

TEST REPORT

Test report no.: 1-3499/17-02-02



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CTC advanced GmbH

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Accredited Testing Laboratory:

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS). The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01.

Applicant

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Manufacturer

Marquardt GmbH

Schloss-Str. 16
78604 Rietheim-Weilheim / GERMANY

Test standard/s

47 CFR Part 15

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

RSS - 210 Issue 9

Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment

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

Test Item

Kind of test item: Vehicle key
Model name: DAG13
FCC ID: IYZDAG13
IC: 2701A-DAG13
Frequency band: 260 MHz to 470 MHz
Technology tested: Proprietary
Antenna: Integrated antenna
Power supply: 3.00 V DC by CR2032 battery
Temperature range: -20°C to +65°C



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Test report authorized:

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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.

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2.2 Application details

Date of receipt of order:	2017-05-19
Date of receipt of test item:	2017-05-29
Start of test:	2017-05-30
End of test:	2017-06-02
Person(s) present during the test:	Mr. Mathias Kiefer

2.3 Test laboratories sub-contracted

None

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 9	August 2016	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American national standard of procedures for compliance testing of unlicensed wireless devices

4 Test environment

Temperature	:	T _{nom} T _{max} T _{min}	+22 °C during room temperature tests +65 °C during high temperature tests -20 °C during low temperature tests
Relative humidity content	:		48 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V _{nom} V _{max} V _{min}	3.00 V DC by CR2032 battery 3.00 V 2.55 V

5 Test item

5.1 General description

Kind of test item	:	Vehicle key
Type identification	:	DAG13
HMN	:	-/-
PMN	:	DAG13
HVIN	:	DAG13
FVIN	:	-/-
S/N serial number	:	-/-
HW hardware status	:	-/-
SW software status	:	-/-
Frequency band	:	260 MHz to 470 MHz Carrier frequency: 314.9 MHz
Type of radio transmission	:	Modulated carrier
Use of frequency spectrum	:	
Type of modulation	:	2FSK
Number of channels	:	1
Antenna	:	Integrated antenna
Power supply	:	3.00 V DC by CR2032 battery
Temperature range	:	-20°C to +65°C

5.2 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:

- 1-3499/17-02-01_AnnexA
- 1-3499/17-02-01_AnnexB
- 1-3499/17-02-01_AnnexD

6 Description of the test setup

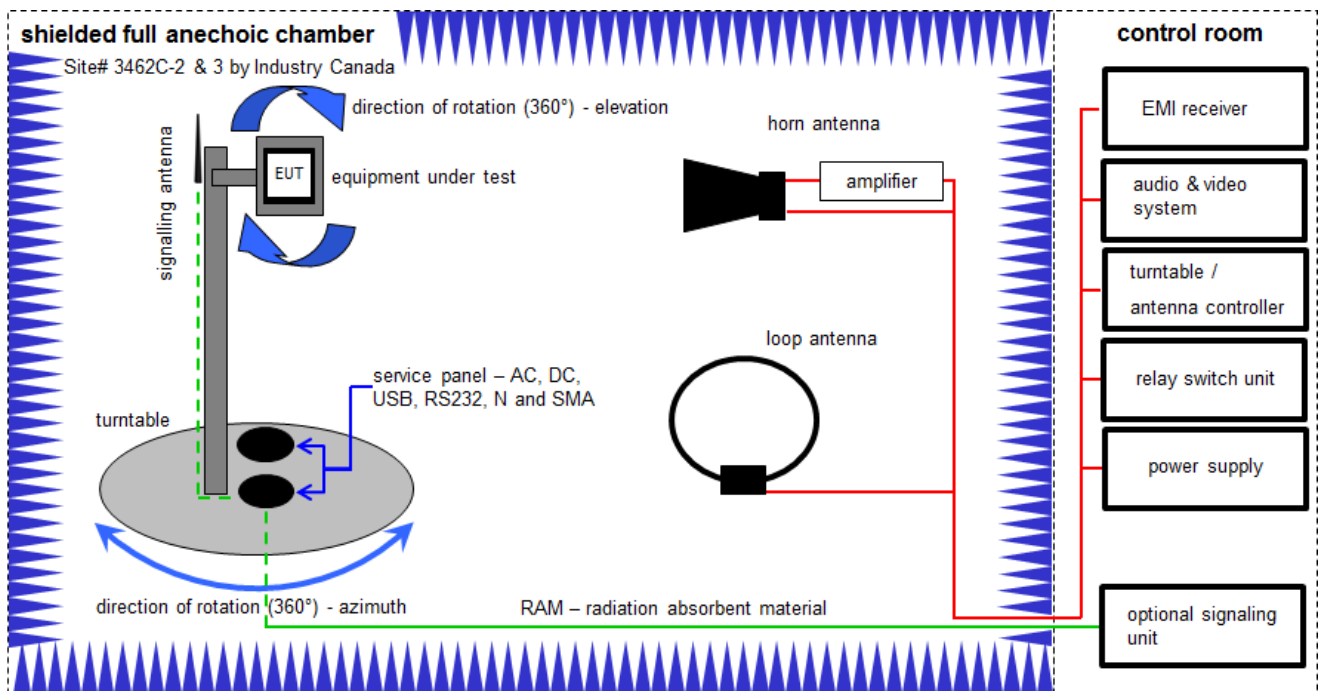
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements 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).

