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TEST REPORT

Test report no.: 1-9148/19-01-05

Testing laboratory

CTC advanced GmbH

BNetzA-CAB-02/21-102

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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 starting with the registration number: D-PL-12076-01.

Applicant

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Manufacturer

Ingenico Group 9 Avenue de la Gare Rovaltain 26958 Valence Cedex 9 / FRANCE

Test standard/s

FCC - Title 47 CFR Part FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio 15 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: Lane/3000 CL/Eth/WiFi/BT FCC ID: **XKB-LANE3000CLWIBT** IC: 2586D-LANE3000CLWIBT UNII bands 5150 MHz - 5850 MHz Frequency: Technology tested: WLAN Integrated antenna Antenna: 8 V DC / 115 V AC by mains adapter PSC16A-080L6 Power supply: Temperature range: 0°C to +40°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:

René Oelmann Lab Manager **Radio Communications & EMC**

Test performed:

David Lang Lab Manager **Radio Communications & EMC**

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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:	2019-12-09
Date of receipt of test item:	2020-01-14
Start of test:	2020-01-16
End of test:	2020-01-16
Person(s) present during the test:	-/-

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
Guidance	Version	Description
KDB 789033 D02 ANSI C63.4-2014 ANSI C63.10-2013	v02r01 -/- -/-	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E 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 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices Compliance measurement procedures for unlicensed - national
UNII: KDB 905462 D02 UNII: KDB 905462 D03 UNII: KDB 905462 D04	v02 v01r02 v01	information infrastructure devices operating in the 5250 - 5350 MHz and 5470 - 5725 MHz bands incorporating dynamic frequency selection Client Without DFS New Rules
UNII. KDD 903402 D04	VUT	Operational Modes for DFS Testing New Rules

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



4 **Test environment**

Temperature	:	T _{nom} T _{max} T _{min}	+22 °C during room temperature tests No tests under extreme temperature conditions required. No tests under extreme temperature conditions required.
Relative humidity content :			55 %
Barometric pressure			1021 hpa
		V_{nom}	8 V DC / 115 V AC by mains adapter PSC16A-080L6
Power supply	:	V_{max}	No tests under extreme voltage conditions required.
		V_{min}	No tests under extreme voltage conditions required.

5 **Test item**

General description 5.1

Kind of test item :	Payment Terminal				
Model name :	_ane/3000 CL/Eth/WiFi/BT				
HMN :	-/-				
PMN :	Lane/3000				
HVIN :	Lane/3000 CL/Eth/WiFi/BT				
FVIN :	-/-				
S/N serial number :	Cond. 190870703261070400002811				
Hardware status :	01				
Software status :	OS Version 038605 / Appli Version 010299				
Frequency band :	UNII bands 5150 MHz – 5850 MHz				
Type of radio transmission :	OFDM				
Use of frequency spectrum :					
Type of modulation :	(D)BPSK, (D)QPSK, 16 – QAM, 64 – QAM				
Number of channels :	24 with 20 MHz channel bandwidth				
Number of channels .	11 with 40 MHz channel bandwidth				
Antenna :	Integrated antenna				
Power supply :	8 V DC / 115 V AC by mains adapter PSC16A-080L6				
Temperature range :	0°C to +40°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:

1-9148_19-01-01_AnnexA 1-9148_19-01-01_AnnexD

6 Measurement uncertainty

Measurement uncertainty						
Test case	Uncertainty					
Frequency accuracy (radar burst)	0.1 Hz					
Level accuracy (radar burst)	± 0.8 dB					

7 Summary of measurement results

\boxtimes	No deviations from the technical specifications were ascertained
	There were deviations from the technical specifications ascertained
\boxtimes	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
DFS-Testing	CFR Part 15, FCC 06-96	Pass	2020-01-27	DFS only

Test Standard Clause	Test Case	Bandwidth	С	NC	NA	NP	Remark
7.8.1* ³	U-NII Detection Bandwidth	-/-			\boxtimes		* 1 * 2 * 3
§15.407 (h)(2)	DFS Detection Threshold	-/-			X		* 1 * 2 * 3
§15.407 (h)(2) (ii) & 7.8.2* ³	Channel Availability Check Time	-/-			\boxtimes		* ¹ * ³
§15.407 (h)(2) (iv) & 7.8.3* ³	Non-Occupancy Period	-/-			\boxtimes		* ²
§15.407 (h)(2) (iii) & 7.8.2* ³	Channel Move Time / Channel Closing Transmission Time	40 MHz	\boxtimes				*2
7.8.3 & 7.8.4* ³	In-Service Monitoring / Statistical Performance Check	-/-			\boxtimes		* ² * ³

Abbreviations/References:

- C Compliant
- NC Not compliant
- NA Not applicable
- NP Not performed
- *¹ Prior to use of a channel
- *² During normal operation
- *³ Not applicable for Client Devices without radar detection.

