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S2-LP: Ultra low power high performance SubGHz Transceiver.

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Agenda

1 SubGHz Product Portfolio

5 PC-GUI

2 S2-LP

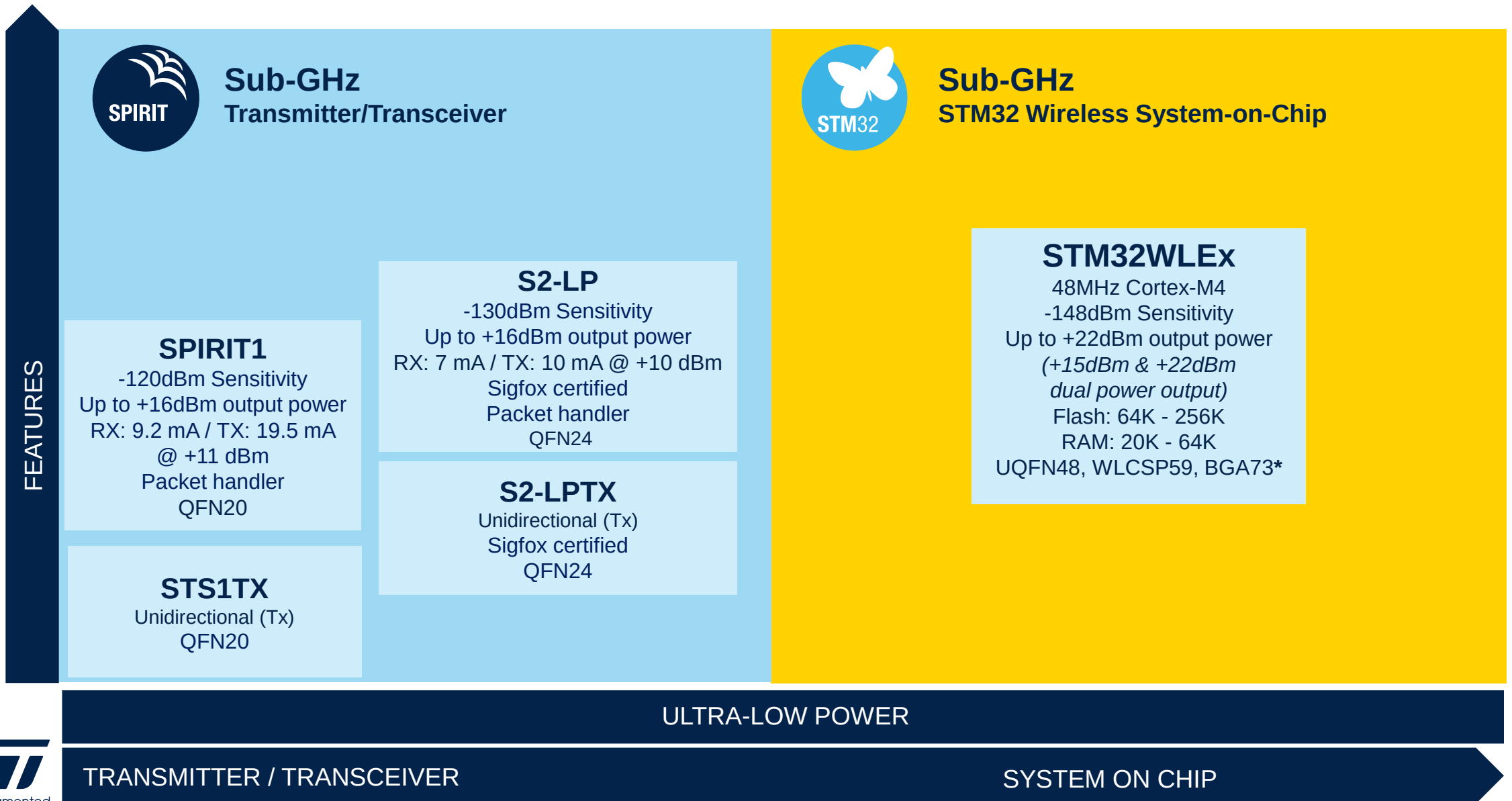
6 Getting started and Demo

3 S2-LPTX

7 Conclusion

4 Tools

Sub-1 GHz wireless portfolio





Sub-1 GHz proprietary radio for the remote monitoring and control



150-174 MHz
300-348 MHz
387-470 MHz
779-956 MHz



SPIRIT1

- RX: **9.2 mA** / TX: **19.5 mA** @ +11 dBm
- Sleep/Stby: **850 nA** / **600 nA**
- Max.Out: **+16 dBm**
- Sensitivity: **-120dBm**
- Mod: 2(G)FSK, OOK
- QFN20 4x4

