



# **BE PREPARED FOR SIGFOX RADIATED PERFORMANCE TESTS**

Version 1.0.0

PUBLIC

## Changes description

Version	Description	Author	Date
0.1	Initial spec	B.Ray	August 15th, 2017
0.2	CW test time	B.Ray	May 18 <sup>th</sup> , 2018
0.3	Wording adapted to new certification approach	B.Ray	September 17 <sup>th</sup> , 2018
1.0.0	Format change	L.Bordes	February 28 <sup>th</sup> , 2020



## SUMMARY

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## 1. SCOPE

This document applies to Sigfox partners planning the radiated tests of the Sigfox Ready™ Certification for a device. Radiated tests will be performed by Sigfox accredited laboratories.

This document intends to describe all the pre-requisites for the device maker to prepare the Sigfox radiated performance tests and details the steps to be followed to achieve it.

At the end of the Sigfox Ready™ certification for device, an uplink radiation class is determined for the certified device according to the Sigfox uplink device Classification table. This reflects the efficiency of radiated power emitted by the Sigfox Ready™ certified object.

Throughout this document, the Device under Test (DUT) refers to the device to be certified.

### **Important:**

The Sigfox Ready™ certification for device does not substitute local regulatory requirements (CE marking, FCC, ETSI or other type approval) where the device is to be deployed.

It is the partner's responsibility to comply with local country regulations.

## 2. DEFINITIONS AND ACRONYMS

### 2.1. DEFINITIONS

#### DEVICE:

A manufactured end-product that is intended for use by end-user customers on the Sigfox network.

#### DEVICE UNDER TEST:

Candidate device for certification and used as reference product during the test.

#### EFFECTIVE RADIATED POWER (ERP):

The power radiated in the direction of maximum field strength under specified conditions of measurements.

$$\text{ERP}_{\text{dBm}} = \text{Conducted\_RF\_Power}_{\text{dBm}} + \text{Antenna\_Gain}_{\text{dB}}$$

#### EFFECTIVE ISOTROPIC RADIATED POWER (EIRP):

EIRP refers to an isotropic antenna whereas ERP refers to a perfect dipole antenna. The relation between ERP and EIRP is:

$$\text{EIRP}_{\text{dBm}} = \text{ERP}_{\text{dBm}} + 2.15_{\text{dB}}$$

#### PARTNER:

The person/company developing a Sigfox product which can be either a Modular Design, Device intended to go through the Sigfox certification process.

#### RADIATION PATTERN:

The variation of the power radiated by an antenna as a function of the direction away from the antenna. This power variation, as a function of the arrival angle, is observed in the antenna's far field.

#### RADIATED RECEIVER SENSITIVITY:

The minimum level of signal at the receiver input, produced by a carrier at the nominal frequency of the receiver, modulated with the normal test signal modulation.



**SIGFOX ACCREDITED TEST HOUSE:**

is a test house accredited by Sigfox to execute Sigfox RF & protocol tests and/or Sigfox radiated performance tests.

**SIGFOX READY™ CERTIFICATION:**

is the certification required for each Device that is intended to operate on the Sigfox Network.

## 2.2. ACRONYMS

Acronyms	Definitions
BOM	Bill of Material
CE	European Commission
CW	Continuous wave
DUT	Device Under Test
EIRP	Effective Isotropic Radiated Power
EIRS	Effective Isotropic Radiated Sensitivity
ERP	Effective Radiated Power
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
GFSK	Gaussian Frequency Shift Keying
PCB	Printed-circuit board
SCA	Sigfox Certification Authority
RC	Radio Configuration
RF	Radio Frequency
RX	Receive
TX	Transmit

*Table 1: Acronyms*

### 3. GET PREPARED STEP BY STEP

#### 3.1. READ THE SIGFOX DEVICE RADIATED PERFORMANCE TEST SPECIFICATIONS

The latest Sigfox radiated performance test specifications can be found into the Sigfox BUILD website:

- **Sigfox Radiated Performance Test Specification** describing all the tests that are performed in radiated mode by the Sigfox accredited test house

Those specifications should be read carefully to ensure that the DUT will match all the Sigfox requirements. Software, hardware and documentation pre-requisites need to be checked to allow the success of the Sigfox device radiated performance test completion

#### 3.2. HARDWARE AND SOFTWARE PRE-REQUISITES

[PRE-REQUISITE-1] DUT power supply

Pre-requisite description: DUT must be powered with the same power supply (battery or external power supply) than the device being deployed on the field. This power supply must be provided to the test house.

