
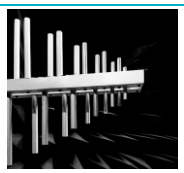
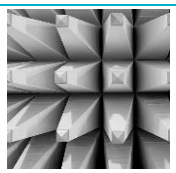

CTC advanced
member of RWTÜV group

# TEST REPORT

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

**Test report no.: 1-0619/20-01-03**

## Testing laboratory


**CTC advanced GmbH**
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
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e-mail: mail@ctcadvanced.com


**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-12076-01-03

## Applicant


**Dialog Semiconductor BV**
Het Zuiderkruis 53
5215 MV°s Hertogenbosch / NETHERLANDS
Phone: -/-
Contact: Steven Leussink
e-mail: steven.leussink@diasemi.com
Phone: +31 73 680 22 10


## Manufacturer


**Dialog Semiconductor BV**
Het Zuiderkruis 53
5215 MV°s Hertogenbosch / NETHERLANDS


## Test standard/s

| | |
|---|---|
| ETSI EN 300 328 V2.2.2 | Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum |

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

## Test Item

| | |
|---|---|
| **Kind of test item:** | **Bluetooth LE chip** |
| **Model name:** | **DA14585** |
| Frequency: | ISM band 2400 MHz to 2483.5 MHz |
| Technology tested: | Bluetooth® Low Energy |
| Antenna: | Integrated antenna |
| Power supply: | 3.0 V DC by battery / external power supply |
| Temperature range: | -40°C to +85°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=Joerg Warken, o=CTC advanced GmbH, ou=WAK-281116, email=joerg.warken@ctcadvanced.com, c=DE
2020.06.26 11:29:31 +02'00'

Joerg Warken
Lab Manager
Radio Communications

## Test performed:

cn=Mihail Dorongovskij, o=CTC advanced GmbH, ou=DOR-281116, email=Mihail.Dorongovskij@ctcadvanced.com, c=DE
2020.06.26 09:08:24 +02'00'

Mihail Dorongovskij
Lab Manager
Radio Communications

# 1 Table of contents

# 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.
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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.

## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2020-06-12 |
| Date of receipt of test item: | 2020-06-19 |
| Start of test: | 2020-06-19 |
| End of test: | 2020-06-23 |
| Person(s) present during the test: | -/- |

## 2.3 Test laboratories sub-contracted

None

# 3 Test standard/s

| Test standard | Date | Description |
|---|---|---|
| ETSI EN 300 328 V2.2.2 | 2019-07 | Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum |

# 4 Test environment

| | | | |
|---|---|---|---|
| Temperature | : | $T_{nom}$<br>$T_{max}$<br>$T_{min}$ | +22 °C during room temperature tests<br>No tests under extreme temperature conditions performed.<br>No tests under extreme temperature conditions performed. |
| Relative humidity content | : | | 54 % |
| Barometric pressure | : | | not relevant for this kind of testing |
| Power supply | : | $V_{nom}$<br>$V_{max}$<br>$V_{min}$ | 5.0 V DC by USB<br>No tests under extreme voltage conditions required.<br>No tests under extreme voltage conditions required. |

# 5 Test item

## 5.1 General description

| | | |
|---|---|---|
| **Kind of test item** | : | Bluetooth LE chip |
| **Model name:** | : | DA14585 |
| **S/N serial number** | : | Cond. 1817_00301 |
| **Hardware status** | : | 321-02-A |
| **Software status** | : | SDK_6.0.14.1114 |
| **Firmware status** | : | SDK_6.0.14.1114 |
| **Frequency band** | : | ISM band 2400 MHz to 2483.5 MHz |
| **Type of radio transmission**<br>**Use of frequency spectrum** | :<br>: | DSSS |
| **Type of modulation** | : | GFSK |
| **Number of channels** | : | 40 |
| **Channel bandwidth (B)** | : | 2 MHz |
| **Channel spacing** | : | 2 MHz |
| **Receiver category** | : | 2 |
| **Antenna** | : | Integrated antenna |
| **Power supply** | : | 3.0 V DC by battery / external power supply |
| **Temperature range** | : | -40°C to +85°C |