Markets



Remote metering



Smart living



Alarm & surveillance



Smart home



Smart utilities



Healthcare & assistance



Smart parking



Smart agriculture



413-479 MHz
826-958 MHz
452-527 MHz
904-1055 MHz



S2-LP / S2-LPCB

- RX: **7 mA** / TX: **10 mA** @ +10 dBm
- Sleep/Stby: **700 nA** / **500 nA**
- Max.Out: **+16 dBm**
- Sensitivity: **-130 dBm**
- Mod: 2(G)FSK, 4(G)FSK, OOK/ASK
- QFN24 4x4





S2-LPTX radio transmitter

S2-LPTX

- **Pin to Pin compatible** with S2-LP
- QFN24 4x4x1

SUB
GHz

Radio performance

- Frequency bandwidth
- 413-479 MHz
- 826-958 MHz
- 300bps to 500kbps
- **+16dBm** output power



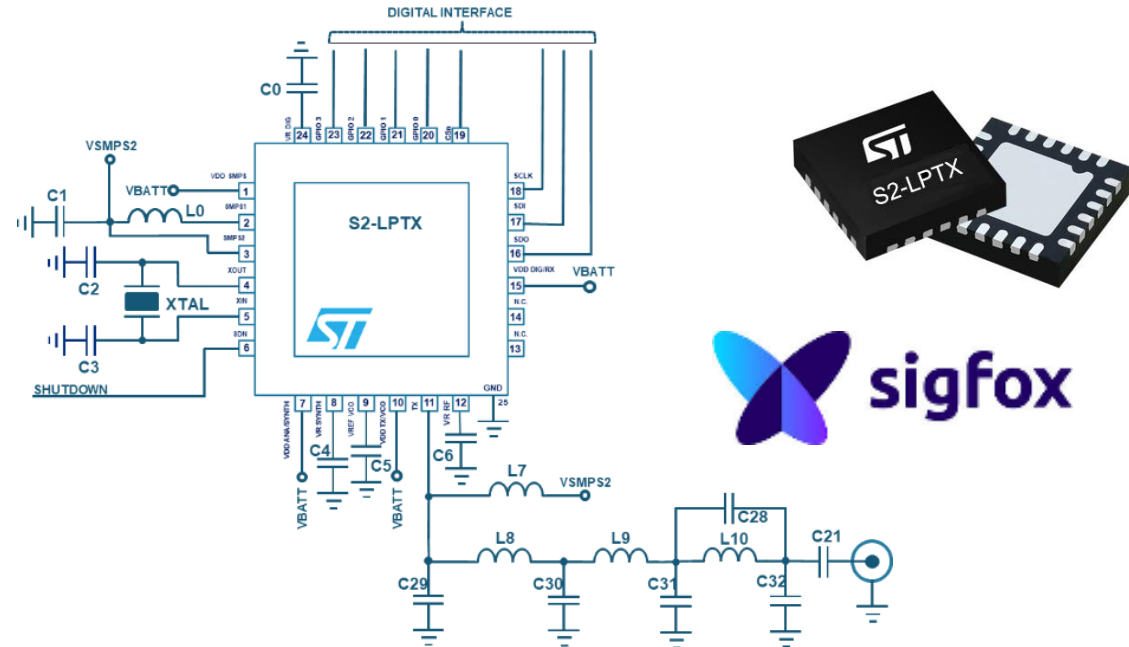
Ultra low-power consumption

- Sleep / Shutdown: 700nA / 2.5nA
- Tx peak current: **10mA @ +10dBm**



Applications

- Asset Tracking
- Alarm System
- Home and Building Automation
- Remote key entry
- Wireless Sensor Networks





