



Prüfbericht-Nr.: <i>Test report no.:</i>	DE229N5U 001	Auftrags-Nr.: <i>Order no.:</i>	168378550 P00257266	Seite 1 von 13 <i>Page 1 of 13</i>	
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2022-06-22		
Auftraggeber: <i>Client:</i>	KERLINK SA 1, Rue Jacqueline Auriol 35235 Thorigne-Fouillard FRANCE				
Prüfgegenstand: <i>Test item:</i>	Wirnet™ iZeptoCell				
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	PDTIOT-IZEC900 (Trademark: Kerlink)				
Auftrags-Inhalt: <i>Order content:</i>	Test Report				
Prüfgrundlage: <i>Test specification:</i>	47 CFR FCC Part 2.1091		RSS-102 Issue 5		
Wareneingangsdatum: <i>Date of sample receipt:</i>	2022-06-27		Please refer to Photo Document		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003283029-001~020				
Prüfzeitraum: <i>Testing period:</i>	2022-07-06 to 2022-07-29				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von: <i>tested by:</i>	X  Lin Lin		genehmigt von: <i>authorized by:</i>	X  Hardy Suo	
Datum: <i>Date:</i>	2022-08-11		Ausstellungsdatum: <i>Issue date:</i>	2022-08-18	
Stellung / Position:	Sachverständige(r)/Expert		Stellung / Position:	Sachverständige(r)/Expert	
Sonstiges / Other:	FCC ID: 2AFYS-KLKZEC900 IC: 20637-KLKZEC900 HVIN: PDTIOT-IZEC900 The certified module has been integrated into the EUT. The EUT contains transmitter module ME310G1-WW (FCC ID:R17ME310G1WW and IC:5131A-ME310G1WW). This report is composite investigation of the final product for compliance with above rules.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>				
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend 3 = satisfactory	4 = ausreichend 4 = sufficient	5 = mangelhaft N/A = nicht anwendbar N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory	4 = sufficient N/A = not applicable	5 = poor N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

V05

TEST SUMMARY

5.1.1 ELECTROMAGNETIC FIELDS

RESULT: Pass

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1. GENERAL REMARKS

1.1 COMPLEMENTARY MATERIALS

None.

1.2 List of Document Change

No.	Report No.	Description
1	DE229N5U 001	First release.

2. TEST SITES

2.1 TEST FACILITIES

TÜV Rheinland (Shenzhen) Co., Ltd.

Address: No. 362, Huanguan Road Middle, Longhua District, Shenzhen 518110, P.R. China

A2LA accreditation certification number: 5162.01

2.2 TEST DATE

Date of test: 2022-07-06 to 2022-07-29

2.3 LIST OF TEST AND MEASUREMENT INSTRUMENTS

Table 1: List of Test and Measurement Equipment

☑ Radio Spectrum Testing (TS8997-R&S)					
Equip. No.	Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
G1825794	Wireless Connectivity Tester	R&S	CMW270	101375	02.08.2023
G1825795	Signal Analyzer	R&S	FSV 40	101441	01.08.2023
G1825796	Vector Signal Generator	R&S	SMBV100A	263301	01.08.2023
G1825797	Signal Generator	R&S	SMB100A	115186	01.08.2023
G1825798	OSP	R&S	OSP 150	101017	02.12.2022

G1825799	Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
G1825800	Test Software	R&S	WMS32 (V11.00.00)	N/A	N/A
G1825801	Power Meter	R&S	NRP2	107105	02.12.2022
G1829620	Power Sensor	R&S	NRP-Z81	105677	01.08.2023
G1826483	Humid & Temp Programmable Tester	BOST	NTH090-60	19040801	02.04.2023
G1826431	Shielding Room 8#	Albatross	SR8	APC17151 -SR8	22.06.2024

2.4 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. facility located at **Error! Reference source not found.** is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. GENERAL PRODUCT INFORMATION

3.1 GENERAL DESCRIPTION

The EUT is Wirnet™ iZeptoCell gateway is part of the global Long-Range Radio fixed network to provide M2M connectivity link between low power end-point and Internet Access. The Wirnet™ iZeptoCell is based on LoRa® technology. It is compatible and interoperable with existing LoRaWAN LPWAN.