## 5.2 Additional information

-/-

## 6 Description of the test setup

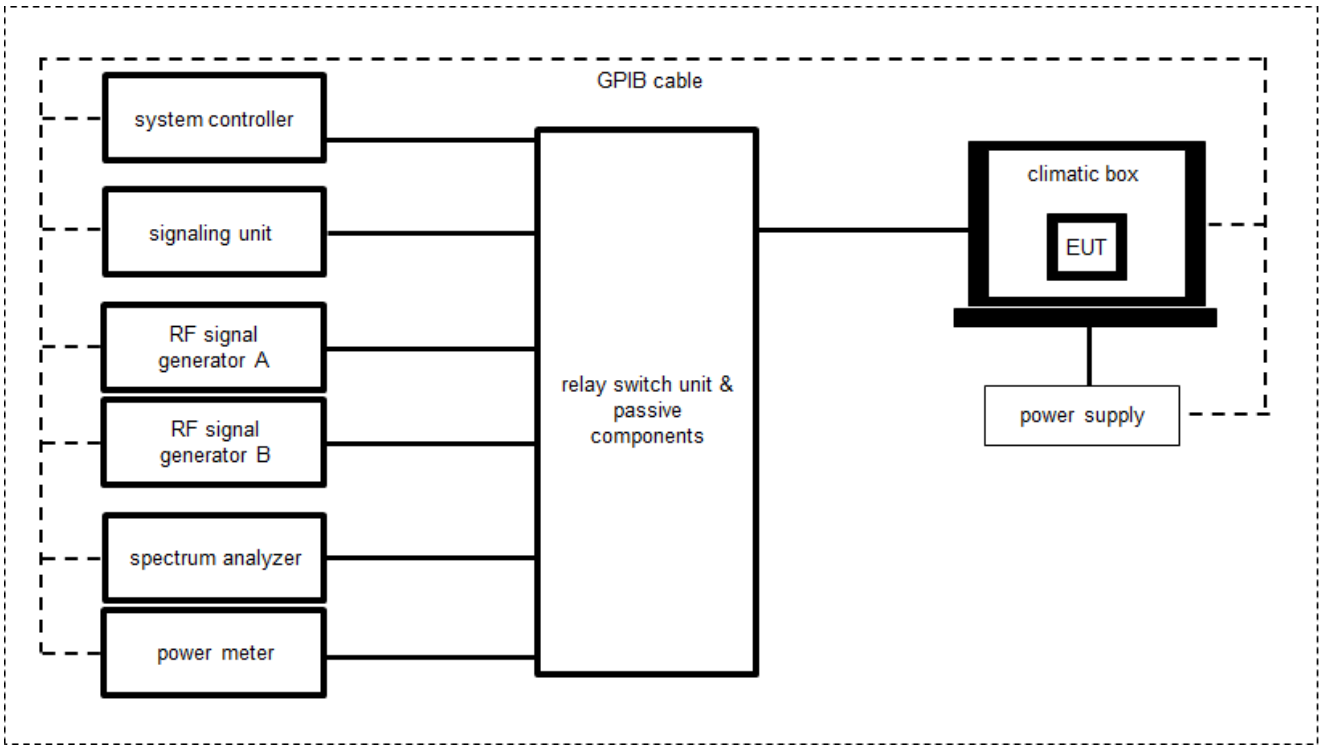
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements 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 |
| vlkl! | Attention: extended calibration interval | | |
| NK! | Attention: not calibrated | *) | next calibration ordered / currently in progress |

## 6.1 Conducted measurements Bluetooth system




OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

*Example calculation:*
OP [dBm] = 6.0 [dBm] + 11.7 [dB] = 17.7 [dBm] (58.88 mW)

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No. | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Switch / Control Unit (including DC-Block, Splitter) | 3488A | HP | -/- | 300000929 | ne | -/- | -/- |
| 2 | A | PC Laboratory 19" | Exone i3 | Fröhlich + Walter | 35230157A0370 | 300004646 | ne | -/- | -/- |
| 3 | A | Signal Generator - 20 GHz | SMB100A | Rohde & Schwarz | 176183 | 300004853 | vIKI! | 09.10.2017 | 08.10.2020 |
| 4 | A | Spectrum Analyzer | FSV30 | Rohde & Schwarz | 103170 | 300004855 | vIKI! | 11.12.2018 | 10.12.2020 |
| 5 | A | USB-GPIB-Interface | 82357B | Agilent Technologies | MY54323070 | 300004852 | ne | -/- | -/- |
| 6 | A | Tester Software C.BER | Version 5.0 | CTC advanced GmbH | 0001 | 400001379 | ne | -/- | -/- |
| 7 | A | Wireless Connectivity Tester | CMW270 | Rohde & Schwarz | 100683 | 300005133 | k | 11.12.2019 | 10.12.2021 |

