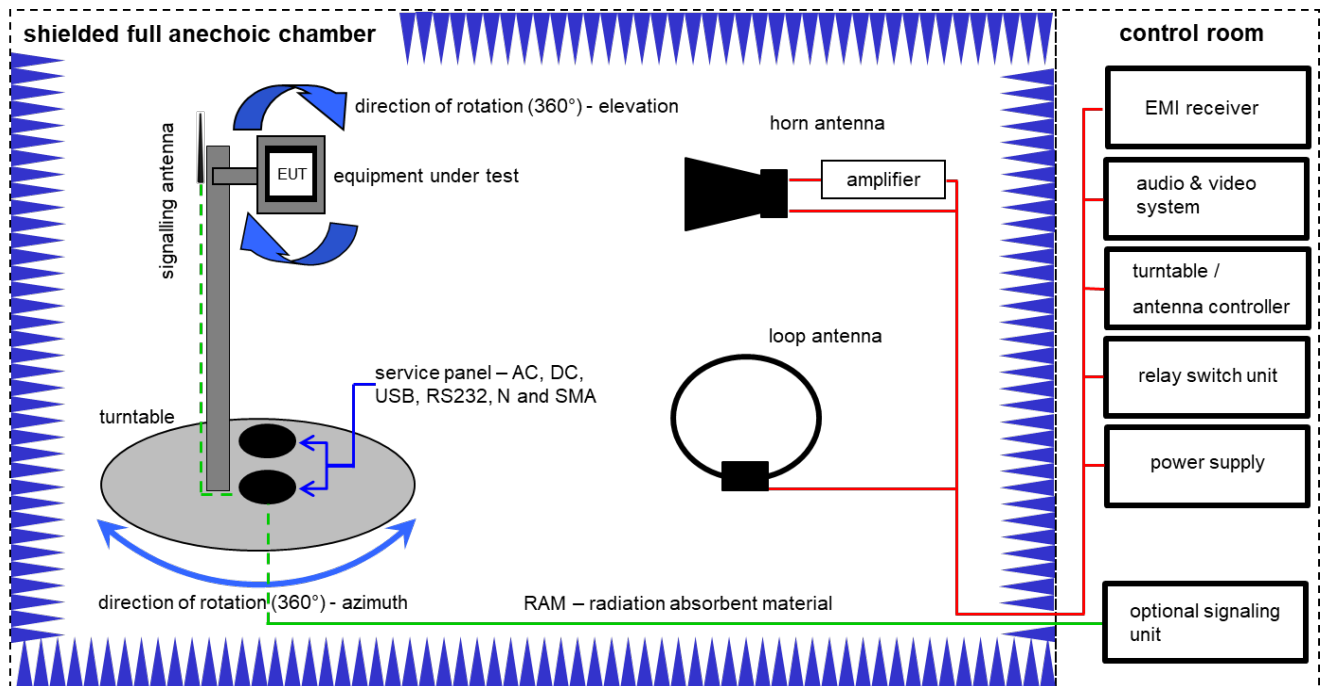
In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vk!l	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter

$$FS = UR + CA + AF$$

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:

$$FS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} \text{ (71.61 } \mu\text{V/m)}$$

Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
2	A, B	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
3	A, B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3089	300000307	vKI!	11.02.2022	29.02.2024
4	A	Band Reject Filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev	-/-	-/-
5	A, B	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev	-/-	-/-
6	A, B	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	09.12.2021	31.12.2022
7	A, B	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
8	A, B	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	19	300003790	ne	-/-	-/-
9	A,B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
10	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
11	A, B	NEXIO EMV-Software	BAT EMC V3.21.0.32	EMCO		300004682	ne	-/-	-/-
12	A, B	PC	ExOne	F+W		300004703	ne	-/-	-/-
13	A, B	RF-Amplifier	AMF-6F06001800-30-10P-R	NARDA-MITEQ Inc	2011572	300005241	ev	-/-	-/-

8 Sequence of testing

8.1 Sequence of testing radiated spurious 1 GHz to 18 GHz

Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

9 Measurement uncertainty

Measurement uncertainty		
Test case	Uncertainty	
Antenna gain	± 3 dB	
Power spectral density	± 1.56 dB	
DTS bandwidth	± 100 kHz (depends on the used RBW)	
Occupied bandwidth	± 100 kHz (depends on the used RBW)	
Maximum output power conducted	± 1.56 dB	
Detailed spurious emissions @ the band edge - conducted	± 1.56 dB	
Band edge compliance radiated	± 3 dB	
Spurious emissions conducted	> 3.6 GHz	± 1.56 dB
	> 7 GHz	± 1.56 dB
	> 18 GHz	± 2.31 dB
	≥ 40 GHz	± 2.97 dB
Spurious emissions radiated below 30 MHz	± 3 dB	
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB	
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB	
Spurious emissions radiated above 12.75 GHz	± 4.5 dB	
Spurious emissions conducted below 30 MHz (AC conducted)	± 2.6 dB	

10 Summary of measurement results

☐	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	CFR Part 15 RSS - 247, Issue 2	See table!	2022-12-12	Reduced testplan acc. customer demand

Test specification clause	Test case	Guideline	Temperature conditions	Power source voltages	Mode	C	NC	NA	NP	Remark
§15.247(b)(4) RSS - 247 / 5.4 (f)(ii)	Antenna gain	-/-	Nominal	Nominal	DSSS	-/-				-/-
§15.35	Duty cycle	-/-	Nominal	Nominal	DSSS OFDM	-/-				-/-
§15.247(e) RSS - 247 / 5.2 (b)	Power spectral density	KDB 558074 DTS clause: 8.4	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.247(a)(2) RSS - 247 / 5.2 (a)	DTS bandwidth	KDB 558074 DTS clause: 8.2	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
RSS Gen clause 4.6.1	Occupied bandwidth	-/-	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.247(b)(3) RSS - 247 / 5.4 (d)	Maximum output power	KDB 558074 DTS clause: 8.3.1.3	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.247(d) RSS - 247 / 5.5	Detailed spurious emissions @ the band edge – cond.	-/-	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.205 RSS - 247 / 5.5 RSS - Gen	Band edge compliance cond. & rad.	KDB 558074 DTS clause: 8.7.3	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	Only OFDM modes
§15.247(d) RSS - 247 / 5.5	TX spurious emissions cond.	KDB 558074 DTS clause: 8.5	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.209(a) RSS-Gen	TX spurious emissions rad. below 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions rad. 30 MHz to 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
§15.247(d) RSS - 247 / 5.5 RSS-Gen	TX spurious emissions rad. above 1 GHz	-/-	Nominal	Nominal	DSSS OFDM	☒	☐	☐	☐	1 GHz to 18 GHz only Only 20 MHz modes
§15.109 RSS-Gen	RX spurious emissions rad. 30 MHz to 1 GHz	-/-	Nominal	Nominal	RX / idle	☐	☐	☐	☒	-/-
§15.109 RSS-Gen	RX spurious emissions rad. above 1 GHz	-/-	Nominal	Nominal	RX / idle	☐	☐	☐	☒	-/-

