



Version 2.1.0
RSA version V3.2.x

RSA User Guide

Note: Only the last version of this document available on the Sigfox web sites is official and applicable.
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IMPORTANT NOTICE

This document does not explain how to execute Sigfox RF & Protocol Tests, this is the role of the Sigfox RF & Protocol Test Procedure (this document is available on <https://build.sigfox.com/sigfox-certification-baseline-CBL#pretesting-with-rsa-and-sdr-dongle> and describes all steps to follow).

1 RSA overview

1.1 What is RSA ?

Radio Signal Analyzer (also called "RSA") is a user-friendly software to analyse Sigfox signals. RF equipment catch Sigfox signal and RSA analyses and compares this signal with the RF & Protocol requirements and establishes verdicts automatically.

Sigfox RF & Protocol Test Procedure are available for each Radio Configuration on Build Website: <https://build.sigfox.com>.

1.2 Hardware

For running RSA, it is required to use a computer with:

- 64-bit compatible processor
- 2 GB RAM minimum
- a USB boot capability

The software package is designed to be used as bootable OS from a PC.

If the Radio Software Analyzer is used with a Virtual Machine (VM), it could give unreliable results, and have unexpected behaviour. The use with VM is not supported. No extension USB cord, no USB hub, ... should be used.

1.3 Software

The software can be downloaded from Build Website: <https://build.sigfox.com>.

The software package is provided in a .ISO . Once the file "SigfoxRadioSignalAnalyzer.iso" file is downloaded from Build Website: <https://build.sigfox.com> create a bootable USB key (refer to the Appendix explanations).

Please check you are using the latest version on Build Website: <https://build.sigfox.com>.

RSA is an application which can be accessed on the desktop of the ubuntu session.

1.4 RF equipment compatible with RSA

RSA can be used with several equipments :

- SDR DONGLE
- Rohde & Schwarz setup (SMBV-100A/B and FPL-1003)
- Litepoint (IQXel-M)

Be carefull, RSA application for SDR DONGLE is publicly available. But RSA for both Litepoint and R&S equipment is dedicated to *Sigfox Accredited Test Houses*.

2 Launch RSA

2.1 License Agreement for SDR DONGLE Only

When launching the Radio Signal Analyzer, you must accept the License Agreement prior using the application.

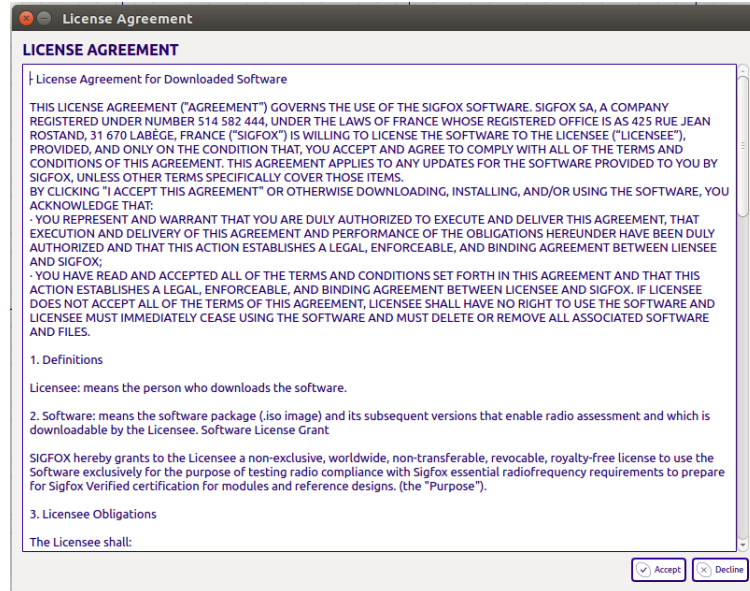


Figure 1: License Agreement for SDR DONGLE Only

2.2 Home Screen

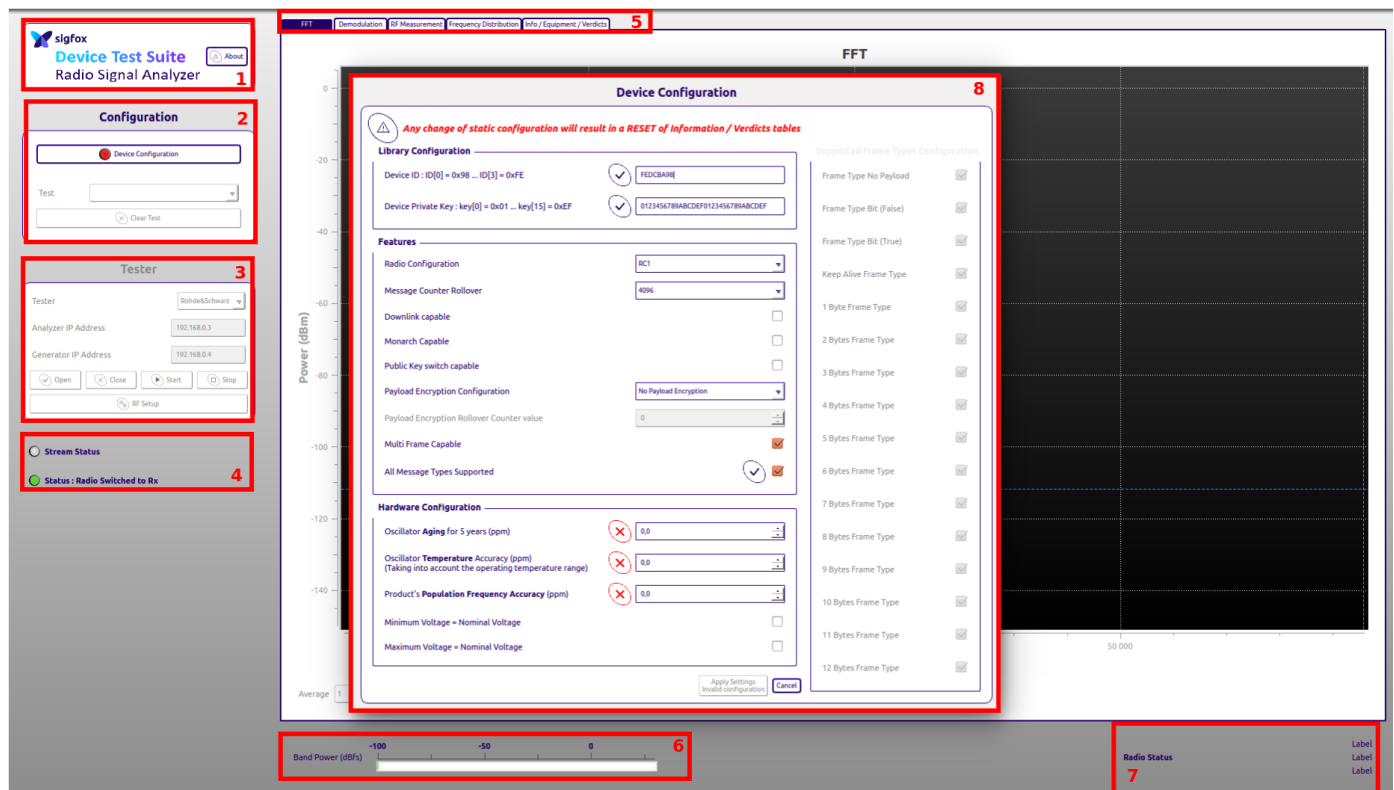
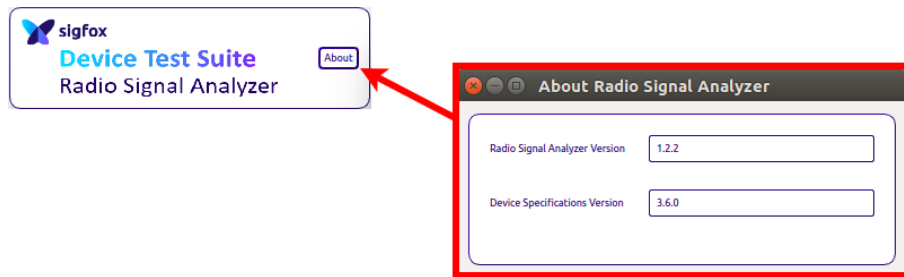


Figure 2: RSA Home Screen

Each part will be explained in this document :

1. *RSA About* : refer to *RSA About Section*
2. *Configuration Part* : for device configuration (refer to *Device Configuration Section*) and Test (refer to *Tests Section*)
3. *Tester Part* : refer to *Tester Section*
4. *Stream Status Part* : refer to *Stream Status Section*
5. *Sub-Windows Part* : refer to *Sub-Windows Section*
6. *Band Power Part* : refer to *Band Power Section*
7. *Radio Configuration Part* : refer to *Radio Configuration Section*
8. *Device configuration sub-window* : refer to *Device Configuration Section*

2.3 RSA About



Check if you have the latest version on <https://build.sigfox.com/sdr-dongle/#rsa-getting-started>.