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8 Additional comments

Reference documents:	None					
Special test descriptions:	A sam	All tests are conducted with Pulse Type 0. A sample with temporary antenna connector was provided to perform the measurements in a conducted way.				
Configuration descriptions:	lperf v percei	vas used to generate the required channel load (duty cycle greater 17 nt).				
DFS functionality:	□ Ma	ster device				
	🗆 Clie	ent with radar detection				
	🛛 Clie	ent without radar detection				
EUT selection:	\boxtimes	Only one device available				
		Devices selected by the customer				
		Devices selected by the laboratory (Randomly)				



9 **RF measurements**

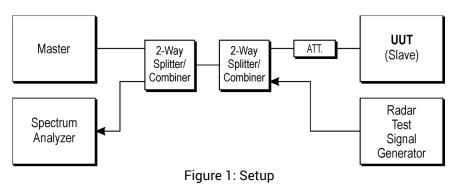
9.1 Description of test setup

9.1.1 Conducted measurements

<u>Setup</u>

Figure 1 shows a setup whereby the UUT is a RLAN device operating in slave mode, without Radar Interference Detection function. This setup also contains a RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device.

Figure 1 shows an example



RPP = SG - CA (RPP-radar pulse power; SG-signal generator power; CA-loss signal path)

Example calculation: RPP [dBm] = -30.0 [dBm] - 33.0 [dB] = -63.0 [dBm]

Equipment table:

No.	Lab / Item	Equipment	Туре	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	А	Vector Signal Generator	SMU200A	R&S	101633	300003496	vlKl!	10.12.2019	09.12.2022
2	А	Spectrum Analyzer 9kHz to 30GHz - 140+30dBm	FSP30	R&S	100886	300003575	vIKI!	13.12.2018	12.12.2020
3	А	DFS-test site	div. Splitter, Cables, Attenuators	Mini-Circuits	na	300004557	ev	-/-	-/-
4	А	Notebook	Latitude 15 6000 Series	Dell		300004737	ne	-/-	-/-
5	А	Dual Band Gigabit Router	RT-AC68U	Asus	F1IM0H056666	400001244	ne	-/-	-/-
6	Α	PC	ExOne	F+W	2890296v001	300005102	ne	-/-	-/-
7	А	RF-Cable DFS-Tester Receiver	ST18/SMAm/SMAm /24	Huber & Suhner	Batch no. 1308650	400001252	ev	-/-	-/-
8	А	RF-Cable DFS-Tester No. 1	Enviroflex 316 D	Huber & Suhner	Batch no. 1560522	400001257	ev	-/-	-/-

* FCC ID: MSQ-RTAC68U

9.2 Parameters of DFS test signals

9.2.1 DFS Detection Thresholds for Master Devices as well as Client Devices With Radar Detection

Maximum Transmit Power EIRP	Value (see note)		
≥ 200 mW	-64 dBm		
< 200 mW and power spectral density < 10 dBm/MHz	-62 dBm		
< 200 mW and That do not meet the power spectral density < 10 dBm/MHz	-64 dBm		
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.			

9.2.2 DFS Response Requirement Values

Parameter	Value
Non-occupancy period	minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning

of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.



9.2.3 Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance.

Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (µsec)	PRI (µsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a Test B: 15 unique PRI values randomly selected within the range of 518- 3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A	$ \begin{array}{c} \text{Roundup} \\ \left[\left(\frac{1}{360} \right) \right] \\ \left[\left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu \text{sec}}} \right) \right] \end{array} $	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Rad Note 1: Short P channel closing	ulse Radar Type 0	should be used for the o	detection band	80% width test, channel	120 move time, and

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4.

Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

Long Pulse Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trails
5	50-100	5-20	1000- 2000	1-3	8-20	80%	30

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms.

Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trails
6	1	333	9	0.333	300	70%	30

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined.

The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set.

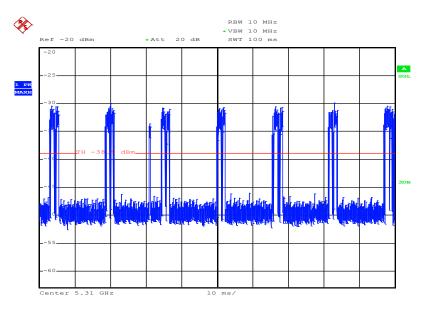


9.3 Test preparation

9.3.1 Channel loading

Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, channel loading can be estimated by setting the spectrum analyzer for zero span and approximate the Time On/ (Time On + Off Time). This can be done with any appropriate channel BW and modulation type.