[PRE-REQUISITE-2] DUT pre-production or production sample

Pre-requisite description: DUT must be a pre-production or production sample i.e. same enclosure (mold compound and form factor), power supply, modem type, antenna, PCB and BOM. No prototypes allowed.

[PRE-REQUISITE-3] TX CW test mode for Uplink

Pre-requisite description: Device maker must provide a way to test the radiated power in Uplink using the CW test mode.

A device set in CW test mode shall emit:

- continuously
- with a single carrier frequency
- with no modulation and no interruption of the power signal

The device maker should refer to their modular design manufacturer or distributor to set the device to this test mode.

PRE-REQUISITE-4] TX CW test mode enabling for Uplink

Pre-requisite description: DUT CW test mode must be enabled with a simple power ON/OFF sequence to ease Sigfox accredited test house measurement (i.e. power ON/OFF button or switch, battery insertion, magnet, AT commands, Build-in tests (hardcoded functions), GPIOs...)

[PRE-REQUISITE-5] TX CW test time for Uplink

Pre-requisite description: Device maker must provide a DUT with a CW test mode which will be sufficient for the complete test procedure at the test house. An “infinite loop” of the CW signal is preferred as the test time can vary from one test house to the other. If a timeout is set, the device maker must check this timeout with the test house.

[PRE-REQUISITE-6] RX GFSK test mode for Downlink (optional)

Pre-requisite description: Device maker must provide a way to test the radiated sensitivity in downlink using the RX GFSK test mode.

### 3.3. VALIDATE YOUR SIGFOX DEVICE

The radiated performance tests are defined in the step 1 documentation. As the radiation tests require an anechoic chamber and some expensive test equipment, those tests are not easy to implement.

Nevertheless, to validate that the device is correctly set in TX CW mode, partner can make a current consumption measurement of the DUT with an amperemeter and check if the value is



close to the expected current consumption of the Sigfox compatible Modem datasheet in the dedicated RC. The current consumption must be continuous.

Another check is the use of a spectrum analyzer and a receiving antenna with a comparison to a reference device. The documentation to perform a rough measurement can be found in the appendix B of the “Antenna design for Sigfox Ready devices” into the Build platform [build.sigfox.com](http://build.sigfox.com).

### **3.4. PREPARE INFORMATION AND DOCUMENTATION OF YOUR END-PRODUCT FOR THE TEST HOUSE**

As each test house has its own report format, the list of needed information must be asked directly to the test house. Common information such as kind of device, DUT description, voltage type and level, antenna type and gain, receiver category... must be delivered.

PRE-REQUISITE-7] Radiated performance Test Guide

Pre-requisite description: the product maker must provide a radiated performance Test Guide to the accredited test house to perform radiated tests of the DUT.

### **3.5. BOOK A SLOT & SEND DEVICE TO SIGFOX ACCREDITED TEST HOUSE**

Device maker will choose a test house among the list of Sigfox accredited test houses able to perform radiated tests (list available in [build.sigfox.com](http://build.sigfox.com)) and will contact it directly to book a test slot. When agreed, partner will send the device to the test house. Payment of the radiated performance tests is done directly to the test house.



### 3.6. SUBMIT THE SIGFOX FILING IN BUILD FOR THE DEVICE

Device maker upload the test report delivered by the accredited test house and submit the Sigfox Filing through the Sigfox BUILD website [build.sigfox.com](http://build.sigfox.com)

Upon approval, Sigfox delivers the Sigfox Ready certificate and uplink class based on Sigfox accredited test house report and documentation of the device.

## 4. SUMMARY LIST OF PRE-REQUISITES

The below list is a summary of the pre-requisites needed to start the radiated performance tests of the Sigfox Ready™ certification

Pre-requisite	Type	Check mark
[PRE-REQUISITE-1] DUT power supply	HW	
[PRE-REQUISITE-2] DUT pre-production or production sample	HW	
[PRE-REQUISITE-3] TX CW test mode for Uplink	SW	
PRE-REQUISITE-4] TX CW test mode enabling for Uplink	HW	
[PRE-REQUISITE-5] TX CW test time for Uplink	SW	
[PRE-REQUISITE-6] RX GFSK test mode for Downlink (optional)	SW	
PRE-REQUISITE-7] Radiated performance Test Guide	INFO	