RE051-19-103489-3-A Ed. 0

MPE test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
Wanesy Wave 915

FCC ID: 2AFYS-KLKWAVE915

Company:
KERLINK

Distribution: Mr LOUVEAU **(Company:** KERLINK)

Number of pages: 11

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval Name and Function	Visa
0	7-Feb-20	Creation	T. LEDRESSEUR, Radio Technician	

Duplication of this document is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above.
This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.

DESIGNATION OF PRODUCT:	**Wanesy Wave 915**
Serial number (S/N):	944DBe050009
Reference / model (P/N):	PDTIOT-WAV01
Software version:	lpiot-refdes-1.5.4
MANUFACTURER:	KERLINK

COMPANY SUBMITTING THE PRODUCT:

Company:	KERLINK
Address:	1 Rue Jacqueline Auriol 35235 THORIGNE-FOUILLARD FRANCE
Responsible:	Mr LOUVEAU
DATES OF TEST:	From 2-Dec-19 to 6-Feb-20
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE FCC Accredited under US-EU MRA Designation Number: FR0009 Test Firm Registration Number: 873677
TESTED BY:	S. LOUIS ***VISA:***
WRITTEN BY:	S. LOUIS

CONTENTS

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **Wanesy Wave 915**, in accordance with normative reference.

The device under test integrates:

- LoRa Hybrid and DTS mode
- BLE and Wi-Fi Radio module

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Residential
Power source:	120VAC / 60Hz

BLE Part:

Antenna type and gain:	2.15 dBi / integral antenna
Operating frequency range:	From 2400 MHz to 2483.5 MHz
Number of channels:	40
Channel spacing:	2MHz
Power Setting:	8
Modulation:	GFSK
Test mode:	PRBS9

WiFi Part:

Antenna type and gain: 2.15 dBi considered/ integral antenna

Operating frequency range: From 2400 MHz to 2483.5 MHz

Channel spacing: 5MHz

Power Setting: atten: 27x0.25

Modulation: DBPSK
OFDM: BPSK
OFDM: 64-QAM

Mode tested: 802.11 b
802.11 g
802.11 n (20MHz and 40MHz)

Data rate: For 802.11b: 1Mbit/s
For 802.11g: 6Mbit/s
For 802.11n: MCS0

Number of channels: 11 for bandwidth 20 MHz and 7 for bandwidth 40 MHz

LoRa Part with BW 125kHz – (Hybrid radio part)

Antenna type and gain: 0 dBi / integral antenna

Power adjusted by software: The power level is tuned to reach max power (22dBm)

Operating frequency range: From 902.3 MHz to 914.9 MHz

Frequency tested: 902.3 MHz, 908.7 MHz, 914.9 MHz for transmission
923.3 MHz, 925.1 MHz, 927.5 MHz for reception

Frequencies plan detailed transmitter:

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
902,3+i*0,2MHz (i=0 à 63)	125	64	200

Frequencies plan detailed receiver:

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
923,3+i*0.6MHz (i=0 à 7)	500	8	600

Number of channels: 64

Channel spacing: 200 kHz

Modulation: LoRa with spread factor: 7 and 10

LoRa Part with BW 500kHz – (DTS radio part)

Antenna type and gain: 0 dBi / integral antenna

Power adjusted by software: The power level is tuned to reach max power (22dBm)

Operating frequency range: From 903 MHz to 914.2 MHz

Frequency tested: 903 MHz, 907.8 MHz, 914.2 MHz for transmission
923.3 MHz, 925.1 MHz, 927.5 MHz for reception

Frequencies plan detailed transmitter:

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
903+i*1,6MHz (i=0 à 7)	500	8	600

Frequencies plan detailed receiver:

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
923,3+i*0.6MHz (i=0 à 7)	500	8	600

Number of channels: 8

Channel spacing: 600 kHz

Modulation: LoRa with spread factor: 7 and 12

Power level, frequency range and channels characteristics are not user adjustable.
The details pictures of the product and the circuit boards are joined with this file.

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15 (2020)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for ComplianceTesting of Unlicensed Wireless Devices.
447498 D01 General RF Exposure Guidance v06	RF Exposure procedures and equipment authorization policies for mobile and portable equipment
OET BULLETIN 65	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

4. RF EXPOSURE

Calculus for LoRa in standalone

RF EXPOSURE: The analyze is realized only with the worst critical mode between hybrid and DTS

Maximum measured power = 21.02 dBm at 902.3 MHz
With a gain of 0dBi
EIRP = 21.02 dBm = 0.1265W

The maximum duty cycle is 40% on the reference period of 6min, so the power computed is: 50.59mW

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:

PSD= $EIRP/(4*\pi*R^{2})$

⇨ $50.59/(4*\pi*(20\ cm)^2)$= 0.010mW/cm^2 ***(limit=0.6015 mW/cm2)***

The MPE ratio is then calculated for the simultaneous transmission.

$$MPE\ ratio(LoRa) = \frac{PSD}{PSD\ lim} = 0.0166$$

The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

Calculus for BLE in stand-alone

RF EXPOSURE:

Maximum measured power = 13.32 dBm at 2402 MHz
With a gain of 2.15dBi
EIRP = 15.47 dBm = 0.03524W

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:

PSD= *EIRP/(4*π*R²)*

⇨ *35.237/(4*π*(20 cm)²)*= 0.00701m*W/cm²* ***(limit=1 mW/cm2)***

The MPE ratio is then calculated for the simultaneous transmission.

$$\text{MPE ratio(LoRa)} = \frac{\text{PSD}}{\text{PSD lim}} = 0.00701$$

The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

Calculus for WiFi in stand-alone

RF EXPOSURE:

Maximum measured power = 16.26 dBm at 2437 MHz (mode 802.11.g)
With a gain of 2.15dBi
EIRP = 18.41 dBm = 0.06934W

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:

PSD= *EIRP/(4*π*R²)*

⇨ *35.237/(4*π*(20 cm)²)*= 0.00138m*W/cm²* ***(limit=1 mW/cm2)***

The MPE ratio is then calculated for the simultaneous transmission.

$$\text{MPE ratio(LoRa)} = \frac{\text{PSD}}{\text{PSD lim}} = 0.00138$$

The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

Calculus for simultaneous transmission

Only the most critical case for Wi-Fi and BLE module is taken into account for this analysis

$\sum$ of MPE ratio = MPE ratio (LoRa) + MPE ratio (WiFi) = 0.00166 + 0.00138 = 0.00304 $\leq$ 1.0

The product meet the requirement for Simultaneous transmission MPE test exclusion from §7.2 of KDB 447498