HT40-Mode: Calculated duty cycle = 17.5%



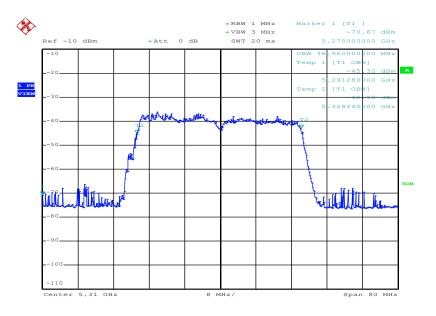
Date: 16.JAN.2020 16:49:18

Plot 1



9.3.2 99% Bandwidth to determine the U-NII-bandwidth

HT40-Mode: 37.0 MHz

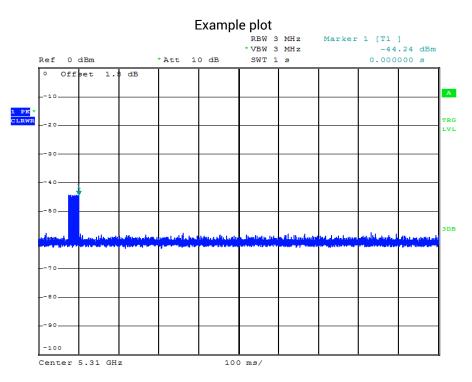


Date: 16.JAN.2020 16:49:59



9.3.3 Radar burst timing signal

To accurately determine the channel closing time and channel closing transmission time the spectrum analyser is triggered at the end of the radar burst (see marker at t = 0ms).



Plot 3



9.4 Test results (prior to use of a channel)

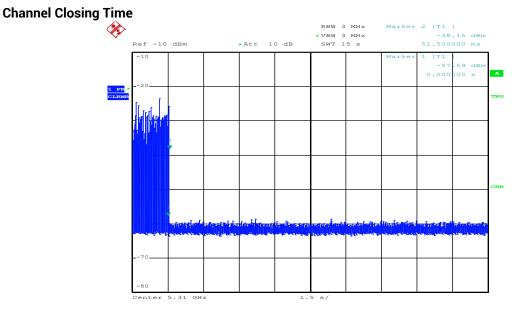
Not applicable.

9.5 Test results (during normal operation)

9.5.1 Channel move time / channel closing transmission time

After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel not exceeding 60ms.

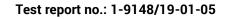
The test is performed during normal operation with the highest bandwidth supported by the DUT.



Date: 16.JAN.2020 16:55:31

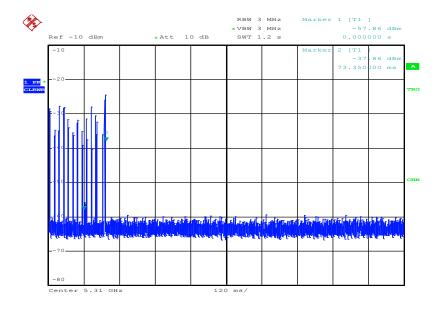
Plot 4

Note: With Marker 1 at the end of the radar pulse (*t* = 0ms) the Channel Closing Time is determined by setting a Delta-Marker to the point where the last transmission occurred. The Channel Closing Time is 52.5 ms.





Channel Closing Transmission Time



Date: 16.JAN.2020 17:11:41



Note: The accumulated transmission time is calculated by the number of bins occurring after t = 0ms multiplied with the Time-per-sweep point-factor resulting from the Sweep Time and number of Sweep Points of the Spectrum Analyser.

The Channel Closing Transmission Time is 0 ms.



10 Observations

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

Annex A Glossary

FUT	Faulia ment un deuteet
EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
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
00	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

Version	Applied changes	Date of release
-/-	Initial release	2020-01-27

CTC I advanced

Annex C Accreditation Certificate – D-PL-12076-01-04

first page	last page
Every of the multiple of the mu	Deutsche Akkreditierungsstelle GmbH Office Berlin Spitelmark 10 20117 Berlin Office Frankfurt am Main B0327 Frankfurt am Main Office Braunschweig Bundeallee 100 B111 Braunschweig
is competent under the terms of DIN EN ISO/IEC 17025:2005 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 1.01.2019 with the accreditation number D-PL-12076-01 and is valid until 21.04.2021. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 7 pages. Registration number of the certificate: D-PL-12076-01-04 Frankfurt am Main; 11.01.2019	The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAKA). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf. No ingression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAKAS. The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (federal luck Grantel), a 2523) and the Regulation (CSI No 765/COM of the Lucypean Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Dirkia) Journal of the European tone) (232 of 9 July 2008, p. 301, DAKAS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA). International Accreditation as the estimational Laboratory Accreditation Cooperation (EA). The signatories to these agreements recognise each other's accreditations. The up-to-date state of membership can be retrieved from the following websites: EX: www.ilec.org IAC: www.ilec.org IAC: www.ilec.org

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

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

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