S2-LP and Sigfox Ecosystem

Hardware development tools



- STEVAL-FKI433V2
- STEVAL-FKI512V1
- STEVAL-FKI868V2
- STEVAL-FKI915V1
- STEVAL-FKI001V1

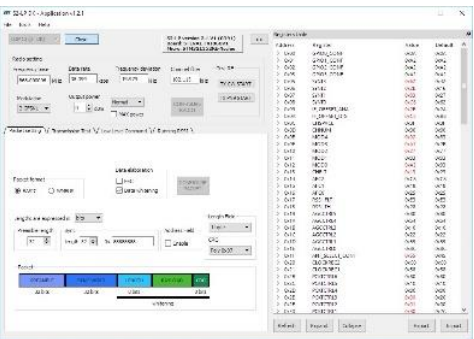


- X-NUCLEO-S2868A1
- X-NUCLEO-S2915A1



Software development tools (GUI, SDK, protocols, RF libraries, etc.)

STSW-S2LP-DK



S2-LP PC GUI + S2-LP SDK



STSW-S2LP-SFX-DK



Sigfox PC GUI + Sigfox SDK

STSW-BNRG-S2LP



DUAL-RADIO SDK

X-CUBE-SFXS2LP1

Application	Push Button Demo	CLI Demo
Middleware	Sigfox Library	
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)	
Hardware	STM32 Nucleo expansion boards X-NUCLEO-S2868A1 (Connect)	
	STM32 Nucleo development board	

Sigfox SDK

X-CUBE-SUBG1

Application	wM-Bus standalone meter	UPD sender and receiver
Middleware	wM-Bus library	Contiki OS and 6LoWPAN stack
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)	
Hardware	STM32 Nucleo expansion boards X-NUCLEO-ID501A4 (Connect) X-NUCLEO-ID501A5 (Connect) X-NUCLEO-S2868A1 (Connect)	
	STM32 Nucleo development board	

S2-LP SDK





STSW-S2LP-DK

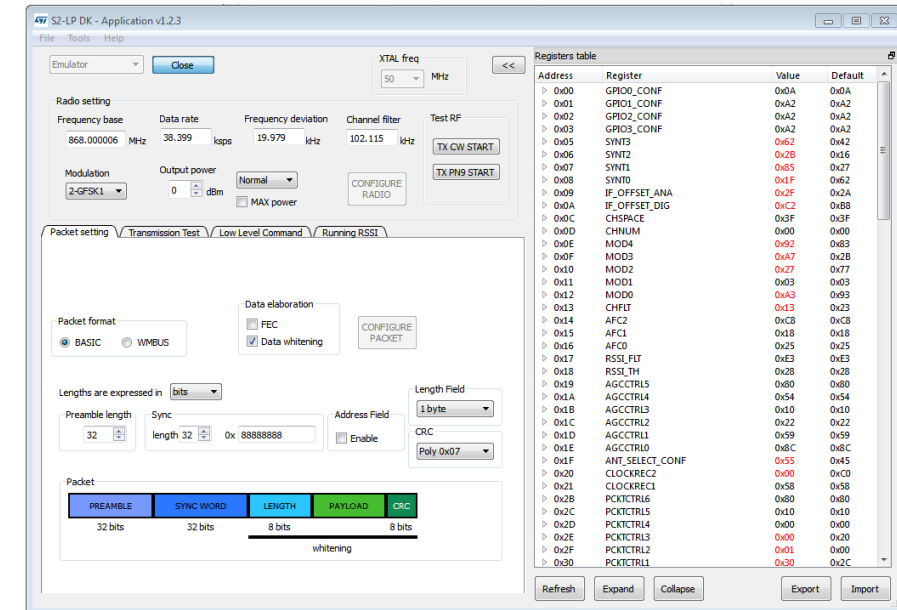
<https://www.st.com/en/embedded-software/stsw-s2lp-dk.html>

- **PC GUI:**

- Radio and packet handler easy configuration
- RF tests and Packet transmission/reception test with PER evaluation
- Register read/write and dump
- C-code generation for fast configuration

- **Firmware examples:**

- Demonstrate how to use the S2-LP features in an STM32 embedded application
- In a single IAR workspace
- Each program (A and B roles of each example) is an IAR and MDK-ARM Keil configuration and can be compiled and flashed onto the NUCLEO board using the embedded ST-Link.