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
vlk!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

6.1 Shielded fully anechoic chamber



Measurement distance: tri-log antenna and 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)

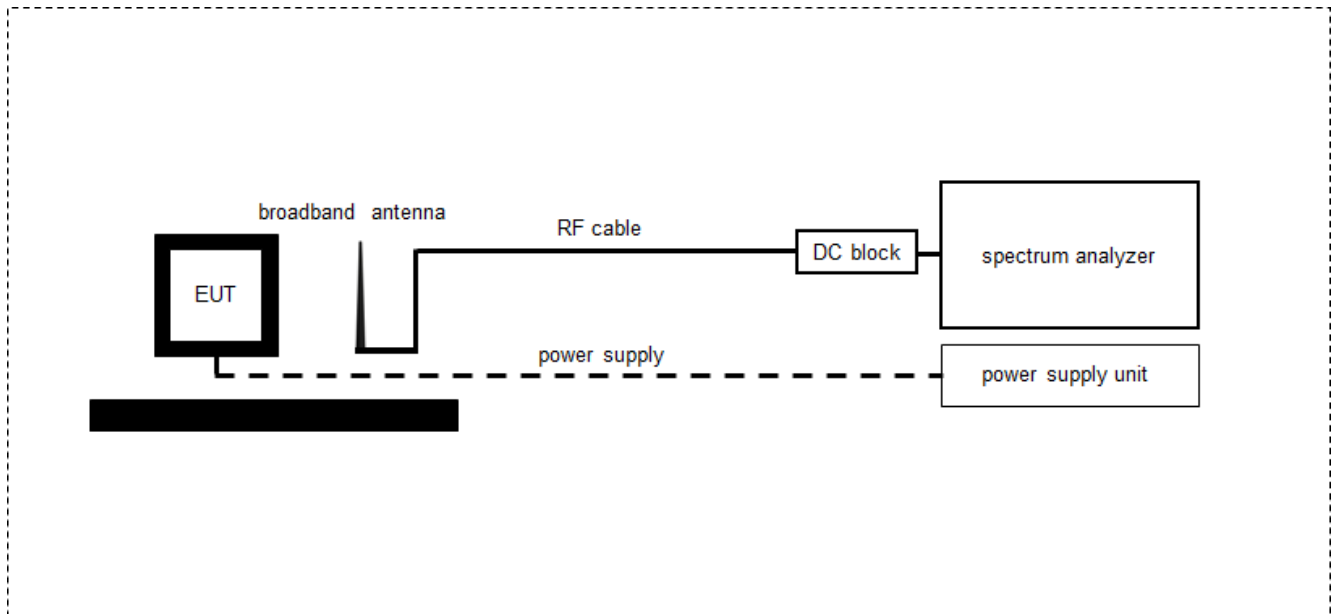
Example calculation:

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

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A, B	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	31.01.2017	30.01.2018
2	A, B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vIKI!	14.02.2017	13.02.2019
4	A, B	Switch / Control Unit	3488A	HP	-/-	300000199	ne	-/-	-/-
5	A	Active Loop Antenna 10 kHz to 30 MHz	6502	EMCO/2	8905-2342	300000256	k	24.06.2015	24.06.2017
6	B	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
7	B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
8	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
9	A, B	NEXIO EMV-Software	BAT EMC V3.16.0.49	EMCO	-/-	300004682	ne	-/-	-/-
10	A, B	PC	ExOne	F+W	-/-	300004703	ne	-/-	-/-

6.2 Test setup for normalized measurement configurations



$$OP = AV + D - G + CA$$

(OP-radiated output power; AV-analyzer value; D-free field attenuation of measurement distance;

G-antenna gain+amplifier gain; CA-loss signal path)

Example calculation:

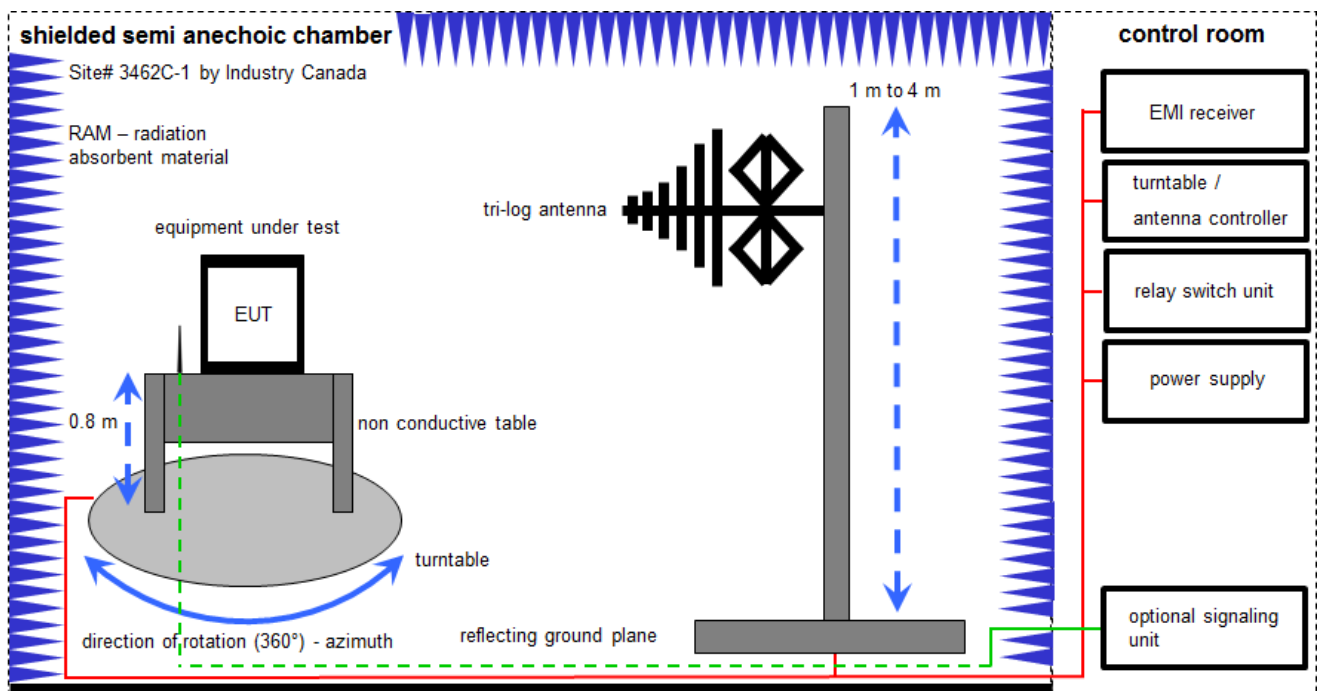
$$OP \text{ [dBm]} = -65.0 \text{ [dBm]} + 50 \text{ [dB]} - 20 \text{ [dBi]} + 5 \text{ [dB]} = -30 \text{ [dBm]} \text{ (1 } \mu\text{W)}$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	DC Power Supply, 60V, 10A	6038A	HP	3122A11097	300001204	Ve	21.01.2015	21.01.2018
2	A	Signal- and Spectrum Analyzer	FSW26	R&S	101455	300004528	k	25.01.2017	24.01.2018
3	A	Loop Antenna	-/-	ZEG TS Steinfurt	-/-	400001208	ev	-/-	-/-
4	A	RF Cable BNC	RG58	Huber & Suhner	-/-	400001209	ev	-/-	-/-

6.3 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

$$FS = UR + CL + AF$$

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

Example calculation:

$$FS [dB\mu V/m] = 12.35 [dB\mu V/m] + 1.90 [dB] + 16.80 [dB/m] = 31.05 [dB\mu V/m] (35.69 \mu V/m)$$

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
3	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
4	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	25.04.2016	25.04.2018
5	A	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	31.01.2017	30.01.2018

7 Sequence of testing

7.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

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 height is 1.5 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement are maximized by the software by rotating the turntable from 0° to 360°. In case of the 2-axis positioner is used the elevation axis is also rotated from 0° to 360°.
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

7.2 Sequence of testing radiated spurious 30 MHz to 1 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 table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- 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 10 m or 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 changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak 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 maximize the peaks by changing turntable position $\pm 45^\circ$ and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, 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.

7.3 Sequence of testing radiated spurious 1 GHz to 4 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.

8 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 210, Issue 9, Annex A	See table!	2017-08-01	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	C	NC	NA	NP	Remark
§ 15.35 (c) RSS-GEN	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	-/-				-/-
§ 15.231 (a) (1) RSS-210 Issue 9	Switch off time	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.231 (b) (3) (c) RSS-210 Issue 9	Emission bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.231 (b) RSS-210 Issue 9	Fieldstrength of Fundamental	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.209 RSS-210 Issue 9	Fieldstrength of harmonics and spurious	Nominal	Nominal	☒	☐	☐	☐	-/-
§ 15.209 RSS-GEN	Receiver spurious emissions (radiated)	Nominal	Nominal	☐	☐	☒	☐	-/-

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

8.1 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

9 Measurement results

9.1 Timing of the transmitter

Measurement:

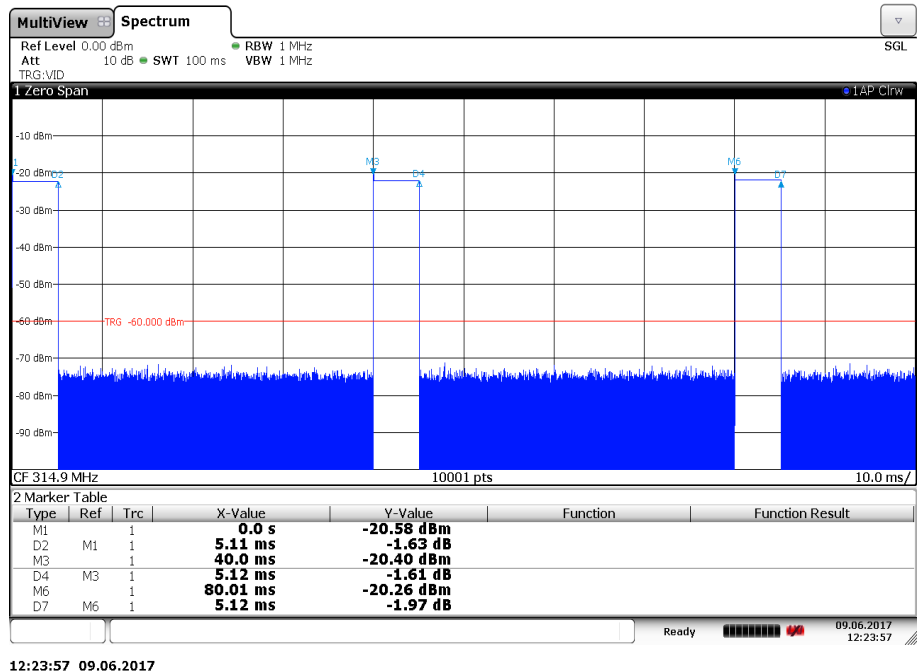
Measurement parameter	
Detector:	Peak
Sweep time:	100 ms
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	Zero
Trace-Mode:	Single sweep
Test setup	See chapter 6.2 A

Limits:

FCC	IC
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.	

Result:

Plot 1: Transmit burst



Transmit time (Tx on) = 15.35 ms
Tx on + Tx off = 100 ms

The peak-to-average correction factor is calculated with $20\log [Tx\ on/(Tx\ on + Tx\ off)]$.
Hereby the peak-to-average correction factor is -16.28 dB

9.2 Switch off time

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	1 s
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	Zero
Trace-Mode:	Single sweep
Test setup	See chapter 6.2 A

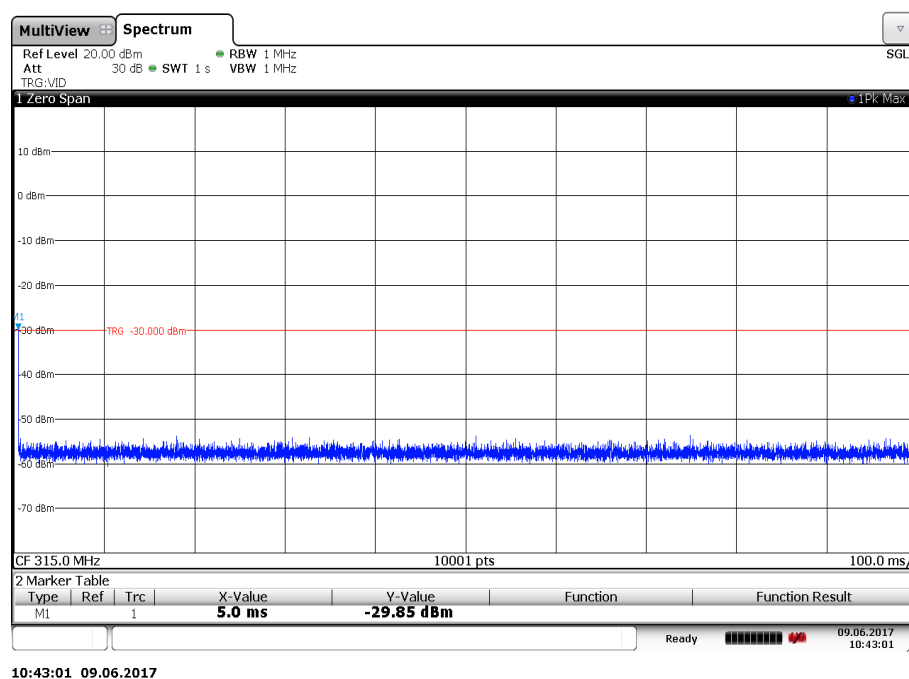
Limits:

FCC	IC
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.	

Results:

The EUT automatically ceases transmission within 5 ms after releasing the button

Plot : Switch off time



9.3 Emission bandwidth

Measurement:

Bandwidth is determined at the points 20 dB down from the modulated carrier and the 99 % bandwidth of the modulated signal.