3 RSA windows and sub-windows

3.1 Stream & Scheduler Status

3.1.1 SDR DONGLE

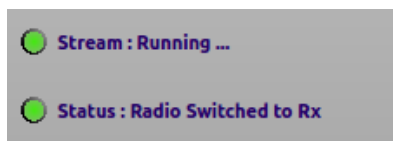


Figure 3: Stream Status : Running ...

SDR DONGLE is real time equipment, record and analysis from RSA is continuous.

3.1.2 Other Equipment

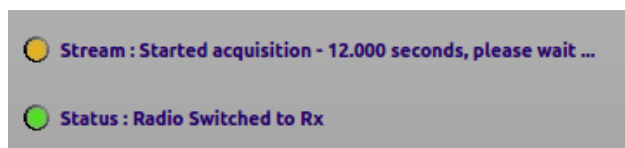


Figure 4: Stream Status : Wait for Signal

It will appear only during RSA record .



Figure 5: Stream Status : Capture Done (on the left) , Failed to record (on the right)

- *Capture Done* : RSA has properly recorded the signal

- *Failed to record* : RSA cannot find the signal

This record is limited to 12s.

3.1.3 All Equipment (test status)

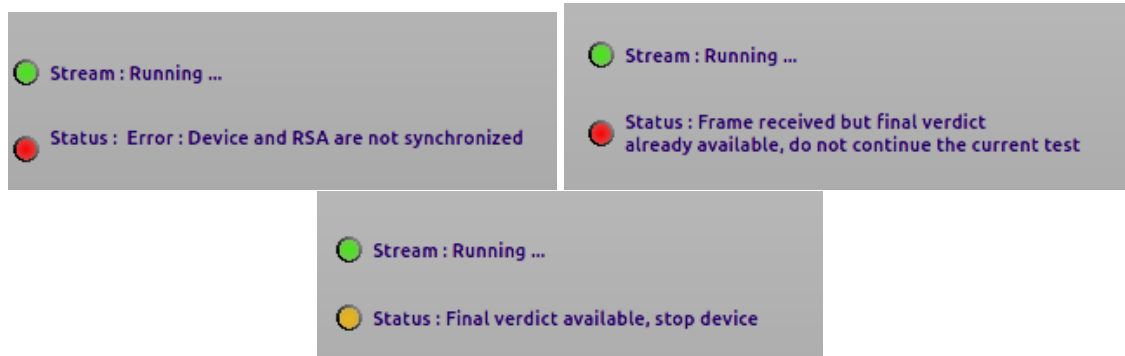


Figure 6: Stream Status

- *Error Cases* : RSA can return an error message on the current test
- *Frame Received but final verdict already available, do not continue the current test* : The current test verdict is already available, current test is finished, stop the device.
- *Final verdict available stop device* : The current test verdict is already available, current test is finished, stop the device.

3.2 Band Power



Figure 7: Band Power (SDR DONGLE ONLY)

Signal should be between -40dBfs and -15dBfs (Decibels relative to full scale) during testing :

- Below -45dBfs : RSA analysis could be wrong due to SNR
- Above -15dBfs : Signal could be saturated and RSA analysis will be wrong

3.3 RC information

```
UL Frequency : 868130000 Hz
DL Frequency : 869525000 Hz
Datarate : 100 bps
```

Figure 8: Radio Configuration parameters

RSA displays all radio configuration parameters on the home window :

- Uplink frequency value in Hz
- Downlink frequency value in Hz
- Datarate value in bps

3.4 TX/RX mode

A dark grey rectangular status bar with the text "Radio Switched to RX" in white.

Figure 9: Radio status

By default, RSA is in RX configuration, it will switch only to send the GFSK.



Figure 10: Switch to TX and Counter (SDR DONGLE Example)

RSA will switch to TX mode after specific timing from Sigfox RF & Protocol Specifications

- Timing starts to 0 with the SDR DONGLE
- With Other Equipment, RSA take latency into account (record + equipment latency)

3.5 Zoom

- Left click while moving the mouse allows to zoom in on specific part of the screen.
- Right Click allows to zoom out.

3.6 Device Configuration sub-window

3.6.1 Device Configuration

Configuration

Device Configuration

Test: UL - RF Analysis Nominal Voltage

Clear Results: UL - RF Analysis Nominal Voltage

Raw IQ File

Device Configuration

Any change of static configuration will result in a RESET of Information / Verdicts tables

Library Configuration

Device ID : ID[0] = 0x98 ... ID[3] = 0xFE ☒ FEDCB98

Device Private Key : key[0] = 0x01 ... key[15] = 0xEF ☒ 0123456789ABCDEF0123456789ABCDEF

Features

Radio Configuration: RC1

Message Counter Rollover: 4096

Downlink capable: ☐

Monarch Capable: ☐

Public Key switch capable: ☐

Payload Encryption Configuration: No Payload Encryption

Payload Encryption Rollover Counter value: 0

Multi Frame Capable: ☒

All Message Types Supported: ☒

Hardware Configuration

Oscillator Aging for 5 years (ppm): ☒ 0.0

Oscillator Temperature Accuracy (ppm) (Taking into account the operating temperature range): ☒ 0.0

Product's Population Frequency Accuracy (ppm): ☒ 0.0

Minimum Voltage = Nominal Voltage: ☐

Maximum Voltage = Nominal Voltage: ☐

Supported Frame Types Configuration

Frame Type No Payload: ☒

Frame Type Bit (False): ☒

Frame Type Bit (True): ☒

Keep Alive Frame Type: ☒

1 Byte Frame Type: ☒

2 Bytes Frame Type: ☒

3 Bytes Frame Type: ☒

4 Bytes Frame Type: ☒

5 Bytes Frame Type: ☒

6 Bytes Frame Type: ☒

7 Bytes Frame Type: ☒

8 Bytes Frame Type: ☒

9 Bytes Frame Type: ☒

10 Bytes Frame Type: ☒

11 Bytes Frame Type: ☒

12 Bytes Frame Type: ☒

Apply Settings Invalid configuration Cancel

Figure 11: Device Configuration sub-window

There are three parts in device configuration sub-window :

- **Library Configuration** : Configure Device's ID/KEY
- **Features** : Configure all "Features" of the UUT
- **Hardware Configuration** : Add oscillator and voltage information

Be careful this configuration should not be modified after starting tests otherwise all results will be reset.

3.6.1.a Library Configuration

Device Configuration

Any change of static configuration will result in a RESET of Information / Verdicts tables

Library Configuration

1 Device ID : ID[0] = 0x98 ... ID[3] = 0xFE ✓ FEDCBA98

2 Device Private Key : key[0] = 0x01 ... key[15] = 0xEF ✓ 0123456789ABCDEF0123456789ABCDEF

Features

Radio Configuration	RC1
Message Counter Rollover	4096
Downlink capable	<input type="checkbox"/>
Monarch Capable	<input type="checkbox"/>
Public Key switch capable	<input type="checkbox"/>
Payload Encryption Configuration	No Payload Encryption
Payload Encryption Rollover Counter value	0
Multi Frame Capable	<input checked="" type="checkbox"/>
All Message Types Supported	<input checked="" type="checkbox"/>

Hardware Configuration

Oscillator Aging for 5 years (ppm)	✗ 0,0
Oscillator Temperature Accuracy (ppm) (Taking into account the operating temperature range)	✗ 0,0
Product's Population Frequency Accuracy (ppm)	✗ 0,0
Minimum Voltage = Nominal Voltage	<input type="checkbox"/>
Maximum Voltage = Nominal Voltage	<input type="checkbox"/>