## 7 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.<br>The content and verdict of the performed test cases are listed below. |

| TC identifier | Description | verdict | date | Remark |
|---|---|---|---|---|
| RF-Testing | ETSI EN 300 328 V2.2.2 (2019-07) | See table | 2020-06-26 | Tests according to customer demand |

| Test specification clause | Test case | temperature conditions | power source voltages | Mode | C | NC | NA | NP | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 4.3.2.2<br>5.4.2 | RF output power | Nominal | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | -/- |
| | | Low | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | |
| | | High | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | |
| 4.3.2.3<br>5.4.2 | Power spectral density | Nominal | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | -/- |
| 4.3.2.4, 4.3.2.5<br>5.4.3 | Duty cycle, Tx-sequence, Tx-gap, medium utilization | Nominal | Nominal | -/- | ☐ | ☐ | ☒ | ☐ | -/- |
| 5.4.4 | Accumulated transmit time, freq. occupation and hopping sequence | Nominal | Nominal | -/- | ☐ | ☐ | ☒ | ☐ | -/- |
| 5.4.5 | Hopping frequency separation | Nominal | Nominal | -/- | ☐ | ☐ | ☒ | ☐ | -/- |
| 4.3.2.6<br>5.4.6 | Adaptivity | Nominal | Nominal | -/- | ☐ | ☐ | ☒ | ☐ | -/- |
| 4.3.2.7<br>5.4.7 | Occupied channel bandwidth | Nominal | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | -/- |
| 4.3.2.8<br>5.4.8 | Transmitter unwanted emissions in the out-of-band domain | Nominal | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | -/- |
| 4.3.2.9<br>5.4.9 | Transmitter unwanted emissions in the spurious domain (cond. + rad.) | Nominal | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | -/- |
| 4.3.2.10<br>5.4.10 | Receiver spurious emissions (cond. + rad.) | Nominal | Nominal | 1 Msps | ☐ | ☐ | ☐ | ☒ | -/- |
| 4.3.2.11<br>5.4.11 | Receiver blocking | Nominal | Nominal | 1 Msps | ☒ | ☐ | ☐ | ☐ | -/- |
| 4.3.2.12 | Geo-location | Nominal | Nominal | -/- | ☐ | ☐ | ☒ | ☐ | -/- |

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

## 8 Additional comments

*The Bluetooth® word mark and logos are owned by the Bluetooth SIG Inc. and any use of such marks by CTC advanced GmbH is under license.*

Reference documents: Bluetooth® Core Specification 5.1
1-0619_20-01-03_log1_conducted.pdf

Special test descriptions: None

Configuration descriptions:

| Bluetooth Low Energy | |
|---|---|
| Longest Supported payload (37 – 255 Byte) | Tx: 255, RX: 37 |
| LE 1M PHY supported | Yes |
| LE 2M PHY supported | No |
| Stable Modulation Index supported (SMI) | No |
| LE Coded PHY supported (S=2) | No |
| LE Coded PHY supported (S=8) | No |

Test mode:

☒ Bluetooth direct test mode enabled
(EUT is controlled via CBT/CMW)

☐ Special software is used.
EUT is transmitting pseudo random data by itself

EUT selection:

☒ Only one device available

☐ Devices selected by the customer

☐ Devices selected by the laboratory (Randomly)

## 9 EUT classification

Type of equipment:
- ☒ stand alone equipment
- ☐ plug in radio equipment
- ☐ combined equipment

Modulation types:
- ☒ Wide band modulation (none hopping – e.g. DSSS, OFDM)
- ☐ Frequency hopping spread spectrum (FHSS)

Adaptive equipment:
- ☐ Yes, LBT-based
- ☒ Yes, non-LBT-based
- ☐ Yes (but can be disabled)
- ☐ No

Antennas and transmission 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.

# 10 Measurement results

## 10.1 Receiver blocking

**Description:**

Receiver blocking is a measure of the ability of the equipment to receive a wanted signal on its operating channel without exceeding a given degradation due to the presence of an unwanted input signal (blocking signal) at frequencies other than those of the operating band and spurious responses.

| Measurement parameters | |
|---|---|
| External result file | 1-0619_20-01-03_log1_conducted.pdf<br>Chapter EN300328 RX Receiver Blocking |
| Test setup | See sub clause 6.1 – A |
| Measurement uncertainty | See sub clause 11 |

Performed: ☒ Conducted

☐ Radiated

**Table 1:** Receiver blocking parameters for receiver category 1 equipment:

| Wanted signal mean power from companion device (dBm) (see notes 1 and 4) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 4) | Type of blocking signal |
|---|---|---|---|
| (-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2) | 2 380<br>2 504 | -34 | CW |
| (-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3) | 2 300<br>2 330<br>2 360<br>2 524<br>2 584<br>2 674 | | |
| NOTE 1: | OCBW is in Hz. | | |
| NOTE 2: | In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. | | |
| NOTE 3: | In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. | | |
| NOTE 4: | The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. | | |