§15.107(a) §15.207	Conducted emissions < 30 MHz	-/-	Nominal	Nominal	DSSS OFDM	☐	☐	☐	☒	-/-
-----------------------	------------------------------------	-----	---------	---------	--------------	--------------------------	--------------------------	--------------------------	-------------------------------------	-----

Notes:

C	Compliant	NC	Not compliant	NA	Not applicable	NP	Not performed
----------	-----------	-----------	---------------	-----------	----------------	-----------	---------------

11 Additional information and comments

Reference documents: Test report 1-2648_16-01-03.pdf
 ICO-OPE-03994 Wifi_labtool_Radio_agreement_procedure

Special test descriptions:

Used power settings:

Channel	1	2	3	4	5	6	7	8	9	10	11
11b	13	13	13	13	13	13	13	13	13	13	13
11g	14	15	16	16	16	16	16	16	16	16	14
11n-20	13	15	15	15	15	15	15	15	15	15	14
11n-40			10	11	12	13	13	12	10		

Configuration descriptions: None

EUT selection:

☐ Only one device available

☐ Devices selected by the customer

☒ Devices selected by the laboratory (Randomly)

Provided channels:

Channels with 20 MHz channel bandwidth:

channel number & center frequency													
channel	1	2	3	4	5	6	7	8	9	10	11	12	13
f _c / MHz	2412	2417	2422	2427	2432	2437	2442	2447	2452	2457	2462	2467	2472

Channels with 40 MHz channel bandwidth:

channel number & center frequency													
channel	-/-	-/-	3	4	5	6	7	8	9	10	11	-/-	-/-
f _c / MHz	-/-	-/-	2422	2427	2432	2437	2442	2447	2452	2457	2462	-/-	-/-

Note: The channels used for the tests are marked in bold in the list.

12 Additional EUT parameter

- Test mode:
- ☐ No test mode available
lperf was used to ping another device with the largest support packet size
 - ☒ Test mode available
Special software is used.
EUT is transmitting pseudo random data by itself
- Modulation types:
- ☒ Wide Band Modulation (None Hopping – e.g. DSSS, OFDM)
 - ☐ Frequency Hopping Spread Spectrum (FHSS)
- Antennas and transmit operating modes:
- ☒ Operating mode 1 (single antenna)
 - *Equipment with 1 antenna,*
 - *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
 - *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*
 - ☐ Operating mode 2 (multiple antennas, no beamforming)
 - *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously but without beamforming.*
 - ☐ Operating mode 3 (multiple antennas, with beamforming)
 - *Equipment operating in this mode contains a smart antenna system using two or more transmit/receive chains simultaneously with beamforming.
In addition to the antenna assembly gain (G), the beamforming gain (Y) may have to be taken into account when performing the measurements.*

13 Measurement results

13.1 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to the lowest channel for the lower restricted band and to the highest channel for the upper restricted band. The measurement is repeated for all modulations. Measurement distance is 3 meter.

Measurement:

	Measurement parameter for peak measurements	Measurement parameter for average measurements
		According to DTS clause: 8.7.3
Detector	Peak	RMS
Sweep time	Auto	Auto
Resolution bandwidth	1 MHz	100 kHz
Video bandwidth	3 MHz	300 kHz
Span	See plot	2 MHz
Trace mode	Max. hold	RMS Average over 101 sweeps
Analyzer function	-/-	Band power function (Compute the power by integrating the spectrum over 1 MHz)
Test setup	See chapter 7.1 – B	
Measurement uncertainty	See chapter 9	

Limits:

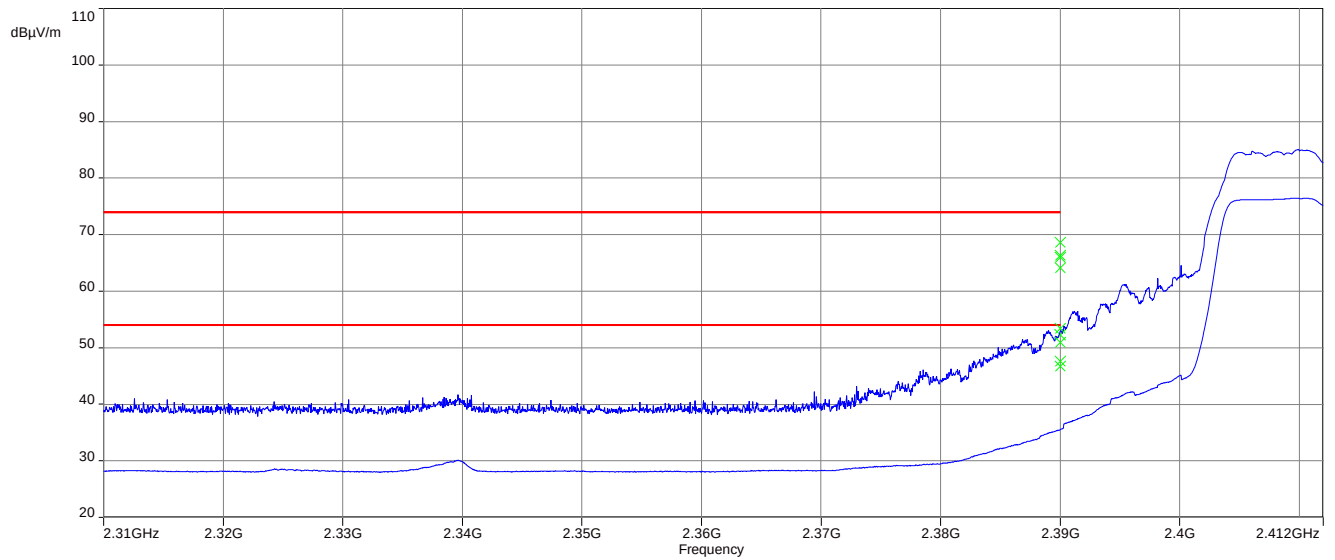
FCC	ISED
74 dBµV/m @ 3 m (Peak) 54 dBµV/m @ 3 m (AVG)	

Results:

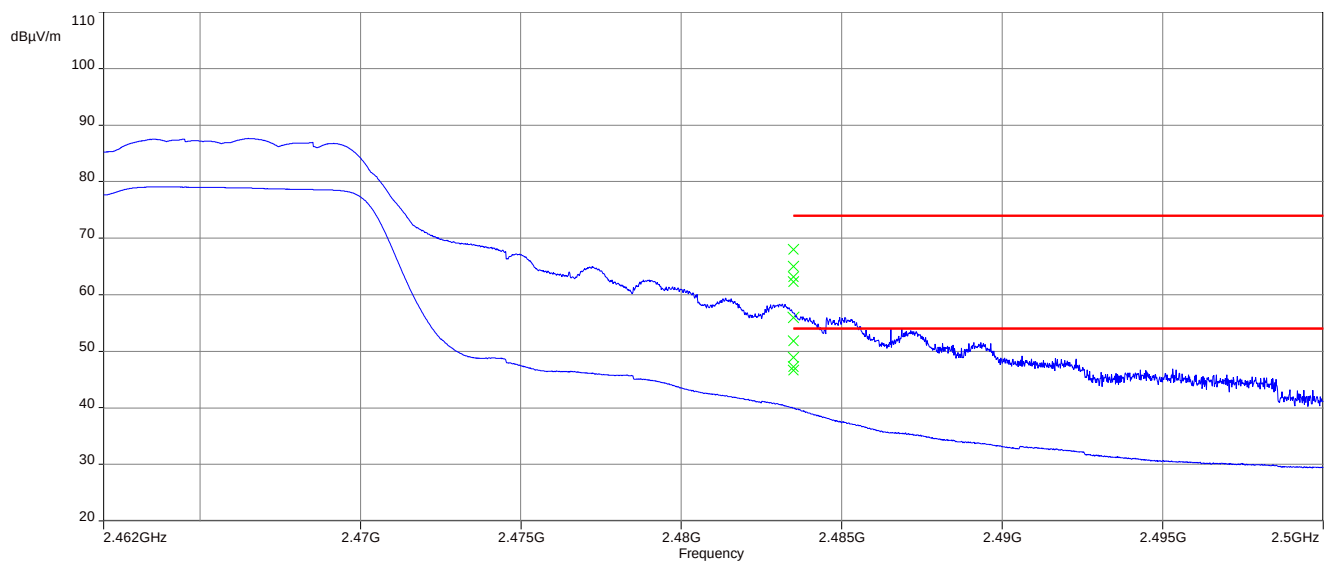
band edge compliance radiated / (dBµV / m) @ 3 m			
	OFDM g-mode	OFDM n20-mode	OFDM n40-mode
Lower band edge	68.6 (Peak) 53.4 (AVG)	67.1 (Peak) 48.8 (AVG)	56.9 (Peak) 43.4 (AVG)
Upper band edge	68.0 (Peak) 51.8 (AVG)	68.1 (Peak) 50.5 (AVG)	57.1 (Peak) 36.7 (AVG)

Plots: OFDM g-mode - peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

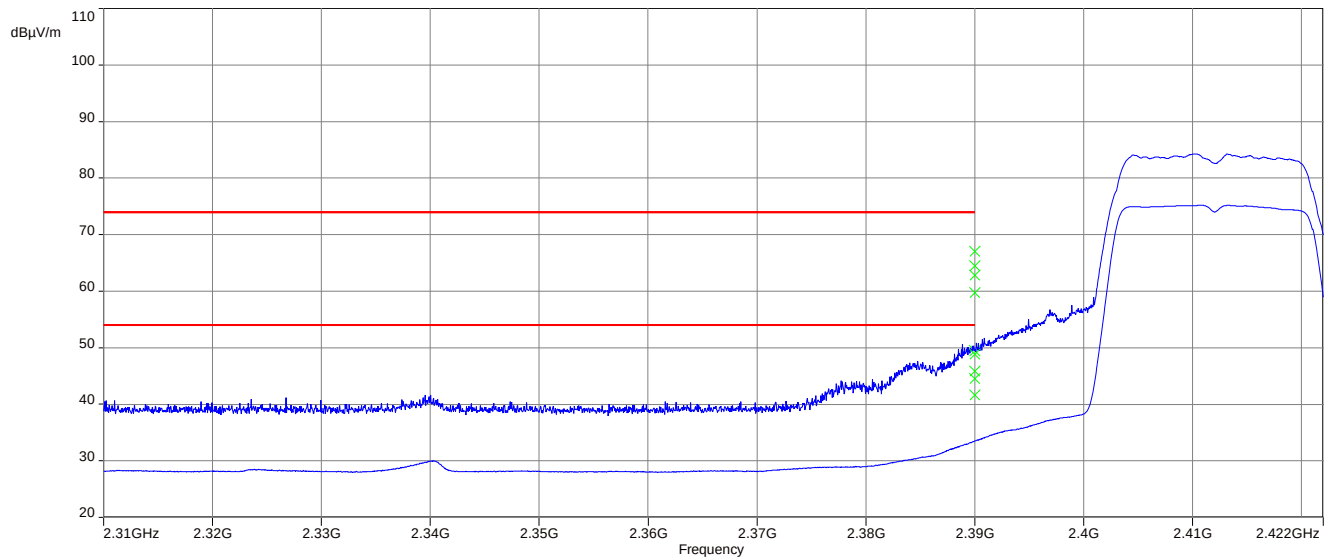


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

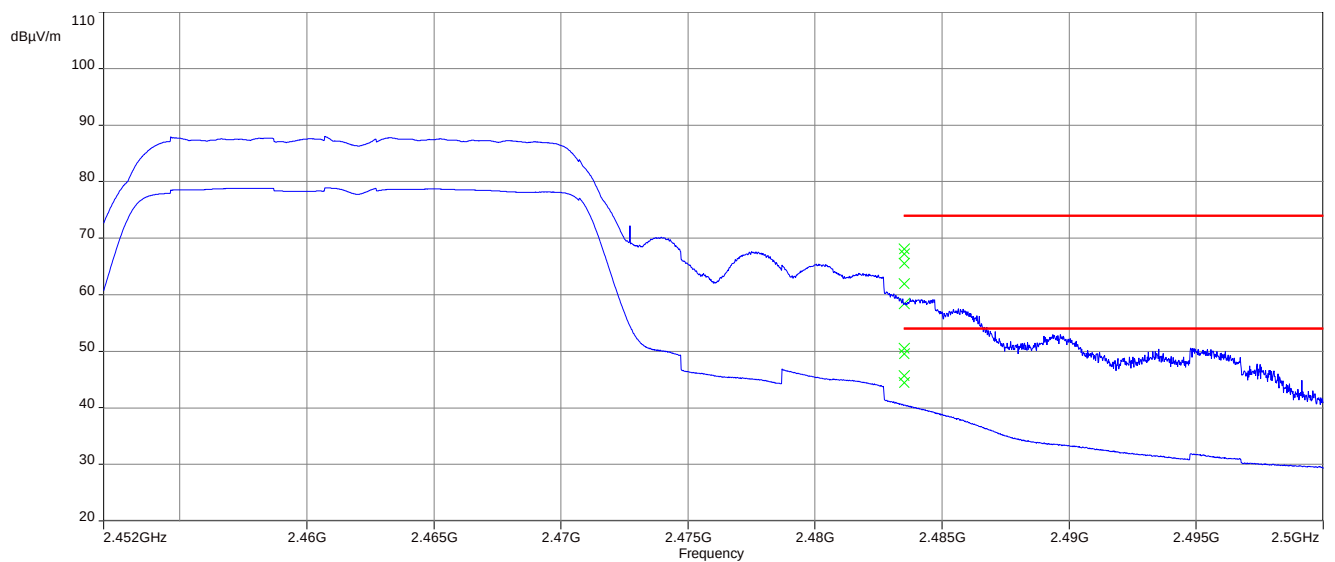


Plots: OFDM n20 - mode peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization

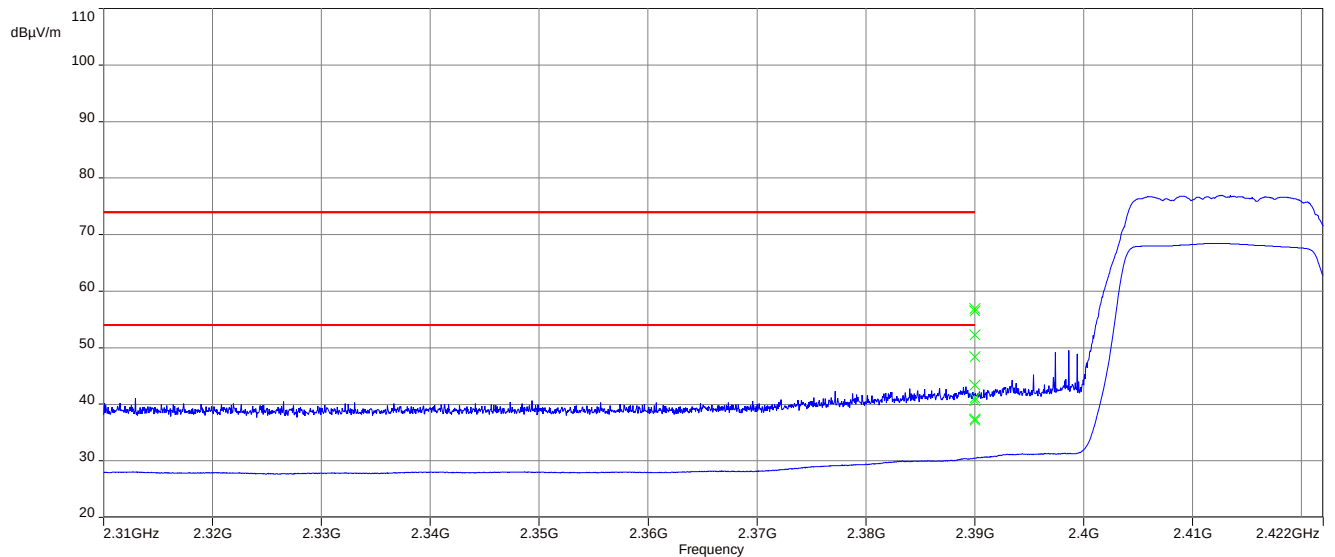


Plot 2: TX mode, upper band edge, vertical & horizontal polarization

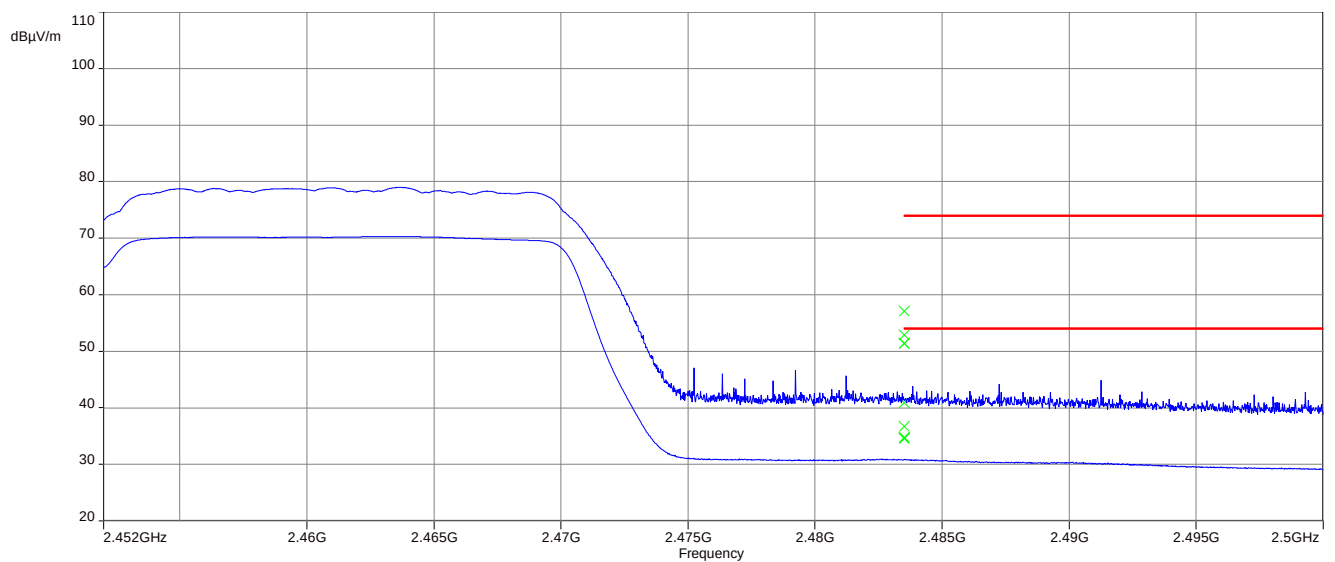


Plots: OFDM n40 - mode peak / average

Plot 1: TX mode, lower band edge, vertical & horizontal polarization



Plot 2: TX mode, upper band edge, vertical & horizontal polarization



13.2 Spurious emissions radiated above 1 GHz

Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode.