The EUT embeds a certified module TELIT ME310G1-WW.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 TECHNICAL DATA

Table 2: Rating of EUT

General Information of EUT	Description
Kind of Equipment	Wirnet™ iZeptoCell gateway
Type Designation	PDTIOT-IZEC900
Trademark	Kerlink
FCC ID	2AFYS-KLKZEC900
IC	20637-KLKZEC900
Operating Temperature Range	0 °C ~ 55 °C
Operating Voltage	DC 5V via USB-A interface
Contains Certified Module	Yes
Module's Model	ME310G1-WW
FCC ID:	RI7ME310G1WW
IC:	5131A-ME310G1WW

Table 3: Technical Specification of EUT

Technical Specification of Wireless – LTE IoT Module	
Frequency Band	GPRS/EGPRS: GSM 850, PCS 1900 eMTC: Band 2/4/5/12/13/25/26/66/85 NB-IoT: Band 2/4/5/12/13/25/26/66/71/85
Rated Output	GPRS 850: Class 4 GPRS 1900: Class 1 EGPRS 850/1900: E2 eMTC and NB-IoT: Class 3 (except NB-IoT Band 71) NB-IoT Band 71: Class 5
Type of antenna	Integral antenna
Antenna gain	Max. 3 dBi @ 698-960 MHz Max. 3 dBi @ 1710-2700 MHz
Technical Specification of Wireless - LoRA	

Frequency Band	902 to 928 MHz
Operating frequency	923.3 MHz to 927.5 MHz 903.9 Mhz to 905.3 MHz
Rated Output (Conducted)	24 dBm
OCW	500 kHz for DTS, 125 kHz for Hybrid
Type of modulation	CSS
Data Rate	SF7 – SF12 / DR 8 – DR13
Type of antenna	Integral antenna, Ceramic Antenna
Antenna gain	2 dBi

3.3 INDEPENDENT OPERATION MODES

The basic operation modes are:

- A. On, communication link established, Transmitting
 - 1) eMTC operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
 - 2) NB-IoT operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
 - 3) GPRS/EGPRS operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
- B. On, communication link established, Receiving/Registered
 - 1) eMTC operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
 - 2) NB-IoT operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
 - 3) GPRS/EGPRS operating
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
- C. Simultaneous transmission with LoRA
- D. Idle
- E. Off

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3.4 NOISE GENERATING AND NOISE SUPPRESSING PARTS

Refer to the Circuit Diagram.

3.5 SUBMITTED DOCUMENTS

- | | |
|---|--|
| <input checked="" type="checkbox"/> User Manual | <input checked="" type="checkbox"/> Rating Label |
| <input checked="" type="checkbox"/> Circuit Diagram | <input checked="" type="checkbox"/> PCB Layout |
| <input checked="" type="checkbox"/> Block Diagram | <input checked="" type="checkbox"/> Photo Document |
| <input checked="" type="checkbox"/> Schematics | <input checked="" type="checkbox"/> Parts List |
| <input type="checkbox"/> Model Difference Letter | |

4. TEST SET-UP AND OPERATION MODES

4.1 PRINCIPLE OF CONFIGURATION SELECTION

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 TEST OPERATION AND TEST SOFTWARE

Test operation refers to test setup in chapter 5.

4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

The EUT was tested together with the following accessories:

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Laptop PC	Dell	E5430	9V28XY1
Wirnet iFemtoCell-evolution 915	Kerlink	PDTIOT-IFE04	005DGa010003
AC/DC power supply	CUI	SMI10-5-V-I38	/
3m USB-A extender cable	Assmann WSW	A-USB30AM-30AF-300	/
3m USB-A to USB-C cable	ACAL BFI	ACCA-21186	/
3m S/FTP Ethernet cable	RS PRO	411-497	/

4.4 COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE

The test sample, which has been tested, contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

5. TEST RESULTS

5.1 ESSENTIAL REQUIREMENTS OF HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

5.1.1 ELECTROMAGNETIC FIELDS

RESULT: **Pass**

Test date	:	2022-07-06 to 2022-07-29
Test standard	:	47 CFR FCC Part 2.1091 RSS-102 Issue 5
Limit	:	Table 1 of 47 CFR FCC Part 1.1310 Table 4 of RSS-102 Issue 5
Kind of test site	:	Shielded room

Test Setup

Date of testing	:	2022-07-06 to 2022-07-29
Input Voltage	:	DC 5V via USB
Operation mode	:	A&C
Test conditions	:	<input checked="" type="checkbox"/> Normal conditions
Ambient temperature	:	25 °C
Relative humidity	:	51%
Atmospheric pressure	:	101.0 kPa

This device is mobile device, and the applicant declares that the minimum separation distance is greater than 20cm. Therefore RF exposure evaluation or computational modeling should be used to determine compliance.

