

MPE test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
Wirnet iBTS 64 Highway

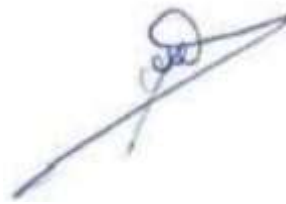
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Company:
KERLINK

Distribution: Mr LOUVEAU

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DESIGNATION OF PRODUCT: *Wirnet iBTS 64 Highway*

Serial number (S/N): 841BXa010006

Reference / model (P/N): Wirnet iBTS 64 Highway

Software version: RF software

MANUFACTURER: KERLINK

COMPANY SUBMITTING THE PRODUCT:

Company: KERLINK

Address: 1 Rue Jacqueline Auriol
35235 THORIGNE-FOUILLARD
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Responsible: Mr LOUVEAU

DATES OF TEST: From 1-Apr-19 to 11-Apr-19

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: T. LEDRESSEUR

VISA:



WRITTEN BY: T. LEDRESSEUR

CONTENTS

	<i>TITLE</i>	<i>PAGE</i>
1.	<i>INTRODUCTION.....</i>	<i>4</i>
2.	<i>PRODUCT DESCRIPTION.....</i>	<i>5</i>
3.	<i>NORMATIVE REFERENCE.....</i>	<i>7</i>
4.	<i>RF EXPOSURE.....</i>	<i>8</i>

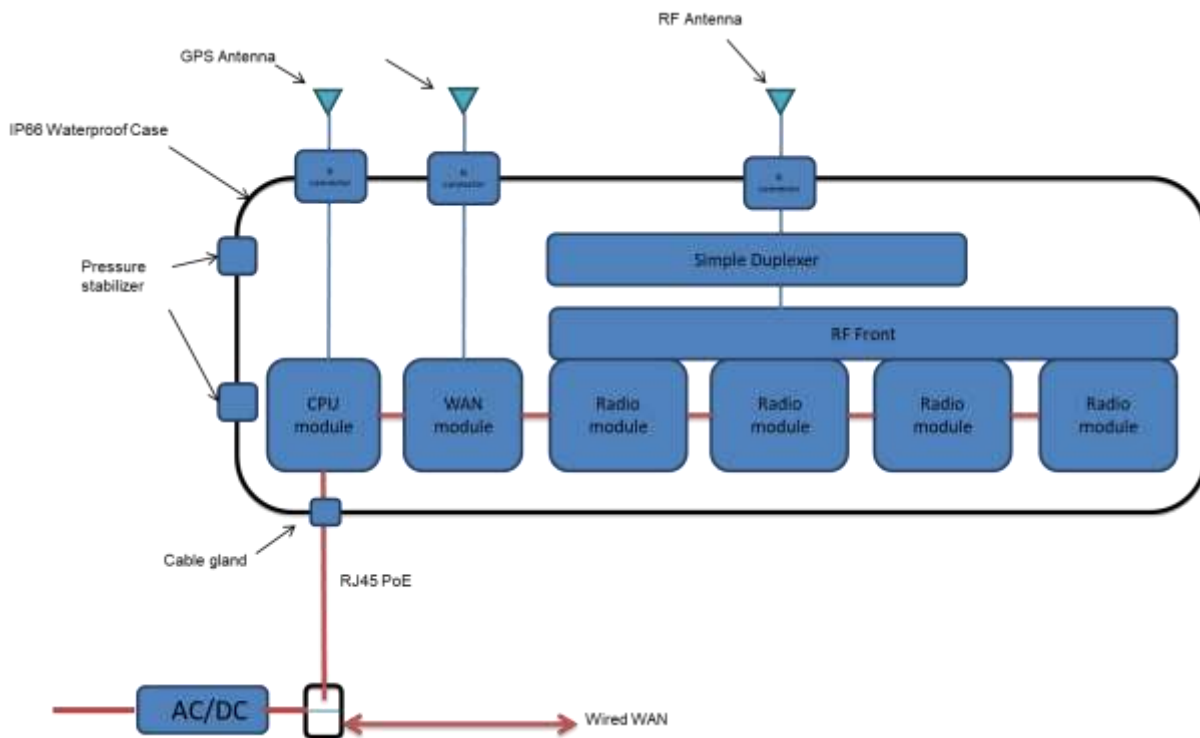
1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: *Wirnet iBTS 64 Highway*, in accordance with normative reference.

The device under test integrates the followings radio function:

- GPS receiver Integrated with CPU
- 3G/LTE module already certified (FCC ID:N7NMC7355). Slot 1
- LoRa function Slot 2 to 5

This test report concern MPE results.



Each slot 2 to 5 corresponds to a LoRa module and each LoRa module possesses 2 RF output.

The product can emit on a single LoRa module at 30 dBm or on 4 modules at 24 dBm. Only one RF output is used during normal use, but both can be used.

In addition when the 4 modules are used it's impossible they emit on the same frequency

2. PRODUCT DESCRIPTION

LoRa

Frequency band used 902MHz to 928 MHz

Frequencies plan detailed (LoRaWAN standard)

Transmitter

Channel frequencies	LoRa bandwidth (kHz)	Number of channel	Channel width (kHz)	SPREAD FACTOR
923,3+i*0,6MHz (i=0 to 7)	500	8	600	7 to 12

Receiver

Channel frequencies	LoRa bandwidth (kHz)	Number of channel	Channel width (kHz)	SPREAD FACTOR
902,3+i*0,2MHz (i=0 to 63)	125	64	200	7 to 10
903,0+i*1,6MHz (i=0 to 7)	500	8	600	7 to 12

Class: B

Utilization: Residential use

Antenna type and gain: 3 dBi or 6dBi

Power source: AC/DC Midspan PoE injector 60W

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.