Measurement:

Measurement parameter	
Detector	Peak / RMS
Sweep time	Auto
Resolution bandwidth	1 MHz
Video bandwidth	3 x RBW
Span	1 GHz to 26 GHz
Trace mode	Max Hold
Measured modulation	☒ DSSS b – mode ☒ OFDM g – mode ☒ OFDM n HT20 – mode ☐ OFDM n HT40 – mode
Test setup	See chapter 7.1 - A
Measurement uncertainty	See chapter 9

Limits:

FCC		ISED
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency / MHz	Field Strength / (dBµV / m)	Measurement distance / m
Above 960	54.0 (AVG)	3
	74.0 (peak)	

Results: DSSS b-mode

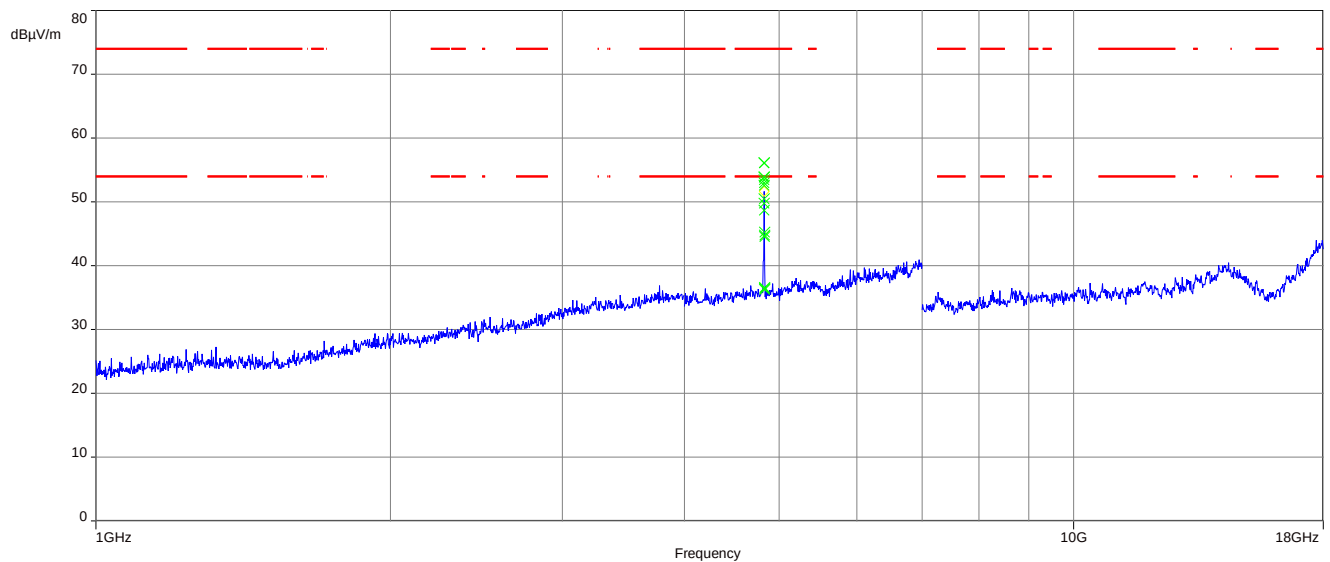
TX spurious emissions radiated / dB μ V/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dB μ V/m	f / MHz	Detector	Level / dB μ V/m	f / MHz	Detector	Level / dB μ V/m
4824	RMS	53.9	4874	RMS	53.3	4924	RMS	50.6
	Peak	56.1		Peak	55.7		Peak	53.6

Results: OFDM g-mode

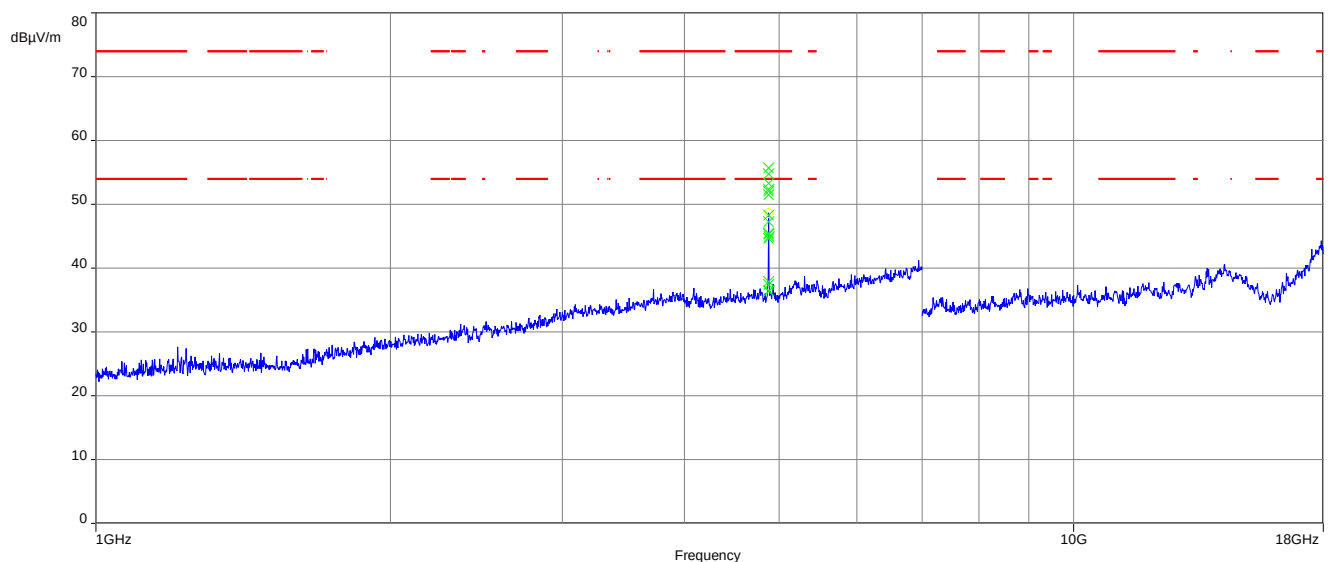
TX spurious emissions radiated / dB μ V/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dB μ V/m	f / MHz	Detector	Level / dB μ V/m	f / MHz	Detector	Level / dB μ V/m
4824	RMS	49.9	4874	RMS	52.1	All detected emissions are more than 10 dB below the limit.		
	Peak	59.4		Peak	61.9			

Results: OFDM n20-mode

TX spurious emissions radiated / dB μ V/m @ 3 m								
lowest channel			middle channel			highest channel		
f / MHz	Detector	Level / dB μ V/m	f / MHz	Detector	Level / dB μ V/m	f / MHz	Detector	Level / dB μ V/m
4824	RMS	45.6	4874	RMS	50.1	All detected emissions are more than 10 dB below the limit.		
	Peak	55.1		Peak	59.0			