Compliance Evaluation

MPE Calculation is based on the conducted power, and considering maximum power and antenna gain. The following formula is used to MPE evaluation.

$$Pd = \frac{P_{out} * G}{4R^2\pi}$$

Where

P_d = power density in mW/cm² or W/m²

P_{out} = output power to antenna in mW or W

G_{num} = Antenna gain in numeric

π = 3.14159

R = Distance between observation point and the center of radiator in cm or m

For single or multiple RF sources, the calculated power density should comply with following:

$$\sum_i \frac{Pd_i}{Pd_{Limit,i}} \leq 1$$

Where:

Pd_i = the power density when the f is i .

$Pd_{Limit,i}$ = the reference level requirement for power density when f is i .

Table 5: Evaluation Results of Single Source

Operation Mode	Frequency (MHz)	P (dBm)	Gain (dBi)	R (cm)	P (mW) (mW)	$G_{(\theta,\phi)}$	FCC_Pd	ISED_Pd	FCC_Limit	ISED_Limit	Result
							(mW/cm ²)	(W/m ²)	(mW/cm ²)	(W/m ²)	
LoRa DTS 923.3 to 927.5	923.30	23.70	2.00	20.00	234.42	1.58	0.07	0.74	0.62	2.78	Pass
LoRa Hybrid 903.9 to 905.3	903.90	19.80	2.00	20.00	95.50	1.58	0.03	0.30	0.60	2.74	Pass
GSM 850 824.0 to 849.0	824.20	27.18	2.50	20.00	522.40	1.78	0.18	1.85	0.55	2.58	Pass
GSM 1900 1850 to 1910	1850.20	23.99	2.50	20.00	250.61	1.78	0.09	0.89	1	4.48	Pass
NB-IoT/eMTC Band 2 1850 to 1910	1850.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	1	4.48	Pass
NB-IoT/eMTC Band 4 1710 to 1755	1710.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	1	4.24	Pass
NB-IoT/eMTC Band 5 824 to 849	824.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	0.55	2.58	Pass
NB-IoT/eMTC Band 12 699 to 716	699.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	0.47	2.30	Pass
NB-IoT/eMTC Band 13 777 to 787	777.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	0.52	2.47	Pass
NB-IoT/eMTC Band 25 1850 to 1915	1850.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	1	4.48	Pass
NB-IoT/eMTC Band 26 814 to 849	814.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	0.54	2.55	Pass
NB-IoT/eMTC Band 66 1710 to 1780	1710.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	1	4.24	Pass
NB-IoT Band 71 663 to 716	663.10	22.00	3.00	20.00	158.49	2.00	0.06	0.63	0.44	2.22	Pass
NB-IoT/eMTC Band 85 698 to 716	698.10	25.00	3.00	20.00	316.23	2.00	0.13	1.26	0.47	2.30	Pass

Note:

1. P is maximum input power of antenna with tolerance.
2. For GSM, eMTC and NB-IoT operation mode, the maximum input power were derived from the original report of module ME310G1-WW.

Table 6: Evaluation Results of Simultaneous Transmissions for FCC

Scenario #	Combination of RF Sources		$\frac{Pd_1}{Pd_{Limit,1}}$	$\frac{Pd_2}{Pd_{Limit,2}}$	$\sum_i \frac{Pd_i}{Pd_{Limit,i}}$	Limit	Result
	Source 1	Source 2					
A	LoRa DTS	GSM 850	0.12	0.34	0.46	1	Pass
B	LoRa DTS	eMTC Band 12	0.12	0.27	0.39	1	Pass
C	LoRa DTS	NB-IoT Band 12	0.12	0.27	0.39	1	Pass

Note:

1. The results are evaluated on the maximum evaluation result of power density (Pd).

Table 7: Evaluation Results of Simultaneous Transmissions for ISSED

Scenario #	Combination of RF Sources		$\frac{Pd_1}{Pd_{Limit,1}}$	$\frac{Pd_2}{Pd_{Limit,2}}$	$\sum_i \frac{Pd_i}{Pd_{Limit,i}}$	Limit	Result
	Source 1	Source 2					
A	LoRa DTS	GSM 850	0.27	0.72	0.99	1	Pass
B	LoRa DTS	eMTC Band 12	0.27	0.55	0.81	1	Pass
C	LoRa DTS	NB-IoT Band 12	0.27	0.55	0.81	1	Pass

Note:

1. The results are evaluated on the maximum evaluation result of power density (Pd).

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