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1 % of the span
Video bandwidth:	3 x RBW
Span:	500 kHz
Trace-Mode:	Max hold
Test setup	See chapter 6.2 A

Limits:

FCC	IC
The OBW shall not be wider than 0.25% of the centre frequency, here maximum 787.25 kHz	

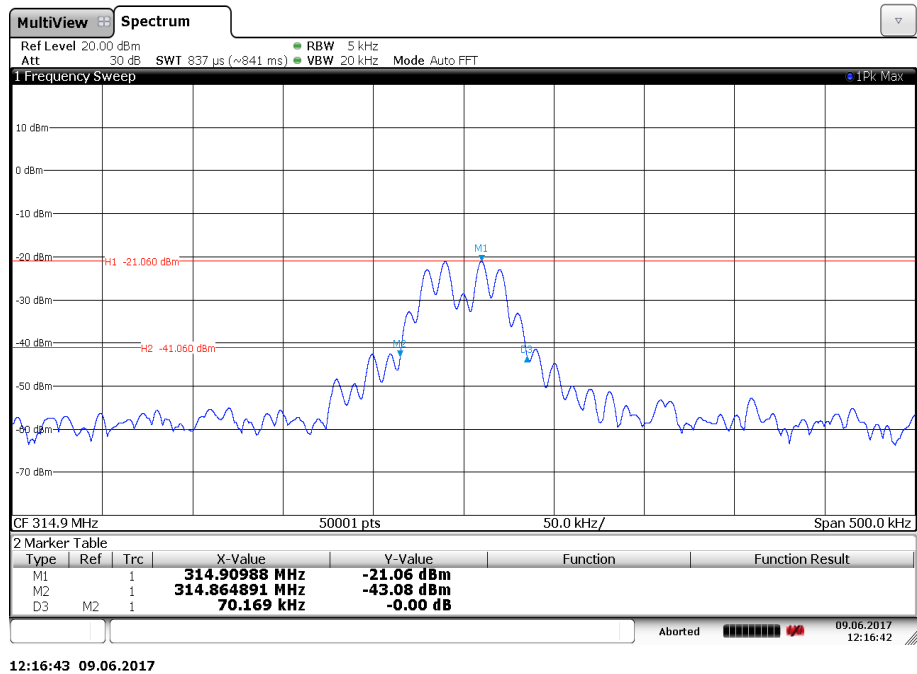
Result:

Measurement procedure	Emission bandwidth	
	F _l	F _h
20 dB bandwidth	314.865 MHz	314.935 MHz
99 % bandwidth	314.767 MHz	315.037 MHz
Limit	314.506 MHz	315.293 MHz
Maximum emission bandwidth	270.332 kHz	

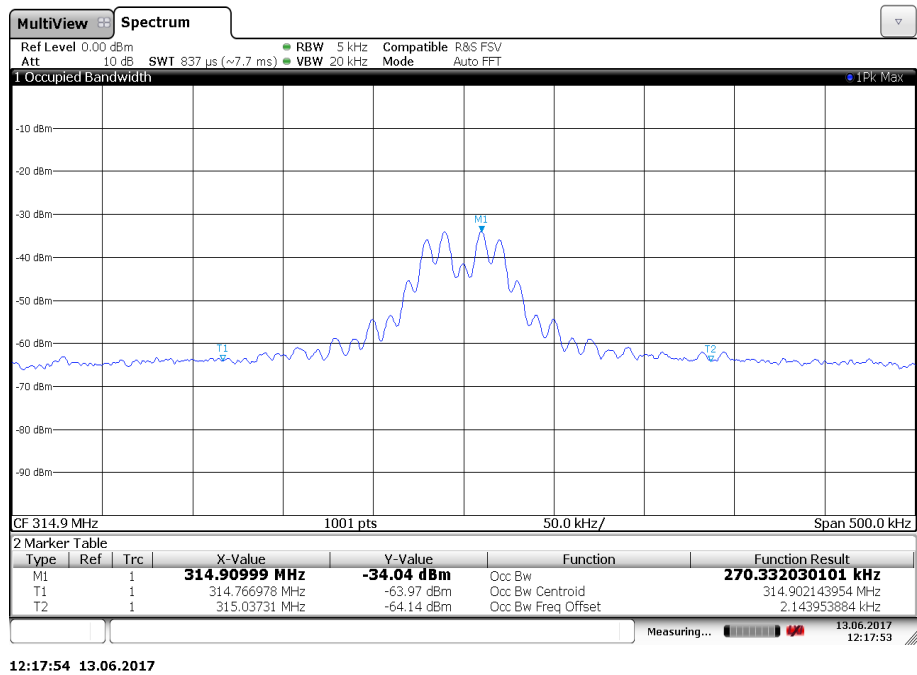
Where: F_l = is the lower edge of the emission bandwidth / MHz
 F_h = is the upper edge of the emission bandwidth / MHz

Plots: Emission bandwidth

Plot 1: 20 dB bandwidth



Plot 2: 99% bandwidth



9.4 Field strength of the fundamental

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	120 kHz
Video bandwidth:	3 x RBW
Span:	Depends on the signal
Trace-Mode:	Max hold
Test setup	See chapter 6.3 A

Limits:

FCC		IC
Field strength of the fundamental.		
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:		
Fundamental Frequency / MHz	Field strength of Fundamental / $\mu\text{V/m}$	Measurement distance / m
40.66 – 40.70	2,250	3
70-130	1,250	3
130-174	1,250 to 3,750	3
174-260	3,750	3
260-470	3,750 to 12,500	3

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

- for the band 130-174 MHz, $\mu\text{V/m}$ at 3 meters = $56.81818(F) - 6136.3636$;
- for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3333$.