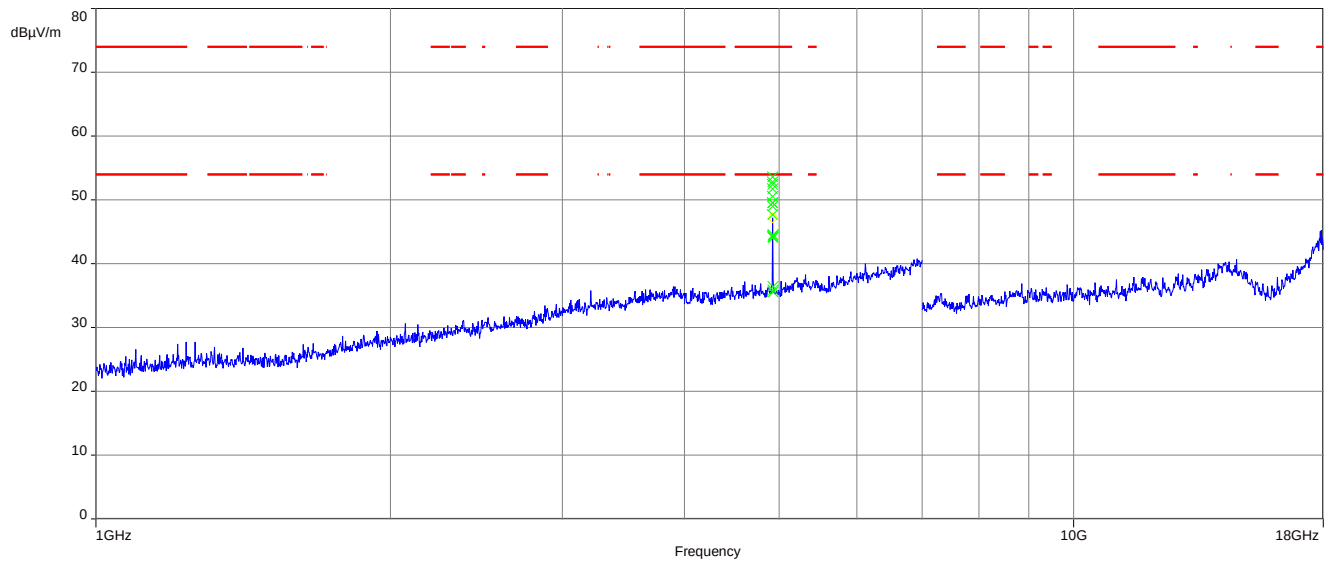
Plots: DSSS b-mode**Plot 1:** Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

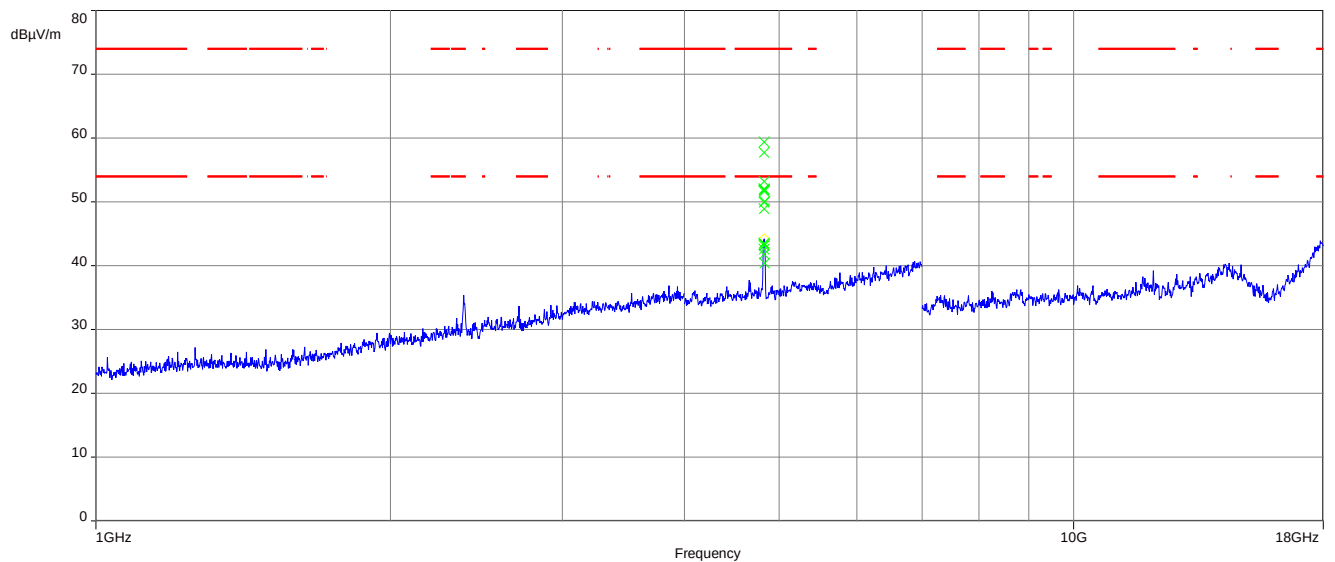
Plot 2: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

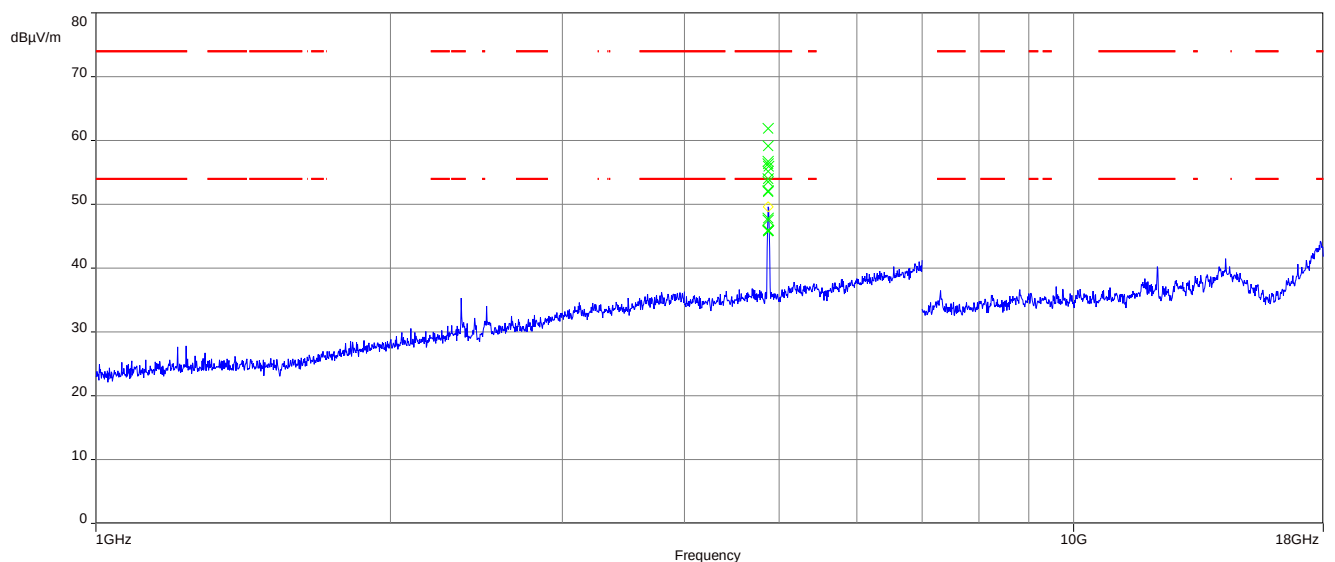
Plot 3: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