Supported Frame Types Configuration

Frame Type No Payload	<input checked="" type="checkbox"/>
Frame Type Bit (False)	<input checked="" type="checkbox"/>
Frame Type Bit (True)	<input checked="" type="checkbox"/>
Keep Alive Frame Type	<input checked="" type="checkbox"/>
1 Byte Frame Type	<input checked="" type="checkbox"/>
2 Bytes Frame Type	<input checked="" type="checkbox"/>
3 Bytes Frame Type	<input checked="" type="checkbox"/>
4 Bytes Frame Type	<input checked="" type="checkbox"/>
5 Bytes Frame Type	<input checked="" type="checkbox"/>
6 Bytes Frame Type	<input checked="" type="checkbox"/>
7 Bytes Frame Type	<input checked="" type="checkbox"/>
8 Bytes Frame Type	<input checked="" type="checkbox"/>
9 Bytes Frame Type	<input checked="" type="checkbox"/>
10 Bytes Frame Type	<input checked="" type="checkbox"/>
11 Bytes Frame Type	<input checked="" type="checkbox"/>
12 Bytes Frame Type	<input checked="" type="checkbox"/>

Figure 12: Device Configuration : Library Part

1. *Device ID* : Candidate Device ID , it is FEDCBA98 by default.
2. *Device Private Key* : Private Key value of the Candidate Device

3.6.1.b Features

Device Configuration

Library Configuration

Device ID : ID[0] = 0x98 ... ID[3] = 0xFE ☒ FEDCBA98

Device Private Key : key[0] = 0x01 ... key[15] = 0xEF ☒ 89ABCDEF0123456789ABCDEF

Features

- 1 Radio Configuration
- 2 RC3 Spectrum Access ☒ NO SELECTED VALUE
- 3 RC Baudrate (bps)
- 4 Message Counter Maximum Value
- 5 Downlink capable ☒
- 6 Monarch Capable ☐
- 7 Public Key switch capable ☐
- 8 Payload Encryption Configuration
- 9 Payload Encryption Rollover Counter value
- 10 Multi Frame Capable ☒
- 11 All Message Types Supported ☒

Hardware Configuration

Oscillator **Aging** for 5 years (ppm) ☒ 2.0

Oscillator **Temperature** Accuracy (ppm)
(Taking into account the operating temperature range) ☒ 3.0

Product's **Population Frequency** Accuracy (ppm) ☒ 4.0

Minimum Voltage = Nominal Voltage ☐

Maximum Voltage = Nominal Voltage ☐

Supported Frame Types Configuration

- 12
- Frame Type No Payload ☐
- Frame Type Bit (False) ☒
- Frame Type Bit (True) ☒
- Keep Alive Frame Type ☐
- 1 Byte Frame Type ☐
- 2 Bytes Frame Type ☒
- 3 Bytes Frame Type ☐
- 4 Bytes Frame Type ☐
- 5 Bytes Frame Type ☐
- 6 Bytes Frame Type ☐
- 7 Bytes Frame Type ☐
- 8 Bytes Frame Type ☐
- 9 Bytes Frame Type ☐
- 10 Bytes Frame Type ☐
- 11 Bytes Frame Type ☐
- 12 Bytes Frame Type ☐

Apply Settings Cancel

Figure 13: Device Configuration : Features Part (Litepoint/Rohde&Schwarz case)

1. **Radio Configuration** : Select the Radio configuration of the *Candidate Device* to configure RSA properly
2. **RC3 Spectrum Access** : Select the proper RC3 spectrum access supported by the *UUT*
3. **RC Baudrate (bps)** : Select the RC baudrate supported by the *UUT*
4. **Message Counter Rollover** : Select the rollover value supported by the *UUT*
5. **Downlink Capable** : Checkbox, select if the *UUT* is Downlink Capable
6. **Monarch Capable** : Checkbox, select if the *UUT* is Monarch capable (Option not available on SDR-Dongle version due to equipment limitations)
7. **Public Key Switch Capable** : Checkbox, select if the *UUT* is Public Key Capable
8. **Payload Encryption Configuration** : Choose the proper configuration (Only for encrypted *Candidate Device*)
 - **No Payload Encryption (default configuration)**
 - **Payload Always Encrypted**
 - **Payload Encryption Capable** : A checkbox will be automatically checked to activate encryption on specific tests
9. **Payload Encryption Rollover Counter Value** : Only for encrypted *Candidate Device*, put the current rollover value of the *UUT*

10. *Multi Frame Capable* : Checkbox, (checked by default) select if the *UUT* is Multi Frame Capable
11. *All Message Types Supported* : Checkbox, select if the *UUT* supports all message types (**be careful, if UUT uses Sigfox library, the "no payload Message Type" is not supported**)
12. *Supported Message type Configuration* : Checkbox, select the supported message types

3.6.1.c Hardware Configuration

Device Configuration

Any change of static configuration will result in a RESET of Information / Verdicts tables

Library Configuration

Device ID : ID[0] = 0x98 ... ID[3] = 0xFE ☒ FEDCBA98

Device Private Key : key[0] = 0x01 ... key[15] = 0xEF ☒ 0123456789ABCDEF0123456789ABCDEF

Features

Radio Configuration: RC1

Message Counter Rollover: 4096

Downlink capable: ☐

Monarch Capable: ☐

Public Key switch capable: ☐

Payload Encryption Configuration: No Payload Encryption

Payload Encryption Rollover Counter value: 0

Multi Frame Capable: ☒

All Message Types Supported: ☒

Supported Frame Types Configuration

Frame Type No Payload: ☒

Frame Type Bit (False): ☒

Frame Type Bit (True): ☒

Keep Alive Frame Type: ☒

1 Byte Frame Type: ☒

2 Bytes Frame Type: ☒

3 Bytes Frame Type: ☒

4 Bytes Frame Type: ☒

5 Bytes Frame Type: ☒

6 Bytes Frame Type: ☒

7 Bytes Frame Type: ☒

8 Bytes Frame Type: ☒

9 Bytes Frame Type: ☒

10 Bytes Frame Type: ☒

11 Bytes Frame Type: ☒

12 Bytes Frame Type: ☒

Hardware Configuration

1 Oscillator Aging for 5 years (ppm) ☒ 0,0

2 Oscillator Temperature Accuracy (ppm) (Taking into account the operating temperature range) ☒ 0,0

3 Product's Population Frequency Accuracy (ppm) ☒ 0,0

4 Minimum Voltage = Nominal Voltage ☐

5 Maximum Voltage = Nominal Voltage ☐

Apply Settings Invalid configuration Cancel

Figure 14: Device Configuration : Hardware Part

1. *Oscillator Aging (ppm)* : Aging value for 5 years from the *UUT* oscillator datasheet
2. *Oscillator Temperature Accuracy (ppm)* : Accuracy from the *UUT* oscillator datasheet taking into account the operating temperature range
3. *Product's Population Frequency Accuracy (ppm)* : Frequency accuracy of the product's population (*UUT* must be a sample of this product's population)

4. *Minimum Voltage = Nominal Voltage* : Checkbox, if the *UUT* has the same voltage value for minimum and nominal
5. *Maximum Voltage = Nominal Voltage* : Checkbox, if the *UUT* has the same voltage value for maximum and nominal

3.6.1.d Error Configuration

The image shows two parts of the RSA configuration interface. On the left is a 'Configuration' sidebar with a 'Device Configuration' tab selected. A red arrow points from this tab to the main 'Device Configuration' window on the right. The 'Device Configuration' window has a warning icon and text: 'Any change of static configuration will result in a RESET of Information / Verdicts tables'. It is divided into 'Library Configuration' and 'Hardware Configuration' sections. In the 'Library Configuration' section, the 'Device ID' field contains 'Error' and has a red cross icon next to it. The 'Device Private Key' field contains '0123456789ABCDEF0123456789ABCDEF' and has a checkmark icon. In the 'Hardware Configuration' section, there are fields for 'Oscillator Aging (ppm)' and 'Oscillator Temperature Accuracy (ppm)', both with checkmarks and the value '10,0'. There are also checkboxes for 'Minimum Voltage = Nominal Voltage' and 'Maximum Voltage = Nominal Voltage', both of which are unchecked. At the bottom right, there is a button labeled 'Apply Settings Invalid configuration' and a 'Cancel' button. A red arrow points from the red cross icon in the 'Device ID' field to the 'Apply Settings Invalid configuration' button.

