

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)

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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

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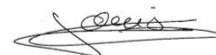
Responsible: Mr LOUVEAU

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

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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)
$903+i*1,6\text{MHz}$ ($i=0$ à 7)	500	8	600

Frequencies plan detailed receiver:

Channel frequencies	LoRa bandwidth (KHz)	Number of channel	Channel width (KHz)
$923,3+i*0.6\text{MHz}$ ($i=0$ 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 Compliance Testing of Unlicensed Wireless Devices.

447498 D01 General RF RF Exposure procedures and equipment authorization policies for mobile and
Exposure Guidance v06 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:

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

$$\Rightarrow 50.59 / (4 * \pi * (20 \text{ cm})^2) = 0.010 \text{ mW/cm}^2 \text{ (limit=0.6015 mW/cm}^2\text{)}$$

The MPE ratio is then calculated for the simultaneous transmission.

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

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:

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

$$\Rightarrow 35.237 / (4 * \pi * (20 \text{ cm})^2) = 0.00701 \text{ mW/cm}^2 \text{ (limit=1 mW/cm}^2\text{)}$$

The MPE ratio is then calculated for the simultaneous transmission.

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

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:

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

$$\Rightarrow 35.237 / (4 * \pi * (20 \text{ cm})^2) = 0.00138 \text{ mW/cm}^2 \text{ (limit=1 mW/cm}^2\text{)}$$

The MPE ratio is then calculated for the simultaneous transmission.

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

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

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

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