- **Documents:**

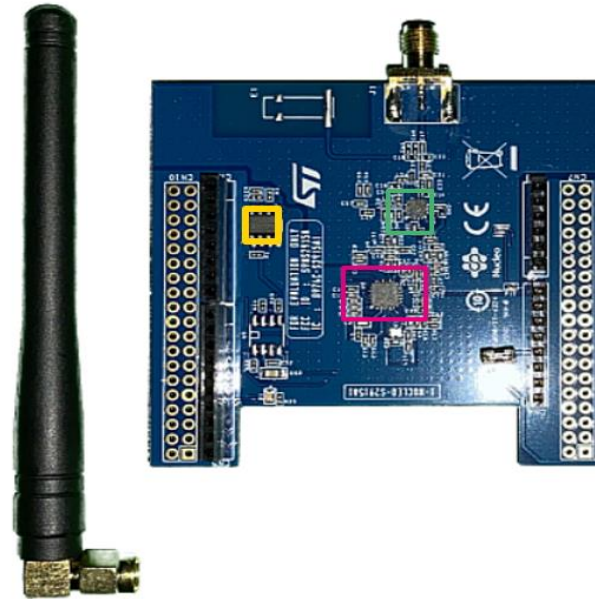
- UM2149: **Getting started** with the S2-LP development kits
- **Schematics, Gerber file** and **BOM** of each STEVAL-FKlxxx board
- **Firmware Doxygen documentation**



Getting started and demo

Hardware development tools

SubGHz proprietary protocol



X-Nucleo-S2915A1

- Frequency band 860 – 940Mhz
- Power output +27dBm
- Part of STM32 Development Environment
- Supported by X-CUBE-SUBG2 and X-CUBE-SFXS2LP1
- Supported by our PC-GUI



Expansion software packs

- X-CUBE-SUBG2
- X-CUBE-SFXS2LP1

- S2-LP (High performance ultra low power SubGHz transceiver)
- SKY66420 (+27 Power Amplifier)
- M95640 (64 Kbit EEPROM)

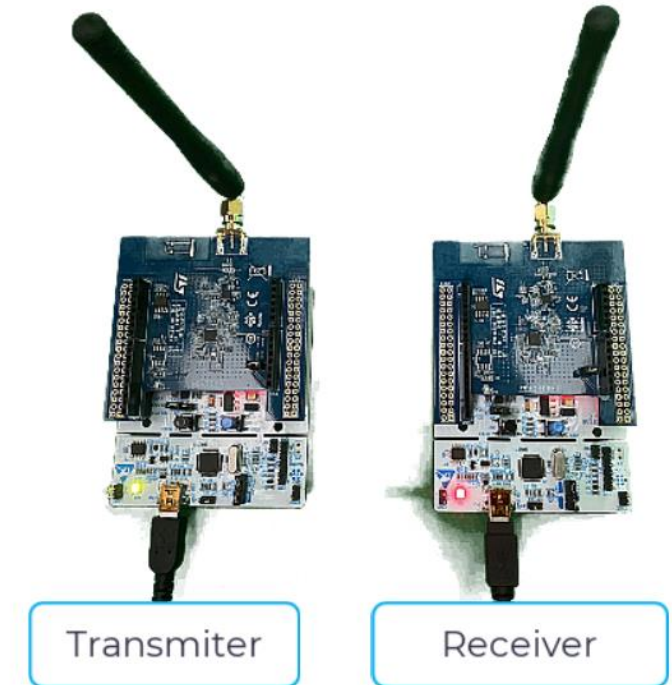


Getting started and demo

PC-GUI – S2-LP democ

Steps:

- Download and Install the [STSW-S2LP-DK](#).
- Connect both boards to the PC and open the PC-GUI.
- Select the appropriate comport for each board.
- Configure the frequency of the carrier
- Configure the data rate
- Configure the channel filter which affects the receiver board
- Select the modulation scheme
- Select the output power
- Configure the radio by clicking the **Configure Radio** button.
- Implement these settings for both boards.
- On the **Packet Setting** tab, configure the packet format and press the **Configure Packet** button.
- Implement these settings for both boards.