Configuration

Device Configuration

Test: UL - RF Analysis Nominal Voltage

Clear Results : UL - RF Analysis Nominal Voltage

Raw IQ File

Device Configuration

Any change of static configuration will result in a RESET of Information / Verdicts tables

Library Configuration

Sigfox Addon Version: >= V0.4.0

Device ID : Error

Device Private Key : key[0] = 0x01 ... key[15] = 0xEF

Features

Radio Configuration: RC1

Downlink Modem: ☒

Monarch Capable: ☐

Payload Encryption Configuration: Payload Encryption Capable

Rollover Counter: 0

Hardware Configuration

Oscillator Aging (ppm): ☒ 10,0

Oscillator Temperature Accuracy (ppm): ☒ 10,0

Minimum Voltage = Nominal Voltage: ☐

Maximum Voltage = Nominal Voltage: ☐

Apply Settings Invalid configuration

Cancel

Figure 15: Configuration Error Case

If a field has not been properly filled in, RSA displays a red bubble on the device configuration part, a red cross on the corresponding field and the button "Apply configuration" is not available.

3.6.2 Tests

Be Carefull : Never Stop/Close the operator during a record, RSA could be freeze

To test your device properly follow the Sigfox RF & Protocol Test Procedure available on <https://build.sigfox.com>

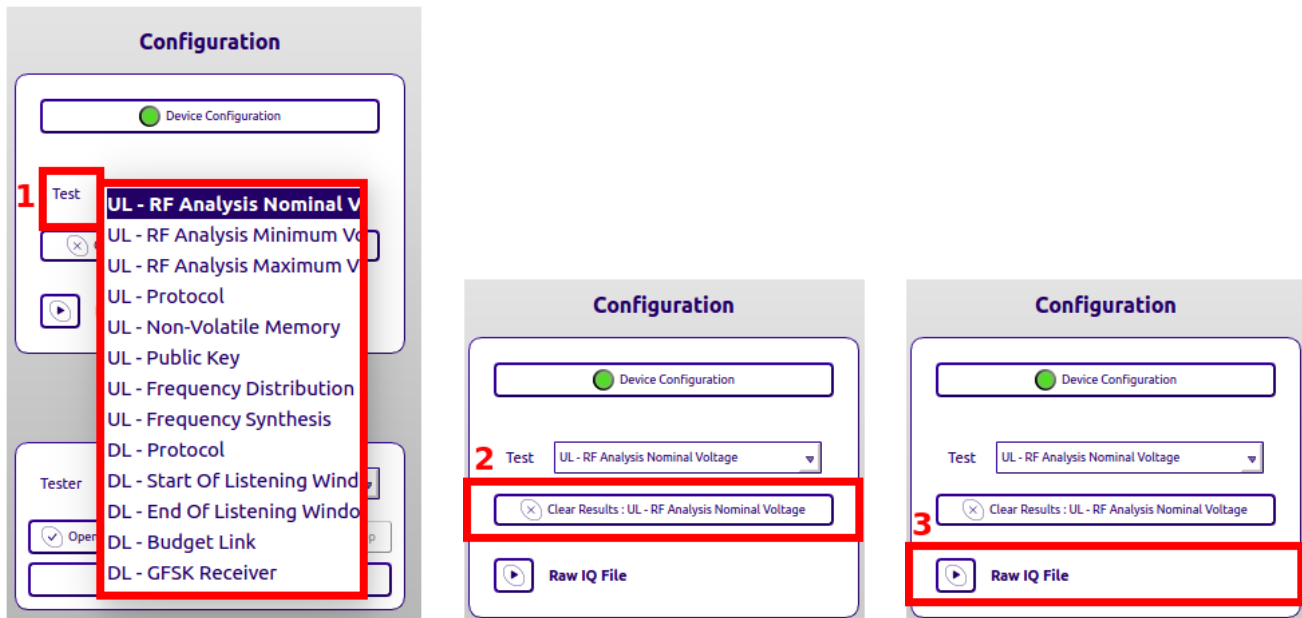


Figure 16: Tests Configuration

Each tests has a specific sub window (description below) with :

1. **Test** : Choose the proper test according to Sigfox RF & Protocol Test Procedure , there are uplink tests (UL), downlink tests (DL) and monarch tests (Monarch).
2. **Clear Test** : Allow to clear the test results (only the current test results) and pictures.
3. **Specific Option (not for all tests)** : Specific option to activate according to the Sigfox RF & Protocol Test Procedure

(Be carefull RSA keeps the worst verdict. Do not forget to make a Clear Test between each attemp)

3.6.2.a Uplink tests (UL)

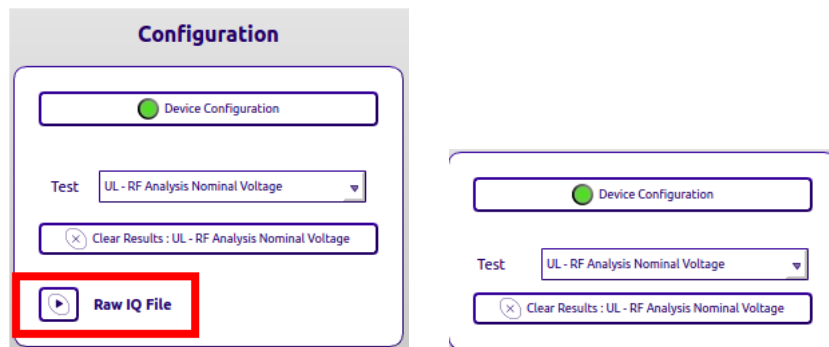


Figure 17: Uplink Tests : Public version (on the left) - TestHouse version (on the right)

Specific Option (only with SDR-DONGLE version) : Raw IQ File : Following the Sigfox RF & Protocol Test Procedure SDR DONGLE, this specific button is used during the test RF Analysis. Click to start recording and click again to stop it.

3.6.2.b Downlink tests (DL)

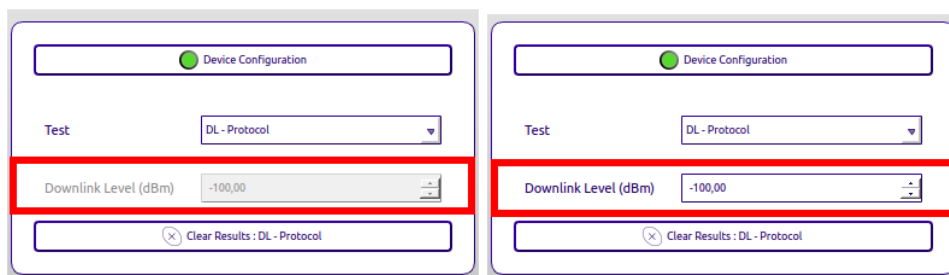


Figure 18: Downlink Tests : Public version (on the left) - TestHouse version (on the right)

Downlink Level (dBm) :

- NOT AVAILABLE with the SDR DONGLE (on the left)
- AVAILABLE with Other Equipment (on the right)

SDR DONGLE limitation :

- Downlink level is not available with the SDR DONGLE due to hardware limitation.
- If the SDR DONGLE freezes during link budget test, click "stop" and "start" again to continue

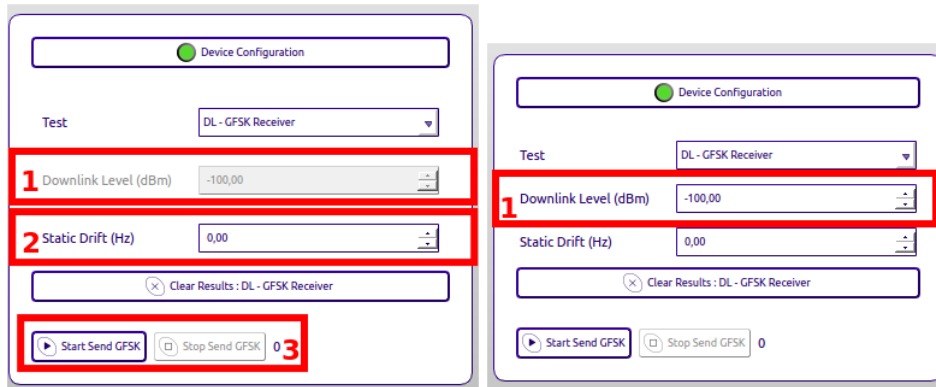


Figure 19: Downlink Tests : Public version (on the left) - TestHouse version (on the right)

1. *Downlink Level (dBm)* :

- NOT AVAILABLE with the SDR DONGLE (on the left)
- AVAILABLE with Other Equipment (on the right)

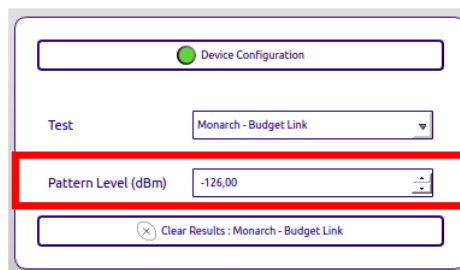
2. *Static Drift (Hz)* : This value is updated automatically by RSA after test RF Analysis.