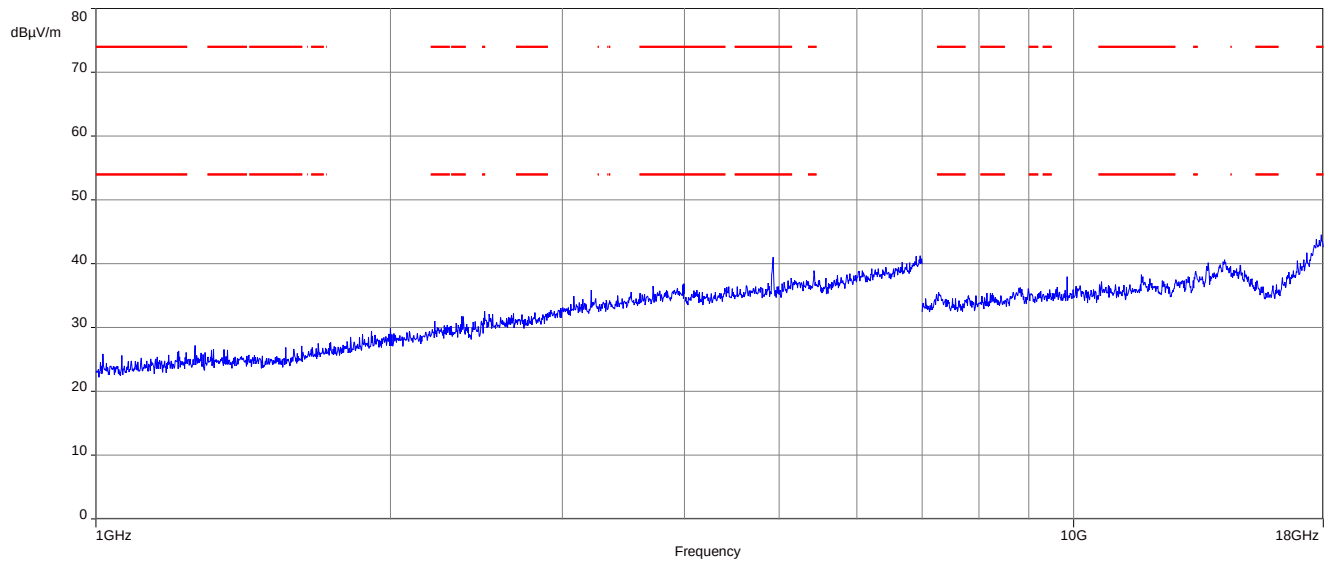
Plots: OFDM g-mode**Plot 1:** Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

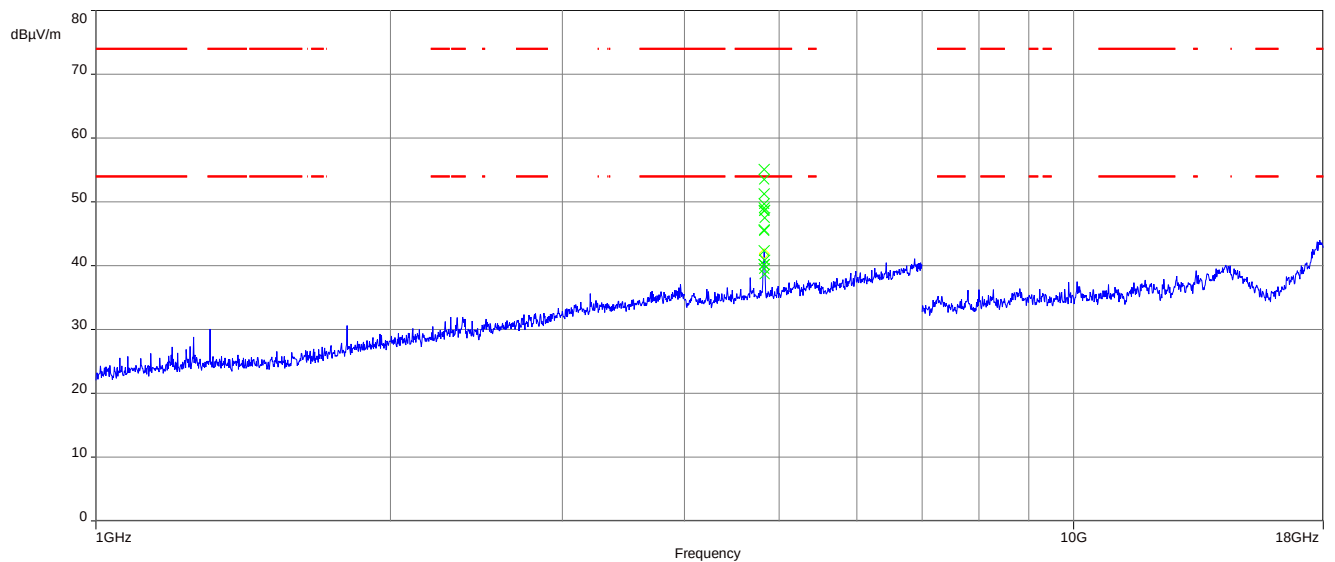
Plot 2: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

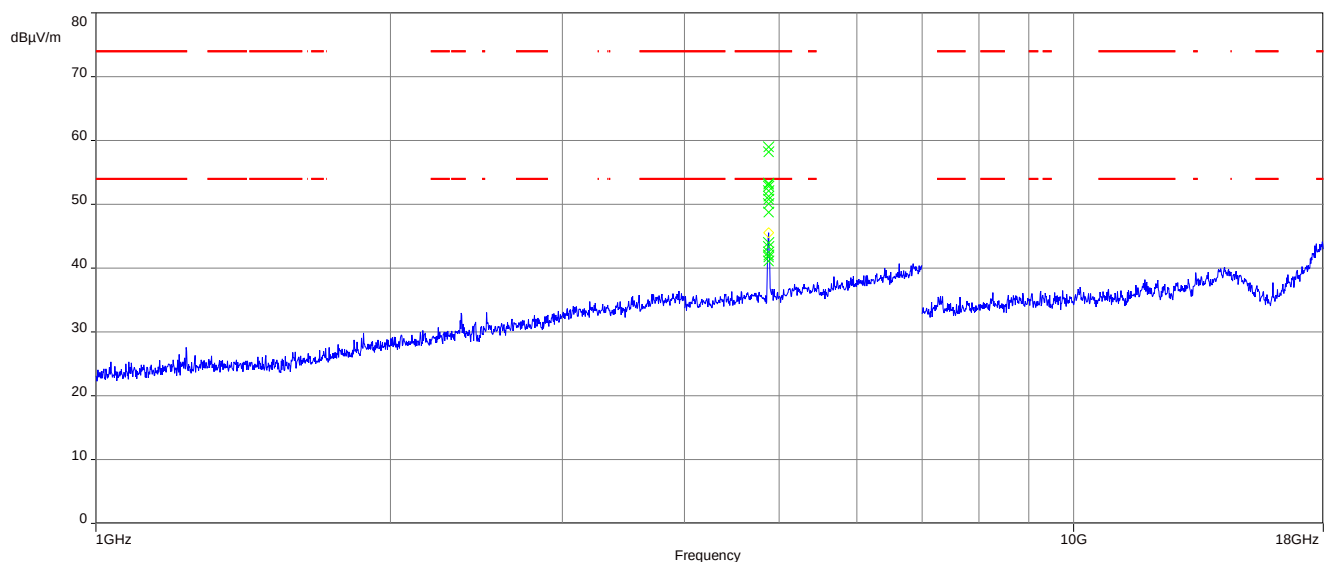
Plot 3: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