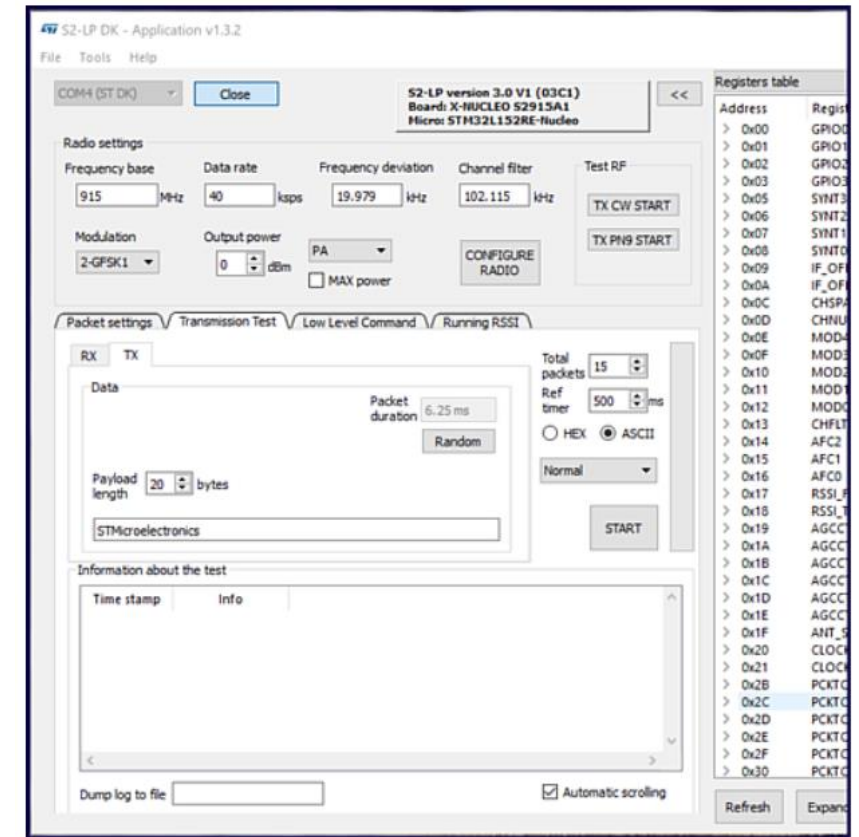


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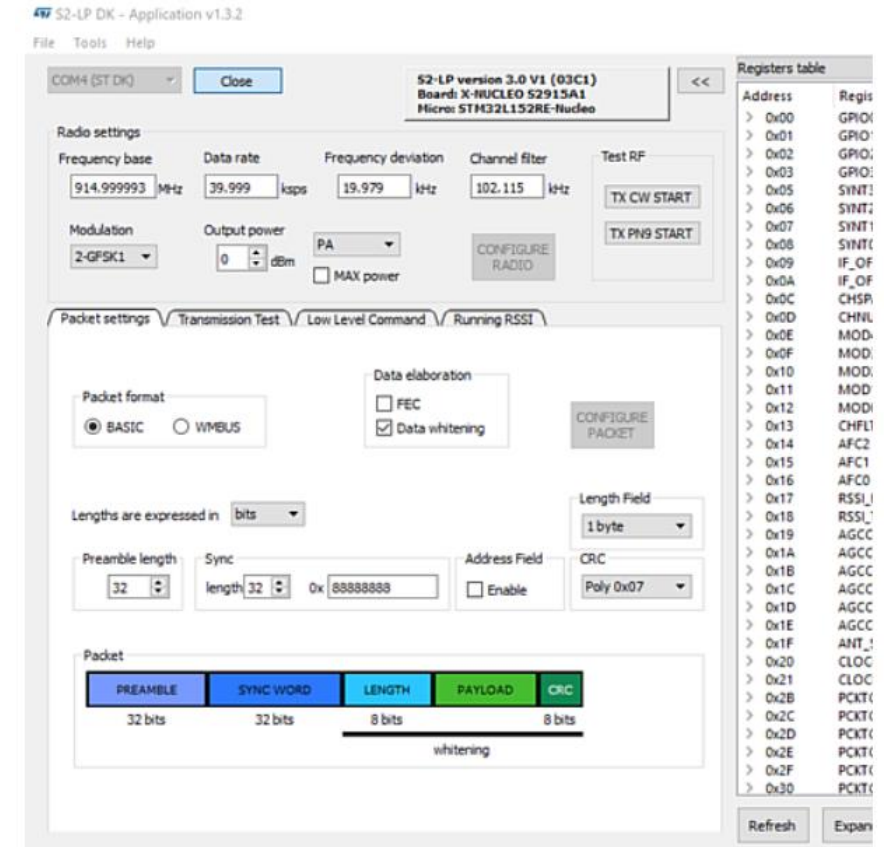