3. *Start and Stop Send GFSK and counter*

- Allows to start sending GFSK or stop sending
- RSA displays the number of GFSK sent

3.6.2.c Monarch tests (MONARCH)

Specific Feature (NOT AVAILABLE with SDR-DONGLE version).



Specific Option : Pattern Level(dBm) : This value is updated automatically by RSA after test RF Analysis.

3.7 Tester Part

3.7.1 SDR DONGLE

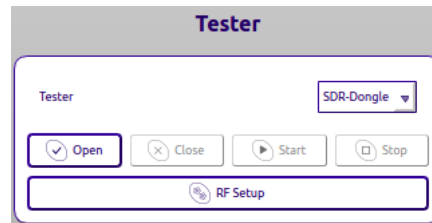


Figure 20: SDR DONGLE RF Setup

With this equipment there is no specific calibration value, RSA already take 40dB attenuator (default attenuator provided with the SDR DONGLE) into account.

3.7.2 Litepoint RF Setup

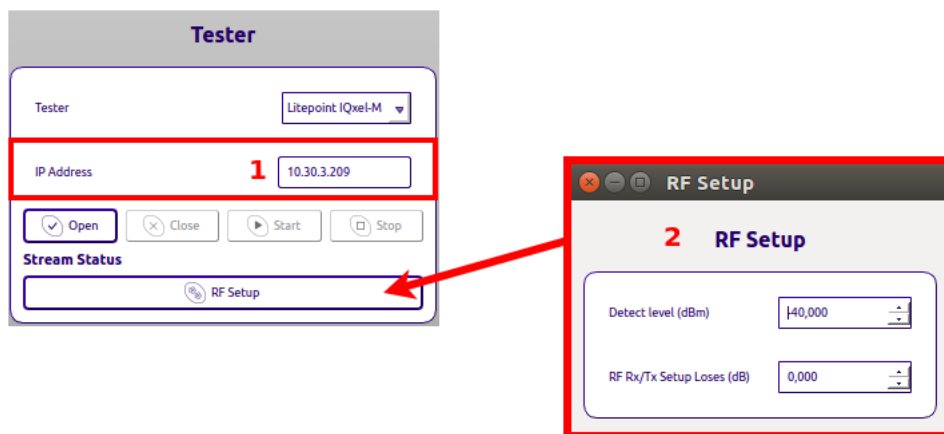


Figure 21: Litepoint RF Setup

Do not forget to calibrate the setup : setup losses (attenuator + cables losses) must be added with a positive value.

1. *IP Address* : Add Litepoint IP Address
2. *RF RX/TX Setup losses (dB)* : Add positive offset for RX/TX losses

Without losses value, RSA results could be wrong or RSA+Litepoint couldn't record signal.

3.7.3 R&S RF Setup

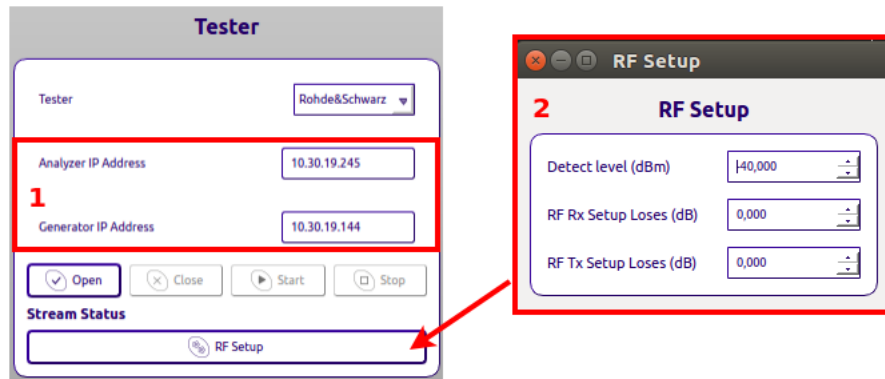


Figure 22: R&S RF Setup

Do not forget to calibrate the setup : setup losses (attenuator + cables losses) must be added with a positive value :

1. *IP Address* :

- *Analysar IP Address* : Add the Spectrum analyser IP address
- *Generator IP Address* : Add the generator IP address

2. *RF Setup losses* :

- *RF RX Setup losses (dB)* : Add RX losses positive offset
- *RF TX Setup losses (dB)* : Add TX losses positive offset

Without losses value, RSA results could be wrong or RSA+R&S couldn't record signal.

3.8 Demodulation Sub Window

<div> <div>FFT</div> <div>Demodulation</div> <div>RF Measurement</div> <div>Frequency Distribution</div> <div>Info / Equipment / Verdicts</div> </div>																
17	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Modulation	Type	Frame #	Rep bit	Freq (Hz)	Rssi (dBm)	Start (s)	Stop (s)	Length (s)	Id	Msg counter	Downlink ?	Data	Hmac Status	Crc Status	Raw Frame
1	PSK	Data	1	No	-13999	-26.23	4.325	6.405	2.080	FEDCBA98	1232	Yes	40 41 42 43 44 45 46 47 48 49 4A 4B	OK	OK	AA AA A0 AC 24 D9 98 BA DC FE 40 41...
2	PSK	Data	2	No	-8029	-25.80	6.922	9.002	2.080	FEDCBA98	1232	Yes	40 41 42 43 44 45 46 47 48 49 4A 4B	OK	OK	AA AA A0 71 3F 8C F2 C9 05 BE F0 71...
3	PSK	Data	3	No	-20031	-26.15	9.520	11.600	2.080	FEDCBA98	1232	Yes	40 41 42 43 44 45 46 47 48 49 4A 4B	OK	OK	AA AA A0 97 2D E4 BE 94 68 C1 D0 51...
4	GFSK	Data	-	-	-13999	-100.00	36.405	36.778	0.373	-	-	-	-	-	-	AA AA AA AA AA AA AA AA AA AA AA S...
5	PSK	Dlx Conf.	1	No	68162	-28.56	40.489	42.249	1.760	FEDCBA98	1233	No	Voltage Idle = 0 mV - Voltage Tx = 0 mV - Temperature = 0 °C - Rssi = -97 ...	OK	OK	AA AA AF 67 04 D1 98 BA DC FE 09 00...
6	PSK	Bit	1	No	30001	-20.02	45.563	46.683	1.120	FEDCBA98	0	No	Bit State = True	OK	OK	AA AA A0 6B C0 00 98 BA DC FE AA B1...
7																

Figure 23: Demodulation Sub-Window

1. Modulation

- **AM** : Frame sent by the *UUT*
- **PSK** : Frame sent by the *UUT*
- **GFSK** : GFSK sent by RSA after downlink request
- **MONARCH** : Monarch Beacon sent by RSA after monarch request

2. Type

- **Data** : Frame sent by the *UUT* or GFSK sent by RSA after downlink request
- **Oob After Downlink** : Frame sent by the *UUT* after receiving GFSK from RSA

3. **Frame #** : Frame number from 1 to 3

4. **Rep bit** : Repeater bit

5. **Frequency (Hz)** : Offset from the center frequency

6. **RSSI (dBm)** : RSSI value of the frame

7. **Start (s)** : Beginning of the frame

8. **Stop (s)** : End of the frame

9. **Length (s)** : Length of the frame (Can be between 1s and 2.1s)

10. **ID** : ID of the Device, should be FEDCBA98 for testing

11. **Sequence** : Sequence Number, this value should be incremented after each Sigfox Message

12. **Downlink ?**

- **Yes** : Downlink Request asked by the *UUT*
- **No** : Uplink Only, No downlink request asked by the *UUT*

13. **Data** : Data from the frame (decrypted in encryption mode)

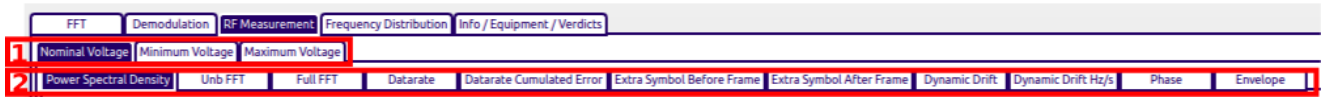
14. **HMAC Status** : Should be OK or KO only (If KO, check the KEY used by RSA and the *UUT*)

15. **CRC Status** : Should be OK or KO only

16. **Raw Frame** : Full frame information

17. **Number of Frame** : RSA display 1000 row maximum and comes back to 1 after

3.9 RF Measurement Sub Window



1. *Voltage* : Sigfox RF & Protocol Tests should be done on the full voltage range of the *Candidate Device* .
2. *RF Measurement* : sub-window for each RF requirement.