**Table 2:** Receiver blocking parameters for receiver category 2 equipment:

| Wanted signal mean power from companion device (dBm) (see notes 1 and 3) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 3) | Type of blocking signal |
|---|---|---|---|
| (-139 dBm + 10 × log10(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2) | 2 380<br>2 504<br>2 300<br>2 584 | -34 | CW |
| NOTE 1: | OCBW is in Hz. | | |
| NOTE 2: | In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. | | |
| NOTE 3: | The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. | | |

**Table 3:** Receiver blocking parameters for receiver category 3 equipment:

| Wanted signal mean power from companion device (dBm) (see notes 1 and 3) | Blocking signal frequency (MHz) | Blocking signal power (dBm) (see note 3) | Type of blocking signal |
|---|---|---|---|
| (-139 dBm + 10 × log10(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2) | 2 380<br>2 504<br>2 300<br>2 584 | -34 | CW |
| NOTE 1: | OCBW is in Hz. | | |
| NOTE 2: | In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 30 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. | | |
| NOTE 3: | The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2. | | |

**Limits:**

| | Channel | |
|---|---|---|
| | Low channel | High channel |
| Performance Criteria | 10% PER or FER | |

* For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

**Result:** Compliant (See log file for details)

## 11 Measurement uncertainty

| Measurement uncertainty | |
|---|---|
| Occupied channel bandwidth | ±5 % |
| RF output power, conducted | ±1.5 dB |
| Power spectral density, conducted | ±3 dB |
| Unwanted emissions, conducted | ±3 dB |
| All emissions, radiated | ±3 dB |
| Temperature | ±1 °C |
| Humidity | ±5 % |
| DC and low frequency voltages | ±3 % |
| Time | ±5 % |
| Duty cycle | ±5 % |

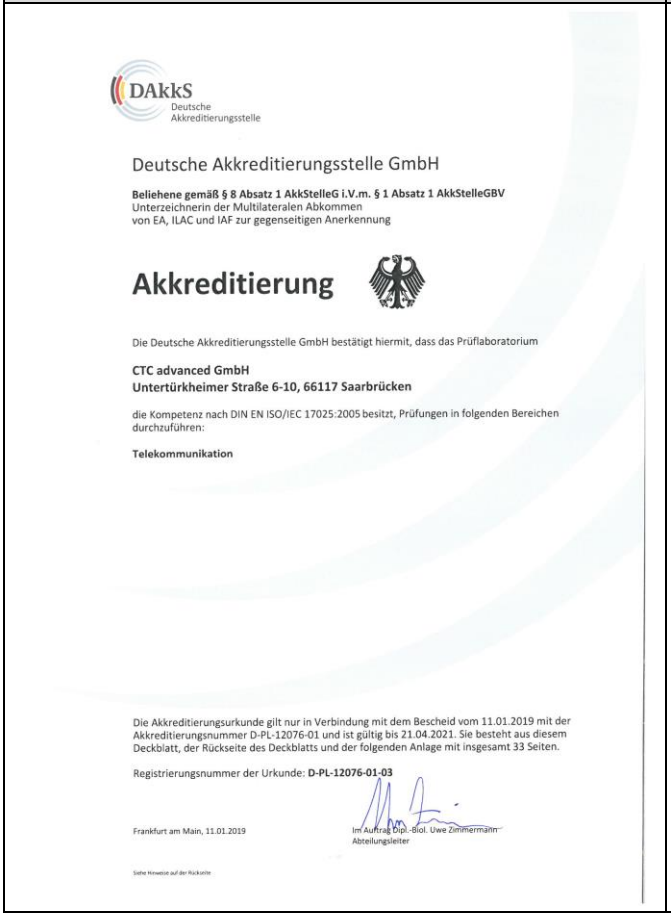
## 12 Glossary

| | |
|---|---|
| **EUT** | Equipment under test |
| **DUT** | Device under test |
| **UUT** | Unit under test |
| **GUE** | GNSS User Equipment |
| **ETSI** | European Telecommunications Standards Institute |
| **EN** | European Standard |
| **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 |
| **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 |
| **GNSS** | Global Navigation Satellite System |
| **$C/N_0$** | Carrier to noise-density ratio, expressed in dB-Hz |

## 13 Document history

| Version | Applied changes | Date of release |
|---|---|---|
| -/- | Initial release | 2020-06-26 |

## 14 Accreditation Certificate – D-PL-12076-01-03

| first page | last page |
|---|---|
|  |  |



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

https://www.dakks.de/as/ast/d/D-PL-12076-01-03.pdf

################################ END OF TEST REPORT ################################