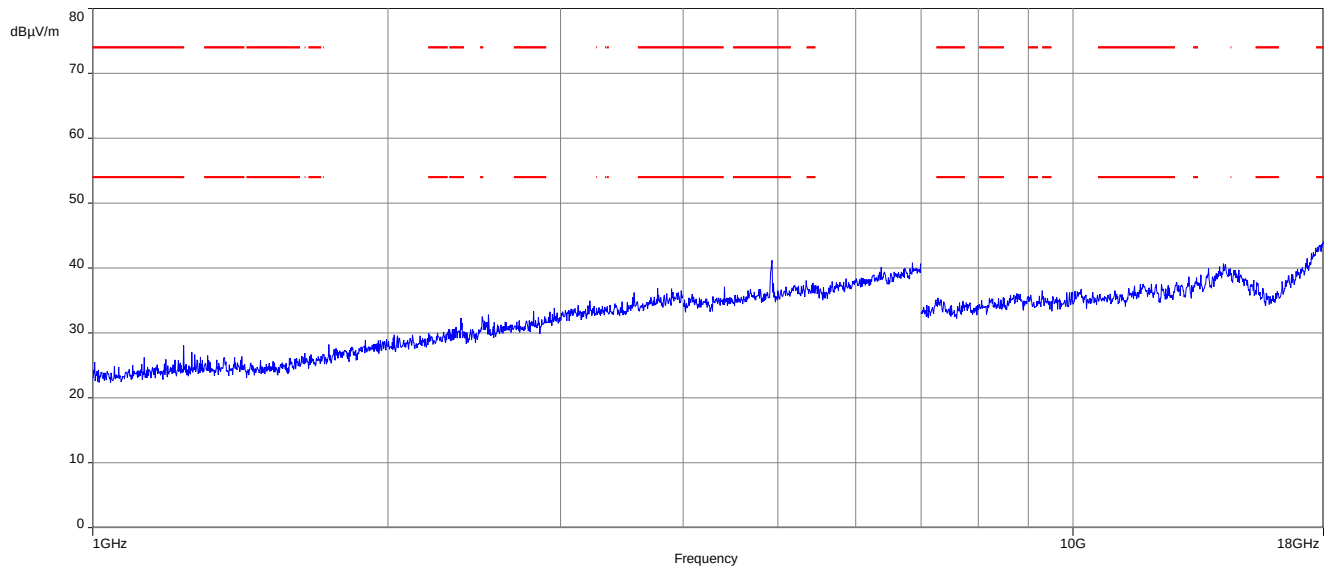
Plots: OFDM n20-mode**Plot 1:** Lowest channel, 1 GHz to 18 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 2: Middle channel, 1 GHz to 18 GHz, vertical & horizontal polarization

The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 3: Highest channel, 1 GHz to 18 GHz, vertical & horizontal polarization



The carrier signal is notched with a 2.4 GHz band rejection filter.

14 Observations

No observations except those reported with the single test cases have been made.

15 Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing

16 Document history

Version	Applied changes	Date of release
-/-	Initial release	2022-07-08
A	HVINs adjusted	2022-12-12

17 Accreditation Certificate – D-PL-12076-01-04

first page	last page
 Deutsche Akkreditierungsstelle GmbH Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition Accreditation  The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory CTC advanced GmbH Untertürkheimer Straße 6-10, 66117 Saarbrücken is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out tests in the following fields: Telecommunication (TC) and Electromagnetic Compatibility (EMC) for Canadian Standards The accreditation certificate shall only apply in connection with the notice of accreditation of 09.06.2020 with the accreditation number D-PL-12076-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 07 pages. Registration number of the certificate: D-PL-12076-01-04 Frankfurt am Main, 09.06.2020 by order:  Prof.-Ing. (FH) Ralf Egner Head of Division The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH. https://www.dakks.de/en/content/accredited-bodies-dakks See notes on back.	Deutsche Akkreditierungsstelle GmbH Office Berlin Spittelmarkt 10 10117 Berlin Office Frankfurt am Main Europa-Allee 52 60527 Frankfurt am Main Office Braunschweig Bundesallee 100 38116 Braunschweig The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkks). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf. No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkks. The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkks is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations. The up-to-date state of membership can be retrieved from the following websites: EA: www.european-accreditation.org ILAC: www.ilac.org IAF: www.iaf.nu

Note: The current certificate annex is published on the websites (link see below).

<https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04e.pdf>

or

https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf

18 Accreditation Certificate – D-PL-12076-01-05

first page	last page
 Deutsche Akkreditierungsstelle GmbH Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition Accreditation  The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory CTC advanced GmbH Untertürkheimer Straße 6-10, 66117 Saarbrücken is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out tests in the following fields: Telecommunication (FCC Requirements) The accreditation certificate shall only apply in connection with the notice of accreditation of 09.06.2020 with the accreditation number D-PL-12076-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 05 pages. Registration number of the certificate: D-PL-12076-01-05 Frankfurt am Main, 09.06.2020 by  Head of Division The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH. https://www.dakks.de/en/content/accredited-bodies-dakks last valid version	Deutsche Akkreditierungsstelle GmbH Office Berlin Spittelmarkt 10 10117 Berlin Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main Office Braunschweig Bundesallee 100 38116 Braunschweig The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAKKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf. No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAKKS. The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAKKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations. The up-to-date state of membership can be retrieved from the following websites: EA: www.european-accreditation.org ILAC: www.ilac.org IAF: www.iaf.nu

Note: The current certificate annex is published on the websites (link see below).

<https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf>

or

https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf

END OF TEST REPORT