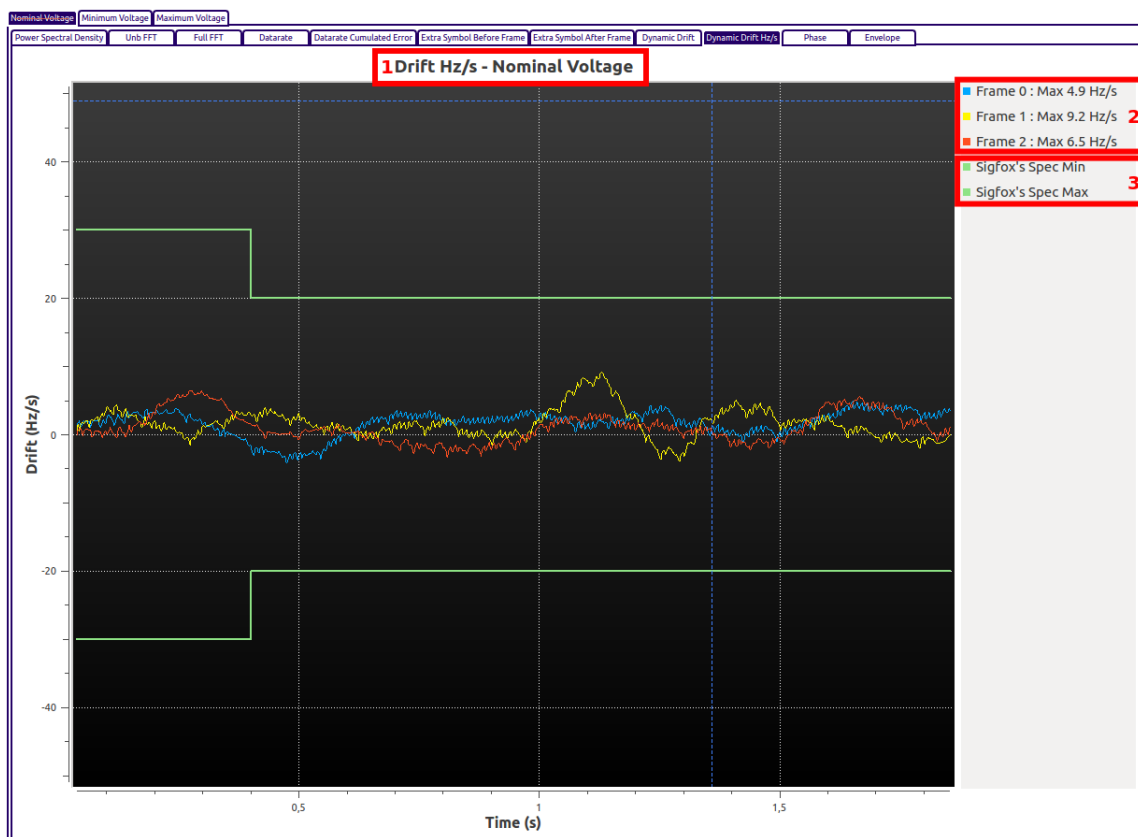


Figure 24: Drift Measurement example

1. *Title* : Title for each graph with voltage option
2. *Results* : Worst value reported by RSA for each frame
3. *Specification* : Limit min and max of the specification