Result:

TEST CONDITIONS		MAXIMUM POWER (@ 3 m distance)		
Mode		Peak	Duty cycle average*	Limit
T_{nom}	V_{nom}	7396 $\mu\text{V/m}$ 77.4 dB $\mu\text{V/m}$	1135 $\mu\text{V/m}$ 61.1 dB $\mu\text{V/m}$	6038 $\mu\text{V/m}$ 75.6 dB $\mu\text{V/m}$
Measurement uncertainty		$\pm 3\text{dB}$		

*) Including the peak-to-average correction factor of -16.28 dB (see chapter 9.1).

9.5 Field strength of the harmonics and spurious

Measurement:

Measurement parameter	
Detector:	Peak / duty cycle average / quasi peak
Sweep time:	Auto
Resolution bandwidth:	200 Hz / 9 kHz / 1000 kHz
Video bandwidth:	3 x RBW
Span:	See plots
Trace-Mode:	Max hold
Test setup	See chapter 6.1 A / B, 6.3 A

Limits:

FCC		IC
Field strength of the fundamental.		
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:		
Fundamental Frequency / MHz	Field strength of spurious / $\mu\text{V/m}$	Measurement distance / m
40.66 – 40.70	225	3
70-130	125	3
130-174	125 to 375	3
174-260	375	3
260-470	375 to 1,250	3
Above 470	1,250	3

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength.

FCC		IC
Frequency / MHz	Field strength / $\mu\text{V/m}$	Measurement distance / m
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
above 960	500	3

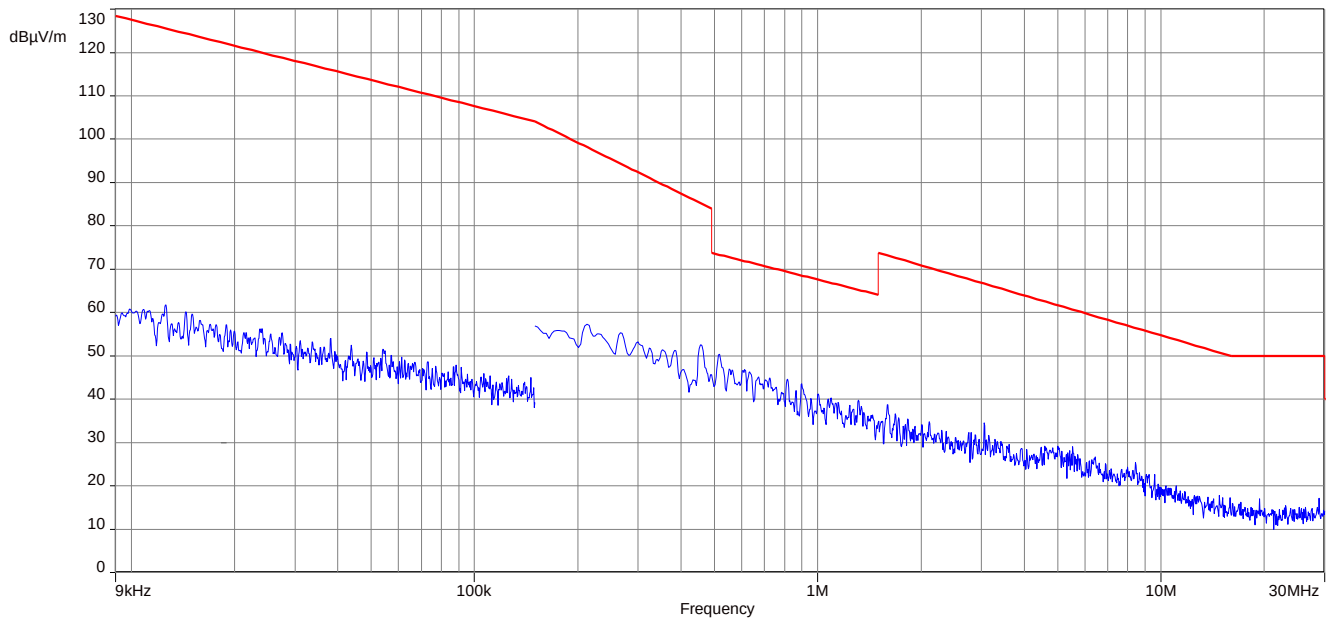
Results:

TX Spurious Emissions Radiated			
F / MHz	Detector	Level / dBµV/m	Limit / dBµV/m
1259	Peak	61.9	-/-
	Duty cycle average*	45.6	
1574	Peak	65.7	54.0
	Duty cycle average*	49.4	
1889	Peak	51.0	-/-
	Duty cycle average*	34.7	
2204	Peak	47.0	54.0
	Duty cycle average*	30.7	
2518	Peak	44.1	-/-
	Duty cycle average*	27.8	

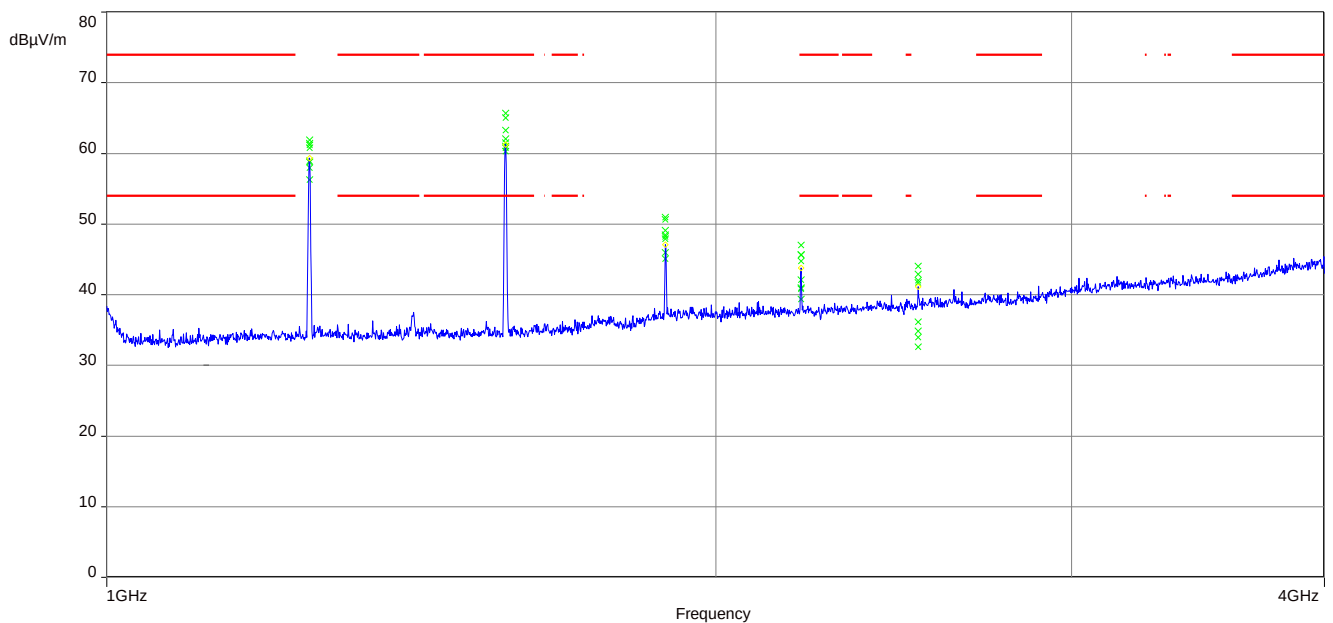
*) Including the peak-to-average correction factor of -16.28 dB (see chapter 9.1).

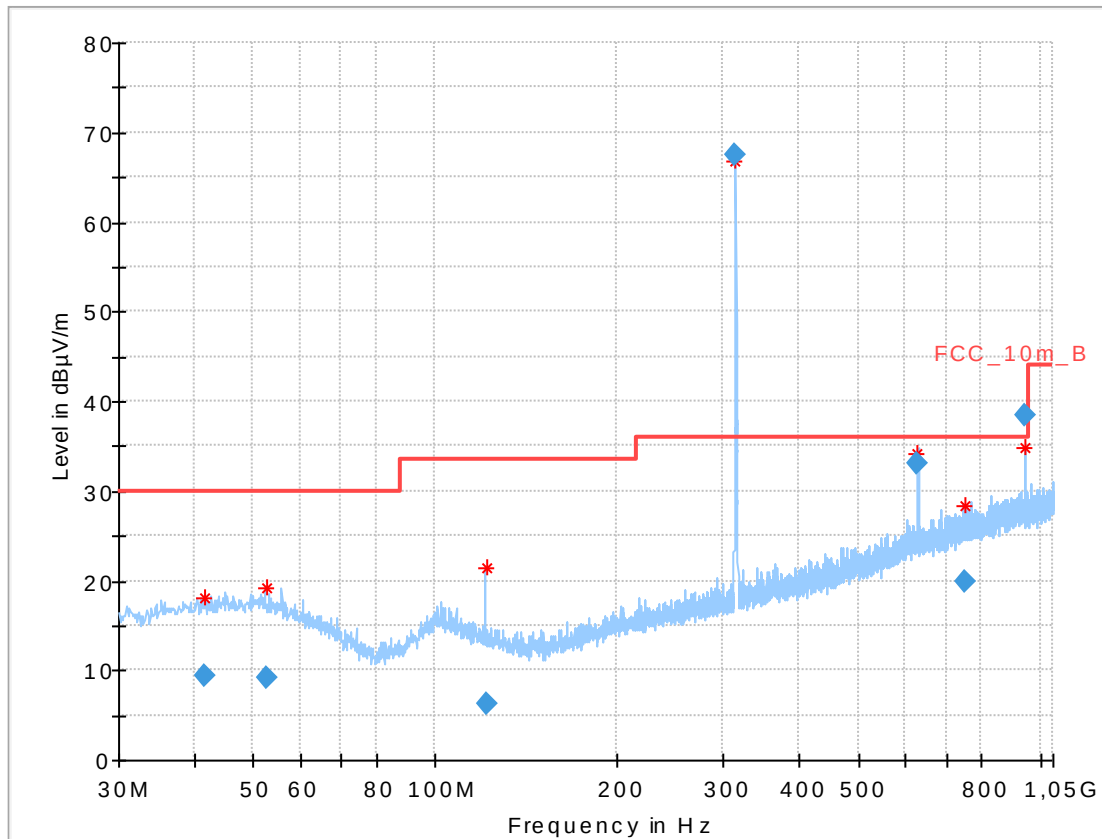
Plots:

Plot 1: 9 kHz to 30 MHz, magnetic



Plot 2: 1000 MHz to 4000 MHz, vertical & horizontal polarisation



Plot 3: 30 MHz to 1000 MHz, vertical & horizontal polarisation**Final result**

Frequency / MHz	QuasiPeak / dBµV/m	Limit / dBµV/m	Margin / dB	Meas. Time / ms	Bandwidth / kHz	Height / cm	Pol	Azimuth / deg	Corr. / dB
41.716650	9.49	30.00	20.51	1000.0	120.000	101.0	V	100.0	13.4
52.718700	9.20	30.00	20.80	1000.0	120.000	170.0	H	80.0	13.4
121.338000	6.23	33.50	27.27	1000.0	120.000	101.0	V	280.0	10.2
314.013900	67.38	36.00	-31.38	1000.0	120.000	98.0	V	81.0	14.9
627.971100	33.11	36.00	2.89	1000.0	120.000	170.0	H	-8.0	21.0
751.202400	19.78	36.00	16.22	1000.0	120.000	170.0	V	170.0	22.7
941.941350	38.41 / 22.13*	36.00	-2.41 / 13.87*	1000.0	120.000	170.0	V	280.0	24.3

*) Third harmonic including the peak-to-average correction factor of -16.28 dB (see chapter 9.1).

10 Observations

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

Annex A Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
ETSI	European Telecommunications Standard Institute
EN	European Standard
FCC	Federal Communication 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
NOP	Non 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
FHSS	Frequency hopping spread spectrum

Annex B Document history

Version	Applied changes	Date of release
-/-	Initial release	2017-08-01

Annex C Accreditation Certificate

first page	last page
 Deutsche Akkreditierungsstelle GmbH Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV Unterzeichnerin der Multilateralen Abkommen von EA, ILAC und IAF zur gegenseitigen Anerkennung Akkreditierung  Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium CTC advanced GmbH Untertürkheimer Straße 6-10, 66117 Saarbrücken die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen: Funk Mobilfunk (GSM / DCS) + OTA Elektromagnetische Verträglichkeit (EMV) Produktsicherheit SAR / EMF Umwelt Smart Card Technology Bluetooth® Automotive Wi-Fi Services Kanadische Anforderungen US-Anforderungen Akustik Near Field Communication (NFC) Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 25.11.2016 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig bis 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 63 Seiten. Registrierungsnummer der Urkunde: D-PL-12076-01-01 Frankfurt, 25.11.2016  Im Auftrag Dipl.-Ing. Ralf Egner Abteilungsleiter Siehe Hinweise auf der Rückseite	Deutsche Akkreditierungsstelle GmbH Standort Berlin Spittelmarkt 10 10117 Berlin Standort Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main Standort Braunschweig Bundesallee 100 38116 Braunschweig Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAKKS). Ausgenommen davon ist die separate Weiterverbreitung des Deckblattes durch die uneingeschränkte Konformitätsbewertungsstelle in unveränderter Form. Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAKKS bestätigten Akkreditierungsbereich hinausgehen. Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abt. L 218 vom 9. Juli 2008, S. 30). Die DAKKS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an. Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden: EA: www.european-accreditation.org ILAC: www.ilac.org IAF: www.iaf.nu

Note: The current certificate including annex is published on the website (link see below) of the Accreditation Body DAKKS or may be received by CTC advanced GmbH on request

<http://www.dakks.de/as/ast/d/D-PL-12076-01-01.pdf>

<http://www.dakks.de/as/ast/d/D-PL-12076-01-02.pdf>