MC7355 module

Extract from MC7355-Module-FCC-MPE-Evaluation-v10r1-2311393

The MC7355 wireless modem can be installed for use in any mobile host as long as the antenna gain of the host antenna does not exceed the gain listed in table 2.

This MPE analysis is applicable to any collocated transmitters with transmit power:

- less than or equal to 29.0dBm for WLAN/WiMAX; and
- less than or equal to 15.0dBm for BT.

Specific FCC IDs for those devices are not necessary or identified in this analysis providing they are classified as mobile transmitters. A 100% duty cycle is used for calculations to present a worse-case analysis when applicable.

Mode	Equipment Category	Max Transmitter Duty Cycle	Transmitter Range (MHz)	Maximum Conducted Power		Max Antenna Gain (dBi)	
				(dBm)	(W)	Standalone	Collocated
GPRS	Class 10	25%	824-849	33.0	2.00	6.5	3.0
			1850-1910	30.0	1.00	3.0	3.0
EDGE	Class 10	25%	824-849	28.0	0.63	6.5	3.0
			1850-1910	27.0	0.50	3.0	3.0
	Class 11	37.50%	824-849	26.2	0.42	6.5	3.0
			1850-1910	25.2	0.33	3.0	3.0
	Class 12	50%	824-849	25.0	0.32	6.5	3.0
			1850-1910	24.0	0.25	3.0	3.0
CDMA	EvDo	100%	824-849	25.0	0.32	6.5	3.0
			1850-1910	25.0	0.32	3.0	3.0
			817 – 824	25.0	0.32	6.5	3.0
UMTS	HSDPA HSUPA	100%	824 - 849	24.0	0.25	6.5	3.0
			1710-1755	24.0	0.25	6.0	6.0
			1850 - 1910	24.0	0.25	3.0	3.0
LTE	Band 17 Band 13 Band 5 Band 4 Band 2 Band 25	100%	704 - 716	24.0	0.25	9.0	6.0
			777 - 787	24.0	0.25	9.0	6.0
			824 - 849	24.0	0.25	6.5	3.0
			1710 - 1755	24.0	0.25	6.0	6.0
			1850 - 1910	24.0	0.25	3.0	3.0
			1850 - 1915	24.0	0.25	3.0	3.0

Table 2: MC7355 Standalone and Collocated Transmission Declarations

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 (2018)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for Compliance Testing of Unlicensed Wireless Devices.
447498 D01 General RF Exposure Guidance v06	RF Exposure procedures and equipment authorization policies for mobile and portable equipment

4. RF EXPOSURE

Calculus for LoRa in standalone

RF EXPOSURE: The analyze is realized only with the worst critical antenna 6 dBi

Maximum measured power = 28.35 dBm at 925.7 MHz

With a gain at 6dBi

EIRP = 34.35 dBm = 2.7227 W

The maximum duty cycle is 40% on the reference period of 6min, so the power computed is: 1089.1mW

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

$$PSD = \frac{EIRP}{4 \cdot \pi \cdot R^2}$$

$$\Rightarrow 1089.1 / (4 \cdot \pi \cdot (20 \text{ cm})^2) = 0.217 \text{ mW/cm}^2 \text{ (limit=0.6183 mW/cm}^2)$$

The MPE ratio is then calculated for the simultaneous transmission.

$$MPE \text{ ratio(LoRa)} = \frac{PSD}{PSD \text{ lim}} = 0.351$$

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 MC7355 in standalone

The results are extracted from MC7355-Module-FCC-MPE-Evaluation-v10r1-2311393 and calculated with the antenna used.

Mode	Frequency (MHz)	Conducted power (dBm)	Conducted power (W)	Duty cycle	Gain (dBi)	Average EIRP (mW)	Power density at 20cm (mW/cm ²)	Limit (mW/cm ²)	MPE ratio
GPRS	824-849	33	2	0.25	4	1253.0	0.249	0.549	0.454
	1850-1910	30	1	0.25	2	396.2	0.079	1	0.079
EDGE	824-849	28	0.63	0.25	4	396.2	0.079	0.549	0.144
	1850-1910	27	0.5	0.25	2	198.6	0.040	1	0.040
	824-849	26.2	0.42	0.375	4	392.7	0.078	0.549	0.142
	1850-1910	25.2	0.33	0.375	2	196.8	0.039	1	0.039
	824-849	25	0.32	0.5	4	397.2	0.079	0.549	0.144
	1850-1910	24	0.25	0.5	2	199.1	0.040	1	0.040
CDMA	824-849	25	0.32	1	4	794.3	0.158	0.549	0.288
	1850-1910	25	0.32	1	2	501.2	0.100	1	0.100
	817-824	25	0.32	1	4	794.3	0.158	0.544	0.290
UMTS	824-849	24	0.25	1	4	631.0	0.126	0.549	0.229
	1710-1755	24	0.25	1	2	398.1	0.079	1	0.079
	1850-1910	24	0.25	1	2	398.1	0.079	1	0.079
LTE	704-716	24	0.25	1	4	631.0	0.126	0.469	0.268
	777-787	24	0.25	1	4	631.0	0.126	0.518	0.242
	824-849	24	0.25	1	4	631.0	0.126	0.549	0.229
	1710-1755	24	0.25	1	2	398.1	0.079	1	0.079
	1850-1910	24	0.25	1	2	398.1	0.079	1	0.079
	1850-1915	24	0.25	1	2	398.1	0.079	1	0.079

Calculus for simultaneous transmission

Only the worst critical case for the WAN module is taken into account for this analysis

$$\Sigma \text{ of MPE ratio} = \text{MPE ratio(GPRS)} + \text{MPE ratio(LoRa)} = 0.454 + 0.351 = 0.801 \leq 1.0$$

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