3.10 Frequency Distribution Sub Window

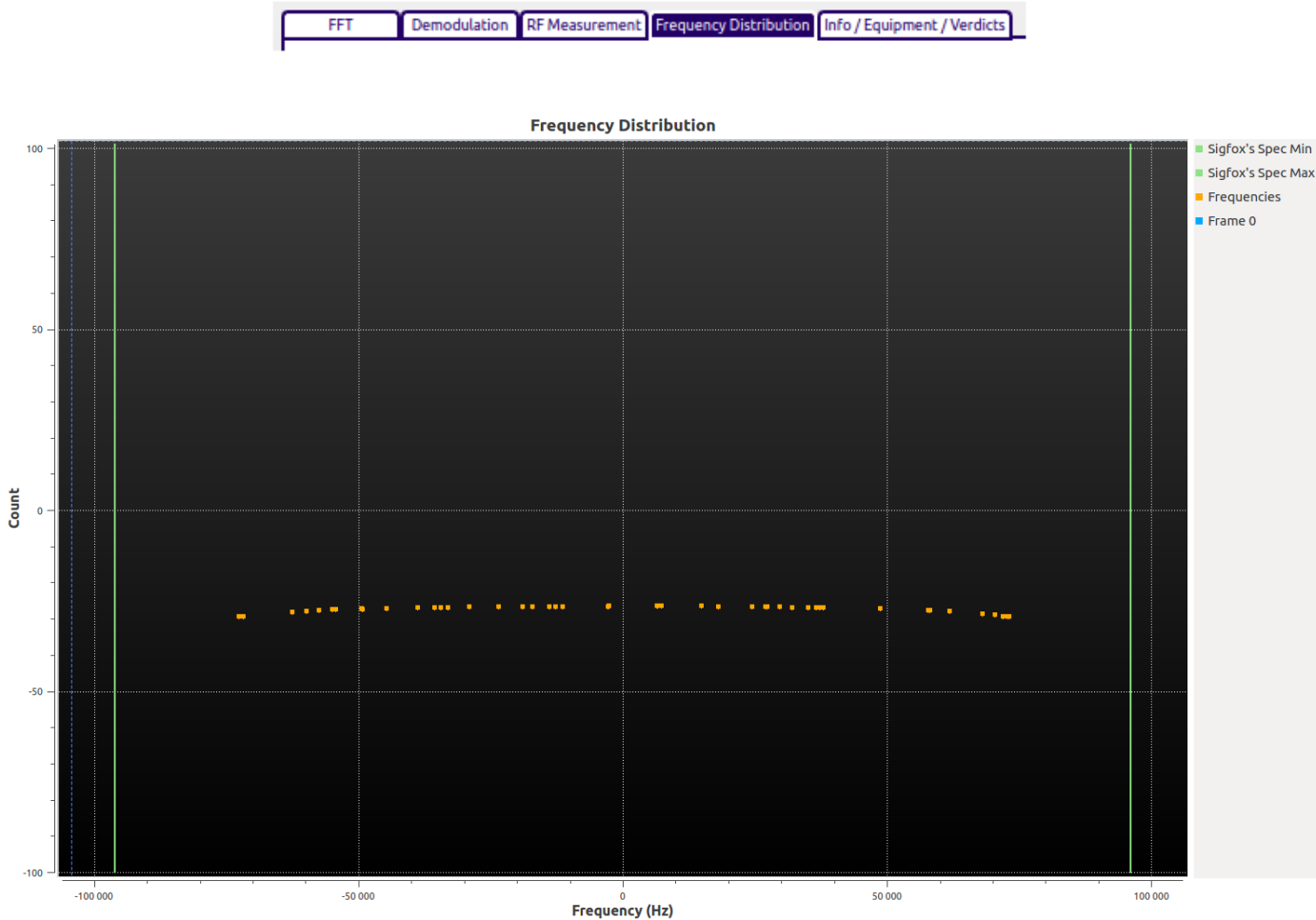


Figure 25: Frequency Distribution Ongoing

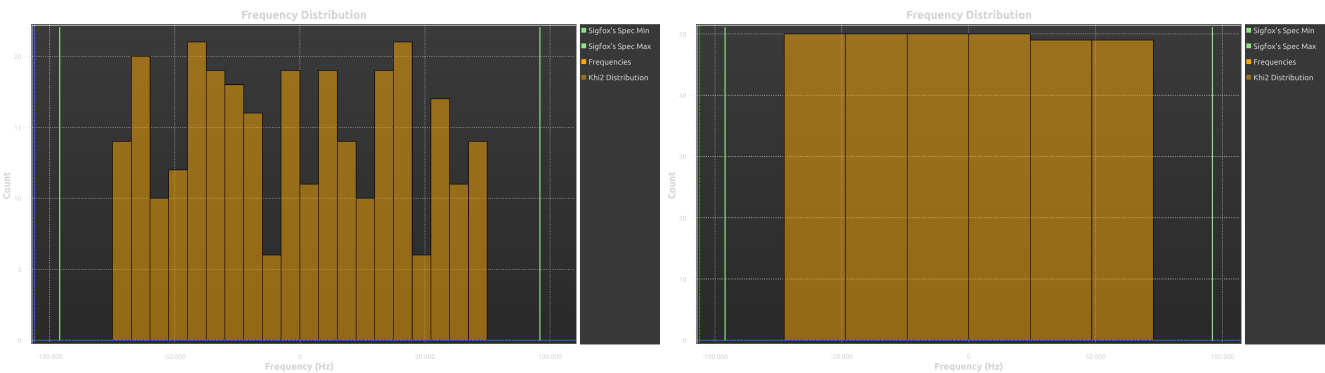


Figure 26: Final Frequency Distribution Example : 100bps (on the left) - 600bps (on the right)

3.11 Info/Equipment/Verdicts Sub Window

3.11.1 Information

FFT

Demodulation

RF Measurement

Frequency Distribution

Info / Equipment / Verdicts

Export Results : Save RF Measurements and Verdicts Table

Information

Equipment

Verdicts

Information	Content
1 Reference (Report reference)	
2 Test Date (YYYY-MM-DD international format)	
3 Tester Name	
4 Approver Name	
5 Manufacturer Name	

Information	Content
1 Product Type (Modular Design/Device)	
2 Commercial Name	
3 Model Name	
4 Hardware version	
5 Firmware Version	
6 Library Version	

Figure 27: Equipment Information SDR DONGLE

- 1. *Report Information* : Add all report information
- 2. *Device Information* : Add all device information

3.11.2 Equipment

FFT

Demodulation

RF Measurement

Frequency Distribution

Info / Equipment / Verdicts

Export Results : Save RF Measurements and Verdicts Table

Information

Equipment

Verdicts

TestSetup		Equipments	
1	Modulation Quality		
2	Demodulated Information		
3	Rx		
4	Tx/Rx		
5			
6			
7			
8			
9			
10			

Test Environment		Value
1	Sensitivity Uncertainty	+/- x dB
2	Temperature Uncertainty	+/- x °C
3	Power Measurement Uncertainty	+/- x dB
4	Temperature	x °C
5		
6		
7		
8		
9		
10		

Reference	Name	Manufacturer	Serial Number	Last calibration	Next calibration
1	A	SDR-Dongle	Sigfox		
2					
3					
4					
5					
6					
7					
8					
9					
10					

Figure 28: Equipment Information SDR DONGLE

1. *Test Setup* : Add all equipment reference for each test setup
2. *Test Environment* : This part should be filled in will equipment uncertainty and environment condition
3. *Equipment Reference* : RSA will detect automatically the Equipment used (in this Example : SDR DONGLE)
4. *Save/Load Setup* : Specific button to save and/or load this setup window

3.11.2.a Equipment References

1	2	3	4	5	6
Reference	Name	Manufacturer	Serial Number	Last calibration	Next calibration
1	A	SDR-Dongle	Sigfox		
2					
3					
4					
5					
6					
7					
8					
9					
10					

1. **Reference** : A Specific letter for each equipment, can be used to fill in the Test Setup part below
2. **Name** : Name of the equipment : Generator, Spectrum Analyser, SDR DONGLE, etc ...
3. **Manufacturer** : Manufacturer of the equipment : R&S, Sigfox, etc ...
4. **Serial Number** : Serial Number of the equipment
5. **Last Calibration** : Previous calibration date (YYYY-MM-DD)
6. **Next Calibration** : Next calibration date (YYYY-MM-DD)

All reference, name, manufacturer and serial number for equipment used directly by RSA will be filled in by RSA. Other equipment (attenuator, other generator, etc ...) and information (calibration date) have to be added by the operator.

3.11.2.b Test Setup

1	TestSetup	2	Equipments
1	Modulation Quality		
2	Demodulated Information		
3	Rx		
4	Tx/Rx		
5			
6			
7			
8			
9			
10			

1. **Test Setup** : These Test Setup Name are used in the Sigfox RF & Protocol Test Plan and represent a part of certification (Modulation Quality represent TX-BPSK for example)
2. **Equipment** : Fill in this part with the reference of all equipment used for each specific Test Setup Name, it could be the serial number of the equipment or the reference form previous table

3.11.2.c Test Environment

1	Test Environment	2	Value
1	Sensitivity Uncertainty	+/- x dB	
2	Temperature Uncertainty	+/- x °C	
3	Power Measurement Uncertainty	+/- x dB	
4	Temperature	x °C	
5			
6			
7			
8			
9			
10			

Test Environment	Value
1	Sensitivity Uncertainty +/- 1 dB
2	Temperature Uncertainty +/- 2 °C
3	Power Measurement Uncertainty +/- 0.5 dB
4	Temperature 25 °C
5	
6	
7	
8	
9	
10	

Figure 29: Test Environment Example (on the right)

1. **Test Environment** : Could be uncertainty values from equipment datasheet or environment values as ambient temperature

2. *Value* : Operator has to replace the "x" for all uncertainty and environment values

Operator can add other equipment uncertainty or environment condition : Pressure, humidity, etc ...

3.11.2.d Save and Load Setup



1. *Save Setup* : Operator can save the full equipment window and keep all information
2. *Load Setup* : Operator can load setup file (saved last time) if the setup is still the same

Operator can save several test setup with different information, just be carefull to load the proper file.

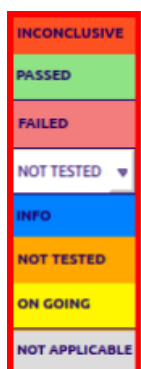
3.11.3 Verdicts

3.11.3.a Results window

	1	2	3	4	5	6	7	8	9	10
	PRS-RFP	Description	Feature	Voltage	Criteria 1	Criteria 2	Result 1	Result 2	Verdict	Comment
1	[PRS-RFP-001]	Spectral Occupation Products Population		Vnom	9	50 Hz			NOT TESTED	
2	[PRS-RFP-002]	Operational Frequencies Range		Vnom	300	136800 Hz			NOT TESTED	
3	[PRS-RFP-003]	Operational Frequencies Distribution		Vnom	300	20			NOT TESTED	
4	[PRS-RFP-004]	Static Frequency Tolerance		Vnom	-20 ppm	20 ppm			NOT TESTED	

1. *PRS-RFP* : Same requirement number as the Sigfox RF & Protocol Specifications
2. *Description* : Same requirement title as the Sigfox RF & Protocol Specifications
3. *Feature* : Specific Feature in case of Downlink, Encryption, Monarch, etc..
4. *Voltage Condition* : Voltage selected for this requirement (test condition)
5. *Criteria 1* : Should be the first criteria of the Sigfox RF & Protocol Specifications or minimum Criteria
6. *Criteria 2* : Should be the second criteria of the Sigfox RF & Protocol Specifications or maximum Criteria
7. *Result 1* : Result according to *Criteria 1*
8. *Result 2* : Result according to *Criteria 2*
9. *Verdict* : RSA has several verdict type (description below)
10. *Comment* : Comment part, should be explanation of the test, etc ...