Getting started and demo

PC-GUI – S2-LP demo

Steps:

- On the **Transmission Test** tab in the GUI connected to the board that is acting as transmitter select the **Tx** tab.
 - Configure the payload
 - Configure the total number of packets that will be sent.
- On the **Receiver** tab in the GUI connected to the board that is acting as a receiver.
 - Set the number of packets that we are expecting to receive.
- Press the start button (receiver board)
- On the **Tx** tab in the GUI connected to the board that is acting as a transmitter press the **Start** button.





Getting started and demo

PC-GUI – S2-LP demo – Reviewing the results.

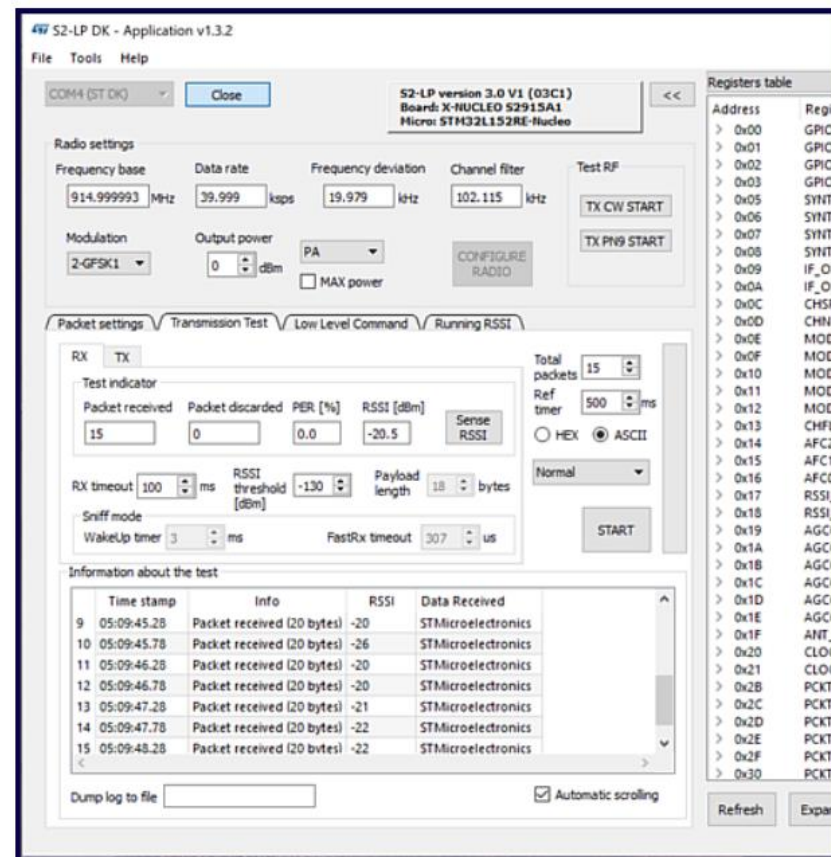
Steps:

On the **RX** tab in the GUI connected to the board that is acting as receiver we find the results of the transaction with the following info:

- Number of packets received
- Number of packets discarded
- PER%
- RSSI

In our case we got the following results:

- Out of the 15 packets sent we received 15.
- PER% was zero.





S2-LP

- The S2-LP is a high performance ultra low power SubGHz transceiver ideal for applications running on batteries
- It has an excellent radio performance with an output power of +16dBm's and a sensitivity of -130 dBm's
- It supports multiple modulation schemes and frequency bands
- The S2-LPTX is the transmitter with the same high performance and ultralow power consumption ideal for low cost applications.
- ST offers a complete set of hardware and software tools as the PC-GUI with fully working examples to speed up time to market.



Thank you