3.11.3.b Verdicts definition



1. *Inconclusive* : The test has been executed but cannot be Passed or Failed due to equipment limitation (SDR DONGLE only) and/or the test has not been properly executed
2. *Passed* : The test match with the Sigfox specification
3. *Failed* : The test does not match with the Sigfox specification
4. *Manual* : This verdict is manual and should be Passed or Failed according to the Sigfox RF & Protocol Test Procedure . This verdict is white to differ from verdict 6 which is automatic.
5. *Info* : Measurement has been done but it's not a verdict
6. *Not Tested* : The test has not been executed
7. *On going* : The test has been started - still on going.
8. *Not-Applicable* : The test is not-applicable according to the device configuration, this requirement will not be checked

3.11.4 Export Results



- Click "Export Results"

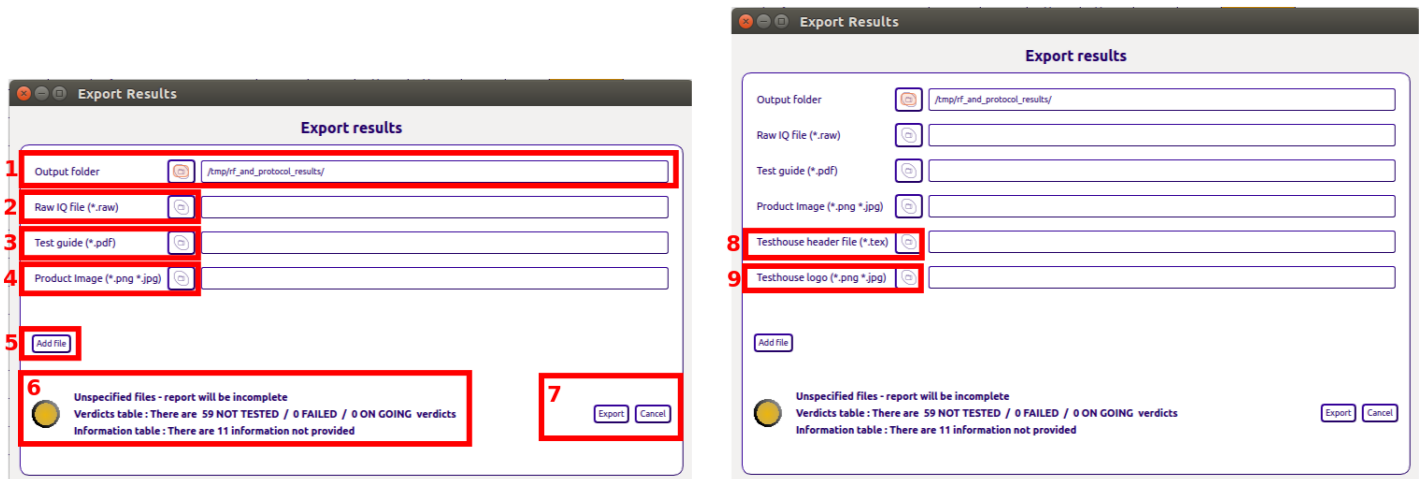


Figure 30: Public Version (on the left) - Test House version (on the right)

- Output folder** : Create a new folder for each new testing
Be carefull, RSA will delete all content of the destination folder before exporting. You can export directly on an external drive (NOT the bootable USB key currently used).
By default the output folder is in /tmp, do not forget to change this output folder or to move the folder after exporting results.
- Raw IQ file (.raw)** : Select the I/Q record
- Test Guide (.pdf)** : Select the *RF & Protocol Test Guide* (.pdf is mandatory)
- Product Image (.png, .jpg)** : Select a picture of the device (size limited to 4MB, in .png or .jpg format)
- Add file** : Tester can add more files which will be integrated in the final tar.gz
- Error message from RSA** : Check this part before exporting results. tar.gz should be full, without NOT-TESTED tests
- Export** : Choose "Export" to generate the sigfoxrfandprotocol.tar.gz (this archive contains results, verdicts, pictures ...) or "Cancel" if something is missing
- Test House Header file (.tex)** : ONLY FOR TEST HOUSE, add test house information file
- Test House Logo (.png, .jpg)** : ONLY FOR TEST HOUSE, add test house logo (size limited to 4MB, in .png or .jpg format)

Be carefull, if one document is missing (Test Guide, Product Image, etc..), final test report cannot be generated

4 APPENDIX

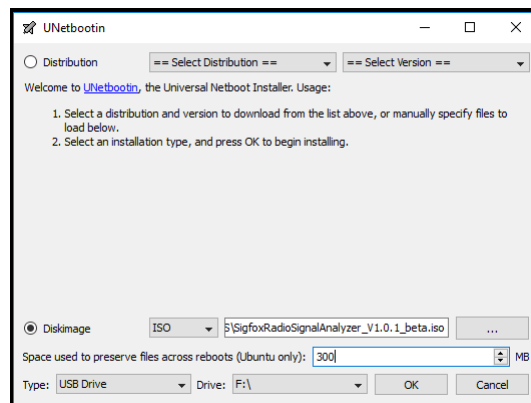
4.1 Password

When the Ubuntu session goes to "sleep" mode, if the session gets locked or suspended, a password is requested to resume the session. The password is "rsa". Be careful, by default, Ubuntu session keyboard is "qwerty".

4.2 Create a bootable USB to use RSA

1. Download UNetbootin at this address: <http://unetbootin.github.io/>

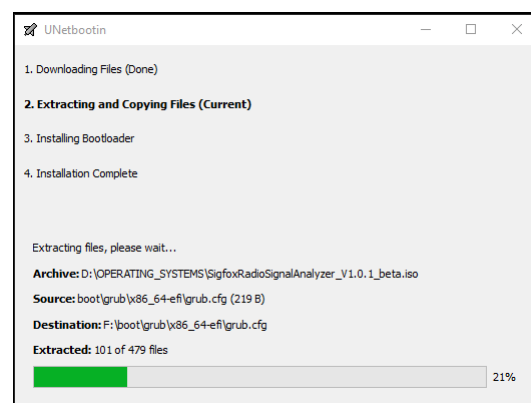
It is a simple prebuilt program it won't be installed on the computer, just run it.



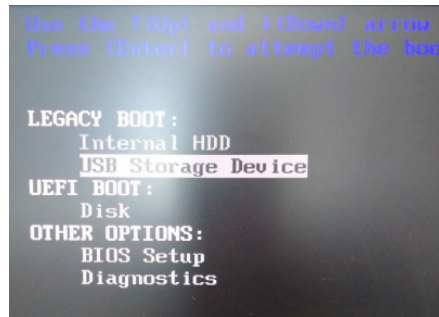
2. Select "Diskimage" - "ISO" - path to /SigfoxRadioSignalAnalyzer.iso

Select "Type" USB Drive and the mounted drive that was enumerated. Click on "OK" and wait for the last step

4. Installation Complete



3. Once complete, you can use the boot option on your laptop/computer to boot on the RSA USB (example below)



4.3 RSA Error Code

4.3.1 Error Code coming from Hardware Equipment

Equipment	Error / Warning	Procedure
Litepoint	<i>Error 57 or 11 or 7</i>	<ul style="list-style-type: none"> • Close Litepoint in Tester part • Turn off Litepoint Equipment • Turn on Litepoint Equipment • Open Litepoint in Tester part
	<i>Other Error code</i>	In case of another error code, try the procedure above.
R&S		Check the R&S VISA error code returned by RSA (in the popup) and check the R&S VISA error code documentation.
SDR Dongle	<i>Link budget</i>	If RSA seems stuck during link budget test : <ul style="list-style-type: none"> • Stop SDR-DONGLE in Tester part • Start SDR-DONGLE in Tester part
	<i>Lib USB error</i>	Do not remove SDR-Dongle before : <ul style="list-style-type: none"> • Stop SDR-DONGLE in Tester part • Close SDR-DONGLE in Tester part • Remove SDR-DONGLE • Connect SDR-DONGLE • Open and Start it in Tester part again

4.3.2 Warning coming from RSA

Error / Warning	Procedure
<i>Cannot open stream source Error</i>	Check the Equipment connection (ip, usb, cables...)
<i>Export result / no write permission</i>	Change the output folder or check and change right for the current folder
<i>Test/information missing to export</i>	Check if all tests have been executed, all documents attached in the export result sub-window.
<i>Acpi Error</i>	Disable acpi (acpi=off command) when USB booting
<i>Ongoing Test</i>	All ongoing tests will be automatically failed during export
<i>Default output folder</i>	/tmp is the default output folder, this folder can be reset, so do not forget to move the final tar.gz generated
<i>Export Result remove files</i>	All files/folders will be removed in the output folder during export.
<i>Test Error/Warning</i>	An error/warning can be returned by RSA in verdict sub-window (current test line) : <i>Example during link budget test : if RSA and device are not synchronized, stop the device, clear the link budget test, start RSA, start the device again.</i>
<i>Downlink Error</i>	If RSA does not send the GFSK, check the demodulation sub-window, in case of HMAC error on uplink frame sent by the device for example, RSA will not send the response.
<i>Spec does not exist</i>	Contact Sigfox support.